PC

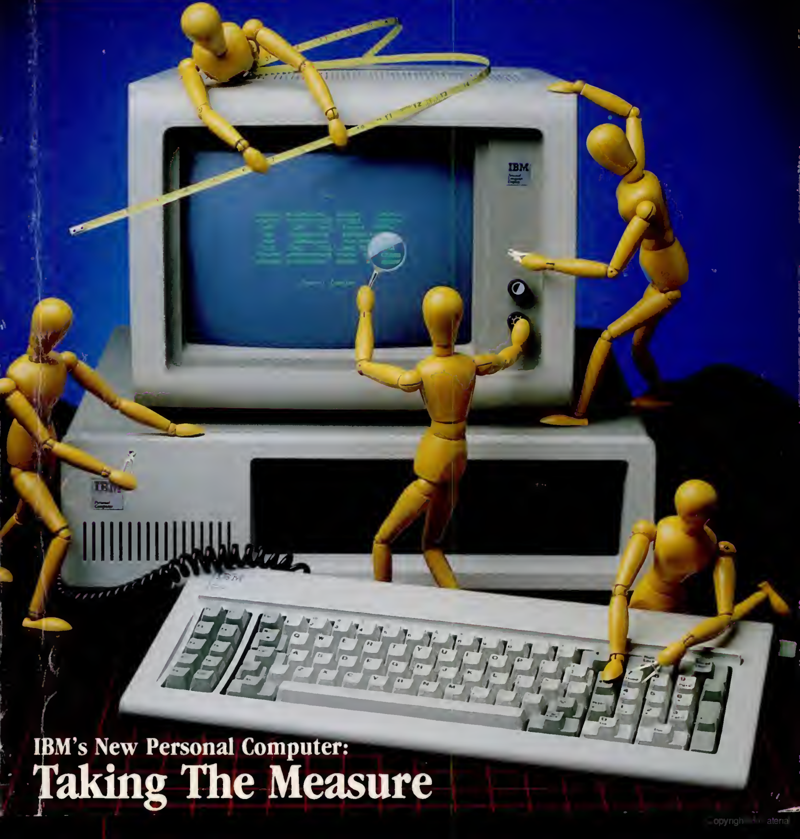
The Independent Guide to IBM Personal Computers

Charter Issue

The Man Behind The Machine?

"Not-so-EasyWriter" A User's Report

Product reports: TecMates, Mathemagic, Visi-1040, The Freedom Network, and more . . .



IBM's New Personal Computer:

Taking The Measure

Presenting the IBM® of Personal Computers.

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It's a computer that has reached a truly personal scale in size and in price: starting at less than $1,600† for a system that, with the addition of one simple device, hooks up to your home TV and uses your audio cassette recorder.

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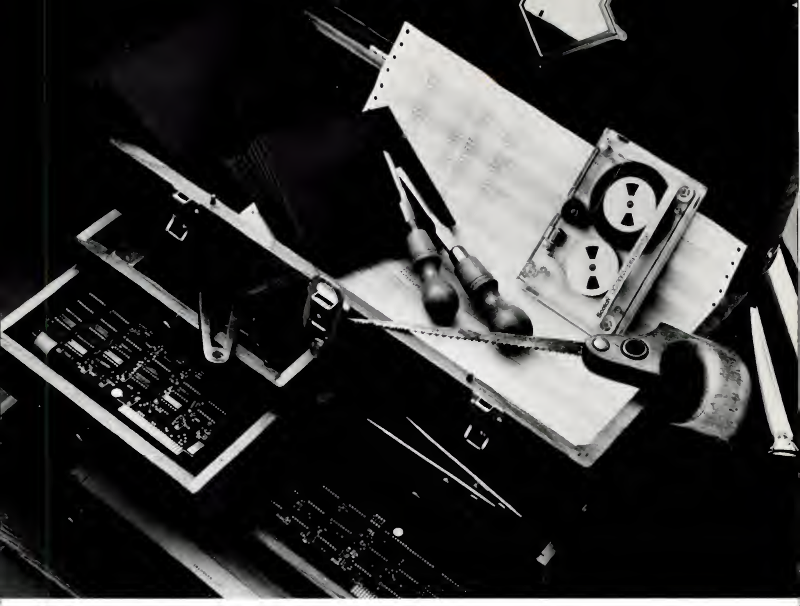
For the IBM Personal Computer dealer nearest you, call (800) 447-4700. In Illinois, (800) 322-4400.

†This price applies to IBM Product Centers. Prices may vary at other stores.
VisiCalc is a trademark of Personal Software, Inc



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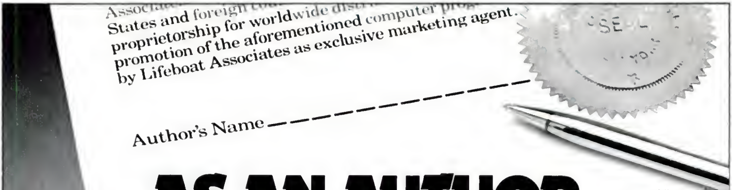

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PCommuniques

A compendium of facts, news, opinions, rumors, gossip, inside intelligence, speculation and forecasts about IBM Personal Computers.

"A Very Different IBM"

An executive of an independent software company that is developing application programs for IBM Personal Computers recently shared with *PC* some experiences of IBM's willingness to work with non-IBM program marketers. Though the comments seemed favorable, the speaker shall, at his/her own request, remain nameless.

"It's a very different IBM," said the software developer. "They at least listen when you call on the phone."

"We went down to see them, and they told us, 'We don't want to develop software for this machine ourselves.' They were very open and helpful about giving us the technical information we needed. The feeling was so radically different—it's like stepping out into a warm breeze."

"They really want to cooperate. After years of hassling—fighting the Not-Invented-Here attitude—we're the gods."

"Billion Dollar Baby"

The above figure suggests Future Computing, Inc.'s assessment of the IBM Personal Computer's economic impact. *IBM's Billion Dollar Baby* is also the title of a 155-page report by Drs. Portia Isaacson and Egil Juliussen, of the Richardson, Texas, consulting firm. Actually, the title is conservative compared to the figures inside. Among the forecasts the report offers those who pony up the $450 asking price:

- Based on product demand estimated by surveying key computer stores, the retail value of IBM's PC hardware sales will grow from $360 million in 1982 to $2.3 billion in 1986.
- Retail value of IBM software sales will grow from $85 million in 1982 to $700 million in 1986.
- Meanwhile, over the same period, PC-related sales of hardware from other companies will grow from $65 million to $685 million, and related sales of software from other parties will rise from $15 million to $395 million.

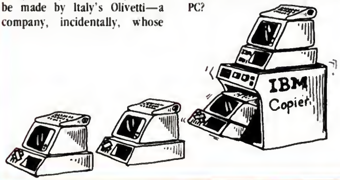
The total for all the above categories will exceed $4 billion by 1986, Future Computing says.

Lookalikes From Home & Abroad

Perhaps expecting that IBM won't satisfy the demand of all who want to buy—or sell—IBM Personal Computers, at least three companies are said to be preparing "lookalikes." One, reportedly coming from Lee Data, a U.S. company, is purported to be compatible with all PC standards, from the disk drives on up.

Then there have been murmurs in the trade press of a PC-compatible personal computer to be made by Italy's Olivetti—a company, incidentally, whose typewriters are sold through some major retail chains. But the Atlantic isn't the only ocean that may have PC lookalikes crossing it.

Rumor has a PC lookalike well along in the works at a Japanese manufacturer. This machine, naturally, wouldn't have IBM's name and reputation to help sell it. But, as a countervailing point, what if the maker could argue that it was a company IBM itself trusted enough to use as a provider for parts of the PC?



IBM Employees Snapping Up PCs.

From the subscription orders pouring into *PC* in IBM envelopes, and from the news *PC* keeps hearing about sizeable IBM-employee Personal Computer Clubs, it's clear that interest in the PC from within the IBM family is substantial. But just how substantial?

In the December issue of *Think*, an IBM company magazine, the number of employee PC orders is put at 10,000. A phone call in October from a *PC* informant claimed 30,000 IBM employees had placed orders for PC systems. At the COMDEX trade show, a number mentioned by more than one visitor to the *PC* exhibit booth was 40,000 employee orders. And just before press time, a note hand-scrawled on notebook paper by an anonymous, self-described IBM employee arrived in our mail. It claimed more than 60,000 IBMers had put in orders for PCs in the first month of the company's employee offer.

Whatever the number, two possible reasons suggest themselves: some employees may hope to capitalize on an anticipated scarcity and IBM's said-to-be-generous employee deal (according to one report: half price, with 2 years to pay through payroll deduction) by reselling for a profit. Others more likely are eager to use their PCs to begin writing programs for submission to IBM's software marketing operation. (That, by the way, is the only channel which employees will be permitted to use for selling their PC creations, according to another source.)

Our loose-leaf correspondent said employee deliveries were going to start last December and be completed by September of '82.

ARCNET Connection Coming?

Word has reached *PC* of a plug-in module under development that will allow connection of IBM Personal Computers to the ARCNET local area communications network manufactured by Datapoint Corp. ARCNET is the local network scheme adopted by Tandy Corp. for connecting their TRS-80 Model II computers together and hooking them up to other devices such as high-capacity mass storage. It also allows the Radio Shack computers to work together with larger computers made by Datapoint. If an ARCNET module for PCs is introduced, it could provide a connection allowing IBM PCs and TRS-80 Model IIs to be mixed together in an integrated system.

PCommuniques

PC Clubs Forming Fast

At least four groups have already been organized for people who have an interest in IBM Personal Computers. The groups' scope ranges from local to regional to national.

Two of the clubs have been formed by employees at IBM facilities, one in San Jose, California and the other in Austin, Texas. The first regional group to come to *PC's* attention is based in the Philadelphia area. And the national group, which has taken the name "Autumn Revolution '81," is headquartered in Tulsa.

Many other groups may already have formed, and many more are likely to appear in the future, and *PC* would like to hear about them. (Drop information to "Clubs," PC, 1239 21st Avenue, San Francisco, California 94122.) Addresses for those we know of so far are:

Philadelphia Area IBM PC User Group
c/o Craig Uthe
4101 Spruce Street
Philadelphia, PA 19104

The IBM Club
c/o David Andrews
310 Honey Tree Lane
Austin, Texas 78746

IBM PC Users Group
c/o Lee Wersel
7255 Orchard Drive
Gilroy, California 95020

Autumn Revolution '81

Autumn Revolution '81, an independent users group for the IBM Personal Computer, has opened its national headquarters in Tulsa, Oklahoma.

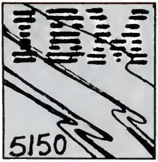
According to organizer Dan Perry, the group already has several thousand members across the nation. Autumn Revolution '81 is "dedicated to its members and to the development and application of the capabilities" of the IBM Personal Computer.

Membership is $30 for one year and $55 for two. The announced benefits include a subscription to the club's monthly newsletter, access to an IBM PC software library, access to a technical library, user training and use of a "technical hotline"—a toll-free number members can call and, for a fee of $1 per minute ($5 minimum), receive user information from a qualified technical person.

Autumn Revolution '81 makes it very clear in its literature that its intentions are highly ethical. The group does not "condone software piracy and other practices intended to undermine or circumvent the honesty and creativity of the persons engaged in the personal computer marketplace."

Autumn Revolution '81
P.O. Box 55329
Tulsa, Oklahoma 74155

Numberless PCs??



Some initial press reports about "The IBM Personal Computer" made quite a thing of its being "the first IBM product without a model number."

T'ain't so! The nice, silvery nameplate on the PC's front identifies it by name only. But on the back of the System Unit, near the power outlet, a matching silvery square discreetly announces the product as the Model 5150. (The number also appears on the specification plate.)

Thus, the PC can be interpreted as an outgrowth, at least in IBM's eyes, of IBM's earlier models 5100 and 5110. Oh well...it's been known to happen before—dumb, stolid parents having a bright, personable kid. (And the kid not wanting to talk much about his parents.)

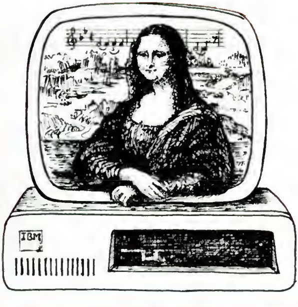
Bar Code Decoded

Been wondering about the bar-code label on the back of IBM Personal Computers—the one that looks something like those on cans of peas? No, you won't see PCs for sale in the supermarket (Yet!) The bars are used in the factory for production control. Each PC has a unique label, and each work station in the IBM plant has a label reader. Every time a PC is moved to a new stage in assembly, the readers are used to report the move to a big computer keeping track of the production process. From this information, a complete who-what-when production history is developed for each unit. If problems crop up, IBM hopes this system will help cure them fast.

PC Production Guess

As you can tell, the topic of the IBM Personal Computer is one with great potential to set tongues wagging. The owner of one such tongue phoned the *PC* offices to give an unverified report about the number of 8088 processor chips IBM had ordered from Intel (the chip's manufacturer). The caller asserted IBM had committed for a minimum of 150,000 chips in 1982, with options to take the order as high as 225,000. Our caller also commented that, to his knowledge, the Personal Computer is the only IBM product using that particular chip, and that we could draw our own conclusions from there.

Program Generator Does Graphics, Music



"Program generators"—programs that help users write other programs—have recently appeared on the microcomputer scene, with varying levels of sophistication and power. (One heavily advertised version is called *The Last One*.) In general, these are only capable of creating programs that do traditional number-crunching and file handling. But Advanced Operating Systems, an Indiana company, has announced the imminent debut of a product in this vein for the IBM Personal Computer—with a special twist. The company's program generator will have full access to the graphics and music features of the PC. Release of the program could come early in 1982.

PCommuniques Pays.

Are you in possession of information you think should appear in *PCommuniques? PC* pays $50 for each contribution published in this section. Submissions must be signed, but anonymity will be preserved upon request. All submissions become the property of *PC* and are subject to editing. For payment, you must include an address and phone number. Write to "PCommuniques," 1239 21st Avenue, San Francisco, California 94122.

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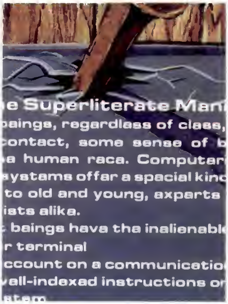

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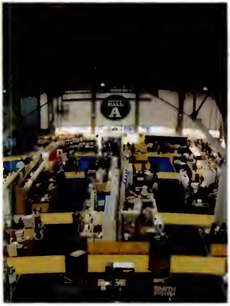

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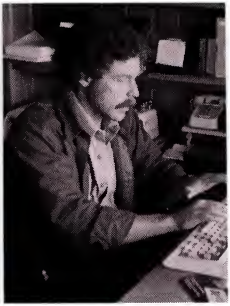

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David Bunnell

FLYING UPSIDE DOWN

CONCEIVED SHORTLY AFTER IBM ANNOUNCED ITS PERSONAL COMputer on August 14, 1981, *PC: The Independent Guide to IBM Personal Computers* was realized in its present form by the vision and determination of those who have contibuted to it.

WE LAUNCHED OUR PROJECT OCTOBER 1, 1981, and six weeks later exhibited our Preview Issue at the Comdex Computer Show in Las Vegas—alleged to be the biggest computer industry show ever. Our PC booth was mobbed for the entire four days of the event. There was a great deal of interest in the IBM Personal Computer sitting on our counter (running the BASIC demo programs), the opportunity to enter our subscription giveaway, and the magazine itself.

We left Comdex in high spirits, and got back to home-base San Francisco just before Thanksgiving. We immediately launched the parallel processes of selling advertising, setting up dealers and putting together the actual editorial content.

Along the way we established a production flow, contracted with the best printer we could find, made plans for fulfillment, set-up a subscription sweepstakes, garnered in the best writers in the business, and proceeded with all of the many other tasks of magazine publishing.

There are good magazines and there are bad magazines as well as successful and unsuccessful ones. We strongly sense that the users of the IBM Personal Computer will demand quality end-user publications filled with useful, well-written information. It is our destiny to be the first such publication and our intention to always be the best.

We unabashedly aspire to that elite set of sensationally successful magazines—*Rolling Stone*, *Playboy*, and *BYTE* are recent examples—that seem to magically combine concept and timing in a brew which results in a dizzy success cycle that no business plan could ever account for.

When you get into the business of pure dynamic change, as we feel we have been in at *PC*, you open up full-throttle and operate largely on instinct. As Tracy Kidder put it in *Soul of a New Machine,* you "fly upside down."

So, we come to you flying upside down.

Fortunately for *PC* and our readers, the *PC* crew is mostly combat vets.

Still, it's the things you don't anticipate which cause the most aggravation. Ironically, in the end they are often the source of our most humorous memories. The whole day before the Comdex show in Las Vegas provided the *PC* crew with several such examples.

The plan that day was that our Marketing Director Cheryl Woodard and myself would leave San Francisco on a morning flight. Upon arriving at Las Vegas we would pick up the rented station wagon, drive to the two hotels we were booked into, check in luggage for ourselves and for Editor Jim Edlin and Staff Photographer Jacqueline Poitier, and then drive over to the Convention Center to make sure our booth was properly setup.

Meanwhile, Jim and Jackie, scheduled on an afternoon flight were driving around San Francisco picking up signs and printed material from a half dozen shops. They would bring these things with them which explains why Cheryl and I brought their luggage.

The first thing that went wrong was that the hotel had no record of my reservation and all the rooms on the Strip were booked for the weekend.

The second thing that went wrong was minor, really, which was the color of the carpet at our booth was red instead of blue. That and the fact they forgot our furniture.

The third thing was that when Cheryl inquired about the furniture she discovered that the people who staff Comdex had never heard of us.

The fourth thing was that Jim and Jackie picked up all the printed material OK but missed their plane. They could see it pulling away from the gate as they dashed into the boarding area.

Finally when it seemed like everything had been pulled back together—the situation at the exhibit hall was straightened out, the hotel reservations were verified, Jim and Jackie got on an evening flight and

Linda Harrison

arrived safely in Las Vegas laden with signs, envelopes and business cards.

We had one remaining chore, which was to pick up 6,000 copies of our *PC* preview brochure from the PSA airline counter. Upon arriving we instantly sighted several boxes marked "PC" stacked behind the counter. That was a source of collective relief.

The rest would be easy—or so we thought.

However, bingo, Murphy again, the airline lost the freight bill. The rudely mannered clerk behind the counter was afraid to release our material to us. Without the air bill he had no record of who shipped it or if it had been paid for. It was near midnight, too late to call the printing company in San Francisco to get the air bill number.

Clearly, it wasn't our fault if they lost the air bill. For a good 40 minutes we discussed the situation in great and sometimes heated detail with this surly, overgrown boy of a clerk. At one point Jim Edlin and I more than half-heartedly considered wrestling the packages away by force. Hadn't we had enough for one day?

Finally, the clerk sensed our hostility and wisely determined it wasn't worth any more hassle. He let us have our brochures. We gleefully drove away, the station wagon loaded down under the weight of 6,000 pieces of slick literature. We were punchy as hell. We were flying upside down.

Zero Base Thinking/Jim Edlin

CONFESSIONS OF A CONVERT

I HAVE WHAT I BELIEVE WAS THE BEST personal computer of the pre-IBM era, though you've probably never heard of it.

It's called a Compucolor II, made by a Georgia company named Intelligent Systems Corp. I'm using it to write this column. If inspired design were all that counted, the Compucolor II ought to have enjoyed the success that went instead to the Apple II. But while Apple had a mostly pale and limited design (though not without a spark of inspiration here and there) Apple did have plenty of inspiration in all facets of its marketing and management. And the Compucolor, with its brilliant design, was afflicted by massive incompetence in the apparently more-vital management and marketing departments.

I mention all this because, though the guiding principle in IBM's design of its Personal Computer appears to have been, "Make a better Apple II/III," I have a strong suspicion that someone influential in the PC's design had more than a nodding acquaintance with a Compucolor II. Many of the PC's features, such as the design of the color/graphics display, echo the Compucolor more than the Apple. It is this discovery that has helped to turn around my views on the IBM PC.

Jacqueline Poitier

Still life of an editor with two computers.

I thought personal computers were doing quite well without IBM, thank you very much.

Initially, you see, I was quite hostile to the notion of the PC. Partly this had to do with resentment toward IBM's latecoming into personal computers, and revulsion at the alacrity with which their entry was greeted. I thought personal computers were doing quite well without IBM, thank you very much, and was repelled by the fawning welcome the personal computer world gave IBM's belated "blessing." But my objections went deeper than that.

The truth is, I am no fan of computers. I love the power they can give people to do things, but I hate the mickey-mouse they often make people endure to employ their powers. While there was once good and necessary reason for most of that mickey-mouse, I think advancing technology has made it largely obsolete. Most of it, I think, now lingers from inertia and force of habit.

Personal computers were slowly growing away from the old, computery traditions, and I feared that if IBM entered the market, ultimately perhaps to dominate it, they would redirect personal computers back into the computer mainstream they embody. I didn't want to see that happen.

Now that I have become better acquainted with IBM's new machine, and the company's new policies, I no longer fear that outcome. It is clear to me that IBM has designed a machine for the future. They have published a technical manual giving away in detail the secrets of their machine. And in that manual's pages one can read everywhere the deliberate effort IBM's designers have made to avoid hemming in the PC's future evolution.

By no means am I saying I'm altogether delighted with the PC in its first go-round. Among other things, I remain disappointed that IBM hasn't made high-resolution color display the standard rather than an option for the PC. I remain disappointed that IBM didn't choose to encourage communications by building a direct telephone connection jack into every PC. (Both these choices would have forced desirable economies of scale.) And I'm still disappointed that IBM settled for an operating system not much advanced beyond the unfriendly qualities of CP/M. But I no longer fear that IBM's initial design choices will set the standard.

Whether IBM intended it or not, Pandora's box is now open. By both design and policy IBM has created an "open system." They have thus insured that if they dawdle about actualizing the potential of this machine, others will keep them honest.

I once dismissed the IBM PC as a "me too" machine. At the present moment, that is pretty much the case. But I now suspect it is "me-too" at the start of its evolution, compared to machines approaching the apex of theirs.

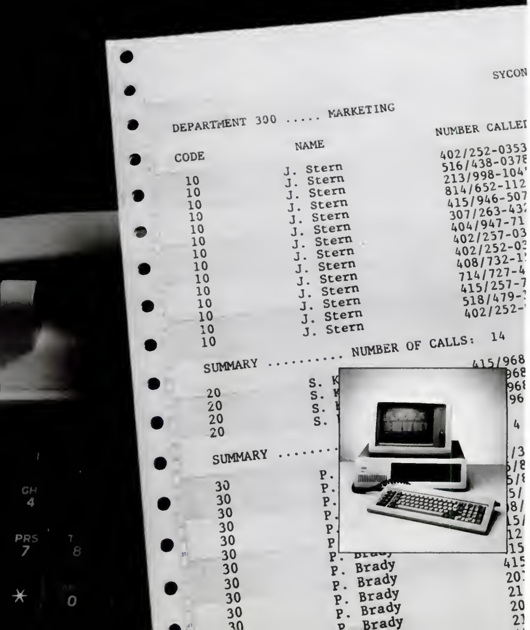
I'm not quite ready to put my Compucolor II away. But I can see it won't be long.

PS—To answer in advance all who may be confused: No, I have no connection with the Microsoft line editor which seems to have borrowed my last name.

–JE

Unauthorized, personal phone calls cost your company money.

Here's how to stop them for good.



To many companies, reviewing the monthly phone bill is an irritating process. Who's making all those calls to places where you know you don't have business?

Our Phone Chronicle now offers you a surefire way to eliminate costly, non-business calls while bringing you other positive control benefits as well.

Phone Chronicle is the versatile new accessory that further enhances your IBM personal computer. It automatically logs all outgoing calls into the computer memory with: date, time, length of call, number called and three-digit, individual employee code.

There's more. The Chronicle is a valuable management tool for allocating phone charges to your different departments and profit centers. In addition, it can quickly verify actual calls made—protecting you against phone-company billing errors.

Comprised of a single PC board, phone plug, cable, diskette, and user manual, the unit has an on-board memory of 100 calls. When memory is almost full, a signal is given. Operating power is supplied by the DC adaptor so that the unit continues to function even when the CPU is turned off.

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For complete details, check and return our coupon. Dealer inquiries are welcome. (Phone Chronicle also available for Apple II.)

O.K. Send information on:

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LETTERS TO PC

HOW THE HECK, YOU MAY WONDER, DOES A BRAND-NEW MAGAZINE GET LETTERS To The Editor to print in its Premiere Issue? Well, we considered making them up. Then we thought maybe we'd try printing Letters From *The Editors this first time around. Next, as good citizens of the microcomputer age, we got the bright idea of soliciting "letters" to our electronic mailbox on the CompuServe Information Service; but nobody replied. Then, to our surprise and pleasure, good old-fashioned letters started showing up attached to people's subscription orders, ad orders, and even just by themselves. So, however paradoxical it might seem, what follow are the real thing. We just figured you'd like to know.*

Report From The Front

I think the IBM PC will bring a lot more people into personal computing. My wife and I are typical of one group. We both consider ourselves professional computer specialists. We had been eyeing a personal computer, but what was available seemed little better than extended toys. There was little feel that the available personal computers were designed to be tools.

My wife and I are software specialists who want the hardware to be transparent to us. The PC gives us this. The system has worked correctly since we plugged it in the first time. Enhancing the hardware does not require an EE degree; adding new pieces requires that you can read and follow simple directions.

The system is quite advanced and gives us capabilities that we don't have on some minicomputer development systems we use. The potential for expanding the system is impressive.

Now for our disappointments. Two months receiving our PC we don't have the 64K memory board to bring us to 128K, which means we cannot use PASCAL. We don't have the word-processing package yet and we don't have the communications hardware and software we ordered. We are annoyed and actually suffering from the lack of these pieces. One motivation for buying the IBM PC was to use it as a word processor for a book I am writing. I'm still writing by hand on legal pads. We hope these pieces don't become another 3830 for IBM (a super disk drive announced two years ago and still not delivered).

The other problem is dealing with ComputerLand. Generally, the ComputerLand people are concerned and helpful, but only to the limits of their knowledge. They do a good (not excellent) job, but a little professionalism like that of their grey-suited brethren would go a long way.

Well, we thought we would send you some news from the front. We are sure your efforts will be a success and have enclosed our subscription order.

Bob Fritz
Computer Sciences Corp.
San Diego, California

Editorial Advice

OK *PC*, I'm interested enough in the IBM personal computer and in your magazine to say "here is my 12 Bucks." As long as I'm subscribing I would like to include a few comments. I sincerely hope that your publication will be involved with more than just applications software. While articles submitted by users and objective reviews of professionally produced programs are invaluable to your readers, I think you can provide an equally important service to a large segment of your prospective readership by including articles about the hardware and system software. To have an in-depth understanding of a system can turn a fun or useful object into a powerful, creative tool.

I expect that a system with the name IBM will attract a great deal of interest from users and non-users alike. And I suspect you will have great success as long as IBM and/or competitors are selling compatible systems. I wish you the best of luck.

Gordon M. Furman
Santa Barbara, California

We hope you find *PC's* Premiere Issue a suitable response to your concerns. *PC* plans to cover hardware, software and all else that relates to owning and using IBM personal computers.

Kind Words

Having been in and around the publishing industry for some time (*Time, Inc., Newsweek, Inc., Saturday Review,* etc.), I know just how difficult and perilous a new magazine venture can be.

I also think I understand a good idea when I see one. *PC* is a good idea. Most new publications aren't. And happily, *PC* is manned by professionals. Something most new publications aren't either. Congratulations on your progress with *PC.*

Brice W. Schuller
Doyle Dan Bernbach Inc.
San Francisco, California

Forgive us, but we couldn't resist running one of these.

Best wishes in your new venture. I think that you are covering a system that is turning out to be a real tiger in the marketplace. It is highly interesting that you have an editor named 'Edlin'. Was he the father of the DOS editor? (Ha!) As for Cheryl Woodard, well, let's just say I think I'm in love!

John Graybill
Gaithersburg, Maryland

Cheryl (our Director of Marketing & Sales) says thanks, and wants to know if you're interested in a lifetime subscription.

...Unkind Ones...

Dear Editor...What I'd like to know is who let this David Bunnell character out of his cage anyway. He's the same clown who once wrote that the Altair computer could "control all the traffic lights in a major city." I bought an Altair and all I could get it to do was change the lights on its front panel. Lord knows what wild claims he'll be making about the IBM.

Jack Rowbar
Traffic Manager
Plains, Georgia

...And Reassuring Ones

We shall be very happy to work with you and your staff and provide information on the IBM Personal Computer for your new publication.

P.D. Estridge
Director, Entry Systems Business
IBM
Boca Raton, Florida

PC welcomes letters from readers. Write to: "Letters, PC, 1239 21st Avenue, San Francisco, California, 94122." Letters published may be edited for reasons of space or style.

The Man Behind The Machine?

A PC Exclusive Interview With Software Guru Bill Gates

HOW WAS IBM ABLE TO SO GAUGE THE PERSONAL COMputer market as to come out with a machine that both incorporates all the good features of existing personal computers and accurately points the direction of future ones?

PC Publisher David Bunnell had a hunch that the answer to this question was to be found in Seattle—home of Microsoft, the first personal computer software company.

His hunch was based on the fact that while several software companies were chosen by IBM to provide the initial software for the IBM Personal Computer, only Microsoft provided a complete range of software. This software includes the IBM Personal Computer Disk Operating System, MACRO-assembler high-level languages BASIC, Fortran and Pascal and even application programs (Adventure and Typing Tutor).

So Bunnell hopped a plane to Seattle to investigate for himself.

Sure enough Microsoft's involvement was total, day-in, day-out. For more than a year, 35 of Microsoft's staff of 100 worked fulltime (and plenty of overtime) on the IBM project. Bulky packages containing computer gear and other goodies were air-expressed almost daily between the Boca Raton laboratory and Seattle. An electronic message system was established and there was almost always someone flying the arduous 4,000 mile commute. While many other individuals and companies consulted with IBM during the course of "IBM PC" development, and most have intriguing yarns to tell, only one company worked with IBM in such an intimate and (especially for IBM) *unheard of* fashion.

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by David Bunnell

"Before they came, they said, 'Hey, we may really do some business. It could be exciting.'"

The highlight of Bunnell's investigation was a fascinating two-hour exclusive interview with Bill Gates, president and co-founder of Microsoft. As it turns out Gates probably knows more about the IBM Personal Computer and its history than anyone (outside of IBM, of course).

DAVID: What can you tell us about Microsoft's involvement with IBM on the Personal Computer project? How it was initiated and what transpired, as much as you can reveal.

BILL: In the case of the IBM project we started off not really knowing what they wanted. They came out in July of 1980 and first talked with us on a very tentative basis as though they were just doing market research. They said, "Don't get too excited and don't think anything big is going to happen."

Then they talked about how something could be done fairly quickly if a machine was designed to run standard software. In fact, we found out later that behind the scenes different labs within IBM had been charged with looking into how they could get a project done on a very quick basis. The typical product design time for a large company like IBM, and they keep track of this, is a little over four years. That is partly because they do such a complete job, and yet, in the personal computer industry, which they had a desire to participate in, you really couldn't be competitive if you speced out your product in 1976 and sold it in 1980. You would be selling an Altair computer against an Apple II.

So they wanted to come up with some way of doing things a little differently. One of the development managers of IBM got a committee together, people from different laboratories, and told them to go out and research the issue. The people we met with were from the Boca Raton laboratory, simply putting together some thoughts, essentially about how to cheat, and their idea was to use software that already existed out in the world, and to use industry standard parts like the Intel microprocessor. So they went back and said that based on using that approach they could get something done in the order of a year.

My understanding is that some of the other groups put in proposals that involved emulating existing IBM instruction sets, and there have been a lot of rumors that one of the groups looked at buying a machine from Japan. In fact, one of our Japanese customers had us do some demonstration software that was probably for that lab that was looking at Japanese sourcing.

In any case, Boca Raton got the go-ahead sometime in late 1980 and they came out with a lot of people, about 12 people. Before they came, they said, "Hey, we may really do some business. It could be exciting." And then they said, "We have a lot of things to do, we'll have our technical team meet with your technical team, so let's do them in parallel. We'll have our legal team meet with your legal team, we'll have the purchasing team meet with your purchasing team, we'll have our technical team meet with your technical team, so we can do four or five things at once." Well, that is fine, but that's me who is going to do those things and I can do only maybe two things at once, so we're not going to be able to have five simultaneous meetings.

Anyway, they came out with 12 people, and we really got things going. We ended up making the hardware a little more state-of-the-art by putting new things in it that went beyond the cardinal rule of getting the project done in a year. But, you know, the second priority beyond getting it done in a year was to have a state-of-the-art machine and by using the 16-bit processor and doing some of the stuff in the graphics, I think everyone pretty much agrees that that was achieved.

DAVID: Why is it important to have a 16-bit processor?

BILL: That is one area where there is a lot of confusion because the standard thing in the industry nowadays is to say, "Who cares about what's inside the machine?" People are buying a solution, not a computer, which is absolutely true. They are buying things like word processing or Visicalc which is one of the applications IBM announced.

I think 16-bits is extremely important, and it is not because of speed, although if you sit down at an IBM machine and play with it a little while you will see that it performs significantly better than existing 8-bit machines.

The main reason for the 16-bit micro being advantageous is its increased address space. That sounds like a technical issue, but what it boils down to for the end-user is that we can do more complex software, with a better end-user interface, in a more transportable form than we have ever been able to do in what I call the "8-bit world."

When I say 8-bit world, I mean the 6502 microprocessor, which is the chip used in the Apple, the Pet and the Atari, or the most popular chip which is the 8080, Z-80 family used in the Xerox 820 machine, the NorthStar, Vector Graphic and many others. In those 8-bit machines there is one common characteristic, which is that the logical address space in the machine is limited to 64K bytes (about 64,000 characters of storage). You have to put the operating system, the program, the data, the graphics memory, if it is going to be efficient—all those things in a single 64K area. You get into some terrible problems where you have to write program code in a hard to maintain fashion to keep it small and in fact that is one of the things that Microsoft is doing absolutely the best job of, is writing stuff in a small amount of space. Its a fine art that we spend a lot of time on, because in 8-bit machines it really made a lot of difference. But this is no longer our focus on 16-bit machines.

People also compromised in the end user interface with their packages because they simply could not get enough stuff in there, and finally the overall capability of the packages are also compromised because you want it to be able to run on all the 8-bit machines. For example, whenever we have put a new feature in BASIC such as good screen handling, which is something that we are working on now, people complain because any feature we put in takes away from the space available for an application.

Now in the 8088 (the Intel 16-bit microcomputer used by IBM), that limit, the logical address space limit, is for all practical purposes gone away. The chip is designed to address up to a megabyte (1 million characters). IBM's announced support for up to a quarter megabyte, that is 256K, and it is very much in the relevant range. In other words, that factor will make all the difference in terms of quality end user interface integrated software.

DAVID: Will your recently announced planning package, Multiplan, be integrated with word processing?

BILL: Not in its initial release. When we first get an extra resource, we don't know all the ways we are going to be able to take advantage of it. All i can really say is the 64K barrier has been the critical constraint in terms of writing software in a transportable form and putting new features in. Now that we have the freedom, we can use some more creativity to take advantage of it. It's just like high resolution graphics was on the Apple. When the Apple II first came out it had high resolution graphics, but for about three years, nobody wrote programs that would take advantage of it. The programs were low resolution and it was kind of bizzare to try to use that extra mode. But today, the Apple II is virtually defined by high resolution graphics. There is simply not an entertainment package around, or even a lot of the serious packages, that don't take advantage of that.

Just some indication of this is that the graphics memory in the IBM PC is right in the address space of the machine. What that means is you can directly manipulate those bits on the screen using any of the 8088 instructions. Particularly the string instructions can be used to great advantage to provide animation type effects up on the screen. We could not have done that on an 8-bit machine, because we would have used up that crucial 64K resource, whereas on the 8088 it is megabyte resource. We put it very high in memory, I think about three quarters of the way up, and so it is there anytime you want to use it.

Myself and someone else here wrote most of the demo programs used on the IBM machine in a matter of about three hours, because the extra versatility provided by directly manipulable graphics allowed us to put commands in BASIC that let you get at the full power of the machine very easily. In the case of the Apple, anybody who knows how to do really good high resolution graphics has to be a guru and so there is what I call a "bits and bytes barrier" to getting in and using the machine. And so to do a good program, you have to be both smart about bits and bytes, and creative enough to create the program. it is a rare individual who combines both of those talents.

In the iBM PC we have lowered the bits and bytes barrier so we will tap Into some people with additional creativity and understanding of how to do whatever the particular need is. We are getting rid of the generai need to get into the innards of the machine to make it really perform. The power of this machine is much more on the surface than an 8-bit machine could possibly deliver.

DAVID: Now that you are into the subject of graphics, tell us more.

BILL: Looking at the graphics, the things that I mean specifically are some of the simple verbs that have been added into the BASIC and I will highlight three of those. The CIRCLE statement is very straightforward, you simply state where the center of the circle is and what the radius is going to be and immediately the thing is drawn at an extremely rapid speed. Also, you've got a lot of other options, you can add it at the end of the statement, like start angle, and end angle, and aspect ratio. The default is simply to do a full round circle, and that is something that the user can get at and use, for example, to do pie charts.

Another statement is what we call PAINT. It is a very simple notion. You simply enter a point on the screen and its just like putting your paint brush down there and painting until you hit the edge of the screen or the border. Say you draw a white border and you want to paint until you hit white, so no matter what the figure you have there is, square or circle or crazy looking thing, it will use its paint brush and paint in until it finds those edges. As a default it paints in the same color as the edges, but if you provide an extra parameter you can paint with another color. So you could paint a white circle with a blue center, or, if you had some sort of a jagged line graph and you wanted to show it as an area, you find a point in the interior and it would paint that arbitrary figure.

PAINT is a single verb. It is quite simple and intuitive and yet its implementation is very hard. That brings through some of the power of this machine. You can paint a figure that's virtually the entire screen in about two seconds. Really, there is no way that that could have been done on an 8-bit machine. It may sound unimportant but when you really get into trying to do some of these new user interfaces, the so called Xerox Star-like interfaces that really are what is going to open up these machines to a wider user population, these graphics primitives are incredibly important. For example, when we put a littie arrow up on the screen to point to things, we use a solid arrow, and to do that efficiently we have actually generated the thing with PAINT.

The final verb I wanted to mention is DRAW and this represents a philosophical

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"If you sit down at the IBM machine and play with it a little while you will see that it performs significantly better than existing 8-bit machines."

decision we made a couple of years ago, which was that every time we put something new in BASIC there is a tendency to add a ton of verbs. In the case of graphics, where you are really adding verbs all of the time, and the user has a hard time remembering all of these verbs and each of them has its own individual syntax, and so that is a problem. The second problem is that if you use a bunch of verbs, then the description of a graphics object is not something you can read or write like a file. It is actually a program and so to move the embodiment of the graphics object around you have to move a program around. Well, that's a real pain, because in BASIC a program and data aren't treated uniformly and so you just get into big problems. What you'd really like is a simple way of using one of the data types already in BASIC to describe arbitrary graphics objects, and what we chose is the string data type. So now we have a simple single verb that gives you almost all the graphics capability and it is called DRAW.

Just to give one example, if you want to draw a box, you use the subverbs, which are R for right, L for left, U for up and D for down. So if I want a 10 × 10 square, I would enter DRAW, put a quote mark to indicate that it is a string, and go "R20 D20 L20 U20" and if I execute that it will draw the box. That is called Graphics Macro Language and the IBM PC is actually the third machine we have put that on. It has been extremely well received, and since using those strings you can write into a file or edit them or search for something inside them super easily.

That same concept has been used for music where it is called Music Macro Language, and so instead of DRAW you use PLAY. Enter PLAY "A, B, C" and it plays the notes A, B and C. It is true if somebody wants to specialize in them they have to learn the so-called macro language for that area, but it consists of really super simple commands and very self-contained.

Music is another case where I don't mean to pick on Apple—the only reason I use it is because it is an example of one of the most popular machines that has a lot of these capabilities and yet they are hard to get to. Once again, with music you have to be a real bits and bytes man to get that Apple to play any kind of decent tone. With the BASIC we have provided here, you can play something in legato, staccato or normal, just knowing a few simple characters that you type in under the control of BASIC. So we are pushing towards fulfilling the promise of these personal computers which is that anybody can just pick it up and use it—it's still not fulfilled but we are moving in the right direction.

"When we first get an extra resource, we don't know all the ways we are going to be able to take advantage of it."

DAVID: *We've been talking about things that IBM has done right which are significant. In your opinion, what are some of the things they have done wrong or not quite right?*

BILL: Well, you know in a way I am biased because of the depth of our involvement. I'd say it's a reasonably good balance, I mean in a way IBM is standing on the shoulder of experience that everybody else had in the industry—in a totally fair and good way, but it's not like 1976 when we didn't know what the market was and how to sell things. A lot of elements have been firmly established.

I have a wish list after we finish a project. I don't think cassette machines are super important and so I think the effort that was put into have a cassette interface wasn't worthwhile. I think everybody is going to run out of slots very quickly. The machine has a 5 slot limitation, but I suspect that an independent peripheral industry will start to do some combination cards that will reduce the pain of having a limited number of slots.

Everybody talks about how they'd like to have more disk space on the machine and of course I always like to see networking on a machine and nobody really has a good solution to that yet. It would be nice if there was a hard disk and I'm sure the independent vendors will come and put one of those on it.

It's possible to do a much better machine in a lot of ways from a hardware point of view. You could put a faster processor in. Intel's has the 8086. You could do a machine that is almost four times the performance. When Intel comes out with their 8087 chip, that will be a nice potential upgrade. I think IBM's Technical Reference Manual makes it clear they have an additional socket on there for that 8087 floating-point processor but from my point of view, which is once again biased, the name of the game is software.

This machine will be significant because it will usher in a new generation of portable software which will be significantly better because of the speed, the address space, the instruction set, the underlying operating system, and the experience gained from the previous years.

I think five years from now the amount of software and the quality of the software on this machine will be incredible. It will dwarf what is available on mainframes, minicomputers and other machines.

DAVID: *I think we should talk a little bit about the operating system. Partly because I see a lot of confusion about MS-DOS and its relation to CP/M, and CP/M-86 more specifically. It seems that I read over and over again in the press that IBM has an operating system that is compatible with CP/M. Does it?*

BILL: Well, not really. There certainly is a lot of confusion about this issue. When IBM announced the machine on August 12 they said they'd be making available three operating environments. And the operating environment that we provided is know by IBM as Personal Computer DOS. We call it MS-DOS and Lifeboat Associates calls it SB-86. So we've got a lot of different names which adds a little bit to the confusion, but that's the operating system.

All of IBM's applications and languages that they're supporting run under it. In other words, VisiCalc only runs under PC DOS. The BASIC only runs under PC DOS, the Peachtree programs, and EasyWriter word processing package run under that. We've done some things there that are substantially different than has been done in CP/M. We did provide an upward migration path—in other words, we made it extremely easy if you've got source code and a translation package to move a CP/M-80 package up into the 8086 environment without worrying about the operating system interface. In other words, we emulate all the CP/M-80 calls because no doubt there is quite a wealth of CP/M-80 packages in existence. In fact the greatest installed base of CP/M-80 machines are the users of Microsoft softcards which plug into Apple computers. So we are probably as aware of that as anyone. Also I think we have more system software under CP/M-80 than any of the other vendors. So we made it possible to do that migration.

The move from 8-bit to 16-bit is an opportunity to improve things a great deal. CP/M-80 became a *de facto* standard in the 8-bit world. There is really no opportunity to change that—the 8-bit designers will essentially stop over the next year. The only chance to move up to a stronger base is to grab this opportunity as we move into the new generation of processors.

Microsoft started out looking at 16-bit operating systems at the high end. About two years ago we went to Western Electric and licensed their Unix Operating System—which we have commercialized to a form known as Xenix. When IBM came along both from a technical point of view and other considerations it made sense for them to work with us on a new product we were doing which was a low-end operating system. So what we've got now is a family of operating systems with MSDOS at the low end and Xenix at the high end—really there's such a broad range of systems. From a single-user floppy system up to essentially a time sharing 16-bit system. We feel it is absolutely critical to have more than one operating system, although you have to have complete compatibility to move up along the line and add additional capability. That's what we have done with MSDOS.

DAVID: *Let's talk a little bit about IBM again. Who do you think the main customers are going to be for the IBM Personal Computer?*

BILL: I suspect that they will sell tons through their DPD sales force to large companies that have been looking at personalized work stations with local intelligence with a great deal of interest but too much fear to date.

The Apple II does not have enough communications capability and CRT capability to really be used in that mode. Until the IBM PC came along there was no product that could be offered to fill that need and I think that it is a huge market.

I've never heard any IBM estimates so I am just guessing here, but I think the majority of the sales will be through their DPD sales force. You know, Sears is doing a super job but they are only projecting five stores by the end of the year. No doubt Computerland will sell a lot of the machines but I doubt if they will be able to keep up with essentially the Fortune 500 demand from standard data processing departments.

DAVID: When do you think IBM will begin to sell through independent retailers?

BILL: All I know is what I read which is that towards the start of next year, they'll start to qualify additional retail vendors.

My understanding is that they will broaden their distribution. You know, IBM has to be admired for some of their conservatism. They only qualify the best and most professional groups to work together with them, because IBM is very afraid that somehow their overall corporate reputation is going to be hurt by what they are doing in this area.

DAVID: Still, IBM is doing some rather radical things, at least for IBM.

BILL: And it scares them that somehow that might hurt their image. So they went to Computerland, which is probably the leader in the independent dealer area. They gave *BYTE* magazine an initial exclusive on talking about the machine. They've really gone to the most established groups to do their work.

DAVID: How many machines do you think IBM will sell in 1982?

BILL: My guess is not based upon any inside information whatsoever but I think it will be not far from 200,000.

DAVID: Really?

BILL: If they can deliver them, the potential is there. I've heard numbers ranging anywhere from 100,000 to 150,000 so I am an optimist beyond the median point of that scale. They'll have to open up more distribution, though. I don't think Computerland can push through that many. And they may run into some production bottlenecks. There are a lot of outside vended parts on the machine and they are not going to compromise quality. Certainly at this point the machine is incredibly short, you know, we've got a ton on order and it is going to take a few months before they come in.

DAVID: Yes, we have the same problem. Let's move on to another topic, which we alluded to earlier. How does your soon-to-be-announced electronic spread sheet, Multiplan, relate to VisiCalc? Is it better?

BILL: Oh, certainly. It's a second generation spread sheet product. We'll be really going into that in our literature and it's a huge promotion thing for us—almost equal to all the promotion we have done for the entire company in its history, just for this one product. But, I'll just mention two things that are critical in Multiplan. The first is the use of naming. You are not put into a mode where you have to use "A10," "B9," "C14" and things like that, which you have to do with VisiCalc. If you want to say that taxes are 6% of sales then you say "taxes are .06 times sales." If you want the sum of all the profits you say "SUM (Profit)" and so we deal with data on a name basis which is the way people are used to dealing with it. The second thing is that we handle what we call Multisheet, which is a pretty obvious capability if you accept the analogy that these are spread sheet simulators. It is quite common to take numbers from, say, your cost sheet and your sales sheet and consolidate together. What you would really like is when you update the cost sheet it will carry over to the summary sheet. As soon as you look at the summary sheet, the information will be there. You don't have to type any commands or do any work every time you make the change to get the information over there. We have accommodated that capability.

One last thing, that I would like to mention also, is the way we have done the end-user interface. We've done away with slashes (/) and the need to know a lot of things about what is going on inside the package. For example, VisiCalc has a feature called "Order of Recalculation." The user has to think about does it go horizontally to recalculate or vertically to recalculate. Well, that's ridiculous. It's up to the computer to figure out the order of recalculation and not force you to figure out how you have to order your data so that things propagate through in the right order. That's a very technical thing.

DAVID: Are you doing other end-user packages?

BILL: The second wave is Multichart and Multifile which is data base and those will come out fairly quick in like three or four months, but anything beyond is easily six to nine months away.

DAVID: One thing you seem to be saying is that we are going to see a whole new set of application programs similar in concept to 8-bit programs only with a lot of improvements.

BILL: Right.

DAVID: Let's slip down the road five years. What are some of the real significant advances you see?

BILL: In five years the cost of computation will really be effectively decreased.

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"We're still not at the stage where I'd tell my mother, or some naive person, just to go out and buy one of these machines."

We'll be able to put on somebody's desk, for an incredibly low cost, a processor with far more capability than you could ever take advantage of. Hardware in effect will become a lot less interesting. The total job will be in the software, and we'll be able to write big fat programs. We can let them run somewhat ineffeciently because there will be so much horsepower that just sits there. The real focus won't be who can cram it down in, or who can do it in the machine language. It will be who can define the right end-user interface and properly integrate the main packages. I expect over the next five years between us and others a heck of a job will get done. You'll be able to sit at your desk and do whatever it is you want to do with information or presenting data or interchanging data incredibly effectively. In other words, we will have changed the way people work.

At that time we'll just see the beginnings of the home information system, because it is so much harder to cost-justify that type of device. But I do feel that the "office of the future" will be the office of the present five years from now.

DAVID: What kind of mass storage device will machines have in five years?

BILL: Well, you'll probably still have local floppies in a lot of cases, but most of the storage size-wise will be in shared file servers—and although optical disk may have had an impact, even at present prices and capacities large (magnetic) disks would suffice. There are 300-megabyte disks down in the $10,000 to $15,000 range now. If you can spread it across 20 users—that is, with a good networking scheme—you could justify it. So, while there ought to be some improvement there, I don't think that we've got any bottleneck even today. Networking is probably one of the big challenges.

DAVID: How are you facing that challenge?

BILL: Well, we've designed a structure in MS-DOS that lets it work in a network environment in a very strong fashion—and it's substantially different than what Digital Research has defined for CP-Net. We're passing high level file calls down the network, through a tree-structured directory.

DAVID: What's the most satisfying experience you've had in this business to date?

BILL: I always sort of latch onto the most recent thing. This IBM project was a super-exciting, fun project. We were given, even for a small company, an incredible amount of latitude in changing how things got done as the project progressed. And we really were allowed to feel like some of the key work had been done here. And we had a really great interface with the people from the customer (IBM), even though they're as far away as they could be, down in Boca Raton. The night flight down there is not too much fun. We had a lot of fun together. We had an electronic mail linkup, and we'd send messages every day and we'd give each other a hard time about whichever group was behind on whatever they were responsible for. We loved to kid them about all the security—how we had to have locks, and sign things in, and use code names and stuff like that—but it was just part of the project camaraderie, really. When the thing finally got put together and we did the demo programs, everybody around here was enthused. That's something WE did!

I don't know how many people have read Tracy Kidder's new book *The Soul Of A New Machine,* but it was like that—and everybody really did get their just desserts of being recognized and knowing what part they put into it. People worked incredibly hard. I guess there was a kind of an anticlimax when I got a form letter from IBM a week after we'd finished the thing which said, "Dear Vendor. You've done a fine job." But they've apologized an appropriate number of times for that.

There'll be more projects. In fact, we're starting up one now which in its general concept should prove to be as exciting. And we're still not at the stage where I'd tell my mother, or some naive person, just to go out and buy one of these machines. In a couple of years we'll achieve that real peak—to fill that gap and feel like it's a real tool.

DAVID: It sounds like from what you're saying that you have probably had more influence on the final result of the machine than anyone, with possible exceptions at IBM.

BILL: Oh, that's absolutely the case. The people at IBM did a fantastic job and there's some super smart people there. I was very, very impressed with the team they put together. They used most of the people who had their own personal computers. Employees within IBM who have the oomph to go out and get their own personal computer and be kidded by their fellow workers, are in general a pretty good class of individuals. And a few of these people were just exceptional.

They were brought in from the company at large and they came down to Boca just for this project. We were the only vendor that understood what the project was about. Even up to the announcement most vendors were kept in the dark about the general scope and the general push of the thing. So we really enjoyed a really unique relationship. I don't think its flattering ourselves to say that I doubt that IBM has ever had such a relationship ever before. In fact, in their internal magazine—*Think*—they even mentioned the role that we played which was quite a thing for them to do. Other than this project, most outside vendors for IBM are really just providing their components and not super involved in how it fits in.

We developed a personal relationship with all those people that's equal to the closest project work we have done.

DAVID: Sounds like it was a lot of fun.

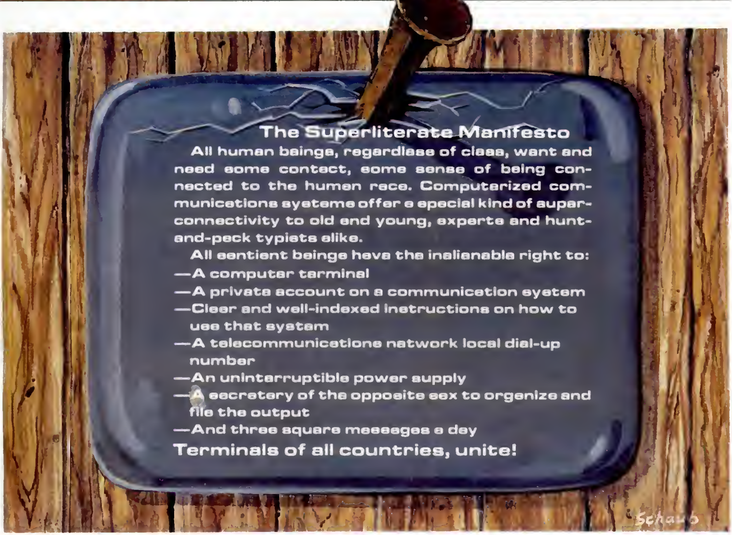
BILL: It was. Everybody around here enjoyed it a great deal. In a way, we always wanted there to be a definitive end to the thing, but even today there's some work going on. It's not like there is just one celebration. Boy, there has been some great...a lot of fun relaxation when we've hit various milestones. I don't know, the announcement was probably the best one because all the way through the project there was this aura that IBM couldn't even say to us that the project would be introduced. They always had to say, "You realize this may get cancelled any day and we'll just call you up and tell you to put all those confidential pieces of paper in a box and mail them back down here and don't call us again." I don't know how long that was really true, but that is really what they had to say to us. To know that the thing would really see the light of day and people would have a chance to evaluate what we had done really made us feel good.

We expect over the next year or two when people have really looked into the machine to see what it can do they will be increasingly impressed. Just like high resolution graphics on the Apple, there is a lot of capability there that will only unfold itself over a fair period of time. Some of that is the stuff we put in there and that will be neat.

I don't read about the TRS-80 any more because it does seem like a long time ago and in comparison it would be pretty easy to make fun of it, but the year or two after we did that project every time we would see somebody disassembling the BASIC or figuring out some little trick we thought it was really exciting.

It's the combination. Software is a great combination between artistry and engineering. When you finally get done and get to appreciate what you have done it is like a part of yourself that you've put together. I think a lot of the people here feel that way.

DAVID: That's quite a statement. Thank you for the interview.



SUPERLITERACY

Network Systems, The CIA And The Electronic Grail: A Writer's Quest For Perfectly Flexible Text

Clifford Barney

WITH TWO FAIRLY INEXPENSIVE DEVICES —IBM's Asynchronous Communications Adapter or an equivalent, and a "modem" connecting it to the telephone network—plus a simple program for communications, you can make an IBM Personal Computer reach beyond its desk or tabletop to communicate with the world. Communications Editor Clifford Barney (who also edits Computer Network News) will report regularly on how PC users can exploit this potential for outreach. In his first contribution, Barney shares some of his own experiences in this arena and weighs its significance for the future.

One day in 1967, I called at the Stanford Research Insitute to interview a computer scientist named Douglas Engelbart about an advanced form of electronic information system he was reported to be developing. I knew little about such systems but I hoped that the meeting might provide the substance of a news story for my employer, *Electronics* magazine.

When I entered his office Engelbart was sitting at one of the first cathode ray tube terminals I had seen. As we talked he began filling the CRT with screens of text, which he would subject to various editing tricks and then dispatch God knew where, all the while keeping up a running commentary in a vocabulary I didn't quite understand, concerning statements and "plexes" and branches and groups.

I watched for two hours as Engelbart played his machine and explained how it was that he could do these wonderful things. However it was no use; I couldn't follow what he was doing, so I didn't see what made it so wonderful. What made the text look like that? Where did it come from and where did it go? What was a plex, really? So I wasted our afternoon, though I don't think Engelbart minded; he seemed to have a wonderful time showing off his creation. He called it Online System, abbreviated to NLS.

I now realize that, like Parsifal botching his first chance at the Grail, I had been vouchsafed an early glimpse of electronic text, but had failed to recognize it. To me, at that time, computers processed only data. Engelbart had shown me English; not programs, not calculations, not columns of figures, but words and sentences. And though a writer by trade, I had been too disoriented to understand them.

It was years later that I next encountered electronic text. This time it resided on the disc drives at the Providence [R.I] *Journal,* where I was doing a turn on the copy desk. The *Journal* had installed an advanced text handling system that integrated incoming copy from wire services and the paper's own bureaus, and directed it to the proper departments in the newspaper: news, sports, features, etc. I used a CRT that could edit rings around the oldfashioned pastepot, scissors and soft lead pencil. And the the text editor not only hyphenated and justified the finished story but even counted my headlines for me, a job I had always had to do myself. Newspaper headlines have to fit in their allotted measure, and generations of copy editors had made sure that they did by counting the letters and spaces. If the head was too long, you had to rewrite it. The type wasn't rubber, the printers used to sneer, it was lead. Now the computer did the counting and the type might as well have been rubber; because if my electronically written headline was only a hair too long, I could shrink the type a little, say from 42 point to "41 point," a type size that strictly speaking did not exist. Then the head would fit and no one would ever notice (though a sampling of middle-aged men, eyesight beginning to falter, may have wondered they were squinting at the paper).

Still digesting this second experience of electronic text, I immediately plunged into the third, several months of messaging and conferencing on Murray Turoff's experimental Electronic Information Exchange System (EIES) network. It was while I was entering EIES's logical gardens that the electronic ephiphany occurred: After 25 years of my pounding typewriter, the typewriter started writing back.

"INITIAL CHOICE?" it said. (This is EIES's method of leading you down the garden path, i.e. choosing from its initial menu.)

I was hooked. The damn thing was finally beginning to share the work. Properly teased, it would cough up endless text without my typing a line. About time, I thought, and proceeded to run it through a few tests. EIES is extensively documented, and I spent a good part of the first few weeks online studying its strange rules for manipulating electronic text. There seemed to be a lot of them, and their purpose wasn't always clear to me. But I did begin to get a sense of what Doug Engelbart had been talking about more than a decade before.

NLS, and the newspaper system, and EIES, had been designed for the manipulation of text, not data. The etymologies offer a clear distinction: data is what is "given," raw information, *August sales* or *altitude in feet;* text is literally a "weaving" of semantic and syntactic patterns. "Text" and "textile" have the same root.

So the interpretation, and even the representation, of text is a multidimensional task. Yet text in electronic form still exhibits all of the plasticity of electronic data in that it may easily be edited, transmitted, merged and searched.

As a writer, particularly one being paid to listen, I might have realized the significance of what Engelbart was telling me. Computerized text systems put communications and information handling on a new level. Once Englebart got NLS airborne, *Electronics* magazine might never be the same.

Not that print was going out of style. NLS has since turned commercial as the office automation system marketed by Tymshare under the name "Augment"; if not exactly flying, it has at least made the transition from an experimental system to a practical tool. Yet *Electronics* continues to flourish, fatter and more authoritative than ever. Electronic text does not replace print, but it does supplant it as the general form of recorded information. Print becomes one of the forms of display.

The medieval monks who transmitted their culture a thousand years ago by copying Biblical texts in the *Book of Kells* would today be making them machine-readable. That way they could be stored online and accessed by the electronic version of a concordance, a data base command language. The service would inevitably be called Scripturenet. You could interrogate it and then salt and pepper your prose with proverbs and learned references, downloaded from the net and merged with your novel, your business report or your letter home.

The Online Marketplace

So far as I know Scripturenet does not yet exist, but dozens of its functional counterparts are competing in what is coming to be known as the "network marketplace," described by Herb Dordick of USC's Annenberg School of Communications as a locus where "products and services can be advertized; buyers and sellers located; ordering, billing and delivery of services can be facilitated; and all manner of transactions can be consummated, including wholesale, retail, brokering and mass distribution."

Targeted as customers in this marketplace are those of us who have access to computer terminals—which includes every IBM Personal Computer equipped with the Asynchronous Communications Adapter, or telephone connection device, and communications software. The network marketplace at first offered raw computer power and then developed online data bases, remotely searchable. But much of what is hawked today as "information services" consists of electronic text that you can access over telephone lines from a computer terminal.

What is so special about this medium? In *Toward Paperless Information Systems,* F. Wilfred Lancaster gave the fullest expression to the importance of *machine-readability* as the key attribute of electronic text. Lancaster, a librarian, helped design the SAFE information system for the Central Intelligence Agency (CIA). The function of SAFE is to give CIA analysts sharable access to remote data bases and files. They can construct private information bases composed partly of their own files and partly of files shared on a network. And the whole system depends on putting information into machine-readable form, permitting easy creation, editing, and transmission of text.

Intelligence Goes Public

On the heels of SAFE comes the private CIA, a multinational "worldwide intelligence service" called the International Reporting and Information System, or IRIS (goddess of the rainbow and Zeus's messenger, according to the indispensable Robert Graves). IRIS has hired the services of a former British prime minister, Edward Heath, as a mascot signifying respectability. The organization will provide commercial information service, not political espionage.

Nevertheless, "IRIS is to be built around a powerful computer, *the operation of which is being modeled on the one used by the CIA in Langley,* according to the *Washington Post* (emphasis added). Lancaster's prototypical analysts, their computer screens trained on all the world's information, or at least as much of it as IRIS can get into machine-readable form.

You and I don't have the same access to resources, and our equipment may be unsophisticated relative to SAFE's, or IRIS's, but we can do essentially the same thing on a PC. Electronic text plus network connections gives the individual unprecedented communications capability.

Einar Stefferud, a consultant who specializes in office automation, rates textual information systems in terms of the *connectivity* and the *mobility* of the information therein. In personal terms, you can see it in the mix of files that scrolls across your CRT. It's different for everyone: now a program to track cash flow, now production statistics, now a Dow Jones report, now electronic mail from a colleague. There is a single display space for all of the information; you can append the cash flow file to the production report, draw your own conclusions, and send an electronic message to your broker. In this repsect, network services become one more input to your computer, just as your stereo set can accept input from a remote FM station as well as an online record turntable.

The services have yet to mature. A clue to the present state of the art in information services is the price of hooking up to IRIS: $20,000 to $200,000 according to the *Post.* Useful databases and sophisitcated text software tend to be expensive.

Yet the primitive text systems available today do provide capabilities for message-sending and "asynchronous conferencing" (meaning not all parties need be electronically present at one time)—capabilities that were simply not to be had ten years ago. A shared text space makes the network something of a library in which everyone can write the books, and a clubhouse where colleagues can gather.

Messaging and conferencing—in which the text is created by the user, not the seller—are not expensive; but they are so new that business management is only beginning to see how they can be used. In organizing commercial computer conferences, I have found even the most technically advanced computer and integrated circuit manufacturers to be wary of investigating computer-mediated communication via electronic text. They'd rather consider video conferencing, which is a wildly expensive replacement for a face-to-face meeting.

Epilog: NLS Revisited

My typewriter now sits on a closet shelf; there are times when it would be handy, but it's too bulky to keep around. As a writer, I have become addicted to the electronic method of creating, storing and transmitting text. I have experimented on a number of text systems, both online and standalone. I have even had a chance to use NLS itself; I too have been able to summon and dispatch screensful of information and mystify my friends; and I have tracked a "plex" to its electronic lair (too complex to describe here).

NLS proved to be a special taste, like olives, and an expensive one at that. But there are now many other text systems available; every personal computer comes with a word processor. So many people have been exposed to electronic text that it has spawned a new discipline, "Electronic English," which has been taught for credit by Dave Hughes at Colorado Technical College. There are those who claim that the medium actually improves verbal proficiency. Others are skeptical; one dissenter has noted darkly that just as the chief effect of the invention of the typewriter was the proliferation of the busines letter, so hypertext might bury us in well-formatted nonsense.

But this argument puts the new wine in old bottles. The potential of electronic text is not to be exploited in asked it to do what is already done well, or well enough. That is a "horseless carriage" approach that we see in the marketing of computer message systems as "electronic mail." (They are really systems for sharing files, and they perform many functions having nothing to do with mail.)

It may be that in order to be properly recognized, the medium needs a catchy name. "Electronic text" is pedantic, and "machine-readable" too technical. Ted Nelson, the visionary author of *Computer Lib/Dream Machines,* coined the term "hypertext," which has become in-group slang for the kind of multidimensional, nonsequential writing that electronic text produces. Another candidate is "superliteracy," a label that makes people nervous until they find out how many of the super literates can't even spell. "Augment" was Englebart's own choice for the commercial name of NLS. He felt that the medium could augment the ability of an information worker in the same way that a lever augments physical strength.

A sentiment like Engelbart's may have inspired the author of the "superliterate manifesto" that has been woven into the EIES hypertext (Conference 52 on Superliterate Societies, EIES). This message (*see box*) is not elitist at all, but a vision of what might be possible from the medium.

The manifesto is not your ordinary account of the potential of computers and computerized text. Yet it does hint that there are more aspects of this new world than we have imagined so far. The next round will be greatly influenced by the thousands of personal computer users who are just beginning to experience the medium, including, presumably, the readers of this text. Your contributions are eagerly awaited.

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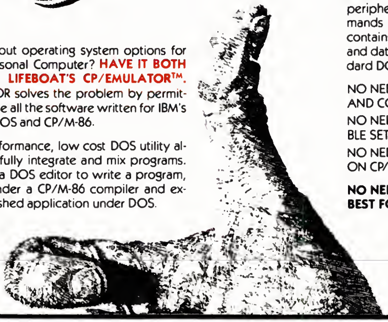

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LIFEBOAT HAS THE ANSWER

THE FREEDOM NETWORK

New service lets you send messages to Telex, TWX, even "fax" machines from your PC.

VIA A NEW TELECOMMUNICATIONS SERvice, IBM Personal Computer users can now send electronic messages to any of several hundred thousand locations with otherwise-incompatible receiving equipment, according to Dick Sherwin of Graphic Scanning Corporation. Sherwin says the accessible devices include teletypewriters (TWX), Telex and facsimilie machines, and specialized office word processors.

The Freedom Network, a service of Graphic Scanning's Graphnet subsidiary, has been in partial operation for several months, and Sherwin said it was scheduled for full operation January 1. The Freedom Network can receive text from any communications-equipped PC, translate or modify the data to suit 110 different variations of hardware, software and communications standards, and then retransmit the message to the designated receiving equipment and location. Cost to the sender will be about 30 cents per 100 words transmitted.

Sherwin says users of the Freedom Network will be able to send electronic messages to about 140,000 TWX and Telex terminals in North America, and to locations equipped with many popular models of "fax" machines such as the Xerox 410 and 3M 600A. They will also be able to send text to offices with communication-equipped word processors from CPT, Lexitron, Wang and others; international Telex will be possible too, Sherwin said.

The Freedom Network translates and retransmits messages to TWX and Telex locations at the time they are sent. Messages to other kinds of equipment are stored in Graphnet's computer for later resending, and can only be stored for destinations already registered with the Freedom Network. Access to The Freedom Network will be available by local telephone call from most large U.S. cities, according to Sherwin. Cost to use the service, over and above transmission time, is $5 a month. There is no initial fee. The 30-cents/100 words rate (Sherwin did not define a "word") applies to most transmissions, and remains constant at all hours. Telex transmission is slightly higher. Users must also bear any cost for their phone calls to The Freedom Network.

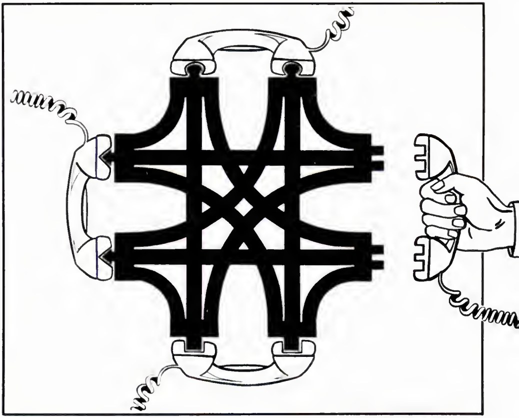

Illustration by Don Nace

Though Graphnet's target customers for the service are "Fortune 1000 companies," Sherwin said the company would not turn away "onesy-twosy" business from individual Personal Computer users. However he said credit references might be requested before an account was established.

Calculations suggest the cost to use The Freedom Network will be very competitive with that of express delivery for moderate quantities of text. A business document of eight to ten average-sized pages could be sent via The Freedom Network for the same price as a letter sent by the Post Office's Express Mail Service. Anything shorter would be less expensive, and in any case delivery would take place in a matter of minutes rather than overnight. (The comparison is inexact because messages sent by The Freedom Network presently cannot include signatures, graphic material, etc.).

If you would like to check out some places you could transmit to via The Freedom Network, you might consider purchasing a directory of Telex and TWX subscribers in North America. This volume, available from Western Union, is set up like a phone directory, with both alphabetical and classified sections. Also, Sherwin says "thousands of subscribers, including many major companies" already have electronic mail addresses assigned on The Freedom Network. A printed directory of subscribers is in the works, and there is a 24-hour "Directory Assistance" service as well.

"We are trying to make electronic communication as easy as possible for people," Sherwin said.

—Jim Edlin

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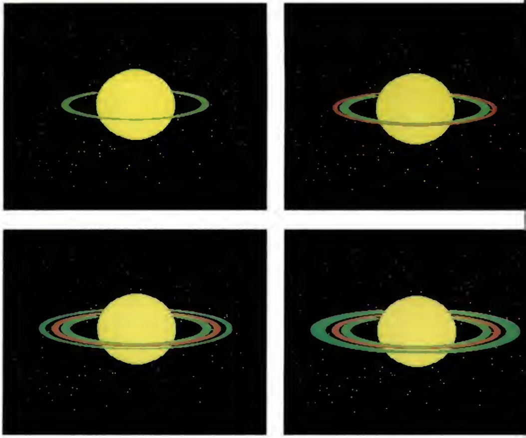
GAMEWARE COMING, BUT...

Carl Warren

SPOT A PERSONAL MICROCOMPUTER, AND immediately you might think of games—games that fill the screen with strange beings, make buzzing sounds and even talk. Games have always been a mainstay of personal microcomputer systems, and the IBM Personal Computer is ideally suited for the electronic illusions. But even though the PC has technically superior features capable of supporting exciting and unique game-ware, some believe that games—particularly of the arcade type—will be the least desired programs for the machine.

Market analysts, and IBM, don't see the Personal Computer as being just another personal computer to be used to entertain the family on a cold winter's night. This computer, more so than others, is targeted as a productivity machine for the family and manager of today, rather than a sophisticated device to garner points by 'chomping' gumdrops or cookies or whatever a game master can dream up.



Graphics resolution, color and animation powers shown in this IBM demonstration should inspire game designers

Playing the "What-If" Game

But gaming is more than just shooting down alien beings from outer space, asserts Dick Ainsworth, creative director at The Image Producers, a program development company in Northbrook, Illinois. Ainsworth believes that users of the IBM computer will want to play true-to-life sophisticated games, like making projections on the outcome of certain business decisions. "Playing the what-if game is more exciting than any arcade game I can think of," says Ainsworth.

Regardless of how you define a game, the key is excitement. And by employing the unique display and control capabilities of the IBM computer, game designers will be able to create some unique packages for it. Partly supporting this thesis is David Ahl, publisher of *Creative Computing*, Morristown, New Jersey. He contends that buyers of the IBM computer will want games, but will demand more intellectual games like Chess, Othello, or Backgammon. "The machine lends itself very nicely to this type of game," says Ahl.

Learning By Playing

If you use IBM as the gauge, Ahl is correct. Intellectual, tutorial style games are the ideal offering. Currently, IBM is offering a series aimed at teaching through game techniques. Fact Track ($90, diskette) covers basic arithmetic skills and is organized by level of difficulty. In the same genre are Arithmetic Games One and Two. The first set has two games called Beano and Rocket that are designed to refine your math skills while playing an enjoyable game. Set number 2, takes the method further and includes basic logic skills. These last two packages are priced at $60 each on diskette, and were developed by Science Research Associates for IBM.

But number games aren't the only thing IBM is offering. The fourth package in the new series is Typing Tutor ($25) which comes to IBM from Microsoft Consumer Products. This product, created by The Image Producers, uses the concept of automated teaching via game skills, and is designed to teach you how to type or improve your typing speed and accuracy.

The tutorial/game technique may be more the rule than the exception according to some industry watchers. Already managers at local ComputerLand stores

Carl Warren, author of over 600 articles, two books and a number of technical manuals, is a Western Editor for EDN magazine, and contributes regularly on microcomputer topics to several other publications.

are finding that buyers of the new machine are asking for software that can be useful over a long period of time. They report few requests for arcade games. Customers will accept, however, those packages that teach as well as play a game.

Creative Computing's Ahl has taken a different approach with three games: Blister Ball, Torax, and Tsuanami, all of which are in the final development stage for the PC. He points out that these aren't copies of other popular games, but are original arcade games that challenge the player and, for that matter, the machine.

Retrofits by March

Ahl and others expect a spate of retrofitted games (adaptations of those designed for other computers) to come available for the PC as early as March, with more sophisticated games coming on the scene 9 to 12 months later.

The reason for the time lag? Programmers have to become familiar with the machine and develop ways to take advantage of all its capabilities. Moreover, even with the development cycle aside, there is wide speculation that most game designers will offer their product to IBM for first evaluation, with only a small number taking the game directly to market. By offering first to IBM, software publishers will have to live with an evaluation cycle which could last as long as 4 to 9 months, depending on the package. The non-IBM method may reduce the time it takes to get the product to market, but direct-selling game publishers may find it difficult to locate the right audience.

To assist in the development of all types of software, IBM is providing would-be authors with full technical support—even to providing a specific engineering contact to answer questions about the operation of the machine, and giving detailed information about the PC's technical details.

But even with giant IBM providing a great deal of assistance, potential game authors may run into possible legal trouble in their retrofitting efforts. Should an author market a game similar in display and playing concept to an arcade game owned by Atari, for example, (which also owns the rights to all Bally games) that author can expect problems. Atari has gone to great lengths, including filing video tape representations of the games with the copyright office to protect its rights. What this will ultimately mean is some of the games you now find in coin operated arcades won't be available on the Personal Computer. What you can probably expect though is for software companies like Dakin5 Corp., Denver CO, to retrofit their popular Kaves of Karkhan to work on the IBM PC, and other game companies to follow suit as quickly as possible.

A Two-Faced Machine

The IBM personal computer appears to be a dichotomy at this early date, since it offers high-resolution color graphics, speedy screen updates good for animation, a flexible game port for handling game controls, plus the power and overall styling to fit business applications. All of which make the machine ideal both for games and business purposes. But Wayne Green, for one, isn't convinced that anyone has really figured out what the machine is to be used for. Green, President of the Peterborough, New Hampshire, company that publishes Instant Software, believes it's still too early to make any broad statements about the machine. Moreover, he isn't sure if it is games or business applications that will be important. He does point out, however, that games are usually popular and that eventually Instant Software will offer a variety of packages, with games being included. But what those games might be, Green would not yet guess.

Conceivably, the powerful IBM PC may open up a whole new era of game-ware. Don't be surprised to see, in the next several months, games that are based on real-life simulations, or that teach complex subjects in the form of a game. According to Loren Werner, owner of a Los Angeles, California based technical documentation firm: "I expect that by 1983 we'll be creating highly technical documentation on the IBM computer, and using gaming techniques to develop an understanding of the topics."

NOT-SO-EASYWRITER

EasyWriter word processing program, version 1.00.

Andrew Fluegelman

EASYWRITER, produced by Information Unlimited Software, program by John Draper and Matthew McIntosh. IBM Personal Computer Word Processing Series.

AFTER ABOUT A MONTH OF UNEXPLAINED delays, IBM's first and, to date, only word processing program for its Personal Computer has finally been released. What will the average writer discover once that pale blue binder has been pulled out of its slipcase?

The first impression is likely to be that the EasyWriter program does in fact live up to its name. The documentation follows the superb format of the other PC manuals, being elegantly printed and clearly written, and making good use of boldface headings and examples printed in contrasting green ink. I was able to sit down and read through the entire body of the manual (84 pages, including a tutorial) in about an hour and come away feeling that I had a fairly good handle on the way the program worked.

EasyWriter is organized on a three-tier system. Upon loading the program and storage diskette, the File System menu appears on the screen, listing sixteen available commands for editing, saving, revising, linking and printing files, plus information about the current file in memory and the capacity of the storage diskette [fig. 1]. The prompt "*COMMAND:*" asks for a one-letter instruction which is the first letter of the corresponding command. It's all clear and straightforward, and even someone who's not familiar with the concept of word processing files should be able to find his or her way without undue anxiety.

The "E" command gets you into the second tier of the program, the Edit mode, which is where all entry and revising of text is done. If no file is in memory, you're presented with a blank screen and a blinking cursor, ready to start writing. If you've already loaded a file into memory, the screen displays the text at the start of the file.

This part of the program makes excellent use of the cursor-movement and special function keys of the PC's keyboard. Individual keys move the cursor in all four directions, scroll the text up or down a "page" (actually, a screen's worth), move to the home position on the screen, to tab stops and to the end of the file, allow insertions and make deletions. Using the CONTROL key in conjunction with these enables advancing the cursor a word at a time, deleting lines of text, and moving to the beginning of the file.

Hitting the F3 special function key inserts a blank line below the cursor. F5 deletes a word (including the space preceding it). F6 "undeletes" previously deleted words, a letter at a time. All of these commands are logical and easy to learn, requiring in most cases a single keystroke that doesn't involve an alphanumeric key. Once again, a first-time user should have a much more comfortable experience starting to write with EasyWriter's simple commands, compared to the many multi-keystroke commands resident on a program like WordStar.

If you hit the key marked F1, you'll see the Help menu [fig. 2], which is displayed above the text being edited and which describes all the special function keys. The F2,-7,-8, and -9 keys control commands for moving blocks of copy and controlling printing (more about those later). The F10 key takes you back to the File System menu, while the F4 key takes you to the third tier of the program, the Additional Commands.

(Before moving on, I must note my first quibble. The Help menu is very easy to call up, but it gives no clue as to how to get rid of it. The manual does note, on page 5-1, that the display can be discontinued by hitting the F1 key again, but someone in need of instant on-screen help isn't likely to want to go paging through a looseleaf binder to figure out how to get un-helped.)

The Additional Commands menu [fig. 3], displayed above the text being edited, lists commands which perform a variety of formatting chores. As with the File System menu, all the commands require single-letter inputs that correspond with the first letter of the command. This time, we are told how to exit (hit the ENTER key).

These three menus cover all the EasyWriter commands, except for a group of "Imbedded Commands," which control print formatting. These are adequately described in the manual, but it would have

continued...

EasyWriter "Block Move" Tips

For those of you who are ambitious, I can pass on a few block-moving tips. First, you don't have to insert lines above and below the block, as the manual states. You can isolate a block in the middle of a paragraph simply by entering insert mode and placing the block markers where you want them. You also don't have to go through the double CTRL-J routine at the end of the copy shift. Once will suffice, before the move. (Why the screen gives the ambiguous messages "BLOCK COPY ON" — "BLOCK COPY OFF" is a mystery.)

On the other hand, make sure that you do move the cursor to the line (or the character) in front of the first block marker before hitting CTRL-J and CTRL-C. If you don't, you'll get a "BLOCK TOO LARGE" message, regardless of whether the block is really within the 3,500-character limit. This bogus error message threatened my sanity for a while. Preserve yours by proceeding very carefully.

One final tip: After CTRL-C, and before moving your copy block, delete the trailing block marker and paragraph-end by hitting the DEL key twice (steps 16 and 17 in the 21-step routine above). Then delete the leading marker by doing the same thing (moves 20 and 21) once the copy has been placed in the new location. This will save you undue cursor movement.

-A.F.

been convenient to include them in a fourth menu that could be called up on the screen. I also wish that the three modes of operation weren't set up on a hierarchical basis. (To get from Additional Commands to the File System, you have to first pass through the Edit mode.) In operation, there are many times when you do want to execute one of the formatting commands immediately following a file instruction —without taking a tour of the whole program.

Those are really just more quibbles, though. Initially, I was truly impressed with EasyWriter as a very friendly program that could be learned quickly by someone without an extensive word processing background. It seemed like an ideal program for a casual correspondent, temporary worker, writing student, or simply for someone not yet convinced that word processing can, indeed, help them write faster and better.

Unfortunately, EasyWriter contains a few very annoying inconveniences and some very serious traps for the innocent computer writer. They start to reveal themselves when you move from understanding the program (which is easy) to actually writing with it, which is, well, not so easy. I've given names to some of these programmed gremlins.

"The Insert Phantom":

When writing or editing text, hitting the Insert key lets you insert text in front of the cursor. This feature operates just about as with other w/p programs, except that it's painfully slow, especially if the screen is filled with a considerable amount of text. The solution, the manual tells us, is to create extra space by using the F3 key to insert blank lines in the text.

All well and good. Hit F3 six times, and all the text below the cursor is dutifully pushed down six lines. Start typing in that blank space and you'll see your new text filling up the first line. Everything looks fine so far, but appearances are deceiving. Reach the end of the first line and you'll see that blank space snap back together, gobbling up a line of your elegant prose in the process.

Woops! The manual does caution you, on page 5-7, that "if you forget to press INS before inserting text, you destroy text to the right of the cursor." But believe me, after weeks of writing with this program, I'm still forgetting and letting my eyes deceive me and gobbling up my words, and I'll wager you will too—and so will your temporary worker and your writing student.

Well, let's say the Insert Phantom is an

continued...

inconvenience. Meet his cousin, "The Enter Demon." The problem with this gremlin is that it's not satisfied with doing just one job. Hitting the ENTER key in text mode puts a little eighth-note symbol on the screen and moves the cursor down to the next line. You use this key to indicate the end of a paragraph, and it works just fine for that chore.

But you also have to use the ENTER key to turn off the insert mode. This is needlessly confusing. (A much more logical arrangement would have been to use the INS key as a toggle switch—hit it once to turn insert on and once again to turn it off.) If you're adding text in the insert mode (which you sometimes have to do, as explained above) and come to the end of a paragraph, you hit ENTER once and it only takes you out of insert mode. You have to hit it again to place your paragraph-end marker. Then you have to remember to hit INS again before continuing—otherwise you'll be gobbled up by the Insert Phantom.

That's not all. You also have to hit ENTER after each of the special formatting commands. If you're inserting these commands in your text, as you're likely to do, you have to go through the same double-strike routine described above. You also then have to deal with the extra line added by ENTER, deleting it with a CONTROL-END. If this is beginning to sound confusing, you're right.

The Enter Demon presents another minor problem. How to insert a paragraph-end in the middle of text? The logical way would be to hit INS, then ENTER. But doing that just turns off the insert mode again. A writer who investigates this conundrum will discover that the ENTER key has insert rules of its own. All you have to do is place the cursor wherever you want the paragraph-end. Hitting ENTER automatically inserts the marker. But will your temporary secretary want to take the time to figure this out before he or she begs to have the Correcting Selectric back?

The Aligning Black Hole

I could go on with more inconveniences, but there are also some very serious problems lurking between the bytes. If you've already got a PC and EasyWriter on hand, load a storage diskette, call up a file of text (make sure it's saved!), and let me introduce you to the "Aligning Black Hole."

Do the following:

1. Hit END, to get to the last text on your file.
2. Hit ENTER. A paragraph-end marker will appear and the cursor will move down to the next line.
3. Hit ENTER once more. A paragraph-end marker will appear on the next line and the cursor will move down again.
4. Now delete that marker by moving the cursor up and hitting the DEL key.
5. Now re-align your text by hitting F4 and typing "A."

Unless your copy of EasyWriter contains a revised version of the program I've got, you're now on your way to the Black Hole. First you'll see the program go through its regular aligning routine. Next, you'll see a little happy-face marker that indicates the end of the file. But the command prompt will indicate that the program is still aligning. And it will continue to be stuck in align mode, with no possible exit, until there's a power blackout, or until you reset the system (and erase current memory!) with the CTRL-ALT-DEL keys.

Preventive medicine:

Check for phantom lines at the end of your file by hitting END and noticing whether the cursor is more than one line below the last line of text in your file. If so, hit CTRL-END several times before aligning. To be safe, always be sure your text is saved before trying to re-align, and pray that your enthusiastic student doesn't stumble upon this black hole on his or her own.

I've also encountered the "Disk Format Charlatan." More than just occasionally, when moving from one File System command to another, I've received an error message that says "DISK NOT INITIALIZED. DO YOU WISH TO FORMAT?"

If this spine-chilling notice appears on your screen, don't panic and type "Y," because, of course, you'll erase everything on your disk while re-formatting. Instead, type "N," and you'll be instructed to "INSERT THE PROPER DISKETTE, THEN PRESS ENTER." Ignore the instruction and simply pull out your working storage diskette and re-load it. Be prepared to get the same error message two or more times before the program reads your disk correctly.

I've experienced this glitch on both my disk drives, which continue to work flawlessly with other PC software. My very strong suspicion is that the problem is inherent in the EasyWriter program. I'd be interested in having this problem confirmed by other users. Meanwhile, warn everyone who's likely to be working with your prized diskettes about this peril.

The last gremlin I'll describe is the "Block Move Blockhead." Plain and simple, the block copy-moving feature of this program is a disaster. It takes a minimum of twenty-one commands and well over a minute to successfully shift a paragraph from one spot to another (place cursor, F3, INS, F8, ENTER, ENTER, move cursor, F3, F8, ENTER, ENTER, move cursor back, CTRL-J, CTRL-J, CTRL-C, DEL, DEL, move cursor, CTRL-G, DEL, DEL). I don't mess with this unless absolutely necessary. (*See box for tips on using the block-move feature more easily.*)

"The Hard Copy Jungle"

When you're ready to print your text, you might find yourself in "The Hard Copy Jungle." This part of the program also contains a number of minor and major inconveniences, plus some real gaffes.

To EasyWriter's credit, the program does present a useful array of what are termed Imbedded Commands. These permit formatting the printout by adjusting all four margins, numbering pages, adding three separate running headings (which can be positioned anywhere on the page), and providing for single or double spacing, variable sheet length, and single-sheet feed. Each of these Imbedded Commands must be inserted as a separate line of text, preceded by a period and terminated by a paragraph-end.

The manual does not warn you, however, that the presence of one of these Imbedded Commands will cause one or more extra line feeds. You can devise ways to compensate and sneak these in at spots where the extra line doesn't cause a problem, but it's really frustrating to have the very commands you use to control your format screw it up in the process.

EasyWriter permits two modes of printing: from the File System Menu, via "H," and from the Edit mode, via F2. Occasionally, these produce slightly different results. Without trying to describe the phenomenon in detail, it seems that printing via "H" doesn't always reset the page numbering and heading features properly. I found printing from the Edit mode with F2 to be more reliable.

EasyWriter comes configured to work with IBM's 80 CPS Matrix Printer, which I haven't tested. If you want to use another printer, such as one which prints letter-quality characters, there's a Reconfigure routine on the Additional Commands menu, which lists various printer options. I tested the "Diablo or Qume type printer" option to reconfigure for a TEC (C. Itoh) Starwriter FP-1500-25, and all of the print features described in the EasyWriter manual (except sub- and superscripts) seemed to work fine.

I didn't have the same luck following the "Spinwriter type printer" option to reconfigure for an NEC Spinwriter 5530. Although the Reconfigure routine gives a

```
                         EASYWRITER FILE SYSTEM
-------------------------------------------------------------------------
A - APPEND FILE    E - EDIT FILE      H - PRINT FILE      U - UNPROTECT
B - BACKUP         F - FORMAT DISK    P - PROTECT FILE    X - EXIT
C - CLEAR TEXT     G - GET A FILE     R - REVISE A FILE   1 - DRIVE A
D - DELETE FILE    L - LINK FILES     S - SAVE FILE       2 - DRIVE B
-------------------------------------------------------------------------
FILE #: 4  M/S hdr    FILESIZE= 145     AVAIL= 18415    %USED= 20    DRIVE B
LINKS ARE:   4  1  2  3
  1 Esywrtr1   13350  2 Esywrtr2    3603  3 Esywrtr3   1638  4 M/S hdr     145
  5 FIG hdr       58
COMMAND:
```

Fig. 1—EasyWriter file system display, showing five files stored on the current disk. (Printed by the author's PC system using the PrtSc command key.)

```
                         EASYWRITER HELP MENU
    -------------------------------------------------------------------
         F1 - HELP MENU         F2 - PRINT               J  - BLOCK COPY
         F3 - INSERT LINE       F4 - ADDN COMMANDS       C  - BLOCK GET
         F5 - DELETE WORD       F6 - UNDELETE            G  - BLOCK PUT
         F7 - STOP PRINT        F8 - BLOCK MARKER        O  - USER KEY
         F9 - ALIGN MARKER      F10- FILING SYSTEM
    L                                                            R
    +----+----+----+----+----+----+----+----+----+----+----+----+----+----+---
```

Fig. 2—Help menu display. Below menu is format "ruler" showing left and right margin settings.

```
                 A D D I T I O N A L   C O M M A N D S
   ---------------------------------------------------------------------
   A - ALIGN TEXT         M - MARGIN SETTINGS       T - TAB SETTINGS
   C - CENTER A LINE      P - PAGE SETTINGS         W - WORD COUNT
   H - HMI SETTINGS       R - RECONFIGURE           ENTER - EXIT TO EDITOR
   J - JUSTIFY ON/OFF     S - SEARCH AND REPLACE
   COMMAND?
   L                                                             R
   +----+----+----+----+----+----+----+----+----+----+----+----+----+----+---
```

Fig. 3—Additional commands display.

bi-directional printing choice, that feature of the Spinwriter wasn't supported. Boldface printing and underlining almost worked, but the line feeds kicked over too soon, or not at all.

There was also a problem printing double-spaced with the Spinwriter. The printer produced single-spaced lines at the bottom of some pages, and always at the end of the file. I did manage to get around this by using the double-space switch on the front panel of the Spinwriter, instructing EasyWriter to print single-spaced, and imbedding ".lines" and ".pagelines" commands that were half the value of what I really wanted.

The EasyWriter program does allow for user-defined printer commands which might be able to remedy such problems. Nevertheless, someone did go through the motions of providing configuration routines. I can only report that if you're a Spinwriter devotee and you prefer writing to studying printer manuals, you're not going to be pleased with what has been provided.

Some program evaluators may be surprised that, for all these cataloged gremlins, I haven't mentioned some of EasyWriter's obvious drawbacks: the indisputable fact that it operates needlessly more slowly than the capabilities of the PC's hardware; its limitation of being able to handle no more than 31 files per disk (maximum 18,500 characters per file); the unavailability of certain formatting sophistications and of merge, sort and spell-check options; the fact that text is stored as specially-encoded data, making it difficult to transfer files to other programs or systems.

I haven't focused on those problems because I don't think EasyWriter was ever conceived as the Rolls-Royce of word-processing programs. Its simple commands and menu structure gave it the potential to be a Beetle—a reliable vehicle that could be driven by anyone, anywhere, without having to call in a mechanic every few miles. That it falls short of that potential is my real disappointment with the program.

The software assembly lines are already humming, and PC users can expect to see compatible versions of the established word processing packages available within the coming months. Many of us with elaborate text-processing requirements will probably snap them up, relieved. But many casual writers would really rather have a truly "easy writer" that adequately serves their needs. Unfortunately, version 1.00 of IBM Personal Computer EasyWriter is not quite that program.

Andrew Fluegelman is the co-author, with Jeremy Joan Hewes, of Writing In The Computer Age, *to be published by Anchor/Doubleday in Fall '82. He is the subject of the* PC Profile *appearing elsewhere in this issue.*

COMING ATTRACTIONS

PC-Lab Reports: What they are; what's in the pipeline.

PUBLICATION DEADLINES FOR THIS Premiere Issue of PC came hard on the heels of the first wave of product introductions for the IBM Personal Computer, and did not permit completion of any product evaluations in the rigorous fashion we hope the "PC-Lab" banner will come to symbolize. In the following article, PC-Lab Director Larry Press introduces the viewpoint and procedures that will guide preparation of articles under that banner, which will start appearing in the next issue.

—The Editors

As you might have guessed from the title, the PC-Lab section of this magazine will publish evaluations of products—both hardware and software—offered for use with the IBM Personal Computer.

The title "PC-Lab" may make you think of a solemn group of researchers in white lab coats, carrying clipboards and conducting experiments; however, this image isn't really accurate. At the present time we have neither a lab facility nor solemn people with white coats. Initially, PC-Lab will rely on a cadre of on-call specialists who will conduct evaluations in their areas of expertise and write up the results for publication. Their work will result in several types of articles

Dr. Larry Press, Director of PC-Lab, heads Small Systems Group, a product evaluation service in Santa Monica, California. He also edits The Personal Computer newsletter of the Association for Computing Machinery.

Comparative Reviews

We will strive to make each of our reviews as objective and repeatable as possible. They will include the results of experiments, tables of capacities, feature checklists, documentation characteristics and general characteristics which are broader than "features." In a comparative review, we will run the same experiments and make the same measurements for each product, and present the results in a common format.

For instance, in a comparative review of file management systems, we would establish several typical data files, and then measure such things as the time required to sort the file or retrieve a record, using each of the programs under review. The amount of disk space used to store the files would also be reported. The capacities of the programs: maximum file and record sizes, number of fields per record, etc., would be tabulated. In considering features and characteristics of a file management program, we would note such things as the number of data types available, the types of indexing which are employed, and the ability to generate reports with various forms of headings and totals.

One possible problem with this sort of experimentally based evaluation is that it might overwhelm relatively non-technical people. On the other hand there is the danger of oversimplifying complex problems and of glossing over important data. This is a difficult tightrope to walk; however, I feel that publications such as *Consumer Reports* have shown that it is possible to inform people about products without talking down to them or boring them to death. If we do our job well, our comparative reviews will teach non-technical readers in addition to helping them in making purchase decisions.

Comprehensive Reviews of Single Products

For several reasons, all of our reviews won't be comparative. For one thing, at this early stage of the game, there are not a lot of similar products to compare. For instance, as of this writing, there is only one word processor available for the IBM Personal Computer. While there will soon be many products to review, the time and effort required to conduct a comprehensive comparative evaluation of several products is substantial. Time is required to plan the evaluation, to conduct experiments and then to interpret and write up the results. Where we think you will value timeliness more than comprehensiveness, we will conduct single-product evaluations.

The danger with a single-product review is that you get one person's subjective opinion. For example, a reviewer who had never used a word processor might love a very poor word processing program, since it was much better than using a typewriter. Furthermore, some people are just more critical than others. One person's "poor" might be another's "good." We will attempt to forestall such problems by selecting reviewers who have experience with products similar to the one under review, and by continuing to emphasize experimentation and objectivity. Instead of saying that a program is "good" or "average", its speed can be measured and its characteristics listed.

Our goal with these in-depth reviews will not be merely to evaluate a single product, but to establish a format which will be used in subsequent reviews of other products of the same type. With time, we will accumulate a group of standard rements will be run and the same characteristics and features tabulated even if differ-

Photo by James McCaffrey

ent people conduct the evaluations and they are done at different times. These would also be used if we were to eventually publish a comparative review. Since they will be used in this manner, a good deal of time will be spent on planning, experimentation and designing the report format for these reviews.

Quick Looks, Previews and Reader Surveys

We will also have a place for shorter, less formal articles. These will describe a quick look at a product, based on using it for a few days, without doing much systematic experimentation. Preview evaluations will offer advance looks at items not yet released for sale, and may be limited by the fact of a demonstration being kept under the manufacturer's control. These articles will not be expected to set formats for subsequent reviews, but will be used as a means of letting the readers know about new products relatively quickly. Quick-look articles will have more room for opinion and informal comparison to other products, so we will continue to be careful about qualifying the authors.

In addition to publishing articles and reports such as discussed above, we plan to poll readers on their experience with various products. These surveys would not be able to go into the detail that a review would, but we would gather significant feedback on reader satisfaction with products and vendors. Reader surveys also feel good to me because they provide a way in which we can all become actively involved with the magazine. It is my guess that a magazine which is *used* by an active community of readers, will be both useful and exciting to contribute to.

What's Next?

As you probably know, IBM has already announced several software packages for the Personal Computer. We have just received copies of the Easywriter word processor, VisiCalc, BASIC and the disk operating system and will try to give you at least a "quick look" at these by the next issue of *PC*. IBM has also announced that they will offer UCSD Pascal, the Microsoft Pascal Compiler and CP/M 86, but as of this writing, they have not yet established a firm delivery date for these systems. We also expect a copy of their communication package any day now, and will probably have something to say about that by the next issue. Finally, IBM has published a technical manual describing the Personal Computer. At first glance, it appears to be quite complete and will be must reading for anyone planning to really get into the machine—either as a hobbyist, or as an entrepreneur thinking of developing a hardware or software product for the personal computer. More on that next time too.

Since color monitors and letter-quality printers are not supplied as part of the standard IBM product line, they will probably be featured in early hardware reviews. We have also heard many rumors about hardware and software products which will be forthcoming from vendors other than IBM. At this time, we don't have any firm dates, so we will wait to see what materializes.

It goes without saying that I would like to hear from you. Let me know what products you would like to see evaluated and what you want to see in the evaluations.

IBM's New Personal Computer:

Taking the Me

No single computer event has ever captured more interest from more people than the introduction of the IBM Personal Computer. No single development in personal computers has ever produced more forecasts of far-reaching change.

But all the interest, all the forecasts, were excited by an unknown quantity. At first, the only things actually known were the name, company and reputation behind the coming product. And, for apparent multitudes, that was enough.

Preliminary reports about the machine began circulating immediately after IBM announced it on August 12, 1981. But these were necessarily based on specifications rather than experience. Early October was when the cash customers were scheduled to begin receiving what some already were calling their "PC"s, and some did indeed receive them, but at the beginning only in a trickle. By the COMDEX show at the end of November (see following story) the IBM Personal Computer was still an object of curiosity.

The atmosphere echoed how an earlier generation must have responded when General Motors introduced its first modern sports car, the Corvette, and only a few early models had been let out on the road:

"What'll she do?"

"How fast?"

"How's she hold in the turns?"

There comes a time when reputation must stand the test of performance, and that is the purpose of the articles that begin here and continue in PC's next issue. We can now begin to take the measure of the machine—to test its reach, its endurance, its power to satisfy.

In this issue we report on the measure of things most immediately accessible: the system software, the potential for expansion, and first impressions in general. First impressions first.

sure
Part One

Jim Edlin and David Bunnell

Photography: Jay Carlson

First Impressions

FIRST IMPRESSIONS START WITH THE box. If someone has given obvious thought to a packing box, you are inclined to suppose they also thought hard about what's inside. IBM has clearly given some thought to its Personal Computer boxes.

To begin with, the packing boxes look good—a tasteful gray-and-white extension of the highly styled machinery within. Secondly, the packing arrangement is exquisitely functional—all tabbed and slotted and nooked and crannied to give the goods maximum protection.

But if you have included the monochrome monitor in your system, the packing boxes also telegraph one other quality about the IBM PC, namely it's an awfully good start but there are lapses. The monitor, unlike the keyboard and system unit, comes in a klunky brown carton bearing random stamps and stickers from its transpacific passage.

Elsewhere in these pages, Microsoft's Bill Gates describes the IBM PC as the personal computer that "stands on the shoulders" of all that has been learned in the last half-dozen years about making personal computers. And so it does, in many respects.

But it is simultaneously the beginner of a new cycle, full of things people will quickly discover can be improved upon.

The keyboard is a good example of both phenomena. Personal computer experience has shown that people like to have two sets of keys for entering numbers—one typewriter-style and one calculator-style. So IBM provides both as standard. Then IBM added a clever arrangement for letting the calculator "pad" double as a set of keys for controling display screen motion. Similarly, in the light of evidence that programmers can make profitable use of special-function keys, IBM provided these too.

The IBM keyboard approaches being a triumph of design, even unto thoughtful touches like adjustable legs for tilt, and a handsome spring cord for connection to the system unit. But that nice spring cord plugs into the most awkwardly placed outlet imaginable, way 'round in back of the computer—rendering half its seemingly-generous length useless. And one wonders how IBM, that ultimate pro of typewriter manufacture, could put the left-hand SHIFT key at the awkward reach they did, let alone omitting the shift-lock arrangement whose use comes so instinctively to the fingers of typewriter users everywhere.

Memory, Memory Everywhere

When one first explores an IBM Personal Computer system, or imagines how one would create programs for it, the dominant impression is one of memory, memory and more memory, everywhere you turn. There is memory for the display, and memory for the other display if you include both monochrome and color in your system. There is memory space reserved for still other displays as yet unspoken-of, or perhaps higher-resolu-

continued...

tion graphics to be offered sometime hence. There's memory for plenty of plug-in read-only software. And still there is more memory space left for programs and data than most personal computers store on one, or even two disks.

Other personal computers use their diskettes as simulated "virtual" memory. The PC could use part of its memory as a virtual diskette.

Getting full memory power out of a PC does not come cheap. For what it costs to give one PC its theoretical (as yet still unusable) maximum of memory, you could instead buy two or three more of the most stripped-down PC models. But the prices will continue coming down and it's comforting to know the capacity is easily accessible.

Professionalism But Rough Edges

The lengthy self-diagnosis for problems that every PC performs every time you turn it on is a continuing reminder of the professional standards observed by those who build it. But the self-check causes a pregnant pause after you flip the switch on, and if you are inclined to expect the imminent failure of all complex machinery, the pauses can be repeatedly heart-stopping.

Rough edges keep showing up as you use the computer. When you format a new disk, the formatting program tells you at one point in the process, "strike any key when ready." Yet, because the process could destroy valuable data if it starts prematurely, the user's manual warns you to be careful of striking a key accidentally <u>before</u> you are ready. One would wish for for a better safety measure than this offhand note. And contrast that situation with the two-hand, two-key contortions—precautions worthy of a factory punch press—needed merely to pause the display listing of a disk directory or BASIC program.

If one is inclined to pick nits, it is probably because they stick out against an otherwise impressively smooth background. But IBM has 120 years or so to correct these. Apparently, that's all the time they have, though; the disk operating system is set up not to accept an entry for "Today's Date?" whose year is any later than 2099.

After which, for all we know, you may end up with an IBM personal pumpkin.

Beanstalk Basic

The PC's BASIC language—powerful and complex.

IN THE HALF-DOZEN YEARS SINCE Microsoft founders Bill Gates and Paul Allen showed up on the Albuquerque doorstep of MITS, Inc., bearing the BASIC language interpreter they had created for that company's pioneering Altair microcomputers, their small seed of a program has grown like Jack's beanstalk. It has shot up and fleshed out to such robust dimensions that a microcomputer-age Jack can truly use it to climb into the land of the computer giants.

THE SEED PLANTED IN ALBUQUERQUE was an 8,000-character (8K) program with limited capabilities that conformed to the spirit of the original BASIC language, which had been invented a decade earlier for use on large computers.

Well that 8K seed planted in the desert sands of Albuquerque has since been nurtured by the rains of the Pacific Northwest (where Microsoft later moved), the hothouse climes of California's Silicon Valley (where Apple Computer, among others, resides), the giant-breeding influences of Texas (Radio Shack), the precise gardening of the Japanese (NEC, among others), and now by the warm sunshine around IBM's Personal Computer factory in Boca Raton, Florida. The resulting growth spurt has left it sextupled in size from its sprout days (to about 48K in the advanced version), with a geometrically proportional increase in power.

The nutrient on which it has grown to such power? Memory, memory and more memory. Thanks to the PC's abundance of memory space, and the ever-falling prices for memory cell hardware, PC BASIC sprawls out over memory acreage hitherto unimaginable for a microcomputer's BASIC language. Two other key nutrients are speed, provided by the 8088 processor's inherent fast operation and an internal instruction set that facilitates high-speed computation, plus experience—the six-year opportunity to discover and supply what people thought was lacking in Microsoft BASIC's earlier incarnations. An additional growth factor for PC BASIC's power was the decision to make it "machine-specific"—that is, to pull many of the hardware design's special features under direct control of BASIC commands instead of requiring their manipulation by POKE and PEEK instructions to obscure memory locations (a common approach for earlier machines).

Where is PC BASIC's new power most noticeable? In the "human interface:" those ways in which a user must go about writing, editing and using programs; in file handling; in error handling; in facilities to create and run interrelated suites of programs; and most of all in graphics, when the advanced version is used.

There are three versions of the Personal Computer's BASIC. The built-in version, supplied with the IBM System Unit in 32K of read-only memory, has most of the new powers except those relating to disk storage, graphics and music. Two supplementary versions of BASIC are supplied with purchase of IBM's disk operating system; one that mainly adds disk-related commands, and an "advanced" version that also adds graphics and music commands. Both versions mate with the 32K of BASIC built into the system unit, the 8K of operating system that is also built in, and the 12K of additional PC DOS operating system loaded in from the same disk as BASIC.

Earlier BASICs often had the on-the-job personality of a meter maid. Park one wrong character in a forbidden zone and it would shout "VIOLATION" and write you up with an error-message citation, showing no mercy whatsoever.

PC BASIC is much more forgiving.

TYPE A LOWER CASE LETTER WHERE A capital is required, and nobody shouts "VIOLATION." BASIC just calmly capitalizes your mistake. Bury a "reserved command word" like ON in a variable name like ONIONS and your Personal Computer goesn't get confused for a moment. What's more, taking the new memory abundance to heart, it lets you give variable names as long as you want, and pays attention to the first 40 characters. To PC BASIC, lucid-to-you names like COUNTY.TOTAL and COUNTRY.TOTAL are mercifully distinguishable.

Editing a PC BASIC program to make corrections and changes is a vastly eased affair compared to earlier BASICs. The program's designers took into account that their product was going to work on a nice, flexible video screen rather than a clunky old teletypewriter, so instead of old-fashioned "line-editing," PC BASIC gives you *screen editing.* If you are typing away on line 350 of your new program when you suddenly realize there's a change you need to make back on line 300, you just hustle the cursor straight up there, type in your change, and it's done. Then you can zip the cursor back to where you were and go on. The editor design isn't as fully adapted to the benefits of video display as it might be, but it has come a long way from the old days.

One last example of the human interface's thoughtfulness is the way BASIC refers to row and column positions on the video screen. They are numbered starting with 1, which is the way people count things, instead of starting computer-fashion with 0 as in other microcomputer BASICs. (In a curious inconsistency, this nice touch applies only for text display. Graphics rows and columns on the screen are indeed numbered starting with zero.)

Error Handling

"ERROR" IS THE COMPUTERIST'S euphemism for something happening in a way other than planned. Handling errors means planning for the unplanned, and somehow making sure that inconvenience to the program user is minimized.

Errors can range from the inadvertent typing of the lower-case L, when the number 1 is needed, to an attempt to read from a data diskette that has had coffee spilled on it. An unhandled error means the program "crashes." By providing lots of easy ways to detect and correct errors, PC BASIC encourages programmers—you included—to anticipate and forestall possible crashes.

An ON ERROR GOTO... command and its GOSUB brother let you direct the program to a special section when an error occurs. In that special section, other commands let the program figure out what kind of an error took place, *and* even the point in the program where the error occurred. A RESUME command, and a variation of the RETURN command that enables return from a subroutine to a chosen line number, allow extra sophistication in recovering gracefully from errors. For debugging purposes, an ERROR command is provided for temporary insertion in programs under development. When encountered, the ERROR command causes simulation of the error named in it, permitting the testing of a program's error-handling segments.

Program Integration

PC BASIC ENCOURAGES THE CREATION of elaborate, interwoven suites of programs by providing such commands as CHAIN, COMMON and MERGE. The MERGE command, together with powers such as RENUMBER, also makes it easy for programmers to build on their earlier work and the work of others.

MERGE can be used during the creation of a program to weave in earlier-written material such as error handling or file handling routines. It can also be used—together with the DELETE command if desired—to modify a BASIC program at the very time it is running. Such powers are likely to encourage the "menu-driven" technique of program design, where a choice made from a menu would cause merging in of the program section responsive to the choice.

The Personal Computer also provides plenty of facilities for weaving machine language programming into BASIC when its extra speed is desired. Both the CALL and the USR commands are provided for this purpose. Ten different user-written routines are accessible at any given point via the USR statement, and the CALL command can branch to any stated point in memory. Machine-language code need not be within BASIC's 64K of memory space; the DEF SEG command (which defines the start of a 64K segment of memory) makes it possible to access the IBM machine's entire complement of usable memory. You could even stash a machine-code routine in an unused page of the video memory on the color-graphics display adapter. And the BLOAD command makes it easy for a BASIC program to draw machine language routines into memory from disk storage.

Graphics and Music

MENTION OF THE BEST HAS BEEN saved for last in this article. The graphics commands provided in the advanced version of PC BASIC will make it possible for BASIC programs to use dramatic graphic presentations simply and routinely.

A similar command having language-within-a-language properties is PLAY—used to produce music from the PC's built in speaker. Even the built-in BASIC language can utilize the speaker with the SOUND command. But the PLAY command is specifically designed for producing musical sequences using the classical Western scale of notes and familiar tempos. Unlike SOUND, PLAY doesn't require the user to know anything about frequencies and durations, only the traditional notes. Regrettably, there seems no easy way the PLAY command can send its compositions anyplace other than the PC's pipsqueak speaker.

Conclusions

PC USERS AND ENTREPRENEURIAL software authors alike should find plenty to laud in Microsoft's new BASIC for the Personal Computer. Because of its range and power, commercial software authors are probably going to be more inclined than before to work at least partially in BASIC. It is clear a lot of thought went into making the details work sensibly, like rounding numbers off rather than just truncating them when converting from double to single precision arithmetic.

Regarding translation of programs from other versions of BASIC, hints are included in the back of the user manual. But chances are that translation in many cases won't be quite as easy as the manual makes it sound—particularly if the programs use machine-specific features such as cursor positioning or display formatting. And in any case the translated programs won't be able to take advantage of PC BASIC's speed and pizazz without major rewrite.

There is, however, a twinge of sadness brought on by this latest version of a language that no longer fits its name. BASIC is now complex. And for the guy who buys something christened a "personal computer" only to discover that the language for commanding it takes 400 pages to explain, one must feel some sympathy.

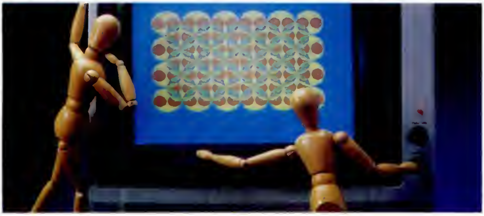
In growing powerful, BASIC has emerged less personal. Many people newly brought into the world of microcomputers by the IBM Personal Computer will find this enhanced BASIC less approachable, more forbidding than its predecessors. Perhaps IBM ought to have borrowed a leaf from Atari and included with its computer not only a comprehensive reference manual to BASIC, but also a friendly, step-by-step introduction for the beginner.

A Language Within a Language

PC BASIC's powerful graphics commands.

TO APPRECIATE THE POWER AND simplicity of one command in PC BASIC's graphics arsenal—the DRAW command—it helps to have seen a child discovering the things he can make a video picture do using the "turtle graphics" instructions of a computer language called LOGO.

By telling an electronic image of a turtle to go this way and that on the screen, even very young children quickly figure out the techniques for developing complex video illustrations. LOGO has a language of simple commands telling the symbolic turtle which way to turn, how far to go in the new direction, and whether to draw a line as it goes. The resulting lines can make shapes, and the resulting shapes can be combined to make still-larger shapes.



DRAW is not so powerful as LOGO nor quite so simply expressed, but it comes from the same school of thought. It is, in effect, a separate graphics language within the larger BASIC language. Each DRAW command is followed by a series of mini-instructions that describe a course of travel for an imaginary penpoint and the actions it should take along the way. The course proceeds from a previously set starting point in any one of eight directions, at 45-degree intervals. The mini-instructions specify distance in each direction and color of line, if any, to be drawn. The instructions for drawing, which are a sequence of letters and numbers, are stored together in a "string" variable.

The dramatic power of DRAW comes from a special mini-instruction ("X string") that allows an instruction string to incorporate others of the same kind stored under different names. Each of these other instruction strings can, in turn, perform the same trick. And so on.

A set of such strings, each bearing the instructions for drawing one simple shape, can thus be conglomerated, layer upon layer, into one long instruction that draws a complex picture. The process can be repeated through many layers of instruction strings. In this fashion a single DRAW command can evoke the appearance of a quite elaborate image.

You might, for example, make one string that draws a little red rectangle, and call it BRICK$. A second string, WALL$ might then make a whole wall by moving the pointer to each new brick location and then instructing: X BRICK$. A DRAW statement for a picture of a house could read: DRAW "X WALL$; X WINDOW$; X DOOR$;. . ." and so on.

DRAW is not quite LOGO. But—to suggest how close it comes—it seems probable that someone could write a reasonable facsimile of LOGO to run on the IBM Personal Computer using Advanced BASIC and relying heavily on the DRAW command.

Three other commands—CIRCLE, LINE and PAINT—also add graphic power to the PC. CIRCLE is a one-step command that enables the creation of circles, ellipses and segments of them. In the case of segments, the ends can, if desired, be connected by lines to the center. The command is a pie-chart-maker's dream.

LINE should really be called LINE/BOX, since it also draws squares and rectangles, in the same fashion that CIRCLE works. Its drawing of a straight line is really just a special case of a box with one dimension of zero. Finally, PAINT is a command that provides for the filling in with color of any enclosed area on the display. So after you create a circle, box or other figure with the earlier commands, you can use PAINT to fill it in.

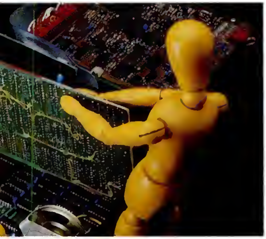
Lastly, one other pair of commands contributes to PC BASIC's graphic nimbleness—PUT and GET. These rely on the principle that any picture on the PC's display is simply an array of numbers in its video memory cells. Such an array can be copied to or from any equal-sized array elsewhere in the computer's memory. One could do such copying with a loop of PEEK and POKE statements, but that tactic is rather slow. PUT and GET accomplish the same thing on a machine language level, moving images in and out of screen memory much faster—often fast enough to create video animation.

An example of their use might be after you created the house image discussed earlier with DRAW, PAINT, LINE and CIRCLE commands. The execution of such an elaborate image might take quite a while on the screen. But once it was there you could store it away elsewhere in memory with a GET statement. Then, sometime later you could call it back to the screen in a small fraction of the time the original commands took to draw it in the first place.

With this powerful set of commands, graphics programmers who have never before found it practical to work in BASIC might find they now can do so. This might speed development of exciting graphics-using software for the PC. Also, as noted in the adjacent article, PC BASIC has broad ability to merge existing program segments into new ones. This may inspire commercial program marketers to develop libraries of graphic elements available for incorporation into other programs. Such elements—display type faces, architectural symbols, simple illustrations, etc.—would be the Personal Computer's equivalent of stencils, press-on lettering and the like.

Open System

IBM comes to the plug-in world of personal computers.



TO OLD HANDS AROUND MICROCOMputers, the idea of augmenting your system with plug-in accessories from a teeming bazaar of vendors is a familiar one. But to the growing new contingent IBM is introducing to microcomputers—folks who are as new to personal computers as IBM itself is—the plug-in game may come as a revelation.

SINCE IBM'S NEW PERSONAL COMPUTER is very much a participant in the plug-in game, a brief review of the rules seems in order.

It boils down to this: buying an IBM Personal Computer is more like buying the centerpiece of a component stereo system than it is like buying an Oldsmobile. Many IBM buyers may not be inclined to believe so at first, but we predict they'll come around. Unexpectedly enough, IBM has provided all the ingredients for *bringing* them around. These are:

- the Personal Computer's accessible design,
- IBM's extremely *a la carte* marketing approach,
- and IBM's generous openness with technical information.

Together, these factors explain why the microcomputer industry terms the PC an "open system."

continued...

The PC's Plug-In Potential

62-PIN EXPANSION SLOTS
Either the five internal sockets, or added ones in an expansion box. (An expansion box would probably use up one slot in the System Unit for a connector that ties the two together.)

- Memory expansion
- Communications ports (according to various standards—RS232, IEEE4888, etc.)
- Direct-connect telephone model
- Connectors for local networks such as Ethernet and Desnet
- Mass storage device controllers (such as for hard disks)
- Music synthesizers
- External device controllers (such as for appliances and lights)

INTERNAL CHIP SOCKETS

- Enhancements to system software in read-only memory
- Alternate character sets for video display
- Game and other programs, or parts of programs, in read-only memory form

KEYBOARD CONNECTOR
The PC's keyboard connector offers interesting possibilities. The PC keyboard itself is an "intelligent" device, and the channel between it and the System Unit is a serial channel that carries information on keys pressed rather than specific character codes.

Each of the 83 keys has its own number (including separate numbers for each of the two shift keys) and sends one code when pressed and a different code when released. Software in the System Unit keeps track of which keys were pressed and released in which order ("*...was the SHIFT key released before the G key was pressed? Hmmm, you must want a lower-case g...*") to handle such matters as shifts and Typamatic repeating. The internal software that handles this is accessible for change; also, 45 of the possible on/off number pairs are left unused by IBM. So there is great potential for outside vendors to connect devices through this channel.

- Add-on keyboards with special function keys
- Musical keyboards
- Graphics tablets and other similar devices

CASSETTE CONNECTOR

- Telephone modems
- Device control (via the "motor on/motor off" feature)
- Speech synthesizers

PRINTER AND COMMUNICATIONS ADAPTERS

- Printers
- Plotters
- Telephone modems
- Scientific or medical instruments

GAME CONTROL ADAPTER

- Joysticks and paddles
- Graphics tablets (digitizer pads)
- Robots

INTERNAL SPEAKER PLUG

- Hi-fi sound amplifiers
- Other devices responsive to analog waveforms

The above list is far from exhaustive. Already, in labs, garages and spare bedrooms from Silicon Valley to Sault Sainte Marie, electronics wizards are huddled over logic analyzers, wire wrap boards and other tools of their trade figuring out how to plug in new goodies to the IBM Personal Computer. As their creations appear, they will be reported and evaluated in future issues of *PC*. (Some have appeared already and are discussed elsewhere in this issue.)

Taking the Measure

Inside the System Unit of the IBM Personal Computer, five long, identical, slot-shaped sockets provide places for connecting to all of the PC's important circuits—59 in all. (This design approach is sometimes called a "bus".) IBM accessories, some necessary like a display adapter and some optional like the game paddle adapter, can plug into these sockets. But so can accessories manufactured by anyone else who figures out the proper interactions with all 59 circuits. (There are actually 62 connections in the socket, but some are duplicates.) To help make this possible, IBM has—in a major reversal of its usual policies—published full disclosure about the goings-on and expectations for each of the circuits.

The PC also has a good supply of other available orifices for plug-in products. There is the cassette-recorder connector, and the matching one next to it for the keyboard. There are sockets on the back panels of most IBM accessory cards. And there are the component sockets on the main circuit board itself, some already occupied and some not. For various other personal computers, all of these connector types have been used to attach one or another add-on devices, and it is reasonable to suppose this will happen with the PC too.

What might be plugged into this multiplicity of sockets, and why? Both the products and the answers range from the mundane to the exotic.

The mundane products and answers tend to go together. For example, companies sell expansion cards for read-write memory, and people often choose to buy such cards because they are priced lower than the manufacturer's equivalent. Other reasons might also apply, such as extra certification and reliability or, particularly in the PC's case, an outside company's design that offers more capacity than IBM sells on a single card.

Exotic products include such things as music synthesizers and graphics tablets. Products in the exotic group are usually sold by outside companies because demand for them is not broad enough to interest the microcomputer manufacturers themselves. But from those who have a special interest, demand can be quite fervent.

A computer music enthusiast might want to plug six complete synthesizer cards into his system in order to supply many different "voices" which are playable simultaneously. In the PC's case, this music enthusiast would first have to invest in a different kind of plug-in device—an *expansion adapter* that provides more slots than the five built into the IBM system unit. One such expansion unit has already been put on the market, by Tecmar; but our hypothetical music lover needn't buy one just yet, because as of this writing no synthesizer accessory has yet been introduced. (Judging from the number available for the Apple computer, it won't be long 'til some appear for the PC.)

Sometimes what is first thought to be exotic later turns out to be popular enough for the big manufacturers to begin offering it. This was Apple Computer's experience with graphics tablets, which are rectangular writing surfaces equipped to detect and report the action of a pen moved across its surface. They are useful in computer-aided design, among other applications. For the PC, a tablet might be designed to plug into the game adapter, the cassette port, or even (with a "Y-connector") to the keyboard plug. In any of these cases, software would also have to be added telling the PC how to interpret and act on the signals sent from the tablet via the plug. In fact, it is appropriate to view the slots of the disk drives as yet another place where "plug-in" products for the PC can be installed. Operating system software that can replace the PC's own DOS, such as CP/M-86 and the UCSD p-System, would be examples of this phenomenon.

Operational Choice

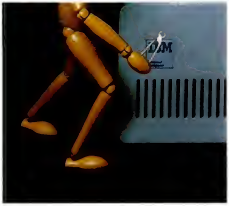
Hal Glatzer

DOS, CP/M-86, p-System: Three operating systems for the PC.

I. About Operating Systems

IN THE MOVIES, WHEN THE KING SAYS, "I want my breakfast," a seemingly endless chain of people relays the order. Like a bucket brigade, the words pass from nobles to guards to servants... "the king's breakfast!"... "the king's breakfast!"... and so on, until the steward tells the cook to fry an egg.

That's how your computer's operating system works. You are the ruler of a microelectronic domain. When you want something, you type in a command to do it, and the operating system actually does the work for you. Programs are only intermediaries between you and your operating system—like the servants in the



king's retinue. If you are working with VisiCalc, for excample, it is the operating system which prepares the "spread sheet" for you to write on, interprets your keystrokes ("that's a 1, a 9, an 8 and a 2") and displays them ("1982") on the screen wherever it has placed the cursor for you. When you are through, the operating system checks to make sure there is enough room in your disk to store the file, and then it transfers the file from the working memory (RAM) to the disk. Finally, it comes back with the "A-prompt" ("A") to tell you that it's ready to serve you again.

A typical program, like VisiCalc, doesn't do those things by itself; it uses the operating system, since those kinds of tasks are common to almost every program and need not be re-invented by each programmer. There is a technical advantage, too, because the program itself can be shorter, saving extra space on the disk for your files.

II. About The Choices

IBM PERSONAL COMPUTER USERS WILL have a choice of three operating systems: DOS, which is the IBM PC's "standard" operating system, CP/M-86, and the p-System, both of which are alternate choices. DOS is priced at only $40, reflecting its position as the "standard." The p-System will cost $675 (with one language included), and CP/M is anticipated to be around $300-350. Because CP/M was the first operating system in the microcomputer industry to be adopted by many different manufacturers, instead of just one, we will consider it first.

III. About CP/M

CP/M WAS DEVELOPED IN THE MID-1970's when floppy disks were being perfected. Surprisingly, the industry giants did not foresee the advantages of floppy disk storage for the then-new microcomputers; nor did they want to sell a microcomputer operating system that could work with floppy disks. So the man who developed the "Control Program for Microprocessor," Gary Kildall, bought the rights to his invention from his employer and went into business for himself, as Digital Research, Inc.

By 1981, CP/M was—*de facto*— the standard microcomputer operating system. There are important exceptions but, by and large, every professional microcomputer uses either CP/M as its factory-standard operating system, or is able to use it with only slight modification.

CP/M was written for microcomputers that use eight-bit processors (that is, they work with eight bits of information at any given moment). When a 16-bit processor became available, CP/M was modified to accommodate it. IBM selected the Intel 8088 chip for its Personal Computer, and Digital Research asked Johnson-Laird, Inc. to customize its 16-bit CP/M-86 (created for the 8088's "brother" chip, the 8086) to work on the PC.

IV. About CP/M-86

"THE OPERATING SYSTEM IS TO A computer what gasoline is to an automobile," says Andy Johnson-Laird, his company's president. "It's only a means to an end. The novice user should not give a damn what kind of chip is inside his computer. Rather, he's asking, What can I do with it? I say, forget about the chip *and* the operating system. The only time you have to worry about the operating system is when things go wrong."

Among the technical improvements Johnson-Laird built in to the IBM version of CP/M-86 were a "status line" at the bottom of the screen that carries messages to the user, such as clock time, or the progress of internal tasks. His enhancements permit the user to alter the way the computer normally works with its peripheral equipment, such as disk drives and printers.

"You can, for example, support both a letter-quality, daisywheel printer *and* a high-speed dot-matrix printer at the same time, with the same files," he says. "Using our ASIGN utility, within a BASIC program, you can select which device will be used for output, and then redirect that

continued...

output at any time. You can tell your computer to regard certain physical devices as logical devices. For example, you can send part of a file, like your remarks that aren't part of the working program, to one printer, while the other can be printing your file out.

"We also put in a fairly extensive system for recognizing escape-sequences," he says, "those special functions that are heralded by the ESCAPE character and one or more subsequent characters—for example, the combination that produces a clear screen. If you want to read the current date and time in a program, you can send an escape-sequence in BASIC, so you don't need PEEK or POKE commands. Both of these concepts, the logical device and the escape-sequence, are rather technical, but they're important to technical users."

V. About PC DOS

THE NEWEST OF THE THREE OPERATing systems is called simply DOS (disk-operating system), and was written by Tim Paterson. It was customized for the IBM Personal Computer by Microsoft, Inc., a company that has led the microcomputer software vanguard since 1975. Its founders were two whiz kids who never finished college; they wrote a BASIC language that ran on the first 8-bit hobby microcomputer, and later wrote BASIC and other languages that are compatible with practically every microcomputer ever built.

Microsoft's product marketing manager for DOS, Chris Larson, describes the difference between DOS and CP/M-86 this way: "CP/M was designed around 8-bit hardware, when technology was less advanced. DOS was designed around concepts of a 16-bit operating system called UNIX, that was developed by Bell Laboratories. Microsofts's languages, such as BASIC, FORTRAN, or PASCAL, will only run on the IBM Personal Computer if DOS is the operating system. There's no way a user can get a Microsoft product onto his machine if he's running CP/M-86."

The differences are technical, but important, according to Larson. "Under DOS, you can use the *full* 256K bytes of available memory for a program—not merely the 64K codespace. That means you can run large programs, such as database management. Eventually, the programs that run on 16-bit minicomputers will be brought down to the IBM Personal Computer, running DOS. With CP/M-86, there is a limit to the size of a file: eight megabytes (eight million characters). With DOS, the file size can be up to one gigabyte—one billion bytes! For users who get hard disks that hold 8M bytes or more, that will be an advantage. "Another technical advantage," Larson says, "is that any command that makes use of a disk file can use a device—that is, to the operating system, all devices look like files. In itself, that's not great, but it has wide implications. If you want to add a new device, under a BASIC program, you don't have to change the BASIC interpreter—only the BIOS, the BASIC input/output system."

On the novice user's level, both DOS and CP/M-86 have advanced error-recovery procedures. Instead of "crashing" or giving you cryptic messages, they give you the choice of ignoring, aborting or re-trying an operation, and a clear, unambiguous message appears in the status line.

VI. About Translatability

MICROSOFT'S LARSON IS CONCERNED about what he calls a "myth" concerning CP/M-86. "There is confusion in peoples' minds," he says, "about the possibility of translating 8-bit CP/M software into 16-bit CP/M-86 software. I've heard retailers—who should know better—say you can take a CP/M disk and put it into a CP/M-86 system. You can't! The software has to be translated at the source-code level (i.e. before it has been through the final conversion stage to fundamental computer instructions). A hobbyist *might* be able to do it, but a typical end-user won't."

The source-code must be exact. If the software does not connect with specific counterparts in the operating system, a program cannot run as it was designed to do. Programs which were written to run on 8-bit computers will not work on 16-bit computers, even if the computers and the operating systems are—to the user's eye—superficially alike. A narrow-gauge railway locomotive will not run on a wide, modern track unless the undercarriage is rebuilt.

"We believe vendors and programmers will translate their best programs into 16-bit source code," says Larson, "and it's just as easy to translate a program written for CP/M into DOS as it is to translate it into CP/M-86. So you will be able to get CP/M software without having to get CP/M-86. I believe that vendors and programmers will translate their most popular programs into both CP/M-86 *and* DOS, and then see which becomes dominant in the marketplace. It's easy to support both, technically, but it's a pain in the accounting department to coordinate orders for software on two different operating systems."

Andy Johnson-Laird admits that CP/M-86 has what he calls a "legacy" of 8-bit software to live up to. "Why does CP/M-86 do that? To provide continuity—so the user will not notice the difference. Certainly, Microsoft's DOS runs programs more rapidly than CP/M-86 can, because it's freed from that constraint, and it can adapt more comfortably to the new hardware environment. The file structure of CP/M-86 is paying its dues to the past."

VII. About Portability

THE CREATORS OF ANY OPERATING system are limited by the design of the chip that does the actual "computing" (i.e., the microprocessor). Because no two "families" of chips manipulate data in exactly the same way, an operating system written for one family probably can not be used with any other. For the IBM Personal Computer, the DOS and CP/M-86 operating systems have been carefully tailored, like a custom-fitted suit, to the family of Intel 8086/8088 chips.

But a new idea arose in the late 1970's at the University of California at San Diego: an idea for an operating system freed from the constraints of a chip's family, and so able to work on virtually *any* computer. It was written in a programming language called PASCAL (named for the 17th century French mathematician and mystic), and based on the computer concept called an "emulator," which works like the plastic spindle that lets you play 45 rpm records on a regular phonograph. Programs written in the p-System are translated into a made-up language for an idealized, altogether imaginary processor chip. Then a fast translating program converts this language for the idealized chip (called "p-code") into a real chip's actual language. The translating program is like a human translator who can simultaneously translate from one language to another, and is called an emulator.

VIII. About the p-System

SOFTECH MICROSYSTEMS, OF SAN Diego, developed this concept into a "machine-independent" operating system, which it calls the p-System. An emulator fetches each p-code instruction, in sequence, and looks it up in a table; for each p-code there will be corresponding instructions appropriate to that particular chip.

According to Al Irvine, vice president for engineering at Softech Microsystems, the user's advantage comes in being able to take any p-code software, written for *any* microcomputer, and run it on any other. Differences in hardware, he said, presently force users to acquire different software for each machine. "It's as if every time you wanted to buy a phonograph record, you could only use records that were compatible with your particular brand of phonograph. Worse—if you wanted to buy a new phonograph, you would have to throw away all the records you'd bought for the old one. Right now, that situation exists with the three major systems of videotape cassettes and two major systems of videodisks. The last thing we want is for the same situation to be perpetuated in the field of computer software."

The p-System has emulators for 20 different microprocessor chips, including the 8086/8088, he said. "A software author can write a program just *once*, and sell it everywhere. The user doesn't care what kind of system the writer used to develop it, all he wants to do is run it. In the same way, the writer shouldn't have to care what kind of system the user is going to run the program on. If all the box needs is a p-code emulator, and that matches the chip inside the box, then the writer can connect the BIOS to it and make the program run."

For the programmer, the whole p-System takes up 55K of p-code on a disk—a block of code roughly equivalent to 150K of machine code for an 8080 chip. But in any finished program, there is only a 3K "kernel" residing in memory at all times; it loads other parts of the p-code as they are needed. "The 'code pool' is dynamic," Irvine said, "and varies with the programs' requirements. If you open a file, for example, the operating system calls up the segments of code that are used for manipulating files. The applications programmer doesn't have to be concerned with how much memory the executing machine has; it runs as a 'virtual memory.' That is, to the programmer or user, the memory size seems very large, but the machine is actually retrieving and filing pieces of memory from the disk all the time."

Right now, the p-System is mainly a programmer's tool, but it will come into its own as an operating system, Irvine said, when users can "pick up other people's software" and run them on their own machine. For that to happen, though, more application programs such as general ledger, spread-sheet simulation, word processing and games will have to be written in p-code itself. Software development systems are currently available which perform the p-code translations from standard programming languages: PASCAL, FORTRAN, and Softech Microsystems' own BASIC; a COBOL will be released later in 1982.

"The exciting moment will come," he added, "when the *end users* discover that the p-system applications programs will outlive their hardware! Their programs will continue to run even on replacement machines."

IX. About The End

EACH USER WILL HAVE TO MAKE HIS or her own choice of an operating system, but Andy Johnson-Laird is philosophical about the selection process. "Which is better? That's like asking which is better—a Ford or an Oldsmobile? They are in overlapping domains. Whichever *you* prefer depends on a lot of things that have nothing to do with their speed or acceleration: things like repair service, or the recommendation of a friend who owns one.

"Choosing an operating system," he says, " is very subjective. Non-technical users won't notice if a program will run a few seconds faster as a result of its operating system. As long as a general ledger program, for example, runs in a 'timely' fashion, they won't care; to them, it's downright miraculous that they can run a computer at all!"

Hal Glatzer is a journalist and television producer who describes himself as an "explainer." His latest book is Introduction To Word Processing, *published by Sybex.*


Microdata


LAS VEGAS
CONVENTION CENTER

Comdex:

The Year 1 PC

Photo: The Interface Group

THREE YEARS AGO, THERE WAS NO SUCH THING AS A COMDEX.

Two years ago, this national trade exposition for computer dealers was held for the first time. About 180 companies set up exhibits in the Ballroom of the Las Vegas Hilton Hotel, and maybe 4,500 people came to see their wares.

Last year the show expanded into the Las Vegas Convention Center's two smaller halls—a space double that of the Hilton ballroom—to accommodate a doubled number of both exhibitors and aisle-walkers.

And this year (November '81) COMDEX moved into the Convention Center's big East Hall, which dwarfs the other two halls combined. Six hundred forty-four exhibitors mounted displays of their microcomputer wares, and nearly 25,000 people reportedly attended. It was a fitting sign for the year when IBM finally decided to enter the world of the personal computer.

IBM was at COMDEX, with an exhibit booth near the entrance—a glossy thing in chrome and smoked Lucite. But in a curious twist the Personal Computer was not to be seen within. Instead, IBM was showing samples of its more traditional data processing hardware, and the blue-suited minions attending the booth admitted to little knowledge of the Personal Computer. IBM's booth seemed one of the few places in the hall where their Personal Computer was not a subject of major interest.

(Speculation was that IBM chose not to show the PC because COMDEX is a show for dealers, and IBM already had all the interest it wanted from computer dealers.)

Elsewhere on the floor, there was evidence aplenty of the interest IBM's PC had galvanized within the microcomputer business. Clearly, people had wasted no time in rising to the opportunity they sensed IBM was creating.

This magazine was no exception. Six weeks after opening our doors for business, *PC* was there exhibiting at COMDEX, handing out copies of our eight-page "Preview Issue." Meanwhile, our editors and photographer were prowling the floor for products inspired by the PC. To our glee, we found plenty, with promises of greater plenty to come.

20 Add-ons in Two Months

The pleasant shocker for us was right down at the end of our aisle, in the booth of a Cleveland outfit called Tecmar. In about the same time it took us to produce our eight pages, Tecmar had produced a complete line of 20 add-on accessories for the PC. They even had an expansion adapter that could pass for the PC System Unit's twin—until you peeked inside and saw a 5-million character Winchester storage disk where the PC has its diskette drives.

Actual IBM Personal Computers on the exhibit floor were relatively scarce, perhaps because people were still having difficulty getting their hands on them. (Folks kept coming by to look at the PC in our booth and asking if we knew where they could get one quick). Those who didn't have one were talking about them anyway.

The IBM PCs we did see on the floor staked out the whole range of microcomputer goods and services. In addition to Tecmar, there was a printing company, a color monitor company, a local-network developer, a few marketers of business and financial software, and no doubt others we missed amid all the COMDEX hurly-burly. One scout we talked to claimed to have seen twenty-five PCs around the hall.

An Automatic Program Writer

Some products we didn't have to find because they found us. Skip Tamargo, president of a Florida company called FutureSoft, commandeered the computer

continued...

Comdex scenes: Clowning around with Amdek color monitor (1). MP[illegible] matrix printer doing graphics with IBM PC (2). Desnet local network connects PC with other computer brands [illegible]. Te[illegible] mar expansion cabinet is PC lookalike (5). PC director of marketing and [illegible] take break from giving out "preview issues" to play watch-the-birdie-watching-you (6).

in our booth for a do-it-yourself demonstration of his *QUICKPRO* software, which he described as an "automatic program writer." While Tamargo stood by to act as a human user's manual, we sat at our PC's keyboard with *QUICKPRO* and worked out a program to gather data from people making inquiries at our booth. Tamargo's software presented us, after a few preliminaries, with a display screen blank except for letters marking each line.

Using the letters to select lines where we wanted text to appear, we formatted an "input screen" with entries for NAME, ADDRESS and all the other facts we wanted to gather from our booth visitors. Tamargo showed us how to indicate the maximum space we wanted to allow for each of these entries, and what kind of information we wanted to permit in each, such as "numbers only." When we finished designing the input screen, *QUICKPRO* asked us for other details about the anticipated size of our files and how we wanted to organize them. On completion, the program crunched away for a while, then presented us with a nice little BASIC program to handle our booth-visitor files. The program had facilities to add entries to the file, change or delete previous entries, and go looking for facts that had already been entered.

Finally, Tamargo had us list our new BASIC program to the screen, and showed that it was a standard, ordinary program that could be edited and modified in any of the usual ways. What's more, as a byproduct of the data entry process, the program was liberally salted with remark statements documenting what each program section was doing. All in all, not a bad performance. (The program did run afoul of some editorial pet peeves though—in several places it required user typing, thinking or calculating when it seemed the computer ought to have been doing the work. Tamargo's reluctance to take advantage of PC's special features such as the "softkeys" also won no applause).

Peripherals Were Central

Over at the display of Micro Peripherals Inc. they were showing a dot-matrix printer they claimed would run rings around the one IBM sells. Their $849 printer was pumping out some very nice looking graphics, and the MPI people were talking about doing some elaborate text printing where the letters would be done using a graphics rather than text approach—allowing italics, simulated script, proportional spacing and other appealing goodies. MPI has promised to lend *PC* one of these printers for further evaluation, and a report on it will be in a future issue.

Another item we admired at COMDEX has already arrived at the *PC* offices for a closer look—a Color II video monitor from Amdek. This monitor is of the "RGB direct drive" type and produces spectacularly crisp, clear and stable images. The improvement over the "baseband" type display we had been using before is dramatic; text at the 80-column width is quite distinct and readable. It caught our eye at Amdek's booth not only because of the great picture, but also because the cabinet design and color fit so harmoniously with the PC. We'll have more on this and other color monitors in an upcoming issue too.

Awards for both a great idea and great graphics are due to a Silicon Valley company by the name of Destek, which was promoting its Desnet "local network" for interconnection of microcomputers. Desnet was being touted as "the key to computer city" and the accompanying artwork was uncommonly handsome for the computer world. The network arrangement, which connects into the PC and other microcomputers using a $100 plug-in card, will supposedly string together several different brands and models of computer into a system working as a unified whole. There was a demonstration that showed this on at least a superficial level, but it will take a more thorough look before we can figure out how much compatibility Desnet really creates.

M.B.A.s for Sale

In the software department, one trend we noted favorably was the appearance of integrated groups of programs that serve multiple purposes. The groundbreaker in this area is a suite of programs being sold under the name *MBA* by Context Management Systems of Torrance, California.

MBA was still in the working stages for an anticipated spring release, but we got a preview look at its combination of an electronic spreadsheet, data base manager, graphics displaymaker, word processor and communications handler. The idea, as Context's Gib Hoxie explained it, is that managers can go into a data base to draw out a selected set of facts, then "change contexts" to move those facts into the spreadsheet program. There they can manipulate them in typical "what-if" spreadsheet fashion, then change contexts again to display the results in graphic form. In theory, they might then switch contexts again to frame a memo around the digested data using the word processor. . . and ultimately use the communications handler to send the whole thing off to a colleague at another location.

At COMDEX, many of these ambitious offerings were on display only as an enthusiastic gleam in Hoxie's eyes. But we did see a demonstration showing good progress on the general theory—even including the ability to split the screen into multiple segments and show operations from four different "contexts" simultaneously. Context appears to have made a heavy investment in promoting their concept, and if a similar investment underlies their final development effort we shall have a finished Context product to tell you about before long.

More executive software for the PC was on display at the booth of Target Software, an Atlanta company recently acquired by Comshare, who makes software for big computers. Target's big gun is called *MasterPlanner,* and is described as an evolutionary upgrade of earlier spreadsheet programs. *PC* was treated to an enlightening explanation by Target's Bob Ranson about the different design philosophies for such programs. Ranson described three categories he says the "gridsheet" programs can fall into—"cursor driven *(VisiCalc),* logic driver *(T-Maker)*, and procedure driven *(Desktop Plan)*"—and showed how *Masterplanner* incorporates strong points of all. His comments will be expanded upon in our next issue, when we do a comparative evaluation of spreadsheet programs.

Challengers Begin to Gather

A last item of interest at COMDEX was the appearance of other microcomputers aimed at or near the PC's territory and with similar capabilities. Victor Business Systems introduced a desktop system built around the same 8088 chip as the PC. It is said to be capable of using software designed for the PC, though it can't read PC diskettes since the drives are incompatible. Its disk storage capacity is double that of IBM's machine, and the Victor also has an optional display format capable of showing much more information—132 columns by 40 rows.

A microcomputer introduced by Fortune Systems, a new company, had slick office styling of the same type as the PC's, and was designed around the allegedly more powerful 68000 processor chip. This machine garnered a great deal of attention from the crowds on the floor, and more will likely be heard about it. *PC* also took interested note of the Otrona Attache microcomputer, which we had plenty of time to view since their booth was right across from ours. The Attache, a portable microcomputer selling for about $3,700, packs a lot of power and appeal into an impressively small package. It seemed to us that people who admire the IBM approach to personal computers would find much to admire in this one if they absolutely had to have a portable.

As for all of the COMDEX exhibitors who had nothing to display for the IBM PC, it seemed like more than half of those we asked claimed they were in the process of getting something together.

With a year for them all to work on it, and judging by how much has happened in the first couple of months, COMDEX's second year of the PC Era promises to be full of worthwhile thngs to write about. And *PC*, naturally, will be there to write about it.

It's going to be exciting. In fact, it already is.

—Jim Edlin and David Bunnell

TecMates

Tecmar unveils a plug-in smorgasbord

THERE IS A SAYING THAT DEFINES *LUCK* as "the intersection of opportunity with preparedness." If that is so, then Tecmar, Inc., in Cleveland, is a very lucky company. Because when IBM presented them with an opportunity, in the form of the Personal Computer, Tecmar met it with seemingly faultless preparedness. The result, a mere three months after IBM's official announcement of the PC, was Tecmar's COMDEX announcement of 20 add-ons, expansions accessories and enhancements for it.

The company's ads could almost be headed, "Everything you always wanted

continued. . .

Comdex: The Year 1 PC

to add to your IBM PC,'' except Tecmar didn't leave people time to have wanted anything for very long. The product line, christened ''TecMates,'' includes:

- a plug-in clock/calendar module
- a BSR X-10-type device control module, and a stepper-motor controller
- a speech synthesizer module
- a module to let several PCs share a printer
- an expansion cabinet with a design matching the PC System Unit
- a Winchester-type hard disk system with controller card
- a video digitizer, and three modules for analog/digital conversion
- a selection of modules for various kinds of input, output and memory
- and aids to custom circuit-board design.

Tecmar president Martin Alpert says his company's preparedness was the result of previous work developing scientific and industrial electronics for use in microcomputer systems that are based on the Intel 8086 microcomputer systems that are based on the Intel 8086 processor. The 8086, he says, has the same internal architecture as the 8088 chip used in the PC.

When IBM announced the PC, Alpert realized Tecmar was well positioned to develop products for it. He began planning immediately. Alpert tells how Tecmar people flew to Chicago and ''camped on the doorstep'' of the Sears Business Systems Center to get two PCs on the first day they were available. ''We got our logic analyzer on it and figured out the bus,'' he says. ''It didn't take very long; it's very straightforward with only a few confusing lines.'' According to Alpert, between 40 and 50 people took part in getting the products ready for previewing at COMDEX.

While Tecmar does offer a hard disk system, software allowing it to be used under the PC-DOS operating system is still lacking. ''We'll be talking to Microsoft about that very soon,'' Alpert said. He anticipated the hard disk system would be available for delivery toward the end of February, with all the other products available a month or two sooner.

A PC Twin

Perhaps the most striking feature of the TecMate line, apart from its breadth and its speedy development, is the expansion cabinet's design as a near-identical twin of the IBM System Unit. Tecmar has even copied IBM's color scheme; the only detectable difference (besides the nameplates) is a slight variation in the detailing of the front panel's small, slotted grille. Commenting on the close resemblance, Alpert said, ''The IBM system has been done right, and everything we do has to be done right too.''

Martin Alpert, Tecmar president, showing off the TecMate line of 20 PC accessories.

The TecMate item that performs the neatest trick is the Device Master module that combines clock, calendar and the sort of device controller that sends signals over electrical wiring to activate lights, appliances and the like. According to Alpert, the module, which has its own battery power, can be used to control the outlet from which the Personal Computer itself receives power. The Device Master can store a command ordering the computer to be turned on at a certain time, then execute a command to turn the computer off, and then—using its own power—turn the computer back on at a preset time. Whereupon, if appropriate autostart software is in the computer, new times can be set and the whole cycle repeated. This trick, like those novelties whose switch activates a mechanical hand that then turns the switch back off, isn't particularly useful, but it is neat. We expect we will have many more practical uses for Tecmar's products to report on before long.

—Jim Edlin

Tecmar Inc.—23600 Mercantile Rd., Cleveland, Ohio 44122 216/464-7410

Mathemagic

A Reverse Twist: Turning Your Computer into a programmable calculator.

THE DEMONSTRATION STARTED DECEPtively, like a juggler tossing one ball. Joe Luciano, one of the creators of the *Mathemagic* program, showed how his new software could take the formula 6 + 1 and—watch carefully now—actually add the numbers together to come up with (tadaa!) 7.

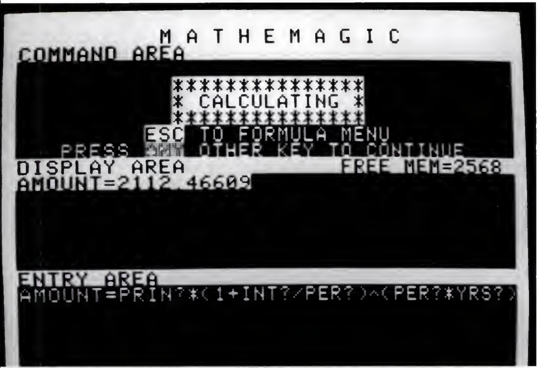
Wow! That's just what you spent thousands of dollars on your computer for, right? Well don't applaud yet folks, because the show gets lots more exciting. In the course of a 50-minute demonstration for *PC,* Luciano used his computer keyboard to have *Mathemagic* pick up one figurative ball after another until it seemed like a fountain of a dozen were coursing through the air. At the end of the show my applause was for real.

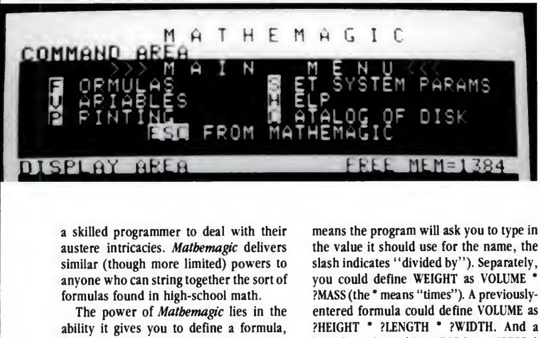
Mathemagic is billed as software to

"turn your computer into a programmable calculator." It does so, but that seems a superficial description of its powers. *Mathemagic* falls into the same gray area the VisiCalc program does—somewhere between being just an "application" program and being a full-bore programming language.

Mathemagic has a strong flavor of what computerists would call a "threaded interpretive language." That weighty phrase describes a simple concept familiar to anyone who has ever used a dictionary—where all the words are defined using other words defined elsewhere in the dictionary's pages. If "sneeze" is defined as "a blast of air from the nose" and you don't know what "blast," "air" and "nose" mean, you can flip to their respective pages and look them up. Then you can go on to look up the words in *their* definitions if the meaning still isn't clear, and so on. Defining one word in terms of others, down through many layers if necessary, is what makes this process "threaded," and flipping step-by-step to all those other pages is what makes it "interpretive."

Threaded computer languages (FORTH is one) are considered by many to be among the most advanced and powerful techniques for making computers responsive to human wishes. But it usually takes a skilled programmer to deal with their austere intricacies. *Mathemagic* delivers similar (though more limited) powers to anyone who can string together the sort of formulas found in high-school math.





The power of *Mathemagic* lies in the ability it gives you to define a formula, name it, then use the name to incorporate that formula in the definition of other formulas.

You might give the name SPEED to the formula ?DIST / ?TIME (the question mark means the program will ask you to type in the value it should use for the name, the slash indicates "divided by"). Separately, you could define WEIGHT as VOLUME * ?MASS (the * means "times"). A previously-entered formula could define VOLUME as ?HEIGHT * ?LENGTH * ?WIDTH. And a later formula could say FORCE = SPEED * WEIGHT. The calculation of FORCE would then be made step-wise using all the formulas defined earlier.

You may detect a similarity between the *Mathemagic* structure and a plain old BASIC program. They are akin, but for many purposes *Mathemagic* would be less complicated to use. *Mathemagic's* named formulas are not unlike BASIC subroutines, but it would take sophisticated program editing software and some deliberate thought to incorporate previously-written subroutines into a program for a new task. With *Mathemagic* you need only indicate the formula by name and new programs will apply it wherever called for.

Mathemagic runs by displaying three separate work areas on the computer screen—(1) a menu area that shows what commands you may give at each stage of the program, (2) an entry area that shows the formula you are presently creating or using, and (3) an answer area, which shows the progressive calculation then displays a final result after you have plugged all values into your formula.

First impressions suggest the program's authors have been very resourceful in designing the program to operate quickly and efficiently, but somewhat less successful at giving it true simplicity of use. The user has to do several tasks of typing, remembering or interpreting that, in a friendlier design, the computer would do for him. Since finishing touches for the program were still underway at the time of *PC's* preview, some of my complaints may not apply to the final version.

The program includes facilities for storing formulas and data on disk, and for printing out results with or without showing all the step-at-a-time intermediate calculations. One-step-at-a-time calculation can also be displayed on the screen, giving the program much potential for educational use. The printouts are designed to serve principally as written records of what calculation took place, and don't provide much leeway in formatting or including notes and comments for later reference.

Like VisiCalc and other spreadsheet programs, *Mathemagic* is a general-purpose product which can be adapted to many different lines of work and study, just by changing the formulas entered into it. Both are good for "what if" work, but *Mathemagic* is designed for linear, sequential calculations rather than the two- and three-dimensional grids the spreadsheets calculate. Obvious uses can be imagined for people working in the sciences, engineering, social sciences, the quantitative side of business, and wherever else numeric formulas are employed.

—Jim Edlin

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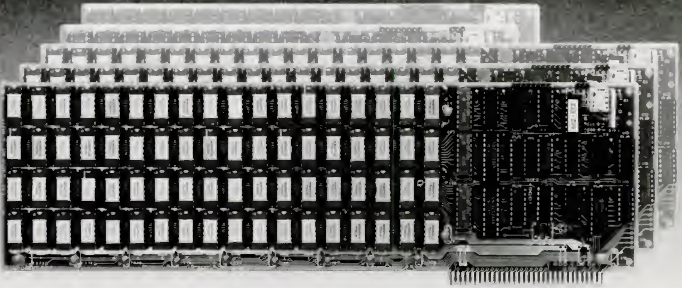

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Jean L. Yates and Dr. Rebecca Thomas

WHAT DO YOU DO WITH ALL THOSE COMPUTERS?

Or: Six Micros is Not Enough

EDITORIAL COMMENT: As a matter of pure happenstance, I live only blocks away from one of the most effervescent, brilliant and unusually outspoken personalities in Microdom—the nearly indomitable Jean Yates (a name almost anyone who follows this industry will recognize, as her prognostications have appeared everywhere from Time *to* The Economist *to* The Wall Street Journal*). I say* nearly *indomitable because I witnessed the time when Jean met her match, in the form of my 12-year-old stepdaughter, Jennifer Poitier. There were six of us sitting at a table at one of San Francisco's finest Chinese restaurants, Tien Fu, when the exchange of barbs and witticisms began. For a full hour-and-a-half, Jean and Jennifer engaged in a conversational duel that left the rest of us stunned and speechless. If ever there is a true national TV show about microcomputers (The* ComputerWorld *entry is not it), these two should be hostesses. In the meantime, it is important, I think, for readers of PC to become acquainted with Jean Yates, whose insights into this business are sought out by major companies and publications throughout the world. Jean's long-time associate, Dr. Rebecca Thomas, known as "Becca" to her friends, is a refined person who sits at Jean's side with a wry smile and usually doesn't get much involved in the conversation. However, for those of us who have gotten to know Rebecca, it is obvious that she is a vital cog in the wheel that keeps Jean's mind spinning to ever-new insights. Personally, I think Jean and Rebecca are equally brilliant and I am pleased that they agreed to write a column for PC. I hope you agree.* —DHB.

Many of the people we meet, both in and out of the computer industry, ask us at some point, "Do you own a personal computer?"

"We own six," we answer (give or take a few depending on what we're up to).

"So what do you do will with all those computers?" is the inevitable response.

Since this is a question that a lot of people considering buying a system ask, and since many IBM PCers are new to personal computing, we would like to share some of the things that make our six computers indispensible to us.

Our use of personal computers breaks down breaks down three ways: home, business, and hobby.

As far as home use is concerned, we maintain our personal checkbook, credit card and other records, categorizing them by deduction. Then the computer prints a listing at the end of the year for each category of the long form, and we just fill in the blanks. We own an Apple II and an Atari game computer, and use them for playing computer games and accessing timesharing facilities that have lots of interesting home-oriented features. Timesharing with "The Source" or other consumer "teletex" facilities gives us access to services ranging from restaurant guides for major cities, to hundreds of games, to electronic bulletin boards on many topics, to educational programs for children and adults.

Telephone and address lists are kept on our computers, and we also use a program that simulates a datebook to schedule appointments. It looks ahead and tells us if the time is free, and we can keep track of everyone's schedules when planning meetings or meals.

We have a large mailing list, divided into several categories. Some are personal, some are personal business, like credit card companies and banks, and others are lists for charitable organizations for which we have volunteered to maintain their mailings and accounting records.

Recently, we implemented a computer program that lists our insured property, both personal and business. We sent a copy to the insurance company and put a copy of the disks in a safety deposit box. When the list needs changing, a printout of it can be updated. When writing off depreciation on business equipment, this list will be used again.

The business uses made of our computers are numerous.

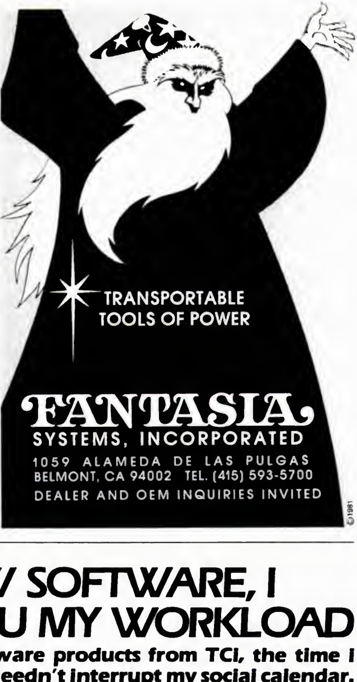
We have two Vector Graphic computers, which are used for letter and manuscript writing (word processing), for recording and managing the large files of literature that we maintain on the microcomputer industry, and for accounting functions. Although our "database" of files is on computers, the same things could be done to manage inventories or files of information on your company's interests.

We estimate that we have written almost 5,000 pages of published text on our computers. This ranges from books to market research texts to newsletters to magazine articles. We keep the articles and books on an electronic index so that pieces of one that are relevant to a new project don't have to be started from scratch. This saves a lot of time.

You may have heard of VisiCalc™, a program available for the IBM Personal Computer that lets your perform "what-if" analyses. We use a program like VisiCalc to perform financial modeling and forecasting functions for our own company and for our clients. It's particularly useful when combined with a plotting program that turns the data into graphics, which can be printed out or photographed for slides for presentations. We find it much easier to understand trends when we use "what-if" programs and then look at the graphic representation.

Rebecca and her coworkers in programming use two of our systems for development work. They contain more complex 16-bit microprocessors and operating system programs. She uses them to write books as well, actually writing about the programs that run the computers. That's how we wrote *The User Guide to the UNIX System*, an introductory text from Osborne/McGraw-Hill.

People say that we are unusual, two women with so many computers, but we feel that we have just found an interesting and lucrative way to experiment with computers and include their efficiency-adding properties in our lives.



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PC for a Publisher

Andrew Fluegelman of Headlands Press

IN THIS CONTINUING SERIES, PC WILL REPORT ON THE people who are using IBM Personal Computers and on the uses they are making of them.

Andrew Fluegelman is the owner and sole staff member of The Headlands Press, an independent book-producing firm located in Tiburon, California. He is also one of the first owners and users of the IBM Personal Computer.

Fluegelman purchased the computer in late October, receiving one of the initial group of PCs distributed by ComputerLand of San Francisco.

Jeremy Joan Hewes

His system includes the PC with 64K of memory, two disk drives, the monochrome display, and the asynchronous communications adapter. In addition to the BASIC that comes with the computer, he has purchased the EasyWriter word processor and the VisiCalc electronic worksheet program. Subsequently he added a letter-quality printer, although he worked with only the computer and disk drives for the first few weeks of operation.

As a member of the publishing community, Fluegelman is aware of the computer's increasing applications to his field, and he believes that his unique position as a book producer makes this technology even more appropriate for his business. "I'm running a book-producing company and operating out of the mainstream—on the West Coast, as an independent. I perceived that for me to stay competitive in my field, I had to be on the front of the

Illustration by James Mo

"It almost instantly felt like an extension of myself . . as though I had 2,000 extra brains grafted onto my skull."

technology; I couldn't afford to be left behind by it. I also feel that publishing is going to be affected tremendously by computer technology, and I had to know about it and be in that arena rather than out of it."

In his role as an independent producer, Fluegelman takes a book from the idea stage through the writing, design and typesetting phases, and often through the printing as well. Before commiting his major resources to a project, however, he makes a publishing agreement with one of the national firms, such as Doubleday or Penguin. The large publisher then contributes toward the costs of producing the book and distributes it nationally. The national firm's name is on the cover as publisher, and Headlands Press is credited on the title page, or given what is commonly called an imprint. Among the books that bear the Headlands imprint are *The New Games Book, More New Games* and *How to Make and Sell Your Own Record.*

continued...

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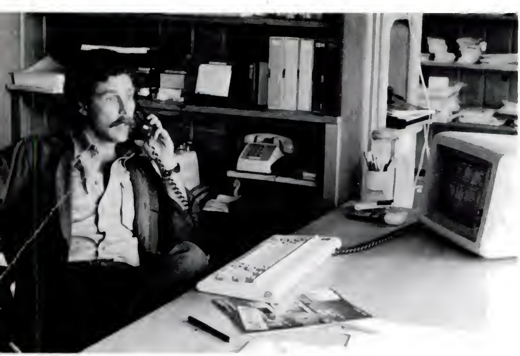

Jaqueline Poitier

For all practical purposes, then, Headlands Press operates as a conventional publisher in the way it develops a concept and manuscript for each book. This generally requires many letters, memos and book proposals, not to mention at least two or three drafts of a manuscript before the editorial process is complete. Consequently, the savings in time and money that word processing could provide, as well as the ease of writing and revising his own material, were obvious to Fluegelman.

New Projects Easier To Take On

"Because I have this capacity to deal with written material in a more efficient way," he points out, "it's easier for me to think of taking on new projects. Previously a manuscript would come in and I'd look at it and say, 'Well, how much revision is this going to take?' or 'How many drafts is this going to have to go through?' And all I would see would be a pack of proofreading and drudgery and trouble. It seems easier to deal with that now. I'll have it put on a word processing system and maybe have a basic edit done, and then get the manuscript back on my system and look at it. Word processing encourages the nth revision."

This capacity is a distinct departure from old methods of dealing with manuscripts and deadlines, he reports. "There were so many times in previous books when ways of making it better were passed up because it was just physically too difficult or the deadline prevented it. And that's a power that I see coming to my business with the computer—I can make all the changes that will make my writing better and the manuscripts I produce better."

Fluegelman's commitment to buy a microcomputer was sealed when he decided to be producer and co-author of a book about writing with computer technology. (This book, called *Writing in the Computer Age,* will be published late this year.) "Doing this book was the motivation to walk into the store and buy the computer. I've said that I needed a computer in my business because I perceived that this technology is changing the nature of publishing. And that is also true for writing. When I had the realization, it led me to see that the nature of writing itself is being transformed. Many people are going out to buy word processors for their specific needs or find that they have ended up with word processing because they bought a computer and have this capability. But people have not yet looked at—or relooked at—the nature of the writing act, the writing craft, and what it is like now that they have this new tool. That's the subject we're addressing in this book, and I think that it will be of help to writers who are thinking about using word processing in their writing. But it will also be helpful to writers who have systems and maybe have learned the particular commands but haven't had the benefit of all the tips that we are collecting from many, many users."

Behind The Decision

Like many major decisions that a businessperson makes, the seemingly "instant" impetus for Fleugelman's computer purchase had a somewhat more lengthy history. He recalls that he attended one of the early computer fairs in San Francisco about four years ago, with the intention of learning about the relatively new phenomenon of personal computers. "But here was all this stuff, and words that I didn't know—even the term 'floppy disk' was intimidating then. There were all these poeple, totally involved and engrossed, and I realized that I did not know the first thing about putting together this information. I came away feeling that I was going to have to learn how to operate a soldering gun before I was ever going to get into the computer world."

But as his understanding of the utility of microcomputers to publishing and writing increased, so did his motivation to learn the language and conquer the technology. "When I had a tangible, practical use for the technology, I had to start assimilating information—to understand what storage was about, what operating systems were, and what different types of software were available." He found that two books were especially helpful to him in this orientation: Adam Osborne's *The Business System Buyer's Guide* (Osborne/McGraw-Hill) and *Crash Course in Microcomputers* (by Louis Frenzel; published by Sams).

Then he began visiting stores and using a friend's word processor to get the feel of the technology. Fluegelman pursued this careful, rational course for several weeks last summer, at just about the time that IBM announced its Personal Computer. As part of his search, he went to see IBM's display model of this system.

"This Is It—This is The One

"After at least two months of going into stores, looking at machines, poring through the depths of Byte and every other magazine, trying to assimilate and evaluate all the information, I really took one look at the PC and said, 'This is it—this is the one.' And it was not rational at all. I was pleased to find when I investigated the specifications that they were good and that the PC does seem to be adaptable and upwardly mobile. I feel that anything I'm likely to want to do is going to be possible with this computer."

One reason for his knowing right away that this was the computer he wanted is the design of the machine. "I think its esthetics are great. I believe that something you interact with every day, especially if it's going to become an extension of yourself, should be pleasing from an esthetic or design point of view. It's important that you'll enjoy spending time with it."

One of the most appealing features for his use of the computer is the detached keyboard. "For me as a writer, the

continued...

minimal nature of the keyboard is a plus. I plan on doing a lot of writing with the keyboard sitting on my lap, without the rest of the machine sitting in front of me. It gives me the chance to not be confronted by lots of machinery and equipment all the time. That's a big plus to me."

Perhaps the principal attraction of the PC for him, though, is its manufacturer. "One of the things that motivated me to buy the IBM PC," Fluegelman explains, "is that it has obviously been consciously created as a consumer product—and as near as I can figure out, a well-thought-out consumer product. I have no special good or bad feeling about IBM as a company, but for a huge firm—especially one that has the reputation for doing things right—to be a making a major investment in an uncharted area, I just had to believe that they have carefully created an integrated system that was going to work right and that was going to be satisfactory to me as a product. I had the feeling that I wasn't buying any strange surprises—that the whole thing was going to work without my having to pick up a soldering gun. And if the whole thing didn't work, that IBM would somehow take care of it."

Knowing that he would be working on a book about word processing, he ordered the PC and found the ComputerLand salespeople very helpful in getting his system to him as soon as they received the machines. There was a slight delay in his receiving the EasyWriter program, however, so he began working with BASIC and VisiCalc.

PC Was Immediately Useful

Even without the word processor, Andrew found that the PC was immediately useful to him in his business. "I've been amazed at how useful it's been already," he notes. "The VisiCalc program is very valuable in keeping track of my financial information, especially because my business is unusual in that my finances are very low volume in one sense—I don't have 10,000 customers—but very complex in that almost every one of the 30 to 50 checks I write each month has to be accounted for separately. I've got a dozen book projects, and I have 20 to 30 expense categories, and I need to account for every one of them. So where many small businesses are characterized by a large volume of routine transactions, my business is characterized by a small volume of complex transactions."

"I set up VisiCalc to keep track of my cash flow items for the next year-and-a-half; I made assumptions of what sales would be, what royalties would be, what my overhead was likely to be. Before I programmed in all that information, I really thought in terms of saving money—if I do this myself, will it save money because I won't have to pay a bookkeeper for so much time. But what I realized instantly when I had the information in the computer is that the control that I have over this information is of such a different dimension that it is just not comparable with my old bookkeeping system. The ease of moving and playing with that information gives me an insight into my business beyond what I possibly could have ever done by hand, and just having that is worth half of what the whole system is costing me."

Another immediate business use he has made of the PC is to write his own accounting program in BASIC. "The program I'm writing now in BASIC is going to write the checks for me, keep the checkbook balanced, and print the ledger. I've got the main part running; it's just left for me to put the little features I want into it. I pretty much made it up out of thin air; I copied a business program out of a book, but it was so far away from the way I wanted my books to be that I just abandoned it. But it helped me get a handle on how to program using random access files, which is really sticky. It took me a while to get a handle on that."

Considering that the PC is his first computer and that he had used it for only two weeks when he began writing this program, Fluegelman's experience seems quite unusual. "Maybe I just learned to write a program by enthusiasm," he suggests. But he has put in a good deal of time and study, and the process of writing his own accounting program has been one of intense experimentation.

200 Hours of Learning Time

"I read Bob Albrecht's book (*BASIC: A Self-Teaching Guide,* by Albrecht, Finkel, and Brown; published by Wiley) when I was traveling recently, and then I studied a book of BASIC games to see what programs were really like. This was before I had the computer, so I could only read about programming. And I've put in a lot of hours—I'd say I've spent 200 or 300 hours learning this stuff.

"One day I wasn't quite getting this ledger program the way I wanted it. I was using a function that tells you where in the random files you are, and I just kept getting weird results. It had a pattern to it, but it just didn't make any sense. I was so frustrated—I had tried everything I could think of to make it work right. So I called Microsoft in Seattle (the producer of BASIC for the PC) and ended up speaking with the guy who spend a year adapting BASIC for this machine. I told him about the problem and asked him what to do about it. He gave me an insight into what might be happening, and it instantly made sense to me. It was something that was not covered in the manual. I was glad to have the answer, and I was thrilled to be able to describe the problem to an expert after only two weeks with the computer."

One "Glitch" So Far

Fluegelman has had one human-induced "glitch" so far—and has learned an important lesson from it. "All the people I talked to and everything I read about working with the computer said 'save your work, save your work,' but I don't think there's any way you can ever appreciate that advice until you've spent the last two hours assembling and recording some financial information and you open your file drawer to get the last piece of data that you need, and the drawer kicks the plug out of the wall, crashing the machine to a halt and fading all your data into ether."

Despite that time-consuming error, Andrew Fluegelman is feeling none of the intimidation or apprehension that marked his first step into the computer world. "I think that what keeps 95 percent of people feeling weird about computers is learning how to boot the machine—how to get the thing running. You sit there in front of it, and you don't know how to get it started. You're afraid that it's going to snap at you or gobble you up or go up in smoke if you don't do the right thing. And I think the other great fear—and I'm speaking as someone who was one of those outsiders—is that when you get it running, it's going to lead you into some 'black hole' that you won't be able to get out of.

"2,000 Extra Brains At My Command"

"But when I started playing with my computer," he continues, "I stopped feeling that it was a machine that was doing things to me; it almost instantly felt like an extension of myself. It was as though I had had 2,000 extra brains grafted onto my skull. I really had that feeling—here are these extra brains, and they're really at my command, for me to string together or build together in any way that I choose."

Would you or someone you know be a good subjec for a PC Profile? PC welcomes suggestions for people to be featured in this series—anyone whose use of an IBM Personal Computer would prove interesting or helpful to readers. Send your recommendations, including up to 50 words explaining why, to PC Profiles, 1239 21st Avenue, San Francisco, California, 94122.

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Book Excerpt

DON'T! By Rodnay Zaks

Chapter 3
FLOPPY DISKS

In his preface to DON'T (Or How To Care For Your Computer), *author Rodnay Zaks notes, "It is true that personal computers have become so simple that anyone can operate them with no prior training, and without any real risk—at least in the beginning."*

"However," Zaks continues, "if a computer is used for business purposes, suitable precautions must be taken to safeguard information and insure reliable operation." DON'T *is a book of detailed advice about such precautions. Zaks says, "The operative word is generally DON'T! hence the title. Quite simply,* DON'T ...unless you know what you are doing."

The book's thirteen chapters offer DON'Ts (and some DOs) concerning printers, software, security and other essential matters. Especially for IBM PC owners who are new to personal computers, the following chapter about floppy disks from DON'T *could help avert anything from aggravation to disaster. (Old hands pay attention too; Zaks points a finger at many sloppy practices indulged in around the* PC *offices.)*

DON'T! (OR HOW TO CARE FOR YOUR COMPUTER), by Rodnay Zaks—Sybex, 1981—244 pages.

Dr. Rodnay Zaks, president of Sybex, Inc., is the author of numerous books on all facets of computers, including Your First Computer.

Introduction

FLOPPY DISKS ARE PROBABLY THE main cause of failures in any computer system that uses them. Nearly all such failures are caused by user mishandling. These failures can be prevented by respecting the rules presented in this chapter. A careful reading and understanding of the information presented in this chapter will probably eliminate 75% of the failures that are apt to happen on a computer system with floppy disks.

Failures due to diskette mishandling usually have tragic consequences. They can destroy crucial data or cause strange symptoms that are hard to diagnose.

Here is a typical horror story.

In order to start Computer System A, a diskette is inserted into one of the disk drives, and a command is typed at the terminal. Normally, the effect of this command is to load the contents of a program from the diskette into the computer's memory.

Unfortunately, one morning, the computer system, which was operating perfectly

For the Home Computer User

The main rule is:

Back-up each important diskette before using it.

Other important rules are:

- Respect the physical and magnetic integrity of the diskette: Don't touch its exposed surface. Don't fold it or compress it. Don't place diskettes near magnetic coils or magnetized objects.
- Label the diskette promptly. Don't use a hard-tipped pen.
- Maintain the proper environment: avoid heat and dust.
- Read this entire chapter. It is the most important one for you if you use diskettes.

up to this time, began to resist all attempts to load from the diskette. As a result, no work could be done on the computer. The maintenance person was called in, showed up the next day, took the computer apart, reassembled it, and mumbled something about a bad contact in the XYZ unit. The computer began operating again.

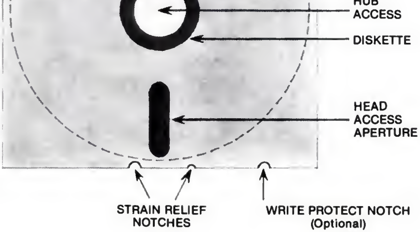
A few weeks later, a new problem occurred; this time, the computer started properly. However, the data file containing all the customer names could no longer be read. After replacing a few boards inside the computer, all in vain, the maintenance man concluded that the software was bad. In this "fortunate" case, the company that provided the software determined that the software was good and suspected the diskette that held the customer names. After much debate between the hardware supplier and the software vendor, the conclusion was drawn that both the hardware and the software appeared to be working, but the data file was bad.

To make a long story short, one of the computer operators had used a ball-point pen to label the diskettes. In doing so, the operator damaged the contents of the diskettes by applying pressure against their cardboard jackets. With the pressure of a pen, dust present inside a jacket is imbedded on the diskette, thus damaging it. The first time the pen was used, the main system diskette used to store the operating system was damaged. The second time, an essential data diskette was damaged. Unfortunately, the damage that had occurred to the data diskette was not immediately detected, and the offending operator was not around when the system failed. Easy diagnosis was no longer possible.

This story illustrates the "time bomb" effect that can occur when operators mishandle the equipment. The problem could have been easily prevented had the operator been trained in proper diskette handling. The hardware and software both operated correctly; the problem occurred because of an inadequately trained operator who damaged several diskettes in an almost unnoticeable way.

To avoid the "time bomb" effect, proper discipline must be used and enforced for the handling of diskettes. Remember that most actions that damage a diskette do not damage it in a way that is immediately visible. For example, contamination by dust or physical damage may not be detected until days or even months later when the affected area of the diskette is read by the disk drive. At that point, the computer might be fooled by incorrect information on the diskette and, consequently, irreparably damage the entire contents.

Once you understand the proper precautions that must be used when handling a diskette, you can avoid many problems by simply using common sense.



Understanding Your Diskette

We will now present the main definitions relating to diskettes, examine the main techniques used for recording data, and discuss the techniques for retrieving the information that was recorded. We will then proceed to the proper handling of a diskette. Let us examine first the diskette itself, then its jacket.

The diskette is flexible and constructed of mylar material, coated with a magnetic oxide. It is enclosed in a square jacket, and rotates inside the jacket when being accessed. The jacket is lined on the inside with a special low friction material that automatically cleans the diskette by trapping dust particles.

Data Recording

Data is recorded on the disk in binary format as sequences of 0s and 1s (bits), and stored as magnetic patterns along concentric circles called *tracks.* A regular 8 inch diskette generally has 77 tracks, while a 5-¼ inch minidiskette can have 35, 40 or 77 tracks per surface. As shown in Figure 3.2, information is structured in *sectors* along the tracks. A whole sector is always read or written at a time, and all data on the disk is identified by a sector number and a track number. Each track can be accessed by moving the head of the disk drive along a radius of the disk.

A mechanism must be provided so that the disk drive may identify any given sector on any track. We have already seen that one of two techniques may be used for this purpose: hard sectoring and soft sectoring.

The read/write head of the disk drive operates like the head of a tape-recorder. The head is applied against the disk surface, while a felt pressure pad is applied against the other side. Any defects in the disk surface, such as dirt or creases, will thus cause loss of information.

When a disk drive is misadjusted, or when the head is dirty, the surface of the diskette is generally damaged, resulting in shiny rings on the surface of the diskette. Inspect your diskettes regularly for such clues.

We have already seen that data may be recorded in one of two formats. Data may be recorded at the surface of the disk either in a single-density format (3,408 bits per inch or bpi) or in a double-density format (6,816 bpi).

The jacket containing the diskette has several roles: protecting the diskette, allowing access to the drive motor and to the drive sensors. These roles are accomplished by the special jacket liner already described and by specialized openings. These openings will now be described.

The Jacket

The jacket has several openings. The center hole or *disk hub* allows the spindle of the disk drive motor to grasp and rotate the diskette inside the jacket at high speed. A diskette should be replaced when the edge of the hole is cracked or torn.

The *access slot* in the jacket (shown in *Details of a Diskette* Figure) allows the read-write head of the disk drive to come in contact with the diskette and to read or write information on the surface of the disk.

The *index hole* on the diskette marks the position of the first sector. A sensor in the drive detects the index hole as it passes by the corresponding jacket hole. Recall that a hard sectored disk has maybe 20 or 32 sector holes in addition to the index hole. A soft sectored disk has only one index hole. The hole is normally on the inside of the disk, except for Memorex disks, where the outer part of the disk is used.

The *write protect* or *write enable* notch is optional. This notch may be used to prevent accidental writing of information on the disk. A write protect or write enable notch allows the user to protect valuable programs or data from inadvertent writing. With an 8-inch floppy, the diskette is write-protected when the notch is exposed, i.e., no information may then be written on the disk. If the notch is covered with a small aluminized square, data may be freely written on the disk. In the case of a mini-floppy, this convention is reversed. Information on the disk is protected when the notch is covered; otherwise, it is not protected. Diskettes are sold either with or without a protection notch. This feature must be specified at the time of purchase.

Alignment/strain relief notches are used to position the diskette correctly. They normally face towards the rear of the disk unit.

Having learned the various types of diskettes, how data is recorded, and the purpose of the various openings in the jacket, let us now learn how to handle a diskette properly.

Handling the Diskette

Proper diskette handling is essential to the reliable operation of your system. Improper diskette handling probably causes most "computer problems." Improper handling "pollutes" the diskette by damaging a few bits (or more) of information. The damage may only be detected much later, thus causing the time-bomb effect for the same user or a subsequent one.

Once you understand the nature of your diskette and are aware of the main dangers, proper diskette handling is quite simple. Most importantly, you must respect the physical and magnetic integrity of your diskette.

Remember the four main characteristics of a diskette:

- It is fragile.
- The data is recorded on a magnetic surface, which is sensitive to electromagnetic fields.
- The magnetic surface is exposed to the environment through the openings in the jacket.
- There is only one correct way to insert a diskette.

Let us examine the rules resulting from these characteristics:

- Respect the physical integrity of a diskette.
- Don't bend or fold a diskette.
- Don't touch the surface of a diskette. The oily chemicals secreted by the skin of your fingers will permanently damage an area of a diskette.
- Keep all sources of magnetic fields away from diskettes, including magnets as well as magnetized objects.
- Maintain the proper working environment. Avoid heat, moisture and dust.

- Insert the diskette into the drive properly.

It is unfortunate that many computer users do not believe in taking strict precautions because they see no immediate ill effects. Because damage generally occurs to only a very small area of the diskette, the diskette might be used for a long time with no visible effect. It is only when data is read or written to or from the damaged area that strange problems start to occur. Because the data stored at the damaged area is modified, the system might start behaving in a strange way that is not directly traceable to a bad diskette. Hence, the strange behavior may be attributed to bad hardware or software, thereby eluding easy detection. It is therefore imperative to insist on proper diskette handling by *all* users.

Now that we know how to handle a diskette properly, we are ready to use it.

Using the Diskette

When using a diskette, four essential recommendations apply:

1. Protect each new diskette.
2. Insert the diskette correctly.
3. Follow a proper power-up/power-down procedure.
4. Inspect diskettes each time they are used.

Let us examine these recommendations.

Protect Each New Diskette

Each diskette is normally contained in a paper envelope. When you first receive a diskette, immediately inspect the envelope for signs of obvious damage. Remove the diskette from the envelope and inspect it for damage. A diskette that has been physically damaged should be presumed to be bad and must be rejected. Don't touch the magnetic surface of a diskette with your fingers or any sharp object.

Remember: if the diskette contains a new program that you have just received, your first reflex should be to make a copy of the diskette and to file the original away in a safe location. Work with the copy that you have created. No exceptions. No excuses.

If you ever wipe out the only copy of a new program that you have just received, you will be convinced that this recommendation is correct. Unfortunately, by that time, it will be too late. This is one area where bitter experience should not be required.

If you are not yet familiar with diskettes, set the write-protect mode on your diskette, by either peeling off or sticking on the aluminum square on the notch (depending on the diskette size), if your diskette has this feature. Use a blank diskette for writing information rather than the one that contains the program. Using the write-protect mode will prevent erroneous writing or erasure of information on your program diskette—provided you insert it correctly.

Now insert the diskette by applying the "rule of thumb."

Insert The Diskette Correctly

Hold the diskette in your right hand between your thumb and index finger, placing your thumb on top of the square diskette label. Open the door of your disk drive and insert the diskette, slowly and firmly until you hear a "click." Then close the door of your drive (if it has one). In most cases, disk drives are designed so that you will correctly insert the diskette automatically if you follow the "rule of thumb," i.e., if, when you hold it, your thumb is pressing against the diskette's label.

When a disk drive is mounted vertically, it is usually on the right side of the screen or the computer, and the diskette label usually faces to the left. When the disk drive is mounted horizontally, the diskette label normally faces up. The longitudinal head access slot is normally inserted first, in the direction of the drive.

If you insert the diskette the wrong way, damage to the data stored on the diskette may result.

There are eight different ways to insert a diskette, but there is only one correct way. Any other way might damage it. If unskilled operators will be using your diskettes, it may be a good idea to print labels that display a large arrow and to place an arrow on each disk jacket indicating the proper way to insert the diskette. This will help to reduce errors when the diskette is inserted into the disk drive.

To remove the diskette, open the door of the disk drive, pull the diskette out, and put it back into its envelope immediately. Then, place the diskette on a horizontal surface *away from the computer* or other electromagnetic equipment or put it in its proper holder or container. (These holders will be described later in this chapter).

Power-up/Power-Down

As a general rule, never insert a diskette into a disk drive until power to the entire computer system has been turned on. If the computer can be turned on separately from the disk drive, it might accidentally write random data on the diskette. In systems where the disk drive is powered directly from the main computer, a diskette may generally be inserted in the disk drive before the system is powered up. If in doubt, don't insert a diskette until power has been turned on.

Conversely, always remove the diskette prior to turning the system off. If the system is turned off while the diskette is still in the disk drive, random data might accidentally be written onto the diskette, thus wiping out some of its contents.

Inspect Your Diskette

Periodically inspect the round hole at the center of the diskette. This hole contacts with the hub that presses on the diskette and rotates it at high speed inside its jacket. Over time, this hole will deteriorate. Most of the damage occurs because of improper insertion. Most microcomputer disk drives simultaneously apply the read/write head and the hub to the diskette so that the diskette positions itself with the hub already through the hole. As a result indentations may appear. Once this hole is damaged, the diskette should be replaced.

Also, examine the surface of the diskette that is visible through the head access hole. Over time, shiny rings will appear. However, scratches, folds, or very shiny wide rings indicate trouble. When these signs appear, test your diskette with a special program, or simply discard it.

Backing-Up

One of the most important defensive measures when using diskettes is to frequently make a backup copy of the information stored on the diskette. Always assume that at some point the data contained on the diskette will be damaged, either by yourself or by someone else. Therefore, as soon as any significant change is made on the diskette, a copy should be created and stored at a safe location.

When backing-up a diskette, it is recommended that you store the copy at a different location than the location where the original is being stored. The reason is quite simple. An undisciplined user is likely to pollute the original diskette and then pollute the backup diskette if it is readily accessible. To guarantee a reliable backup, the duplicates should be stored far away from the original that they intend to protect. Don't hesitate to create multiple backups but make sure that they are all properly labeled. Always write the date when the copy was made on the label of the backup diskette. (Remember: use a soft-tip felt pen only—don't use a ballpoint pen or a pencil).

We have now learned how a diskette looks, how it works, how to handle it, and how to insert it. There is still more to learn: how to label it, how to store it, as well as how to maintain a suitable environment. Let us examine these topics.

Labeling

Surprisingly, labeling can be a major source of problems for two reasons:

1. Hidden damage to diskette can be incurred when writing on the label;
2. Insufficient identification may result in misuse, erroneous filing or accidental erasure.

Let us examine these two problems in turn.

Writing On The Label

Remember: when writing on a label on a diskette, never use a hard pencil or ballpoint pen. Pressure exerted on the label can damage the diskette underneath by either deforming the diskette or by pressing dust particles captured by the lining inside the jacket into the magnetic surface of the diskette. When writing on the label, use only a soft felt-tip pen. As a general rule, it is best to write on a separate label and *then* carefully affix that label to the diskette.

Also, don't use an eraser to erase a label. Residue from an eraser will find its way first into the envelope and from there to the magnetic surface of the diskette where it will cause damage.

Identify the Diskette

Whenever you modify the contents of a diskette, identify it properly. In time many copies of a file are created. Unless they are properly identified, much aggravation can result from using or destroying the *wrong* version. Immediately after use, always label each diskette with at least the following information.

1. The name of the file
2. The date

In addition, it is desirable to keep with the diskette a printout of its directory, i.e., the complete list of the files it contains. Generate this printout on the printer, then tape it to the envelope in which the diskette is kept.

Whenever possible, name files in such a way that successive versions can be identified. Start with LIST1, then call the second version LIST2, the third LIST3, etc. As long as you know what the latest version is, this works.

Beware of situations where several files are updated on the same diskette. You may no longer know which file was changed when. In such a case, create a separate backup copy of each file that was changed, or else carefully list each file along with the date it was last modified.

When a diskette is a master or a copy, identify it as such. Masters are normally kept in a separate location and handled with great care. Backup copies are also generally stored in a separate location.

Dispose of obsolete copies after a reasonable period of time, or else:

1. You will quickly accumulate dozens of useless diskettes.
2. You may encourage errors by keeping old versions around.

Storing Diskettes

Both physical and environmental factors should be considered when storing diskettes. Diskettes can either be stored horizontally or vertically, but they should not be stored in such a way that they will sag, slump, or be compressed. They should be protected from adverse magnetic or environmental conditions. Let us now examine the do's and don'ts for storing diskettes.

DON'T Let Them Lie Around

When not in use, a diskette should be stored in a protective envelope and preferably filed away. Leaving a diskette lying flat and unprotected on the top of your computer is an open invitation to disaster. Dust will accumulate on the diskette. Usually, no immediate effect will occur as the dust particles will be captured by the inner lining of the diskette. However, once more dust has accumulated, or pressure is applied to the lining of the disk jacket, one or more specks of dust will scratch the disk surface and damage data. Later on, when the data is used, because it is damaged, it will cause erratic system behavior and there will be no easy explanation for this behavior. Again, this is the time bomb effect.

DO Store Them Properly

When stored, diskettes should not be bent or stressed in any way. They may be placed in a box as long as there are no physical obstructions inside the box that might exert pressure on them. Don't overcrowd diskettes in a single container.

When storing diskettes horizontally, don't stack more than 10 diskettes on top of each other. Diskettes should not be compressed.

Diskettes may also be stored in vertical plastic holders. The advantage of plastic holders compared to metal ones is the guarantee that plastic holders are not or will not become magnetized. Such holders range in style from rotating diskette holders to plastic boxes and vertical rack holders.

Using plastic will help prevent a magnetized metal element from coming in close proximity to the diskette, but it will not eliminate the danger altogether. In other words, a diskette lying in a plastic file holder may be wiped out if a magnetic coil or a magnetized screwdriver is placed near it. Therefore, the file holders themselves should be located away from sources of electromagnetic interference.

Hanging file holders may be placed in metal cabinets. Metal cabinets will, to some extent, shield the contents of a diskette from electromagnetic radiation. Naturally, this is true only if the metal cabinet is not magnetized.

Environment

Diskettes must be used in a proper environment. Here are the main enemies of your diskette:

- temperature extremes
- dust
- liquids and vapors
- electromagnetic interference

Let us examine each of these constraints in turn.

Temperature

Diskettes should be kept away from direct sunlight and extreme temperatures. Typically, diskettes will operate only between 10° and 50° Celsius (50° to 122° Fahrenheit). They will accept a relative humidity of 10% to 80%. If a diskette has been exposed to a temperature below 5°C or over 50°C (41° or 122°F), it should be presumed damaged, and discarded.

Special high-performance diskettes can withstand higher operating and storage temperatures. They may operate from 10° to 70°C (50° to 158°F) and may be stored at temperatures ranging from −40° to 70°C (−40° to 158°F).

Don't use a diskette that has just been brought in from outside the building if there is a singificant difference between the indoor and the outdoor temperatures. Allow a period of 24 hours for the temperature of the diskette to equalize with the temperature of the computer room.

Dust

Dust is one of the greatest enemies of diskettes. Dust may be due to an unclean environment or to more subtle causes such as heavy smoking, machinery (for example, drills used in dentistry), or specks of paper from a high speed printer. All sources of dust should be removed from the vicinity of disk drives.

Smoke in the air will also deposit particles on the surface of a diskette. This will cause the head to scratch the disk surface, thereby damaging the diskette.

Liquids

Liquids will damage the surface of a diskette. Don't use or even keep a diskette that has come in contact with a liquid. Discard it; it is unusable even after the liquid has dried. The residue will contaminate the diskette. The best precaution is to ban all liquids from the computer room. Whenever this is not practical, care should be taken not to spill liquids on diskettes or on diskette jackets or envelopes.

Vapors

Avoid placing solvents close to diskettes as chemical fumes may affect the magnetic coating of a diskette. Dangerous fumes encountered in office environments include fluids for duplicating machines, nail polish, and some adhesives.

Electrical and Electromagnetic Interference

Electromagnetic interference (EMI) is the name given to electromagnetic radiations that interfere with recorded data. Data can be destroyed or even wiped out entirely if a strong electromagnetic field or electrostatic field is applied to a diskette. Strong electromagnetic radiations are emitted by transformers and coils. A diskette should never be placed in close proximity to a magnetic coil (such as those used in telephones) or a degaussing coil (such as those around a color television tube).

Remember: don't put your telephone on top of a diskette, a box of diskettes, or even the disk drive. If the telephone rings while on top of a diskette or disk drive, it will wipe out any diskettes underneath it. (If you have any doubts, try it on an old diskette). Keep the telephone cord short enough so that the telephone can never be inadvertently placed on top of disk drives or a work table where diskettes might be lying.

Any metal object should be suspected of being magnetized. In particular, screwdrivers and paper clips tend to become magnetized over a period of time. A magnetized screwdriver placed in close proximity to a diskette can damage the data. Similarly, car keys and other metallic objects may become sufficiently magnetized to affect a diskette. Always store diskettes in a proper container away from electromagnetic radiation.

Diskettes must also be protected from static. In a dry environment, static electricity can build up. In particular, if a computer room is equipped with wool carpeting, it is possible for up to 15,000 volts of static electricity to build up in the body simply by walking on the carpeting. If a finger is pointed at the computer or a diskette, an electrostatic discharge may occur and a spark will travel between the tip of the finger and the computer or diskette. A spark may also occur if you walk across the room and touch a metal part while holding a diskette. Such a spark is guaranteed to wipe out some of the contents of any diskette, as well as disrupt operation of the computer. To avoid this problem, you can use anti-static mats and sprays. Whenever the danger of static electricity exists (for example, on a dry day), either be careful not to point a finger at the diskettes, or be sure to ground yourself carefully before doing so. You can ground yourself by touching a metallic object connected to the frame of the building or by touching a neutral ground.

Transporting Diskettes

Mailing Diskettes

Diskettes are often mailed. When mailing a diskette, use the best possible packaging that will guarantee the physical integrity of the diskette. Use rigid inserts in the envelope. If you use cardboard, make sure it is the corrugated kind. Place a sheet of it on both sides of the diskette, with the ridges of one sheet perpendicular to the ridges of the other. Don't use ordinary cardboard, such as the back of a paper pad. It is not stiff enough and will bend, which may destroy data on the diskette. Whenever possible, place the diskettes inside the package, ¼" to ½" away from the flat side. Distance is an excellent protection against pressure and magnetic objects.

Traveling with Floppies

Airport X-ray machines will not harm a floppy. However, the coils of the machinery surrounding them are dangerous. It is best to keep diskettes away from these machines.

Preventive Maintenance

Two types of preventive maintenance action are recommended in order to safeguard your diskettes:

1. Keep your disk drive within the prescribed settings.
2. Use defensive procedures to maintain the integrity of your data.

Let us examine these two maintenance procedures in detail.

Maintaining The Drive

Disk drives must be correctly calibrated and aligned, i.e., the drive must be calibrated to the proper tolerance and the heads must be properly aligned. This is best accomplished by a specialist but can be done by a dedicated tinkerer. Special alignment disks are available from the manufacturer to facilitate this process. Typically, a drive will stay aligned for a year or more.

The disk drive heads should be cleaned regularly to eliminate dust. The frequency of cleaning depends on the environment in which the disks operate and the discipline of the users. As a rule of thumb, disk drive heads should be cleaned at least once a year. Special head-cleaning kits are available for this task. Preferably, solvents such as alcohol, freon or thinners should not be used.

Let's go through the steps involved in cleaning a read/write head using a kit.

Step 1: Saturate the cleaning fabric on the special diskette with the cleaning solution as shown in above.

Step 2: Insert the diskette into the drive.

Step 3: After 30 to 50 seconds remove the diskette and make a note on the diskette that it has been used. Typically, each diskette may be used up to 15 times.

When double-sided diskettes are used, an extra opening may be found on the back of the cleaning diskette than can be helpful when cleaning the opposite side of the head mechanism.

Half of the diskette contains a special cleaning fabric and the other half contains a regular dry fabric that wipes off the read/write head.

Depending on how frequently the diskettes are used, and the cleanliness of the environment, cleaning can take place every few weeks or months. Anti-contamination techniques, such as cleaning, normally have two main positive effects:

1. The read/write heads are kept contamination free.
2. Operators are reminded of the risk posed by dust and other particles to their equipment and will generally become more cautious.

A typical list of disk contaminants includes: dust, other particles, hair, skin flakes, fingerprint oil, and smoke film.

Dual-sided diskettes are much more susceptible to dust than single-sided diskettes. With a single-sided diskette, the ceramic read/write head presses on one side of the diskette while a soft felt backing presses on the other side. Compression of the diskette material is minimal. In the case of a dual-sided diskette, two ceramic read/write heads are applied to the diskette simultaneously, one on each side.

Don't attempt to clean the diskette surface itself. Any contact with the disk surface will contaminate it.

Remember also that disk drives are sensitive mechanical devices. When moving a disk drive, be careful to avoid shocks and vibrations. Such physical disturbances might misalign the head.

Physical damage to a diskette is inflicted either by the drive or the operator. Diskettes should be frequently inspected for signs of wear or damage. If there is visible wear or damage on the disk surface, the disk should be presumed bad and should no longer be used. A backup should be used instead and the suspected disk should be discarded. Remember, the appearance of large shiny rings may indicate a mechanical problem with the disk drive.

Most diskettes become damaged before they wear out. However, in circumstances where diskettes are valuable and are frequently used, center rings are available and can be used to reinforce the spindle holes of diskettes.

Disk Failures

Diskette failures will seldom occur if proper handling procedures have been followed. If a diskette has been handled properly, and a disk drive failure occurs, improper calibration or alignment should be suspected.

Let us examine disk errors and possible causes.

Disk Errors

Disk errors are due to the accidental change of the value of one or more bits of information at its surface. Such errors are traditionally classified in three main categories:

1. *Drop-Outs.* In this case, bits are wiped out either beacuse of a defect on the disk surface or because of an inadequate write signal generated by the read/write head. Both cases are generally attributable to contamination or to physical damage to the diskette.
2. *Drop-Ins.* In this case, spurious bits are written in locations where they should not be. This is generally due to electromagnetic interference where a strong magnetic field creates spurious information on the surface of the disk. This can also be due to disk drive malfunction or to erroneous software that writes information in a place it is not supposed to.
3. *Bit Shifts.* This problem refers to the physical shifting of bits of information at the surface of the disk. Such shifting results in timing errors that may make the data unreadable. This type of problem is generally caused by electromagnetic interference, but it may also be caused by physical distortion or high temperature.

Most disk errors are detected during the reading process. This happens because the data that was stored on the disk has been damaged ("polluted"). Usually, the data contained in the affected file on the disk has been lost. In any case, the contents of the entire disk should now be suspected, and the polluted diskette should be replaced by the backup.

However, if a failure occurs while writing, three causes should be suspected before accusing the equipment:

1. The write-protect tab may not be properly positioned over the notch (or removed from it, in the case of a minidiskette).
2. There may be a software protection feature in the operating system that prevents unauthorized writing on a given file.
3. You may be using the wrong type of diskette for the disk drive. In particular, a hard sectored disk will not work with a soft sectored disk drive.

Floppy Disk Summary

Floppy disk failures are the most common cause of failures for small computers. Proper diskette handling requires respect for the physical and magnetic integrity of the diskette. As long as proper handling precautions and proper operating procedures, including a thorough backup procedure, are followed, diskettes will operate reliably for long periods of time.

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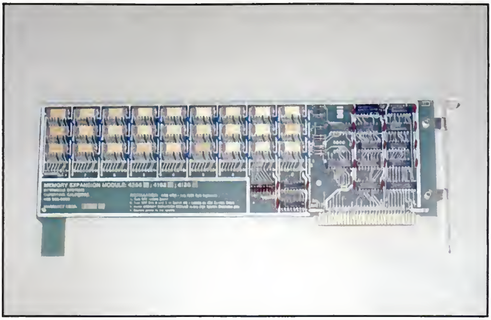

INTERMEDIA SYSTEMS OF CUPERTINO, California has begun production of their model 4192 Memory Expansion Module, which provides 196,608 characters (192K) of read-write memory (RAM) for the IBM Personal Computer. When installed, this added memory brings the computer to its announced capacity of 256K. The board is designed specifically for use in the PC and can be installed in any available expansion slot except that used for the disk controller. The manufacturer says PC owners can purchase the new product at ComputerLand stores for $1,095.

One advantage of this single-board memory unit, Intermedia says, is that it has economical space and power requirements for the PC. It makes relatively little demand on the computer's power supply, and users get the memory equivalent of three 64K expansion boards in one slot. Considering that there are only five such slots in the PC, this concentration of memory could be highly beneficial to anyone who wants to take full advantage of the options available for the computer.

For example, one of the slots is occupied by a disk controller (unless the PC uses a cassette only, an unlikely possibility); a second is used by the board that controls both the printer and the monochrome display; if a color monitor is used, the printer and color monitor require separate boards, filling separate slots; the communications card occupies one slot; and a game paddle takes up one more slot. Thus, with any assortment of options, the PC could not accommodate three individual 64K memory expansions to bring it to the 256K potential without an auxiliary chassis as well.

The price comparison of three 64K boards or one 192K unit is likewise favorable. The cost of three IBM expansion boards with 64K each totals $1,620; at $1,095, the single memory expansion board costs 32 percent less. These prices are also indicative of how rapidly this technology and its costs have changed: little more than two years ago a 64K memory board sold for as much as $1,000, and five years ago that much memory cost $1,500 and occupied as much space as all the boards in the PC.

At present, the software that can utilize this added memory is limited, but many of the major program publishers are reported to be adapting or developing software that will take advantage of the PC's larger memory capacity. One currently available product that is able to use more than the standard 64K in the computer is Microsoft's Pascal. The advanced disk BASIC sold with the computer also can utilize more than the 64K memory at present. In addition, IBM announced in early December that a Fortran compiler will be available in March and a macroassembler will be ready in February of this year; both are being developed by Microsoft and will be able to use the added memory. Personal Software has announced an upgrade of its *VisiCalc* program that will use up to 214K for a spreadsheet, and says it will provide the upgrade free to purchasers of the earlier version.

Tom Kornei and Harry Kline, developers of the Intermedia Systems board, emphasize the quality of their product and their solid experience in the electronics field. Both men have advanced engineering degrees from the University of California at Berkeley, both are former Hewlett-Packard employees, and their independent company has been in business for ten years. They design and manufacture a variety of electronics products, most of which are supplied to the Medical Electronics Division of Hewlett-Packard.

Their new product is simple to install and soundly made, and the firm offers a one-year warranty on the board. The unit is built with industry-standard 64K dynamic RAM chips, has a stainless steel mounting bracket and a fiberglass "foot" for secure placement, and is supplied with the cardholder needed to hold it in place in the computer's cabinet. Special packaging was designed for shipping the board; it consists of a large wrapping of convoluted foam inside a sturdy cardboard box. Each board is tested by being "cooked" for ten hours at 50 degrees Centigrade before it is shipped to a dealer.

Although other manufacturers have announced their intention to market similar memory expansion boards, Intermedia Systems asserts it is the first to have such a product in distribution. See *New Products* section for related announcements.

Intermedia Systems, 10601 S. Saratoga-Sunnyvale Rd., Cupertino, California 95014, (408) 996-0900.

"WITH THE UCSD p-SYSTEM,™ WE CAN WRITE ONE APPLICATION THAT GOES FROM APPLE TO ZENITH."

HARRY BLAKESLEE, President, Denver Software

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UCSD p-System and UCSD Pascal are trademarks of the Regents of the University of California.

Product Report

Visi-1040

Tax planning models for spreadsheet programs.

TAX SEASON IS HERE AGAIN, AND WHILE *PC* doesn't have any tips on reducing your share of the national debt, we do have news of something that will make filling out the forms a lot less painful.

That something is the Tax Planning Model, from Pansophics, Ltd. Designed to work on an IBM PC with either VisiCalc or SuperCalc, the Tax Planning Model is actually four spread-sheet files, each of which contains a format for filling out one of the following tax forms:

- Unmarried, single 1040 return
- Unmarried, head-of-house 1040 return
- Married, joint 1040 return
- Married, separate 1040 return

These models are included in the "personal package" and retail for $100. There is also a "professional" package selling for $150, which in addition to the above contains two additional files:

- Corporation, 1120 return
- Partnership, 1065 return

Jay Carlson

The most apparent advantage of this method of figuring income tax is that all the calculations and lookups are performed automatically. If you want to know what your tax situation would be like if you had received that raise last October, you can easily enter a different number in the income earned column and press the exclamation key (!) for manual recalculate (VisiCalc version). Presto, like magic the numbers change before your very eyes. Ouch, it's a good thing you didn't get that raise after all.

In testing the single 1040 return model, using bogus figures for income and deductions, *PC* discovered that it only takes about 10 minutes using these tax models to figure your taxes. And that's for a novice, non-CPA type person. With practice, we calculate that you could figure 80 to 100 returns in a single day using the Tax Planning Model.

The best part is once you've filled in the numbers for your return, you can slip an actual 1040 form in your printer and then print it out. Every number will appear in the correct position on the form.

The tax models have been geared to the 1981 return so that the new combined dividend and interest deduction is figured in as well as 1981's special 20% capital gains maximum tax.

—David Bunnell

VisiCalc Tax Plannning Models:
Pansophics, Ltd., Whistlestop Mall, PO Box 59, Rockport, Massachusetts 01966, (617) 546-3104.

IBM Personal Computer

SOFTWARE

★ C.P.A. General Ledger ★
★ Balance-Forward Accounts Receivable ★
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All programs run with IBM Personal DOS
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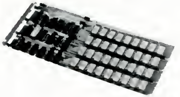


Memory Board

for IBM personal computer

256K Bytes $995
192K Bytes $850
128K Bytes $695
Field Expansion Kit 64K Bytes $175

- Addressable to any 64K boundary
- Board is disabled on unused blocks
- Low power — Small size
- Install in any expansion slot
- One year warranty
- Available now

Sigma Designs, Inc.
P.O. Box 3765, 3866 Eastwood Cr.
Santa Clara, CA 95051
(800) 538-8157 ext 929
(800) 672-3470 ext 929 (Calif. only)

Increase Memory 4X on the IBM Personal Computer

Datamac Peripheral Products offer the perfect solution to the major limitation of the IBM Personal Computer - only a 32K or 64K byte memory. The Datamac Memory Expansion Board - The First & the Only Available - contains 4 TIMES the amount of memory offered by the IBM Personal Computer. The 64K byte board is currently priced at about 20% below IBM's suggested retail price. Configurations can be set at 64K, 128K, 192K and 256K bytes.

The Datamac Memory Expansion Board is AVAILABLE NOW for immediate delivery.

Call or write for more information - Dealer Inquiries welcomed.

datamac

Peripheral Products Division
680 Almanor Avenue
Sunnyvale, CA 94086
(408) 735-0323

HOW TO BE AN INFORMED BUYER

Legal considerations when you buy a computer.

K. Stewart Evans, Jr.

THE FACTS OF THE CASE: John Doe Buyer thought he had purchased the top-of-the-line, state-of-the-art personal computing system just right for his business when he signed the written purchase contract. Later, when the computer system failed and could not be repaired, despite repeated attempts, Buyer discovered that the promises and assurances of quality were meaningless. So Buyer sued the manufacturer of the computer system to recover the purchase price, repair expenses, and lost profits.

THE RULING: Upon evaluating the contract Buyer had signed, the court ruled that all warranties had been excluded.

THE RESULT: Buyer was left with a computer that did not work, and he was required to pay the full contract price for the system.

THE MORAL OF THIS STORY IS NOT THAT our courts are unfair, unjust, or manufacturer-oriented. Rather, the moral is that no buyer should enter into a contract for the lease or purchase of a computer system armed with only half of the requisite knowledge. Knowing computer technology and your particular requirements for its use is not enough. To avoid Buyer's predicament, it is essential to either learn the relevant principles of law or have a legal expert review the terms of the agreement before it is made final.

This article will introduce you to the legal knowledge that could have saved Buyer from his costly mistake. The general principles of this law, the Uniform Commercial Code, apply in most states, but you would be wise to learn the specific rules of your state and to seek the advice of an attorney if you have any questions about a purchase agreement.

K. Stewart Evans, Jr. is a partner in the law firm of Boothe, Prichard & Dudley, with offices in Fairfax and Alexandria, Virginia. His specialty is commercial litigation, and his work includes computer-related matters.

Promises, Promises

The primary legal obligations that arise between a buyer and a seller relating to the quality of the goods purchased are known as warranties. A warranty is a promise or assurance by the seller that the goods will conform to certain specifications regarding quality, performance, or durability. Warranties fall into two main categories: express warranties, which are assurances actually made by the seller to the buyer; and implied warranties, which are created by law.

EXPRESS WARRANTIES. An express warranty is created by the seller in any of three ways: (1) an affirmation of fact or promise; (2) any description of the goods; or (3) any sample or model that is made part of the "basis of the bargain" (that is, the ingredients influencing the buyer's decision to buy). The law does not require that sellers use formal words such as "warrant" or "guarantee," or that theyhave a specific intention to make a warranty. Therefore, advertisements, brochures, pamphlets, sales talk, and demonstrations used to "show off" the features of a computer system may actually amount to express warranties by the seller.

The seller's affirmation of the value of goods or any opinion or commendation of the goods is not a warranty. For example, if the seller asserts that one computer is the "best computer ever made," this statement is not an express warranty. Equally important, if the seller makes promises after the buyer has decided to purchase the computer, these are not express warranties, because they are not a part of the basis of the bargain.

IMPLIED WARRANTIES. Unless excluded or modified by a seller, a warranty of merchantability is implied in any agreement for the sale of computers between a buyer and a seller, as defined by the Uniform Commercial Code (UCC), which applies in all states but Louisiana. To satisfy this warranty, the goods must at least pass without objection in the trade under the contract description and be fit for the ordinary purposes for which such goods are used. A refrigerator that will not cool, a heater that will not heat, or a computer that will not perform the storage, retrieval, and data processing functions computers ordinarily perform are examples of goods that are not merchantable.

Another type of implied warranty—of fitness for a particular purpose—may be created when a computer system is purchased. This warranty applies when the seller has reason to know the buyer's particular purpose in purchasing the computer; the buyer relies on the seller to select and furnish the right computer; and the seller is aware that the buyer is relying on his or her skill or judgment in the matter.

When Is a Warranty Not a Warranty?

Considering the express warranties that can be created by every advertisement, promise, or assurance made by a seller, and the implied warranties created by law when a buyer purchases goods from a seller, how is it that our Mr. Buyer found himself with a computer that did not work and no legal remedy? Simple. Buyer voluntarily agreed to eliminate virtually every warranty and legal right to enforce those warranties which the law creates. How? When he purchased the computer system, Buyer signed a written contract that included the following language:

"Seller agrees to exchange any parts shown to have become defective from normal wear and use during the first six months from date of delivery. Purchaser expressly waives all damages, whether direct, incidental or consequential. There are no understandings, agreements, representations or warranties, express or implied (including any regarding merchantability or fitness for a particular purpose) not specified herein, respecting this contract or the equipment hereunder. This

Illustration by Linda Nace

contract states the entire obligation of seller in connection with this transaction."

Buyer ran into a trio of weapons that sellers of goods use to protect themselves from the legal obligations that arise from warranties: disclaimers of warranties; limitation of damages; and limitation of remedies. If you encounter anything resembling this language in a purchase agreement, do not sign it; take the document to a lawyer and have him or her supply alternative wording that protects you.

DISCLAIMERS. The function of a disclaimer is to limit or exclude standards of quality, performance, and durability from a contract or agreement. While the effectiveness of a disclaimer can be a difficult legal question, all purchasers of computers should be extremely wary of any such provisions. To disclaim or exclude the implied warranty of merchantability, language which uses the term "merchantability" is required, and, in the case of a written contract, that language must be conspicuous. A disclaimer or limitation of implied warranties of fitness must be in writing and conspicuous. But expressions such as "as is" or "with all faults" are effective to exclude implied warranties of merchantability and of fitness for a particular purpose.

LIMITATION OF REMEDIES. Remedies available under the UCC for breach of warranty may be limited by agreement between the buyer and seller. The following example of a limitation of remedies clause limits the buyer to receiving replacements for defective equipment: "Damaged or defective equipment will be replaced without cost by the seller. Except for such replacement, buyer receives no other warranty." Using similar clauses, the seller can limit his or her legal obligation to the buyer. It is not clear whether current law prohibits the limitation of remedies when a written warranty is given for consumer goods.

LIMITATION OF DAMAGES. Current law does not prohibit limitations of damages in consumer product contracts. Therefore, language such as "Seller is not liable for any damage to business, property or reputation resulting from any defect or malfunction in the computer equipment" is an acceptable method for the seller to limit his or her liability. With this clause in a contract, the seller would not be liable for damage such as property damage resulting from an electrical short, loss of data, or delay in turning out projects, bills, or other information. Language that attempts to limit the seller's liability for personal injury resulting from a defect in the goods is generally disfavored by the courts, however.

The Moral Revisited

If your computer fails and the warranties arising out of its purchase have not been disclaimed, do not think that you can automatically recover damages. There may be other factual and legal hurdles to overcome. But knowing what you have agreed to and understanding the legal obligations of that agreement are necessary first steps. There is no substitute for reading and understanding all of the provisions of any agreement you sign. Your failure to do so can result in the loss of important legal remedies available to you.

THE AGE

The Land of Altair

Imagine a Land where computers are in the hands of the people. Creative people from farmers to merchants to engineers to housewives to dentists to poets.
Imagine a Land where the computer is in harmony with man with nature with hope with peace.
Imagine a Land where computer power is affordable and accessible and understandable to almost everyone.
You are imagining the Land of Altair.
The Land of Altair is now.

THE LAND OF ALTAIR *BY DAVID BUNNELL first appeared in the September 1975 issue of* Scientific American *as part of a 2-page advertisement announcing the world's first personal computer, the* Altair 8800.

The Altair and its history is in most respects synonymous with the early history of personal computing. Mits, the little company in Albuquerque, New Mexico, which proclaimed to Scientific American readers that they had invented a product which was going to change the world history for all time, went through a dizzy success cycle and then sputtered to an ignominious non-existence.

Along the way, folks at Mits created or inspired virtually every component of the personal computer market (see following page). David Bunnell, the publisher of PC, *was the Vice President of Advertising at Mits, and Eddie Currie was the Chief Executive Vice President. Together in this series they tell the story of* The Age of Altair.

OF ALTAIR

David Bunnell and Eddie Currie

PART ONE:

The Quiet Revolution

THE PERSONAL COMPUTING AGE HAS been in a continual dynamic state since its beginning in 1975 with the introduction of the Altair microcomputer.

The Altair was a neatly designed "expandable" computer in a sky blue metal box with rows of flashing red lights. Interestingly enough, the Altair, which was the first commercially available computer to be designed with a single microprocessor chip for its brains or "CPU," didn't come from California's Silicon Valley—spawning ground of micro chip companies—or Boston's Route 128—where "minicomputers" were born. Instead, it came from Albuquerque, an unlikely desert town known mostly for its turquoise jewelry and Mexican restaurants.

Though not many realize it, almost every aspect of the personal computer industry had its beginning with this single development. This included the first computer to ever be offered in kit form, the first personal computer BASIC and other high level languages, the first personal computer retail stores, the first personal computer convention, the first personal computer publication, and the first software publisher for micros.

In 1975 more Altairs were sold than any other single model of computer as it took its place in history as the first of the so-called "affordable computers."

Yet, the Altair Age began quietly with few of its participants realizing that it would spawn several hundred new companies, nearly a hundred publications, a dealer network of thousands, and an installed base of literally hundreds of thousands of personal computers throughout the world, and employment for millions.

How could one have guessed that the Altair computer and its knockoffs known as "S100 Bus" machines would be proved capable of compiling virtually every language available for computers of any type, playing games, music composition and production, splendid graphics, teaching its owner a wide variety of skills, linking up with other micros around the world via the ordinary telephone line, speech recognition and speech simulation—not to mention myriad other activities.

The Altair Age was the creation of one man, Ed Roberts, a former Air Force engineer stationed in Albuquerque who upon leaving the service started his own electronic development company—which he first called M.I.T.S. for Micro Instrumentation and Telemetry Systems. Upon incorporating a year later he shortened it to Mits, Inc.

Though Roberts began his company by designing a hobbyist model rocket, he soon moved into scientific test equipment and then into both pocket and desktop electronic calculators.

Roberts designed the Altair with 16 card slots (the PC has 5) and, as IBM has done, he designed the plug-in structure to be easily accessible to third party vendors and computer hobbyists.

Roberts' goal was to provide a "real computer" to the masses much in the spirit of Henry Ford. This computer was basic and minimal. But it was made from standard multiple source components and it used the spiffy new 8-bit Intel chip, the 8080. Costing under $400 in its minimal configuration of 256 chamsters of memory (and that's not "K")—the Altair was a real computer. It was infinitely expandable and best of it, it worked.

The Altair story has many twists and turns. Each time this revolution has appeared to stabilize, another new development has sent it hurtling forward again; whether it's the introduction of the Z80 or the 8086 or the 68000, or the advent of the mini-Winchester, the momentum is continuing to build.

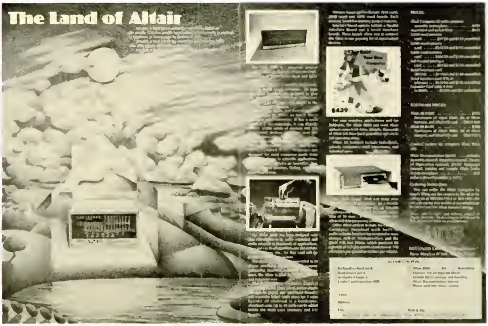
Just as we began to suspect that there is a clear view of the future at hand, perhaps the most significant event of the decade occurs.

IBM enters the market with the IBM Personal Computer. This machine, with its powerful 8088 microprocessor, with enough internal memory to contain an entire floppy, clearly marks the beginning of a new era.

From our perspective, a tremendously significant event has once again begun without much fanfare and with relatively little attention from the media.

As significant as the Apple and Radio Shack computers have been in proving that there is indeed a big market out there for micros, the IBM ranks right up there—with the Altair. The reason is that as IBM PC sales mount up into hundreds of thousands, and then millions, IBM will polish up the personal computing market that the Mits Altair originally created.

Next Month: THE ELECTRONIC COWBOYS FROM ALBUQUERQUE



WORDSTAR MADE EASY

A GOOD USER'S MANUAL FOR A COMPUTER product ought to be designed attractively. It ought to be easy to use, to put the reader at ease and eliminate some of the anxiety attendant upon learning something new. Certainly it should provide a useful index and offer some gentle introduction (such as a glossary) to all the new terms and concepts it contains. Unfortunately, the manual that MicroPro supplies with its WordStar word processing program has none of these attributes. The WordStar manual is loaded with information about the complex and varied features of this program, but it does not offer an easy way in.

WordStar is currently being adapted for use on the IBM Personal Computer, and this powerful program will add a welcome dimension to word processing for PC users. Even more welcome, though, is the new book *WordStar Made Easy*, by Walter Ettlin, published this month by Osborne/ McGraw-Hill. *WME* is not the last word in documentation, but is a quantum improvement over the MicroPro manual, which can quickly overwhelm readers with its dense format and type-crowded pages.

Unlike the MicroPro manual, Ettlin's guide has an index, an eye-pleasing format with ample white space on the pages, and an intelligent organization. The fourteen lessons in *WME* cover groups of related commands, and the paragraph or two devoted to each keystroke is headed in boldface type with that command. Therefore, a glance at any page in the book will quickly disclose which commands are covered on that page.

Ettlin's book is about half as long as the MicroPro manual for WordStar, and some information is sacrificed in achieving this more manageable length. The author quite rightly regards his work as an accompaniment to the MicroPro manual, however, intending that *WME* be used routinely, with the longer manual for reference when necessary. As an aid to this two-book system, *WME* has page numbers in the margins that refer to locations in all versions of the MicroPro manual where related information may be found.

There are deficiencies in *WordStar Made Easy*, however. The index is not very comprehensive, and it is not cross-referenced. This diminishes the utility of the index and at times can be misleading. For example, the author refers to the process of lining up the margin (usually on the right) so that every line ends at the same column, as "reforming." He uses this term in the index but does not list any of the more common alternatives, such as "justification" or "alignment."

One solution to this problem would be to have a complete glossary, including every term that a beginning user might not know. It is difficult for an expert to imagine what a novice knows or does not know. We become "experts" very quickly, in our own estimation, and soon forget that once we thought that a "menu" was nothing but a list of available dishes to eat and "prompt" was not a noun, but an adjective meaning on time. Yet every document that might be used by someone unfamiliar with a given system, or with computers in general, ought to have a good glossary.

Of course, none of this would matter if every user were content to follow *WME* slavishly, step by step, from beginning to end, and compose his or her own index/glossary while going along. And here we come to the most fundamental criticism not only of *WME*, but of all documentation of this sort that I have seen. It does not allow sufficiently for the way real people actually learn a new software package in the real world, which is by playing with it. Let me take my own advice and explain what I mean by "playing."

Upon first sitting down with a new software package, I find it impossible to follow a manual or tutorial very far without thinking of some operation that I just must learn how to perform right now, no matter that the manual does not get to it until page 106. I usually try to figure it out and sometimes succeed, especially with the use of a help menu, but I often fail. In the process, I always learn something about the system.

When I'm finished with such a digression I return to the manual, taking up its instructional sequence where I left off. I cannot learn any other way, and I believe that most people learn by this method; that is, by following their own curiosity. Curiosity is the only reliable educational motivation, and any manual that forces a student into a preconceived and inflexible learning sequence not only violates the student's individuality, but forfeits the aid of curiosity, turning the student from an ally into an antagonist.

A comprehensive glossary and a cross-referenced index are the two most important means of avoiding this mistake. Third most important is adopting a style that conveys the learner that he or she may indulge a freedom to "play." Rather than say, as Ettlin does in several places, words to the effect that "we'll cover this subject further in a later chapter," he might better have said, "If you want to pursue this train of thought, feel free to go to chapter such and such right now, or see index references x, y and z."

—Les Cowan

WORDSTAR MADE EASY, by Walter Ettlin Osborne/McGraw-Hill, 124 pages, $7.95

Second Opinions

To me, the principal strength of *WordStar Made Easy* is that it gives readers a series of projects with which to learn WordStar. There is no substitute for learning by doing, and Ettlin provides several different types of documents for users to learn with: simple paragraphs, form letters, pages with internal lists and special indentations, and even examples of charts and elementary graphics. When you've completed WME's exercises and examples, you will have used most of the features and commands WordStar contains, and—more important—you will have some ideas about how to apply them in business situations.

WordStar Made Easy is a great help to anyone who is exchanging a typewriter for a computer, and it certainly makes mastery of WordStar's varied components simpler than either the manual supplied by MicroPro or Les Cowan's preferred learn-by-experimentation method. Both experimentation and the WordStar manual are essential parts of the full learning process—it's just that Walter Ettlin has made it easier for all of us to get started.

—Jeremy Joan Hewes

NEW ON THE MARKET

SOFTWARE

Arithmetic Games

IBM has announced three arithmetic programs in its Personal Computer Education Series. They are *Fact Track* ($90), which assists students in learning basic arithmetic, and *Arithmetic Games*, Set 1 and Set 2 ($60 each), which build mathematics and logic skills in game playing situations. *Fact Track* measures mastery of single-digit addition and multiplication in two ways—by correct answer and rate of response. All three programs are by Science Research Associates, and are available now through PC dealers.
International Business Machines Corp., P.O. Box 1328, Boca Raton, FL 33432. 800/447-4700; in Illinois, 800/332-4400.

Typing Tutor

A touch-typing instruction and drill program that creates individualized typing drills has also been added to IBM's Education Series. *Typing Tutor* ($25), from Microsoft, Inc., automatically adjusts to the user's skill level each time it is used.
IBM, (see above).

Small Business Accounting

General Accounting ($425), a program package by BPI Systems, Inc., will be available in February for use by small businesses and professionals. Once the user makes journal entries into the system, it can automatically post ledgers, prepare financial statements and close the user's books.
IBM, (see above).

Languages Galore . . .

IBM has also announced expansion of its Computer Language Series for the PC. First of the new products will be *Macro Assembler*, to be ready in February, and *FORTRAN Compiler*, coming in March; both run under PC DOS and are by Microsoft, Inc.

A later addition to the Series will be the *UCSD p-System* ($625 with one language), an advanced operating system which functions with both *UCSD Pascal* ($175 separately) and *FORTRAN-77* (also $175). The p-System and associated languages, both from SofTech Microsystems, will be released in April. Included with the p-System are a screen-oriented editor, a macro-assembler, and advanced "turtlegraphics" for graphic displays.
IBM, (see above).

BASIC Utilities

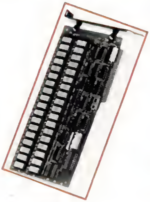
A set of utility programs for BASIC programmers, including subroutines for formatted input, matrix input and arithmetic, line drawing and file searching, has been released by Basic Business Software, of Las Vegas. The *BASIC Utilities* disk ($75) also contains a program for cross-referencing, and similar aids.
Basic Business Software, Inc.—P.O. Box 26311, Las Vegas, NV 89126—702/876-9493.

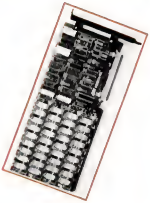
"Common BASIC Programs" etc.

Adaptations for the IBM PC of the programs contained in the book *Some Common Basic Programs* (Osborne/McGraw-Hill) are being offered by Basic Business Software. The disk is $35. The same company is also offering PC programs for *Plotting* ($75—it plots an array of data points to any printer, *Amortization & Depreciation* ($30) and *Finance Calculator* ($30).
Basic Business Software, Inc., see above.

HARDWARE

Several Companies Announce Memory Boards





In addition to the 192K memory expansion board now being produced by Intermedia Systems (see related story in this issue), two other California firms have announced the availability of memory boards with varying capacities. Datamac Computer Systems of Sunnyvale offers an expansion board that can be configured for 64K, 128K, 192K, and 256K bytes of memory, with parity. The price of Datamac's 64K expansion unit is $499, and the larger memory units are comparably priced; the board is available now.
Datamac Computer Systems, 680 Almanor Ave., Sunnyvale, CA 94066; (408) 735-0323.

A.S.T. Research, Inc., of Irvine also offers memory expansion boards with capacities of 64K, 128K, 192K, and 256K in one unit, with full parity checking. The firm offers a one-year warranty on these boards, which are priced from $495 to $1595.
A.S.T. Research, Inc., 17925 Sky Park Circle, Suite B, Irvine, CA 92714; (714) 540-1333.

Communications and Development Modules

Two hardware products also offered by A.S.T. Research are a communications option card that contains two RS232 ports that can support asynchronous, bisynchronous, SDLC, and HDLC protocols, and a Wire-wrap/Extender card set for PC users who are doing hardware development.
A.S.T. Research, (see above).

PERIPHERALS

8-inch Compatability for the PC

INSTOR Corporation has developed INSTOR/801, a floppy disk for the PC that uses the IBM Diskette I Basic Data Exchange format. With this device and the PC's Asynchronous Communications Adaptor, the PC can read and write an 8-inch IBM 3741 format disk.

The 801 interfaces through the PC's serial (RS232) port and, using software provided with the product, can transmit data into the PC's memory (for subsequent writing on PC disk) or receive data from the PC and write it on the

continued next page. . .

3741 format disk. Thus, the INSTOR 01 provides compatability between the PC and some 25 other computers that utilize IBM 3741 format disks. This disk exchange system is priced at $2,000, inciuding necessary software.
INSTOR Corporation, 175 Jefferson Drive, Menlo Park, CA 94025; (415) 326-9830.

Multi-font Typographic Printer

The Modei 700 typographic printer ($3,360) by Sanders Technoiogy can print draft copy at high speed, then print a final version in muitipie typefaces that come ciose to typeset quality. Many mechanical parts are common with the Diabio 630 daisy-wheei printer, and the Modei 700D, due for March reiease, will be compatibie with the Diablo 630's software control codes. Six different type styies or sizes can be installed in the printer, which also has piug-in slots for four additionai draft/finish sets ($125 each). The printer can be set by switches for all common computer interfaces.
Sanders Technology, Box 1226, Nashua, NH 03061, 603/882-1000.

Chronograph for Date and Time

The "stack" modem from Hayes Microcomputer Products, Inc. of Norcross, Georgia now has a matching companion—the Hayes Stack Chronograph, a calendar/lock that can be attached to the PC through an RS232 port. In addition to providing accurate timekeeping, users may deveiop software to log programs and data according to time and date and to send instructions to the computer to control security devices such as lights, burgiar alarms or sprinkier systems.
Hayes Microcomputer Products, Inc., 5835 Peachtree Corners East, Norcross, GA 39902; (404) 449-8791.

Graphics Printer

Centronics Data Computer Corporation has announced production of the Modei 739 printer, which is capable of both graphics and conventional text printing. Text is produced in a 7x8 dot matrix at speeds of 100 characters per second (regular letter spacing) and 80 cps (proportional spacing.) Graphics are printed at a resoiution of 74 dots per inch by 72 dots per inch. The Centronics 739 can take sheet, fanfold or roll paper up to 9 inches wide (inciuding pin feed), features a seif-test, and comes in both parallei and serial models. This printer costs less than $1000.
Centronics Data Computer Corporation, Hudson, New Hampshire 03051; (603) 883-0111.

BOOKS

Guide to Inventory Management

Retailers who are using or are contemplating use of a computer for inventory controi wiii find weicome guidance in *Inventory Management for Small Computers*, by Chuck Atkinson, just published by dilithium Press. The author owns a saiiing business and wrote this book after designing his own inventory system. Atkinson's program, listed in the book, features records of stock on hand, prices, and automatic posting of items sold to the general inventory list as a sales receipt is printed.
Inventory Management for Small Computers, by Chuck Atkinson, 120 pages, $12.95; Dilithium Press, 11000 S.W. 11th St., Suite E, Beaverton, O 97005; (503) 646-2713.

PC Overview

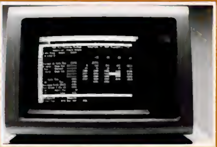
A book titied IBM's Persona Computer ($14.95) has been published by Que Corporation. Th team-written book offers an overview of the microcomputer marke and where the PC fits into it, an anaiyzes its hardware and software components on an item-by item basis.
Que Corp., Indianapolis, IN 317/842-7162.

EVENTS

Computer Swap

The high tech flea market will become a nationwide event in the coming year, according to John Craig, originator of Computer Swap America Craig will take his swap meet, which has been based in the San Francisco Bay Area, to southern California on Saturday, February 6th at the Orange County Fairgrounds in Costa Mesa. The event will return to northern California on April 24th, at the Santa Clara County Fairgrounds in San Jose. The most recent swap meet, held in San Jose last October, drew more than 5,000 people.
Computer Swap America, P.O. Box 52, Palo Alto, CA 94302; (415) 494-6862.

COMING UP



Visi-Clones

A PC-Lab comparative report on "spreadsheet" programs, including the original, *VisiCalc*, plus *SuperCalc*, *Multiplan* and other pretenders to the throne.

Inside IBM

PC visits the PC's birthplace in Boca Raton, Florida, for a first-hand report on the how-and-whys of the IBM Personal Computer. Don Estridge, the IBM executive in charge of the Personal Computer program, shares insight into the PC's design in an exclusive *PC* interview. Also: A peek at the soon-to-open new PC factory and what it bodes for the PC's future.

More From Microsoft

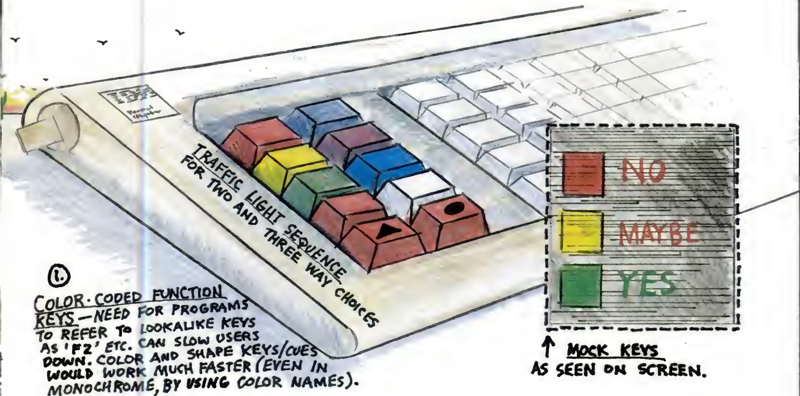
To follow up this issue's interview with Bill Gates, *PC* talks with Vern Raburn, President of Microsoft Consumer Products, a division of Microsoft. His views on future trends in application software are of particular interest to *PC* readers, since Microsoft will undoubtedly continue to supply programs for the IBM Personal Computer.

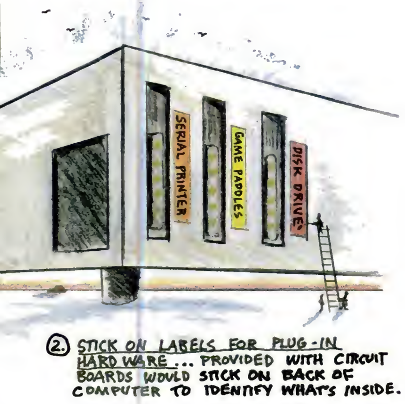
Plus...

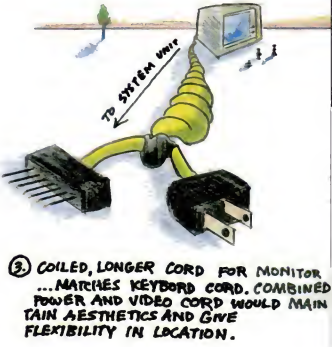
Taking The Measure—Part 2. . .Color Monitor Test. . .more Product Reports. . .new product news. . . a *PC Profile*. . .and lots more.

Index To Advertisers

wish list™







PC invites readers to contribute Wish List ideas for publication. Any product, service or design idea you'd like to see for IBM Personal Computers is fair game for *PC*'s Wish List feature. Ideas selected for publication will be illustrated by *PC*'s artist. *PC* will pay $25 for the featured Wish List idea used in each issue, $10 for other ideas awarded Honorable Mention. All published ideas will be credited to the person or organization submitting them, and become the property of *PC*. In case of duplicate submissions, any award will go to the entry with the earliest postmark.

Send Wish List ideas—a description, sketch or both - together with your name, address and phone number to *PC* Wish List, 1239 21st Avenue, San Francisco, California 94122. Sorry, we can't discuss the Wish List feature by telephone.

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The Independent Guide to IBM Personal Computers

T.M.

SPECIAL: RUBIK'S CUBE SIMULATION

PCOLOR SPECIAL: Color Display Survey, Using PC Graphics

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IBM Cranks Up the Software Machine

Boca Diary

Visiting the Birthplace of the IBM PC

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Permanent Memory
(ROM) 40K bytes*

Microprocessor
High speed, 8088*

Auxiliary Memory
2 optional internal diskette drives, 5¼", 160K bytes per diskette

Keyboard
83 keys, 6 ft. cord attaches to system unit*
10 function keys*
10-key numeric pad
Tactile feedback*

Display Screen
High-resolution*
80 characters x 25 lines
Upper and lower case
Green phosphor screen*

Diagnostics
Power-on self testing*
Parity checking*

Languages
BASIC, Pascal, FORTRAN, Macro Assembler

Printer
Bidirectional*
80 characters/second
12 character styles, up to 132 characters/line*
9 x 9 character matrix*

Color/Graphics
Text mode:
16 colors*
256 characters and symbols in ROM*
Graphics mode:
4-color resolution: 320h x 200v*
Black & white resolution: 640h x 200v*
Simultaneous graphics & text capability*

Communications
RS-232-C interface
Asynchronous (start/stop) protocol
Up to 9600 bits per second

*ADVANCED FEATURES FOR PERSONAL COMPUTERS

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But what makes the IBM Personal Computer a truly useful tool are software programs selected by IBM' Personal Computer Software Publishing Department. You can have programs in business, professional, word processing, computer language, personal and entertainment categories.

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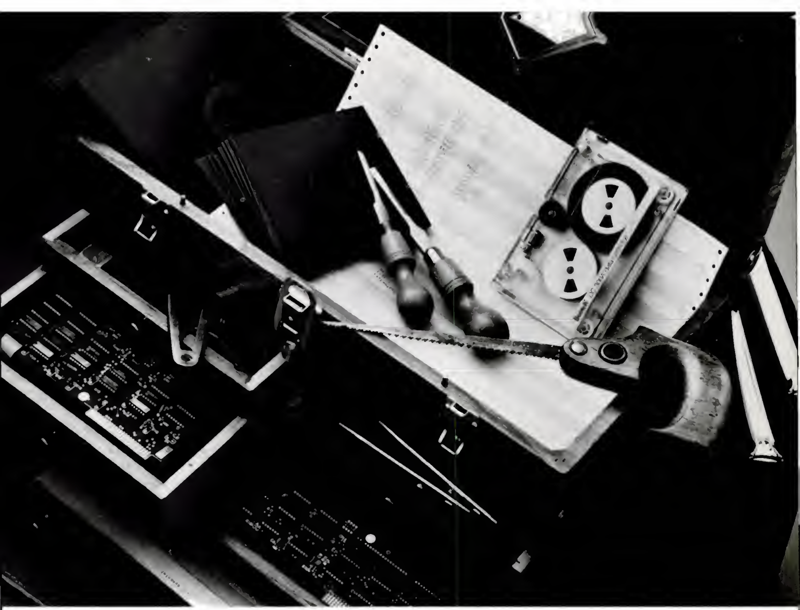
IBM

The IBM Personal Computer and me.

†This price applies to IBM Product Centers. Prices may vary at other stores.

For the IBM Personal Computer dealer nearest you, call (800) 447-4700. In Illinois, (800) 322-4400. In Alaska or Hawaii, (800) 447-0890.



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Next, languages. Microsoft 16-bit Cassette BASIC is standard with the IBM Personal Computer. But Microsoft also provided 16-bit Disk BASIC, Advanced BASIC, Pascal, FORTRAN, and utility software for the Personal Computer. For fun, we added the Microsoft™ Adventure game. For self-improvement ...Typing Tutor.

Why Microsoft? Microsoft virtually invented microcomputer software when we put BASIC on the first personal computer. Since then, we've developed a full range of languages, utilities and operating systems. Software that has become a standard for the 8-bit world. Software that is becoming the standard for the 16-bit world. That's why the world's leader in computer hardware came to Microsoft, the world's leader in microcomputer software.

MICROSOFT

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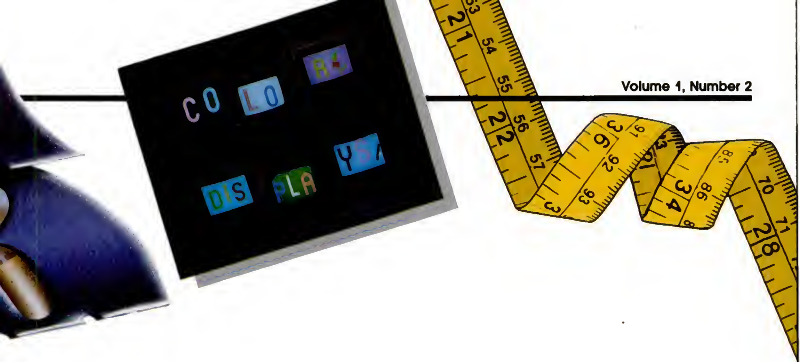
The Independent Guide to IBM Personal Computers

IN THIS ISSUE



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The Independent Guide to IBM Personal Computers

DAVID BUNNELL
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DIGITAL RESEARCH™

Letters to PC

English vs. "Computerese".

Last weekend I acquired the first issue of *PC* at the San Diego Computer Show and was thrilled to finally find a magazine providing information about micros written in "ENGLISH."

Rookies, like myself, find it very difficult to make sense out of the articles in most magazines on the market today. They are mostly written for professional programmers, analysts, etc., who, with years of experience, have acquired the command of the "Computerese Language." Born and raised in Italy, I have had a hard enough time learning English, not to mention all the abbreviations used in American-English.

I found Andrew Fluegelman's article on *EasyWriter* particularly interesting, I will gladly refrain from using it!

Mimma Fonti
The ANSWER in COMPUTERS
San Diego, California 92115

Oral exam for PC prize?

I'm puzzled about the color/graphics monitor adapter included with the 16K computer you advertised to give away. I was informed by one of the local IBM retail stores that the color/graphics monitor adapter requires 32K to operate it. If that is true, the system described in your advertising will not work. I am not sure I want to win a system that requires me to buy some additional item to make the system work.

Have I been misinformed? If the retail dealers are correct, that leaves me concerned about the accuracy of the information you will print. You are, after all, supposed to become the printed authority on the IBM Personal Computer.

Bruce Baker, Jr.

Looking a gift computer in the mouth, eh? Well, either you have been misinformed or you misunderstood. The PC system prize in our sweepstakes that ended February 28 is fully functional. It is, in fact, the basic system that IBM features in its advertisements. The color/graphics adapter has 16K of display memory built in; added to the 16K in the computer, perhaps that is the "32K" you were told about. We wouldn't knowingly give out a bum computer—or bum information. But your question points out that the many PC options can be confusing. See this issue's article on color displays for more enlightenment.

Displaywriter fan's plea.

I do not own a Personal Computer, but I do own the IBM Displaywriter (8086 microprocessor) which resembles in some ways the PC (8088). I've bought CP/M-86 and CBASIC-86 specially configured for the Displaywriter by Digital Research. Also, IBM is said to be preparing a BASIC and some equivalent of the *VisiCalc* program for the Displaywriter. It might be a good idea to create a section in your magazine—just a page maybe—for Displaywriter owners. We are bound to be very much interested in what's available for the Personal Computer, because a good part of the software might run or be transferable to the Displaywriter—which happens to be one of the most sophisticated 16-bit microcomputers on the market. I for one am subscribing to your magazine for precisely that reason.

Georges Khal
Atelier Cybernetique Orphee
Montreal, Quebec

We plan to add some Displaywriter coverage in future issues.

Why IBMers buy.

Two things to comment on: first, why do you think IBMers buy computers for other reasons than "regular folks" do? The many IBM friends I know who are buying an IBM Personal Computer are doing so because they are upgrading from a TRS-80 or Apple Computer, not because of any expected shortage or chance to make a buck.

Second, comments regarding the article on *EasyWriter* by A. Fluegelman: regarding the "block move" tips, the 'block copy on', 'block copy off' messages are not ambiguous. In the 'block copy on' mode, it is possible to use CNTL "G" more than once to place a given block at different spots in your text. In the 'block copy off' mode, only one copy of the block is permitted. You can hit CNTL "J" one or two times, depending on which mode is desired. Also, only one "ENTER" is needed after inserting the second block marker, and only one delete is therefore needed when clearing it later.

Although *EasyWriter* may not be on a par with some more costly programs such as *WordStar*, I find it to be highly useable.

I thoroughly enjoyed Volume 1, Number 1; I hope you soon decide to make it monthly.

Kenton Graham
Round Rock, TX

The writer who speculated on why IBM employees are buying PCs so eagerly responds that he knows plenty of "regular folks" who are very receptive to chances for making a buck. Re: monthly publication of **PC**, *it will commence this August.*

More about *EasyWriter*.

The "Not-so-*EasyWriter*" piece by Andrew Fluegelman is interesting and useful. I have just assisted one of my clients in installing this text editor and the results were excellent. My client was not looking for a super system, but something easy that he and his secretary can use to produce relatively simple material. The biggest problem was that the manual provided by IBM is far too complicated for the neophyte. I had to produce an entirely new manual suitable for people who are essentially computer illiterates.

Prof. Andrew Vazsonyi
St. Mary's University
San Antonio, Texas

What to read before you buy your IBM® Personal Computer.

LETTERS TO PC

I am very pleased with my IBM Personal Computer. I also purchased the *EasyWriter* software. Previously I had a TRS-80 Model 1 computer for three years. With that, I used two word processing programs, *Scripsit* and *The Electric Pencil*. I was pretty fast on them, and once I knew the system I didn't make any disastrous mistakes. It was a different story with "not-so-*EasyWriter*." I wanted to try out the features of my new Epson MX-100 printer, but found to my dismay that all was not OK with either the documentation or the software. For instance, I spent two days trying to learn how to underline words . . .

Frank P. Vlamings
Newark, California

Mr. Vlamings' tips on how to make EasyWriter *do underlining on the Epson printer appears in this issue's User-To-User section.*

Regarding the article on the *EasyWriter* program, I agree! So do others I have talked to who have used the version on the IBM PC. I regard the pen I am holding as a true easy writer compared to the program product. I wish I could get my money back. I would much prefer a full screen editor and text formatter which uses *standard* system files.

Robert Fritz
San Diego, California

I hope Mr. Fluegelman's comments have been passed on to IBM and Information Unlimited Software, Incorporated. User feedback of this nature is vital to the health of personal computing. A future release of this product that corrects and enhances its weak spots, I am confident, will be well received by the user community.

Another sore spot in the software arena of the IBM PC is the PASCAL compiler. The compiler requires a minimum of three diskette changes during each and every compile. Putting disks in and out of the drives is an operational nightmare. The problem stems from the limited disk storage capacity (160K per disk). This may be a subtle strategy to get PASCAL users to migrate to hard disk. An improvement in the operation of the PASCAL compiler is definitely needed.

C.L. Pfau
Ralston, Nebraska

Random (and sequential) request.

I've had a PC since November (color, disk, 128K, printer) and am interested in learning how to set up random and sequential files and, via a modem, move them back and forth to a mainframe. Any articles on this in the coming year would be appreciated, since the appendix which covers this in the BASIC manual is neither clear nor exemplified well.

Leslie Hendrickson
Eugene, Oregon

Watch for a two-part series on using BASIC for random and sequential files—and even explaining what the heck they are—in **PC***'s next issue.*

Miscellany . . .

I need help in finding a "letter-quality" printer which can be interfaced with the IBM PC, which has a print wheel to match the typeface of this letter, i.e., "Letter Gothic," 12 pitch. I have seen some print wheels advertised for Qume printers, which meet this typeface in appearance. Do you know of any others?

Samuel E. Jeffries
Raleigh, North Carolina

A report on available letter-quality printers is in the works for later this year.

I take exception to the reference that the first personal computer publication was Altair related. *Recreational Computing* née *People's Computers*, née *People's Computer Company* was continuously published since its 1972 debut, until its sale last year. But since we started it well before the machines actually existed in micro-form, perhaps it is more precisely labeled the first personal computing periodical—for real hair splitters. Keep up the great work, and *bon voyage*!

Marlin Ouverson
Editor, *Dr. Dobb's Journal*
Menlo Park, California

As an IBM employee, I am pleased to see that your publication lives up to the same standards as some of ours. Keep up the good work.

Terry Taylor
Hayward, CA

Number Crunching, etc.

We expect to purchase an IBM PC, but our main application is in engineering and will involve a great deal of number crunching. We've heard about the impending Intel 8087 floating-point processor which should help speed up this type of computing, but we have several questions which no one seems able or willing to answer. First, is the 8087 intended to supplement the 8088 or will it replace the 8088? Also, if we purchase the IBM PC now, will we be able to add the 8087 later when it is available? If it is added later, will we need all new software? We also wonder whether double-precision computations with either the 8088 or the 8087 will provide the 32-bit accuracy obtained with the IBM 360 and 370 systems, or if we should consider a different microcomputer for number-crunching applications?

Alfred T. Miesch
George Van Trump, Jr
Lakewood, Colo

Your questions indicate a healthy attitude—namely starting with your needs rather than a choice of hardware. We don't have specific answers, but may have more when the 8087 option is actually offered.

Whither PC

I found your predictions of resounding success for your magazine interesting, but I have a somewhat different prediction for you. You will do quite well at first. Then the very machine to which your pages are devoted will be your undoing. I predict that the IBM Personal Computer and the networks that connect them together will put most printed paper magazines out of business within a surprisingly short time. The technology now exists to produce electronic magazines, including advertising with color pictures of the hardware, and actual demos of how software operates, and get them to a large number of users very quickly. Soon, someone will do it. I predict the first subject will be one of interest to everyone capable of receiving the magazine-Personal Computers. I would love to have had a copy of your first issue in early December. I would have considered it very good, then. Now it's old hat, compared to the information that's been coming over IBM's internal network. I suggest you either find a way to get your magazine to readers a lot more quickly, or be the first to produce a good electronic magazine. If you don't, I predict you'll be out of business within five years.

Bob Blase
New Paltz, NY

Perhaps you didn't notice, but the name of the company that publishes **PC** *is "Software Communications, Inc." Chew on that awhile, fellow.*

—DHB

PC welcomes letters from readers. Write to: Letters, PC, 1528 Irving St., San Francisco, California 94122. Letters published may be edited.

DAVID BUNNELL

Cowboy Publishing

"As soon as that little dogie is down and hog-tied, you go out and find you some office space."

First off, let me warn you that you may have a hard time understanding Cowboy Publishing and how it relates to *PC* magazine.

You may decide that the whole idea is just plum loco, and p'rhaps it is.

However, I 'spect it will make a mite more sense to most of y'all once I've given you the story behind it all.

So, like or not, here goes.

This here magazine got started in the spare bedroom of our home last October 1. By Halloween, it had grown into the dining room. Then by November it was in the kitchen, the dining room, the basement and was starting to sneak into my bedroom.

By December our living room was an art production department where artists Don and Linda Nace, who came from New York, worked from sunup 'til the cows came home, helping to put the first issue together.

And the amazing thing is, that although there were a few tough moments, we not only survived, we got a bit tougher and a whole lot smarter in the process. You'd think we were working at Time, Inc., and not out of a house in San Francisco, judging from the results.

Well, let me tell you, some mornings me and my family didn't know what to do. Them phones would start ringing off the hook about 4:30 a.m. with people who wanted subscriptions and information on advertising and all sorts of stuff like that.

Jacqueline, my wife, planned to work for the magazine part time as staff photographer. Well, she ran herd on the entire subscription department, supervised the proofreading, provided traffic management between editorial, art and suppliers including the typesetter and printer, and still did the pictures and even a little word processing as well as a zillion other things.

My side-kick and good ole buddy Jim Edlin, who's been around personal computing a long time, just like me, decided he'd like to pitch in. Jim wound up sharing the spare bedroom/office with me where he acted in tandem as associate publisher and editor and somehow found time to write copy.

PC's other associate publisher, Cheryl Woodard, who used to round up buyers for Osborne/McGraw-Hill books, was situated in the dining room where she single-handedly organized and operated the sales and marketing effort of *PC*.

Between startup in October and the printing of the Charter Issue in January, some 34 folks worked at one time or another in our large, but not *that* large, house.

We didn't just work at putting out *PC* magazine, we *lived PC* magaine.

Now early one morning last December—which seems like about six years ago—I came down the stairs in my bathrobe to fetch a cup of coffee and perhaps even fix me up some toast before the phone started up. I looked at the dining room table piled up with stacks of paper, typewriters, and other office gear. I looked at the kitchen table, which was also piled high with stacks of paper, typewriters, etc. There were boxes and boxes of brochures near the door. There was a makeshift table in the parlour with an IBM Personal Computer on it, and beside that was a dual 8-inch disk drive (which never was connected to anything, anyway).

"What is this?" I hollered.

Some few hours later when folks were running up and down the stairs to answer one of the three phones in the office because the two phones in the dining room were being used, the answer came to me. I stopped dead in my tracks and mumbled to no one in particular, "This is Cowboy Publishing."

Well, now, do you understand? Cowboy Publishing was how we managed to get *PC* out so fast and right pretty, too. You see, we didn't have no time to set up offices, roundup furniture, and do all them things. We was publishing a magazine.

But, as fun as Cowboy Publishing is, the real trick is to only do it once. As soon as that little dogie is down and hog-tied, you go out and find you some office space. You hang up your spurs and start being a real business.

Actually, Cowboy Publishing refers to days gone by. Nowadays, we're just weekend cowboys. Still, we like to sit around the fireplace and spin a yarn or two, and we 'spect before long we'll have some new tales to tell.

ZERO-BASE THINKING / JIM EDLIN

The Monochrome Mistake

One afternoon in January, Carl Warren phoned to chat about Radio Shack's new Model 16 computer, which he had seen introduced.

Among the product features Carl described with approval was the Model 16's "high-resolution" (capable of showing fine detail) display graphics. I immediately interrupted to ask, "Does it also have color?" Carl's equally immediate reply, dripping with "what-a-dumb-question," was, "It's a *business* machine!"

There was no mistaking that Carl's implicit answer was, "No, of course not!". Or that his censure, almost certainly mirroring Radio Shack's attitudes, was based upon the assumption that business computers were designed for serious use and therefore (obviously) need have no truck with fancy fripperies such as color display.

The attitude is commonplace. When computer manufacturer Adam Osborne spoke about his then-new Osborne I at a convention, someone in the audience asked him why he hadn't provided for color in his machine. His answer: "If you want to play games, get an Atari."

Such views, so confidently expressed, cause me to imagine movie bigwigs a few decades ago blustering among themselves, "Well that color stuff is alright for the cartoons, but it just wouldn't be appropriate for serious *drama*." That was before they saw *Gone With The Wind*, no doubt. Their spiritual heirs are the computer experts who disdain color in workhorse products.

Why are dismissals of color by other manufacturers relevant to the IBM PC, which does have color capability? They are relevant because, according to reliable sources, few buyers are choosing the PC's color options. The word is that, so far, the bulk of PCs are being equipped for monochrome only.

If true, that is readily understandable. But I think it is also a pure shame.

Several facts encourage the choice of a monochrome display. Though IBM offers a color adapter card, it sells no color equivalent of the monochrome display. IBM's monochrome display is handsomely integrated with the rest of the PC's cabinetry, and it provides appealingly crisp, readable characters on the screen. The choice of monochrome shaves hundreds of dollars, if not a thousand or more, off the price of a complete system. And very little PC software—none of it among the workhorse programs—takes full advantage of the system's color capabilities.

At the end of your rainbow is there a pot of black and white?

The facts favoring a choice of color are less tangible; although they should prove more compelling. At the top of the list: Software which exploits color cleverly will help your computer serve you as a more powerful and efficient tool. Unfortunately, this is hard to appreciate without experiencing how it does so, just as you may once have found it hard to appreciate how a computer, or word processing, or a spreadsheet program, or whatever you now depend on, could contribute to your business efforts.

In a spreadsheet program, color can help you quickly distinguish positive amounts from negative, totals from line items, and so forth. In word processing, color can help marked sections stand out from the rest of your text, can visually separate text from status information, and can do all sorts of similar, useful things.

Whenever information is presented in graph form, color is a major aid to comprehension. In general, programs can be made faster and easier to use if color cues are used to guide you through their options—much as colored lines on the floors or walls of buildings provide visitors with at-a-glance directions.

If you will be paying other people to do much work at the computer, color offers another intangible benefit. Color is friendlier to work with, more stimulating. One's brain is less inclined to go numb when staring at a screen that offers changing color stimulation to the eyes, which ought to translate to a very tangible benefit—the increased productivity of people working at the computer.

If you are buying a PC setup equipped for business, you will probably be spending between four and five thousand dollars on a monochrome version. An upgrade to color would increase your investment by perhaps 20 percent. But, when good color software becomes available, I expect it will quickly help you pay back the extra investment.

There, however, is the rub.

Software developers are flocking to get in on the opportunity created by the IBM Personal Computer. But, if few buyers purchase color systems, few software developers will work at exploiting the PC's color features. IBM's Don Estridge, who directed the development of the PC, says graphics and color features were considered important to provide for because, "We thought the capability you see now in games would ultimately be available in business applications." IBM, however, has left it to you to decide whether you want to include those features in your initial system.

I think that if you settle for monochrome, you are making a big mistake. If you want to see those super-programs that Don Estridge envisioned, you ought to make the investment that will encourage their development. Business or pleasure, once you enjoy the power of good color software, you'll never want to go back.

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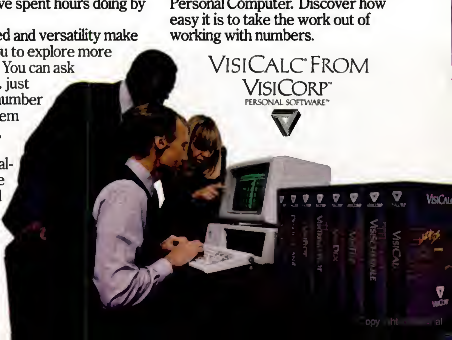


PCOMMUNIQUES

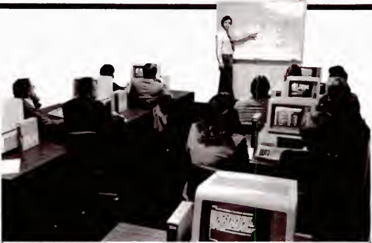
A compendium of facts, news, opinions, gossip, inside intelligence, speculation and forecasts about IBM Personal Computers.

Higher Math

It has been widely reported that the empty component socket in the IBM PC's main circuit board has been provided for eventual installation of the Intel 8087 mathematics "co-processor." Now comes a hint that one other empty socket on the circuit board is also awaiting the 8087's appearance.

The socket in question is the empty one next to the bank of read-only memory chips where PC BASIC and the core of the operating system are stored. An informant tells us that the empty socket is being saved for an enhancement to BASIC that will use the 8087's high speed math. The "floating point" math routines in the new BASIC chip will, it is said, supplant those now used and will increase number-crunching speed dramatically. Our informant claims to have tested an 8087-equipped machine with the enhanced software and says "it runs like a 360," (a large IBM computer of years past). When spreadsheet and other number-intensive programs are rewritten to take advantage of the chip, our 8087 fan says they will run unbelievably faster. As for graphics, the fans says when the CIRCLE statement is used in 8087-enhanced BASIC, "a circle doesn't draw itself around the screen, it's just there."

If the 8087 is so wonderful, how come you can't get it for your PC yet? We're told Intel is not building the chip in production quantities so far. The present versions of the chip apparently find all that arithmetic something of a chore and heat up 'til they are too torrid to touch. Debugged versions will have to run cooler before production quantities will be seen. Meantime, IBM is said to have several PC's running with preliminary releases of the 8087. With the covers off, we presume.



Franchise Adopts PCs

Newest franchised business to hit the microcomputer scene is a hands-on school teaching how to put the little beasts to work—a sort of electronic-age Evelyn Wood course. And the computers they bought for students to lay hands on are—you guessed it—IBM PCs.

The Evelyn of this play is Phoenix entrepreneur Tom Palazzo, and his emporiums are christened CompuGuidance International Computer Training Centers. While Palazzo says the instruction is adaptable to "virtually every popular microcomputer available," it is the PC that his students are going to be getting intimately familiar with. Ten core courses are said to be available from your local CGI, with the dual objectives of helping you determine the best system to buy, then maximizing its effectiveness after purchase. (How coincidental! That's what we think PC is all about too.)

Buggy BASIC

Speaking of the PC's BASIC language, a few bugs have turned up in the initial version—as several informants have taken trouble to advise us. One whisperer also tells us that the BASIC now delivered with PC's is recompiled code done for the 8080 microchip (the data in this issue's "BASIC Benchmarks" article tends to support that) but that a new, faster version using the full

8086/8088 instruction set is on the way. Rumor has it that replacement BASIC memory chips are coming, that they will both fix the bugs and have the faster program code, and that PC owners with the old chips will likely be offered a painless way to switch. (Please don't bug IBM on the strength of this buggy rumor; if it turns out to be true, we'll print a confirmation.)

One bug we found ourselves is that when you list a BASIC program to the COM port (where our serial printer is connected) lines are ended with a carriage return but no line feed. Thus, the program ends up printed all on one indecipherable, very black line! There is a suggested fix for this in our User-to-User pages.

Colorless Clue

Have you wondered how come IBM sells a beautiful monochrome display for the IBM Personal Computer, but offers no equivalent color display to go with color-graphics equipped PCs? According to one rumor that came in over PC's transom, the explanation is that a PC Model 2 is in development that will have a built-in, high resolution color display (an RGB-type monitor, says our rumor-monger).

We're not sure we believe this one. But it seemed like a good opening for our special "Color" issue. And if it does prove true, remember . . . you heard it here first.

Double Headed Disk Drives

Upgrading a PC system to two-sided disk drives should be a simple matter, according to Tom Kornei of Intermedia Systems, a company that makes add-in circuit boards for the PC. Kornei has been poring over the disk controller electronics and says that both the

controller and disk drives have signal lines for "head select." He also says the Tandon drives IBM uses are equipped with "diode switching logic" for using two read/write heads. Besides the extra head itself, Kornei thinks conversion to two-sided disks, which would double storage capacity, would take only minor changes in "head end software." In passing, Kornei also comments, "everything is there for double density."

Buggy DOS?

Then, there is the following bug in PC-DOS reported by an owner in the Pacific Northwest, who chooses to remain anonymous but will still see his name in print—on a $50 check.

At least two versions exist of release 1.00 of PC-DOS. There appears to be a bug in the original version that IBM does not want to say anything about. I was having difficulty using DOS to transmit over the serial interface with a hardware handshake. Even though DOS was responding to the signal (on the CTS or DSR pin), it was losing characters. The technician at ComputerLand did not know what to do, but one day he mysteriously received in the mail a disk labeled "Serial Printer" with no accompanying

PCOMMUNIQUES

documentation. We tried it and it fixed the problem. There is no new version number for this DOS; it is also labeled "Version 1.00."

Here is a way to test to see which version you have: set the CTS pin in the serial interface to "off" (hold it between -3 and -15 volts). Then use COPY to send a file out the serial port (e.g., "COPY TEST AUX:"). With the first version, the message "Aux I/O error" continually appears, about once a second, until COPY gives the usual message that a file has been sent, which of course has not happened. (Every time "Aux I/O error" appears, COPY thinks that a character has been sent.) With the new version, after entry of the COPY command, nothing happens. (DOS is waiting for the CTS line to change state.) You can get out of the routine by hitting Control-Break, at which time the message "Aux I/O error" appears once. There is still a problem with the DSR signal, even with the new DOS. When DSR is "off," characters are again lost at a rate of about one per second, but the error message does not appear. Let's look for a third version of "Version 1.00" that will fix this!

Economy Route to Second Disk Drive

If you have do-it-yourself inclinations, here's a suggestion on how to save up to $300 on adding a second disk drive to your PC.

The Tandon TM100-1 disk drive is very similar to the standard diskette drives used in the IBM Personal Computer. In fact, it's indistinguishable. I am tempted to suggest that it's exactly what IBM uses. IBM charges $570 for the drive. Tandon sells to distributors who are free to charge whatever they want, but recent advertised prices range from $225 to $310. I bought one by mail-order and one week later I had the drive, carefully packed in popcorn and solid foam. The label on the right rear of mine read: 661-3-R150 122F.

—Jonathan Seder
ProActive Systems
Palo Alto, California

ASCII Me No Questions . . .

Since you ASCII'd anyway, those five letters are an acronym for the American Standard Code for Information Interchange. ASCII is a standard that tells computers how to get from the numeric codes it understands to the letters, numbers and punctuation you understand. As it happens, ASCII is not the standard which IBM computers have traditionally used; IBM went instead with a standard of its own, unpronounceably acronymed EBCDIC.

These codes are a little like religions: if you were born into IBM's family you went to the EBCDIC church, while personal computers universally learned ASCII's catechism.

But the PC, a schismatic from IBM tradition in so many respects, was baptized an ASCII machine—or so it seemed. Now, someone has been trying to tell our communications editor, Cliff Barney, that the PC is really a closet EBCDICer. The significance is that PCs, if they do in fact have EBCDIC in their soul, could communicate more easily with bigger IBM brethren. Cliff's source says the PC operates with ASCII only because a circuit inside it is doing constant translation, and if switched off the machine's true EBCDIC colors would immediately be revealed.

We're not sure it matters, except to fanatics of the faiths. Any machine as smart as the PC could pray in ASCII and EBCDIC simultaneously and never miss a beat.

PC Goes Latin

We had never considered having a "Travel" department in PC. But if we get any more reports like the following, we'll have to start thinking about it.

Against the advice of my computer salespeople in New York, I took my newly-purchased IBM Personal Computer to the province of Tucumán, in the northwestern part of Argentina. The place I went to was 3,000 feet above sea level, 95 percent humidity, 95 degrees in the shade (it was summer there). The electricity was 50 Hz, 220 volts, and subject to frequent "brownouts." But with a simple 220-to-110 volt transformer, "Leticia" (as the IBM Personal Computer is lovingly called there) was working the first day I arrived—Dec. 14, 1981. At the time I left the country to return to New York, my friend and I were programming and displaying optical systems. A program to calculate the lens in the Schmidt camera, which we did just for fun, appeared in the January issue of a professional optical magazine. I left the computer there, and I am told it is still working without problems.

José A. Valcinkas, PhD
New York City

Software Author Sounds Off

PC was on the "cc:" list when an angry software author fired off a blistering reply to some letters from IBM's external program submissions department. The exchange began when the author inquired about submitting programs for publication by IBM. In return, an informational packet arrived, but the author chose not to respond. A few months later, the author was included in a survey mailing inviting reaction to the first packet. This time, the author responded. Some choice excerpts . . .

I am taking the time to respond because, in your own inimitable IBM manner, you seem to be concerned about communications and comments from microcomputer program authors.

In October, 1981, I received an unsigned letter over your name, and 13 pages of extremely formidable legal prose. As an attorney and Certified Public Accountant I can appreciate your company's need to protect itself against the rest of the real world, but as a program author I decided that I didn't need the obviously legalistic and impersonal (witness the unsigned and undated transmittal letter) approach that IBM had decided to take with its potential authors. For this reason your letter was filed in a folder labeled "IBM JOKE" for future reference.

Today I received an offset follow-up letter that didn't even include your name, although it did have a date and your title . . . if you really want to communicate with software authors and even begin to plumb the depths of talent that is out here you have got to look down from your lofty *Fortune* 5 position and make some attempt at PERSONAL communication. In case you hadn't noticed, the name of the product is the IBM PERSONAL Computer (even though I'm sure that you refer to it internally as the Model 5150).

I will now answer the questions listed in your questionnaire: (1) Yes, I own two IBM Personal Computers (in addition to seven other microcomputers). (2) Yes, I have published programs. The current count is 14, with 5 more to be released in the next 3 months. (3) No, I do not plan to submit a program to IBM. There are two basic reasons why. First, this letter should have made its point that I am not interested (nor or most other bright software authors) in dealing with forms, unsigned letters, and generally with the impersonality that IBM continues to exhibit. Second, and probably more important—what's in it for me? What can IBM do that I can't do more effectively and less expensively by myself . . . ?

I have spent the better part of an hour writing this letter, and I hope and pray that it has not been wasted. I have spent this time because I truly believe that you have a superb product and that if you would spend a little bit of time and effort in "cleaning up your act" you could be as successful in the micro field as you have been in mainframes.

"Graphics will become as critical to the workstation of tomorrow as the keyboard is today."

—Microsoft's Bill Gates, at a seminar for software authors planning to write for the IBM PC.—MARCH 8, 1982

CLUB NEWS

IPCO INFO

IPCO stands for IBM Personal Computer Owners Group. It was formed in Pittsburgh, Pennsylvania by two engineers and their wives—Jim and Cindy Cookinham and Steve and Windy Hart. The stated purpose of the group is "to represent the owners and users of the IBM PC throughout the world."

IPCO publishes a newsletter called the "IPCO INFO" and is setting up a Software Exchange program. Members of IPCO who contribute a program to the IPCO library will receive four free programs of their choice (all on diskette).

Membership in IPCO is $15 a year for residents of the United States and $20 for Canadians. Prices for residents of other countries have not yet been established.

For more information, write to: IPCO, Inc., P.O. Box 10426, Pittsburgh, Pennsylvania 15234.

Hot Flash From Indianapolis

PC Editor-in-Chief David Bunnell found this message on his desk: "EXTRA! EXTRA! IBM PC Users Group formed in Indianapolis. Call David Reed at (317)259-7892. Plans call for a newsletter and monthly meetings."

It's SW-PCUG in Dallas-Fort Worth

The name of the Dallas-Fort Worth IBM PC Users Group is SW-PCUG. Membership is $30 a year and it includes a newsletter, monthly meetings, demonstrations, and assistance

with software and hardware problems. Also the group plans to distribute public domain software. Contact: Samual P. Cook, 309 Lincolnshire, Irving, Texas 75061, (214) 253-6979.

Hawaii Users Group

The first meeting of the Hawaii IBM PC Users Group was held February 16 in Honolulu. Membership in the

group is $2. For more information, write: Doug Long, 1750 Kalakaua, Suite 3-168, Honolulu, Hawaii 96826.

PCommuniques Pays

Are you in possession of information you think should appear in *PCommuniques*? *PC* pays up to $50 for each contribution published in this section. Submissions must be signed, but anonymity will be preserved upon request. All submissions become the property of *PC* and are subject to editing. For payment, you must include an address and phone number. Write to "PCommuniques," 1528 Irving Street, San Francisco, California 94122.

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Boca Diary

by David Bunnell

It's the week before Christmas. The charter issue of PC Magazine is in a mad flurry of typesetting, proofreading, & production. It is in a state which I call "flying upside down".

Illustration: Michael Sterkman
Art Direction: Tia

Thursday, December 17, 1981—

It's the week before Christmas, and the charter issue of *PC* magazine has reached that frenzied stage of production which I call "flying upside down."

However, two lucky *PC* staffers, the publisher and the photographer, have won a reprieve: we are flying—right-side-up—to Boca Raton, Florida, a resort area north of Miami. Many of the passengers seated around us are wearing palm tree prints and oversized, frivolous hats; it's easy to see that they're on their way to a vacation or a holiday reunion. However, we have a much more serious purpose in mind: we are on assignment to visit the birthplace of what could turn out to be the most dynamic electronic product of the decade the IBM Personal Computer.

Actually, I find this turn of events somewhat strange, although certainly in keeping with the gyrations of the personal computing business. Last August, when IBM announced the Personal Computer, I was sitting in my office at Osborne/McGraw-Hill, in Berkeley, California, staring out the window at people wind-surfing in the neighboring recreational pond. I was thinking about how much I liked being a book editor and how I might stick it out for a few years.

To tell the truth, the announcement didn't exactly cause me to jump out of my chair with excitement. "IBM, ho-hum," I thought. "Just another computer company jumping into the personal computer market."

What finally awakened my curiosity, however, was the attention the IBM Personal Computer was getting in the press and the impact it had on the people around me. None of my associates wanted to talk about the Apple III or the Osborne I computer anymore, nor did they want to fantasize about writing the next super-selling program. They didn't even care about the movies.

All they wanted to talk about was the IBM Personal Computer—what it was, its potential and limitations, and, most of all, the impact IBM would have on the business of personal computing. Would the major shareholders of Apple quickly sell their stock and retire to Hawaii? Would Tandy go back into the leather business? Did Commodore even know yet? Those were the burning questions of the day.

Friday, December 18, 1981—

I am blown away. What to me is a hurricane, but to Floridians would be a mere wind storm, is shaking the walls and windows of my ocean-front motel room far more fiercely than a California earthquake. Also, the phones are out, but that's not what I'm talking about.

What I am talking about is our visit to the IBM Personal Computing division, which has turned out to be a major event and one which I am very pleased and somewhat surprised about.

First of all, the place itself is a standard gray IBM building situated in a rural setting just off the freeway on the inland side of Boca Raton. We were there from nine in the morning to around six in the evening, during which time I talked with many of the top people involved in the design, production, and marketing of the IBM personal computer. We also got a fascinating tour of both the "old" IBM factory (where the PC is currently manufactured) and the newly built IBM PC factory, which, by all appearances, will be in operation within a few months.

Our guide and hostess for the day was Jeanette Maher, the Senior Information Representative for the Personal Computer division. Jeanette is a very competent professional who knows how to conduct business in a friendly manner. In fact, all the IBMers I met that day seemed to be cut from the same cloth: entirely professional but neither stuffy nor arrogant. Also, I noticed that they really care about excellence, taking pride in both their individual and the company's accomplishments.

Jeanette and her associate, Hal Jennings, Marketing Support Representative (no relation to "HAL"), greeted us in the reception area and led us to the nearby Personal Computer demonstration room. There we spent the morning in meetings with the key members of the development team that made the IBM Personal Computer. (In between these visits, we played with the new IBM math games, including *Beano* and *Rockets*.)

Our first two visitors were Bill Sydnes, Engineering Manager, Entry Systems Business, and David Bradley, Manager of Entry Systems Business Architecture. I asked them about the open-bus structure of the Personal Computer and how they felt about third-party companies selling such things as IBM PC-compatible memory boards. Sydnes told me that the PC was definitely "designed to be open." He and Bradley were very interested in hearing about these products and they were fascinated that so many were already available.

They were particularly intrigued by Tecmar, the Cleveland engineering company which, at that time, had already developed more than 20 options, including a PC expansion box. I confess that I was taken aback by this. Although I came to Boca with few preconceived notions, I was surprised to learn that IBM would welcome competition.

Then Sydnes said something which I found stunning: "The definition of a personal computer *is* third-party hardware and software."

I told him that I appreciated the open-bus design but questioned there being only five slots for plug-in boards. He said that it was a "design trade-off" having to do with the size of the power supply in relation to its capacity.

Sydnes pointed out that the IBM Personal Computer has the capacity to emulate the IBM 32/70 mainframe, and thus he expects the IBM Personal Computer to find its way into many major corporations where it will be used both as a stand-alone unit and as an intelligent terminal hooked to the 32/70.

Obviously proud of the PC achievement, Sydnes said that the PC has been designed for maximum flexibility and that it could easily be interfaced to any kind of printer or display. (Some PC users might dispute the word "easily.")

Following my conversations with Sydnes and Bradley—whose most memorable quote was that he was "not at all surprised" by the success the IBM PC is having—I met with Senior Programmer Mel Hallerman and Dave Stuerwald, Manager, Entry Systems Business, Programming and Publications. These two gentlemen threw some light on the operating system question. I asked them which of the three operating systems—DOS, CP/M-86, or p-System—would be used the most. Without the slightest hesitation, Stuerwald replied that the "great majority of users will use DOS" because they will want to take advantage of its "native interpreter," Microsoft BASIC.

"If code is written in Microsoft BASIC, then it doesn't matter what the CPU is," Stuerwald further explained.

Hallerman added that while all three operating systems "have value for us" and that there will be "a nice market for all of them," the "overwhelming majority will be DOS-based."

Next, I met with the man who actually designed the IBM Personal Computer: David O'Connor, Manager of Systems Architecture.

Mr. O'Connor, who is an extremely bright and articulate fellow, seemed proudest of the "human interface" aspects of his design, such as the fact that open manuals can rest on the keyboard and that it fits into office furniture (the main unit can be installed in a drawer, which explains why the keyboard cord is plugged in at the back).

I asked him when they started the Personal Computer project and he said that it was in July, 1980.

He volunteered that there was an "unbelievable level of enthusiasm" during the time of the project and that indeed, there were lots of days when "I had to tell people to go home."

The design of the IBM PC is a "conservative design" and O'Connor freely admitted that when designing physical packaging, there are always "compromises" to be made.

I asked O'Connor why IBM chose to use a 16-bit microprocessor rather than a standard 8-bit machine. His answer to this question was that there isn't anything very challenging about 8-bit machines. "Can you find anything they haven't tried?" he asked. "On the other hand, 16-bit machines have the potential for far more commercial and design applications."

O'Connor believes that color graphics will rapidly become important in business applications. He is hoping someone will design a color-card adapter with an attachment for a light pen so that users could paint or draw color directly on the screen.

"If color is so important," I asked him, "how come it wasn't included as a standard option? Why does it require a separate interface board?"

O'Connor's answer was that it was done separately so that the PC can have two monitors operating in tandem. The color monitor would be used for graphics while the monochrome display would be used for menus.

Before departing for his busy office, he pointedly took time to express his belief in the importance of third-party software authors' employing a keyboard usage consistent with that in other programs. I assured him that I would make our readers aware of his concern, and that *PC* also believes in maintaining keyboard standards.

Following the meeting with O'Connor, we left the gray building to have lunch with Jeanette at a nearby restaurant, where I learned that she had been an IBMer for 12 years and that she had a wealth of experience in the public relations field. Jeanette moved from New York to Boca Raton for the Personal Computing Project, and we discussed the drastic change in environment that this had brought about.

Upon returning, I had a fascinating interview with Philip D. (Don) Estridge, Division Director, Entry Systems Business Unit, who is in charge of the entire project and who presently heads the Personal Computer division. Estridge, who is a lanky, imposing figure, seemed as though he had a thousand things on his mind, which I am sure he did. Still, he projected a take-charge attitude and quickly warmed to my questions. In fact, he was ready with his answers much faster than I was with my questions. I found him such an interesting person that the minute I returned to the motel, I had to play the tape and transcribe the highlights of our conversation, which follow:

Estridge

PC (that's me!): Why did IBM enter the personal computing market?

Estridge: The simplest reason is that it represents an opportunity for business. With the explosion that occurred between 1977 and 1979, it became enough of a business to be interesting.

The second reason is a little more difficult to pin down. We believed we could build a machine that would be something special—so special that people who hadn't used IBM equipment before would use it. Also, our own employees would have access to a personal computer; it would give an outlet to the programming creativity that was inherent in the IBM population.

Building lots of PCs

PC: Why did you decide to go with third-party software?

Estridge: We believed that a very wide array of software would be one of the key factors in the widespread use of the Personal Computer. There is no way that a single company could produce that much software; even if it were possible, it would take too long. So we needed to have the participation of other software authors and companies.

Another reason was a little more pragmatic: we didn't think we could introduce a product that could out-BASIC Microsoft's BASIC. We would have to out-BASIC Microsoft and out-VisiCalc VisiCorp and out-Peachtree Peachtree—and you just can't do that. They have established good products and it didn't make any sense for us to ignore that. Quite the contrary; we really wanted their participation.

PC: Are you surprised by the response to the IBM PC?

Estridge: We wanted to fit into what we believed was the existing infrastructure of software houses, authors, hardware vendors, and retail distribution channels that had arisen. We were very anxious to get people to understand that we really did want to fit in and that we weren't trying to set rules for others to live by. We are very surprised that this view seems to be getting across well. No, "surprised" is not really the right word; "pleased" is better.

From the standpoint of the success of the machine, the demand for it is very strong. We always thought it would be, and it is every bit as strong as we'd hoped for.

PC: How many machines will you ship in 1982?

Estridge: Lots!

PC: Well, I tried.

(Things may be different at IBM with regards to the Personal Computer project but getting projections of, or information about, future products is impossible. Jeanette scolded me mildly for persisting in asking such questions, but I continued to do so in the hope that something might slip out. It didn't.)

PC: In developing your strategy, did you closely examine Apple's strategy and the reasons for their success?

Estridge: No, we didn't. We didn't look closely at any single product. Instead, we looked closely at what purchasers were doing. We asked these kinds of questions: Why did the customer buy? What machine capabilities were the customers using? Why would people want to buy a personal computer in the future? If you hadn't purchased one yet, what was it you were waiting for?

PC: Nonetheless, many industry analyses conclude that the IBM Personal Computer is a "Super-Apple" because it has high-resolution graphics, music, and other similar features. Also, it seems that IBM's promotional campaign is similar to Apple's, is perhaps following Apple's lead.

Estridge: Well, we certainly would not call it a Super-Apple. We think there are a lot of features in the machine that stand on their own. It has some similarity to other machines but there are significant differences as well.

As far as promotion goes, we wanted to make sure that people knew we had this machine, so we began our advertising effort with the most eye-catching, appealing awareness campaign we could devise. If that makes our promotion look like someone else's, it is an accident.

PC: Some of our subscribers have commented that they wish IBM had provided better word processing, that is, a more advanced package than EasyWriter.

Estridge: We wanted a middle-of-the-road word processor, one that would function relatively well for a private individual and also offer a minimum level of function for a professional. We also wanted one that would be affordable. We knew there were packages that had more functions and were more expensive, and we knew there were packages that had fewer functions and were less expensive. We just made our choice.

PC: Can you share with our readers some more about the project itself and how you were able to put it together in just a little over a year?

Estridge: Gee, it seems like only yesterday. There were a lot of people at IBM—not just in the technical areas, but throughout the company—who wanted IBM to build a personal computer. There was a high level of enthusiasm; if you became a member of the project that enthusiasm carried over into the project. From the beginning, we knew what we wanted to build so we didn't spin our wheels asking, "Is this the thing we really want to do?" I think it has already been shown that we were more on the track than off it. Then we just went to work—and didn't eat or sleep for a year.

I don't remember the exact quote, but someone said that it was "One percent inspiration and 99 percent perspiration."

[Note: It was said by Thomas Edison, who doesn't work for IBM.—Ed.]

PC: Can you share with us any of your fears before IBM made the announcement?

Estridge: Well, you never know for certain how people are going to react to a product, so there is a great deal of uncertainty about its probable success. We received a great deal of support from people in the software community, such as Microsoft and Personal Software, who told us, "You've got a good machine," and our advertising people told us we had a good machine. But, what about the people who were going to express their support in terms of dollars and cents? That part we didn't know.

Also, what if we couldn't build it? The Personal Computer constitutes a lot of product and a lot of volume in a short time. Never before has any division of IBM tried to build so many computers. What if we couldn't do it? What if one of our suppliers ran into a problem that none of us had anticipated? There were any number of unknowns.

PC: Aren't you still facing some of these manufacturing and supply questions?

Estridge: No, the question today is how quickly we can build them, not *IF* we can build them. We are shipping them and the quality is just superb. Our attention has turned to building enough so that there can be off-the-shelf delivery.

PC: Will IBM continue to build the machine in Boca Raton or will there be other locations?

Estridge: Well, we do build at Boca right now. We are always asking ourselves whether we are doing the best job. I would say "forever" and "always" are things that never happen at IBM.

PC: That is a quote you could apply to the whole PC project.

Estridge: We are very quick to change our plans if we find a better way.

PC: Tell us why you called it the Personal Computer.

Estridge: Because that's what it is.

PC: Why doesn't it have a model number?

Estridge: We thought that putting a model number on it would cause confusion about what the machine was for, so we just didn't do it.

PC: But doesn't that create a problem with future machines?

Estridge: It doesn't bother me. Someone asked me what the next IBM personal computer would be called, and I said, "The IBM Personal Computer." I don't know why there should be anything but the name.

PC: Were there alternatives?

Estridge: There are always alternatives.

PC: Can you tell us what some of the other leading candidates were?

Estridge: We never talk about the others.

PC: Are you concerned about software piracy?

Estridge: Our plan is to protect the software in a simple way: by impressing users with the fact that unauthorized copying is illegal. If we were to find it being done flagrantly, we would probably take clear action. It is against the law, and it is stealing our assets. Beyond that, software piracy takes all the fun out of the very reason software authors want to participate, which is to be creative and to have a chance to strike it rich through royalties. It doesn't make sense.

PC: Still, even with copy protection, it is pretty easy to copy a diskette.

Estridge: But it is wrong, and it is disappointing to me to think that there are people who knowingly do it. It is just a form of thievery. I think it is the single greatest threat to the viability of these machines.

PC: Do you think the price of software is a factor?

Estridge: I don't know if you were at the recent Boston Computer Society meeting, but Mike Markkula, from Apple, talked about something that turned out to be somewhat controversial. He said, in effect, "Why don't we forget about having copy protection, let's just don't do it. That way, we'll implement—that is, we'll not copy protect—the code but price everything the same. We could price it on the basis of the cost of manufacturing the diskettes rather than on the basis of the value of the material stored on them." This approach would be similar to that used in the record industry and there is a lot of merit to this idea, but none of the software authors will agree to it.

PC: Maybe when the volume goes up?

Estridge: Only when people stop copying. It has nothing to do with volume. People have to stop copying.

That was an intense interview; following it, I was pretty depleted. However, the highlight of our Boca journey was yet to come.

Next there were brief discussions with Manager, Entry Systems Business, Sales and Service, "Sparky" Sparks, and Staff Communications Specialist Dave McGovern. We talked mostly about the new market directions IBM is taking with the PC. Sparky assured me that IBM will soon be announcing new retail outlets for its Personal Computer, but he was careful not to say when or where—or especially, how many.

Then Jeanette introduced me to Dan Wilkie, a tall, athletic-looking man who is the Manufacturing Manager. He was in a very relaxed, jovial mood. I discovered the reason for this attitude when I shook his hand, as he happily announced that that very day, the IBM PC manufacturing division had reached its production goal for 1981.

Naturally, I asked him what the production goal was and with a smile he declined to tell me. But he assured me, and I later verified with my own eyes, that (as Estridge would say) it was "a lot."

Wilkie had come to take us on a tour of the two manufacturing facilities, both the new plant (recently constructed but not yet in use) and the old, which was in triple-shift production.

Both manufacturing plants are approximately five miles from the division's headquarters. We drove to the sites in three cars, caravan-style. Wilkie lead the way in his Corvette Stingray—not the kind of car I'd expect an IBM executive to drive, but then, the Personal Computing division, I'm finding, is really something quite special and unorthodox, especially for IBM—and I mean that in a totally positive way.

Jeanette followed Wilkie in her car, and we followed Jeanette. It was a good time to collect a few good thoughts and clear some of the old memory locations which, in my mind, are well under 256K.

"This is really exciting," I remember thinking.

Our first stop was at the new plant, a big, long, gray concrete building with lots of windows but otherwise nondescript as far as other manufacturing facilities I have seen.

Touring the factory

Dan Wilkie

Dan Wilkie was waiting for us at the front, and he let us in by slipping a plastic card into a slot on the door. The building was empty and we were the only ones there. From the looks of it, only the finishing touches need be made before they could move into it. They were still setting up portions of the assembly lines, which Wilkie told us would begin with one "fully automated" line and one semi-automated one which will be converted when all the automation bugs are worked out. Dan told us that the interior of this building was 100,000 square feet, including 25,000 for manufacturing (concrete figures at last! I wrote these down feverishly).

Wilkie began our PC tour in a huge parts room where he explained to us that the manufacturing procedure at the Personal Computer plant is a lot like a kit-building process. In other words, it is not done from the ground up—the circuit boards and the keyboards come preassembled from other plants. Here they are packaged together with the IBM chassis, single-disk drive, and 48K memory. All IBM PCs currently begin in this stage, which should tell you something about the number being sold with cassette interfaces to hook to home tv sets.

Next, we walked the length of the automated line, where Wilkie stopped at various key points to explain how IBM Personal Computers are made, tested, and packed in boxes ready for shipping (there are nine full-size loading docks in the back of the building and as he talked, I fantasized one semi-truck after another loading up with PC's).

Interestingly enough, each IBM PC is built by a single worker who, more or less, has his signature on it, since IBM can use the bar codes on the back to identify the worker who assembled the machine.

The first part of the process is the CPU assembly, which involves installing the CPU circuit board along the bottom of the chassis.

Once the units are assembled, they are plugged into a robot tester which does an automatic power test under the watchful eye of an IBM Series 1 computer. Here a keyboard simulation test is performed and the printer interface is tested. Next, the PC is moved by a "pick and place" robot and placed on a huge, metal-frame carousel where up to 750 machines can be "burned in" at one time. This test includes a "high pot" test which should identify any weak components.

Following the burn-in, the machine is removed from the carousel (again, by a robot) and plugged back into the robot test for a second automatic power test. Following this, it is transferred to the end of the line, where yet another robot picks it up and puts it into its shipping box. (This carton is designed to withstand a 36" drop on all sides and corners.)

Following our tour of this fascinating new factory, we went to the old factory. While it lacked the automation features of the new building, it was nonetheless remarkably efficient and productive. As a matter of record, the first part of this building we saw was the large shipping area, where several thousand PCs were in stacks ready for shipment.

Eh gads, I thought, IBM is really serious about making these things.

The biggest treat for us at the old facility was watching IBM technicians as they assembled and tested Personal Computers, doing very much the same assembly procedure that will be done in the new building. Though I have little basis by which to judge, in my view, they appeared to be extremely competent and proficient. Many of them joked with Wilkie as we went down the line and they posed for photographs.

Our IBM day concluded in the parking lot of this manufacturing plant as the sun was setting. It was past six on a Friday evening, and I'm sure Dan and Jeanette were anxious to get home for the weekend. We thanked them on behalf of ourselves and our readers—who will hopefully benefit from this Boca trip at least half as much as we have.

The wind is still shaking my windows. It is 6 a.m. and as I peer out the curtains I am astonished that it is a clear day. The morning sun is rising over the Atlantic. It shines brightly on Boca Raton.

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Jim Strothman

CRANKING UP THE SOFTWARE MACHINE

How IBM is working to bring plenty of PC software to market.

It's called, simply enough, IBM's Personal Computer Software Publishing Department.

And to authors who are seeking fame and fortune by writing programs for use with the IBM Personal Computer, it's an easy way to approach the giant firm. If the software passes IBM's tests, IBM will publish, market and distribute it.

Let the program author beware, however, for he or she has to play by IBM's rules. As of this writing, while the sky's the limit on fame, "fortune" will not exceed $100,000—unless the software author can convince IBM an exception is justified.

The $100,000 limit, written into IBM's standard "Acceptance Agreement," has resulted in complaints from some hopeful authors, who also don't like another term which says, "IBM's obligation to pay royalties to you shall end when four (4) years have elapsed from the date of the general availablitity from IBM of a program product based on the Program," should that occur before the $100,000 limit is reached.

Nevertheless, the stated limitations have not discouraged many hopeful application writers.

Ed J. Marill, manager of application planning for the IBM Personal Computer, who oversees the Software Publishing Department, said his program reviewers "are beginning to have a significant number of submissions."

IBM historically does not disclose volumes or numbers of employees engaged in any specific activity, but Mr. Marill said he was pleased thus far and is seeing "a satisfactory level" of submissions from outside IBM, as well as from IBM employees.

As of this writing, IBM has not announced any programs that were processed via the Personal Computer Software Publishing Department route. Previously announced programs resulted from separately arranged agreements between IBM and software vendors, including Microsoft; Personal Software, Inc.; and Peachtree Software, Inc., to name just three of the main ones.

And because other alternatives exist to IBM's Software Publishing Department, program authors should explore them before signing any agreement with IBM. Even IBM's standard initial agreement—needed simply to give the company permission to review the prospective program—contains a provision that prevents the writer from changing his or her mind later. It states:

"If IBM accepts your program for possible use and marketing, you agree that you will enter into an Aceptance (sic) Agreement with IBM in the form provided herewith." (IBM said it plans to fix the spelling of "aceptance" when it prints new forms.)

"...the form provided herewith" is the standard "Acceptance Agreement," discussed previously, with the $100,000 limitation.

IBM has good reasons for getting the writer to commit prior to actual acceptance. If it didn't, and the program author had a change of heart and decided to have it published by another vendor, IBM would be what is known in industry parlance as "contaminated" with knowledge of the program's details. This would make IBM's legal position more difficult were it to introduce a product later with similar function, and, in fact, would give IBM pause about bringing such a product to the marketplace at all.

Let's look at the submission procedure, and some other important considerations would-be writers should keep in mind.

Contacting the Department

Organizationally, the Software Publishing Department is located at IBM's Entry Systems Business (Personal Computer) headquarters near Boca Raton (actually Delray Beach), Florida, reporting to Don Estridge, ESB director. That's where the key people are located who actually review the content of submissions, and experience with personal computers was key when IBM was recruiting internally at the time the department was created.

However, like large mainframes, the Florida unit has a "front end" which aspiring authors must contact first. Those interested in exploring the IBM route should write: IBM Personal Computer Software Submissions, Dept. 765, Armonk, New York 10504. By return mail, authors will receive information packets, including the blank agreements, submission instructions and a list of helpful "things to consider" when writing a program.

While seemingly bureaucratic, IBM again has good reasons for this "front end."

Long before the Personal Computer, in fact for most of IBM's existence, people and other companies have approached it with ideas, including new inventions and programs. The same corporate function experienced in handling past overtures is now also the Personal Computer Software Submissions "front end." Simply stated, its objective is to assure that the

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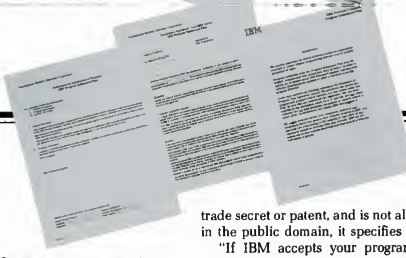

IBM's Agreement: An Overview

AGREEMENT FOR SUBMISSION OF PROGRAM

The agreement contains three parts: (1) General Provisions; (2) Program Description; and (3) Specific Provisions.

The *General Provisions* section is brief and primarily advises authors that their submission should be original, complete and fully operational.

(Ed J. Marill, manager of application planning for the IBM Personal Computer, said he didn't feel that submissions necessarily had to be a completely finished program—but at least in the prototype state, far enough along to show its function, ease of use, prompts and so on.)

Format isn't specified, other than saying the submission "must be entirely in writing." Mr. Marill emphasized that content was the most important consideration.

The *Specific Provisions* section is perhaps the most interesting. In addition to asking the author's assurance that he or she is of legal age and that the program does not infringe on any copyright, trade secret or patent, and is not already in the public domain, it specifies that:

"If IBM accepts your program for possible use and marketing, you agree that you will enter into an Acceptance Agreement with IBM in the form provided herewith."

IBM wants that up-front commitment, Mr. Marill explained, because it wants to avoid any possible problems that might later be caused if a writer should give it to another party after IBM had considerable knowledge of the detail in the program.

The same section also asks the author to agree that "$100,000 shall be the absolute limit of IBM's liability in the event of any controversy arising between you and IBM with respect to this Agreement, the Acceptance Agreement, or your submission and/or its subject matter."

ACCEPTANCE AGREEMENT: NON-IBM AUTHOR

Once IBM has approved a program product submitted by an outside author, a representative of IBM will sign this agreement.

It grants IBM, in effect, the right to market or license it however the company sees fit. In turn, IBM agrees to pay a 15 percent royalty.

However, a provision under the Royalty Section has resulted in complaints. It says:

"IBM's obligation to pay royalties to you shall end when four (4) years have elapsed from the date of the general availability from IBM of a program product based on the Program, or when the total of all royalties paid by IBM to you equals one hundred thousand dollars ($100,000.00), whichever occurs first. No further payments of any kind shall then be due to you.

Mr. Marill said IBM felt the $100,000 limitation seemed "fair and reasonable." He said the company would, however, "be willing to react if it's the right thing to do," meaning that if any author felt that, in his or her instance, this was unfair, IBM would be willing to listen—and possibly change the number.

Elsewhere, the agreement calls for the author to "enforce your rights against infringers of your copyright, to the extent reasonable under the circumstances . . ." While unspecified, it leaves the impression that IBM could be expected to assist if someone infringed on the copyright.

In a section called "Conversion and Maintenance," the author is alerted that, for the first four years of the program's general availability from IBM, he or she will be expected to "use your best efforts" to verify and correct errors "within ten (10) days after each notification."

—Jim Strothman

ideas of the inventor, or program author, aren't mishandled in a way that could later hurt either party.

"Any corporation has a problem when looking at ideas from the outside," acknowledges Mr. Marill, "so we must use cautious language in the agreements, for example, which doesn't compromise ideas—especially when similar ideas might be coming from the inside."

The initial "Agreement for Submission of Program" asks for the "minimum information" needed for initial screening, he said.

Mr. Marill said that, once IBM receives a signed "Agreement for Submission," it has a self-imposed goal of deciding in six weeks whether to approve or not approve the proposal. This time could be longer, or shorter, however, depending on the complexity of the review process and the clarity of the submission.

While a submission does not have to be a completely finished program, "it should be at least in the prototype state," he said. "We don't want just ideas—we want some level of implementation that shows its function. We want to be able to demonstrate, for example, that it's friendly, easy to use, that good prompts come up on the screen and so on."

During the review process, the IBM evaluators likely will get a second or third opinion within the department, he said. If the application is a specialized one, such as for real estate or medicine, and expertise is not within the department, a specialist will be found, he assured. With its larger computer line, IBM has developed software expertise in a vast assortment of applications.

While copyright and other legal concerns are covered in the review process, the main effort is put behind the program's content—"Is it worth investing money on?", the department head said.

Mr. Marill and the "Things to Consider" instruction sheet that's provided with the information packet emphasized that programs are desired which are original, unique, useful and "friendly," as well as well designed and supported by adequate publications.

Things Writers Should Consider

The "Things to Consider" sheet says:

"Programs with the best chance of being published will be easy to use, offer a better way to accomplish a task, be entertaining, or will provide something special or unique to the end-user. The emphasis is on quality, wide appeal and uniqueness."

It notes that "of particular interest" is software in the following categories: (1) home/personal finance; (2) education; (3) recreation (games); (4) business/professional; and (5) software development tools.

Mr. Marill emphasized that IBM is "wide open" to program applications in other areas. Of submissions received to date, no particular trends have been noticed, he said, nor have any particular weaknesses or strengths been generally identified.

In the home/personal finance category, IBM is looking for everything from simple data management to sophisticated systems for people with complex financial investments. In education, self-improvement courses are of interest. Entertainment can vary from arcade-type games to sophisticated games, such as chess.

Programs for business and professional users could be of special interest. For while IBM is letting Sears and ComputerLand stores, plus IBM Product Centers, do most of the marketing to individuals, its main marketing effort to large business users will be done through IBM's two big marketing divisions—one focusing on large national accounts and the other on smaller businesses.

The IBM Personal Computer is expected to compete very well in the business marketplace, and this would make it significantly more attractive for would-be authors to develop business applications.

The "Things to Consider" instruction sheet encourages writers to ask such questions as:

• What makes your program special:

• What makes your program unique? A better or faster way to do a job; a method to solve a problem that has not been solved; an easy to understand user guide?

• Does your program take the user into account?

• Are the following used properly, and are they appropriate to the user and your application? Color; Sound; Screen design; Help screens and instructions; Adequate error messages; Consistency; Speed; Publications.

• Does your program let users make mistakes and still go on?

• Is your user guide adequate for us to evaluate your program? For the users to learn about and utilize it easily?

• Does your program do the user's whole job? Does the program design allow for expansion?

Mr. Marill said that, while he expected BASIC to continue to be a popularly used language, the key is to produce a program that's friendly and easy to use. IBM has announced early availability of a PC Macro Assembler by MicroSoft, for developing programs in BASIC, Pascal and FORTRAN; a MicroSoft FORTRAN compiler for writing programs in a version of FORTRAN-77, a popular scientific and engineering language; and program development aids from SofTech Microsystems, Inc., called the USCD p-System (Version IV) with UCSD Pascal and FORTRAN-77.

Once a program submission is approved as an IBM-endorsed product by the Software Publishing Department, it will be promoted and distributed "through the same channels" as current software, Mr. Marill said.

Software for the Personal Computer is available only at the same authorized outlets where hardware is sold. It is not available via mail order, for example.

Jim Strothman is a syndicated columnist whose reports on new technology are distributed by the Register & Tribune Syndicate. Before starting his column, he had been employed by IBM for several years.

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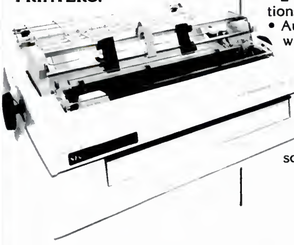

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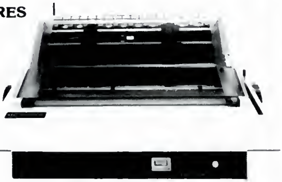

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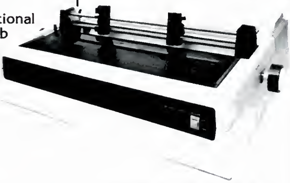

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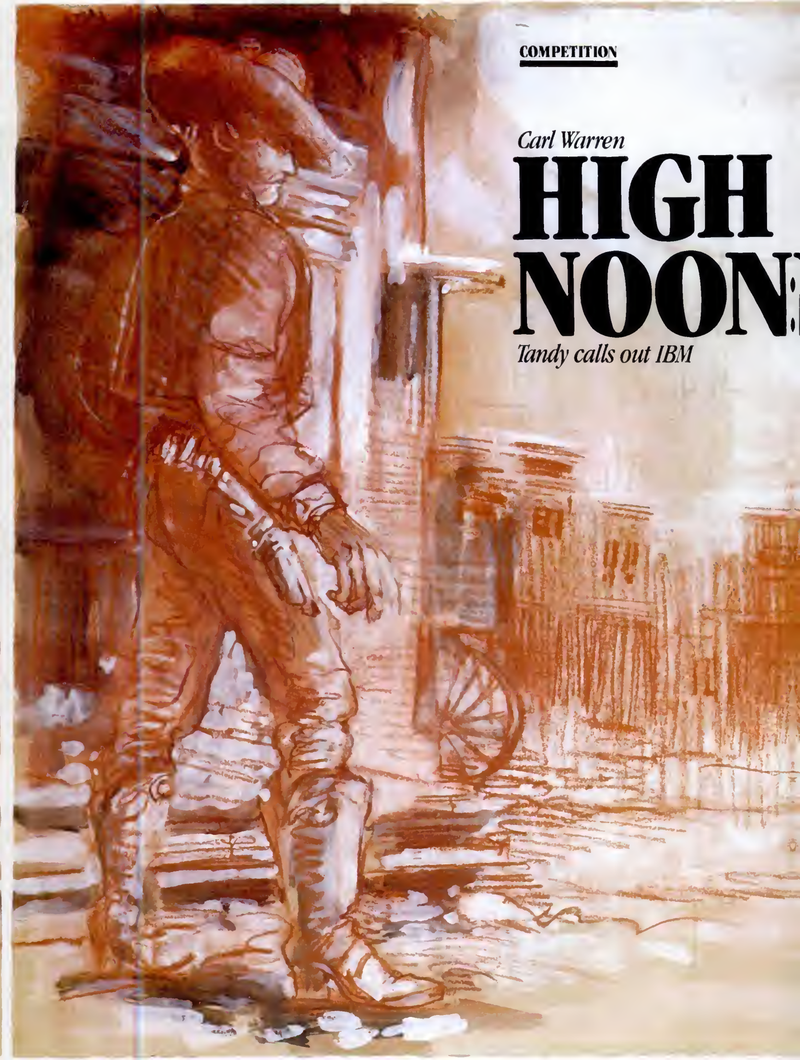
HIGH NOON:

Tandy calls out IBM



In a setting replete with ten gallon hats and bottles of Lone Star beer, Tandy Corporation's Radio Shack division this past January issued a challenge to IBM by introducing a powerful new computer dubbed the "TRS-80 Model 16." At $4,995 for the basic system, the Model 16 is priced in the same range as typical business configurations of the IBM Personal Computer and, by some measures, could be viewed as offering more capacity for the money.

Like the IBM PC, the Model 16 is based on a more advanced microprocessor than those used in Tandy's and other companies' earlier microcomputers. But instead of the Intel 8088 used in IBM's PC, the Fort Worth, Texas, firm chose the more powerful and easier to program Motorola 68000. In addition, the intreped Texans developed a dual-processor design that puts an 8-bit Z-80A microchip in tandem with the 16-bit 68000. When the 16-bit processor is in control, the smaller chip handles input and output operations; but the Z-80A can also serve as the primary processor, enabling the Model 16 to use software already created for Tandy's TRS-80 Model II, upon which the newer machine is patterned.

A basic Model 16 system consists of:

—A single disk drive capable of storing 1.25 million characters (megabytes) of information;

—128 thousand characters of main storage, expandable to 512 thousand characters;

—Connection ports for adding printers, plotters, and telephone communication devices (modems);

—Expansion slots for adding such items as the $499 high-resolution graphics board.

Besides all these enticing attributes, the Model 16 is capable of supporting multiple users and tasks. By connecting two additional terminals to it, the Model 16 can serve as the primary host for three users simultaneously. (Radio Shack introduced an inexpensive terminal at the same time as the Model 16.) Tandy's new computer is also equipped to communicate via the ARCNET local area network system announced last September.

Why Only Two Additional Users

Interestingly, the multiple user feature is among the ones most damned by industry observers. Many feel that two aren't

ation: JenAnne Birkmeyer

enough. But Dr. John D. Patterson, Tandy/Radio Shack's vice president of research and development, counters that adding users tends to degrade the system's performance. Patterson believes it is better to add additional user stations either through the ARCNET, which can support any number of users and peripheral devices, or through another newly-announced product, the Network III. This $599 device is designed to support as many as sixteen users in a round-robin fashion. Its potential significance is great, but it was the least touted of the products introduced.

Although the Model 16 design is capable of supporting extra users and handling several tasks, such as allowing printing of a document while you're working on another job, these powers are not currently available. And some expect they may be a long time in coming. According to Don Williams, publisher and editor of the respected *'68' Micro Journal*, it appears that Radio Shack was premature in their offering.

More Than Just A Big Machine

Williams might be correct in his assessment if Tandy had elected to lump all their efforts into one product, as did IBM. But Tandy has taken the empty-your-six-shooter approach to introducing new items.

Besides the powerful desktop computer system, its add-on graphics system, and the Network III, Radio Shack also unveiled an updated version of its handheld personal computer. This computer, called the TRS-80 PC-2, costs $279.95 and is essentially a TRS-80 Model I that fits in your hand. It can have as much as 18,000 characters of storage and, like the Model 16, it can connect to the ARCNET. It can also be used to communicate remotely to a Model 16.

This total product offering, according to Tandy's president, John Roach, is a way of reaching the small business audience. Roach says Radio Shack now has something for every application and can provide an upgrade path that is both supported and inexpensive. This is something they apparently aren't convinced IBM can do.

But What About IBM?

Of course, IBM hasn't been resting on its laurels either. Already, reports have it that the Personal Computer has sold in excess of 50,000 units, and that an ex-

pected 200,000-plus will be sold by year-end. Sources at Sears and ComputerLand reported that the machine isn't gathering any dust on the shelves, but refused to release any concrete figures on total sales.

Although Tandy introduced a host of products to surround the Model 16, IBM is relying in part on outside sources to add additional value. For example, Tecmar, of Cleveland, Ohio, has already created more than twenty add-on products for IBM's machine. According to Tecmar's vice president of marketing, Dave Wertman, the company currently has no plans to support the Tandy machine. Microsoft Corporation's Consumer Products Division is also gearing up to support the IBM machine with both hardware and software. Microsoft's Vern Raburn says that the company is preparing an add-in memory board, with special software to treat it like a disk storage system. Raburn says this product will speed up the entire operation of IBM's machine, and make it stand toe-to-toe with any available microcomputer.

It appears, though, that the real support factor for the IBM machine will be the software. Reportedly, IBM has already signed contracts with Micropro International Corp. to sell its series of word processing and data handling packages. Neither IBM nor Micropro could be reached for comment, but as this is being written, an announcement is expected within the month.

Even as IBM makes vigorous efforts to develop or buy software for the machine, other companies—such as New York City-based Lifeboat Associates, and the Oakland, California firm, G&G Engineering—are already beating them to the punch. Lifeboat, for example, is readying a number of its popular packages including *TMaker*, an electronic spread sheet. According to Lifeboat's vice president of software development, Harris Landgarten, the company also has a product that will permit the use of any software written for Digital Research's CP/M-86 operating system to be used instead with the IBM's PC-DOS.

G&G Engineering's approach is different. Rather than providing products directly for the IBM machine, they are marketing tools that permit software designers to use other, more powerful systems, based on the popular S-100 bus, to create software for the PC. Furthermore, they have developed a software link—a reverse of Lifeboat's mentioned above—that permits any package written to run under PC-DOS to work with CP/M-86.

Software Lagging For The Model 16

Tandy officials, with surprising candor, are quick to admit the paucity of software for the 68000 microprocessor. They assert, however, that a single user operating system and the COBOL language will be available when volume delivery of the Model 16 begins. By the same time, Radio Shack plans to have converted for the machine a number of existing COBOL applications packages including accounts receivable and payable, general ledger, and payroll.

Unlike IBM, Tandy has elected to do its own development of the multi-user, multi-tasking operating system which the Model 16 needs to fulfill its potential. Many observers in the industry foresee a long upward path for Tandy before it has a viable system, and believe the company's choice is a mistake. Meanwhile, other companies do offer multi-tasking operating systems that might fill the breach. The MSP system, from Hemenway Corp., Boston, Massachusetts, supports multiple tasks and, according to chairman Jack Hemenway, can handle multiple users simply by adding the necessary software modules, a task Hemenway's firm is currently engaged in.

Users Don't Really Care

With all the hoopla surrounding both machines and all the learned prose from the so-called informed consultants, there is a fact escaping many who write about and analyze such microcomputer products—namely, most users don't really care whether or not the machine uses an Intel or Motorola part, or whether or not it crunches numbers as quickly as a multi-buck mini- or a mega-buck maxicomputer. There are, however, a few analysts who see the case from a user's standpoint.

Grant Bushee, a vice president of Cupertino, California-based Dataquest, hit the nail on the head when he described this latest round of high-performance micros as an emotional reaction rather than a solid technical decision. He believes it is hard to define what the right technical level is and that IBM forced the issue by using a 16-bit microprocessor when a standard 8-bit part would have served the purpose.

Bushee and other pundits agree that what is really required is for vendors to offer a large library of user-ware, rather than a raft of development-ware. Typically, users are asking for software items such as spreadsheet calculators, database managers, software interfaces that remove the operator from the operating system, the ability to handle several tasks concurrently, and packages in general that operate in an interactive manner.

While both the PC and the Model 16 are capable of running such software effectively, at bottom they are not really comparable machines. The PC is designed for single-user, single-task operations, or to work tied into a business' main computer. Moreover, the PC software philosophy appears to embrace the practice of using products that have already gained acceptance on other computers, such as Micropro's *WordStar.*

TRS-80 Model 16.

On the other hand, the TRS-80 Model 16 appears geared to multi-user, multi-task applications. Tandy's approach is more toward developing unique-to-its-machine software that meets demonstrated needs rather than the expectations of software designers.

Depending upon your specific application, either machine is adequate. This is a factor that is very important in today's system world, asserts Epson America's director of market planning, Chris Rutkowski. Referring to his firm's MX-80 dot matrix printer (supplied with the IBM PC), he comments, "This printer is adequate for the intended job. We never planned it to solve all printing problems, or to work with a big mini. What we developed is a printer that meets the expectations of small systems users. And that's exactly what's required of a microcomputer system." Rutkowski thinks it's foolhardy for system designers to try to be all things to all people. Moreover, he isn't convinced that current system suppliers really know what the intended users want or expect.

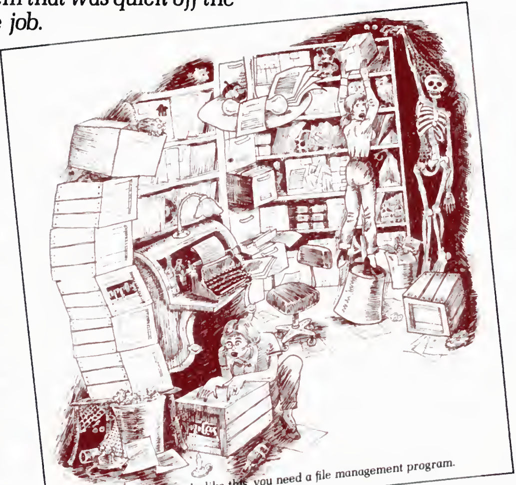
Rutkowski isn't alone in his opinions. Los Alamitos-based computer consultant Nancy McMullen has found that, more than anything else, users want a machine that works all the time every time and doesn't take a Ph.D. to learn how to use. In addition, she has found that users want some form of hand holding to get them used to the machine. And guess what? Tandy designers agree. They have found that users want as much help as they can get either from documentation or computer-aided instruction on how to use the machine. As a result, they are already offering such instruction with current machines and plan to extend the technique to the Model 16, as they release more software products.

The Barrels Are Smoking

As the two giants eye each other from opposite ends of Main Street, sunlight glints off the barrels of their six shooters. Each has fired a salvo but no wounds are yet evident. In the meantime, just beyond the horizon, another challenger is riding towards town . . .

Testing T.I.M.

A file management system that was quick off the mark, but slower on the job.



If your office looks like this, you need a file management program.

The gold rush is on. Everyone wants to develop and market software for the IBM PC, and many companies that have been selling software on earlier personal computers are hurriedly converting their programs. T.I.M., which stands for Total Information Management, claims to be the first file management program available for the PC.

T.I.M. came out quickly because it is written in Microsoft BASIC and has been available for some time on other personal computers that, like the PC, use Microsoft BASIC. It is a file management system, which means that it can be used to create and maintain many different types of data files. It might be used with a personnel file, a file of real estate listings, a file of subscribers to a publication or a file of books or phonograph records you own. In other words, a file management system is intended to help you keep track of any data you might be interested in; it is not restricted to a specific application. (If you are unfamiliar with the idea of a file management system and such terms as *file*, *record*, *field*, *keys* and *index*, see the introduction accompanying this article.)

First Impressions

In looking at T.I.M. or any other package, I give myself one hour to read over the manual, and then try the program out. This enables me to form a first impression and to get a feel for how difficult it is to learn the program. In that first hour I learned a T.I.M. file may contain as many as 32,767 records, if you have the disk capacity, and that each record can have as many as 40 fields which each may be up to 60 characters long. All of the records in a given file must fit into the same format. It is possible to create files, to maintain them, to look through them and to generate reports based upon the information stored in them. It seemed as if using T.I.M. would be easy because the manual is clearly written and well organized; however, the manual was disconcerting in one respect. It contains a number of references to earlier versions of T.I.M. for other computers, which seemed very careless and made me wonder if T.I.M.'s authors hadn't gone too fast in trying to be first on the market.

Having read the manual, it was time to try T.I.M. out. It comes on three disks, each of which contains different parts of the program. The fact that the program resides on three disks is bad news, since it means that the operator must often swap disks when a new function is needed. You also get a disk containing four sample data files that are used in the manual's tutorial examples. A beginner could learn nearly everything there is to know about T.I.M. by using these files in conjunction with careful study of these examples.

When T.I.M. is loaded, it displays a main menu which is used to move to other menus. The menus are nearly self-explanatory and "help screens" are only a keystroke away. I began by creating a file of checking account data (described in the article *Files, Fields, Records, etc.*). This task involves specifying the name, size, and type of each of the fields in the records. It is a tribute to T.I.M.'s clear menus that doing so for the check file took less than ten minutes and I only had to refer to the manual once. I would expect that anyone with a little programming and data processing background would be able to do the same as easily. Defining a file in this manner creates a directory entry which contains the field specifications for future use, but doesn't enter any data into the file. The next step was to add some records.

This proved to be as easy as creating the file had been. Once you select the "add record" command from the menu, the system displays a "form" on the screen, which shows each of the field names and their lengths. You can move the cursor to various parts of the form and key in values. There are several time-saving data entry features; for instance, a single keystroke will insert the current date into a field, or duplicate the entry that was used in the previous record. When values are entered, the system automatically does some error checking, e.g., it won't let you put letters in a numeric field; however, other desirable types of error checking, such as limits on numeric values, are not provided for.

Problems and Irritations

While I generally found the system easy to use during this first encounter, problems did turn up. In their hurry to be first on the market, the authors of the program went light on error checking. When I do something wrong, I want the computer to explain the problem and then give me a second chance. T.I.M. usually does just that, but all too often it just stops execution and returns to BASIC's command level. When this happens, you must take the time to restart the system and you may have lost work. Microsoft BASIC makes it possible for the programmer to intercept any error a user or the system may make, and this sort of blind return to the system should never occur. Another irritation is that, in an attempt to save the operator a few keystrokes, T.I.M. does not wait for you to hit the "enter" key after you type something which it knows will only be one character long, for example, a menu selection. This sounds good, but what happens in practice is that you often hit the enter key anyhow, which generally signals some further action choice. This is good intention, but bad design, especially with untrained operators.

Speaking of untrained operators, I showed one how to use T.I.M., and within an hour, she was able to add records, search for records and update (alter) records in the check file. While the two problems mentioned in the previous paragraph bothered her, this still seemed a reasonable learning time.

Overall, the first impression is that T.I.M. is easy to learn and to use. Part of that simplicity is achieved by cutting down on options which you might like to have, but much is due to good design and documentation. On the other hand, careless re-writing of an earlier manual and failing to account for many operator errors evidences a blind rush to get the product on the market. Finally, compared to file management systems on other personal computers, T.I.M. seemed slow because it is written in Microsoft BASIC.

Further Exploration

Several experiments were tried in order to get some data on T.I.M.'s speed and storage requirements. The results are summarized in Tables 1 and 2. Files containing 12, 100, and 500 records were generated using a test program. The records in these files contained a four digit numeric field in addition to the fields of the check accounting file. This extra field, which contained a random number from 0 to 9999, was used for time sorting and record retrieval. Each of these files was the only one on its disk. Two drives were used in all of the tests, one for the program and the other for the data file. In tests involving two data files, such as copying the records from one file to another for backup, each file was on a different drive in order to speed things up as much as possible. Although it didn't seem to make much difference, the maximum T.I.M. buffer size of 2,400 characters (bytes) was used for each test. Times shown in Table 1 don't include time spent in swapping disks and setting up the various operations. For example, the time for sorting a key does not include choosing the sort option from the menus or specifying the sort keys; it is just the time for the actual sorting.

The times necessary to create the test files are shown in the first line of Table 1. Once the files were created, I made a minor change in their definition. This restructuring is done by creating a second file and then copying the data from the first file into it. Creating the second file, with a change in field size and type, took only a few minutes and went smoothly. Once the new file was created, the old data was copied into it. The copy time for the 12 record file was only 57 seconds, but, as you see in Table 1, restructuring the larger files took much longer.

In addition to restructuring data files, it is possible to change the appearance of the screen forms. Again, only a few minutes were required to design the custom form shown in Figure 3.

I was also curious as to how much disk space a file would occupy. Each T.I.M. file requires a data file on the disk, a directory entry and a file for each key which you define. Table 2 shows the disk requirements for my 12, 100 and 500 record files. The data and index files grow in proportion to the number of records added, but the directory entry does not. The designers of T.I.M. could have made some tradeoffs at this point, for example, encoding the data file or using variable length fields; however, this would have slowed the system down, a price that they were evidently not willing to pay.

File Maintenance and Locating Records

Once a file is created, most of your time will be spent in maintaining it, which means adding records, deleting

Vital Statistics:

Program Name: T.I.M.

Company: Innovative Software
9300 West 110th Street
Overland Park, KS
66210
(913) 888-0154

Price: $500.00

Hardware Requirements:
64K memory
80 column display*
1 disk drive
80 column printer*

Language:
Microsoft BASIC

Operating System: PC DOS

Program Capacities:
32,767 records per file
40 fields per record
60 characters per field
40 index fields per file

Command Structure: menus

User Aids: help screens
function key legends

*Initial version works only with monochrome display and parallel printer adapters.

Files, Fields, Records, etc.—An Introduction

Before getting into a review of T.I.M., we should agree on a few basic terms and concepts having to do with data files. Let's start with the words *file* and *record*. For the time being, forget that we are speaking about computers and ask yourself what these words mean. For example, if you call your auto insurance agent and he says, "Just a minute while I get your record from my file," what is he saying? He probably goes over to a metal filing cabinet where he has the records for all of his customers and takes out a single folder with your record in it. Inside the folder is a form which has all sorts of information like your name, your address, the make and model of your car and how much liability insurance you carry. He is looking at your record, but, if he looked at my folder, he would find the same form filled in with my values. He will refer to the items on the form as *fields*.

The ideas of file, record and field also apply to computer data files. In the same way that the insurance file was made up of many records, a computer file is made up of many records. Let's also assume that each record contains the same categories of information (fields) arranged in the same order, just as each person's insurance record used the same form. As a simple example, consider a file with information on your bank checking account, having one record for each check you write. What information would you like to store on your checks; in other words, what would be the fields in the check records? The check number, date, name of the recipient, amount of the check come immediately to mind. You might also like to store a remark to remind you of the purpose of the check, and a code to separate the business checks from the personal ones.

Figure 1 lists the names of these fields along with their sizes and the type of information which can be stored in each. For example, the amount field is 10 characters wide and can hold a dollar figure, while the business/personal code field is only one character wide. The remark field is fifty characters wide and the type, alphanumeric, means that any alphabetic, numeric or special punctuation character is okay. Field names, sizes and types are some of the information which must be provided to a file management system whenever a new file is created.

Field name	Length	Type
Check number	5	sequential number
Date	8	date
Recipient	25	alphanumeric
Amount	10	dollar
Bus/pers	1	alphanumeric
Remarks	50	alphanumeric

***Figure 1,** The name, length and type of each of the fields in a check file.*

CHECK NUMBER	DATE	RECIPIENT	AMOUNT	BUS./ PERS.	REMARKS
1	02/12/82	John Press	25.00	P	for books
2	02/12/82	John Press	125.00	P	delivery work
3	02/12/82	Samantha Press	12.50	P	candy
4	01/21/82	Roberto Lastrico	400.00	B	clerical work
5	12/21/81	Roberto Lastrico	325.50	B	typing
6	01/21/82	Joe Press	50.00	P	birthday present
7	01/19/81	Natalia Lastrico	37.45	P	party supplies
8	02/12/82	Carla Lastrico	550.00	B	data management software
9	02/12/82	Carla Lastrico	1250.00	B	printer and adapter
10	02/12/82	Lillian Press	125.00	B	turkey
11	02/12/82	Marcela Ortuzar	417.00	B	auto repair
12	02/12/82	Marcela Ortuzar	31.50	B	spark plugs and hoses

***Figure 2,** A 12 record check file.*

A: 3, 1, 12, 7, 6, 2, 10, 5, 4, 11, 8, 9
B: 8, 9, 7, 4, 5, 6, 1, 2, 10, 3, 11, 12
C: 12, 10, 5, 4, 11, 8, 9, 3, 1, 7, 6, 2

***Figure 3,** Three indices for the file shown in figure 2. The first index (A) orders the file on check amount. The record with the smallest amount ($12.50) is first, etc. The second index alphabetizes the file on recipient's name (last name first). The third index sorts the file on two fields, one within the other. Can you see which ones?*

Figure 2 completes this example by listing 12 records which might be found in our check file. Take a look at it to make sure that you understand the ideas of file, record and field, because we will use this data in several tests of T.I.M.'s performance.

We also need to say something about key fields and indices. Glance back at Figure 2. What order are the records in? What order would you like them to be in? At one time you might be interested in searching for or printing out the checks written to a certain person. In that case, it would be nice if they were sorted alphabetically by recipient's name. If, however, you wanted to find the check you wrote on a certain day, you would like them sorted according to date. It is clear that there is no single answer to this question. Can you give a few other examples where still different ordering would be preferred? I have been speaking of "sorting" the records and, while computers can certainly be programmed to physically reorder the records in a file, there is another, often better, way to deal with the need to retrieve records in varying order. This involves building *key* fields and building *indices*.

Figure 3 illustrates these ideas. Let's say, for example, that we wished to be able to retrieve records in order by the amount of the check. We would say that AMOUNT was a *key* field and build an index. The index could be merely a list of record numbers, in order of ascending check amount. Figure 3 illustrates these ideas, but, in order to understand it, you will need to refer back to Figure 2, which lists the tire data file. The first index shown ere sorts the records by check nount. Record number 3 is for the allest amount ($12.50), record num- r 1 is for the next smallest ($25.00), c. The largest check ($1,250.00) is cord number 9, so it is the last entry the index. Figure 3 also shows an dex on the RECIPIENT field, which orts" the file into alphabetical order. e third index shown in Figure 3 is a tle bit trickier. Can you figure out nat it does before reading on?

The third index uses multiple keys sort the file on AMOUNT within JS/PER. What this means is that all the business checks will be sorted to one group and all of the personal ecks into a second and that within ese two groups, the records will be dered by AMOUNT. Note that in gure 3 the business checks all pre- de the personal checks. Why didn't e personal checks precede the busi- ess checks? Because the code for isiness, "B", precedes the code for rsonal, "P", in the alphabet. In this ample, we would refer to BUS/PER the *major* field and AMOUNT as e *minor* field. Note that there is othing to stop us from building a key hich orders the file on more that two elds, for instance, it might be useful report your checks by AMOUNT ithin RECIPIENT within BUS/PER. an you think of other keys which ight be useful.?

Finally, you may have heard of *atabase* or *data management* systems, d be wondering if they are the same file management systems such as I.M. While there are no universally cepted definitions of these terms, I ould distinguish a file manager as eing more limited than the others. A e manager, as I use the term, is de- gned to work on one file at a time ther than an entire database which ight be made up of many files, all of hich are related to each other. Al- ough T.I.M. is able to generate a cer- in type of report using two files, it is ot designed to handle multi-file data ises; each T.I.M. file is treated inde- endently.

—Larry Press

them and changing or updating them. Adding records is quite simple, as stated above. A form is displayed on the screen and you "fill it in." Filling in and editing this screen form is accomplished using the commands shown in Figure 4. The function keys on the left of the keyboard are used instead of the cursor control, insert and delete keys on the right. This is a little confusing; however, it enables you to use the cursor control keys as a numeric keypad. After you add new records, they must be merged into the data file, and, again, you notice how slow T.I.M. is. Table 1 shows the times needed to merge just a single record into a data file.

To delete or update a record, you must first locate it in the file. Figure 5 shows the interactive commands which may be used in finding records in a T.I.M. file.

For instance, if you wanted to find a check that you had written to Roberto Lastrico, you would like to step through the file using the RECIPIENT field as a key. T.I.M. will let you do this, assuming that an index has been created for the key field. T.I.M. is quite flexible in the creation of indices. A file may have up to 40 indices and they can be based upon either simple, single field keys or compound, multiple field keys. For instance, an index might sort the file on AMOUNT within RECIPIENT. This flexibility is quite useful and, like everything else in T.I.M., creating an index is easy but time consuming.

To create an index all you do is specify the key fields, start the sort and get a cup of coffee. Table 1 shows the time to sort the check file on the four digit random number field which was added for this test. The 12 record file required only 19 seconds; however, sort times grew rapidly with file size and 100 records took a minute and 59 seconds. I tried the 100 record sort again using the check number field, which was already in sequence rather than random, but that saved only 6 seconds. The fun really began when I tried a 500 record file. Not only did the time escalate to 22 minutes, but the sort did not work properly!

Once a key is built, it is possible to step through the records as if they were in order by that key, but it takes about 3.2 seconds per step. If we are looking for Roberto Lastrico's check, we don't want to search alphabetically, we want to jump straight to it. Direct (non-sequential) searches can take only one form in T.I.M.: the value you are searching for must ex*actly* match the contents of the key field. In our example the search would be for a record in which the RECIPIENT field contains "Roberto Lastrico." The time to search for a record varies depending upon where it happens to fall in the index, so Table 1 shows a range of times for searches in files of 12, 100, and 500 records. It might not seem like 10 or 15 seconds is long to wait for a search, but I have used file managers on other personal computers that were much faster, requiring more like 2-3 seconds. Because it is written to run under PC BASIC, T.I.M. is slow. Furthermore, few systems would limit you to searches for exact matches on single fields.

Since it is good practice to back up your files periodically, another test measured the time necessary to copy a data file—including its directory and indices—from one disk to another. Table 1 shows the times needed for each file. (Since a T.I.M. data file can have several associated files, like the T.I.M. directory, which must be kept together with it, you must use the copying functions built into T.I.M., rather than DOS, for duplicating T.I.M. files.)

Generating Reports

In addition to looking through data files and maintaining them, a file management system allows you to generate reports about the data in a file. As a report generator, T.I.M. is easy to use, but not very flexible.

Let's say that we want a report which shows the check number, date, recipient's name, amount and indication as to business/personal for each of the checks in our 12 record file. The first step is to define the report format, which takes only a minute or so. It is also easy to try your report out by having it "print" on the screen rather than on paper, and if it is not quite right, it is very simple to edit it. Once the format definition is complete, it can be saved in a library and reused without repeating the definition process.

Figure 6 shows a copy of this report. Part of the reason that defining the format of the report was so easy is that T.I.M. does not give the user much flexibility. For example, it would be nice to use report headings which were not the same as the field names you chose when creating the file, to have two-line headings, to center, left justify or right justify a column of data or to space the columns out. Had

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Error Correction	No	No	Yes	Yes
Capacity Formatted	5 MBytes	5 MBytes	5 or 10 MBytes	10 MBytes
Avg Seek Time	95 ms	125 ms	70 ms	60ms
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T.I.M. provided such options, it would have been possible to produce a report like the one shown in Figure 7. It would have been nice if report definition had been handled in the same manner as screen definition, where the user is allowed to create a special custom design if the pre-designed formats don't satisfy.

T.I.M. wouldn't be the T.I.M. we've grown to know if printing reports weren't a bit slow as well. The report shown in Figure 6 required 45 seconds print time and the one in Figure 8 took 68 seconds. Admittedly, the IBM matrix printer is slow, but even it had to wait for T.I.M. to prepare lines for printing.

Reports can also have control breaks. For example, it is easy to generate a report such as Figure 8, in which business and personal checks are listed separately and subtotals are calculated for each group as well as a grand total. Defining that report took less than a minute, but again, additional features such as more levels of subtotals (T.I.M. allows two) or calculation of averages could have been provided. Finally, although not shown in our check example, it is possible to have fields (report columns) which are calculated from other fields. For instance, in an inventory report, quantity on hand could be multiplied by unit price to create an inventory value field.

What if you wanted a report that showed only checks greater than a given amount, or only business checks? It would be nice if it were possible to directly specify such a sub-file, but it is not. Instead, it is necessary to first create a second file which contains only the records that you wish to include. Then you print the report using that smaller file. This is conceptually simple, and defining the selection criteria for creating the sub-file is, as usual, very easy; however, the process is inefficient since T.I.M. must read through the entire file in selecting the sub-file and then read through the entire sub-file to print the report. As we have already seen, T.I.M. does not posess blazing speed, so going back through the data file takes a lot of time. Table 1 shows the time necessary to select the business checks from our files (about half, selected at random, were business checks).

Conclusion

A general picture begins to emerge from all of this. On the positive side, T.I.M. is easy to use. The manual is well

Timing T.I.M.

Operation	Number of Records in File: 12	100	500
Convert ASCII file to T.I.M. format	45s	5m 51s	29m 9s
Restructure file	57s	7m 3s	37m 33s
Merge single record into file	57s	1m 51s	4m 34s
Sort (create index) on 4 digit field	19s	1m 59s	22m
Search on 4 digit random number key field	7-9s	10-15s	15-19s
Copy file, indices and directory	57s	2m 10s	7m
Select subfile for business checks only	54s	3m 49s	17m 55s

Table 1. *Tests of T.I.M. speed. Three check files, with 12, 100 and 500 records were created. A special 4 digit, numeric field containing a random number was added to each record for the purpose of timing sorts and searches. Times are shown in minutes and seconds.*

File	Number of Records in File: 12	100	500
Directory	1664	1920	1920
Data area	1280	10496	52224
Indices (per field)	512	512	1280

Table 2. *Disk space requirements. Each T.I.M. file requires disk space for a directory entry, the data records and the index entries.*

```
Main T.I.M. Menu

    A = Add/Inspect/Update a record        L = List generation
    C = Create a new file                  M = file Maintenance
    D = Display T.I.M. directory           R = Report generation
    F = File specifications                S = Select records from a file
    H = Help menu                          U = Utility commands
    I = word processor Interface           X = eXit to operating system

Enter command
```

Figure 1. *The main menu. This menu is used to access secondary menus. It is often necessary to change program disks when moving from one menu to the next.*

```
FILE: B:CHECKS   EOF   KEY: SEQ   DIR: +   SCREEN: 1
RECORD: 14 ( 14 )      DEL:N      TYPE:S 0

1 Check Number _____
2 Date _______
3 Recipient _________________________
4 Amount __________
5 Remarks __________________________________________________
6 Bus/Pers _

1=Lft 2=rt 3=Up 4=Dwn 5=Insert 6=C dlt 7=Last 8=Date 9=F dlt 10=Exit
```

```
FILE: B:CHECKS   EOF   KEY: SEQ   DIR: +   SCREEN: 1
RECORD: 14 ( 14 )      DEL:N      TYPE:S 0

1 Check Number _____ 2 Date ________ 4 Amount __________

3 Recipient ________________________ 6 Bus/Pers _

5 Remarks ____________________________________________________________________________
```

Figures 2 and 3. *"Default" screen layout for check file, with fields displayed one per line, and custom screen which can be designed with a little extra work.*

```
cursor movement by character      jump to the first record in sequence
cursor movement by field          jump to record n in sequence
cursor to top of form             step +/- 1 record in sequence
character insert                  jump +/- n records in sequence
character delete                  search sequentially for match on partial field
field delete                      step +/- 1 record using key field
tab                               jump +/- n records using key field
insert current date               search for exact match using key field
use value from prior record
```

Figures 4 and 5. *T.I.M.'s commands for editing and locating records.*

Sequential Check Report
02/21/82

Check Number	Date	Recipient	Amount	Bus/Pers
1	02/12/82	John Press	25.00	p
2	02/12/82	John Press	125.00	p
3	02/12/82	Samantha Press	12.50	p
4	01/21/82	Roberto Lastrico	400.00	b
5	12/21/81	Roberto Lastrico	325.50	b
6	01/21/82	Joe Press	50.00	p
7	01/19/81	Natalia Lastrico	37.45	p
8	02/12/82	Carla Lastrico	550.00	b
9	02/12/82	Carla Lastrico	1250.00	b
10	02/12/82	Lillian Press	125.00	b
11	02/12/82	Marcela Ortuzar	417.00	b
12	02/12/82	Marcela Ortuzar	31.50	b
			==========	
<GNO-TOTAL>			$3.348.95	
GR Record count = 12				

Figure 6, Report. Showing check number, date, recipient name, amount and the business/personal code

Check Number	Date	Recipient's Name	Amount	Bus (b) Per (p)
1	02/12/82	John Press	25.00	p
2	02/12/82	John Press	125.00	p
3	02/12/82	Samantha Press	12.50	p
4	01/21/82	Roberto Lastrico	400.00	b
5	12/21/81	Roberto Lastrico	325.50	b
6	01/21/82	Joe Press	50.00	p
7	01/19/81	Natalia Lastrico	37.45	p
8	02/12/82	Carla Lastrico	550.00	b
9	02/12/82	Carla Lastrico	1250.00	b
10	02/12/82	Lillian Press	125.00	b
11	02/12/82	Marcela Ortuzar	417.00	b
12	02/12/82	Marcela Ortuzar	31.50	b

Figure 7, Improved report. The formatting of the report shown in figure 6 left something to be desired. This illustration shows some ways in which it could be improved: centering columns, spacing them out, two-line headings, etc. Unfortunately, these are not possible using T.I.M.

Business and Personal Checks
02/21/82

Bus/Pers	Date	Recipient	Amount	Check Number
B	02/12/82	Marcela Ortuzar	31.50	12
B	02/12/82	Lillian Press	125.00	10
B	12/21/81	Roberto Lastrico	325.50	5
B	01/21/82	Roberto Lastrico	400.00	4
B	02/12/82	Marcela Ortuzar	417.00	11
B	02/12/82	Carla Lastrico	550.00	8
B	02/12/82	Carla Lastrico	1250.00	9
<TOTAL>			$3.099.00	
MJ Record count = 7				
P	02/12/82	Samantha Press	12.50	3
P	02/12/82	John Press	25.00	1
P	01/19/81	Natalia Lastrico	37.45	7
P	01/21/82	Joe Press	50.00	6
P	02/12/82	John Press	125.00	2
<TOTAL>			$249.95	
MJ Record count = 5				
			===========	
<GNO-TOT			$3.348.95	
			===========	
GR Record count = 12				

Figure 8, Totals and subtotals. Subtotals are printed whenever the value of the control field (bus/pers) changes. Before the report was printed, an index sorting the file on amount within bus/pers had to be created.

organized and clearly written. The screen interaction, menus and help screens are done well enough that it is seldom necessary to refer back to the manual after a first reading. Anyone who is familiar with data processing and has some background in programming should be able to set up T.I.M. files and reports. Once a file is defined, a few hours would probably suffice to train a non-technical person to operate the system well enough to maintain files and generate reports.

To some extent, T.I.M. is easy to use because it is simple and doesn't offer many options to the user. There could have been more flexibility in searching for records and in report definition, for instance. However, a good part of the ease of use must be attributed to the design of the system, so, if T.I.M. is capable of doing your job, you will find it friendly to use.

Unfortunately, you will also find it slow. Because of this, T.I.M. is best suited to applications where files are small, unless it is possible to process information in relatively large, periodic batches (such as a mailing list for a monthly publication). T.I.M. would be poorly suited to tasks such as an inventory system, where the file ought to be updated whenever a transaction occurred.

A good deal of the blame for this slow operation (and probably for the decisions to cut down on options) is due to the fact that it runs using the Microsoft BASIC interpreter. When Microsoft makes their BASIC compiler available for the PC, a considerably faster version of T.I.M. should be forthcoming. Speed of operation would also be enhanced by using a hard disk rather than floppy disks. Not only would speed of reading and writing the disk be increased, it would no longer be necessary for the operator to swap the three program disks in and out of the floppy disk drive. That gets tiresome in a hurry.

But all of T.I.M.'s shortcomings cannot be blamed on the BASIC interpreter. I also think that its release was too rushed. This shows up in many ways, like the careless editing of the manual for the PC version, several minor bugs in the program, a few major bugs in the program and not trapping all operator errors. I am sure that all of these problems will eventually be cleared up, but an extra month or so of testing and fixing should have prevented them.

T.I.M. Faces Real Life

As Marketing and Sales Director of *PC* magazine, I have many of the business needs that a database management program such as *T.I.M.* is designed to satisfy. I keep records on advertisers, potential advertisers, and retail distributors that number in the thousands, and must monitor magazine shipments to dealers and advertising orders, as well as their related invoices.

Looking through the *T.I.M.* manual, I discovered many ways *T.I.M.* could help me organize the mass of information my department routinely handles. I've used other off-the-shelf microcomputer programs, so the terminology—"files," "record lengths," "bytes,", etc.—did not intimidate me. In fact, the manual gave me bright hopes that *T.I.M.* and I would get along quite well; I felt, after reading the manual from cover to cover, that I had a sound understanding of *T.I.M.*'s capabilities, limitations, and mode of operations.

Knowing I had a review to write and only a limited amount of time in which to write it, I decided to limit my work with *T.I.M.* to the Retail Dealer Sales functions. I tentatively planned to use *T.I.M.* files and reports in the following ways:

1. To generate mailing labels;
2. To generate sales reports and inventory, open inventory, and dealer lists by using a file based on invoices and a file based on dealers;
3. To use the dealer file to generate lists of buyers and their telephone numbers; and
4. To use a word processing program, together with the dealer file, to generate 'personalized' form letters.

My first hands-on encounter with *T.I.M.* was painless. Within hours, using the program was almost effortless; within two days, we had created, modified, and restructured a dealer file containing 94 names. At this point, I wrote a letter to a friend, saying, "TIM is great! It's going to make things a lot easier for me."

And then the problems started.

When I encountered error messages I didn't understand, I called Innovative Software for help; fortunately, I knew enough about computers to know that we should copy the error messages exactly as they appeared on the screen, even though they were completely meaningless to us. The people at Innovative Software patiently listened as I recreated the situation and read them the error messages. Shortly thereafter, they called back to explain that I had a "bad disk" and that they'd rush a new copy to me overnight. They did, and my work was interrupted only for a day or so; but the situation was still upsetting.

Woodard: "My overall impression of T.I.M. was more positive than not . . ."

First, the absence of any explanation for the error messages in the manual left us unable to solve the problem without assistance; this omission continues to plague me. Further, the programs revert to BASIC whenever anything goes wrong, and the documentation offers no assistance in recovering from the error.

A second problem had nothing to do with *T.I.M.* but everything to do with using a computer in an office situation. When the new copy of *T.I.M.* arrived, an over-zealous co-worker reformatted and recopied the program disks; in the process, he erased everything we had done to that point. It took at least a day to recreate the lost files; as a result, I learned to keep our working files on diskettes locked in my desk.

At this point, I had to revise the scope of my review, since time was running out and I discovered that some of the program options were unavailable. For example, when the word processing option is selected from the main menu, it reads, "not available." Also, the reporting format proved to be so awkward for generating invoices that I decided to have them printed and to complete them with a typewriter.

In light of my revised expectations, I proceeded to have dealer files, reports, and lists developed. All of these files, lists, and reports have proven to be helpful, and thus my overall impression of *T.I.M.* is more positive than not. It's a relatively 'friendly' program that is both easy to learn and flexible to use, and I'm impressed by the variety of ways in which it can report information from the dealer files.

On the other hand, we encountered some aspects of the program that were so frustrating they caused us to limit the number of applications in which we could utilize *T.I.M.* A friend of mine, who is a programmer, tells me that many of these problems do not originate with the *T.I.M.* program itself. In the following examples, when I know *T.I.M.* to be blameless, I'll say so.

First, *T.I.M.* comes on three program diskettes which are used in conjunction with a data diskette containing your files. To move through the various phases of a particular operation (e.g., updating a file, sorting it in some particular sequence, and writing a report), we had to shuffle the three program disks in and out of the disk drive; it seemed that 90 percent of our time was spent waiting in front of a screen that read, "One moment while program is loading."

My friend told me that this problem was the result of IBM's diskette format, which doesn't provide adequate space for large programs. Since there's 256K of memory on my IBM PC, I asked him why the program hadn't been designed to allow all the programs to be loaded into memory at one time. The answer: *T.I.M.* is written in Microsoft BASIC, which, although easy to use, is unable to address more than 64K of memory at one time. Therefore, this frustrating and time-consuming feature of *T.I.M.* represents a trade-off in which ease of language use was achieved at the cost of program efficiency. Perhaps a brilliant and user-dedicated programmer could have overcome these limitations and/or reached a more satisfactory compromise, but the *T.I.M.* programmers have chosen not to do so. Perhaps this problem will be solved in future versions.

Although I've already mentioned the omission of error messages from the manual, I want to come back to that topic because it was another source of recurring frustration. The following incident is typical:

I was trying to save a report format in the Report Format Library and was repeatedly tossed out into BASIC. Receiving no explanation from either the computer or the manual, I had to spend 45 minutes trying to discover why a program that worked yesterday was not working today. Finally, using the IBM DOS command, "Check Disk," I discovered that the diskette was full and, therefore, would not accept any more data.

In this case, discovering the nature of the problem did not solve it, or even suggest a solution, since it is a feature of the program's design to store libraries on an already crowded program diskette, not on the data diskette. The only way to overcome this particular obstacle is to make several copies of the program diskette and to distribute the different libraries among them. It took an entire afternoon to solve this problem; better documentation would have made that effort unnecessary.

My final criticism concerns sorting speed. When the dealer file contained only 94 records, it could be sorted very quickly; now that it contains more than 250 records, a sort takes a great deal longer. The *T.I.M.* manual warns that having several key fields would slow the sorting and merging processes, and so we've reduced the key fields to the two that are essential: zip code and standing order. As our *PC* dealer base grows—and it has the potential to reach 2,000 by the end of the year—all of these processes will become even slower.

As a result of this problem, I have decided not to use *T.I.M.* in applications requiring frequent sorting of large(r) data files. For example, I plan to have a file created which would describe all of our present and potential advertisers in some detail. There are already more than 700 such companies and individuals on our "comp list" and the number is growing rapidly. I don't think it would be wise to use *T.I.M.* with a list that size.

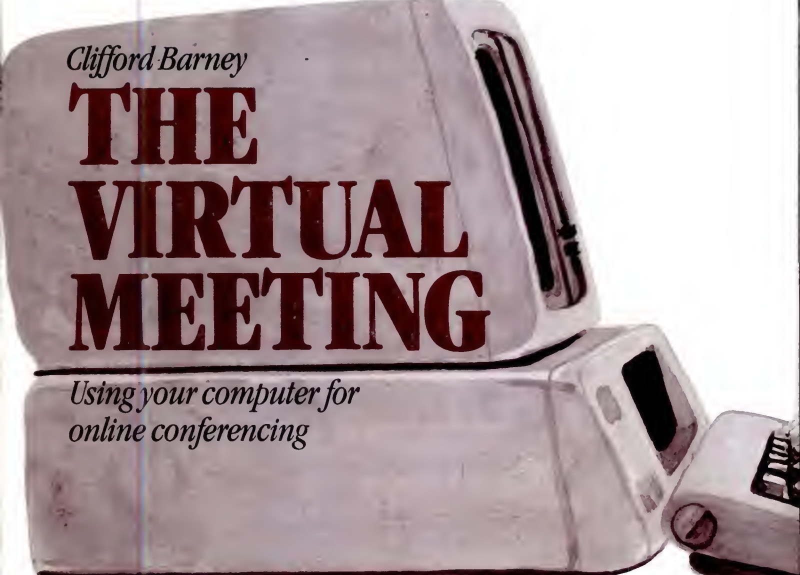
There are other minor problems that will undoubtedly be corrected before long, e.g., *T.I.M.* can't be used with a color monitor and the word processing interface isn't yet available. All in all, *T.I.M.* is better than a filing cabinet and we will continue to use it for small, uncomplicated tasks such as mailing lists since it's easy to learn and flexible to use. However, I do hope that a more powerful database program—one that's able to perform the more sophisticated tasks I have in mind—will be available soon.

Computer conferencing is not a substitute for anything, but is an entirely new form of group interaction. The members do not meet, and it is irrelevant whether or not they are "online" at the same time. They communicate with each other indirectly via the computer files which they jointly create and which they access via software on a "host" computer system. The host, which may be any suitably equipped and programmed computer but is usually of the large, traditional type, keeps track of who has seen what entries in the file and notifies users when new material is present.

The only equipment required for computer conferencing (CC) is an ordinary terminal with communications capability—hardly a rare item today. Personal computers such as IBM's PC can easily be set up to fill the role.

The mechanism of CC is simple. The host computer recognizes individual users, or "accounts," as members of a given conference. The members are permitted to read and write in its files according to whatever protocol they want to establish. In an open conference, users can read all of the items and enter their own contributions. Normally, they will not be able to change files created by others; however, in some instances, it may be useful to give one member the editorial power to add and delete. Files may be either signed, unsigned, or even pseudonymous. Members may send messages to each other privately and may have a personal file space for notekeeping.

When this system is linked with a personal computer that has its own information processing capability, the user has an unprecedented opportunity to integrate his/her individual work with others'. Cooperation takes on a new dimension when the individual is free to work at an individual pace, yet the network is always available.



Clifford Barney

THE VIRTUAL MEETING

Using your computer for online conferencing

How this capability is put to use depends upon the purpose of the conference. The files may contain little more than items of general interest to a loose group of colleagues, or they may record something as detailed as the creation of a precise electrical specification.

"Only the help pounds a keyboard . . . voice input/output is the opium of the managerial class."

One of my favorite examples of the application of computer conferencing is the inside-out press conference conducted on EIES. Art Kleiner, an editor of *Co-Evolution Quarterly*, set up an on-line meeting for the sole purpose of providing him with the information he needed to write a magazine article. As a reporter who is used to chasing news sources—or ducking them when they thought they'd been misquoted—I was enchanted by the simplicity of Kleiner's vision. He had collected all of his sources in one electronic space and had their comments in a machine-readable form. There had been nothing like it in the annals of journalism since the days when Welsh bards from opposing armies met on a hilltop during a battle to decide among themselves how the fighting should be reported.

Despite its advantages, CC is widely held to be unsuitable for commerce because it requires the use of a terminal. "Only the help pounds a keyboard" is the way this view was expressed in one EIES conference. The emerging class of personal computer owners together with the generation of kids now surfacing in Komputer Kamp and in video game arcades may undermine this premise.

A subtler objection to CC is that it demands written input. Few people like to write, whereas many people enjoy the sound of their own voices, so sweetly reasonable and so soon forgotten. Voice input/output (I/O) is, in fact, the opium of the managerial class. Freed of the demands of typing, the theory goes, executives will treat their computers like robot secretaries: take a letter, file this, what's next on the schedule?

Unless managerial speech has suddenly acquired a clarity unknown elsewhere in society, however, the resulting text is likely to be unreadable. Though humans are frequently capable of flights of eloquence, very few of us speak in ordered sentences and paragraphs. Speech is by nature redundant and elliptic; written text is, or strives to be, ordered and complete. Someone will have to edit the spoken input.

In any case, the issue is probably a chimera. A study of EIES use by sociologist Roxanne Hiltz showed that the prime determinant of system use was neither typing ability, nor familiarity with computers, nor preference for speech over written communications—these factors proved to be of no measurable influence—but *mindset*. The people who used the system most and professed to get the most out of it were the ones who *anticipated* that they would like using EIES before they ever came on-line. They proved to be the people who already knew other on-line participants; in other words, the ones who already had some community of interest.

Hiltz's results illuminate the true nature of computer conferencing: It is a system by which people with a joint purpose may conveniently carry it out. Surely someone can find a use for that.

Conferencing Networks: What's Available

One of the reasons that CC is so mysterious is that it is not yet widely available. The largest conferencing system, the ARPANET, with more than five thousand members, is restricted to Defense Department contractors. (Although outsiders may slip in through a few semi-legal 'gateways', they do not normally have access to the full system.)

The Electronic Information Exchange System (EIES) provides very sophisticated conferencing software and is accessible via Telenet. Members pay $75 per month plus $7.50 per hour for Telenet's packet-switching services. Query Anita Graziano at the Computerized Conferencing Communications Center, 323 High Street, Newark, NJ 07102.

Some so-called "community bulletin boards" offer conferencing software for local use; a prime example is the Conference Tree, which began in San Francisco and is presently cloning in other cities. A directory of community bulletin boards is available for $1 from AMRAD, 524 Springvale Ave., McLean, VA 22101.

Cross Communications Co., of 93[illegible] Pearl St., Boulder, CO 80303 is offering a[n] entire conferencing package, called "Ma[trix,]" for installation on DEC computers. Cross also plans to make Matrix availabl[e] via Telenet for approximately $20 pe[r] hour.

The Rolls-Royce of conferencing systems is probably Augment, a corporat[e] product from Tymshare, 20705 Valle[y] Green Drive, Cupertino, CA 95014. Augment provides ARPANET-like services either in-house or via Tymnet, Tymshare's packet network.

A rudimentary conferencing system may be constructed out of the messagin[g] and bulletin board services provided b[y] Telemail, which is itself a value-adde[d] service of GTE Telenet. Telemail charge[s] corporate users $140 per month, with [a] $500 minimum on Telenet charges.

The Source, an information networ[k] owned by the *Reader's Digest*, will offe[r] a form for conferencing via its Participat[e] service this spring. Participate was devel[-] oped on EIES and is migrating to th[e] Source in several forms and at severa[l]

"Computer conferencing is a system by which people with a joint purpose may carry it out."

price structures. Basic Source rates are [a] $100 entry fee plus from $4.25 to $17 pe[r] hour of connect time (depending on th[e] time of day). Source headquarters is lo[-] cated at 1616 Anderson Road, McLean[,] VA 22102; accounts are also sold at ComputerLand stores.

For those who would like to read mor[e] about CC, the canonical text is *The Net[-] work Nation*, subtitled "Human Communication via Computer," by Starr Roxanne Hiltz and Murray Turoff of EIE[S] (Addison-Wesley, Reading, MA, 1978[).] This book is a technical, historical, an[d] sociological description of CC. A ne[w] summary and analysis of research int[o] CC is to be found in *Studies of Compute[r] Mediated Communications Systems: Status and Evaluation* by Hiltz and EIE[S] colleague Elaine Kerr. It will be pub[-] lished this spring by the Academic Press, New York.

Conferencing Compared:

Computer conferencing is such a mysterious animal that there is a great temptation to begin by describing what it isn't. It isn't electronic mail, for instance. And it isn't back-and-forth on-line messaging, like a written-out telephone call. And it certainly isn't video conferencing.

However this procedure may be dangerous. The "not" operator functions in some sentences in such a way that the reader or listener gets the uncomfortable feeling that the existence of something is asserted in one breath, only to be denied in the next, as we may see in the well known self-canceling instruction, "Don't think of a hippopotamus."

There was a professor of anatomy at Cambridge University who was apparently ignorant of this semantic pitfall, for in his lectures, he always listed the common mistakes that students inevitably (in his experience, anyway) made. "The nerve doesn't go here," he would say, "and it doesn't go there, and so you don't get this reflex and you don't get that one." Not surprisingly, he often had cause to lament, "I told my students exactly the mistakes they should avoid, and these are the very mistakes they always make."

It is probably best, therefore, to describe computer conferencing by stating what it is, rather than what it isn't. Yet here again we meet that subtle serpent, the negative: the most obvious fact about computer conferencing, and the one that separates it from all other forms of teleconferencing, is that it is *asynchronous*, i.e. the members need not be present simultaneously. Expressed more positively, it is a meeting or conference between dozens or even hundreds of people, that takes place when only one of them is present. That person is the one who happens to have the attention of the host computer's operating system.

In this respect, computer conferencing (CC) resembles a formal conference in which one must first obtain recognition from the chair in order to speak. However in CC one does not speak, one writes; and that is its second defining characteristic. The creation of a continuous written record is CC's most original contribution to group communication. Here is a medium that makes it possible for a large group of people, widely separated in space and independent of all time considerations, to create a joint text that accurately reflects all of their views; a text in which all contributions can (usually) be identified by source and time of composition; a text which, moreover, can be searched by author, date, or any other keyword recognized by the host computer.

What could be more suitable for coordinating the work of a large number of individuals? Considering the practices of American business, in which managers and executives spend 75 percent of their working hours "communicating" (either attending meetings, writing up reports of those meetings, or talking on the telephone), one might easily imagine that the corporate sector is busily investigating CC.

Here the imagination is running ahead of reality. It is true that business is exploring teleconferencing as a way of reducing the time, irritation and, above all, the expense of shuttling executives to all parts of the world to manage affairs that are increasingly global, rather than local. Every trade journal worth its controlled circulation has devoted its "special report" to the joys of teleconferencing. What they usually mean, however, is video conferencing.

The accompanying chart tabulates some of the differences between face-to-face meetings, video conferencing, and CC. Next to the elegance of CC, video looks like brute force. It demands a multimillion dollar investment to establish, and the coordination of many people, many miles apart, to set in motion. And in the end what have you got? A meeting in which only one person can speak at a time, whose transcript is always delayed, and whose results are skewed by body language and who-sits-where.

Satellite video communication has been shown to be a clumsy substitute for a face-to-face meeting, of little more value than an ordinary phone call. It demands so much extra equipment to establish special conference rooms that taking part in a video conference is like putting on a space suit to take a stroll around the block. (Bell Labs officials shunned their own Picturephone service, which required them to go to a special room, because it took more effort than it was worth.)

Clifford Barney

A Communications System Morphology

System parameter	Face-to-face	Video conferencing	CC
Medium of transfer	Verbal & nonverbal	Verbal & nonverbal	Written word; graphics
Effective group size limit	Unstructured: few tens Structured: hundreds	Few tens	Unstructured: many tens Structured: thousands
Occurrence of interaction	Coincidence of all	Coincidence of all	Individual choice
Frequency of interaction	Predetermined	Predetermined	Individual choice
Speed of interaction	Talking rate	Talking rate	Reading speed
System memory	Recordings	Recordings	Machine-readable
Memory modification	None	None	Electronic
Memory retrieval	None	None	Unlimited
Transformations	Transcription	Transcription	Hard copy
Structure	Varied but fixed once chosen	Single and fixed	Dynamic and adaptable

Adapted with permission from The Network Nation, *by Starr Roxanne Hiltz and Murray Turoff; Addison-Wesley Publishing Co., Inc.; Menlo Park, CA 1978*

CLIFFORD BARNEY

Communications Briefs

Cut-Rate telemail vendor fed up, abandons service.

Claiming that Telenet management is giving him the cold shoulder, Ed Magnin of the Telephone Software Connection has decided to quit providing low-cost Telemail service. Loss of TSC means that Personal Computer owners no longer have access to the cheapest and simplest electronic mail service heretofore available.

Telemail is a powerful, user-friendly electronic mail system operated worldwide by GTE Telenet over its packet-switched common carrier network. Telemail is normally marketed to businesses for $140/month plus a $500 minimum on Telenet connect charges. Acting as an independent broker, under an agreement with Telenet, Magnin bought the service and resold it. He charged $5/month plus the actual Telenet rates, with no minimum.

Magnin operated out of his home on a couple of microcomputers. Nevertheless, at one time last year TSC was the fourth-largest user of Telemail, billing around $5,000 a month. At least half his customers, Magnin says, were personal computerists who accessed the network after 9 p.m., when the Telenet rates dropped to $4/hour. (It is $14/hour in the daytime, $7/hour evenings.) Magnin mother-henned his clients, answering all messages personally, providing nearly a hundred state and special interest bulletin boards (including one devoted to the PC), and running interference with Telenet to correct customer problems.

But Telemail, Magnin charges, failed to provide the Telex service it promised, reneged on several agreements with TSC, confused billing by failing to separate network acess charges from charges for special services, and even miscalculated some bills. Telemail also failed to correct an annoying software glitch that caused long delays in transmitting messages to and from Magnin himself.

In the end, Magnin says, the headaches weren't worth the rewards. Periodically threatened with the loss of his large-user discount, and fearing a rise in Tlenet rates, Magnin abruptly decided to get out of the Telemail business as of Feb. 28. TSC will continue as a seller of telephone-delivered software (for Apple computers) via direct dial to TSC in Torrance, CA.

TSC's abandonment of Telemail prompted one user to comment that high network charges remain the principal roadblock on the "information freeway." At $15/hour, he predicted, information networks will remain "curiosities" for both personal users and businesses.

Telemail acknowledged that Magnin's complains were justified, and expressed regret that he was giving up the service.

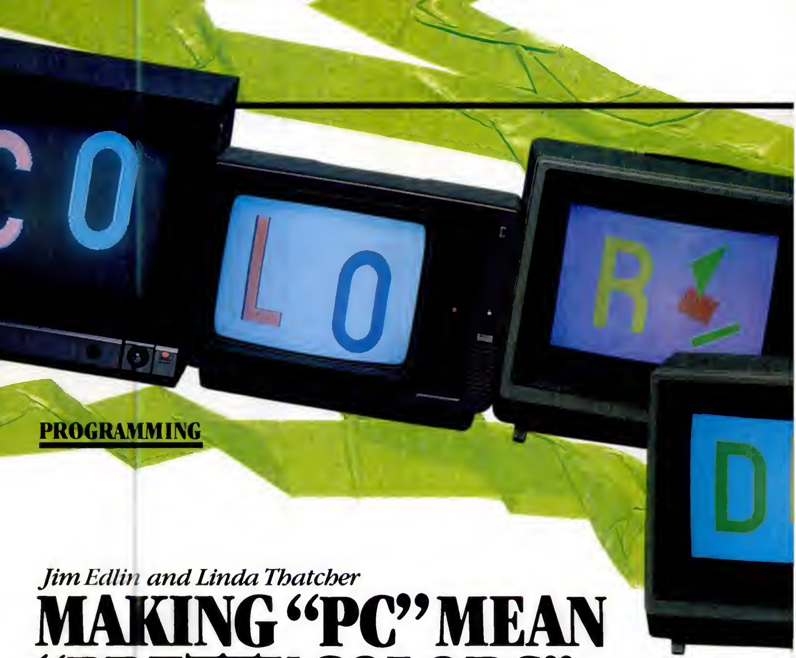
Electronic mail only slightly expensive that TSC/Telemail is still available on The Source and the CompuServe network. Telemail, however, is more flexible and easier to use than these systems, which have rudimentary search software.

Publisher Folds Newspaper, Mounts Online Newsletter Service

The bottom line looks better in electronic publishing than in print to Independent Publications, Inc., which announced an online newsletter service less than a month after it folded the Philadelphia *Bulletin* newspaper. Under its Newsnet service, Independent Publications will distribute some 70 newsletters via telephone dialup lines. The first, already online, is *Communications Daily*.

The newsletter publishers will supply machine-readable text on magnetic tape; subscribers will be able to access the text at $24/hour (plus the newsletter subscription price).

Independent Publications shut down the once-proud *Bulletin* in January after many money-losing months.



PROGRAMMING

Jim Edlin and Linda Thatcher

MAKING "PC" MEAN "PRETTY COLORS"

If you want to equip your IBM Personal Computer to display color text and graphics, the number of possible ways is in the same league as cat-skinning.

At present, however, all the ways have one common prerequisite: you must first equip your PC with IBM's color/graphics display adapter, an investment of approximately $300. (This does not mean you can't also have/use the monochrome display adapter; the two are designed to function in tandem.) After you've acquired the adapter, depending upon your needs and desires, you can achieve color display capabilities for an additional $70 or less (assuming you already own a color TV), or you could add another $1,000 or more to the cost of your system.

The factors determining your location in that spectrum should be the immediate uses you have in mind for color plus the amount you care to invest in being prepared for the future. The overwhelming, 'right-now' consideration is *resolution*, i.e., the level of detail and sharpness the display is capable of reproducing. Resolution is measured by how many dots (in a horizontal line) and how many lines (vertically) can be distinctly and separately displayed. The PC is capable of producing 640 distinct dots (320 in color) on 200 distinct lines, at two levels of brightness for each. How much of that resolution you need depends upon the programs you plan to buy or write. The future consideration is this: do you want to be prepared for color adapters or other devices capable of even greater feats of resolution, as well as for the programs that might exploit them? (A future intersection of microcomputers and video disks is worth consideration at this point.)

There are three basic options to consider, as well as arrays of secondary choices within each. Since the marketplace is still adjusting to the new opportunities created by the PC, the choices are not as clear-cut as they could be; the present lack of a substantial body of published, color-using programs is also a significant factor.

Hardware Choices

The color/graphics adapter has three different places where a display can be connected; these connections define the three categories of hardware that can be used. Each connection point enters at a different stage of the electronic process that paints color pictures onto a video screen.

To understand the choices, it helps to have a rough conception of how video's ephemeral painting process works. The image you see is built up from three superimposed pictures, each of which is a single, pure color, i.e., one of the three "additive primaries," or red, green, and blue. (These are slightly different from the paint-pot "subtractive" primaries you splaysand equipment courtesy of Computer Connection, San Francisco; ComputerLand of San ancisco; ComputerLand of the Castro.

Graphics display program by Lon Poole, photographs by Ed Kashi.

learned about in elementary school.) The triple images are built up by ever-sweeping electron beams that, when energized, make phosphor spots on the screen glow in color.

For the simplest of systems, imagine the computer keeping track of each beam's regular, repeated sweeps, energizing it whenever it is aimed at a spot where its color is desired. Displays that work according to this system are called *RGB* (for red-green-blue) monitors. Since RGB is the simplest approach, you might expect it is the least expensive; but, in fact, it costs the most. One reason for the expense is that the economics of color displays are influenced far more by television use, which is a multi-million-unit business, than by computer use, which is still relatively rare. RGB monitors are also more of a precision device than is a mass-produced TV. A D-shaped, 9-pin jack on the back of the IBM color adapter provides signals for an RGB-type display.

In broadcast television, the signals defining the three superimposed color pictures go through two additional stages of processing. First, the signals are combined to form one "composite" signal. Then, the composite picture signal is overlaid onto a broadcast carrier signal. The steps are similar to music from a guitar, drum, and piano being combined into a single signal in a record groove, then that signal being incorporated into a radio wave when the record is broadcast. To recreate the picture at the receiving end, both the overlaying and combining processes have to be performed in reverse. For a computer to send a picture to a broadcast-oriented display, it must take on one or both functions of a miniature television station.

The device that acts as a TV transmitter is called an "RF (for radio frequency) modulator." These can be bought for $70 or less, and will allow the IBM color adapter to send pictures to your standard color TV. RF modulators are connected to the IBM color adapter unit on a multi-pin plug inside the IBM system near the back of the circuit board.

If a TV set is equipped to let you bypass the broadcast receiving stage via a separate connector, or if you select one of the special-purpose displays that omits the broadcast part, your PC can send it the composite video signal, which comes from the round, stereo-like jack at the back of the color adapter.

The three main hardware choices, then, are a TV set with RF modulator, a composite video monitor, or an RGB monitor. What factors influence the choice between them?

The Trade-offs

If, as a child, you ever played the game "telephone," you know that the more times information is handled, the more

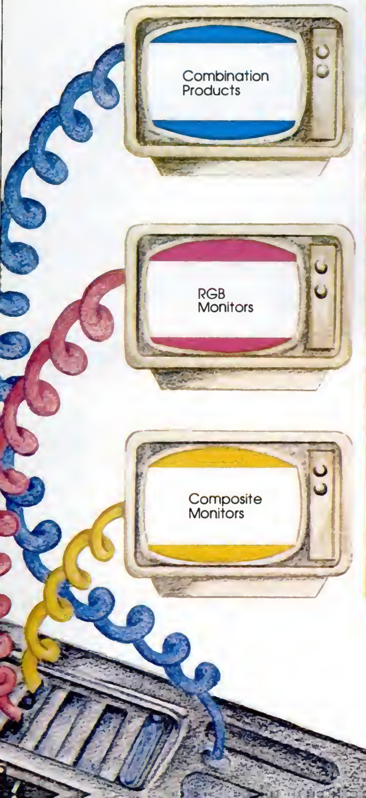
Color Displays

likely it is to become distorted. That effect is what makes the RF modulator/TV set combination least desirable, and makes even composite monitors a compromise. The extra handling tends to mush up the sharpness of the picture.

A second major limitation is that TV sets are designed to adhere to a standard, i.e., a specified way of sending TV signals that is uniform within the US (other nations also have broadcast standards, most of which are different from ours). Among other things, the standard defines the size of the channel, or bandwidth, which may be used for the picture information. Your computer could be capable of sending more picture detail, as the ICM PC is, but the bandwidth 'door' in the display is too small to let it through. Since composite monitors are usually built to television standards, they also suffer from this limitation. (A composite monitor designed to higher-bandwidth standards could approach the sharpness of a similarly designed RGB monitor, but would still lose quality because of the extra handling to make the composite signal.)

In the case of RGB monitors, which are liberated from the constraints of the broadcast-TV standard, the limitations

Color Displays: What's Available



Make/Model	Physical			
	Screen Size (diag)	Cabinet Size (in W × H × D)	Weight (lbs.)	Controls on Front
Electrohome C50-050	13"	21.5 × 13.25 × 17.25	60	◆▲△●○■□
RCA VFM 575	19"	25.5 × 17.12 × 17.36	55	
Sony KX 1901	19"	19.88 × 17.88 × 19	72	■□▽
Amdek Color II	13"	17 × 14.5 × 15	32	◆▲△●
Data Ed/Teco TN1440	13"	18.5 × 14.8 × 13.6	31.6	◆▲●
Electrohome ECM 1302-1	13"	18.5 × 13.31 × 14.61	35	◇▲
Electrohome ECM 1302-2	13"	18.5 × 13.31 × 14.61	40	◇▲
Hitachi CM 1472	13"	17 × 14.75 × 15.2	32	◇▲△●
NEC JC 1202 DH (A)	12"	14.88 × 12.08 × 16.26	25.79	◇▲
Amdek Color I	13"	17 × 14.5 × 15	32	◆▲△■□
BMC 12 CL	13"	—	—	◆▲△■□●
Heath GD2-1320	13"	20.25 × 14.00 × 14.75	33	◇
Hitachi CN 1481	13"	17 × 14.75 × 15.2	25.6	◇▲△■□●
NEC JC 1201M	12"	14.88 × 12.02 × 16.26	25.79	◇▲
Sharp XR 3013	13"	19.84 × 15.33 × 15.85	37.7	
Zenith DC13PF2	13"	20.25 × 14.00 × 14.75	33	◇

◆ On | △ Contrast | ● V-Hold
◇ On/Vol | ■ Tint/Hue | ○ H-Hold
▲ Brightness | □ Color | ⧗ Sharpness

arise from manufacturing precision. Theoretically, an RGB monitor of unlimited picture resolution is possible, but reality intervenes with how small and how precisely you can place dots of phosphor on the screen and drill patterns of microscopic holes, and so forth. It is these differences that account for the variation in both the performance and the price of different RGB displays.

RGB monitors for use with computers are often set up to be digital, implying that they can be told whether a color dot should be on in a particular place, but not how bright it should be. IBM shook up this status quo by equipping the PC color card to display two levels of brightness. As our "What's Available" survey shows, the marketplace is scrambling to respond. (Since composite monitors and TVs are broadcast-oriented, they are designed to reproduce levels of brightness.)

So the "bottom line" is this: *TV sets*—easy on the pocketbook but hard on the eyes; fine for games and low-detail graphics; limited to 40-column width for text, and even then, tough to look at for long. *Composite monitors*—almost as limited as TV sets, but will be easier on the eyes. *RGB monitors*—the only display

			Picture/Sound			Miscellaneous			Comments
Connection	Cable Provided?	Power Used (note 1)	Resolution (H × V)	Colors	Sound	Suggested Retail	When/Where Available	Warranty	
td. TV	Yes	65 W (note 4)	256 × 200	6 (8 gray)	?	$972	Now, Ind. dlrs	1 yr. P&L	Base unit for complete Videotex system.
ulator	Yes (2)	110 W	525 lines (note 3)	N/A	Yes	$599.95	May '82 Indep. dlrs.	90 days L, 1 yr. P	An enhanced, upper-end TV set.
Multi	Yes	130 W	340 lines (note 3)	N/A	Sep. Sys.	$1,500	Now, Sony dlrs.	Not stated	"Proteel" model, also avail. in 25" version (KX2501).
in	Yes	70 W	560 × 240	8/16 (2)	Yes	$995	Now, Computer-Land, IBM & Ind. dlrs.	1 yr. P&L, 2 yr. tube	16-col. stand. after 3-1-82; earlier models can be upgrad.
DIN	No	70 W	360 × 230	8/16 (2)	Yes	$599	Now, dealers or direct from Co.	90 days P&L	Lowest reso. of RGB monitors that release specific figures.
Plug	Yes	65 W (note 4)	"Medium"	N/A	?	$570	Apr. '82 Ind. dlrs.	1 yr. P&L	Comp. or RGB input. Different video tube from mod. 1301-2.
	Yes	65 W	"High"	16	?	$978	Apr. '82 Ind. dlrs.	1 yr. P&L	Canadian manu. Preferred for color text display.
in	Yes	70 W	560 × 240	16	Yes	$950	May '82 Ind. dlrs.	90 days	Equivalent to Amdek Color II.
in	No	67 W	690 × 230	8	?	$1,095	Now, Ind. dlrs.	90 days P&L	Highest reso., most expensive, not capable of 16 col.
Plug	Yes	65 W	260 × 300	N/A	Yes	$449	Now, Computer-Land, IBM, Ind. dlrs.	1 yr. P&L, 2 yr. tube	
Plug	?	?	?	N/A	?	$450	Now, Ind. dlrs.	?	Several specifications not supplied by mfr.
Plug	No	82 W	240 lines (note 3)	N/A	Yes	$399.95	Now, Heath centers & catalog	90 days P&L	Most controls at back, could be inconvenient.
Plug	Yes	65 W	260 × 240	N/A	Yes	$450	Now, Ind. dlrs.	90 days	
Plug	No	67 W	340 × 240	N/A	Yes	$399	Now, Ind. dlrs.	90 days P&L	
Plug	?	110 W	300+ lines (note 3)	N/A	?	$	Now, Ind. dlrs.	90 days P&L	Also avail. in 19" model (XR3019).
Plug	No	82 W	240 lines (note 3)	N/A	Yes	$399.95	Now, Zenith dists.	90 days P&L	Same as Heath model GD2-1320.

Chart: Research, Linda Thatcher; Design, Canoo Graphics

▽ Normal/RGB Selection Switch

NOTES:

(1) All models 110/120 volts, 60 HZ unless indicated otherwise.

(2) Basic model can reproduce 8 colors; add on modification allows display of two intensity levels for 16 total "colors."

(3) Mfr. does not release horiz. resolution information.

(4) Also capable of 220/240 volt, 50 HZ. operation.

type capable of showing the picture definition the PC is capable of producing; costly, but essential if you want to work extensively with color text as well as graphics and use 80-character-wide lines; however, not all RGB models can achieve the resolution of the PC.

The Survey

To help you gain an idea of the color display products available, *PC* undertook a survey. Our explorations consisted of telephone conversations with manufacturers and distributors, careful reviews of specification sheets, and visits to retail outlets. The fact we learned most clearly is that the information we were seeking is harder than expected to come by, and also a little slippery. What we were able to learn is summarized in the table that accompanies this article.

Some products are antecedents of a generation that aspires to equip your "media room."

Except for one RCA unit, we did not specifically survey TV sets. In general, a TV set's quality as a color display for your PC will be proportional to its quality as a TV set. We did not specifically survey RF modulators either, but the one we ran across was the Sup*R*Mod 5, from M&R Enterprises in Santa Clara, California. This unit sells for approximately $60 and comes with the plug needed for connection to IBM's adapter. Plugging it in properly, however, can be tricky and we suggest you have it installed for you, if possible.

The other products we surveyed fell into three categories: composite-type and RGB-type monitors, plus some combination products intended for more than one purpose. Most of the displays were suitable for top-of-the-computer placement, but there were a few biggies more suited to group viewing. Our chart reports the screen size (in inches) measured diagonally from corner to corner, the cabinet size and weight, and the controls that are easily accessible from the front. Composite displays require more controls for adjustment and are likely to need more frequent fiddling, so we thought you'd like to know which ones you could get at without moving the monitor or trying to locate the knobs by feel alone. Some of the front controls are recessed or hidden behind doors. The chart does not indicate cabinet material or color; although none of the cabinets fits in with the look of the PC as nicely as IBM's own monochrome display does, most RGB displays are some shade of gray. Power requirements were fairly uniform; only the Electrohome displays were equipped for outside-the-US power standards. Smaller screens, in general, drew about as much power as a 60-watt bulb, 100 watts being the cluster point for big screens.

In the video specifications, we report resolution information to the extent manufacturers were willing—or able—to supply it; we did not investigate this ourselves. Many companies simply don't release horizontal dot resolution, and no one but Teco and Amdek were able to talk about bandwidth as such; a pity, since it's a useful measure, we think. The column entitled "Colors" applies only to the RGB monitors, since the other kinds of display can reproduce all colors. Most of the RGB monitors we found were limited to displaying the eight basic colors in IBM's video palette (black, white, red, green, blue, yellow, magenta and cyan, which is a lightish blue). Electrohome's RGB model was set up for IBM's full 16 colors (the eight above plus eight shades with different brightness, e.g. black becomes dark gray), as is Hitachi's and Amdek said all their production would be thus modified after March 1, and provides a kit that would convert earlier specimens of its Color II model to 16-color capability. Most other makers said a change to 16-color capability was in the offing, or offered modification kits.

Many models included built-in sound capability. This is of no immediate use with the PC, which has its own built-in speaker and does not transmit sound through the color display adapter. However, this feature may be worthy of consideration with regard to future uses for your monitor.

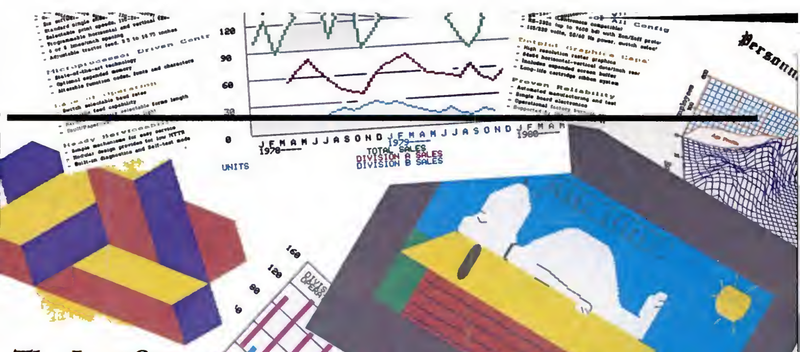
Several different connector types were provided for delivering the video signal to the display. They are listed as they were reported to us, but don't be confused by the various names, many of which are the company's own version of standard connectors. All you need to know is that if there isn't an RCA plug on the computer's end of the cable for a composite display, or a 9-pin plug for an RGB display—or, worse, no cable provided at all—either you or your dealer is going to have to do some fooling around to make the connection.

Warranties tended to be the 90-day variety, although a few companies (RCA, NEC, and Electrohome) offered a year on some models, and Amdek stretched that to two years for the tube.

Some products we looked at, notably the Sony Profeel series, had aspirations broader than serving as a display for your Personal Computer. They are the antecedents of a product generation that aspires to equip your "media room" and hook up to videodisk players, cassette recorders, and who-knows-what-else. However, many of their self-adjusting features could be a hindrance rather than a help so far as computer display is concerned. One Electrohome model in our chart is set up to work with videotex (remote information library) systems such as Telidon in Canada, where Electrohome is based.

The bottom line is that RGB monitors are the only display type capable of showing the pictures the PC can produce.

In trying to get information from some large companies, we found them very confused about where in their organizations computer displays belonged—or ought to belong. RCA, in particular, seemed to have no idea what we were talking about; fourteen (long-distance) phone calls and three divisions later, we gave up on Zenith and called our local Heathkit Electronics Store, which provided us with the information we needed. Smaller companies, particularly Amdek, seemed to be most interested in serving the IBM PC market. The bulk of the composite monitors we surveyed seem to owe their existence largely to serving the Apple computer market, and seemed far less relevant to the needs of the PC.



The Last Step
COLOR PRINTERS

The PrintaColor (l) and Prism (r) printers, and samples of their output.

Whether you are using color to interpret data, enhance text, or enrich pictures, its advantages can be substantial. But with a color display alone, you can enjoy those advantages only when you are where your computer is. An ideal setup would include ability to translate your color displays into more portable form, i.e., print them on paper. This option is not available yet except to those with plenty of technical prowess; but the wait may not be long. In the meantime, your camera can fill the breach in some situations.

Manufacturers of two relatively low-cost color printers have stated intentions of customizing their products for the IBM PC in the near future. One of these is Integral Data Systems, Inc. (IDS), of Milford, New Hampshire. For $1,995, IDS sells a printer, called the Prism, that is capable of printing in seven colors—though the color set (cyan, magenta, yellow, green, purple, brown and black) does not exactly match the PC's displayed set. The Prism is a dot-matrix type printer with a multi-color ribbon that makes multiple passes across each line where more than one color is to be printed.

You could plug a Prism into your PC now and print in color if you wrote your own programs to do so, but there isn't any convenient way of simply reproducing a color image on your display onto paper. Peter Eisenhauer, director of marketing for IDS, says a remedy for this lack is underway. According to Eisenhauer, a PC now resides in the IDS engineering department, where the top priority project is to develop an interface which will allow automatic printout of PC color screen images. Eisenhauer also points out that the Prism is a modular system, so a buyer could begin with the basic printer ($899), then add the plug-in to upgrade to color capability at a later date.

A color printer that uses a different process is the PrintaColor, from a corporation by that name in Norcross, Georgia. The PrintaColor uses fine jets of color ink shot at the paper to create its image, and it seems better at covering large color areas than the Prism but poorer at text. PrintaColor's unit prints with only three colors of ink, omitting black, and as a result is able to create only a muddy gray-brown where black is desired. Its palette also does not quite match the PC's screen colors. Suggested retail price for the least expensive PrintaColor model is $3,995, and Daniel Byford, a spokesman for the company, says it too is working on an adapter that would allow easy control by IBM PCs.

Yet another option might be a color plotter like that recently introduced by Hewlett-Packard to sell for $1,595. Plotters work by moving colored pens around on a sheet of paper. For displays that are more graphic than text, the H-P plotter seems to do a slicker (if slower) job. But the colorful sample distributed by the company is somewhat misleading. It shows a lovely multicolor set of graphs, but the plotter appears capable of using only two colors at a time without human intervention. A colorful image like H-P's sample would, as we understand it, require several changes of the felt-tip pens inside the machine. The H-P plotter is now on the market, and could be connected to the PC's asynchronous communications adapter or equivalent, but again the lack of software specifically designed to control it means it would not be especially useful to most people.

Look What Apparat has for your IBM Personal Computer.

The following add-ons are available immediately:

- 2 Dual Headed 40 Track Drives – (appears as four) 640K of storage, software patch, easy internal mount. $630.00
- Combo Card – Parallel printer, ASYNC communication (RS-232), and clock calendar functions, uses only one slot. $279.00
- 2 Single Headed 40 Track Drives – 320K of disk storage, easy internal mount. $450.00
- 48K additional RAM – 27 chips plug into master PC board $75.00
- Add-on Memory Card – (uses 64K dynamic RAM chips), 64K – $425.00, 128K – $525.00, 192K – $625.00, 256K – $725.00
- Prom Blaster – Programs most 1K to 4K EPROMS of 25XX and 27XX single or multivoltage, personality modules, read/write software. $149.00
- Apparat Game Diskette – $24.95
- Clock Calendar – Features seconds, minutes, hours, day of week, date, month and year, backup battery, leap year and crystal time base. $129.00
- Prototype Card – 3.5 by 8 inch wirewrap holds 150-14 pin dips. $29.95
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"ON GOING SUPPORT FOR MICROCOMPUTERS"

Lon Poole

COLOR GRAPHICS

A hands-on, how-to introduction to PC BASIC's powerful graphics commands

Discuss computers these days and it's guaranteed that you will hear the words "computer graphics." Computer salespeople, buyers, owners, and ordinary users all agree that a machine's graphics capabilities are a good measure of its worth, and PC votaries are no exception. Not only does the PC have excellent color graphics capabilities when the color graphics adaptor board is installed, but it really is quite easy to include graphics in any PC BASIC program.

What Is Graphics?

Before I discuss programming graphics displays, let's take a look at what computer graphics is. Some people believe that computer graphics is intricate spiral line drawings or blocky, bright-hued cartoons, while others envision the on-screen action of their favorite arcade game. All these viewpoints have one thing in common: they assume that computer graphics are only a means of entertainment.

Although graphics can entertain, they are a powerful aid to comprehension and can inform people in a way that no report can. Most people are intimidated by the profusion of numbers of a typical computer report. Not only do graphics attract, and maintain, a user's attention, but they process raw numeric data and make it easier to understand. Which can you grasp faster, a list of seven-digit numbers or a graph that shows their relative values at a glance?

Of course, graphics can no more replace reports than pictures can replace poems or movies replace novels; exact, to-the-penny numbers document the accuracy of accounting reports. All too often, however, a financial analysis requires poring over columns of dry statistics. That's where a computer graphics program can be an indispensable tool, allowing the computer to wade through the numbers and display a picture of the results on the screen.

A Graphics Application

Let's take a look at a practical application. The BASIC program accompanying this article is based upon one which appears in *Some Common Basic Programs* by Lon Poole and Mary Borchers (Osborne/McGraw-Hill, 1979) and employs the statistical technique of exponential regression to calculate the average growth rate of a value at regular intervals of time, and then to project the extent to which the numbers will increase or decrease in the future. Analysis of this type is useful in evaluating and predicting sales, costs, patronage, and other factors that usually grow or decay at an exponential rate.

This article explores the PC BASIC graphics statements used by the program. You can enter the growth-rate program in the computer as is and use it on any PC equipped for color graphics. A step-by-step analysis of the program itself appears with the program listing, and Fig. 1 shows the starting phase of the program, i.e., the point at which the data on the program works is entered.

Ways To View Your Data

As originally written, the Average Growth Rate program displays the average growth rate percentage and the exact values of future projections. Fig. 2 shows how this looks on a monochrome monitor. Although the projections are only estimates, the exact numbers are not as important as the magnitude of those numbers and the overall trend, features which are easier to see when the data is displayed in graph form.

One way to graph data is to plot each number as an individual point. Fig. 3 shows the data from Fig. 2 in a point graph on a color monitor. The color not only enhances the appearance of the display, but also imparts more information: red points are past data and green points are projections.

Drawing lines between the plotted

Lon Poole, author of several books including The Apple II User's Guide and Some Common Basic Programs, has recently turned his attention to the IBM Personal Computer.

points can further enhance the data. Fig. 4 displays the same data as Fig. 3, but now the red and green dots are connected by colored lines which add more color and make the trends more transparent.

A bar graph of the data in Figs. 2-4 offers a completely different look, as illustrated by Fig. 5. All this color on the screen has a very dramatic impact.

Any one of the preceding graphics displays offers a substantial improvement over the ordinary report format in Fig. 2. The differences between the graphics displays are mostly aesthetic; different people will have different preferences. Fortunately, the PC creates point, line, or bar graphs with equal ease.

PC BASIC Graphics

On the PC, all three versions of BASIC make it easy to transform verbal output to graphics output. Cassette BASIC, Disk BASIC, and Advanced BASIC can all plot points and draw lines and boxes. The only special equipment you will need is a color graphics adapter and a color display screen.

Advanced BASIC has other graphics capabilities as well. It can draw circles, arcs, and ellipses, and can fill in any area of the screen with a solid color. Advanced BASIC requires at least 48K of random access memory (RAM), one disk drive, and IBM's disk operating system (DOS).

Although BASIC graphics on the PC is easy, it's not for the rank beginner, so it's a good idea to practice with some of the staples of BASIC before beginning to use graphics. PC BASIC's graphics statements will augment the standard BASIC statements, but they will not replace them. You still need to know how to use statements such as PRINT, INPUT, FOR, NEXT, DIM, and LIST.

Foreground, Background, and Border

The display screen has three different regions: border, background, and foreground. Background, as the name implies, is the region of the screen on which everything is displayed. When you turn on the PC, the background region is the black part of the screen which can have characters on it. Text and graphics images appear in the foreground, superimposed on the background. The background has a border around it which is not visible when the computer is turned on because both border and background are black The border compensates for variations

The Difference Color Graphics Makes:

Fig. 1.—Data entry for Average Growth Rate (AGR) program

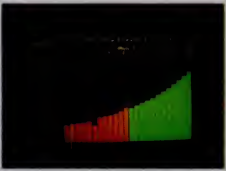

Fig. 5.—AGR program bar graph

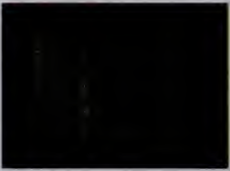

Fig. 2.—AGR program numeric output

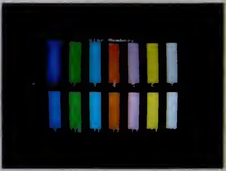

Fig. 6.—Text colors and color numbers

Fig. 3.—AGR program point plot

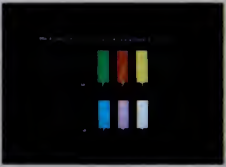

Fig. 7.—Graphics palette and color numbers

Fig. 4.—AGR program line graph

Fig. 8.—A diamond drawn by the listing in text

between different televisions and monitors by providing a safety margin against overscan, the tendency for the image at the edges of the screen to be partially or completely lost.

The COLOR Statement With Text

In PC BASIC, the COLOR statement allows you to specify different colors for foreground text, background, and border.

"Which can you grasp faster, a list of numbers or a color graph that shows their relative values at a glance?"

Colors are specified by number, as illustrated by Fig. 6, which correlates color numbers with actual colors. Color numbers 0 through 7 are available for foreground, background, and border, whereas colors 8 through 15 are available in the foreground for text only. Some color displays will show the same colors for numbers 8 and 0, 9 and 1, 10 and 2, etc., even though the computer sends out different signals. The following statement changes foreground color to magenta:

COLOR 5

The COLOR statement affects only the foreground color of items entered (typed) *after* it is executed; text that is already on-screen will not change color. Any text displayed after a COLOR statement changes foreground color will be in the new color. After executing the statement above, the PRINT statement below will be magenta when it is entered, as will its output when you press the RETURN key to execute it.

PRINT "Waltz of the Toreadors"
Waltz of the Toreadors

The next statement makes the foreground color magenta and the background color blue:

COLOR 5, 1

The background color immediately changes throughout the screen; as before, the foreground color change is not retroactive.

To make the foreground magenta, the background blue, and the border white, use this statement:

COLOR 5, 1, 7

The border color and the background color change at once; the change of foreground color only affects future text.

As you can see from the examples above, the first number in a COLOR statement specifies the foreground color, the second number specifies the background color, and the third number specifies the border color.

Omitting any of the numbers in a COLOR statement results in the color of the item you omitted remaining unchanged. For example, this statement changes the background color to cyan without changing either the foreground or the border colors:

COLOR , 3

Notice the comma ahead of the 3. It indicates that the first number, which selects the foreground color, is to remain unchanged. Two commas ahead of a number mean that it is the third (border) number, and that the first and second numbers, which select foreground and background colors, respectively, are unspecified. For example, to change the border color to green without altering the foreground or background colors, enter:

COLOR , , 2

Text and Graphics Modes

Everything discussed so far pertains only to a display used purely for text, which is called text *mode*. In text mode, any of the 256 characters in the PC character set can be displayed. The presence of the color graphics adapter allows the use of two additional screen modes (in BASIC), both of which are graphics modes. In these modes you can plot single points; draw lines, boxes, circles, and arcs; and color the interior of delineated areas. The addition of these abilities allows a user to construct elaborate pictures which can be displayed together with any of the 256 text-mode characters.

The PC BASIC graphics modes differ only in the number and size of the points displayed and in the number of colors allowed. *High-resolution* mode divides the screen into more points than *medium-resolution* mode; consequently, high-resolution points are about half as wide as medium-resolution points. High resolution is strictly black and white, whereas medium resolution allows as many as four different colors to be used on the screen concurrently.

Switching Screen Modes

The SCREEN statement allows a user to switch between text and graphics modes. The following statement switches to medium-resolution graphics:

SCREEN 1

This statement switches to high-resolution graphics:

SCREEN 2

To switch back to text mode, use this statement:

SCREEN 0

The SCREEN statement erases the screen and sets the foreground color to white, the background and border colors to black. (Although the SCREEN statement offers other options, in this article we'll use only the simpler forms shown above.)

The COLOR Statement With Graphics

The COLOR statement is actually two statements in one. COLOR works one way in text-mode, another way in the medium-resolution graphics mode, and is illegal in high-resolution graphics mode, in which the foreground color is always white and the background and border colors always black.

In medium-resolution graphics, the COLOR statement has no border color

"You can plot single points; draw lines, boxes, circles, and arcs; and color the interior of delineated areas."

specification. The border is always the same color as (and thus is indistinguishable from) the background, which can be any of the 16 colors in Fig. 6. The choice of medium-resolution foreground colors is limited, and the scheme for specifying them differs markedly from the text-mode scheme.

The COLOR statement chooses one of two sets of medium-resolution foreground colors; these sets are referred to by IBM as *palettes*, and each has four colors. Once the palette is chosen, the statements which actually plot and draw on the medium-resolution graphics screen can choose individual colors from it. To understand the parameters of the palette's use, imagine an artist painting a picture. She has two palettes of paint on her

Average Growth Rate Program

```
10 KEY OFF
20 CLS
30 WIDTH 40
40 DIM F(24)
50 PRINT "      Growth Rate and Projections"
60 PRINT
70 PRINT
80 PRINT "    This program analyzes sales or other figures from past months,
           computes an average growth rate, and projects future figures.
           You specify the number of past and future months.";
85 PRINT "  The total number of months cannot exceed 24."
90 PRINT
100 PRINT
200 INPUT "How many past months";M
210 INPUT "How many months to project";P
220 IF M+P>24 THEN PRINT :PRINT "ONLY 24 MONTHS TOTAL, PLEASE!":GOTO 100
230 PRINT
240 PRINT "Now enter amounts for past months:"
250 PRINT
260 FOR J=1 TO M
270 PRINT "Month";J;
280 INPUT F(J)
290 NEXT J
300 T=LOG(F(1))
310 V=0
320 FOR J=2 TO M
330 L=LOG(F(J))
340 T=T+L
350 V=V+(J-1)*L
360 NEXT J
370 A=6*(2*V/(M-1)-T)/M/(M+1)
380 A=EXP(A)-1
390 AGF=EXP(T/M-A*(M-1)/2)
400 FOR J=M+1 TO M+P
410 F(J)=INT(AGF*(1+A)^(J-1)+.5)
420 NEXT J
430 MIN=F(1)
440 MAX=F(1)
450 FOR J=1 TO M+P
460 IF F(J)>MAX THEN MAX=F(J)
470 IF F(J)<MIN THEN MIN=F(J)
480 NEXT J
490 S=168/(MAX+MIN)
1000 CLS
1010 FOR J=1 TO M+P
1020 IF J>M+P THEN J=24:GOTO 1050
1030 PRINT
1040 PRINT "Month";J;TAB(10);F(J);
1050 NEXT J
1060 PRINT TAB(18);"(Growth Rate:";INT(A*10000+.5)/100;"%)";
1100 GOSUB 2000
1110 FOR J=1 TO M+P
1120 IF J>M THEN C=1
1130 PSET (J*11+45,200-INT(S*F(J))),C
1140 NEXT J
1200 GOSUB 2000
1210 PSET (56,200-INT(S*F(1))),C
1220 FOR J=2 TO M+P
1230 IF J>M THEN C=1
1240 LINE -(J*11+45,200-INT(S*F(J))),C
1250 NEXT J
1300 GOSUB 2000
1310 FOR J=1 TO M+P
1320 IF J>M THEN C=1
1330 LINE (J*11+45,200)-(J*11+54,200-INT(S*F(J))),C,BF
1340 NEXT J
1400 A$=INPUT$(1)
1410 SCREEN 0,0,0
1420 RUN
2000 A$=INPUT$(1)
2010 CLS
2020 SCREEN 1,0
2030 COLOR 0,0
2040 C=2
2050 PRINT "         Average Growth Rate Is ";INT(A*10000+.5)/100;"%"
2060 PRINT "Amount"
2070 PRINT "  !!   <---------- Month ---------->";
2080 PRINT "  \/   1  3   6   9   12  15  18  21  24";
2090 FOR J=5 TO 25 STEP 5
2100 LOCATE J,1
2110 PRINT INT((168-(J/5-1)*40)/S+.5);
2120 NEXT J
2130 RETURN
```

work table, but can only hold a single palette at a time. When she chooses to use one palette, she can only paint with the colors on it. In order to paint with the colors on the other palette, she must put down the one she is holding and pick up the other. The medium-resolution graphics display works in the same way, but with one variation—when a user changes from one palette to another, the colors on the screen change from the colors of the first palette to the colors of the second.

"It's really quite easy to include graphics in any PC BASIC program."

As you might expect, the palettes are numbered zero and one, and the colors on them are numbered from zero to three. Fig. 7 correlates actual colors with palette and color numbers. Notice that on each palette, color numbers 1, 2, and 3 are fixed. Color number 0 is, *de facto*, fixed, since it is always the same as the current background color. Text printed on a medium-resolution screen appears in palette color number 3, i.e., either in yellow or in white.

In medium-resolution graphics mode, there are only two numbers in a COLOR statement: the *first* sets the background color and the second chooses the palette for foreground color. Yes, this specification format is the opposite of the COLOR statement in text mode. Remember, the border color is the same as the background color, so there is no third number. Assuming a SCREEN 1,0 statement has been executed to put the screen in medium-resolution mode, the following statement selects a blue background and chooses palette 0:

COLOR 1, 0

The currently active background color can be retained and the palette number changed by omitting the background color specification:

COLOR , 1

When the COLOR statement is executed in medium-resolution graphics mode, both background *and* foreground colors change immediately and retroactively—unlike in text mode, in which foreground color changes are not retroactive. For example, if some items were drawn in green, red and yellow using palette 0,

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The COLOR statement chooses one of two sets of medium-resolution foreground colors; these sets are referred to by IBM as *palettes*, and each has four colors. Once the palette is chosen, the statements which actually plot and draw on the medium-resolution graphics screen can choose individual colors from it. To understand the parameters of the palette's use, imagine an artist painting a picture. She has two palettes of paint on her work table, but can only hold a single palette at a time. When she chooses to use one palette, she can only paint with the colors on it. In order to paint with the colors on the other palette, she must put down the one she is holding and pick up the other. The medium-resolution graphics display works in the same way, but with one variation—when a user changes from one palette to another, the colors on the screen change from the colors of the first palette to the colors of the second.

As you might expect, the palettes are numbered zero and one, and the colors on them are numbered from zero to three. Fig. 7 correlates actual colors with palette and color numbers. Notice that on each palette, color numbers 1, 2, and 3 are fixed. Color number 0 is, *de facto*, fixed, since it is always the same as the current background color. Text printed on a medium-resolution screen appears in palette color number 3, i.e., either in yellow or in white.

In medium-resolution graphics mode, there are only two numbers in a COLOR statement: the *first* sets the background color and the *second* chooses the palette for foreground color. Yes, this specification format is the opposite of the COLOR statement in text mode. Remember, the border color is the same as the background color, so there is no third number. Assuming a SCREEN 1,0 statement has been executed to put the screen in medium-resolution mode, the following statement selects a blue background and chooses palette 0:

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The currently active background color can be retained and the palette number changed by omitting the background color specification:

COLOR , 1

When the COLOR statement is executed in medium-resolution graphics mode, both background *and* foreground colors change immediately and retroactively—unlike in text mode, in which foreground color changes are not retroactive. For example, if some items were drawn in green, red and yellow using palette 0, switching to palette 1 immediately changes them to cyan, magenta, and white, respectively.

Graphics Screen Coordinates

In order to display points, lines, boxes, and so forth, the computer needs to know where they go, which requires that it be given a definite description (unique identifier) of every point on the screen. Imagine that a piece of graph paper is superimposed on the screen and that each box on the grid corresponds to one graphics point. By numbering the rows and columns, any box can be described by giving its *coordinates*, that is, its column and row numbers. That is exactly the way points on the graphics screen are identified. Column numbers begin with zero at the left edge of the screen; the rightmost column is 319 in medium-resolution graphics, 639 in high-resolution. In both graphics modes, the top row is zero and the bottom row is 199.

The PSET Statement

Neither the COLOR nor the SCREEN statements alone creates graphics images on the screen, but only condition the screen for the medium- or high-resolution graphics to follow.

The PSET statement plots a single point on the graphics screen at any given coordinates and uses the same format in either graphics mode. The following statement will plot a point at the intersection of column 45 and row 10:

```
PSET (45,10)
```

A color number is optional in the PSET statement. When it is absent in medium-resolution mode, color 3 (yellow or white) is used. If the PSET statement has no color specification in high resolution, it plots a white point.

To specify a color in a PSET statement, add a comma and the color number after the coordinates. In medium-resolution graphics, the color number (0 through 3) chooses one of the four colors from the active palette (see Fig. 6). In high-resolution graphics, an odd color number chooses foreground color (white) and an even color number chooses background color (black). For example:

```
PSET (180,150),1
```

In medium-resolution graphics, the statement above plots a green or a cyan point, depending upon which palette is active. In high-resolution graphics, the statement above plots a white (foreground) point.

The LINE Statement

In addition to plotting points, all versions of PC BASIC have LINE, a powerful statement which draws straight lines as well as empty and solid-color boxes.

Given that any two points define a straight line, it stands to reason that the LINE statement must include the beginning and ending points of a line. The straightforward way to do this is to specify the coordinates of both:

```
LINE (50,150)-(1,10)
```

The statement above draws a straight line from the point at column 50, row 150 to the point at column 1, row 10.

Line color is specified in the same way in the LINE statement as it is in the PSET statement. Following the end-point coordinates, add a comma and the color number. In medium-resolution graphics, the color number chooses one of the colors from the active palette; in high-resolution graphics, an odd number chooses foreground color and an even number chooses background color. If the color specification is absent, as in the example above, color number 3 is used in medium-resolution graphics. If it is absent in high-resolution graphics, the foreground color is used.

```
LINE (50,70)-(70,90),,BF
```

The statement above creates a square the same size and in the same locations as the empty one created earlier. The only difference is that this square is solid red or magenta (depending on which palette is active) in medium resolution. In high resolution, the statement above draws a solid black square, thereby erasing the screen in the area it covers.

Numbers, Variables, and Expressions

In the interest of simplicity, all of our examples have used numeric constants to specify color numbers and coordinates; however, variables and expressions are also allowed. Fractional values are rounded to the nearest whole number. The Average Growth Rate program listed at the end of this article demonstrates the power of variables and expressions in graphics statements.

Relative Coordinates

There are two ways to specify a point. Until now, we have always stated the actual column and row numbers of each point, which is known as the *absolute form* of coordinate specification. The alternative, called the *relative form*, specifies coordinates relative to the last point plotted. When the word STEP precedes the numbers in parentheses, it means those numbers are *offsets* to the coordinates of the last point plotted. Consider these two PSET statements:

```
PSET (40,23)
PSET STEP (10,-3)
```

The first statement above uses absolute form. It plots a point at column 40, row 23. The second statement above uses relative form. It plots a point which is 10 columns to the right and 3 rows up from the previous point plotted, i.e., at column 50, row 20.

You can use either the absolute or relative form to specify the coordinates of any point. Of course, you must use absolute form for the first point you display, since there is no previous point to be relative to.

Now that you have been introduced tc the individual statements of PC BASIC graphics, you can refer to the Average Growth Rate program and see how they work in actual practice.

Average Growth Rate Program

(See page 78)

This program has nine parts: setup, input, computation, verbal output, point graph output, line graph output, bar graph output, conclusion, and headings subroutine. To make it easy to identify and separate the parts, each is shown in a different color.

The first part of the program (lines 10-100) performs various housekeeping chores. First, the program turns off the bottom-line display of the function key uses (line 10). Next it clears the screen and sets screen width to 40 columns (line 20 and 30). After that, it dimensions a single-precision numeric array (line 40). Here and elsewhere, the program indolently uses single-precision variables where integer variables would suffice. Next, the program displays a title and instructions (lines 50 through 100).

Lines 200 through 290 input data. The program user must break down the 24-month analysis period into past and future (lines 200 and 210). The total number of past and future months cannot exceed 24 (line 220). After that, the user must enter a figure for each past month (lines 230 through 290).

Lines 300-490 perform the exponential regression on the entered data (lines 300 through 390). Next, the program projects future figures (lines 400 through 420). After that, it computes a scaling factor for the graphic output (lines 330 through 390). To do this, it must find the highest and lowest figures among the past and future figures (lines 400 through 490). Then it divides the graph height, 168, by the sum of the highest and lowest figures (line 490). The result is a scaling factor which will allow all figures to appear on the graph.

Lines 1000-1060 display the exact amount of past and future figures for each month in the analysis.

Lines 1100-1140 use the PSET statement to plot a single point for each past and future figure in the analysis period. Variable C determines the color of the point.

Lines 1200-1250 use the LINE statement to draw a line from one figure to the next. A PSET statement plots the first start point (line 1210). Variable C again determines the color of the point.

Lines 1300-1340 use LINE statements to construct solid-color boxes, one for each past and future figure. The width of each box is the same but the height varies according to the magnitude of the figure. Once more, variable C determines the color of the point.

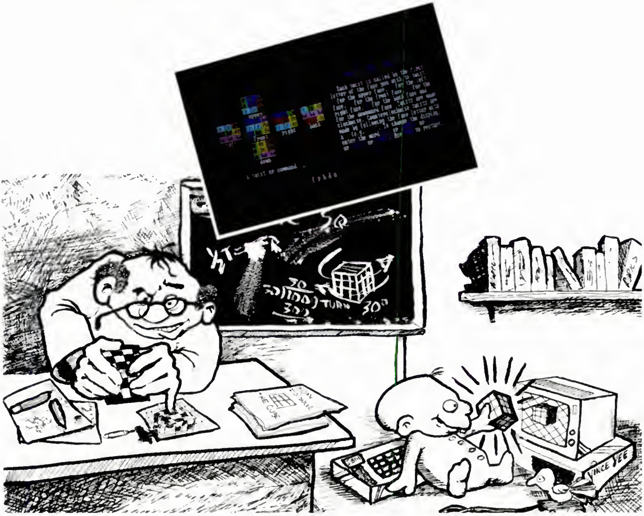
Lines 1400-1420 pause for the user to press any key, then reset the screen to text mode and end the program.

Lines 2000-2130 are a subroutine. It first waits for the program user to press any key (line 2000). Then it clears the screen, sets medium resolution graphics mode, and chooses a black background and foreground palette 0 (lines 2010 through 2030). It sets variable C to specify color 2, red (line 2040). After that, it displays a screen title together with column and row headings (lines 2050 through 2120).

Karl Koessel

MAGIC PCUBE

A simulation of Rubik's Cube on the IBM PC



To try out several features of PC BASIC in an actual program of some complexity, Programming Editor Karl Koessel decided to develop a computer simulation of the popular Rubik's Cube puzzle. The program demonstrates how it is possible to make a 'model' whereby a computer program mimics the behavior of a physical object. The inner workings of the program depend on the MOD arithmetic function that is one of PC BASIC's enhancements. (MOD tells you the value of the remainder after you divide one number by another.) Koessel also designed the program to detect whether a system is set up for color or monochrome display.

For the color-display version, Koessel took advantage of the many color and appearance variations PC BASIC allows. Though perhaps at some cost to its speed, the program also uses the long variable names and formatting abilities PC BASIC permits to improve a program's understandability. It contains no features from the Disk or Advanced versions of BASIC and, with remarks deleted, will run on a PC with 16K of memory. Following is Koessel's description of the program, with some sample displays and excerpts from the program itself. For details on getting a copy of the complete program, see the end of the article.

The 'Magic Cube' has become quite popular since its days as a tool for Ernö Rubik, a teacher of architecture and design at the School for Commercial Artists in Budapest. Rubik used the cube to sharpen his students' ability to visualize three-dimensional objects. (Douglas Hofstrader has an excellent article expounding both the cube's mechanical structure and its mathematical characteristics in the March 1981 *Scientific American*.)

The Magic Cube has six differently colored faces, each with nine 'cubies' in a three by three matrix. Initially, each face is one color, all the cubies on a face the same. But each face may be rotated about its center, moving each cubie of that face (except, of course, the center cubie) to a different position on that same face. Although this face may remain one color after the turn, the rotation will also move the three closest cubies of the four bordering faces, mixing the colors on those faces. After twisting a few faces, the col-

```
1099 '*************************    DISPLAY PRINTING ROUTINE    *****************
1100 FOR FA= 1 TO 6
1110 FOR P=0 TO 8
1120     LOCATE X(FA)+XOF(P),Y(FA)+YOF(P)
1130     BR=BR(FIX(CUBIE(FA,P,1)\10))
1140     IF BR THEN COLOR CUBIE(FA,P,2)*-16,BR:GOTO 1160
1150     IF CUBIE(FA,P,2) THEN COLOR 0,7 ELSE COLOR 7,0          :'Highlights ?
1160     IF DM THEN PRINT USING"\\";CUBIE$(FA,P,DM);
         ELSE PRINT USING"##";CUBIE(FA,P,1);          :'Print chosen display type
1169 '****   These lines make for a cleaner display as colors/highlights change
1170     IF P=1 OR P=2 THEN ND=1:GOSUB 1240
1180     IF P=8 OR P=0 THEN ND=4:GOSUB 1240
1190     IF P=7 OR P=6 THEN ND=-1:GOSUB 1240
1200 NEXT
1210 NEXT
1220 COLOR 7,0                               :'Normalize foreground, background
1230 RETURN
1239 'Find proper colors for each side of space between cubies
1240     IF BR THEN COLOR BR,BR(FIX(CUBIE(FA,(P+ND) MOD 12,1)\10)) ELSE 1260
1250     PRINT CHR$(221);:GOTO 1280
1260     IF CUBIE(FA,P,2)=CUBIE(FA,(P+ND) MOD 12,2) THEN 1270 ELSE COLOR 7,0
1270     PRINT " ";
1280 RETURN
1299 '*************************    CLEAR PROMPT/INPUT LINES    *****************
1300 LOCATE 14,1:PRINT "One moment, please..."SPC(79)SPC(39)SPC(39)
1310 RETURN            :'Clears lines 14 & 15; also if WIDTH 40 clears line 16
1399 '*************************    TURN OFF HIGHLIGHT FLAGS    *****************
1400 FOR J=1 TO 4
1410     FOR K=1 TO 3
1420         CUBIE(FACE(J),((POSITION(J)+K-2) MOD 8)+1,2)=0
1430     NEXT
1440 NEXT
1460 FOR P=1 TO 8
1480     CUBIE(F,P,2)=0
1490 NEXT
1500 RETURN
```

This program section displays the newly changed cube diagram on the screen after a twist.

```
1799 '*************************    PREPARE TO TURN OUTER CIRCLE    *************
1800 FOR J=1 TO 4
1810     FOR K=1 TO 3
1820         'Set cubie values in holding cells
1830         HOLD((J-1)*3+K)=CUBIE(FACE(J),((POSITION(J)+K-2) MOD 8)+1,1
1840         'Turn on highlight flags
1850         CUBIE(FACE(J),((POSITION(J)+K-2) MOD 8)+1,2)=-1
1860     NEXT
1870 NEXT
1880 RETURN
1899 '*************************    FINISH TURNING OUTER CIRCLE    **************
1900 FOR J=1 TO 4
1910     FOR K=1 TO 3
1920         CUBIE(FACE(((J+OSO) MOD 4)+1),((POSITION(((J+OSO) MOD 4)+1)+K-2)
         MOD 8)+1,1)=HOLD((J-1)*3+K)                  :'New value of each cubie
1930         FOR DM1=1 TO 2                           :'Associated names follow
1940             CUBIE$(FACE(((J+OSO) MOD 4)+1),((POSITION(((J+OSO) MOD 4)+1)
             +K-2) MOD 8)+1,DM1)=PLACE$(DM1,FIX((HOLD((J-1)*3+K))\10)))
1950         NEXT
1960     NEXT
1970 NEXT
1980 RETURN
```

This section of the program keeps track of the bordering faces of the cube to be changed when a twist is ordered.

ors become quite scrambled. Note that no matter which face is twisted, the center cubie of each face maintains its orientation to the other center cubies and, assuming we do not turn the entire cube but only the faces, each center cubie never changes its position.

The challenge of the Magic Cube is to reorder the scrambled colors to their original segregated state. This is very difficult. But, by keeping track of the twists performed, we may learn 'sequences' that swap the colors of certain cubies while leaving the other cubies undisturbed after the sequence is completed.

In "Notes on Rubik's 'Magic Cube'" by David Singmaster, the faces have been given names. Because any two cubes may have different colors, or colors that are arranged differently, the faces are named not by color but by place. From Singmaster's convention, the faces are called 'upper', 'left', 'front', 'right', 'back' and 'down'. A 90-degree rotation of a face is called a 'twist'. Clockwise twists are named by the single letters 'U', 'L', 'F', 'R', 'B' and 'D' respectively, designating the face twisted. Counterclockwise twists have the same notation plus a prime (the single close quote) following, as in 'L'.

The program begins by asking you to give each face an arbitrary color (on the monochrome display, simply the name of a color). It then prints brief instructions, displays the Magic Cube unfolded on the screen as six faces of nine cubies each and asks for a twist or command.

Below each face is its name. These names may be erased (or, if off, reprinted) by entering the command 'LABELS'.

Each cubie is represented by two consecutive characters. Initially, they are the first two letters of the names of the faces, but they may be replaced by code numbers (used by the program) or by the first two letters of the names of the colors you gave each face. To change to these different types of display, enter the command 'CODES', 'COLORS' or 'FACES'.

For those with a color display, the cubies have assigned background colors. And an additional command, 'BIG', changes the size of the display from small characters to large or vice versa. The instructions fit only in the WIDTH 80 display mode.

To twist a face clockwise, enter a single letter naming the twist, such as 'R'. To twist a face counterclockwise, the single letter name must be followed immediately by the prime 'R''. The program then highlights the cubies that will be changing positions by printing them in reverse

"The challenge of the Magic Cube is to reorder the scrambled colors to their original state."

characters (black on white) on a monochrome display or by blinking them on a color display. A second question asks if it is okay to proceed before performing the twist by updating the display. Then a list of the twists made so far is printed on the lower portion of the screen, and the program returns to ask for another twist or command.

The program will also respond to one other command. When you enter 'NEW', the program restores the cube to the starting configuration and erases the twists.

One last note for programmers and mathematicians: because of the circular nature of the twists and of the cubies around each face, the program makes ample use of a new BASIC function found on the IBM Personal Computer. This function performs modulo arithmetic (also known as 'clock math'). See the IBM BASIC manual, pages 3-21.

For a copy of the Magic PCube program . . .

The complete program for Karl Koessel's simulation of the Rubik's Cube is several hundred lines long—too long to print here in its entirety. PC will make copies available in either printed or disk form to readers who want them. Mail requests to *Cube Program, PC, 1528 Irving Street, San Francisco, CA 94122.* For printed copies, send $3 with a self-addressed, business-size envelope. For disk copies, send $10 with a blank, PC-formatted disk in a suitable mailer with a self-addressed return label. Make checks payable to Karl Koessel.

A Tale of Two Beginnings

Charlie Hoerner, corporate pioneer and Gary Moonert, private entrepreneur.

Charlie Hoerner and Gary Moonert are helping to spread the word and the applications of the PC, even though neither man works for IBM. In fact, these two advocates of microcomputers are working in different areas of society: Gary's principal interest is in helping bring this technology to new individual users, while Charlie is concentrating on uses for the computer within a large corporation. Both are at the beginning of a promising new venture, and the PC is a central figure in their stories.

Charlie Hoerner

Charlie Hoerner of Foremost McKesson

Hoerner works in the Information Services department of Foremost-McKesson, the largest drug wholesale distributor in the United States. Several years ago, the corporation significantly improved its operations and earnings by computerizing many basic operations (*Business Week*, December 7, 1981). Since making the step into large-scale computing, the corporation has begun a program of utilizing small computers both as part of its office automation program and as management tools.

That's where Charlie Hoerner comes in. The coordinator of corporate activities in office automation, he has also assumed the task of introducing, evaluating and developing uses for the five IBM Personal Computers that Foremost-McKesson has purchased. Hoerner points out that these pilot machines are expected to be the first of a series to be purchased by the company: "We're estimating that there's a good likelihood of another 15 to 20 machines going in throughout the corporation within the next six to twelve months," he says.

Economy is a major consideration in the corporation's anticipated purchase of 20 or more of these desktop computers. As Hoerner notes, "We don't know what all of the applications are going to be. One thing we do anticipate, however, is that they're going to expose people to some of the potentials of computing in a way that previously wasn't economically possible."

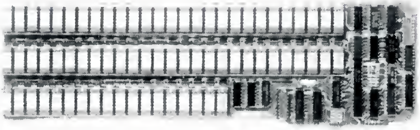
VisiCalc Is Key

At present, the main application of the PC at Foremost-McKesson is financial analysis and calculations—and the reason for the PC's immediate utility in these areas is the *VisiCalc* program.

One of the firm's PCs is in the Treasury department, where financial projections and analyses must be based on formulas or assumptions that can change rapidly. Hoerner believes that the greatest number of requests for more PCs will come from areas of the corporation involved in financial planning, specifically, from *VisiCalc* users. "The greatest interest that we've seen comes from people who have to do a lot of financial analysis, people who are dealing with a lot of change and want to be able to evaluate all the alternatives. You can't write a program using conventional programming languages, with a programmer sitting there, and have it change back and forth and be that flexible."

Another of the five microcomputers is used by the planning and analysis group within the corporation, and the remaining three PCs are presently being used by Hoerner and two other members of the Information Services department. A sixth PC will be added in a New York office of the company and will utilize communications hardware and software to exchange financial data with the San Francisco headquarters. One initial use of this coast-to-coast hook-up will be to monitor foreign currency rates, which change frequently and thus can affect the firm's day-to-day operations.

Would you or someone you know be a good subject for a ***PC Profile?*** *PC welcomes suggestions for people to be featured in this series—anyone whose use of an IBM Personal Computer would prove interesting or helpful to readers. Send your recommendations to PC Profiles, 1528 Irving Street, San Francisco, California 94122.*



All five people evaluating the uses of he machine at corporate headquarters iave some experience with computers; he three Information Services staff nembers have data processing back- rounds, and the two treasury and plan- iing people have personal computers at iome, although neither has a PC. So, to late, the PC users at Foremost-McKesson ire not novices.

Hands-on Learning

That situation is changing quickly, iowever, according to Hoerner. He has pent several weeks giving demonstra- ions of the PC to interested departments, ind his standard technique has been to et an inexperienced volunteer actually perate the computer as that person's co- vorkers look on. "It lets the person using he machine know there's nothing magi- al going on at the keyboard," he reports. 'It's hard to keep an eye on the screen ind see what keys are being pushed at he same time. And for the people watch- ng, they know that person doesn't know iny more about it than they do—so that akes away the mystery."

When presenting this unfamiliar tech- iology to a group, Hoerner lets the com- iuter do most of the work. "I've set up the lemonstrations to be very straightfor- vard, such as using the auto-execute unction so that all you have to do is load n the diskette and turn your back on it. And while I'm talking, they hear all this eeping and clicking going on, and all of sudden, a menu comes up on the creen. That's very clear-cut—you don't iave to worry about it at all. People enjoy hat."

In addition to the financial planning ctivities presently employing the IBM Personal Computer, word processing is nother area of strong interest within the ompany, according to Hoerner. At pres- nt, however, he is not able to place a sys- em in a department for that purpose, be- ause he has not found satisfactory oftware. "We're looking forward to VordStar," he states. "We tried *Easy- Vriter* [the word processor sold with the ystem by IBM and the only one presently vailable] and we decided it was just $175 lown the drain. It just wasn't useful nough."

Even when more versatile word pro- essing software is available, Hoerner loes not expect the PC to replace the mall number of dedicated word proces- ors presently in use by the corporation. "I don't see the PC replacing word pro- cessing in high-volume work, since I find it hard to imagine that something that's a general-purpose computer using 'over- the-counter' software is going to replace something that was custom-designed from the ground up to serve a secretarial function."

Hoerner points out that one primary advantage of a dedicated system is its ease of learning and use. "If somebody has to remember that F16 means this in one application, and that in another, the system is just not as easy to operate as a dedicated word processor, which has clearly labeled function keys that say 'Find' or 'Go To' and that serve a particu- lar function. So it's worth paying the extra money for a dedicated word processor in those situations."

"With the right applications, I can envision an excellent tool for managers."

A Management Tool

However, if clerical functions are not, at present, a likely application of the PC, managerial functions are. "The purchase price, to my mind, is reasonable enough that, with some discounting and with the right applications, I can envision a system that's an excellent tool for managers. It must have the software, though, including a good word processor that's simple; it doesn't need a lot of fancy features, but it must be easy to use. Such a system must also have versatile communications capa- bilities that allow a manager to use time- sharing networks, to upload and down- load files, to bring in files, and to pass things to *VisiCalc* and to other comput- ers."

Before this potential can be realized within the company, Hoerner believes that further development and evaluation will be necessary. "I see the potential for the PC as a desktop computer for manag- ers, but I think the corporation is going to have to take that on as a project and make that happen and then hand it over to the manager as a finished product—not just give him a bunch of boxes and say, 'Here, have a good time.' Not only doesn't the manager have the time to do it, but you're reinventing the wheel at every place."

"Reinventing the wheel" may also be an apt description for setting up the PCs when a bulk order is received, Hoerner recalls. "When you make a multiple order from the company, not from a store, you get one big box for each component, and then you get a box of spare parts. Each little part has a number on it, and there are instruction manuals for putting them together."

Setting Up Is Hard To Do

Considering that the basic computer comes with 48K of memory, and most business users routinely order the 16K ex- pansion kit to have 64K of memory, in- stalling the spare parts isn't a mere matter of slipping a board into a ready slot. "When you do the memory expansion," he says, "you've got to put in these nine integrated circuits. All the IC's have legs that are a little bit flared, and all the sock- ets are lined up directly below, so the odds of somebody who's never seen a ma- chine like this getting them all in without bending a pin or breaking it off are rela- tively small. You have to roll the thing and get the pins so they're straight up and down and then guide the IC into the holes.

Except for these problems with setting up the PC, Hoerner has been well satis- fied with the computer. "I'm very im- pressed with the reliability of it and I haven't had any trouble," he states.

Hoerner recognizes the necessity for a trade-off between maintaining low prices for multiple orders of the system and the customer's responsibility for assembly. In fact, he predicts that increased user in- volvement is a trend in this business. "I recognize the way the industry's going, and this is one of the things that's going to be new. Providing installation, on-site training, and field support for everything that goes wrong has become an intoler- able expense for companies making hard- ware with prices this low—especially hardware that's sold, not rented. So the upshot is, if you're going to get that price on something, you're going to have to put up with the inconvenience and learn to do it yourself."

Hoerner is confident that he and his associates can weather the initial storms of installation and fashion a useful and reliable system around the PC. However,

(Continued on page 95)

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Gary Moonert

at present, he is less certain about the software. He has written several programs in BASIC to help him demonstrate and evaluate the machine, and he has modified the minimal communications program that is part of the PC's DOS. But he is not impressed with the separate communications software distributed by IBM, and this capability is essential if the PC is to be widely used within Foremost-McKesson.

"The communications software is pretty primitive right now," he observes. The major disadvantage, according to Hoerner, is that the IBM communications software does not make it easy to "upload and download" data between your personal computer and the remotely located host computer. "You can exchange with another PC or you can function as a certain terminal for a host system—but not both. I was very surprised that they released the software this way."

Like many other PC users, however, he is anticipating that many software developers will step in to fill the void. "As far as the software goes," he predicts, "you can only hope. I'm guessing that the PC market's going to be big enough that we're going to see tons and tons of software coming down the chute within the next year."

Because he believes that the IBM PC will find a valuable place within Foremost-McKesson, Hoerner has begun to develop the integrated system of hardware and software that staff members will need. "I've already started sketching some ideas for design considerations, and I'll be hiring someone soon. One of the criteria for the job is that they know BASIC. We'll be writing some experimental software to go with what we presently have for the computer."

Hoerner has one other long-range hope for this personal microcomputer and his work. "There's one more area that I'm kind of dreaming about," he confides. "I don't know how soon it's going to come, but it seems inevitable. And that has to do with the interface between home and office. If people have equipment at home that's compatible with what they have at the office, all of a sudden it expands their capabilities and flexibility. Although it has an inherent risk, in that people might be tempted to work 24 hours a day, the potential rewards include the ability to do some work at home and thus to avoid some of the commuting hassle. Given rising energy costs, it's about time we started looking for alternatives along this line."

Gary Moonert, Technology Consultant

Gary Moonert is another seeker of alternatives, and his plans center around the home-work strategy that is Charlie Hoerner's dream. Specifically, Gary is forming a company to advise individuals about technology on a personal level. "What I really want to get down to doing," he notes, "is being the technology assessment expert for the average person. They might come to me and say, 'I think I want a computer,' and I'll listen to them and ask questions and offer alternatives at different prices and with different features."

Although he has worked as a data processing professional for 15 years and currently is employed by a major California bank, Moonert's new career focuses on individuals. "My specific interest is in advising the individual," he states. "The corporations have people to give this assistance, and if they don't, they have IBM to tell them. But the public doesn't have this kind of help."

As the first step in educating himself in personal computers, Moonert bought a PC from one of the ComputerLand stores. His system includes the computer with 64K of memory, the companion dot-matrix printer, the mono display, and the color graphics component so that he can use his color television as a monitor as well. He also purchased two disk drives, the DOS system, and *EasyWriter*.

Like Hoerner, Moonert had the specific intention of evaluting the PC for its strengths, weaknesses, and applications for general use. The difference is that he'd like to see computers in the hands of housewives, kids, and anyone else who doesn't come into contact with this technology on a regular basis. His perspective is that these machines, together with the other electronic marvels available today, are truly tools for all of us.

Technology as Friend

"I use the term 'technology' in the most magnanimous of spirits," Moonert points out. "When I say that word, I'm removing it from the arena of mainframe computers; I'm talking about a whole world that is ultimately there to serve everybody."

Nor is his focus limited to computers: "It's not just computers' it's what I consider to be technology as it's going to relate to everybody: television as components, such as a color TV that is also a monitor for the computer; the telephone that links you to many things; stereo that could work with the television components. All these things can be part of a system that is planned for each person according to his needs, taste, and budget."

These interests have been part of Moonert's thinking for a long time, and his present job involves improving the relationships between computer professionals and people in the bank who utilize their services. Now he hopes to take his services "beyond the walls of the corporation," as he puts it, and IBM's introduction of the Personal Computer told him that the time had come to launch his new career.

"Actually, as a career for me, this was something I looked at and didn't take seriously as being do-able until IBM sort of sanctified personal computing by making this machine. Now I've bought the computer, taken it home, played with it,

"If people have equipment at home that's compatible with what they have at the office, all of a sudden it expands their capabilities."

opened the cover, looked inside and said, 'This is a personal computer. Never mind that the marketing emphasis isn't on individual home computing use right now. It's there. It's capable of doing recipe archiving, music, and other things that business users aren't going to do with it, by and large.' "

Priority Number 2

Moonert believes that despite the PC's obvious utility as a versatile home computer, IBM has not yet included the individual user in its marketing efforts. "It appears to me that IBM's marketing and literature is directed toward the small-business user whose computer needs are similar to those of the company's traditional customer base. I don't yet see the thrust from IBM to place the Personal Computer in the homes of the public. I think that will come, but it's priority number two for IBM. I think they're very cagey, in a marketing sense; they have an immediate marketplace that they can center their attention on—the corporations, banks, and so forth. They can sell a hundred or five hundred to these places. When they feel that they've more or less saturated that market segment, they'll get more serious about the system's ultimate marketplace, which is the personal computer user. In other words, I think this machine was accurately—and strategically—named for a purpose the IBM is some time away from."

Though his purpose in assessing the PC is different from the business thrust he sees dominating IBM's present marketing strategy, Moonert has some of the same reservations about the system as Charlie Hoerner. The biggest problem for both men in trying to evaluate the potential of this system is the lack of applications software.

"My perspective on behalf of my ultimate client is that I could see a lot of reasons for a more integrated approach to the whole system," he states. "It's a large disappointment to me that you can't easily transfer files between *EasyWriter* and DOS—they are independent systems. I can't imagine why in the world they constructed it that way."

Software Solutions

Although Moonert's data processing experience includes programming, and he has written some programs for his own use on the PC, he does not plan to join the ranks of software developers. "I look around at the record of other personal computer implementations and users," he observes, "and there's obviously been a large amount of bright, generally young talent that has seized the TRS-80, the Apple, and the Atari. Those people are a talent base who are dying to do what needs to be done for the PC, and I am waiting for them to do it. Programming is not my primary area of interest, and it's not where I feel my talents, and therefore my contributions, ultimately lie."

Instead, Moonert is content to wait until the software and integrated system comes of age for the PC, and he believes that that won't be long. "The IBM PC industry is in its infancy, and I don't have to make my living at this new career yet. I'm willing and able to wait until the industry is right for me to do what I want to do. It's only a matter of time. I have the feeling that it's not years, but months, or in some cases, even weeks. The kids down at ComputerLand playing on the machines are one layer of it, but more importantly, it's the hobbyists—or latent hobbyists—inside corporations like IBM who are the brightest minds going and who have been waiting for something like this to roll around. They will come up with things for the PC that are mind-boggling."

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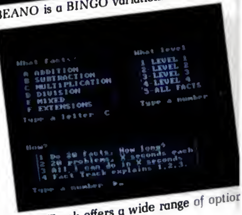

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These three titles are among the first educational programs to be released for the IBM Personal Computer. Because they were introduced so soon after the computer itself, they were expected to be somewhat rudimentary, and indeed they are. In spite of this, they were thoughtfully developed and do have real educational value; best of all, children will love them, though maybe not as much as they love some of the current video games. The truth is that, overall, these releases, developed at an IBM subsidiary called Science Research Associates, Inc., have a great deal of redeeming value.

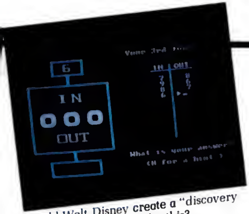
Fact Track

I liked Fact Track from the first moment I used it. The program presents itself well, both academically and aesthetically; it uses color graphics and sound to interest users at the beginning, and then easily understandable directions to ensure that they will stay and learn.

Fact Track teaches 390 arithmetic facts, involving addition, subtraction, multiplication, and division. The brief and well-organized instruction booklet gives a description of these basic func-

**Prices at other outlets may vary.*

Cassidy Warner and her mom, Katie, have a great time playing BEANO.



Would Walt Disney create a "discovery machine" that looks like this?

tions, but you can also work with mixed numbers or extensions of these that require seven additional skills. These skills include multiplying and dividing by ten, adding three single-digit numbers, and adding one-digit numbers to two-digit numbers without renaming (adding from right to left). In addition, if you choose one of the four basic skills, you have the option of working at sub-skill levels one to four.

And still this is only the beginning.

The three packages are "Arithmetic Games Set 1," "Arithmetic Games Set 2," and "Fact Track." Each package consists of a floppy disk, instruction booklet, and warranty card packaged in a handy brown vinyl binder. Each one requires an IBM PC with 64K bytes of memory, and a color/graphics monitor adapter with a television set or color monitor. Once you've narrowed down the topic of the lesson, its length and method of presentation are the next user options.

The time option is particularly delightful, as it consists of a simple yet eye-pleasing graphic sliding scale. By pressing the arrows instead of entering digits, you choose from 20 seconds (displayed on the left) to 200 seconds (lights up on the right).

After selecting a time limit and the number of problems you think you can solve, the program asks you if you want to race against the computer. I always found myself in a racing frame of mind as I went through the program, and I doubted that anyone would not want to race.

However, when I asked Cassidy Warner, age 9, to try out the math games, I discovered that she was initially too timid to challenge the computer to a race. Only after she gained confidence in her ability to master the games did she wish to race the computer.

Cassidy's test of Fact Track pointed out its major weakness, which is that the program is too limited. While Cassidy loved the way the game worked and found it very exciting, she is already very competent in the skills it teaches. Thus, Fact Track really offers her little more than amusement. This conclusion is probably applicable to many situations.

BEANO

On the other hand, BEANO, which is part of "Arithmetic Games Set 1," was a different matter. BEANO is a variation of BINGO that is played on a card (depicted on the screen) containing a grid of numbers. In the least difficult of three levels of play there are seven "Free" spots on the player's card and the numbers are all under 20.

A graphic version of a pair of dice spins underneath the card, then settles to show two random numbers. The idea is to use these numbers by adding, subtracting, multiplying, or dividing them so that the result will be equal to a number on the card.

I tried the most difficult version against the computer and after a false start found it to be a very challenging exercise. In this version there is only one free spot and the dice roll three numbers. On my first attempt I discovered that the game does not calculate left to right; instead it first multiplies and divides from left to right and then adds and subtracts.

The number I wanted to arrive at was 35, and my dice had rolled 8, 1 and 5. Thus, I entered "8−1×5." To my dismay I discovered that the answer to this problem was "3" according to the way BEANO calculates. My solution to this dilemma (since I did not wish to alter my own calculation logic) was to simply put parentheses around every problem, such as (8−1)×5.

BEANO was challenging and fun. Cassidy and her mom played the game for about an hour while we took their pictures. They are both ready to come back and I think BEANO is a hit. However, BEANO's companion program, "Rockets," is another story altogether.

Rockets

Arithmetic Games Set 1 has one good program, "BEANO," and one dud, "Rockets." It reminds me of 45 rpm records I used to buy when I was a kid, with a hit single on one side and vile scratchy sound on the other. However, Arithmetic Games Set 2 is different. It contains two equally mediocre games called "Discovery Machine" and "Number Chase."

Discovery Machine

In Discovery Machine a number goes into a machine pictured on the screen. Some mathematical event happens and it comes out of the machine transferred into a new number. The trick is to discover what the machine is doing to the number.

Not a bad idea, and it has educational value, but it is hard to forgive SRA for such poor, elementary graphics. Come on, folks, this is a DISCOVERY MACHINE, how come it can't look exciting?

Number Chase

Number Chase is also an interesting idea. You try to guess the computer's secret number before the computer guesses your number.

Like Discovery Machine, its graphics are nothing to cheer about, and I honestly wonder what value for your money these two programs give you. In my opinion, they should be sold for under $10. I have a few other opinions I'd like to share with you, so I'm going to get up on my software soap box long enough to air out some minor irritants.

Impressions from the Software Soap Box

Minor Irritant #1. As with other IBM PC programs, the first time you use the SRA arithmetic game packages you have to perform the relatively fool-proof, yet definitely computerese, procedure of loading DOS from the DOS disk into the machine and then copying it onto the program disk. I really find this to be an annoyance. It runs contrary to my notion that operating systems should be totally invisible to the vast majority of users. If DOS has to be on the disk to make it work, then it should be loaded by the manufacturer.

Minor Irritant #2. The dreaded NUM LOCK key. [When this key on the PC keyboard is depressed, the key pad functions as a number pad.] When it isn't, the keys do other things. This is a problem because there is no indication of which mode the NUM LOCK key is in at any particular time.

Programs such as these, which require mostly number keystrokes, should give you NUM LOCK *feedback*. What this means is that there should be some indication on the screen of whether or not you are in NUM LOCK.

Minor Irritant #3. The dreaded SHIFT LOCK key. This is not particularly important to the programs reviewed here, but nonetheless it has the same problem.

Minor Irritant #4. These programs, like many other "educational" programs, accept homogenized public school standards as their goals for student performance. Personal computers have the potential to accelerate the learning curve in exponential leaps. If you understand this potential, you probably realize that if we can learn more, then indeed we can actually raise our standards.

Minor Irritant #5. Few educational programs seem to have been designed with an understanding of the realities of the classroom environment. In particular, the relationship between student and teacher is often overlooked or misunderstood.

For example, while the SRA programs can be run with or without sound, which may be useful in a busy classroom, the option is entirely student selectable. Neither teacher nor computer can control the situation unless the student cooperates. In some classrooms they will and in others they won't, but in both cases they require teacher attention that could best be used elsewhere.

All in all, not a very inspiring beginning for educational software on the IBM Personal Computer. I certainly hope to see much improved releases in the future.

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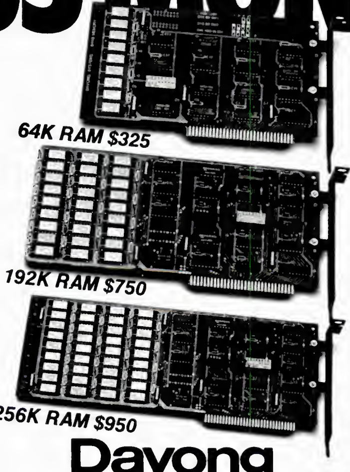

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Letter Writing With *EasyWriter*

The PC's *EasyWriter* word processing program includes the ability to display as many as three headings or footlines anywhere on a page, a very useful feature unmatched by even the mighty *WordStar*, which only provides for two such headings. One way to use these three headings is to insert date, addressee, and page number references at the top of each sheet of a multi-page letter, following a standard business letter format. Further, this feature can be made to operate automatically, eliminating the need for the writer to monitor page breaks.

The following routines accomplish this letter-writing task very reliably and, at the same time, provide a good method for organizing address and correspondence files neatly within the *EasyWriter* file system. Working through the following routines will also give the user a hands-on tutorial covering virtually all of the *EasyWriter* embedded commands.

Formatting the Envelope

The first file to create is a print formatter that will print both an address and a return address in the proper positions on a standard business envelope. Begin by loading the *EasyWriter* program and then load a blank storage diskette formatted with IBM DOS and initialized with the *EasyWriter* overlay. From the File System menu, type C Y to clear memory and enter the Edit mode. Then, type everything shown in Fig. 1, character for character. This file will be explained later, but for the present, save it as File #1 by pressing key F10 (return to the file system) and typing S (save) "ENVELOPE" (name of file).

(Note: the ¶ symbols in the figures indicate carriage returns, made by hitting ENTER at the keyboard and displayed on the screen as eighth-note symbols.)

The first entry in the file, .formstop, like all the embedded commands, begins with a period and must be terminated with a carriage return. It instructs the printer to pause between pages and is used whenever the printer does not contain continuous-form paper.

Fig. 1—Envelope formatter

Fig. 2—Letter formatter

Fig. 3—Sample address file

Fig. 4—Sample letter file

A .space0 instruction embeds single spacing by telling the printer to insert zero spaces between lines. Remember to start with a period and to be sure that the zero immediately follows the word "space."

The next four embedded commands, .titlea, .titleb, .titlec, and .page, are what I call clearing commands since they eliminate any heading and pagination instructions which may have previously been put into effect, ensuring that no headings or page numbers will appear on the envelope.

The command .top0 instructs the printer to insert no (zero) blank lines before commencing printing, and operates under the assumption that the envelope will be positioned with the printer's head at the top of the printable area. .margin0 sets the left margin at the begin-printing-here position.

The next three entries contain a return address, which should be entered as indicated. If an address is already printed on the envelope, omit the .margin0 command and enter three blank lines (which are necessary to keep the vertical spacing correct) by pressing the ENTER key three times.

The three carriage returns shown in Fig. 1 move the print head down to the proper position to begin printing the addressee's address. The .margin52 command sets the left margin approximately 4½ inches from the left edge of the envelope. The envelope formatter file ends here; later it will be linked to separate address files.

Formatting the Letter

The next file to establish is a letter formatter. From the File System menu, type C Y, then enter the contents of Fig. 2.

Name and save this as File #2 by pressing key F 1 and typing S - LETTER.

The first six embedded commands on this file are clearing commands, as in the ENVELOPE file. The next two commands instruct the printer to position the print head four lines from the top and to set the left margin ten spaces in.

The .pagelines66 command tells the printer know that each page is 66 lines in length—the standard for printing six lines to an inch on 11-inch paper—and is the default for the *EasyWriter* program. It's inserted here as another clearing command in the event that another value may be in effect.

The .lines50 command specifies how many lines will be printed on each page. To determine the number of lines in the bottom margin, subtract the .top and .lines values from the value of the .pagelines command.

The next two lines contain your address, which will be printed at the top of each letter; if you're using printed letterhead, substitute carriage returns. The following line contains the current date.

The final three commands instruct the printer to print a heading on all subsequent pages of the letter. The .titlea,1, portion of the first of these commands directs the printer to print heading a on the first line of the second page. The today's date portion of that command contains the text that will actually be printed on line one.

The .titlec,3,page command directs the printer to print the word "page" on the third line of the second page; if it had read .titlec,3,sheet, it would have printed the word "sheet". Be sure to follow the spacing and punctuation exactly.

Fig. 5—File system menu showing linked files

Fig. 6—Second page of printed letter, with heading

The last command on this file, .page3,6, tells the printer to number each page and to position that number at line 3, column 6. This works in conjunction with the previous command so that the third line will print as "page 2".

One final note: These last three commands are placed below the address and date text so that the heading does not print on the first page of the letter. The program accomplishes this by clearing the heading and page numbering for the first page and inserting the heading commands so that they'll take effect when the printer reaches page two.

Creating an Address File

To write a letter, begin by creating two files—one for the address and one for the text. From the File System menu, type C Y, then create your address file, which should look like Fig. 3. Remember that the ¶ symbol indicates carriage returns.

Save this as File #3 by pressing key F10 and typing S - #Edlin.

The first three lines of this file are a normal address. The fourth line contains another embedded command, which completes the heading to appear on page two of the letter and instructs the printer to print "Jim Edlin" on line two of the page.

The address file should contain this embedded command even if the letter is certain to be less than a page long, since you may want to use this file later on for another letter. The insertion of this command is also necessary to ensure the correct spacing of the first page of the letter.

Creating a Letter

To write the letter itself, clear the editor by typing C Y from the File System menu. Start the letter with the salutation, as in Fig. 4. Try to make sure that it's long enough so that you'll be able to see the second-page heading feature operate when you print the letter.

Remember to end the letter with the embedded command .eject, which not only ejects the last page of the letter from the printer, but also resets the page-length counter in the event several letters are to be printed in succession.

Save this letter as File #4 by hitting key F10 and typing S - @Edlin. The function of the @ symbol will be explained later.

Printing a Letter and Envelope

The first step toward printing the letter and addressing the envelope is to link the four files (envelope formatter, letter formatter, letter address and letter text). From the File System menu, load File #2, LETTER into memory by typing G 2. The first linked file must be loaded into memory for linking to work properly. Then link the four files by typing L 2, 3, 4, 1, 3 and pressing ENTER. The File System menu should look like Fig. 5.

Before printing, a final routine is necessary to ensure that the automatic page numbering begins with the number "2". From the File System menu, type E; the contents of the LETTER file should appear on the screen. Now press key F4, to enter the Additional Commands menu.

Next, type P, the command for page settings. The prompt will ask for PAGE #:. Type 2, indicating that numbering is to start with that numeral, and press ENTER.

The prompt will now ask for # COPIES:. Respond by pressing ENTER. The next prompt is PRINT TO SCREEN?. Press ENTER again. Now press ENTER once more to exit from the Additional Commands menu. The screen should once again display the contents of the LETTER file.

You're ready to print. Position the first sheet of stationery in the printer, make sure the printer is turned on, recite a short incantation to the micro-dieties, and press the F2 key.

If your prayers are answered, the printer should print the return address (assuming you included it in the file) and the date, and then pause. Press a key and the printer should skip a spa and type the addressee's address, th pause. Again, press any key and t printer should skip another two spac and start printing the letter.

At the bottom of the page, the print should eject the first sheet and pau Position the second sheet and press a key again. The printer should begin printing the three-line heading and th continue with the letter, as in Fig. 6. the letter continues to a third page, t printer should pause again and print t heading with "page 3" at the top.

When the letter is completed, t printer should eject the last sheet a pause again. Position the envelope, a press any key. If nothing happens, pre any key again. The address should printed automatically at the correct p sition on the envelope. Depending the size of the printer's buffer, some the pauses may not occur.

Establishing a Routine

Don't expect all this to work perfec the first time; in fact, plan on consumi a fair quantity of stationery before th routine is fine-tuned to your printer a letterhead. Start this fine tuning by e tablishing a standard way of inserti the paper and envelopes in the print The commands listed in the figures a based upon a start-print position that approximately one inch below the t edge of the page and approximately inch from the left edge.

If your starting print position is d ferent, you'll have to make adjustmer with the various .margin, .top, and .lin commands. If the second-page headi doesn't print in a spot suitable for yo adjust the values of the various .title a .page commands. Bear in mind that t value of the .top command in the LE TER file determines where the first li of the regular text of the letter will pri and that this value must be at least o greater than the value of the .titlec a .page commands, which determine t line position of the page-numberi heading.

Experiment—it will be worth Once an acceptable format is esta lished it can be used for all your cor spondence.

The second part of establishing routine is managing the address and l ter files. The system I've used identif each address file with a # symbol a each letter with the @ sign. Since the File System menu displays four files to a line, address and letter files can be kept adjacent to one another, which should make it easier to keep track of files to be linked. For general correspondence, you can simply create the files in order and purge them as the disk nears its storage capacity.

If you correspond frequently with the same people, you may want to format a disk with approximately 12 addresses, leaving enough room to create letter files. Unfortunately, *EasyWriter* doesn't permit linking files on separate disks, which limits the ability to use the program for mass-mailing applications. You can, of course, transfer address or letter files from one disk to another by loading them into memory, changing disks or disk drives, and saving the loaded file to the new disk.

A User's Report

I've been using this routine for all of my business correspondence for three or four months now, and it works very efficiently and reliably. My personal preference is to do all of my letter writing on the computer and leave the printout for the end of the day. This keeps me in create mode and frees me from distractions. The end-of-day print routine is good physical therapy.

When I am ready to print, the first thing I do is to get my LETTER file and revise it to list the current date, making sure to revise the text of the .titlea command as well. Then I link files and start printing, letter by letter. The step I forget most often is to reset the page numbering for each letter. You have to do this, or else page two of your second letter will be printed as "page 4".

After a while, you'll develop what I call keyboard routines—sequences of commands which you can execute by rote, without having to think about them or follow the prompts on the screen. For example, in linking and resetting the page numbering, you can just pound out:

"G 2 L 2, 3, 4, 1, 3, ENTER E F4 P 2 ENTER ENTER ENTER ENTER" in rapid succession and be ready to start printing with the F2 key. The keyboard buffer will permit you to input commands ahead of the program, and pretty soon you'll feel enough in control to wail away with computer-assisted letter writing.

EasyWriter Underlining for Epson MX-100 printer.

Frank Vlamings writes: "I spent two days trying to underline words using my newly acquired *EasyWriter* software and Epson MX 100 printer." Stumped at last, Mr. Vlamings went first to his ComputerLand store and then to IBM for help. There were a couple of false starts, but eventually, Mr. Vlamings did receive instructions which worked. He describes them as "extremely cumbersome" and says, "I don't believe I will use it unless I absolutely have to." He says IBM wrote him that a better "fix" is being developed, but submits the following until an alternative is available.

1. Insert 5 lines above the line you wish to underline (F3)
2. Enter insert mode and type on first line .USER$141
3. Enter insert mode and type on second line .EOL$
4. Delete extra inserted lines above the line you wish underlined
5. Insert 5 lines below the line you wish to underline
6. Enter insert mode and use space bar to move cursor below the word you are going to underline
7. Now type the underline
8. Enter insert mode and type on first line below underline .USER%10
9. Enter insert mode and type on second line below underline .EOL%
10. All embedded commands must be at the beginning of each line and terminated with the end of paragraph (ENTER key)
11. Delete any extra inserted lines below the second line and the rest of the text

—Frank Vlamings

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Jim Strothman

PERSPECTIVES ON PROTECTION

In the 1880s, Gilbert and Sullivan had to steam to New York with a full London cast, and mount an authentic production of their "Pirates of Penzance" in order to head off the success of a 'pirated' American production down the street. International copyrights were scoffed at, and they fought all their lives to secure royalties.

A hundred years later, the protection of copyrighted material is still taking bizarre twists. A federal appeals court has ruled that home videotaping of TV shows is an infringement—overturning a lower court, and disputing evidence that audio taping has not hurt radio broadcast profits. Xerox takes out full-page ads reminding people that they can't 'xerox' something because the company's name is a trademark; they don't want to join Vaseline, Kleenex and Scotch tape, who are fighting to stay out of the public domain.

And computer proliferation . . . well, that has led to the most difficult problem of all. Simply put, it is this: everybody needs 'backup' copies of software, but how can you make copies without opening the door to piracy?

The Software Dilemma

"There is a perception that software is a freebie, that it 'comes with the machine,' and that may have contributed to the piracy problem," says Jeff Walden, public relations manager for VisiCorp.

"Now, manufacturers have realized that software is what *sells* the machine in the first place. The customer doesn't need to know anything about copy-protection except that the disk doesn't copy. Why? To protect our copyright," he says, "and keep it safe from both casual and professional piracy."

The former occurs in many users' groups and among friends: one person buys a program, makes copies and gives them away; they trade them like baseball cards, or pool them for common use. Except possibly to recover the cost of a blank diskette, money rarely changes hands.

"I believe anyone who buys a program has the right to enough copies to feel comfortable."

On the other hand, professional thieves sell illegal copies *as if* they were legitimate, at prices high enough to avoid suspicion but lower than the manufacturer's suggested price or a reasonable discount. Because they have not invested in research and development, marketing, quality control, or after-sale service, their profits are enormous, and do not contribute toward improvements in the next 'generation' of software.

"There are ten man-years of effort that went into the original Apple version of *VisiCalc*," Walden says, "plus the time we spent customizing it for the PC and other computers. There's an awfully large investment in it. Some people feel that software should be priced according to its manufacturing costs, like the price of a diskette. But I say you have to consider the effort that went into development and maintenance.

"We don't know what the piracy will be like for the PC, but it was particularly rampant for Apple computers in general," he adds. "Interestingly, though, piracy seems to bear no relation to the list price of the software. In my estimation, people who made $16 game programs had as much piracy as we did with the $250 *VisiCalc*. Of course, it's hard for me to conceive of grey pinstripe-suited businessmen, huddled over a PC, trading software."

[An IBM spokesperson says, "We're new in the personal computer business, so we're looking at the issue more carefully than in the past. All our PC application programs are copy-protected, but development software isn't. We prefer not to comment on the issue right now."]

Legal Strategies

VisiCorp is "adamant" about copy-protection, legally as well as technically. "We've instituted a license agreement between the company and the end-user," Walden explains, "that increases our copyright protection under the law. There will be no change in the effect on the end-user, but it carries a different legal interpretation, and some users will note that a change has been made."

If that doesn't help stem the tide of piracy, license agreements may grow increasingly restrictive. In a column for the trade journal *Information Systems News*, attorney Bruce K. Brickman describes a

hypothetical software license agreement that "contains language making [the] user liable for the consequences of its unauthorized disclosure." Though he is writing about mainframe and minicomputer software, the principle may have to be applied to microcomputer software. "In effect," he writes, "the user becomes an insurer, underwriting the vendor's business."

Innovative Software Applications (ISA) is a company that requires customers to sign license agreements, but its software—chiefly the proofreader Spellguard—is easily copied under the CP/M operating system.

"Users *want* to make backup copies, or transfer a program from one disk format to another," says Will Pape, of ISA. "Say they bought Spellguard on an 8-inch single-sided, single-density disk and want to run it on a 5¼-inch double-sided, double-density disk; or suppose they buy a hard disk and want to load it on that."

Technical Strategies

Pape says that ISA has chosen, instead, for every direct sale, to put the customer's name into the first 'page' that appears on the CRT screen. But that's hard to do with sales through dealers, or in private-label (OEM) sales of Spellguard by word processing software companies. Their biggest worry, says Pape, is not the individual customer, but the occasional dishonest dealer who makes more copies for sale than his contract with ISA permits. To solve that, ISA developed a scheme for embedding dealers' names, and the consecutive serial number of each copy, into the software itself. They have made that process available to other software manufacturers and vendors.

"One company hired us to make it possible for a dealer to sell low-priced demonstration copies that can't be upgraded into usable products without the manufacturer's participation," Pape says. "A person can buy a limited version of a program for, say, $10, that's recorded on one side of a disk. If he or she decided to buy the whole program, the dealer calls an '800' phone number and gets a special code to enter into the program. That unlocks the other side of the disk where the full program resides.

"At ISA, we're not selling 'disks,' we're selling service. If there's a way that a software company can verify that a caller is a valid customer, that'll help them provide service, and make piracy less attractive." Pape says, however, that even after direct sales, many customers forget to mail back their 'warranty cards' to register as legitimate customers. Still, conventional copy-protection won't work at ISA. "We don't do copy-protection, because CP/M provides you with all the tools you need to get in and diddle with a program."

CP/M-86 is the operating system that was customized (from CP/M) for the IBM PC by Johnson-Laird, Inc. As Andy Johnson-Laird, its president, admits: "There is no difference as far as copy-protection is concerned—there is no protection!"

"Locks are for honest people, and the law is inadequate," he says flatly. "Even honest users copy software, because they don't perceive that as dishonest."

Johnson-Laird cites the experience of MicroPro, which in 1980 tried to copy-protect its WordStar (CP/M) program: "It lasted about 30 days, because it was a convoluted technical scheme that got in the customers' way, and screwed up the dealers."

Making The Best Of It

"We've gone round and round on this issue many times," says Bill Baker, president of Information Unlimited Software, Inc., which produces EasyWriter. "IBM asked us to copy-protect it for the PC, as we did for Apple and other computers, but copy-protection is hard on us, and hard on the customer.

"I've come full-circle: I used to be advocate for copy-protection, but not more. Software is intangible," he s "and people don't think of it the way t think of tangible property, like their c puters. Teachers make photocopies books for their students, and comp people make copies of their software

"If we copy-protect our word proc ing program, we know that somebod sure to have an accident with a disk and won't be able to make a copy, or one, in time to get out a critical report. whom," he asks, "should we focus ou tention? On the people who are goin rip us off anyway, who get satisfac from breaking our codes? No. We wa make it easier for our legitimate cust ers to use our product, to get our ser and support, and to work with us and from us."

"I believe anyone who buys a prog has the right to enough copies to feel c fortable," declares Peter Gordon, of Microsystems, which does developn and marketing for software products. terribly inconvenient not to have

"Another approach is to build in 'time bombs'—things tha go wrong unless the customer gets periodic updates."

flexibility of extra copies because disks themselves are so easily mis dled. Why put complicated protec schemes into a program in the first pl You're just giving lip service to the t toward customer service."

Future Trends

The next generation of products have more sophisticated copy-protec mechanisms than are now available, these may be as fraught with problen the current crop is.

"Do you remember the famous pu with nine dots, and you have to con them without lifting your pencil fror paper? The solution is to go *outside* square. We may have to do somet dramatic like that," says Andy John Laird. "One approach is to do what A Osborne did with his business app tions package: he sold the disk media for a low price, letting dealers add value to it by customizing it, but he copyrighted the printed words in the instruction books.

"Another approach would be to build in what I call 'time bombs'—things that go wrong unless the customer gets periodic updates. If the program asks for the date, we could set it up to crash after one year. We could create rounding-errors for numbers, that automatically go into effect after the program has been used a certain number of times; the customer has to get the dealer to refresh the program, somehow, to prevent them.

"The philosophy behind those ideas is that, if you've got stolen stuff it doesn't perform. But surely," he says, "some innocent person will be hurt accidentally."

MLI's Peter Gordon thinks there will always be 'keys' to protection mechanisms. "If you copy a program like *VisiCalc*," he says, "you get something that *looks* okay, but it won't run because the program encounters an odd-looking track on the disk. One of the utilities that comes with the PC DOS [disk operating system] is called COMPARE. It's used to verify that something is authentic, but it's very primitive. It only checks the data fields and not the formatting of the data on the disks, so it would probably okay a disk copied directly that, in fact, won't run.

"I envision a family of utility programs, that I call a 'superutility,' which will format, diagnose, copy, modify and even restore files that have been 'killed.' Its main use will be for fixing defective disk files," he says, but suggests that it could serve as a kind of 'locksmith.' "There must be 25 other people around the country working on utilities like these."

Bill Baker says that IUS has had to fend off copy-breaking programs. He notes, caustically, that "their disks are copy-protected! You can't use their software to copy their own program. So what side of the fence are they on? The expediency side. They're just out to make a buck.

"We believe in appealing to people's ethics, and having them send in their warranty cards and be registered as legitimate customers. IBM asked us to copy-protect *EasyWriter* for the PC, and we're dedicated to giving them what they want. But for future products that we sell on our own, we're not going to copy-protect them. We intend to get our products out to people so they can use them with no hassles," he declares.

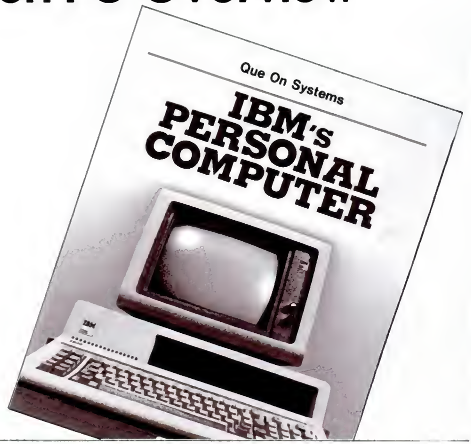
Baker also raises the problem of computer networks as channels for copying software. "Microcomputers are the key to distributed processing and accessing large computers remotely, through services like The Source. You can 'download' programs from their mainframe into your micro. Since there's no way to copy-protect a large, hard-disk pack, copy-protection itself becomes a joke. I say, if you know what you've got, and how to get it, then 'Power to the People!' "

What Do You Say?

Share your views on the copy-protection question. What's fair, what's possible, what's unacceptable from your perspective? A follow-up article will publish a cross-section of replies. Write to: Protection, PC Magazine, 1528 Irving Street, San Francisco, California 94122.

PC BOOK REVIEW/LES COWAN

A Team-written PC Overview



IBM's Personal Computer; Que Corporation, Indianapolis; 277 pages, $14.95

IBM's *Personal Computer* is the product of a "team of writers," according to the book's introduction. Actually, they are a team of experts, not of writers. They have produced a guide to the PC micro which will be an extremely useful aid for some, but is badly written at best, and almost unreadable at worst. Chapter Five, which, ironically, deals with languages, is especially bad.

Since the book has many good qualities, let us begin with the major criticism. It comes of the prevelent misconception that a technical background is of more use in writing a technical book than an ability to write. The publishers who hold this opinion would not, I think, defend the analagous proposition that a clergyman is better qualified to build a church than a general contractor. The fact is that any writer worthy of the name can learn a body of information and then present it in a craftsmanlike way. That is, once he has spent the years it takes to become a good writer. The four experts who collaborated on *IBM's Personal Computer* should have supplied the information which they have spent years accumulating, and let someone with a readable style put it into words. That would have avoided the outrages of syntax, the wordiness, the abuses of the passive voice, and the outright incorrect usage that plague the pages of this otherwise useful work.

IBM's Personal Computer is two hundred and seventy-seven pages long, perhaps ten percent of that length consisting of unnecessary verbiage. It is extremely well organized and laid out, with lots of eye-succoring white space, apt illustrations, a very comprehensive table of contents and, best of all, a good glossary and a thorough index. It is composed of three sections and appendices, preceded by an introduction. The introduction sketches the history of IBM, partly as a prelude to pointing out that with the PC, IBM is departing from some of its traditional policies. For the first time it is using components manufactured by other companies, acting friendly toward software written by outsiders and marketing through non-IBM outlets.

The first section of the book devotes three chapters to describing the machine's hardware, peripherals and operating software. One of the best features of this section is a comparison of various CPUs, in text and chart, and a good discussion of the power of the 8088 CPU used in the PC machine. The authors like this CPU so much that they even honor it with a brief discussion of its lineage, the Intel 8000 series.

The second section covers software available for the PC machine. The infamous chapter five discusses the immediately available languages: IBM (Microsoft) BASIC, IBM PASCAL and FORTRAN, University of San Diego's PASCAL and FORTRAN, and the available assemblers. Chapter six explains and evaluates business software presently available through IBM—IUS's *EasyWriter* word processor, *VisiCalc* and Peachtree's general ledger, accounts payable and accounts receivable packages. Chapter seven does the same for educational software.

A word about the Que 'evaluations': they consist of text descriptions of the software, their major 'outstanding features' and 'significant limitations.' Accompanying charts list every possible feature a given program could have, and check off those offered by the software under consideration. These charts, or check-lists, were a little gimmicky, with over-involved instructions for weighing their conclusions according to a complicated formula to make them more relevant to your particular application. Nevertheless, the evaluations would be of the greatest help to prospective purchasers trying to decide what word processor or financial package to buy. Strangely, though the educational software was described thoroughly, it was not evaluated—no outstanding features or multipage check-lists. This illustrates one of the limitations of the book itself; it is really slanted very heavily toward business users, both in tone and in content. Incidentally, by registering their names with Que, owners of the book may qualify for evaluations of new software as they are published. Que does not say what charge will be made for this service, if any.

The third part of the book covers 'Other Topics.' These turn out to be various aspects of computer communications:

using the PC as a terminal for a mainframe, use of the data-base services such as Source, intra-office electronic memos, electronic mail, etc. A discussion of various timing modes for computer-to-computer data transfer assumed that the reader knew more about the subject to start with than most likely do.

Here is a weakness of the book. It attempts to be too many things, and is none of them completely. As mentioned above, it is mostly a guide for businesspeople who are considering a purchase. But then, why some of the technical discussions, such as the three paragraphs on asynchronous, synchronous and bisynchronous data transmission. The typical businessperson who comes upon that sort of thing is guaranteed to smile politely and turn the whole confusing thing over to the company's Permanent Executive Committee for Purchasing, Evaluation and Institutional Delay.

Furthermore, throughout the book, IBM is spoken of with admiration and reverence. IBM salespeople could use the book as a sales aid. Again, this is probably the result more of confusion over what the book was supposed to be, than a desire to flack for IBM. The book is certainly even-handed about pointing out flaws of hardware and software, as well as superior qualities. It's just that flaws are mentioned with an off-hand shrug, as it were, and superior qualities are written in flashing neon with historical footnotes.

Throughout, the book speculates about what may be expected in the future. Here, too, an ambiguity nagged. Whence comes the information that, for example, future announcements will tell of an increase in the PC's interactive capability or that a COBOL compiler for the 8086/8 may be expected from Microsoft by mid-1982? Dozens of these forecasts are sprinkled through the book; hardly a subsection does not end with one or two. Unfortunately it is never clear whether the authors' prescience is derived from official announcements, industry rumors, wishful thinking or a crystal ball.

The appendices of *IBM's Personal Computer* are a thoughtful touch. They include a list of IBM BASIC commands, a list of software publishers for the PC machine, and a command by command comparison of two available disk operating systems, PC DOS and CP/M-86. Throughout, the book has other little tidbits which are of interest. It is noted that IBM declined to comment on Que's software evaluations. IBM's warranty and purchase agreement is published in toto. IBM's invitation to independent software writers is passed along. A price list covers the machine and a large number of peripherals.

The book does not leave out much. Notably, competing products were compared only in the category of CPU. I would like to have seen comparisons with Apple, Cromemco, et al. in other categories, such as available software, interfaces, peripherals, languages, etc.

Another omission is that the slant toward business is never spelled out. Unwarned, non-business types might waste time and money expecting to get answers to questions the book never addresses. For instance, I would like to know what kind of video signal the machine puts out. This is not a business question and is not answered here.

In summary, *IBM's Personal Computer*, though written in a very poor style, is otherwise well organized and designed. It will be especially valuable to prospective business users, at whom it seems to have been aimed. It will also serve well as a general reference for all PC users, especially if the software evaluations increase greatly and at little or no cost. Certainly, if you are shopping for micros, this book would be well worth picking up.

EasyWriter to get improvements

Company executive says updated version is coming

"IBM is going to issue an update to *EasyWriter*; we're writing it for them," said William Lohse, vice president of sales and marketing for Information Unlimited Software, Inc. (IUS), the program's developer, in an exclusive interview with *PC*. "Most of the requests and problems that have been brought to our attention are being addressed in the update," Lohse said. He denied, however, that the revision was directly related to a critical review by Andrew Fluegelman in *PC*'s last issue, saying, "We were doing the work that we are doing before we read Andrew's article."

In addition to revealing the forthcoming *EasyWriter* version and describing some of the changes, Lohse talked about two soon-to-be-introduced IUS products aimed at *EasyWriter* users. One will be a spelling checker that works with *EasyWriter* text files and the other a service that offers advice by telephone to *EasyWriter* users who have questions about using the program. The latter appears to be a ground-breaking move toward separating the sale of a software product from what the computer industry calls "support."

Regarding criticism in the *PC* review, Lohse said, "We accept input from all quarters, and we appreciate it." He said the revised program would "respond to most of the concerns expressed by Andrew Fluegelman and those that have been brought to our attention by other people." Lohse was reluctant to get specific about the nature of the enhancements, "because of our relationship with IBM." But he did indicate that the program's disk storage arrangements, a source of much criticism, will be substantially reworked.

Disk Files To Be Standard

"It writes standard PC-DOS files," Lohse said of the updated program, which will be called "Version 1.1." He said the use of specially formatted disks for *EasyWriter* text files will no longer be necessary; it will be possible to store them on any disk normally formatted for the PC-DOS operating system, and *EasyWriter* files can coexist on a disk with PC-DOS files of any other type. Text files saved by *EasyWriter* will be listed in the usual disk directory with the suffix *.EW* after the file name, such as TEXT.EW. An enhancement related to this change is that standard files from other programs can be loaded into *EasyWriter* for editing, and text edited with *EasyWriter* can include PC programs.

"It's more easily a part of the IBM software operating family," said Lohse. "It works very easily with other programs, at least with [the] *VisiCalc* [program], so you can go ahead and edit *VisiCalc* files or write Pascal or BASIC programs with it."

Besides these details, Lohse described the enhancements as "making it faster and more powerful." "A couple of features in the editor" was as closely as he would pinpoint where the extra power would be most noticeable. Asked if the improvements to making the program "faster" would come by reducing the keystrokes needed for common editing operations, Lohse said, "I know it will be speeded up in some areas." But he added the cautious qualification, "Certainly there are advances made in that area, but I think that the experience may be that it is not as speeded up as people would like it in that particular area." Lohse also said an updated user's manual was being prepared for *EasyWriter* 1.1.

Exchange Plan Hinted

The IUS executive hinted there would be an arrangement whereby owners of the earlier *EasyWriter* version could exchange for the enhanced one, but again he wouldn't discuss specifics. "From our conversations with IBM, the opinion is that we want 1.1 to be the issuance that exists. So they will make it easy for people to get the new *EasyWriter*," he said. "The purpose is to have it get as soon as possible into everybody's hands who bought the original *EasyWriter*, and to have it be well accepted." For new buyers, Lohse indicated that the new version would be sold at the same price as the original.

New Products

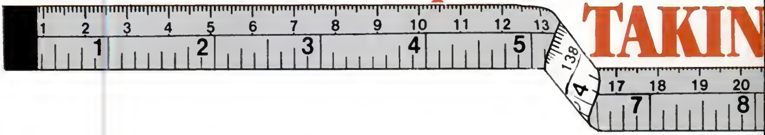
The two new products Lohse revealed were software items—a spelling checker (see box) and a service plan. Asked if it made sense for the company to be working on new software while *EasyWriter* was receiving substantial criticism on its lead product, Lohse responded, "That's the same question IBM asked." He continued, "Every single resource we can put on *EasyWriter* we have put there," and he explained that the spelling checker was actually developed by independent authors and was being handled by IUS in its role as a publisher.

EasyWriter for the IBM PC will be the first product IUS will treat under its planned separate-support approach. "We'll be offering to users the ability to get a specific product—support—in many ways over the phone, and we'll be charging for it," Lohse said. "We think that as the industry develops that will be the way to provide the kind of service we want to provide and make it obvious to people what they're getting."

—Jim Edlin

IUS's New Spelling Checker

"We will be coming out with a spell-checking program that will work with *EasyWriter*," said Bill Lohse of IUS. "It will not be available for our Apple market; it will only be available for the PC. It has about 90,000 words, and it fits into about 92K, which is a much stronger compression technique than the others (similar programs) that I know. It's fast. It can handle prefixes and possessives. It can distinguish faults such as improper capitalization and improper use of hyphenation. For example, it may see 'Easy' and say 'I do not recognize that capitalization.'" Lohse said it hadn't been determined whether the product would be distributed by IBM or not.



TAKIN

A Glimpse at Two PC Manuals

Jeremy Joan Hewes

In some ways, the Personal Computer is a departure from IBM's usual way of doing things. For example, the computer's price is relatively low, making it competitive with other micros, and the company intends to market programs written by independent software developers. Both of these policies are designed to attract consumers to the exploding small-computer market, a ballpark in which IBM has clearly decided to play (more or less) by the rules of the game.

One solid feature of the IBM entry into the micro market is its user's manuals: they are handsome, practical, clearly written and organized, and concise. As with any guides to new equipment, there are a few omissions or lapses of style, but in general, IBM's own manuals offer a suitable introduction and thorough documentation for both the novice and the experienced user.

IBM's Emphasis

IBM has planned its marketing campaign to appeal to people who are not familiar with computers, an approach reflected in the PC's documentation. For example, the *Guide to Operations*, the fundamental manual that comes with the computer, devotes 168 of its 240 pages to setting up the system and operating it. By comparison, the user's manual for the Osborne 1 computer provides only 31 pages of such elementary information, in chapters titled "Getting to Know Your Computer" and "How to Use Your Computer," before plunging into explanations of its resident programs. The *Applesoft Tutorial*, an introductory manual for Apple II computers, goes overboard in the other direction, cramming its pages with hardware and software details that could clog the circuits of any beginner's brain. IBM's introductory guide falls in the middle, displaying a more personal, less business-oriented approach than the Osborne I manual and a less cluttered, computer-devotee orientation than the Apple II guide.

Although some of the introductory material in the PC's *Guide to Operations* (*GTO*) covers the computer's disk operating system (DOS) and BASIC, two other manuals prepared by IBM are devoted to the operating system and BASIC language, respectively. Consequently, although there is some overlap in the coverage of BASIC and DOS, this duplication of information assures that a novice can take advantage of the disk operating features and write simple programs using only the elementary manual.

Publishing Savvy

Since the *GTO* is every user's introduction to the PC, a more detailed look at it is worthwhile. Like the other PC manuals, this book is a cloth-covered, three-ring binder that comes in a cloth-covered slipcase. Not only are the manuals elegant-looking, they stand on a shelf or desk without support, eliminating the annoyance of constantly-sliding bookends or the need for a space-eating storage rack.

"They are handsome, practical, clearly written and organized, and concise."

The binder is smaller than the standard 8½ by 11-inch format, measuring 7¾ by 9 inches. Like most other hardware and software documentation (Apple's spiral-bound manuals are an exception), the ringbinder format allows new pages to be added or corrections to be made inexpensively. The *GTO* pagination format follows another convention in microcomputer documentation: each chapter or major subsection of a long chapter is numbered as a unit (e.g., DOS 8, Keyboard 3) permitting expansion without extensive page renumbering.

Four suggestion/criticism forms at the back of the manual represent another instance of savvy planning. Each is a separate page that can be folded, stapled and mailed, postage-paid, to IBM—not only a nice gesture, but one that will help the company improve its documentation without necessarily compensating the users who provide valuable feedback. Specifically, a note above the space for comments on the form reads: "IBM may use and distribute any of the information you supply in any way it believes appropriate without incurring any obligation whatever. You may, of course, continue to use the information you supply."

GTO's Guts

The contents of the *GTO* offer an orientation to assembling and using the PC system in a logical and easy-to-understand sequence, and consist of six sections: Introduction, Setup Procedures, Operation Instructions (the longest by far), Problem Determination Procedures, Options, and Relocate. Only the "Problem Determination Procedures" section suffers from excessive technical bluster in its title; the chapter should have been named "Troubleshooting," since that's what it's about. The first four sections represent the heart of this manual for new users, the "Options" chapter covers installation of options available from IBM, and the "Relocate" chapter discusses disassembling the system and packaging the pieces to move it to another place (a digest that could have been included in the "Setup" section).

The manual is generously illustrated throughout and consistently provides a fundamental orientation to working with a microcomputer. Operator commands and examples of screen messages are printed in green, making attractive pages that allow the new user to follow the series of steps that should be followed when giving commands, loading programs, or performing diagnostic tests.

One glaring omission from the screen details, however, is error messages, which are present in the IBM DOS but are nei-

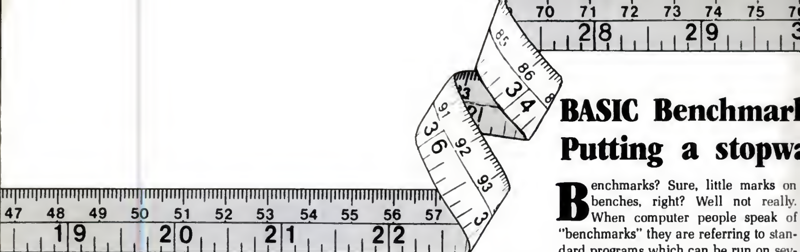
HE MEASURE

Part Two

ther mentioned nor illustrated in the *GTO*. The error messages are listed in an appendix to the DOS manual, but there will be some surprised PC beginners who hit the wrong key or type an unacceptable file name and get a screen response that the *GTO* didn't lead them to expect. This is an omission that certainly should be corrected in future editions of the manual; in fact, it may be an oversight, for at one place in the discussion of DOS, the manual warns users not to touch the keyboard while changing disks (assuming a one-drive configuration)—although there is no clue as to what will happen if they do hit a key. Incidentally, the PC DOS error messages themselves are straightforward and friendly by comparison with those of the CP/M operating system, giving such feedback as "Bad command or file name."

Another more-than-bothersome feature of the *GTO* is the absence of an index, although one is included in both the DOS and BASIC manuals, and *GTO*'s table of contents is detailed enough for beginning users. Finally, cassette storage in a system configuration without any disks is a subject that deserves more attention than it is given; the sole information for cassette-only users is a 14-page section buried in the "Problem Determination Procedures" chapter.

Given these relatively minor and easy-to-remedy exceptions, the PC's *Guide to Operations* is not only a fine tutorial for this computer system but also a good introduction to working with any microcomputer. IBM has gone beyond many other manufacturers' efforts by offering the essentials of dealing with disks, naming files, and even alerting users to the "whirring and clicking" as DOS is loaded from the disk into memory. A "Helps and Hints" section also contains advice that users often get only from friends or salespeople—usually after a catastrophe, such as a warning to make backup copies regularly and to check filenames or commands on the screen before hitting the "enter" (return) key.



Sacrifice in Style

Although the *GTO* should prove to be a valuable source of information for computer novices, it is written in a simple style that even moderately knowledgeable readers may find cloying. Some of the analogies border on silly, such as this explanation of what it means to "write over" a disk file: "Similarly, if you record a Chicago Symphony program on an Elvis Presley tape, you can no longer listen to Elvis." Such attempts to make the text chatty and relevant to all possible users are admirable, perhaps, but they are likely to elicit moans or howls from many readers.

A similar flaw occurs at a few places in the *GTO* text where the authors have assumed too little sophistication and intelligence on the part of readers. For example, in the instructions for typing filenames and commands, the manual confides: "Computers are fussy about the number zero and the letter O—they want what they want, and you can't fool them into taking the wrong one." This almost idiot-level explanation precedes the notation that on the screen the zero has a slash through it and the O doesn't—a fact that could have been stated without the accompanying lecture on computers' dispositions.

Fortunately, these lapses in style and tone are exceptions to a sound introductory manual. More important, IBM has probably come closer than any other micro manufacturer to reconciling the sometimes conflicting needs of computer novices and informed users. In short, the PC's *Guide to Operations* is much like the computer itself—solid, functional, unsurprising, and just about right.

VisiCalc at a Glance

The first of the independently produced programs and manuals to be distributed with the PC is *VisiCalc*, from Personal Software. This electronic spread sheet is the number-one seller among applications programs for microcomputers as well as a highly appropriate first offering from IBM. In fact, this program's availability alone may influence some wavering buyers to choose the PC rather than its near competition, such as the Xerox 820, which offers another spreadsheet program instead of *VisiCalc*.

The *VisiCalc* manual for the PC has almost the same content as that for the Apple II, although the two versions are written by different authors. To the PC *VisiCalc* manual, author Van Wolverton has added a summary at the end of each chapter as well as two appendices dealing with controlling the printer and exchanging files, respectively. In addition, Wolverton has contributed a fifth lesson to the four included in both versions; this sophisticated new example deals with scientific notation, powers, and formulae.

IBM has chosen to use the same readable typeface as in other PC manuals, in contrast to the "sans serif" type of the Apple *VisiCalc* manual. Commands and screen messages are also displayed in green, another point of continuity with the system's documentation. Both of the attributes make learning the complex *VisiCalc* program easier, but potential users should understand that this calculation-and-hypothetical-situation program takes study and experimentation, and that its manual is a good deal more demanding than the *GTO*.

Second Opinion

My reaction to the examples of chatty style and simple tone Hewes objects to is exactly the opposite of her view. Such a style probably comes very hard to IBM, and I applaud them for making the effort. I believe many users of the PC will like and benefit from the friendly, basic approach, and think it has a valuable place so long as a separate, un-flowery reference section is provided for knowledgeable users who don't want to be bothered with the novice's tutorials.

—Jim Edlin

BASIC Benchmarl
Putting a stopwa

Benchmarks? Sure, little marks on benches, right? Well not really. When computer people speak of "benchmarks" they are referring to standard programs which can be run on several systems in order to compare their performance. In preparing this article, I wrote several such benchmark programs, each of which is designed to measure some aspect of the PC's speed. For example, there is a program that measures the time taken to retrieve information from a random access data file, and another one that measures the time needed for mathematical computations.

In all, twenty-five benchmark programs were used to check out PC BASIC. They covered six major areas of operation: control statements, memory access, text string manipulation, calculation, file processing, and general capabilities. All programs were written in Microsoft BASIC and timed while running with the PC's standard disk BASIC interpreter. (I tested to see if there are speed differences between the three versions of PC BASIC, cassette, disk and advanced; as far as I can see, there are not.)

The timing figures, when taken out of context, may not seem to have much meaning. After all, do you have any instinctive sense of whether 15 seconds is a fast or slow time for a computer to add 5,000 numbers? Probably not. But even so, the tests establish reference points for later comparisons. In the future, we will be able to compare how fast 5,000 additions are carried out using other software such as Pascal or FORTRAN or perhaps some other version of BASIC. We will also be able to measure the impact of new hardware add-ons such as hard disk storage systems or the 8087 arithmetic processor.

The data gained from benchmark programs can also serve another valuable purpose. They can help you "tune" programs that you write. If you want to know how much faster a FOR loop will run when you use integer variables, or how much search time could be saved by reorganizing a data file or changing a buffer size, quick benchmark experiments can tell you.

Control Statements

Benchmarks in the first group tested

how fast control statements are executed. Test 1 measured the speed of an empty loop (no statements except those of the loop itself) using the FOR and NEXT statements. The loop was tested two ways, once using an integer variable to count the repetitions, and again using a single precision variable to do the counting. Notice in the table of results that the integer version ran about 28 percent faster.

Test 2 is an empty loop similar to the first test, but using the DO and WHILE statements instead of FOR and NEXT. The same two variations were performed here. The DO/WHILE combination is significantly slower, suggesting that, when programming, you should use the FOR statement and integer variables if a loop will be executed frequently.

The third test measured the time used to call a subroutine. Tests 4 and 5 show the time taken to compare numeric and string variables, respectively, for equality. Three variations were done for the numeric comparison, using each of PC BASIC's variable types. Double-precision variables, as might be expected, were handled somewhat more slowly. The string comparison was done four times, using increasingly long strings. Again as expected, the longer the string the slower the response.

Memory Access

Tests in the second group dealt with the time needed to access memory. The experiments were built around assignment statements such as B=A. Statements of this type can be used with all three types of number variables and with string variables, and as an added complication these can be either simple (scalar) variables or elements of arrays. Assignment statements using all types of simple variables all required the same time, although I suspect that slight differences would have shown up if more precise measurements had been taken. Storing information in arrays took longer. Tests 6, 7, 8 and 9 tested memory access first with simple numeric and string variables, then with number and string variables in both one- and three-dimensional arrays.

Two additional facts regarding memory access turned up. Assignments involving string variables require the same amount of time regardless of the string length (evidently memory location pointers are merely altered). It also turned out that access to constants is slower than access to variables by about ten percent.

Variations on Test 1 showed that the length of variable names and the number of variables in a program also affect execution speed in the PC BASIC. Presumably the reason is that before a variable's value can be found in memory, the interpreter must look up its location in a symbol table. The larger the symbol table, the longer this procedure takes.

"To my disappointment, the PC was only about 13 percent faster than an Apple II computer."

I experimented with two ways of lengthening the symbol table—using longer variable names, and adding names. When, in the empty loop program of Test 1, the variables "INDEX" and "NUMBER" were substituted for "I" and "N", execution time jumped from 26 seconds to 34. An equal slowing was recorded when I established 24 other one-letter variables before running the test with "I" and "N". Thus, if you write a program in which certain variables are accessed very often, it might pay to give them short names and define them early.

Text String Manipulation

Tests 10 through 13 examined the manipulation of text strings. The test involved removing three-character substrings from the 11-character string "LARRY PRESS." I did one test each where the substrings were taken from the beginning, middle, and end of the larger string, then one test combining all three operations. The time taken to extract a substring from the middle was 25 percent longer than at either end.

Arithmetic Speed

Computers wouldn't be called computers if arithmetic speed were not important. Tests 14 and 15 covered that area. My first test included addition, subtraction, multiplication, and division done all together. As usual, I ran it with all three types of number variable. Surprisingly, integer arithmetic proved slower than single precision. To discover why, I ran tests that each included only one of the four operations. Integer division turns out to be the culprit. Furthermore, execution time is influenced by the order in which operations take place; when I reversed the order of multiplication and division in my test program, execution time was cut by ten percent.

Complex Calculations

If you are interested in engineering and scientific applications, you may be curious as to the speed of computation involving transcendental functions such as SIN. Test 16 looked at the speed of these functions. Single precision computations are predictably faster than double; and the magnitude of the argument doesn't seem to affect execution speed in most cases.

File Processing

For all my test on file processing, I used a setup with the program disk in one drive and the data files on an otherwise-blank disk in the other drive. Test 17 measured the time to locate and read 200 randomly selected records from a 1,000 record file. In these cases, using a record length that was a power of two resulted in noticeable time savings.

Because random access files are sometimes processed serially, Test 18 investigated this and found that execution time is a direct function of record length. But here, execution time was unaffected by whether or not the record length was a power of two.

One surprising thing I found was that changing the size of the memory buffer for processing random access files, which PC BASIC allows, had no effect. When I quadrupled the buffer size for my test program from the default 128 characters, the speed stayed exactly the same. Since this discovery contradicts the BASIC manual, I tried Test 19, which copies a file instead of merely reading it. Again to my surprise, a large buffer provided no speed-up.

Several tests were run using serial files. Copying a 100-record file with 128-character records took one minute even.

BASIC Benchmark Tests

CONTROL STATEMENTS

Number	Test	Numeric Type	Repetitions	Time (sec.)
1A	FOR-NEXT	integer	30,000	26
1B	loop	single	30,000	38
2A	DO-WHILE	integer	5,000	20
2B	loop	single	5,000	24
3	GOSUB call		15,000	31
4A	IF A = B	integer	10,000	32
4B	THEN	single	10,000	32
4C	branch	double	10,000	35
		String Length		
5A	IF A$ = B$	1	10,000	30
5B	THEN	10	10,000	35
5C	branch	100	5,000	34
5D		255	2,000	25

MEMORY ACCESS

Number	Test	Numeric Type	Repetitions	Time (sec.)
6A	B = A	integer	10,000	22
6B	assignment	single	10,000	22
6C		double	10,000	22
		Dimensions		
7	B$ = A$		10,000	22
8A	B(J) = A(J)	1	5,000	16
8B	B(J,K,L) = A(J,K,L)	3	5,000	25
9A	B$(J) = A$(J)	1	5,000	17
9B	B$(J,K,L) = A$(J,K,L)	3	5,000	26

STRING MANIPULATION

Number	Test	Repetitions	Time (sec.)
10	MID$	5,000	25
11	LEFT$	5,000	20
12	RIGHT$	5,000	20
13	all above	5,000	55

ARITHMETIC SPEED

Number	Test	Numeric Type	Repetitions	Time (sec.)
14A		integer	5,000	49
14B	+ − ÷ ×	single	5,000	39
14C		double	5,000	137

Number	Test	Time (integer)	Time (single)	Time (double)
15A	+	15	16	18
15B	−	15	17	20
15C	×	15	18	21
15D	÷	29	22	111

COMPLEX CALCULATIONS

Number	Test	Time (single)	Time (double)
16A	tangent	68	68
16B	sine	27	27
16C	cosine	44	44
16D	arctangent	20	21
16E	exponential	18	18
16F	log	19	20

FILE PROCESSING

Number	Test	Buffer Size	Record Length	Time (sec.)
17A	random search for 200 from 1,000		63	50
17B			64	45
17C			127	69
17D			128	56
17E			129	68
18A	serial read through 1,000		63	28
18B			64	28
18C			65	28
18D			127	56
18E			128	56
18F			129	56
19A	copy 50 records	128	128	27
19B		512	128	28
19C		128	127	28
19D		512	127	29
20A	see note			57
20B		456		38
20C		912		32

Note: Copy 100 records of 114 characters each. Test 20A is serial copy routine, 20B and 20C use "pseudo-random" technique.

RANDOM NUMBERS

Number	Test	Numeric Type	Time Normal*	Time Short*
21A	which of	integer	136	121
21B	8,190 numbers	single	178	162
21C	are prime	double	186	170

*"Short" times are when all variable names in program (e.g., "PRIME") are reduced to a single letter ("P").

BENCHMARK-DERIVED TIPS

1. Use the FOR statement rather than DO WHILE for critical loops.
2. Use integer variables for loop indices.
3. Long variable names will slow your program down by making the symbol table larger.
4. Define frequently accessed variables early in your program to force them to the top of the symbol table.
5. Pay attention to the order of operations in critical arithmetic expressions since it has an effect.
6. Use integer arithmetic when possible, but beware of integer division.
7. Make random access record lengths powers of two, even if you have to add a little padding.
8. Use the "pseudo-random" technique for processing serial files.
9. Never put remarks inside of frequently executed loops.

A few ways in which you can speed your programs up were discovered while benchmarking the BASIC interpreter. Some of these (short variable names, for example) are inconsistent with good programming and documentation practice, so use them only in critical parts of your programs.

A BENCHMARK PROGRAM

```
10 DEF FNTIME=VAL (LEFT$(TIME$,2))*
   3600+VAL(MID$(TIME$,4,2))*
   60+VAL(RIGHT$(TIME$,2))
20 DEFINT I-N
30 A=1
40 INPUT "TRIALS";N
50 J=FNTIME
60 FOR I=1 TO N
70 B=A+A
80 NEXT I
90 PRINT FNTIME-J
100 INPUT "MORE";Y$
110 IF Y$="N" THEN STOP
120 GOTO 40
```

The program used for Test 1. Lines 10, 50 and 90 use the PC's internal time-keeping function to time the test.

Speed did not seem affected by slight changes in record size. In another test, I used a sample file of 100 name-and-address records with a 114 character record size. Treating it as a normal serial file, 57 seconds were required to make the copy. Test 20 is the one that copies the same file using the BASIC manual's "pseudorandom" recommendation; here, larger buffer sizes finally produced a noticeable time saving.

General Capabilities

The final benchmark tests I ran evaluated random number generation, video output, REMARK statements, and two larger programs testing overall performance.

Random number generation was tested because game programs often use it. To generate 15,000 random numbers took 35 seconds.

As I ran the benchmark programs, it seemed to me that the computer was writing information to the display screen rather slowly. So I devised a test that covers the screen with lines of 79 "X"s then jumps to the upper left corner and repeats. On a PC with a monochrome display adapter, it took 74 seconds to fill the screen ten times. For comparison I ran the same test on a Digital Microsystems computer connected to a standard 9600-baud terminal, also using Microsoft BASIC. On that system the test ran in less than half the time—35 seconds—suggesting that if you require fast video output from BASIC programs you may have to use assembly language subroutines.

The REMARK test was merely an empty loop with a REM statement in the middle of it. The addition of that REM more than doubled execution time, so be careful not to put remarks inside of loops.

For a more general test, I used the program PRIME that appeared in a September, 1981 *Byte* magazine article by Jim Gilbreath. Gilbreath wrote the program in many different computer languages and published the results of running it on many different machines. The program looks for prime numbers (those undivisible by factors other than themselves and 1), and is a good test of overall performance since it combines arithmetic, control statements and memory access. Test 20 checked the time needed to find which of the first 8,190 odd numbers are prime.

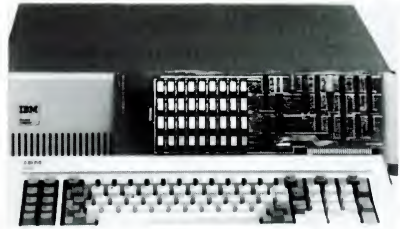
Comparative Results

To my disappointment, the PC was only about 13 percent faster than an Apple II computer on the prime-number test. Several of the other tests were also run both on the Apple and on a computer with a Z-80 microprocessor, each using Microsoft BASIC. In general, the PC is about halfway between the two in internal computing speed. Although the Intel 8088 microprocessor can operate on two bytes of data at a time, it is slowed down by the fact that the data must be transferred to and from memory one byte at a time.

For a software comparison, I ran a Pascal language equivalent of the prime number program, using the Microsoft Pascal compiler. The compiled version ran more than 20 times faster than the PC BASIC version, and compared favorably to results for this benchmark on Z-80 based computers with similar software.

For a printed copy of the programs used by Larry Press to run his PC benchmark tests, send a self-addressed, stamped business-size envelope to *Benchmarks, PC, 1528 Irving Street, San Francisco, California 94122.*

FIGHT THE SQUEEZE!!



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Add 3rd and 4th drives to your IBM. Includes cables. Simply plug in and go. All drives 100% tested before shipping.

	Part No.	Price
Single Drive	#EFD1	$450
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	Part No.	Price
16KByte Memory Expansion for Chasis	MEM16	$ 25
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Floppy Disc Controller with serial printer interface now you can connect your serial printer (Avail. May)	FDC/sp	$249
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Internal Floppy D

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NEW ON THE MARKET

Inexpensive Color Plotter

Hewlett-Packard's new HP 7470 is a microprocessor-based, small-format pen plotter capable of an 8.5 x 11-inch plot area, two-color output, 1/1000-inch resolution (step size), and a plotting speed of 15 inches per second.

The plotter is capable of accepting either 8.5 x 11-inch or ISO A4-size paper. It automatically selects between two pen stalls and can accommodate both HP fiber-tip pens (available in ten colors and two widths) and transparency pens (seven colors, two widths) used to produce overhead projections. Intelligence features include built-in character generation and the ability to rescale (enlarge/reduce) or reconfigure (expand/condense) images and characters automatically.

The unit is equipped with an RS-232C interface and requires a maximum of 25 watts to operate. Graphics software (HP-GL) to drive the plotter is available, although it is unclear whether or not it will run on the IBM PC.

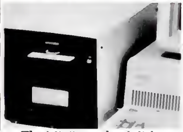
The HP 7470 will be available March 1 through computer retailers and Hewlett-Packard; the suggested retail price is $1550.

HARDWARE

Hard Disk Storage

Three companies have introduced products for users who want to upgrade their disk storage capacity. Datamac's add-in Winchester disk system can be installed directly in the floppy disk area of the IBM PC. The system includes the disk drive, disk controller (which supports as many as four Winchester drives, is fully buffered, and offers automatic error correction), software, and documentation. Available in May, the system will offer storage capacities of 6MB ($2995), 12MB ($3495), or 18MB ($4195) per drive.

Datamac Computer Systems, 680 Almanor Ave., Sunnyvale, CA 94086; (408)735-0323.



The MiniMega hard disk and floppy disk backup system includes a controller, host adapter, operating software, power supply, cable, cabinet, and operating instructions. The system contains an on-board microprocessor, makes media errors transparent to the host computer, and is available either alone, in 5 or 10MB configurations, or integrated with a 5.25-inch, 1MB floppy disk backup. Contact the company for information about price and a current $200 rebate.

Santa Clara Systems, Inc., 560 Division St., Campbell, CA 95008; (408)374-6972.

Davong Systems' DSI-501 Winchester disk drive fits inside the Drive Two location in the IBM PC chassis, providing 5MB formatted file capacity and a data transfer rate of 5 megabits per second. Compatible with both the PC-DOS and Qunix (Unix-like) operating systems, it includes the Winchester disk drive, a disk controller board, power supply, cables, and software (diagnostic program, hard-disk formatter, and installation/configuration program). The DSI-501 is presently available through ComputerLand stores at a suggested retail price of $1995.

Davong Systems, Inc., 10601 Terra Bella Ave., Mountain View, CA 94043; (415)965-7130.

Finally, as of March, Tallgrass Technologies' TG-1000/1200 Winchester HardFile subsystems will incorporate the newly developed TG-100AT combined disk/tape controller, which includes a revised format allowing increased data storage per track and increases the storage capacities of the TG-1000 and TG-1200 to 6.267MB and 12.534MB, respectively.

Tallgrass Technologies, 9009 W. 95th Street/P.O. Box 12047, Overland Park, KS 66212; (913)381-5588.

Memory Expansion Boards

Davong Systems has announced the availability of a series of RAM expansion boards: the DSI-64K ($325), the DSI-192K ($750), and the DSI-256K ($950). These boards may be placed in any free system slot, are compatible with all IBM PC hardware and software, and are available from ComputerLand.

Davong Systems (see above)

Memory Technologies' MT512-XIB memory board offers a maximum capacity of 512KB of random access memory with full parity checking, bank selectable in blocks of 64KB to allow the user to purchase the board with an initial 64KB and then to expand it to full capacity using the company's MT649 Memory Expansion Sets. The board ranges in price from $499 (64KB) to $1995 (512KB) and is covered by a one-year warranty on parts and labor.

Memory Technologies, Inc., 25 Main St., Twelve Mile, IN 46988; (219)664-5741.

An error-correcting memory board available in storage capacities ranging from 64KB ($495) to 192KB ($1195), in 64KB increments, has been introduced by Boulder Creek Systems. The board detects and corrects single-bit errors and flags double-errors as a parity error.

Boulder Creek Systems, 4859-C Scotts Valley Dr., Scotts Valley, CA 95066; (408)438-4546.

Autodial Modem

General DataComm's 103J-M is an auto-answer modem designed for full duplex, asynchronous operation over the switched network at data rates of from 0 to 300 bps. The modem, which operates over all dial telephone lines, features Automatic/Manual and Data Talk modes.

General DataComm, One Kennedy Ave., Danbury, CT 06810; (203)797-0711.

Peripheral Switchboxes

Two peripherals-switching stations have been introduced by Automated Control Systems. The ACS 200, a three-position parallel switching box, allows the user to alternate between two, Centronics-Compatible printers from a single CPU port; a front panel switch controls printer choice. The ACS 232 serial switching box permits a single computer port to support two terminals; the switch is fully buffered and operates at baud rates up to 1MB. Both the ACS 200 and

NEW ON THE MARKET

the ACS 232 have a list price of $129.95.
Automoted Control Systems, 1801 130th NE, Suite 4, Bellevue, WA 98005; (206)881-0177.

Communications Cards, Etc.

AST Research is presently offering a series of products designed to enhance the storage and communications capabilities of the IBM PC. These include:

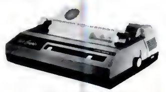
—A series of memory expansion boards, ranging from 64KB ($495) to 256KB ($1145), with full parity checking; fully assembled, tested, and burned-in.

—Two asynchronous, serial communications boards: the CC-032 (one RS-232 port) for $145; and the CC-132 (two RS-232 ports) for $275.

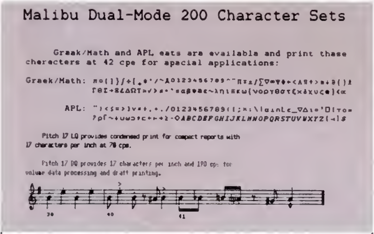
—An advanced communications board, the CC-232, featuring two independent, programmable RS-232 ports supporting asynchronous, bisynchronous, SPLC, and HDLC protocols.

—A direct-connect modem offering two ports: an RS-232 serial and a direct-channel modem.
AST Reseorch, Inc., 17925 Sky Pork Circle, Suite B, Irvine, CA 92714; (714)540-1333.

Graphics Printer



The Centronics Model 122 graphics dot-matrix printer is a 120 characters-per-second (CPS), 132-column desk-top peripheral intended for use in data and business processing applications. It provides both alphanumeric printing and 6- or 8-pin addressable graphics; other standard features include bidirectional printing in single-space alphanumeric mode, unidirectional printing in graphics mode, and selectable forms length and lines per inch. The suggested list price is $1195.
Centronics Data Computer Corp., Hudson, NH 03051; (603)883-0111.



Dual-mode Printer

Malibu Electronics has introduced the Dual-Mode 200, a printer capable of performing both high-speed (165-200 CPS) data processing tasks as well as high-quality, low-speed (42-70 CPS) word processing duties. Features include the ability to output proportionally spaced and justified text; to change fonts and/or print-quality modes at any point in a document; and to employ a variety of text emphasis devices, including boldface and underlining. A selection of fonts is available. The suggested list price is $2995.
Malibu Electronics Corporotion, 2301 Townsgate Rd., Westlake Village, CA 91361; (805)496-1990.

Carrying Cases

The Computer Case Company has introduced a line of carrying cases for the IBM-manufactured PC components: the IB1501 ($129) can contain the CPU, keyboard, and manuals; the IB502 ($99) holds the monitor; and the P403 ($89) is designed to carry the matrix printer. In addition, these cases can be used to provide dust-free storage and can be locked to prevent unauthorized access.
Computer Case Company, 5650 Indion Mound Court, Columbus, OH 43213; (614)868-9464/(800)848-7548.

SOFTWARE

UCSD p-System

Network Consulting, Inc., (NCI) has introduced an implementation of the Version 4 Softech/UCSD p-System operating system for the IBM Personal Computer. The p-System is an operating system that compiles programs written in Pascal, FORTRAN, and BASIC into a form in which the programs are "transportable" between (can be used on) machines built around a variety of different microprocessors. The NCI implementation includes features that enhance memory use and storage options and allow the use of non-IBM peripherals.

The NCI p-System supports RAM disk, a feature that allows any extra memory to be used as if it were located on a floppy disk and thereby significantly increases the speed of certain operations (e.g., compiling). By fully utilizing the space available on the floppy disks, NCI p-System makes it possible to use ten sectors per track rather than the eight IBM recommends, resulting in a 25 percent increase in disk storage capacity. Automatic discrimination between eight- and ten-sector diskettes is provided, assuring compatibility between IBM (eight) and ten-sector diskettes. In addition, any combination of single-sided (provided with the PC), double-sided, and double-density (double-tracked) disk drives is supported.

The operating system also includes a number of other features, such as a floppy disk formatter for all supported diskette formats; hard disk back-up and recover functions via floppy diskette; terminal mode; remote supervisory terminal support; and a number of I/O support functions. The company plans eventual support for Ominet and the 8087 coprocessor and for the Corvus Constellation, Tall Grass Technology, and Tecmar hard disk systems. Although the p-System is available as a package (including total system, Pascal compiler, extended memory, native code generator, double-track support, RAM disk, Turtlegraphics, and print spooler) for $800, a number of other, separately priced options are offered.
Network Consulting, Inc., A106-1093 W. Broadway, Voncouver, Conodo V6H 1E2; (604)738-3500.

FORTH Language

PC/FORTH, a complete FORTH program development system for the IBM PC, has been introduced by Laboratory Microsystems. The basic package ($100) includes an interpreter/compiler with virtual memory management; the fig-(FORTH Interest Group) FORTH line editor; a screen editor modified to take advantage of the PC's graphics display capabilities; an 8086 assembler; a reverse translator; debugging aids, utilities, and a series of demonstration programs. The FORTH vocabulary has been extended to give full access to all PC-DOS operating system facilities. Options include floating point extensions (available either in full software or support routine ver-

sions) for a series of arithmetic coprocessors ($100) and the Laboratory Microsystems' version of the Nautilus FORTH Cross Compiler ($300, requires PC/FORTH).
Laboratory Microsystems, 4147 Beethoven St., Los Angeles, CA 90066; (213)306-7412.

Word Processor

Select Information Systems has announced the availability of an IBM PC version of their Select word processing system. Select, which includes an on-screen, interactive teaching program (*Teach*), is designed for the novice user whose only interest in a computer is in its ability to accomplish tasks. The program, which is compatible with virtually all CP/M-based systems, includes two 5.25-inch floppy disks containing the word processor, *Teach*, and installation instructions; *Superspell* (a proofreading program); *Merge Print* (a program that integrates mailing lists with any *Select* document); and a reference manual. The suggested retail price is $595.

The company has also introduced two new software programs: *Teach/M*, a self-teaching program designed to introduce novice users to the essentials of using CP/M; and Converse, a CP/M-based telecommunications program for general office use.
Select Information Systems, 919 Sir Francis Drake Blvd., Kentfield, CA 94904; (415)459-4003.

IN PRINT

Periodical Index

COMPendium is a monthly, periodical guide to the contents of computer publications. The bulk of the magazine consists of synopses of all non-editorial articles appearing in 20 major personal computer magazines (from *Byte* to *TRS-80 Microcomputer News*) and of directories of book, hardware, and software reviews found in those publications. *COMPendium* includes a section called "ADwatch," which lists the publications in which advertisements for major products appeared, as well as a section called "Infoservice", an inexpensive ($20/75 words) classified advertisements section in which users' groups, newsletters, magazines, stores, etc., can describe their activities and services. Subscriptions cost $18 per year in the U.S. and $20 in Canada. Publisher/Editor: Michael Bierbauer.
Epicurious Publishing Company, P.O. Box 129, Lincolndale, NY 10540.

Reference Cards

Two products designed to reduce the time spent searching through the manual for forgotten syntax rules or commands have been recently introduced. The IBM PC BASIC Memory Jogger is a single-sheet, color-coded list of the computer's commands, statements, functions, and alternate keys. It measures 8.5 x 14 inches, includes a built-in easel to allow it to stand upright, and costs $10.
JC Computer Specialists, P.O. Box 3465, Federal Way, WA 98003.

The Easy Find reference card contains 14 panels of information obtained from the IBM BASIC manual and includes lists of information such as Basic statements, commands, I/O-related functions, string-related functions, graphics and color, and operators. All entries are alphabetized and contain a brief description of the item and an example of its use. Printed on light cardboard, it costs $3.50.
Minimagic Co., 104 Park Rd., #34, West Hartford, CT 06119; (203)233-6261.

A PC EXCLUSIVE INTERVIEW/DAVID BUNNELL

Microsoft's Vern Raburn

When *PC* Publisher David Bunnell recently interviewed Vern Raburn, President of Microsoft Consumer Products, he asked him point blank if Microsoft would be coming out with a word processor for the PC. Raburn refused to answer but we believe the following discussion will be of interest to our readers. We think that by declining to answer, Raburn may have answered the question. Anyway, he gave us pause for thought.

PC: Is Microsoft planning a word processing package for the IBM Personal Computer?

Raburn: I cannot answer that question.

PC: With a 16-bit machine and all of that addressable memory, you could come up with a writer's dream.

Raburn: One of the critical elements of word processing today is that the really good word processing machines—such as Wang and Xerox—are dedicated systems. This is one of the reasons why *WordStar* suffers by comparison. You have to use all of those control codes. Of course, their response is "Hey, if I am keeping my hands on the keyboard, and I am only adding one key, those control sequences become much faster than punching a dedicated key."

PC: But it is so easy to hit a wrong control key.

Raburn: The theory is that people who use word processing machines are people who type all the time. This means that they are very proficient at the keyboard. They don't hit wrong keys. I am just giving you the party line right now. I don't agree with this completely, but unless you are willing to go out and build a dedicated machine with a lot of dedicated functions . . .

PC: The IBM has some dedicated keys.

Raburn: There are ten function keys. You can do many things with them. IBM has been insistent that we implement those keys into any products we produce. Multiplan uses those keys. That is a problem with word processing. If we really want to get into it. The way that the word processor becomes really nice is when you get away from keyboard input. Which means, use keyboard input for words only and use something like a mouse, or a joy stick, or a track ball for the editing commands.

Raburn: *"Few people even have a glimmer of the power . . ."*

PC: Voice recognition would be a great way.

Raburn: Oh, voice recognition is the ultimate solution.

PC: I would think that a system that could recognize words such as "delete" might be possible now.

Raburn: Voice recognition is still not a viable alternative. I believe strongly that it ultimately will be, but right now it cannot be done.

PC: What are the possibilities for integrating a word processing program and graphics with an electronic spread sheet program?

Raburn: I would throw in database management. That's where the 16-bit processor comes in. When you have a megabyte of working memory you can put all that stuff in there. Then you are talking about a complete information processing system. A knowledge processing system, if you will.

PC: How far are we away from that?

Raburn: In some ways it exists today. That is what the Star system is. The Star will ultimately have all of those capabilities—database, word processing, graphing, charting, communications.

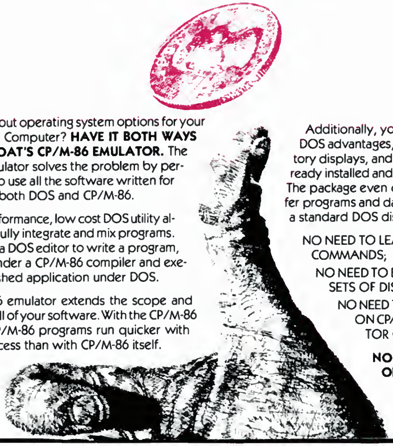
PC: You're talking about the Xerox Star system?

Raburn: Yes, exactly. If you want to pay about $100,000 you can have it now. We are a couple of years away from doing that on a $5,000–$10,000 machine.

PC: With a machine like that you could be a one-man army.

Raburn: It's phenomenal. There are very few people even in the computer business who have even a glimmer of the power that we are going to make available to people in a very short period of time. The 18-hour days around here get tiresome. But I believe that Microsoft will be one of the companies in the forefront that ultimately integrates all of this technology. We are coming up to one of those points in history that occurs every once in a while where a group of totally separate technologies are going to start maturing simultaneously. The result is going to be a new technology—a new way of doing things that has never even been thought of before. That is extremely exciting.

IBM'S DOS or CP/M-86?



Confused about operating system options for your IBM Personal Computer? **HAVE IT BOTH WAYS WITH LIFEBOAT'S CP/M-86 EMULATOR.** The CP/M-86 emulator solves the problem by permitting you to use all the software written for IBM's PC for both DOS and CP/M-86.

This high performance, low cost DOS utility allows you to fully integrate and mix programs. You can use a DOS editor to write a program, compile it under a CP/M-86 compiler and execute the finished application under DOS.

The CP/M-86 emulator extends the scope and capacity of all of your software. With the CP/M-86 emulator, CP/M-86 programs run quicker with faster file access than with CP/M-86 itself.

Additionally, your program will enjoy all the other DOS advantages, such as large file size, dated directory displays, and more. The DOS peripherals are already installed and DOS commands are fully available. The package even contains a utility program to transfer programs and data files from a CP/M-86 diskette to a standard DOS diskette.

NO NEED TO LEARN A NEW SET OF UTILITIES AND COMMANDS;

NO NEED TO END UP WITH TWO INCOMPATIBLE SETS OF DISKETTES;

NO NEED TO SPEND HUNDREDS OF DOLLARS ON CP/M-86, WHEN THE CP/M-86 EMULATOR COSTS $75.

NO NEED TO WONDER WHICH OPTION IS BEST FOR YOUR IBM PERSONAL COMPUTER.

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Perform miracles of manipulation on your keyboard with Lifeboat's PMATE.

This new generation text editor is the most sophisticated text editor available today and is bristling with features previously unavailable on microcomputers, making it ideal for virtually any program or data file editing.

PMATE's command set includes full screen single keystroke editing, horizontal scrolling, automatic disk buffering, macro command language, text formatting, expression evaluation, conditional branching, I/O with prompting, and other programming language constructs. PMATE makes use of 11 buffers for storage, and includes commands permitting work on more than one text at a time. Unique to PMATE is the facility for user customization. Keystroke functions can be redefined, and sequences can be programmed to directly execute macros. Video commands can be changed, and macro functions can be written, to emulate any other editor with which you may be familiar. PMATE provides full side-scrolling, and can be used with virtually ANY video terminal on the market. IF you use an editor, you need PMATE.

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THE AGE OF ALTAIR

Part Two

The personal computer traces its roots back to the Altair computer first manufactured in January, 1975, by Mits, Inc., a little company which came from the desert sands of Albuquerque, New Mexico. For the next two and a half years, Mits, Inc. so dominated this new found market that the company literally defined personal computing. David Bunnell and Eddie Currie were both uniquely involved in the beginning of personal computing as Mits vice presidents. Together in this exclusive PC *series, they tell the story of* The Age of Altair.

CONTEXT OF THE REVOLUTION

It is important to understand the period in which the Altair Computer was born if one is to truly appreciate the growth of what was initially considered a modest market.

Students of the computer in the early 1970's were constantly frustrated by the computer priesthood which dominated the cathedrals of the computers, i.e. the computer centers. These sacred shrines provided shelter and isolation for the IBM 360, the Univac 1130 and other such number-crunching beasts.

Computer students spent countless hours laboring, often in vain, not at the computer but at key punch machines. Having punched their programs into Hollerith cards, an artifact of the previous century, they made their way with great temerity to the hallowed computer room. They weren't allowed inside this room, but instead were permitted to pass their deck of cards through a small window and retire to await the "job" completion.

Enter The Hungry Card Reade

In as little as two hours or in
cases as long as two weeks they ret
to the little window to learn that the
puter system crashed, or the card r
ate all their cards, or the cards
dropped prior to introduction int
card reader (that is, the operator wa
en an opportunity to shuffle the dec
their listing had inadvertently bee
tached to the listing of another pe
output who was nowhere to be f
and so on.

In those rare instances when the
of cards and the printout were retur
was often discovered that a comm
been deleted from, say, column 12
first card in the deck and that, of c
was "Fatal Error Number 345"—wh
you could find the right reference
ual, could be decoded as meanin
again, Charlie."

From the Sands of New Mexico came the World's First Personal Computer

No one was permitted to touch the mputer unless they were a member of e priesthood. Consequently there olved the popular academic pastime of ing an axe to the computer. Thus the mputer was further restricted by metal rs, armed guards, police dogs, electron- locks and other devices.

st A CIA Plot

It was commonly believed that such iversity computers were instruments of vert activities sponsored by the CIA. owever, computer students knew that s a ludicrous concept because they ew the problems associated with run- ng a ten-card program to sort a few mbers in ascending order. It could take ys, if not weeks, to get such a program rking.

By late 1974 frustration among those erested in computers had reached an -time high. Thus, when the free spirits ong them learned of the availability of omputer which could be purchased for ew hundred dollars and enshrined in e's spare bedroom or garage they pro- ded Mits Altair a ready market.

The majority of those who flocked to e post office had limited discretionary nds, so they purchased the "kit form" of e Altair computer. Mits soon found a iving business trying to repair the myr- d attempts to render bags of resistors, kets, integrated circuits, capacitors, Ds, pc boards and a plethora of other n-descript components—held in place cross-threaded screws and acid core der—into a living, breathing computer th flashing lights that rivaled the IBM nts.

Of course, the half-life of these home- ew computers was relatively short ce the acid was slowly eating the hed circuit from the pc card. Critical mponents were not infrequently found rking amongst the edge connectors on e mother board having slipped their rly solder bonds.

llo, Hello, Hello . . .

It was during this period that Mits de- loped the concept of "infinite hold."

Though the Altair could be purchased in assembled form, most early customers opted to build the low-price kit, shown here in an early Mits advertisement.

This early byproduct of the microcomputer revolution resulted when hobbyists found access to university and other institutional telephones from which they called Albuquerque without charge to discuss at length fine points of remote computer construction.

Some of these hobbyists are still holding, yet even so these interminable telephone calls rapidly consumed the available Mits repair staff so that computers waiting in the repair queue were often left to trespass on eternity.

The Great Chip Debate

For some time prior to the advent of the Altair computer, debate had raged at Harvard between Bill Gates and Paul Allen as to which microprocessor they should write a BASIC interpreter for. The announcement of the Altair with its Intel 8080 CPU ended these discussions and sent three young enthusiastic men (the third was Monty Davidoff, aka Mad Dog) off to write the code which would eventually find its way into millions of personal computers.

A few weeks later, Paul Allen arrived in Albuquerque armed only with a paper tape having never seen an 8080 chip. Within twenty minutes 4K Altair BASIC was up and running.

With the release of a 4K dynamic memory board along with 4K BASIC on paper tape, the teletype machine all but vanished from the surplus stores where it had been stashed in great excess. Although BASIC had appeared on college campuses years earlier, it had fallen into disfavor for serious work and was replaced by FORTRAN and COBOL. Undaunted, the hobbyist picked up the BASIC banner and pressed on. This simple act of faith was to have an enormous impact upon future generations as we shall see.

Consuming Megahours

Many a megahour was consumed by the unsuspecting hobbyist in front of his trusty teletype machine waiting patiently for Altair BASIC to be loaded into the machine through the paper tape reader. Often the end of the tape was met by abject silence meaning that somewhere a tiny cell within the bowels of the 4K dynamic memory board (remember the term "dynamic" as it will loom up out of the swamp again) had "dropped a vital bit" during the loading process. A major breakthrough occurred each time the system responded with the long awaited "MEMORY SIZE?" prompt which meant that with any luck at all you would soon be running BASIC.

Strange as it may seem, Mits discovered that customers who could not afford a teletype machine or 4K memory board were often far happier if their computer was not functioning since that left them with an avocation, viz. repairing it. Another interesting discovery was that much of the desire to own an Altair was based on the prestige an owner got by impressing his friends that he had his own computer.

The result was that thousands of people mailed in the full payment for their computers which they might not see for weeks or even months. The cash requirements for Mits were greatly facilitated by this never-ending backlog.

The Federal Trade Commission entered a new era of bureaucratic red tape with the advent of the mail order computer. Many of the regulations in effect today grew out of Mits related activities.

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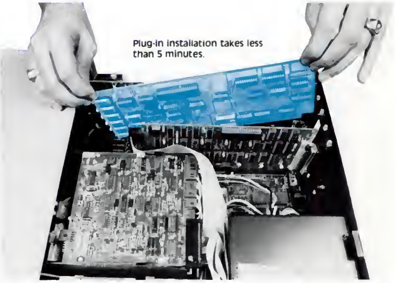

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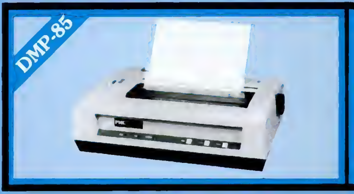

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Advertiser Index

CORRECTIONS

In the previous issue's Advertisers Index, the advertisement of G&G Engineering, on pp. 70-71, was incorrectly identified as that of Godbout Co.

The previous issue's excerpt of *Don't* by Rodnay Zaks, beginning on p. 72, should have been identified as Copyright © 1981, Sybex.

PC regrets the error and omission.

Coming Up

CP/M's Creator

PC interviews Gary Kildall, creator of the CP/M operating system, to find out what the future holds for this software family on the IBM Personal Computer.

PCs In The Classroom

National University, in San Diego, is using PCs by the truckload to acquaint students with the power of personal computers. We visit to see how.

At The Faire

For the past five years, the West Coast Computer Faire has been one of the seminal rites of the personal computer world. *PC* reports on the IBM PC's impact at the 1982 Faire.

"Letter Quality" Printers

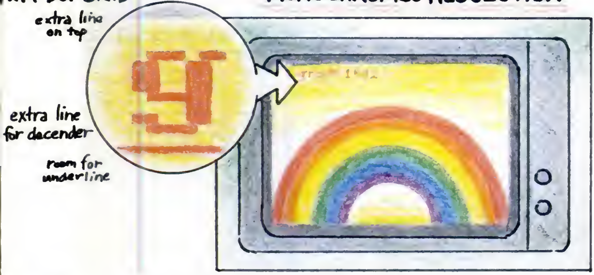
When dot-matrix printing isn't good enough, you may want one of these. *PC* surveys what's available and helps interpret the choices.

Plus . . .

An evaluation of the PC keyboard in Taking The Measure, Part 3 . . . a *PC* profile, product reports, and plenty more . . .

WISH LIST

COLOR DISPLAY TO MATCH MONOCHROME'S RESOLUTION



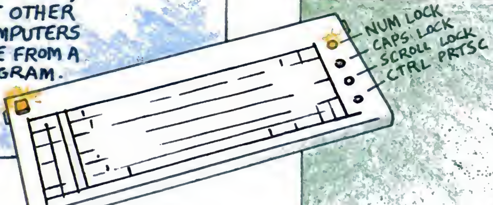
720 x 350 RESOLUTION (vs. 320 x 200)... BUILT IN 128K DISPLAY MEMORY FOR FULL 16-COLOR CHOICE ON EACH DOT... AT $750. to $1,000. THIS WOULD FIND A READY MARKET AMONG SMALL BUSSINESS AND PROFESSIONAL BUYERS.

—Robert Brown
Sunnyvale, Calif.

HARDWARE RESET BUTTON

A SIMPLE BUTTON, LIKE ON MOST OTHER PERSONAL COMPUTERS TO DISENGAGE FROM A RUNNING PROGRAM.

—Frank G. Wood
Newhall, Calif.



KEYBOARD TELLTALES

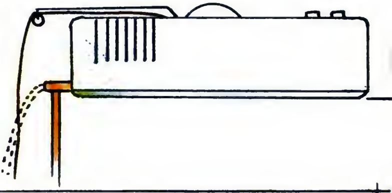
LIGHTS ON KEYBOARD TO INDICATE STATUS OF TOGGLES.

-Diana Herron
San Diego, Ca

RIGHT ANGLE PRINTER PLUG

UNLESS IBM PRINTER IS PUT FULL FORWARD ON PRINTER STAND, PAPER SCRAPES THE CABLE. RIGHT ANGLE CABLE WOULD SOLVE PROBLEM.

—Patrick John Sebrecht
San Diego, Calif.



PC invites readers to contribute Wish List ideas for publication. Any product, service or design idea you'd like to see for IBM Personal Computers is appropriate. Ideas selected for publication will be illustrated by *PC*'s artist if needed. *PC* will pay $25 for the featured Wish List idea in each issue, $10 for others published. All ideas published will be credited to the submitter and become the property of *PC*. In case of duplicate submissions, any award will go to the earliest postmark. Send a description or sketch of your idea to : *Wish List*, PC, *1528 Irving Street, San Francisco, California 94122*. Sorry, we can't discuss the Wish List feature by telephone.

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Personal, Professional, Technical — or somewhere in between ...
PC-MATE™ makes the IBM Personal Computer a perfect match

PC-MATE™ from TECMAR is the first and only complete expansion series available for the IBM Personal Computer. There are currently more than twenty PC-MATE™ expansion options available, and new products are continuously added to the list.

When you want more from your IBM Personal Computer, look to PC-MATE™.

You can create a SUPER PERSONAL COMPUTER with household lights and appliance control, voice output, and give it more memory than any ordinary personal can handle.

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Ask your local computer store for more information on the PC-MATE™ series from TECMAR, or call for the name of your nearest authorized PC-MATE™ dealer.

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Personal Computer Expansion Chassis (see photo)
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Parallel Medium Speed Input/Output Interface
Serial Medium Speed Input/Output Interface
Parallel High Speed Input/Output Interface
Serial High Speed Input/Output Interface
Analog to Digital Converter - 8, 12, 14, 16 Bit
Dust Cover Set for IBM PC and Peripherals
High Speed Static Memory (RAM/ROM)
Digital to Analog Converter - 8 and 12 Bit
Multi-System Printer Sharing Facility
CMOS Memory with Battery Backup
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Electrically Erasable EPROM
BSR X-10 Device Controller
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Video Image Digitizer
IEEE 488 Interface
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Music Synthesizer
Voice Synthesizer
Extender Board

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Additional products are already under development, so if we don't have what you need, chances are good that we soon will.

Tecmar Inc. PERSONAL COMPUTER PRODUCTS DIVISION
23600 Mercantile Rd., Cleveland, OH 44122 (216) 464-7410

PC

The Independent Guide to IBM Personal Computers

Volume 1, Number 3 $3.00

WANT TO SELL YOUR Used Apple?
SEE P. 72

GARY KILDALL
The Man Who Created CP/M

IBM Announces CP/M-86

WordStar Released

Baby Blue, Using Data Files, FORTH, Hundreds of New Products

PLUS: Adam Osborne & David Bunnell tell you how NOT to buy a Micro


Keeping up
with modern time

Roller skates can gain you a little speed. But they can't help with the unprecedented pressures, problems and paperwork of this information age.

That kind of challenge calls for a special solution—a tool for modern times: the IBM Personal Computer.

Getting things accomplished.

The most-often-asked questions about this tool are: how easy is it to use, and just what do I use it for?

The first question is simple to answer, because the IBM Personal Computer is surprisingly simple to learn.

The second question has no single answer, however. Because the uses for the IBM Personal Computer are as varied as your needs—as limitless as your imagination.

Storing form letters at the office, for example. Attendance records at school. Or tax records at home.

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Completing sales reports as easily as your kids can revise and print book reports.

Or teaching students "dry" subjects in game form (while they learn there's more to computers than intergalactic battles).

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Keeping up with modern times is tough enough. But intelligent planning is key. What if interest rates plummet? What if property taxes soar?

What's the latest stock report? What's the Aspen ski report?

With an IBM Personal Computer, and an expanding library of software, you can forecast. Plan ahead. Test contingencies. Tap information networks that bring the world into your lab. Your office. Your classroom and your living room.

What's in store?

So to keep up with modern times, visit your authorized IBM Personal Computer dealer today.

Ask what programs are available now. Get a demonstration.

IBM PERSONAL COMPUTER SPECIFICATIONS

User Memory
16K-256K bytes*
Microprocessor
16-bit, 8088*
Auxiliary Memory
2 optional internal diskette drives, 5¼", 160K bytes per diskette
Keyboard
83 keys, 6 ft. cord attaches to system unit*
10 function keys*
10-key numeric pad
Tactile feedback*
Diagnostics
Power-on self testing*
Parity checking*

Display Screen
High-resolution*
80 characters x 25 lines
Upper and lower case
Green phosphor screen*
Operating Systems
DOS, UCSD p-System, CP/M-86†
Languages
BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL
Printer
Bidirectional*
80 characters/second
12 character styles, up to 132 characters/line*
9 x 9 character matrix*

Permanent Memory
(ROM) 40K bytes*
Color/Graphics
Text mode:
16 colors*
256 characters and symbols in ROM*
Graphics mode:
4-color resolution: 320h x 200v*
Black & white resolution: 640h x 200v*
Simultaneous graphics & text capability*
Communications
RS-232-C interface
Asynchronous (start/stop) protocol
Up to 9600 bits per second

*ADVANCED FEATURES FOR PERSONAL COMPUTERS

And be sure to check the hardware features that set this personal computer apart. (Bring the box above to simplify comparison shopping.) You'll find that the quality, power and performance are what you'd expect from IBM. The price isn't.

For a store near you (or for information from IBM about quantity purchases) call (800) 447-4700. In Illinois, (800) 322-4400. In Alaska or Hawaii, (800) 447-0890. IBM

The IBM Personal Computer
A tool for modern times

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PC
The Independent Guide to IBM Personal Computers

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BOOK REVIEWS

PC PROFILE

FOLLOW-UP

AGE OF ALTAIR

BOOK EXCERPT

EDUCATION

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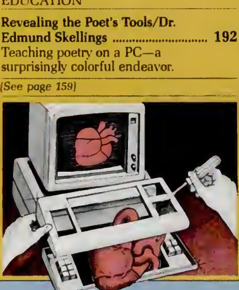

COLUMNS

DEPARTMENTS

COVER

Concept—Jacqueline Poitier
Design—Linda Harrison
Painting—Linda Schaub-Nace

PC

The Independent Guide to IBM Personal Computers

(ISSN applied for) Published bimonthly by Software Communications, Inc.

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CompuServe 70370,532 **The Source** STØ 938

Subscriptions: Within USA—six issues for $14.50, twelve issues for $27. Elsewhere—six issues for $29, twelve issues for $54; air delivery (please remit US funds). Please allow four weeks for delivery of your first issue.

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"WHAT IF..."

Seldom is your first solution to a problem the only one, or the one that's necessarily best.

That's why our VisiCalc® program is #1 in the business: the most widely-used business program ever for the personal computer.

It's a powerful "electronic worksheet" that takes the work out of working with numbers. Whether you are working with investments, cash flow, inventory, estimates, budgets, plans—nearly anything numerical, the VisiCalc program will help you work better, smarter, faster.

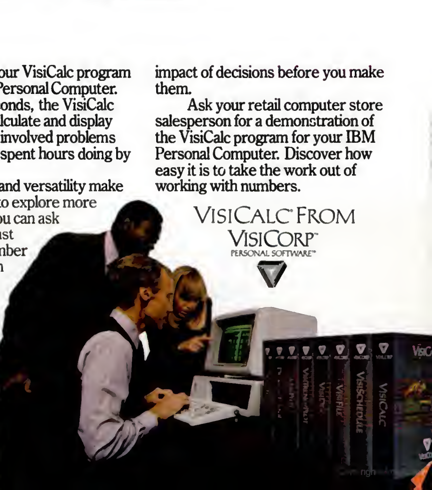
And the VisiCalc program lets you take full advantage of the IBM® Personal Computer's memory expansion capability. You can create worksheets six times larger than those possible at the 64K level. So you can solve even the biggest problems with our VisiCalc program and your IBM Personal Computer.

In just seconds, the VisiCalc program can calculate and display the answers to involved problems you could have spent hours doing by hand.

Its speed and versatility make it easy for you to explore more alternatives. You can ask "What if?"... just change any number in your problem and instantly, the VisiCalc program recalculates all the numbers and displays the new results. So you can readily analyze the impact of decisions before you make them.

Ask your retail computer store salesperson for a demonstration of the VisiCalc program for your IBM Personal Computer. Discover how easy it is to take the work out of working with numbers.

VISICALC® FROM
VISICORP™
PERSONAL SOFTWARE™



Letters To *PC*

PC Sells a PC

I have been in the market for a good personal computer for several months, and have been trying to digest the brochures and articles describing the various products currently on the market. Your magazine unequivocally sold me on the IBM Personal Computer, better than any sales brochure could or would. The interview with Bill Gates and your section "Taking the Measure" were superb. It gave me a thorough insight into the thought that went into the design of the computer and its software.

After reading your magazine, I went right out and placed an order for the IBM Personal Computer, and am now eagerly awaiting delivery.

J.L. Arps, President
Arps Petroleum Company
Bellevue, Washington

A Bet "On the Come"

Bravo, your first issue is outstanding. We are, so to speak, babes in the wood as to computer knowledge and found many wolves out there in the marketplace. Through a long, agonizing search, we decided to obtain the IBM PC (because it is clearly the best micro on the market) and leave ourselves adrift without the software we really wanted, such as *SuperCalc*, *WordStar*, *SpellStar*, and *MailMerge*, gambling that either CP/M-86 would be available soon enough or that those items would be rewritten in PC-DOS.

Arthur O. Carmichael, P.E.
Livonia, Michigan

Your "gamble" has paid off. This issue carries reports on lots of new products, including CP/M-86 and a plug-in board that lets you run WordStar *and* MailMerge.

Monochrome Mistake—Two Views

"The Monochrome Mistake" (*PC*, April-May, 1982) is very misleading in outlining the relative advantages of color vs. monochrome displays. Color displays are great, all else being equal. Unfortunately, all else is not equal. There are good reasons why "business" software generally is not designed to use color displays on the IBM PC or any other computer.

Obviously, color displays convey more information, which, in computer terms, means *memory*. For a monochrome display, each small dot forming a character is either on or off. However, for a color display each dot also has some color attribute, which uses more memory. The practical result is that the characters produced by IBM's color display have only about *half* the number of dots available (64 vs 126) to form a character as the monochrome display, and that means that color display characters are harder to read.

Another problem related to how easy it is to read the screen is the quality of the video display itself (TV or monitor). Color video is produced by scanning the surface of the picture tube with three electron beams, which must be perfectly aligned to produce high resolution. Black and white, with only one electron beam, has no such alignment problem. It is a fact that even a very expensive, studio-quality color monitor cannot match the resolving power of a relatively inexpensive black and white monitor.

For business applications, you need the best display quality you can get, because someone will have to look at it eight hours a day. With present technology, it just is not possible to equal the quality of a monochrome display for any reasonable amount of money, so I will continue to recommend *against* color for business applications. Compare them yourself—anyone can see the difference.

Burks A. Smith
Datasmith Micro Software Systems
Shawnee Mission, Kansas

Jim Edlin responds: Screen resolution is a valid concern, but it's color graphics, not color text, that really demands extra memory. I use a color display (not on a PC yet) several hours a day for word-processing and wouldn't trade back for the world.

Bravo for "The Monochrome Mistake" (*PC*, April-May, 1982)! We at IDETIK Corporation agree with Jim Edlin's point of view. Color has a lot of potential and we are one of the few manufacturers to capitalize on it. We offer a board for the Personal Computer which has high resolution, 16 colors, and other features too numerous to mention. Let's hear it one more time for using the graphic potential of the Personal Computer!

Huron Smith
IDETIK Corporation
Madison, Wisconsin

Minimal Configurations

Please don't sniff or look down on those who own minimal configurations. My 5150 is a 32K system, and I am quite happy with it. Not everyone can plunk down \$4,000+ for disk drives, printers, extra memory, etc., at least not all at once.

Charles A. Miller
Atlanta, Georgia

PC is an equal opportunity magazine. We do not discriminate on the basis of memory, disk drives, or software origin.

Chip on Chips

Your "PC Production Guess" (*PCommuniques*, February-March, 1982) was an embarrassment. A couple of electronic trade magazines have already disclosed another IBM product which uses the Intel 8088. That information is months old, as a matter of fact.

Disclosure of "maybe's" is warranted when verification is impossible. However, advertising ignorance is not what a potentially great periodical should be doing in its infancy.

L. Chip Getter
IBM Corporation
Tarrytown, New York

We don't knowingly advertise our ignorance. If you could give us the real number, we wouldn't need to speculate. However, we appreciate it when our readers point out our goofs. Thanks.

Electronic Mail

This is my first time on (CompuServe's) Micronet, and I appreciate the fact that you provided your user's number to write

Letters

to. I just *had* to write my first electronic missive to you.

Gary L. Jackson
Hermosa Beach, California

We like to proctice what we preach. CompuServe subscribers con reach our editors at 70370,532 and Source mail can be sent to ST0948.

End-to-End Makeup

I've had your PC about a month and mine about a month, and I love them both. I would like to add some positive reinforcement to something that I really appreciated. Not one of your columns ended with a "continued on page #." I could read through your whole magazine without having to flip back and forth 67 times. Please keep up the good work.

Jim Schings
Canton, Michigan

We're pleased you noticed. Publishers call it "end-to-end mokeup" and it sometimes mokes our lives a little more difficult, but we think it's worth it. Glad you agree.

Article Ideas

A suggestion: No doubt among your readers there will be more or less complete neophytes who have elected to use the IBM Personal Computer as their initial machine for entry into the computer experience. For those who have not "worked their way up" and acquired familiarity with computers previously, using the IBM and its documentation may be like learning to fly in the Space Shuttle!

A helpful department might be "Learning to Use the Personal Computer" (or some such title) in which various commands, statements, and functions that are available on the system would be explained in more detail than that in the manufacturer's documentation and interesting, illustrative programs presented in which these capabilities are documented.

Albert R. Frederick, Jr., M.D.
Boston, Massachusetts

We haven't got a formal department title yet, but articles of this type will be a staple of our content. See Lon Poole's article (PC, April-Moy, 1982) on "Using Color Graphics" for storters.

IBM's entry into personal computers has been late. However, those of us who anticipate significant progressive and innovative developments from them find ourselves frustrated in not knowing what plans lie ahead in terms of both hardware and software. Companies other than IBM have, or suggest, available materials which are adaptable. I, for one, would be willing to defer acquisition, knowing a particular item was in the throes of development. It would be my preferred choice rather than adventuring into potentially unexplored turf. Therefore, if IBM is reluctant to formally publish its project calendar, could PC interject one of its own?

R.M. Jarrett
West Hollywood, California

IBM is understandably tight-lipped about its unreleased products. Our New On The Market *section contains information on almost everything we know about, and* PCommuniques *shares gossip, rumors, and speculations.*

Communication Correction

Clifford Barney's comment ("Communications Briefs," *PC*, April-May, 1982) that CompuServe's electronic mail is "only slightly expensive" is misleading, and certainly does not do justification to CompuServe. First of all, CompuServe's non-prime time rates ($5) start at 6 p.m. so you have three hours during which they are cheaper than the $7 mentioned there for Telenet. The non-prime-time rate continues until 5 a.m. Those are the user's local times. Secondly, there are "several" bulletin boards by special interest groups that provide "computer conferencing," as defined on page 58 of the same issue of *PC*. For example, MUSUS is a bulletin board for members of the UCSD Pascal User's Group to which I belong and regularly conference with others. Another group is devoted to CP/M Operating System problems and interests. There are many other features which I will not mention. There is a one-time cost of $19.95.

Gene Gingerich
Santa Barbara, California

Boca Boo-Boo

I have just finished reading the second issue of *PC* magazine, and you and your staff can certainly be proud of the magazine.

I know you were introduced to many IBMers associated with the Personal Computer when you visited us. However, while David O'Connor is indeed an "extremely bright and articulate fellow" ("Boca Diary," *PC*, April-May, 1982) and had responsibility for the architectural design of the Personal Computer, it was not he who you met; it was David Bradley, manager of Systems Architecture.

Jeannette A. Maher
Communications
IBM
Boca Raton, Florida

My opologies to both Mr. O'Connor ond Mr. Brodley. DHB

No Computerese, Please

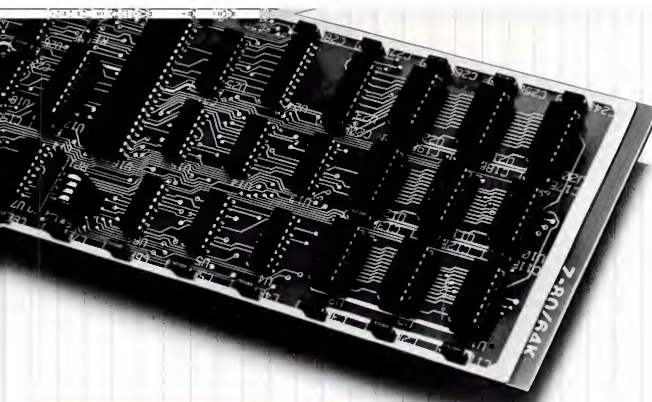
I originally purchased an IBM PC in response to my young son's desire to have a computer "like everybody else in the neighborhood and school." He wanted an Apple but I held out for a more traditional name. His primary interests were amusement, games, and just fun. After reading your first issue, I realized there may be some business application for me as well.

Our request of you: Please don't forget that some of your readers are not computer specialists, freaks, or even very knowledgeable in the world of RAM, ROM, DOS, BITS, BYTES *od infinitum*. Remember that some of us are civilians and need to be patronized.

A. Dean Lynn
Tarzana, California

Request granted: We couldn't agree more with your comments obout "computerese."

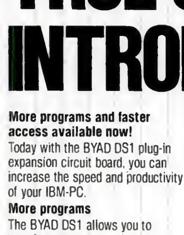
PC welcomes letters from readers. Write to: Letters, PC, 1528 Irving St., San Francisco, CA 94122. Letters published may be edited.



TRUE CP/M® FOR YOUR IBM® INTRODUCING BYAD DS1

More programs and faster access available now!
Today with the BYAD DS1 plug-in expansion circuit board, you can increase the speed and productivity of your IBM-PC.

More programs
The BYAD DS1 allows you to transform your system into a CP/M computer giving access to the largest existing software library (CP/M version 2.2). Data base Management, word processing, business programs, and literally thousands of CP/M programs can be used.



Faster
The DS1 board contains 64K bytes of parity RAM and a Z80B microprocessor. The Dual Systems, Z80 and IBM 8088, achieve improved performance CP/M with up to 30 times faster access through interrupt driven full I/O buffering. DS1 uses the 8088 as an intelligent concurrent I/O processor which performs keyboard type-ahead buffering, printer buffering, disk track and directory buffering.

Easy Operation
No learning curve or new commands when using DS1. Utility programs are provided for reading various 5¼" diskettes directly, moving files, and to link your IBM with a serial port to any existing CP/M system. An expanded version, BYAD DS2, contains a built-in serial port and includes all features of DS1.

Cost Competitive
Both BYAD DS1 and DS2 operate with a minimum 48K single drive system. The DS1 costs only $660 and the DS2 with serial port, $760. A comprehensive operating manual is available at $40 and the cost will be applied to the purchase of either a DS1 or DS2.

Send check, money order or call 312 539-4922 and give your VISA or Master Card number for quick delivery.

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312 539-4922

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Integrated Hardware and Software Systems

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	CONCURRENT CP/M-86	CP/M-86	IBM PC DOS	UNIX™	iRMX-86™
Available on IBM Personal Computer	●	●	●		
Single-User with Background Consoles	●				
Real-Time Control	●				●
Password Protection	●			●	●
Time and Date Stamps	●		●	●	●
Record and File Locking	●				●
Local Area Network Support	●	●			●
Shipped with Editor, Assembler and Debugger	●	●			
1 Megabyte Memory Management	●	●		●	●
Winchester Disk Support	●	●		●	●
CP/M File Compatible	●	●			

ADDITIONAL FEATURES:

- 32 Megabyte File Capacity
- 512 Megabyte Disk Capacity
- Real-time message passing nucleus essential for multi-tasking, data communications and industrial control applications.
- Supported by existing CP/M-86 compatible languages.
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If you use numbers to mak
forecasts, there's
that has the power to do m
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for you when you use your
ter:

rCalc™

The IBM Personal Computer brings new power to personal computing. Most software programs can't take advantage of that power. The SuperCalc™ program, by Sorcim, is the exception.

The reason is SuperSheet,™ which, unlike VisiCalc® and other spreadsheets, allows you to make full use of the IBM Personal Computer's expanded memory. As a result, you can make 5 year forecasts as well as detailed breakouts impossible with other programs.

Designed for business professionals who don't have a background in computer programming yet demand the most powerful electronic spreadsheet money can buy, SuperCalc™ is easy to use while answering the most complex "what if" questions.

You need change only one variable and you see instantly how that change affects your assumptions. And SuperCalc's exclusive AnswerKey™ walks you through the program by letting you stop and ask "What should I do next?"

If you own or plan to own an IBM Personal Computer, don't buy an electronic spreadsheet program without first learning about SuperCalc.™

Send me your brochure:
The Power of SuperCalc,™ which explains SuperCalc in everyday English.

Name ______________________________

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Send this coupon or write **Power of SuperCalc™** on the back of your business card and send to Sorcim Corporation, 405 Aldo Avenue, Santa Clara, CA 95050 (408) 727-7634.

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students,
professionals, scientists,
managers and many
The Independent Guide to IBM Personal Computers
IBM's New Personal Computer:
Taking The Measure

DAVID BUNNELL

For Ten Minutes *PC* Was Free

Feeling strongly that *PC* is well worth its cover price, I have resisted most suggestions to give copies away—even for promising promotional reasons.

During the recent West Coast Computer Faire, however, there were a few frantic moments when, for the sake of human safety, I had to throw my magazine principles into the wind.

For those who don't know, the West Coast Faire, held annually in San Francisco, is by definition a consumer trade exhibit that features microcomputers and all sorts of microcomputer-related products. But it is also much more.

Located just north of Silicon Valley, the heart of "microdom," the West Coast Computer Faire, more than any other event I know of, captures the spirit and points the future direction of personal computing. It is a happening in which entrepreneurial upstarts and the established vendors of personal computing products are deluged by hordes of hobbyists, business people, professionals, educators, students, and many others representing every sex, race, and age.

During the three days of this year's Computer Faire, some 40,000 people crammed down row upon row of exhibits in two giant exhibit halls, and filled to overflowing capacity the seminar rooms located on four floors.

PC magazine was there, of course. We rented a triple booth from which, once we finally got them, we sold a ton of magazines. Our Faire experience was one of woe and frustration followed by moments of triumph. In other words, it was a typical *PC* tale, the likes of which we've shared with our readers before.

Perhaps you've noticed that this issue of *PC* is perfect-bound like a book instead of stapled together like the first two issues. Herein is the clue to the problem.

PC has grown much faster than anticipated. We originally thought our charter issue would be 48 pages, but it was 100. After issue two (148 pages) was printed, our printer discovered that it was too fat to be easily bound and stapled by his equipment. Binding problems created an unforeseen delay in getting the issue to the show, which caused the *PC* staff to have heartburn for the first day and a half of the Faire.

If you knew the details, you'd understand why it was miraculous that the magazines arrived about 12:30 a.m. on the second day of the show (Saturday).

From that point on, the Faire experience was much more gratifying. *PC* magazines sold as fast as we could handle the transactions.

Saturday night *PC* had fun as we toured the Computer Faire Party Circuit (CFPC). Following a few brief stops at wine and cheese affairs in assorted hotel suites, we hit a real winner—the Microsoft party, held in an elegant Victorian mansion. This event featured plenty of fabulous food, a flowing bar, and lots of old rooms to explore, to say nothing of a lively crowd dotted with many of my old microcomputer chums.

STILL MORE people were crowded in. Suddenly it looked to me as if the counter of our booth would collapse and we would be crushed by the resulting stampede.

For the *PC* crew the real highlight of the Faire came on Sunday—the final day—when we held the *PC* drawing for our IBM Personal Computer contest. First, we had the drawing announced over the Computer Faire's public address system. The announcement said that *PC* magazine at booth such and such would be giving away an IBM Personal Computer in 20 minutes.

Afterwards, more than one person said they wished they could have seen a bird's-eye view of the resulting riot. The announcement, which was heard throughout the show, caused thousands of people to stop dead in their tracks. Then they headed for the *PC* booth.

Behind the counter of our booth was a contest drum into which were stuffed the 50,000-plus entries of people who over the course of the previous months had entered the "Win a PC" contest. Twelve-year-old Jennifer Poitier was positioned to pull out the winner.

Some people wanted to know if it was too late to sign up (which, of course, it was). Crowds of people arrived at the booth to see what was going on.

Still more people crowded in. Suddenly it looked to me as if the counter of our booth would collapse and we would be crushed by the resulting stampede.

Needing to do something fast, I yelled out, "For the next ten minutes, *PC* is free!"

The other *PC* people picked up the clue, and as fast as possible we began shoveling magazines into the hands and over the heads of the crowd. This had the desired effect of diverting attention and keeping them from crushing in further.

The tumbler stopped and Jenny picked the winner—Paul Hardiman from Milwaukee. Soon the throngs thinned out, although activity at the booth was extremely brisk for the rest of the afternoon. We had survived the Computer Faire.

Announcements

Due to *PC*'s tremendous growth and success, and the large amounts of material we need to cover, *PC Magazine* will be publishing monthly, beginning with our August '82 issue.

And beginning with this issue, *PC Magazine* will be perfect bound, rather than saddle-stitched. This will afford easier reader access to special section titles (printed on the spine), and allow each issue to be stored as a reference guide on bookshelves.

PC is proud to announce that Brian Dessin Day, PC's Design Director has won the prestigious "Maggie" Award, given annually by the Western Publications Association for excellence in magazine design. Brian, who was tapped for his outstanding work as Art Director for "Darkroom Photography" Magazine last year, says the award was "totally unexpected." And, "we intend to win one next year with *PC*", he says.

Announcing the "What did one computer say to another?" contest. Send me your responses to this question. I will publish the best ones including author credit.

PC POWER will continue to grow and grow. For an interesting definition of this term, read Jim Edlin's column, which follows. Jim, who served as PC's founding editor, has caught the software bug. He is actively developing a low-cost software package which could have monumental impact on the personal computing market. Expect PC to keep up with these developments.

PC Power, by the way, is evidenced by the flock of PC look-alikes, computers that will read either PC DOS or C/PM-86 files. Expect us to examine these developments more closely in future issues.

Would you like to contribute to PC, as a writer, or just as an interested informant? Drop me a line or put a message on the Source and we'll send you a PC Contributor's information pack.

PC Power

For computers too, anatomy is destiny. What a computer can achieve depends on how it is built.

Much of what has become conventional in computer programs was dictated by limitations of yesterday's hardware. The reasons are gone but the conventions survive because computer programmers are comfortable with them.

Programs that don't dispense with outdated conventions make you work and think harder than you need to. This is true for all sorts of programs but is easily seen in the case of word-processing. Take the "insert" function found almost universally in word-processing programs. The insert function dates from a time before word-processing was done on video screens; you edited on paper with a terminal that slowly clacked out copy. To insert something in your text, you "played out" your text on paper to the point at which you wanted to make the insertion, shifted to "insert mode," typed your addition, then switched insert mode back off and played out the text to the point of the next change.

The constraints of that hardware design also explain why deletion in word-processing typically works forward in your text rather than in the more intuitive backward direction. On a system with an ink-and-paper terminal, you would play out text to the point of deletion, shift to delete mode, delete as much material forward of your working position as you wished, then shift out of delete mode again. You couldn't delete backward no matter how logical that might seem, because what you wanted to delete was already there in real ink on your paper. The limitations of the hardware demanded that you learn a new layer of habit contrary to intuition.

Today, when the text in progress is in ephemeral video instead of permanent ink, there is no need to have a special insert mode or a counter-intuitive deletion procedure. You can simply "go" where you want in your text and make the desired change.

The next generation of systems could have let you insert without a special mode,

PROGRAMS that don't dispense with outdated conventions make you work and think harder than you need to.

but they couldn't show you your revised text in correct form as you changed it. You had to use a "reform" function after changes. The reason: These systems, though they used video display, used it in the form of terminals, which are devices separate from the computers to which they are attached. Even the fastest terminals take 2½ seconds or so to completely rewrite a full screen. Since people can type a lot faster than that, a terminal screen could never keep up with the changes. Computers such as the PC don't use terminals. Their display is integral with the computer's memory and can be completely changed in 1/30th of a second—so you can see the form of your text adjust as you type in changes. The widely used "reform" function becomes a dinosaur.

Then there are functions such as underlining and boldface type. Older computers have to show you the presence of such emphasis by displaying code symbols around the emphasized text. The PC can show you underlining and boldfacing by doing so on the screen. Any word-processing program that doesn't (most of them so far) is guilty of wasting PC Power.

Worse are programs that screw up through a failure to provide for PC Power. IBM has designed keys that automatically repeat the function as long as they are held down. This is fine in normal typing, but it can be disastrous when the keys are used to command program functions and an absent-minded user holds one down while lost in thought. You could easily end up in limbo while your text file is saved on disk 20 times in a row. IBM lets programmers switch repeat-action off or on key by key, and any program which fails to do so at the appropriate times is unworthy of PC Power. In the same way, programs should set the state of the number/cursor keys via software in anticipation of how a user will need to employ them at given stages of the program.

The PC Power list goes on for all types of programs: function keys, large memory, color and graphics, multifont printing . . .

Before you buy software, examine it with care. If it attempts to foist anachronisms like "reform" commands and "insert" modes upon you, proclaim PC Power to the marketplace by declining to buy it. (Note that even IBM doesn't always honor the power of its new machine—witness the counterproductive "insert" key they provide.) IBM Personal Computers command a premium over machines further from the state of the art. If you have paid this price, you owe it to yourself to insist on software that justifies it. You owe it to yourself to reject software that does not exploit PC power.

How to ma
work like

First, neatly cut out the "370" label.

Now, when nobody's looking, nonchalantly tape it to your terminal, just under the "IBM," as if it really belonged there.

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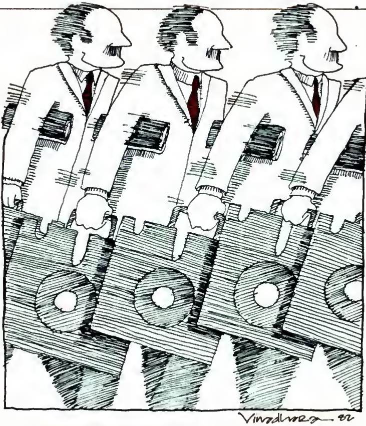
PCommuniques

A compendium of facts, news, opinions, gossip, inside intelligence, speculation, and forecasts about IBM Personal Computers.

No PC at OAC

At the national Office Automation Conference (OAC) in San Francisco last April, IBM had a large and handsome exhibit booth, but the Personal Computer was nowhere to be seen in it. How come, you may wonder? After all, isn't the PC touted by many as IBM's first crack at the elusive "office work station?" (Xerox exhibited its personal computer as a candidate for that role.) The PC's banishment, one source told *PCommuniques*, was decreed by an unnamed executive at IBM headquarters, out of fear that the PC would steal the show. This exec reportedly worried that crowds would flock around the PC if it were exhibited, and thus give short shrift to the more expensive wares ("boat anchors like the 8100," according to our source), which IBM is selling far less quickly than PCs. So, why no PC at OAC? If our source is accurate, Cinderella would have understood perfectly.



Portable PC?

The computer pictured above, which was a big draw at the OAC, is not an IBM product. It is the Compass computer from Grid Systems Corp.—an $8,200 portable wonder with a flat, fold-down display. It does, however, have some interesting points in common with the IBM PC. Consider these: 8088 processor with 8087 mathematics coprocessor, 256K of memory, and a display with 320 by 240 graphics resolution—no color, though. (The Compass also includes a 1,200 bps phone connector, 256K of bubble memory to take the place of disk storage, and a bunch of custom-developed software. It is designed to connect via networks to a variety of central computers, which Grid Systems also provides for its main data storage.)

Graphics on Monochrome; OCR for Free

If you have both the monochrome and color/graphics display adapters for your IBM Personal Computer, you may already have discovered that, though both have identical 9-pin connectors, the IBM monochrome monitor remains blank if plugged into the color/graphics connector. It can, however, be made to work with the graphics card by wiring pin 7 of the monitor plug to the center connector of the round, composite-signal jack. See the *Option Installation Manual* to set the switches inside the system unit so both color and monochrome adapters are selected. The monochrome display will show minor distortions due to the different video frequencies it is designed for, and you won't get color, but it's a usable stop-gap arrangement.

Also, did you know your PC has pattern recognition software built into a part of the operating system? It is used when the color/graphics adapter is set to graphics mode and a BASIC program tries to read text from the screen. A built-in subroutine compares the dot pattern of shapes on the screen to the patterns stored for generating characters on the screen. This is the same principle used in some optical character recognition (OCR) systems, and works fine as long as you haven't drawn something on top of the characters you want to read from the screen. (See page A-61 of IBM's *Technical Reference Manual* for more about this cute trick from the folks at Microsoft.)

—Mark Dionne,
Solid Software,
Newton, Massachusetts

Semi-Hard

What good does 256K of memory do your computer if you don't have software capable of using it? What good does software capable of using 256K of memory do you if you have only 64K in your computer? Aha! That's the kind of question that put Sears together with Roebuck, Simon with Garfunkel, and strawberries with cream. Now it has brought together Sorcim Corporation, a publisher of software, and Vista Computer Company, a maker of memory boards. The fruit of their union is called "SuperCache"—a packaged combo of 192K memory expansion for the IBM PC and a financial modeling program that can fill up all those extra cells. The proud partners claim the $800 package price is less than the two items would sell for individually, and the buyer gets to use the full potential of both items right away.

PCommuniques

From Boca to Berkeley

Berkeley, California is an unlikely habitat for an IBM veteran of 22 years, but Paul Chasen, recently of Boca Raton, has joined Information Unlimited Software as its new vice president for research and development. Chasen, whose work at IBM goes back to the original 360 mainframe computer, was instrumental in IBM's acquisition and release of vendor software for the PC. Like a retired naval officer at the helm of a tugboat, Chasen will help the independent software company ready its new products for the IBM, Apple, and other personal computers.

Software Show-Biz

"Interactive system design is a branch of show business, specifically, moviemaking," says Ted Nelson. The iconoclastic author of *Computer Lib*, a seminal anticipation of personal computing published in the mid-1970s, expanded on this thought in a talk to the National Office Automation Conference. Nelson encouraged designers of office software to think in terms of major visualizations, sound effects, pace, and continuity. He argued that making a program work right takes only a quarter as much time as giving it "the right feel" and proposed that a new kind of professional, analogous to the movie director, be an influential participant in the design of future business computer programs. Nelson also suggested office software take some hints from arcade games such as *Pac Man*—having an "attract mode," for example, to get potential users acquainted with its features.

Frontiers of a discipline are often expanded when people from other disciplines move into it and introduce notions and techniques from their original fields. As the son of two Hollywood professionals, Nelson had an opportunity to absorb the craft of moviemaking. Having chosen computers as his own field, he may be in a good position to understand the value of translating over those show-biz techniques. "Cue the cursor. Lights, camera—compute."

Plug-in Price Drop?

Before "PC" stood for "Personal Computer" in the IBM world it stood for "plug-compatible"—a phrase describing other manufacturers' equivalents that would plug in to replace elements of IBM systems. Thomas Hong is a veteran of that earlier p-c business. Now he forecasts that phenomena he saw in the original IBM-plug-compatible industry will happen again with companies that make p-c's for today's PCs.

Hong, president of Davong Systems, which makes PC memory add-ons and hard-disk storage systems says, "In the beginning, prices were high. A lot of companies went in without understanding what they were getting into. Then IBM cut prices on products the plug-compatible equipment was designed to replace. Prices dropped, profit margins eroded, and a lot of companies went out of business."

To avoid that scenario, Hong says his company will set low prices to begin with, which he says he can do because Davong is well financed and can order in volume to get discounts from suppliers. His not entirely disinterested advice to smaller companies that want to make PC plug-ins: "Stay away from the commodity markets like memory boards—stick with more specialized markets." Hong's advice to buyers: "Be prepared for prices to fall."

> *"Firms in high technology are . . . creating a personal computer industry that will soon outsell the auto industry."*
>
> —George Gilder, writing in The Wall Street Journal, April 22, 1982

Whither Modular Video?

Ever wondered how come the IBM PC's screen display circuitry is designed as a plug-in card rather than built right into the basic design? The ability to respond flexibly to marketplace developments seems like one good explanation. For example, note the elaborate display of the new Concept computer from Corvus Systems, Inc., which the company modestly describes as "the next generation in personal computers." You can flip the Concept's display 90 degrees from vertical to horizontal; when vertical it can display 72 lines of 90 characters; when horizontal, it will show 56 lines of 120 characters. It's the equivalent of about three PC graphics displays stacked together (720- by 560-point resolution). As with the PC's graphics adapter, text and pictures can be mixed. Corvus sells the basic unit for $4,995.

Will this jazzy display make your PC obsolete? Not hardly. Courtesy of the modular display adapter, if Corvus's design proves a hit, then either IBM or other companies could produce a plug-in equivalent for the PC. All the rest of your system stays intact and the upgrade is easy as pie—the memory space for such a dense display is already designed into your PC.

No-Cigar Department

Previously in these pages we quoted someone's assertion that the PC is the only IBM product to use the Intel 8088 microprocessor. "What a mistake," wrote one reader. He told us we were "flagrantly incorrect" because the IBM Displaywriter word-processor also uses the 8088. To this individual we award neither $50 nor a cigar; as we understand it, the Displaywriter uses the 8086 processor. Close, as they say, but...

This department will surrender its own stogie to the repo man on account of a bona fide erroneous report. We misstated (*PC*, February-March, 1982) the terms of the discount offered IBM employees buying PCs. According to a price sheet we've been sent, the average employee discount on hardware is about one-third off retail (such as $1,517 for a 48K, 1-drive system unit listing at $2,325). Software discounts run about 45 percent (such as $91 for the $175-list *EasyWriter* program). One system per immediate family member is allowed at these prices, with 12 percent, two-year financing through payroll deduction.

PCommuniques (February-March,1982) reported that software authors who are IBM employees can sell their wares only through Big Blue.

An IBM employee who prefers to remain anonymous suggests another way for fellow employees to sell their programs. Staffers can submit programs to Science Research

Associates (SRA) of Chicago, Illinois. SRA, an IBM subsidiary, is looking for educational software.

Timely Sign

When IBM gave them its blessing, personal computers gained a new aura of legitimacy. But now they have been implicitly endorsed by an even more significant arbiter of public acceptance, *Time* magazine. With its May 3 issue, *Time* inaugurated a continuing section entitled "Computers." We assume it is the personalization of computers that is making them of regular interest to *Time* readers. For the sake of symmetry, *PC* briefly considered adding a section called "Time"—but that's always in short supply around here.

IBM Announces Changes To Software Submission Plan

IBM has announced new terms and a submission procedure for programs. Effective immediately under the new plan, dollar royalty ceilings have been eliminated. Royalty terms—percentages, advances, and duration of payment—will be individually determined for each accepted program and documentation. Software submission is a new two-step procedure. A single-simplified agreement is signed before submitting a program to IBM. Thereafter, a separate software contract will be offered when a program is found acceptable by IBM.

Software submission packets, containing an explanation of the revised Software Submission Plan, copies of the new Software Submission Agreement, and guidelines to assist authors, will be available from IBM, External Submissions Department 765 PC, Armonk, NY 10504. Authors who currently have software under evaluation may choose, upon IBM finding it acceptable, between the previous and revised Software Contract.

Xerox Monk

Stephen Kennedy, a soon-to-be-graduate of UC Berkeley, suggests a new term for the computer enthusiast. If a 'grease monkey' is an accomplished mechanic, then what do we call those who work with computers? Stephen flashed on the famous Xerox monk, and, like a miracle, the term came to him—"CHIP-MONK."

PCommuniques

A Visi-tor Speaks

Getting past the imitation-equals-flattery chestnut, how do the folks at VisiCorp feel about the many "VisiClones"—23 by one count—that their VisiCalc spreadsheet program has spawned? Rich Melmon, director of product marketing for the company, fielded that question among others during a recent visit to the PC offices. "VisiCalc is a two-year-old product," said Melmon. "It's easy for people to see what's needed to add to it. After selling more than 200,000 copies, it's easier still for us."

The imitators tend to look at the problem in too narrow a way," Melmon continued. "The spreadsheet market is different from what it was two years ago. You're dealing with more corporate rather than personal data; you're dealing with more numbers and with data that already exists somewhere in a corporation's computers. The next generation of spreadsheet software must address these issues." The next generation? Melmon wouldn't elaborate but suggested more might be forthcoming at the National Computer Conference in June.

> *"Word processing is like a dishwasher; you put the words in and they come out cleaned up."*
>
> —*Theodor H. Nelson, speaking to a session at the Office Automation Conference, April 2, 1982*

We ASCII-d, He Answered

Whoever told your communications editor (PCommuniques, April-May, 1982) that the IBM PC somehow used EBCDIC code internally for better communication with big mainframes was pulling his leg. The PC doesn't have an EBCDIC bone in its body.

EBCDIC (pronounced ebb-suh-dick) is the standard interchange code for most IBM machines, probably because it is a binary representation of a punched card code. However, the fact that the PC uses the Intel 8088 microprocessor instead of an IBM-developed CPU makes it a strictly ASCII machine.

As far as communication with big IBM mainframes is concerned, most of the big machines can speak ASCII to the outside world out of necessity to communicate with a variety of non-IBM terminals over the telephone. The IBM System/34, for example, supports both ASCII and EBCDIC in its communications software. Even if the big machine couldn't speak ASCII, it would be a simple matter to write a program for the PC that would do the conversion.

—Burks A. Smith

Big Name Disk-tionaries

Here's a computer-age version of an old philosophical quandary: Who checks the spelling of your spelling-checker program?

The newest answer is: The editors of big-name dictionaries. Yes indeed. No longer need you settle for an off-brand lexicon to comb your text for goofs. New York entrepreneur Dick Brass has gone around and sewn up the microcomputer rights to several well-respected reference works that he is now relicensing to publishers of proofreading programs and the like. Brass says PC users will soon be able to check their text against word lists from *The Random House Dictionary*, *Black's Law Dictionary*, and *Stedman's Medical Dictionary* for starters. Peachtree Software will be the first to base products on word lists from Brass's company, Dictronics Publishing, Inc., but he says other firms will follow.

Brass is also promoting new products built on familiar reference books. In April he and Peachtree demonstrated a program built on the *Random House Thesaurus*, for use in conjunction with word-processing. When you seek a synonym, Brass says the Peachtree program will produce an on-screen list of possibilities from the 80,000-word *Thesaurus* in no more than three seconds. Brass said the program would definitely be available for the IBM PC this year, but he wouldn't say exactly when.

Disk Conservatism

"PC" might stand for "pretty cautious" in design, at least in the case of the PC's disk storage system. Anyhow that's the impression one gets from Stuart Lynne of Network Consulting, Inc. up in Vancouver. Lynne's company has been developing a version of the UCSD p-System operating system for the PC, and in the process it has been able to squeeze extra speed and 25 percent more storage out of the PC's disk drives.

As an example of IBM's caution in design, Lynne cites the gap size used between sectors of data on the disk. IBM leaves gaps equal to 80 characters of data, but Lynne says a 30-character gap is adequate. By making this change, NCI shoehorns ten data sectors onto each disk track, where IBM settles for eight. To speed up disk access, Lynne's software waits only half the time—four milliseconds vs. eight—that IBM allows for the disk head to settle in position before reading or writing.

If IBM's design is as cautious as Lynne paints it in disk storage and other aspects, the conservatism is understandable. In designing a product for people unfamiliar with computer quirks, wouldn't you want to err on the safe side in the reliability department while leaving it to others to test where the real limits are?

PCommuniques Pays

Are you in possession of information you think should appear in *PCommuniques*? *PC* pays $50 for each contribution published in this section. Submissions must be signed, but anonymity will be preserved upon request. All submissions become the property of *PC* and are subject to editing. For payment, you must include an address and phone number. Write to *PCommuniques*, 1528 Irving St., San Francisco, CA 94122.

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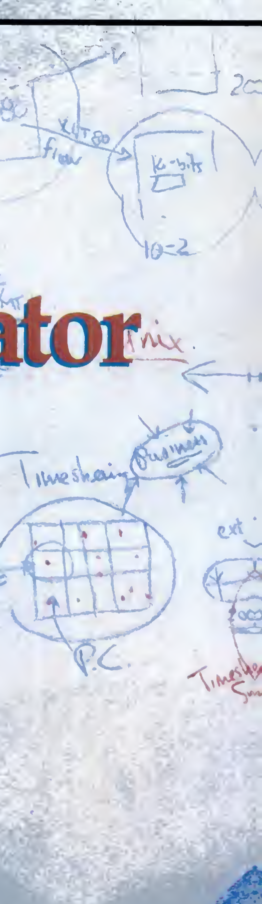
An Indepth PC-Exclusive Interview with Software Pioneer Gary Kildall

CP/M's Creator



For a few years in its early adolescence, the microcomputer industry had its own version of Hollywood's Oscar, presented by an awards committee of one, microcomputer publisher (now manufacturer) Adam Osborne, in recognition of each year's most significant contribution to the advancement of the new industry. Recipients of the award included such personal computer luminaries as Apple Computer Corporation's Chairman Mike Markkula (1979) and VisiCalc program authors Dan Bricklin and Bob Frankston (1980). But the very first person to get the award (1978) was a bearded, young software author working out of a Victorian house in the seaside village of Pacific Grove, California.

Paraphrasing the citation that accompanied the award, presenter Osborne told a packed banquet hall, "We had a lot of silly little boxes being sold to enthusiasts and doing nothing. Gary Kildall came along and gave us CP/M, an operating system that allowed those silly little boxes to start doing something useful."

Four years later, with IBM and other major companies vying for a share of the market, the little boxes no longer seem silly at all. And Gary Kildall no longer works in a Victorian house. Digital Research, Inc., the company he founded, now spills out of a sizable new office complex overlooking Monterey Bay. CP/M, an acronym for Control Program for Microcomputers, is now offered not only for computers with curious and unfamiliar names, but is available and in demand for machines bearing the nameplates Wang, Digital Equipment Corporation, and other computer-industry heavy hitters. Its influence has spread even further. Kildall describes IBM's own PC-DOS, together with operating systems sold by several other companies, as "a CP/M derivative." Now, in what must be interpreted as another award of sorts, there is a version of CP/M officially issued under the IBM name and logo, though the disk's copyright notice credits Digital Research.

The original credit, of course, belongs to Kildall himself, who devised the first CP/M version as an entrepreneurial venture after the semiconductor maker he worked for (Intel, maker of the 8080 and now 8088 processors) told him that his CP/M precursor had no commercial possibilities and that they were not interested

Illustration: Linda Harrison

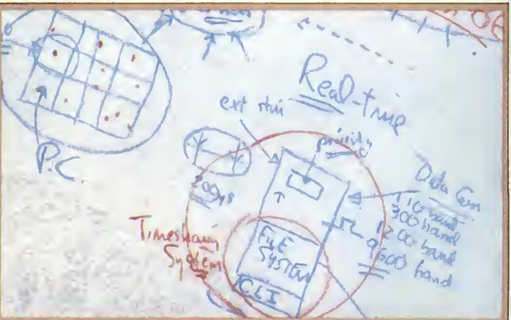
in it. Now Digital Research offers several advanced descendants of CP/M, as well as computer languages such as CBASIC and a variety of related "systems software" products. Intriguing new products are hinted at for imminent announcement. Kildall has not retired to his laurels behind an expansive desk in some paneled office, however. He is still a man doing the work he loves—harnessing the intricate inner workings of computers. Moments after the end of the interview that follows we spotted him back in his open-office cubicle, surrounded by three computer screens, intent at the keyboard of one of them.

One spring afternoon Gary Kildall took a break from his terminals to share with PC some tales and insights about CP/M-86 as it is now offered for the IBM Personal Computer, and to gaze a little into the future. His enthusiasm frequently burst through his laid-back demeanor, erupting into a profusion of colored diagrams on the blackboard behind him.

PC: Tell us about CP/M-86 and how it compares with PC-DOS.

Kildall: Basically, you know the history of PC-DOS—where it came from, and so forth. It's one of the variety of operating systems we call CP/M lookalikes. It arrived on the scene between CP/M version 1.4 and CP/M 2.2, so it has characteristics of CP/M 1.4 and extensions toward the CP/M 2.2-style file system, but with differences because they were kind of simultaneous in design. There are subtle differences but PC-DOS is fundamentally the same as the 8-bit version of CP/M as far as the user is concerned, and also as far as the program interface. Most of the interface differences between PC-DOS and CP/M are misunderstandings of the CP/M calls by the person who wrote the original PC-DOS implementation, simple things like returning FF rather than 1, things that are of no consequence but just weren't done specifically the same.

CP/M-86 has been out for about 14 to 15 months. It was designed around CP/M-2. It's exactly the same as CP/M-2 in terms of the function calls, the way the interface appears to the user, and the way the program interface appears to the programmer. The difference is in the extensions you find in the 8086 processor. Number one is memory management; the major extension is being able to partition



An Uninitiate's Glossary

The patois of the master programmer rolls flowingly from Gary Kildall's tongue. Readers familiar with computer intricacies down at the "bits-'n-bytes" level will follow right along. However, we think all who are interested in PCs can benefit from Kildall's insights. To assist uninitiates we offer this glossary.

Returning FF—A function within the operating system reporting the result of its operation to another part of the program by sending the number "FF," which is 255 (the largest a single-memory cell can hold) written in the base-16 shorthand programmers often use.

Development—Program writing.

Symbol table—One product that prepares a program using assembly language.

Persistence—In video displays, the tendency of an afterimage to remain after the screen has been erased.

Backplane—A section of the system unit into which additional circuit cards can be plugged.

Z-8000, M68K—Microprocessors competitive with Intel's 8086.

Source program—A program in assembly language, which gets translated to an "object program" of numeric instructions the processor understands.

Add immediate 5—A program instruction in 8080 assembly language, ordering that 5 be added to the current number the processor is working on.

Op(eration) codes—Numeric instructions—one for each of the basic operations (such as "add" or "compare") provided in a particular processor's design.

Registers—The working spaces of a processor chip. Different chips have different assortments of registers with different names.

Flags—Special registers that record particular details of a number, such as whether it is zero or not.

Shifts and rotates—Types of arithmetic operations used on binary numbers.

Data bus—The channel via which components of a computer system exchange information.

Algorithms—Formulas for calculation.

Megahertz—For a microprocessor, how many millions of times per second its internal clock ticks, permitting another step in one of its basic operations.

Bank switching—Exceeding the maximum number of memory cells a processor is designed to use by switching its connection among more than one bank of memory.

out and allocate memory, to load multiple programs, for example.

PC: That's a difference between CP/M-86 and the 8080 version of CP/M. How about other differences between CP/M-86 and PC-DOS?

Kildall: CP/M is really a complete development environment; with it you get an editor, an Intel-compatible assembler, and a debugging system—DDT—that has built-in disassembly in the debugger itself. So you can just pick up CP/M-86 and start developing your own high-performance applications. From the beginning, CP/M has always had that flavor to it. It's a base-level operating system that is a complete development system in its own right and doesn't need anything else to support it, though people have gone off and added to it. It's like the IBM PC in that way—an open system. The basic system, when you get it and turn it on, still works to perform basic functions. But some people will go toward BASIC interpreter and others toward Pascal or PL/1.

PC: A lot of people are going to be buying the PC who are not software developers and are not likely to become software developers. Will you or IBM offer a user or "run time" version of CP/M-86 for people who don't need the assembler, the debugger, and so forth?

Kildall: I don't know. There aren't any plans for doing that at this point. It's traditional for CP/M to have those tools available and we don't want to change that structure right now. We'd be having all sorts of difficulties with the pricing differences. The basic thing we're trying to do with our initial release of CP/M-86 is to make it as much like the 8-bit world as we can. We feel there are a number of reasons it was successful and that the same thing will be true for 16-bit. We just have to get it out there and see what customer reaction is. We'll go from there and work some things out with IBM.

THE THING *we're trying to do with CP/M-86 is to make it as much like the 8-bit world as we can.*

PC: How do you feel about describing the PC, with its 8088 processor, as a 16-bit machine? After all, you call the operating system CP/M-86.

Kildall: I see a 16-bit machine as one that has more memory. I don't think of it as anything more than that. Hence the PC qualifies as a 16-bit machine. It satisfies all my needs because I've never been concerned about the speed of an 8-bit processor; they've always been fast enough to do the tasks I want. The only thing I've been concerned about is running out of symbol table space, or just trying to stuff a lot of functionality into a small spot. The 16-bit machine relieves that pressure. You've got it with the PC.

PC: What's your evaluation of the PC in general? What do you see as its strong and weak points?

Kildall: I think the product itself looks really good. They've done an excellent job of IBM-style presentation. It looks good, works nicely, and the display is reasonably good though it has a little bit too much persistence for me. One problem is it needs more backplane; you can't stuff as many boards in as you'd like. And 5¼-inch disks are just not enough. This industry already knows that we've evolved past those things. You're talking about a 256K memory system with 160K single-sided drives, and that doesn't make a whole lot of sense. The 5¼-inch hard disk add-on is going to occur with any serious usage of the system. Other than that I don't think there's anything particularly wrong.

In terms of the marketing, they've taken a very professional approach to set standards toward which the rest of the industry can work. I think we've learned things about the presentation of our materials that we'll use in the rest of our product line. I'm sure the companies that maintain the level of presentation that IBM has provided will be successful with their software products, and those that don't—that still have a kind of shabby appearance—will probably be out of business within the next few years.

PC: When was the first time you or somebody at Digital Research knew about IBM's PC project, and what were your thoughts when you learned about it?

Kildall: I can't recall exactly when we found out about it. It's probably been over a year. I get a little reluctant to talk about it, because I don't know that they're not going to come back and ask, "Why did you say that?" IBM is very careful about what you put out. But we've known about it since fairly early in the project.

PC-DOS is one of a variety of operating systems we call CP/M lookalikes.

About my response to it: I was really happy. We've put a lot of effort into 8086 stuff for the last couple of years—made a big investment moving our software in that direction. I was really concerned, probably about the time IBM was first talking about using the 86, that the 86 was not going to make it. Everybody was talking about the Z8000, and the M68K was on the horizon, and I thought, "We're going to have some real troubles here if the 86 doesn't make it. We're going to have a really hard time, because we'll have to go back to old CP/M-80 and hope it supports the development of our next generation of software after this *faux pas*." IBM basically decided the 86 was going to make it, that we've got a substantial market there to sell to.

PC: You said CP/M-86 has been out for 15 months. What application software has become available for it, and will that software be immediately usable on the IBM PC?

Kildall: There's quite a bit of stuff out that's translated from the 8-bit world. There's a considerable amount of CBASIC (commercial BASIC) software that can come over immediately. The amount that's going to be available will be evolutionary.

We've contacted a lot of the software vendors we work with. We've told them we're getting into this and are interested in supporting their downloading and production efforts. We've got maybe 15 or 20 of these that IBM has allowed us to use as test sites; they are doing word-processing systems, general ledger, accounts receivable, and spreadsheets.

One way we're motivating software translation is with our IBM Displaywriter

Killdall on . . .

CP/M-86's DOCUMENTATION: We're the only supplier to IBM that has done the whole thing—from creating the document, typesetting and printing it, to delivering it in packaged form. This was something we wanted to do to get the experience—everything down to the little picas.

FUTURE IBM DEVELOPMENTS: We're trying to get our OS to match their releases of hardware and so forth. It's really impossible for me to say anything specifically about more disk space, or facilities in data communication, or whatever, because we're really under their confidentiality agreements on those things and we value that very highly. But I can say we're in step with all the things that will be available on the PC. We're in a very open relationship with IBM. They want our system to be successful on their computer. As a result, they let us know in a timely fashion to be sure that our system supports their features.

IBM SOFTWARE PUBLISHING: I don't think they understand the problem of getting new, independently authored software into production in a useful way. I think they're using a simplistic approach that will probably change when they get some experience. The approach of taking software from employees and giving them a cap of $100,000 on royalties is one that we know from experience won't work.

PC SOFTWARE DISTRIBUTION: I think there is going to be difficulty in trying to stuff a large amount of software through a small funnel. Timing is really critical; the reaction time isn't fast enough. Nine months to a year to react isn't fast enough. Alternate marketing channels will develop for software. The most selected or preferred software will end up being in computer stores and on IBM shelves, but not the most innovative software; I think you'll find that elsewhere.

version of CP/M-86. We're really doing promotion, saying to software vendors, "We're selling bunches of this stuff. It's a very popular system and we don't have any competition." Once they get things running on the Displaywriter, they can go over to the PC immediately.

We also have a program at test sites called "send-receive." It will go out at reasonable cost to vendors who are interested. "Send" runs on 8080 systems and "receive" runs on the PC or any 8086 system, and there is an RS-232 connection we make according to our specification. The program has a little interface to the user that asks what kind of programs you want to send, where they're coming from, where they go to over here, and then there's automatic retransmission going back and forth. This makes it easy to get 8-bit stuff over to the PC. But it's going to be an evolutionary thing. Available right away on the PC, I'd say, are probably six or seven popular software packages.

PC: What are some of the complexities involved in translating a program from 8080 to 8086 form?

Kildall: Straight translations at the source program level you can do pretty much mechanically. For example, an 8080 "Add immediate 5" instruction turns into an "Add AL 5" on the 8086—a very straightforward translation of the op codes themselves. The complexity in mechanical translation comes from situations such as this: The 8080 instruction DAD H takes the HL register and adds DE to it. For the 8086 the equivalent instruction would be something like ADD DX BX, which is fine, no particular problem. You just say the DX register is the same as HL and BX the same as DE. The problem is that the 8086 instruction has a side effect of setting the zero flag, and the 8080 instruction does not. In mechanical translation you end up doing something like saving the flags, restoring the flags, doing some shifts and rotates, and so forth. These add about five or six extra instructions to get the same semantic effect. There are a lot of sequences in 8080 code that produce very strange sequences in 8086 code; they just don't map very well because of flag registers and things of that sort. The way we get software over is a thing called XLT-86. It's been out six months or so.

PC: By "better" code do you mean smaller?

Kildall: Twenty percent smaller than if you just took every op code and did a straight translation, saving the registers to preserve semantics.

PC: How does the size of the translated program compare to the 8080 version?

Kildall: If you take an 8080 program, move it over to 86 land and do an XLT-86 translation, you'll find that it is roughly 10 to 20 percent larger. With 16-bit machines it's more difficult to address everything; you get op codes that are a little bit bigger on the average. An interesting phenomenon is that one of the reasons you don't get a tremendous speed increase in the 16-bit world is because you're running more op codes over the data bus.

PC: Is CBASIC also going to be available for the PC?

Kildall: CBASIC and also Pascal MT+. These are both running on the PC right now. They'll be offered simultaneously. Then CIS Cobol. PL/1-86 is a more difficult thing. We've worked on that since last July and it looks like it's pretty close now. We have a lot of future in that one, especially on the IBM PC. We've seen a lot of interest from people who are getting into the PC through IBM channels—PL/1 users; the biggest community of PL/1 users is IBM itself. But the biggest software vendor languages are CBASIC, number one, and Pascal, number two. These are going to be the basic tools.

> ***IF YOU'RE using a 4-megahertz Z-80 versus a slower 8086 processor, the Z-80 version may run faster.***

PC: Will you introduce any enhancements for CBASIC?

Kildall: Color graphics. We've got an in-house color graphics subroutine about ready that will be made available through our languages. It does direct, display memory operations for high-speed rectangular painting, building objects and circles, things of that sort.

PC: Are your CBASIC color graphics similar to those in Microsoft's Advanced

BASIC for the PC?

Kildall: They're similar—the same kind of stuff. But we're not necessarily looking for exact compatibility because the CBASIC community is different from the MBASIC. We had the orientation toward color graphics some time ago, and whether there was IBM or not, it was an important part of our future.

PC: Microsoft's BASIC is very specific to the hordwore feotures of the PC, such as the function keys. Will CBASIC be modified in similor woys?

Kildall: I don't now how product specific it's going to be. Other manufacturers, the Japanese for example, have specific requirements too. Our intent is to be as general as we can with the facilities or functions that we add to CBASIC. As this market grows, there's no doubt we're going to have more machine-specific things coming into the language if the customer demand is great enough. Right now the implementation for the IBM PC will handle all the function keys and that sort of thing. That's no problem because that's built into the internals of our operating system. For the display, in terms of handling screen management, it comes in a package we're going to be releasing called DM, a display manager. This product has been in the works for probably close to a year; it's definitely in the final stage, but we haven't announced anything. The display manager is something you can link with CBASIC or Pascal or PL/1 or whatever, and it will handle all the stuff you like to do in terms of getting a fully interactive screen.

One of the things I think is significant about what we're doing is taking functions like the display manager system and really standardizing it as part of the operating system. There's also a thing called AM-86, an access method for high-level data-file interfacing.

PC: On other microcomputers it is possible to run Microsoft BASIC under CP/M. Will it be possible to do so on the PC?

Kildall: Doing something like that is fairly trivial. The differences are relatively easy to take care of through a simple interface. Whether we'll do something like that, whether that would run MBASIC, we don't really know at this point. We would need some specific clients to do that. The intention is not to.

PC: Whot about the possibility of softwore emulotors that would ollow programs for PC-DOS to run under CP/M-86 or vice versa?

Kildall: I'm not really hot for emulators of other systems, basically because then you've got to track someone else's development cycle; they come up with a new release and you've got to scramble. There's been an emulator announced for CP/M-86 that supposedly runs under PC-DOS. I haven't seen the emulator, but I understand the differences between the two systems, and I would be extremely surprised if that emulator in fact emulated CP/M-86. Emulators can get you in a lot of trouble.

PC: What do you think is important in the design of on operoting system?

Kildall: When you're designing operating systems or talking about software in general, the successful software seems to be that which fits the resource you're working with very closely. If you have a small memory system, the OS is small. It has functionality that is just what you need and does not have a lot of extra frills or bells and whistles. If you overload the machine, the

> *SINGLE-USER concurrent is the mode of operation we feel is going to be the most important for the PC.*

software will not be successful because it's going to run ineffectively, and if you don't use all the facilities, someone will come in and use them. During the last decade we've seen the evolution from 256-byte read-only memory, which was the first "operating system" that ran the Intel 4004, up to what we're looking at now in terms of real time systems and networking, data base management, and all sorts of things that are really embedded in the OS itself.

Software design for the 8-bit machine takes limited resource into account. You have a small operating system, typically single-user, a single-stream operating system, and it's not going to have any overlays. The reason you don't have overlays is you are typically using a floppy disk and they're just not fast enough to do overlays. The result is the OS is small, the application code is large, and that's why CP/M itself can't get much larger, because the typical application for an 8-bit machine uses almost all that memory, and that's the real constraint. To go to something like concurrent systems—concurrency is doing background and foreground—you have to do it with bank switching, and that's all nonstandard.

The software design for a 16-bit machine takes additional resources into account. We're talking about 128K of main storage in a minimal system, and often a hard disk. What you want to do is add functionality to the OS—the kind of things people are really going to need: concurrency, multi-access file systems, network communications, and shared code. Our strategy is moving people from the 8-bit world to the 16-bit world: The first step is

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to take 8-bit CP/M and move them over into 86 CP/M, and add memory management for the megabyte machine and multiple-resident programs. Fundamentally, this is the only difference in the system, so anyone who understands 8-bit CP/M can go into 16-bit CP/M and see the same things.

PC: Where does this strategy lead for the future?

Kildall: Single-user concurrent is the mode of operation we feel is going to be the most important way for the PC and other 16-bit machines to be used. That means you have a terminal attached to your PC and work with multi-ground operations. You might have the word processor in the foreground at a particular time. Behind that you have background applications. They're hidden, but could be brought back up to your active console. Maybe there's a payroll program printing checks on your printer at the same time you are doing your word-processing, and maybe a compile going, a network interface, and possibly some programming down the line.

You have to learn how to use this effectively. When I'm going to develop one of my programs, I can be in the editor, switch over to being in the middle of my debugging so I can find more things that are wrong with my program, go back into the editor and make the changes immediately, then switch back to test some more. What I used to do was go into the debugger, make some changes, maybe make some hand patches, take some handwritten notes, run a little further, then go back into the editor and make all those changes. With concurrency you get that immediate response, go right back into the editor, make the changes, do some more debugging. The result is you get all the fixes in by the time you finish the debugging session.

> ***WE'RE TRYING to bring the mini- and mainframe software vendors into the 16-bit software world through concurrency.***

We're trying to bring the mini- and mainframe software vendors into the 16-bit software world through concurrency.

PC: Besides concurrency, what other changes do you see coming?

Kildall: Since we don't have the same limitations on the size of memory, we're going to get a lot more competition in terms of comprehensive, say, spreadsheet-type applications. We've got this functionality; there's no effective limit on what we can add to that functionality. So the old applications we've seen are going to be vastly improved. Each product is going to be significantly better and probably at close to the same price.

We're going to enter the data communications area—that's going to be a hot item. We're very interested in that; we're going to be announcing our plans for a product fairly soon.

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CP/M Arrives

IBM releases a tailored-for-the-PC version of CP/M-86 that profits from the learning curve.

CP/M-86
IBM Corporation,
Boca Raton, Florida
$240

It is a little ironic that the IBM Personal Computer version of the CP/M-86 operating system seems in several ways better fitted to the PC than does IBM's first-introduced and seemingly favored alternative, the IBM Personal Computer Disk Operating System (PC-DOS). However, the better fit is mitigated by CP/M-86's six-times-greater price tag, and is possibly explained by CP/M-86's debut six months further along the "learning curve" than the introduction of PC-DOS.

CP/M-86, introduced on April 5 and priced at $240, includes a single, 5¼-inch disk and a manual in one of the now familiar slipcases. The disk contains 13 programs, or "command files," including versions of Digital Research's assembler and debugger programs for the PC's Intel 8088 processor. The disk is not copy protected. The user's manual consists of 372 pages organized into 11 chapters, a preface, 6 appendices, and an index.

In a feature-for-feature comparison, IBM's version of CP/M-86 is strong where PC-DOS is weak, but the reverse is also true. One irony in a comparison is that the function keys—the use of which IBM is said to have urged vigorously upon outside software developers—are used more meaningfully by CP/M-86 (hereafter, simply "CP/M") than PC-DOS. (Yet both operating systems require that users memorize the meanings of the keys; neither provides the on-screen legends offered by the PC's BASIC language.) The keys are used by PC-DOS to edit lines of input to the operating system. CP/M uses the keys for single-keystroke execution of such oft-used functions as viewing a disk directory or checking the available space on a disk.

Other areas in which CP/M seems stronger than PC-DOS are in offering programs easier access to the PC's display and keyboard features, and in easing serial-type communications. IBM's BASIC language companion to PC-DOS contains many commands for controlling display features, such as cursor position, character color or other attributes, text or graphic screen mode, and the like; but PC-DOS itself is devoid of mechanisms for dealing with such matters. Using CP/M, you can control all the display adjustments and similar items by sending the operating system sequences of two or more characters started with the "escape" character.

Easier Use of Serial Port

PC-DOS's BASIC also provides comprehensive facilities for adjusting operation of the asynchronous serial communications ports, while PC-DOS itself has no equivalent controls. That's inconvenient if you want to use the COPY command to print a file on a serial printer that communicates at some speed other than the built-in setting PC-DOS uses automatically. CP/M provides two commands, PROTOCOL and SPEED, that deal with most imaginable requirements for setting up serial communications. The PROTOCOL command allows selection of either widely used convention by which an attached device can tell your computer when it is, or is not, ready to accept data (the XON/XOFF and ETX/ACK protocols); there's also a third choice for when no protocol is required. The SPEED command lets you set all the remaining adjustments you might need to cope with in order to establish successful serial communication: transmission rate, number of "stop bits," and the like. By incorporating these features into the operating system, CP/M makes it unnecessary for individual programs to recreate them, and simplifies using CP/M commands, such as TYPE, directly with serial devices.

Contrariwise, PC-DOS has a MODE command that allows direct adjustment of line spacing and character size on the IBM matrix printer and permits tinkering with display positioning to compensate for a maladjusted video monitor. CP/M lacks both these features.

Tells What it's Doing

Surprisingly, in view of the ultra-terse screen interaction style of earlier CP/M versions, CP/M-86 is very communicative in several respects about what it is doing. When you start it up (either by switching on the computer or pressing CTRL-ALT-DEL, just as with PC-DOS), it counts off, "READING 1 . . . 2 . . . 3 . . . 4" as it loads the four disk sections of its main program into memory. It then displays a list of the hardware it detects as installed and working in your PC. When you give the command to format a disk (in CP/M it's called NEWDISK), the first result is a screen message repeating back to you which disk drive you've ordered to perform the formatting procedure. The message warns you, "ALL DATA WILL BE ERASED FROM THE DISK" and asks, "Is this what you want (y/n)?" If you say yes, CP/M then displays a running progress report as data tracks are written and verified.

IN VIEW of the ultra-terse style of earlier CP/M versions, CP/M-86 is very communicative.

There are other areas in which PC-DOS is a better communicator. When a problem has occurred in using a disk, PC-DOS gives you the choice, "Abort, Retry, Ignore?" while CP/M presents the laconic choice, "A, I, C, R?" (and it's still not clear what "C" does!). CP/M's facilities for copying and moving files, collectively known as PIP for Peripheral Interface Program, carries forth the same inscrutable command syntax seen in earlier CP/M versions. Thus CP/M gains a point for consistency, but PC-DOS gains an offsetting one for understandability.

A key feature of PC-DOS that CP/M apparently does not provide is an option to set up a disk so a certain program or series of them goes to work automatically after you turn on or reset the computer. Apparently, it is possible for software experts to add an "autoexecute" feature to CP/M, but such a feature is not standard. Also, PC-DOS provides explicit methods for programmers to create their own variation on the "command processor" program that interprets how to handle your commands to the operating system. This kind of variation may be possible with CP/M, but ways to achieve it are not explicitly given in the manual. One way variant command processors are used is by programs that redefine key meanings on the keyboard, or lock out such key functions as break and reset—a frequent strategy to frustrate software copying.

Disk Capacities About Even

Disk storage capacity for the two systems is comparable. A formatted CP/M disk has 141K of free space after the operating system has been copied to it. CP/M will have an edge in the future, however, since it includes the ability to use two-sided disk drives, which IBM is expected to have announced by the time this is published. PC-DOS is a little more detailed than CP/M in its reports of disk contents; it shows a file's size to the exact number of characters, where CP/M shows an approximate size rounded up to the next larger "K." But CP/M offers extra features in assigning "attributes" to files and allocating files among up to 16 separate "users."

When CP/M is in control of the computer, it uses the bottom line of the screen for a "status" display, which includes the current time and date. Those who do not enjoy seeing their life tick away in front of them, second by second, will find this feature questionable. CP/M does not demand you type in "today's date" as does PC-DOS. Instead, it goes on using the last time and date it was aware of until you set it otherwise. When first loaded out of the box, the disk displays the date 2/10/82, perhaps suggesting when the last tinkering with the product was finished.

> *A FORMATTED CP/M disk has 141K of free space after the operating system has been copied to it.*

The user's manual is very much in keeping with those accompanying other software IBM sells for the PC. It is well and clearly, but not frivolously, written. The organization is simple and quickly understandable. The novice will not feel unduly put off, nor the expert patronized.

Considering the Choice

Comparing functionality and ease-of-use, the choice between these two operating systems would appear to be in the "six-of-one, half-dozen-of-the-other" category. Each excels in spots and falls down in others. From the programmer's point of view, a choice has yet to emerge. The key "function calls" by which programs employ the operating system are virtually identical between the two. CP/M-86 sells for six times the price of PC-DOS, but includes tools for assembly-language programming that PC-DOS does not provide. The assembler is considered by many to be an essential tool for advanced programming.

For those who don't plan to do assembly-language programming, CP/M seems a less compelling purchase. Ultimately, it will depend on the appeal of other software that is marketed to run using one program or the other, or perhaps a different system will come along and overshadow both. An obvious gap in the CP/M offering is a minimal version meant only to support the use of other programs, a so-called "run-time package" priced comparably with PC-DOS. Availability of a run-time package would make it easier for software marketers to choose CP/M without imposing a $200 price disadvantage on their programs.

The introduction of some compellingly desirable program offered to work only with CP/M-86 might shift the momentum in its favor. Regarding conversion of existing programs from earlier CP/M versions, all parties generally concede that the conversion effort is about equal to get to CP/M-86 or PC-DOS.

The real value of CP/M-86 may be in illustrating what even a short move along the relatively horizontal part of the learning curve can produce. CP/M may be winning wide acclaim and adoption as "almost an industry standard," but its version for the IBM PC tends to suggest there are plenty better things to come.

—Jim Edlin

Still Another CP/M Choice

CompuView Products introduces its own CP/M-86 version and says it's "better than IBM's."

A Michigan software company has not only begun selling the CP/M-86 operating system for the PC ahead of IBM's own version of the software, they claim to have improved upon it as well.

CompuView Products, Inc., says that *VEDIT*, its $325 implementation of CP/M-86, includes an increase in the IBM Personal Computer's standard 5¼-inch disk capacity to 196K characters, plus a way to define the use of the function keys. For $100 extra, the user also gets horizontal scrolling and a full-screen text editor.

According to systems programmer/analyst Rick Fortson, CompuView's CP/M-86 uses "more of the available disk space," giving the user 193K of the 196K disk capacity. It also reads from and writes to any 5¼-inch, "double-density" disk format, not only those created on the IBM PC.

CompuView's CP/M-86 will work with all the IBM hardware, Fortson says, including the hard disks, which are not yet available, "because it's easy for our BIOS (basic input-output system) to handle them. We even handle expansion memory better than PC-DOS does."

Fortson says that CompuView's CP/M-86 is also more versatile than IBM's PC-DOS because it contains a terminal-emulation package. "Say you bought an application program that's written for CP/M-86, but it didn't specifically have the PC listed in its configuration utility. With our CP/M-86 you could emulate one of the terminals that it *did* list, such as the Televideo or Beehive or Hazeltine, and so on. The software for doing that is already in our BIOS."

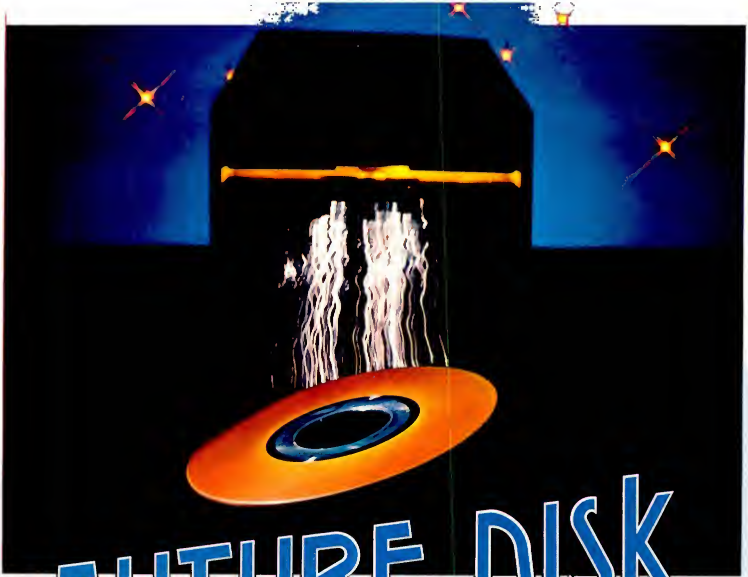
The reason for that, says Fortson, is that CompuView has, for two years, sold a powerful text editor, *VEDIT* (pronounced 'veddit'), a CP/M product used mainly by programmers to edit programs. Because *VEDIT* had to be configured for many different terminals, he says, "we already had the tables of CRT characteristics, the escape-sequences, and so on."

FRANKLY, we've got IBM beat, feature for feature.

VEDIT is now offered for the PC as well, he said, in both a CP/M-86 and a DOS version, for $195. "The customer can also purchase our update subscription service: $45 for two updates. Since *VEDIT* came out, we've offered an update every four to eight months; we believe in 'instantaneous' customer support. I should know. I'm the guy that patches software for your particular machine if you call in saying it doesn't work right."

"Software without headaches" is CompuView's design philosophy, says Fortson. "Even for an inexpensive screen editor [*VEDIT*] people get more support than they're used to. With the CP/M-86, frankly, we've got IBM beat, feature for feature."

—Hal Glatzer



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Another CP/M alternative—a plug-in module that lets your PC use existing CP/M-80 programs.

Baby Blue, XEDEX Corporation, 1345 Avenue of the Americas, New York, NY 10105 (212/489-0444). $600 for the board, software, and manual; $980 includes *WordStar* and *MailMerge*.

Baby Blue from XEDEX Corporation is intended for PC users who want to have their cake and eat it too. It is an alternative for those who choose the PC in anticipation of a new generation of powerful programs, but whose immediate needs seem better met by existing programs designed for other computers. Baby Blue could also serve people who already have a substantial investment in programs or data files not easily transferable to the PC.

XEDEX's $600 Baby is a plug-in board and set of programs that, according to the manufacturer, allow an IBM PC to run the vast library of software that was written for the CP/M-80 operating system. CP/M-80 is the older brother of CP/M-86, which is now available for the IBM PC. The closest thing to an industry standard, CP/M-80 can play host to an estimated 2,000 ready-to-run programs. MicroPro International's *WordStar* word-processing system is one example of a CP/M-80 program that is in high demand by PC users.

Because the IBM PC uses an Intel 8088 processor instead of the earlier 8080 and Z-80 chips for which the original CP/M was designed, most software written for the CP/M-80 systems cannot run under either CP/M-86 or PC-DOS disk operating systems without some rewriting. Baby Blue creates compatibility by providing a Z-80 based "computer within a computer" while the PC itself remains under the control of its own 8088 processor. As a bonus feature, Baby Blue contains an additional 64K (65,535 characters) of memory. When in use, Baby Blue uses its own memory chips. When the PC is working under its own operating systems, Baby Blue functions as a 64K expansion board, upgrading a 64K PC to a 128K system.

Aside from the different operating system, another potential source of incompatibility is that most CP/M-80 software is written for computers that use an external terminal, whereas display and keyboard functions are built into the PC. To overcome this, Baby Blue causes the PC to act like a Televideo 950 terminal. XEDEX selected the Televideo because, of all the popular terminals, it has screen and keyboard characteristics most similar to those of the PC, yet it is also compatible with the terminal supported by most CP/M programs, Lear-Siegler's ADM-3.

As I explain later, a CP/M-80 program or data file can be entered into a Baby Blue equipped PC in one of four possible ways. Once the program is in your computer, Baby Blue adds to it an additional 4K of code and then writes it to the disk as a PC-DOS file. The 4K consists of commands that inform the PC that it is about to run a CP/M-80 program and to turn on Baby Blue. All this is invisible to the user. Once that code is attached, you use it like any other program or file on your directory. A secondary advantage of using Baby Blue with existing CP/M-80 software is that XEDEX, by using some of the PC's memory and other facilities, has added up to 7K of additional working memory to the maximum available using most Z-80 or 8080 based computers.

Baby Blue is the first product of the New York based XEDEX Corporation. But

Illustration: Jim Ludke

XEDEX President Harris Landgarten is no stranger to CP/M. He, along with several other XEDEX executives, left Lifeboat Associates, a major marketer of CP/M compatible software, to form this new venture.

A precedent for the IBM/Baby Blue combination comes from the Apple II microcomputer, whose processor, like the PC's, is not capable of running CP/M-80. To get around this, Microsoft Corporation offers Apple owners the "SoftCard." The SoftCard product, like Baby Blue, contains a Z-80 processor and gives the Apple user the choice of running the Apple under its regular operating system (Apple DOS) or the transformed Z-80 Apple under CP/M. Unfortunately, the SoftCard equipped Apple uses two incompatible operating systems, so software that runs under one system cannot access data created by the other.

IF BABY Blue is to open up the treasure chest of CP/M software, the user must find a way to read the disks.

To avoid that disadvantage, Baby Blue writes its files using IBM's PC-DOS operating system. The CP/M-80 data and program files can co-exist with PC-DOS files on the same disks, and data files created with CP/M-80 software can later be read by other programs that use PC-DOS. Vendors are gradually developing programs to take full advantage of the PC's 256K memory capacity. With any luck, many of these programs will be able to access files created by the Z-80 programs running under Baby Blue.

A cautionary note: As of this writing, PC-DOS files cannot be accessed by programs that run under CP/M-86. Since data created by Baby Blue controlled programs is written in PC-DOS, it is not presently compatible with CP/M-86 software. However, with computers everything is subject to change—usually for the better. It wouldn't surprise me if someone has already written a program to solve this problem.

How to Obtain Baby Blue Software

If Baby Blue is to open up the treasure chest of CP/M software, the user must find a way for the PC to read the disks that the software comes on. XEDEX President Landgarten outlined four methods to obtain software that will run on the Baby Blue equipped IBM PC.

The easiest is to buy programs distributed in the Baby Blue format. XEDEX sells its own release of MicroPro's *WordStar* and *MailMerge* and is currently negotiating with other software publishers to provide Baby Blue formatted versions. The format problem is not unique to Baby Blue. There are several CP/M disk formats and all manufacturers of new Z-80 equipment face the same task of either adapting other companies' CP/M software or convincing the publishers to release a special version to run on their new machine. XEDEX is following the lead of Osborne, NorthStar, and other computer companies by releasing its own versions of the most popular software while encouraging software publishers to produce compatible versions. Since issuing a CP/M program for a new format is relatively easy, publishers often oblige.

Another way to obtain IBM compatible CP/M-80 software is to purchase it in another format and convert it to work with Baby Blue. A "convert" program is included on the disk provided by XEDEX. According to XEDEX, the program allows the user to convert programs that are formatted to work on other machines. Part of the "convert" process includes placing 4K of PC-DOS code at the beginning of each CP/M-80 file. The "header" is placed on the file by Baby Blue's software and is invisible to the user. At press time XEDEX was planning to support the following formats: SuperBrain 3.0 (not quad density), Osborne Double Density, the NEC PC-8000, Cromemco single-sided double density, Triumph Adler, Alphatronic, Columbia Data Products, and the new Heath/Zenith 48 TPI format. If the convert program works as planned, you can take an

WHEN the PC is not working under its own operating system, Baby Blue functions as a 64K expansion board.

off-the-shelf disk for one of the supported formats and convert the program to run on the IBM PC.

A more cumbersome way to convert software is through data communications. It is possible, says Landgarten, to connect almost any CP/M computer to an IBM and "port" over the software from one machine to the other. This is done through the communications ports of both the CP/M machine and the IBM. It can be done by cable or by sending data via telephone. A serial communications port and/or a modem are optional on the PC. The disk that accompanies Baby Blue contains a program that will attach the necessary PC-DOS "header" to the front of the CP/M program, and XEDEX will sell you software that enables the IBM to receive CP/M files. But you will also need the appropriate communications software for the sending computer.

The fourth method for obtaining software is through a service that XEDEX plans to offer. For about $100 per disk XEDEX will transfer existing CP/M programs and data to a format that can be read by Baby Blue.

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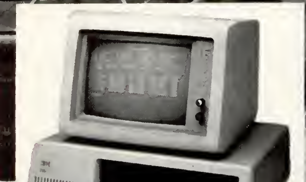

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Some Software is Not Compatible

Regardless of how you try to transfer them, some CP/M-80 programs will not work with Baby Blue.

The first limitation is that the programs must fit within the physical limitations of the PC. If the program requires 400K of disk storage, it cannot be stored on a standard 160K PC disk. It might, however, be possible to run the program if the PC is equipped with a hard disk or a higher capacity eight-inch floppy disk. Programs that won't run under CP/M 2.2 won't run on Baby Blue. Baby Blue will also fail to support programs that use what Landgarten termed "primitive disk calls," such as calling upon the disk operating system to "read a certain sector." Such calls, according to Landgarten, "are most likely to show up in disk utilities you aren't likely to use anyway." Other programs that will not work include those that are dependent on specific hardware of the computer or display device. Programs designed to run on an Osborne computer or a SoftCard equipped Apple are not going to run on an IBM or any computer other than the one for which it was designed.

Transferring programs from one machine to another can also interfere with the licensing agreements that users sign with the software publishers or distributor. In recognition of that, Landgarten cautions, "We are not providing the convert program so that people can take software they run on one computer and convert it to the IBM. The purpose is to allow users to buy software immediately that has already been written rather than waiting for it to be rewritten on the Baby Blue format."

Does It Work?

A prereleased prototype of Baby Blue arrived at our office just in time for this issue. This article was typed on the IBM with the CP/M-80 version of *WordStar*. It is virtually the same *WordStar* that for years has been the word-processing workhorse on most microcomputers. XEDEX has improved the program to take advantage of the PC's cursor control and function keys. They also provided us with a special version of the *SuperCalc* spreadsheet program to run on a Baby Blue equipped IBM. Both *SuperCalc* and *WordStar* worked as advertised and both created data files in standard PC-DOS. Using a BASIC program written by one of our editors, we were even able to convert Baby Blue's *WordStar* files so that they could be edited with the *EasyWriter* and *VolksWriter* word-processing programs.

PC did not test the convert program, nor did we attempt to "port" software from a CP/M system to a PC.

Will It Become Obsolete?

Baby Blue might get you through the current software drought, but in time there is bound to be a plentiful supply of software written for the PC's native 8088 processor. If the programmers are as farsighted as the PC's hardware designers, much of the new software will be better suited for the PC than that which will run on Baby Blue or any other Z-80 processor. Six hundred dollars is a lot of money for a stop-gap measure, but Landgarten points to several reasons why his Baby should have a long and useful life. First, it adds 64K of memory that can be accessed by IBM's processor. Baby Blue sells for only $40 more than a 64K IBM memory board and, like a memory board, it takes up only one expansion slot, although a number of companies have introduced single-slot boards that provide up to 256K of additional memory. Baby Blue also adds another processor to the IBM, which XEDEX says will later be able to perform chores while IBM's 8088 processor is busy doing something else. For example, using as yet undeveloped software, the Z-80 could be sending text to a printer while the 8088 is running a text editing program.

BABY BLUE creates compatibility by providing a Z-80 based "computer within a computer."

Will It Meet Your Needs?

Whether Baby Blue is for you depends on your software needs. If you can be served by software that runs with PC-DOS or CP/M-86, you probably don't need any "babies" in your system. As a general rule, before buying any hardware, be sure it will run the specific software packages you need. But if you want to run programs that are available for the Z-80, then this Baby may bring joy into your life. /PC

OPERATING SYSTEMS/HAL GLATZER

PC-DOS Wins One

CARE Computer's MatchMaker *lets PCs use software from Datapoint's DATABUS operating system.*

Beginning in September, CARE Computer Systems plans to offer a software product that will open up a veritable catalog of applications programs to the IBM Personal Computer. The Bellevue, Washington firm is currently testing *MatchMaker 8600*—a program that converts Datapoint minicomputer software into programs compatible with IBM's PC-DOS operating system. To develop the product, the company abandoned a previous project working toward compatibility with the CP/M operating system.

"The effect of our product," says Gerald Nelson, executive vice president of CARE, "will be to bring a 437-page book of seasoned, third-party software from Datapoint's catalog to the PC user. Those are field-tested, existing applications programs that have been available for years."

CARE markets systems built around Datapoint computers, specializing in general ledger and medical records-keeping software for nursing homes; they install Datapoint minicomputers on customers' premises, and also operate a remote computer service bureau (with an IBM mainframe) for some 800 clients. The idea for *MatchMaker 8600* grew out of a desire to make use of microcomputers.

"Our software is written in DATABUS, Datapoint's operating system language, but it's not easily transportable into BASIC or COBOL or other languages that a micro could use," Nelson says. CARE was impressed by CP/M, and found a computer manufacturer that—at first—was willing to support their conversion costs, but later backed out of the project.

"Then the PC came along. It made me nervous that we were going in one direction—8-bit CP/M—and IBM was going in another—16-bit machines with greater memory addressability. Now, the Datapoints are 8-bit machines, with multi-user capabilities, but that's hard to achieve on microcomputers. The IBM PC seemed like a good product, and we figured we'd rather bet on IBM and be on their side of the line than be against them. We re-targeted the conversion of DATABUS from 8-bit CP/M to PC-DOS."

Mike Orr, who actually did the conversion, was formerly a product manager for the business-oriented COBOL language at nearby Microsoft, and he describes the project this way: " DATABUS is inherently an interpretive language, even on the Datapoint. What that means is that the software is processing every instruction one step at a time, so the user sees only the high-level, English-like language, and the machine sees only its elementary machine language. There's an 'interpreter' between them.

"For turning DATABUS files into PC-DOS files, we created an interpreter that translates the DATABUS instructions into pseudo-code, an intermediate step that can then be translated for each operation. There is an alternative approach, called a compiler," Orr explains, "that would take an entire program and translate it into machine language, but the advantage of our approach over the compiler approach is that it is smaller and more easily portable among different machines. The major disadvantage is that it is slower than a really well-done compiler can be.

"But the interpreter is really a bridge—you can call it a 'portable bridge'—to other 16-bit processors, and to other operating systems besides just PC-DOS. Ultimately, we'll be making DATABUS conversions to the Motorola 68000 chip and to UNIX operating systems."

The first applications software that will use the PC instead of a Datapoint will be CARE's own *VistaCARE* system for nursing homes, and CARE does not expect to make further translations itself. Rather, says Nelson, "We will make *MatchMaker 8600* available to the 50 other Datapoint OEMs" (companies that develop products using Datapoint computers) and "open up the PC to them." /PC

Hal Glatzer is a journalist and television producer who describes himself as an "explainer." His latest book is Introduction To Word Processing *published by Sybex.*

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At The Faire

The West Coast Computer Faire, held unnually in San Francisco, hos been o tribol rite of the microcamputer industry since 1977, when the Apple II and Commodore PET computers made their public debuts there. The Foire is not exoctly o trade show, nor a convention or conference; descriptians like "gathering of the clan" or Hal Glatzer's image of "The Big Game" seem to copture its spirit.

While there ore sizable microcomputer industry outposts elsewhere (Baca Raton, far example), ond the roots of the industry can be traced to Albuquerque and other pluces, the San Francisco Bay areu and neighboring "Silican Valley" have became to microcamputers whot Detroit is to autos and Pittsburgh is ta steel—hame buse. So each year the clan cames aut to the Fuire to revel and swop stories. And the clan keeps getting bigger, with the crawd swollen ever more by fuscinated anlookers and would-be initiates. Products ure shown ond lectures given, but not with the blue-suit or pipe-ond-tweed otmasphere of more traditionol events. Attending the Faire is on experience unto itself.

At last year's Faire IBM was an official exhibitor. Asked when her company was going to intraduce its "real" persanol computer, an IBM representative pointed to the Model 5120 on display ond said, "This is it." (Four manths later we all knew better.) In 1982 IBM itself didn't exhibit. But the presence of the PC was everywhere—the biggest source of excitement in the place. PC magazine was there too, hawking our wares ond checking out the scene. Following are several reparts from PC staffers.

The West Coast Computer Faire was like a homecoming weekend far Silicon Valley alumni. At the vernal equinox—a caol, green mament be-

fore the waxing sun baked their grasslands brown—some 40,000 people crowded into San Francisco's stadium-like Civic Auditorium and Brooks Hall for the "big game."

Hundreds of team players drew the crowd in, their pennants and jerseys proclaiming brand-name and no-name goods, arcane peripherals, and exotic languages. Those celebrating the rites of spring had their ceremonial "king" in Faire organizer Jim Warren, who made himself ubiquitous on rollerskates.

The Faire offered me a chance to see how far the IBM Personal Computer team (which had moved to Boca Raton, Florida from Armonk, New York) would go against the home-town boys and girls of Northern California's indigenous industry.

Yet IBM itself was conspicuously absent, and it was not the only league leader to stay off the field: Atari, Zenith, and Microsoft set up no booths, and the latter two asked only the trade press "sportswriters" to attend their news conferences. Instead, resellers and dealers represented them, going head-to-head with Apple, Osborne, Radio Shack, and other first-string players who were there in person.

Around the Faire at least two dozen booths had a PC on display, and many more had flyers that swore that their hardware or software was—or soon would be—running on the PC. In this wide world of computer sports, some exhibitors' literature reminded me of TV wrestlers in before-the-match interviews, shouting gruff and bluff promises of strength; others were more soft-spoken, like golfers who have played only 9 of 72 holes in a tournament.

One company, Datamost, proclaimed that their software, *WRITE-ON!* ('!' is part of the name, by the way) was "easier than *EasyWriter*," as "powerful as *WordStar*," and "a program editor too." To them things like word wrapping, variable inserts to form letters, print formatting and text merging were unique features.

More subtle was Quadram Corporation, which modestly touted its memory expansion board for the PC this way: "The first mass-produced IBM cards [sic] shipped by a supplier other than IBM. . . . With four cards being shipped, Quadram has become one of the leading suppliers of IBM peripheral boards." Did they mean four varieties or just four boards? (And I thought I knew what "IBM cards" were—those things you're not supposed to fold, spindle, or mutilate.)

EXHIBITORS' literature reminded me of TV wrestlers in before-the-match interviews—gruff and bluff.

Giveaway Winner Drawn

For a few moments, the *PC* exhibit booth became the center of attention at the West Coast Computer Faire, as Jennifer Poitier (daughter of *PC*'s production manager Jacqueline Poitier) drew the winning name in our promotional giveaway of an IBM Personal Computer. As a dense crowd pressed around, Jenny gamely plunged her hand into the barrel and drew out the entry of Paul Hardiman of Milwaukee. The response to *PC*'s drawing was one more indication of the intense interest IBM's PC elicited from Faire attendees.

Team sports again: A club that has been on the field since the beginning of the PC game showed off its latest player. Information Unlimited Software, Inc. brought out *EasySpeller* as a teammate to its *EasyWriter* word processor.

EasySpeller has a built-in dictionary of 88,000 discrete words and showed itself to be very user friendly, giving full-sentence explanations of its activities. "*EasySpeller* does not recognize this word at all," appeared when a word in the file was not found in the dictionary, and "*EasySpeller* sees improper capitalization," showed up when an ordinary word was capitalized as a proper noun. *EasySpeller* accepts non-*EasyWriter* documents and will proofread any PC-DOS-created files, including BASIC and FORTRAN programs.

A potentially dangerous competitor to the PC-DOS software jockeys was a piece of hardware delicately called "Baby Blue" (a pun on IBM's corporate nickname, "Big Blue"). The product is a microcomputer on a single-printed circuit board that allows programs for the CP/M operating system to run as if the PC were an 8-bit, CP/M-compatible microcomputer—the very computer IBM had hoped to render obsolete by using the 8088 16-bit chip. Since there is still little software that takes full advantage of the 8088, Baby Blue may fill in the gaps. But if 16-bit software (written for PC-DOS or CP/M-86) comes down the pike soon, Bob Dylan's lyrics may be heard blowing in the wind: "It's all over now Baby Blue."

So here's the latest from the press box at Silicon Valley Stadium, over radio station WCCF: The team from IBM has yet to knock anybody out of the running, but don't let the first innings fool you. The name of this game is hardball.

Surrender at the Faire

I arrived at the West Coast Computer Faire as a freelance writer in search of anything new and exciting in the world of computers. Having no bias toward any particular system, I wandered through the cavernous convention stopping at whatever booths struck my fancy. After three days of nonstop talking and gawking, I surrendered my free-agent status.

Within a week I signed on as an editor at *PC*, and I just took delivery on my own IBM Personal Computer.

I didn't need the Faire to convince me that the PC was an excellent computer. Like a lot of people, I was holding back until I saw adequate software and hardware for the machine. There are a lot of excellent computers on the market, but what makes a machine exciting is the support it gets from others—software authors, equipment manufacturers, users groups, even book and magazine publishers. Any lingering doubts were erased by my experience at the Faire.

The Faire pierced certain myths about IBM's new computer. Myth One: Limited software. Software may have been limited in October when the machine was released, but a lot of programmers have been burning the midnight oil in the intervening six months. The Faire had enough software offerings to satisfy some pretty diverse demands.

Faire goers in search of word-processing software could view demonstrations of *VolksWriter*, *Select*, and *Write-On*, and Norell Data Systems promised the imminent release of *EasyText*.

Spreadsheet shoppers were not limited to IBM's *VisiCalc*. "Calcalikes," it seems, are fair(e) game. Sorcim was showing *SuperCalc* while others were claiming that their electronic spreadsheets were just around the corner.

PCers in need of communications software were not bound to IBM's Asynchronous Package, since Micro-Link made it to the Faire. Data Base management needs could be filled by Norell's *EasyData*, ISU's *EasyFiler*, Washington Computer Service's *Record Management System* and two packages from Johnson Associates.

Games, though not plentiful, were displayed by Stoneware and Digital Marketing. There was even a program called "The Programmer," designed to help you write your own programs.

While there weren't as many software packages as there were for Apple, TRS-80, or CP/M microcomputers, there were plenty from which to choose.

Myth Two: The PC is expensive. Faire goers were treated to add-ons that transformed the PC into a bargain system. Davong's Faire Special included a 192K memory board for \$599—\$39 more than IBM's 64K board. To store the data generated by all that cheap memory, they also showed a \$1,995 five-megabyte hard disk. These disks hold 31 times the data of an IBM floppy at 3 1/2 times the price.

Buyers of color monitors could see the light for a lot less. Both ATI and Electro-Home had color monitors for less than \$600. Berkeley Micro-Computer was one of many companies selling memory chips. They also had a six-foot extension cord for the PC keyboard.

Engineers, programmers, scientists, and system designers also had products from which to choose. Hurricane Labs, for example, was showing its PC prototype wire rap and expander boards, and promising lots more for the future. Basic Business Software demonstrated a series of utility programs to take some of the drudgery out of programming. They also offered some pretty sophisticated statistics packages to run on the PC.

Even would-be entrepreneurs had a chance to cash in on the PC bonanza. The Software Emporium offered franchises to anyone "with a modest amount of capital and a willingness to work hard." The PC was the most prominently featured computer in the Emporium's prototype advertising.

For every firm that had a PC product at the Faire, there were several that had some in the works, not yet ready for exhibit. Need proof? Check out this issue's "New on the Market." If that's not proof enough, stay tuned. Next year's Faire might just be a PC Carnival.

—Larry Magid

The Programmer Previewed

The most tantalizing booth at the Faire for me was that of Advanced Operating Systems. They were showing off a nearly finished version of *The Programmer*, a program to help write other programs. I wanted a copy the minute I saw it.

The Programmer is not one of the so-called "programs that program." It is a program that helps you write programs in BASIC. By far its nicest attribute is that it takes in the full range of the PC's capabilities: graphics, sound, communications, etc. Menus in the program present you with choices of all the things the PC can do. The screen graphics menu, for example, includes a choice to draw a line; and if you select this, *The Programmer* will then ask you where the line should start and stop, what color it should be, and whatever else it needs to know. By showing you listings of the PC's features in this way, the program keeps reminding you of all the things the PC can do.

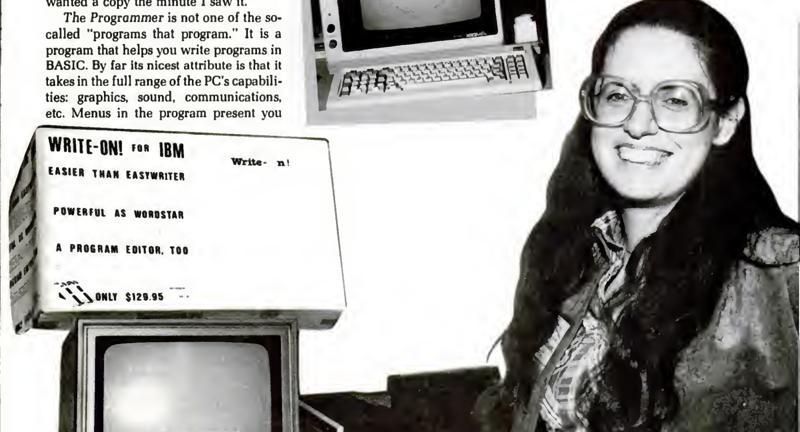
Making a program this way is a little like stringing beads. You still need to define what you want a new program to accomplish; but once you do, you just outline the steps, and *The Programmer* turns it into a BASIC program. While in the bead-stringing stage, you can shift back and forth between *The Programmer* and your evolving program to check how it's coming along, then go back for changes or additions. If the eventual product lives up to the preview, this one's going to be a biggie.

—*Jim Edlin*

Word-Processors Proliferate

One obvious message from the Faire exhibits was that PC users will have plenty of choices about what they use to process words.

The cottage-industry corps had already been hard at work. In a small booth tucked away on a mezzanine, Camilo Wilson (above left) showed off his *Volkswriter*



program—aimed at those seeking simplicity. Downstairs, DataMost was marketing a version of *Write On!* that Betsy Speicht (right) had rapidly adapted from its original version for the Apple II computer. (The manual binder bore apple pictures, but a sticker was affixed that said "IBM Version.")

SOME 40,000 people crowded into the stadium-like Civic Auditorium and Brooks Hall for the big game.

The makers of IBM's chosen software, *EasyWriter*, previewed a newer and different program, *EasyWriter II*, that they will be marketing on their own. And other companies, while not yet showing their products, certainly wanted to make sure you knew they were coming. These included Sorcim Corp., publishers of the *SuperCalc* spreadsheet, which was talking up a companion *SuperWriter* program, and Select Information Systems, who had their *Select* program demonstrating on several machines including the Xerox personal computer. Select's Zev Rattet said the IBM PC version of the program was just about to be released.

PC Panel Draws Standing Room Only

The Computer Faire's three-hour panel discussion entitled "The IBM Personal Computer" drew a standing-room-only crowd of more than 500 information-hungry individuals. They turned out to hear a panel that included such stars of the PC firmament as Microsoft's Bill Gates and Digital Research's Gary Kildall. The only missing ingredient was a representative from IBM itself, and though none were on the podium, some visitors from Boca Raton were spotted in the audience. The session was organized by John Reutter, president of Megasoft, a software systems company that is developing educational and entertainment software. In addition to scoring the coup of getting rival software authors Gates and Kildall on the same stage, Reutter assembled two hardware manufacturers—Martin Alpert, president of Tecmar, and Bob Lindgren, vice president of marketing at DataMac Equipment Corp. Other speakers at the session included Fred "Chip" Pood, senior vice president for mergers and acquisitions at Micropro International; Richard Mandel, national products manager at ComputerLand in Hayward; *PC* publisher David Bunnell; and *PC* founding editor Jim Edlin.

Each panelist gave a 15- to 20-minute talk followed by a few minutes of questions and answers. Here are some highlights.

John Reutter, Megasoft

For three to four years many of us speculated about when IBM would drop its bombshell and legitimize our industry. In August 1980, IBM began forming the project and put together 250 PC "freaks" within IBM. I had a number of friends at IBM who had their own PCs—some of the early ones. They had to hide the fact that they had them. It wasn't an accepted thing to go home and play with your PC if it didn't have an IBM label.

The project was completed in less than a year. And the software that was sold to the public for three to four years, with thousands of bugs in it, was found and corrected before IBM introduced its computer onto the market. This was to maintain respectability.

IBM is one of the very few companies in the entire world that overnight could create a billion-dollar industry.

Bob Lindgren, DataMac

I talked with a lot of the ComputerLand Store owners—the ones who have been around for a while, who have been through the Apple. They said the Apple would be a ripple on a pond. But the IBM seems to be a tidal wave. And it doesn't seem to be subsiding at all.

Memory is an area that, as users, you're gonna have to look at. If you look at IBM's announcement, they say the maximum configuration would be 256K. Remember, with five expansion slots, when you take a floppy and you take your monitor and your printer, you're left with three expansion slots. The obvious thing was to increase the density of the board. We wondered why they didn't increase the capacity of the board.

The other area that we looked at on a PC that was interesting and seemed to be similarly deficient was the amount of floppy disk storage offered. IBM used Tandon drives and the 40 tpi drives, which gave a capacity of 160K. So really you have a floppy storage problem, especially with some of the software that's being supported. You need certain data bases that you can't get to with those sized floppies.

Dr. Martin Alpert, Tecmar

Tecmar has developed 26 products for the IBM PC. By virtue of handling these products, we've been able to learn a great deal about the PC and our market.

Many users are first-time users without significant technical background, which is why quality of product and high reliability are so vital.

IBM is one of the few companies that overnight could create a billion dollar industry.

There are certain product omissions that were obvious. And IBM, by providing complete documentation, facilitated third-party hardware vendors' meeting those needs. High-density RAM, Winchester drives, and expansion chassis were some of the products. You can now find literally dozens of manufacturers of memory for the PC. Most of these commodity products are very similar, with a few variations. It is the peripherals that make this PC acceptable to a multitude of applications. It is these peripherals that give this PC personality.

New software can be used to add new functions to the hardware. For example, at the show, we've announced software products that allow the standard memory board to act as a disk.

IBM has set very high standards that this industry must also adhere to.

Fred "Chip" Pood, Micropro

The projection before IBM entered [the market] was that we'd have between one and two million micros out this year. They're now forecasting four and five million by 1985.

Professional and business people are by far the dominant users of microcom-

NEC's new letter-quality printer gets personal with IBM.

The Spinwriter® 3550 lets the IBM PC get down to business.
NEC's new Spinwriter letter-quality printer is the *only* one plug-compatible with the IBM Personal Computer. So you get the business applications you've been wishing for. Letter-quality output for word and data processing. Multi-language, scientific, and technical printing. Simple forms handling. Quiet operation. And the reliability of the industry's most popular printer line.

NEC designed the new Spinwriter especially for the IBM PC. It comes complete with documentation and training materials to fit your PC user's handbook. Just plug the Spinwriter in and your PC instantly becomes more versatile and flexible.

More than 8 forms handlers and 50 print thimbles boost PC versatility.
NEC designed the Spinwriter's 8 modular forms handlers to accommodate a wide range of paper and document sizes and types. The easily mounted handlers let your computer print out the forms you need for data processing, word processing, graphics, accounting or other business applications.

The Spinwriter's 50 print thimbles can more than triple your PC's usefulness. They come in both constant pitch and proportional-spaced fonts, plus in foreign language, technical and scientific versions. They snap in and out in seconds, and let you print up to 203 columns on 16-inch paper. They each last for more than 30 million impressions.

This printer's special features make everything look better on paper.
The Spinwriter's software-invoked features include automatic proportional spacing; bidirectional, bold and shadow printing; justification; centering; underscoring; and sub/super scripting, all at speeds up to 350 words per minute.

That big extra, Spinwriter reliability.
The new 3550 is part of NEC's renowned Spinwriter family, the world's most popular line of letter-quality printers.

Spinwriters have the industry's best mean-time-between-failure rating, in excess of 3,000 hours. In terms of average personal computer usage, that's more than five years.

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puters. We feel it's the needs of the office that are the driving force behind software development. ComputerLand stores in New York and *MIS Week* in February 1982 recorded that 93 percent of the PCs are purchased by businesses, both small and large.

We perceive that the trends in software are three-fold: (1) The needs of the office environment are going to be crucial to the development of applications software; (2) The entire office environment needs to be integrated; (3) One of Micropro's intents is that our software will allow Bill Gates to recommend the IBM PC to his mom. It must be easy to use and alter.

Canned application software has a major problem. The likelihood of satisfying everyone is virtually impossible. There have been accounts receivable (A.R.) as long as there have been professions. Yet nobody's ever come up with a definitive A.R. package, because businesses are all different. All packaged software is just an approximation of what the user wants. A more powerful microcomputer from the world's largest computer company is not going to change this fact. The problem will become worse as whole new types of users absolutely unknowledgeable about data-processing enter the microcomputer world. We feel the answer lies not only in better hardware, but, specifically, in better software.

ONE of MicroPro's intentions is that our software will allow Bill Gates to recommend the IBM PC to his mom.

Hardware is interchangeable. You have much more invested in learning how to use a piece of software. We want to capitalize on that investment for you by having you learn one piece of software and making the next piece that much easier to learn—keyboard techniques are the same, operator techniques are identical, menu schemes are the same, prompts are the same, data is compatible between programs... It has to be. If we don't do it, someone else will. And we intend to be number one.

Bill Gates, Microsoft

[Gates wrote the first BASIC language for a microcomputer and is, in Reutter's words, "singlehandedly responsible for creating our industry."]

We have today a 16-bit world. (The PC) is the first of a new class of machines that will become increasingly important.

Some of the key packages now on the IBM machine (*VisiCalc, EasyWriter*) never existed in the 8080 environment.

There is a very large user base out there today developing systems under MS-DOS.

Lifeboat Associates will be publishing a wide variety of applications in MS-DOS environments, and that's important. That's the type of momentum that leads to an operating system being accepted as a standard.

I think everyone's aware, in the case of the machines today, that you can buy a nice peripheral, but in most cases the applications won't take advantage of it.

I expect most work for IBM machines will be done in a high-level language. The extra power of the instruction-set means that the inefficient cost for working a high-level language is greatly reduced from the 8-bit environment. The key reason for working in machine language in the 8-bit environment was the limited address space, and that is something the IBM PC solves.

I think you'll see packages that'll demand more and more memory. I encourage you to get a board that's expandable, even if you only go with the 128 initially.

Dr. Gary Kildall, Digital Research

We transported fundamentally the same environment into the 16-bit world to provide transportation paths for software vendors... the same function calls, the same memory organization, and the same base page. Everything is fundamentally the same, with extensions to handle memory management and multi-resident programs.

The common mode of operation for 16-bit machines, including the PC, is going to be a single-user, concurrent system.

I EXPECT most work for IBM machines will be done in a high-level language.

One thing we'll see in the 16-bit world that will be a change from the 8-bit environment is that the professional programming languages will become more incredible. You'll see some migration away from small basic systems and into COBOL and PASCAL environments.

Jim Edlin and David Bunnell, PC magazine

Jim Edlin and David Bunnell discussed customer trends (Fortune 500 companies, small businesses, and professionals are prevalent), made future projections (by the third quarter of 1982, IBM will be shipping 1,000 PCs a day), and opened the Pandora's box on a new rumor, that IBM will open a PC manufacturing plant in upstate New York and one in France). "It's important to be first," said Bunnell, "with a magazine or a product."

Richard Mandel, ComputerLand

Mandel touched on several key issues involving PC sales and development. High points of Mandel's presentation centered on:

- ComputerLand's role in convincing IBM to publish the PC schematics. (ComputerLand was involved quite early in PC's development.)
- First-quarter ComputerLand sales, which indicated that all line sales expanded as a result of PC's entry into the marketplace.
- Emerging sales patterns. The customer base for the PC consists of Fortune 1000 Companies, which tend to install multiples—50 to 1,000 machines per firm.

—Kathleen Burton

Discovering The Source

A network novice's initiation into the uses of a telecomputing service.


Illustration: Mick Wiggins

Three weeks before my IBM Personal Computer was to arrive I signed up for The Source information and communication service. I had only a vague hint of what its computing power could offer, but the concept of an electronic resource—an array of services available from the comfort and convenience of my home—seemed particularly appealing.

I purchased a subscription to The Source to access its large data base, to get late-developing financial information, and to monitor legislation in health care from Capitol Hill. Initially I focused on the information library that was available, but I soon recognized the communication possibilities inherent in this new medium. A user can receive news, transmit text, reproduce documents, and rapidly communicate information to a specialized interest group that know each other only through the electronic service.

IBM Post

One of the features of The Source is POST, a classified ad and bulletin board service. Subscribers participate in open forum to trade goods and services, discuss topics of mutual concern, and establish interest groups. Anyone can send up to 23 lines on the POST free of charge within 75 subject categories. Photography, antiques, aviation, even apartments for rent are shown as separate POST categories. Each of the popular computers has its own POST listing. Naturally I accessed the IBM POST, and I found it immediately helpful.

THERE'S something magical about typing a reply to a letter and knowing it's instantly in another person's mailbox.

Every evening messages appearing on the POST brought me new information about the PC: additional software, hard-disk availability, data on RGB monitors, problems with features, and recommended peripherals.

Since this was my first computer, I had many questions about its use. One immediate problem I noticed while using the communication package was the backspace feature, which should delete incorrect characters. Instead, card-like symbols in reverse video would appear on the screen and alter the communications flow. I inquired if anyone out there in Source-land could help me.

My POST communique was answered immediately. This was a software problem, and its correction required a simple patch.

Furthermore, I wanted to be able to print out material from The Source while it was appearing on the screen. IBM's communication package did not provide for this. I sent out an inquiry on the POST for assistance. Very quickly people responded who had already developed a solution. They sent me a few simple modifications to the IBM package, which allowed me to echo the screen in ongoing print-out. Here were experienced and technically proficient programmers sharing information to help solve those problems.

As questions and answers popped up night after night, I realized that I had become part of a network that was effectively overhauling the IBM asynchronous communication software and making it a practical tool for the needs of home users.

PC Gazette

Following The Source's menu led me to an option called "user publishing." It allows subscribers to set up files that are available to all. One individual has created a category called *The PC Gazette*, a file of information about the machine. It contains communications going back to 1981. It also has an index of articles published in PC magazine, a listing of available software, and prices from IBM product centers. One can learn about user groups starting to form throughout the

(Continues)

About *The Source:*

The Source service can be used by almost any personal computer or computer terminal. Source transmission is accomplished through either of two telephone networks, Telenet and Tymnet, which are reached via an ordinary telephone call.

IBM Personal Computer owners wishing to use The Source will need a modem, which connects the computer to a telephone line, and an asynchronous communications card with an RS-232 serial port. One can reach The Source through the COMM.BAS program included with IBM's disk operating system (PC-DOS). Communications software sold separately can also be used.

A subscription to The Source costs $100 and may be purchased from retail computer stores or directly from Source Telecomputing Corporation, 1616 Anderson Road, McLean, VA 22102.

The subscription is a one-time-only fee. Charges for actual use of The Source are based on connect time and type of service accessed, although there is a $10 monthly minimum. Rates vary with time of day, from $4.25 an hour between midnight and 7 a.m. to $18 an hour for prime-time use (7 a.m. to 6 p.m. Monday through Friday).

A new, advanced data base called Source Plus is available at additional cost. Source Plus features include commodity reports and recommendations, a record of bills before Congress, and Comp-U-Star, an electronic department store. Books, major appliances, tools, tires, cameras, and carpeting are among the items that may be purchased through Comp-U-Star. A worldwide trading network and a customized information research service are also available through Source Plus.

New subscribers receive a host system number, a six-character identification code, and a personal password. These numbers must be entered correctly, in proper sequence, to connect with The Source.

Subscribers also receive a user's manual, which we found intelligently written, well documented, logically arranged, and adequately indexed.

There are two routes to maneuvering through The Source. It appears designed with operating simplicity in mind, and people with little or no previous computing experience should become proficient quickly in its use.

A menu screen displays a set of alternatives, and selection usually leads to a submenu of additional options. A choice there may lead to yet another group of categories. As you become familiar with The Source, you will probably choose to bypass the menus and type in direct commands.

One can also switch rapidly from one application to another, from accessing information to actual communication.

The Source will automatically disconnect if no activity is registered at command level after three minutes.

—Stuart Schwartz and Ellen Wilson

(Continued from page 67)
country and track the evolutionary development of the PC.

CHAT

During my first week on The Source, I was reading UPI news when something flashed on my screen: some call letters, a small identification, and a personal introduction, "Would you like to chat?"

CHAT is a feature that allows typewritten conversation with another subscriber. I had read about CHAT in the user's manual for The Source, but it didn't prepare me for the reality of this stranger coming into my home electronically. I was shocked but managed to respond.

Most conversations centered on computers and their uses. Through the CHAT feature I met a graphics designer in New York, a baccarat dealer in Las Vegas, and a Detroit TV technician who offered me a place to stay when the San Francisco Forty-Niners went to the Super Bowl.

One random contact on the electronic network turned into an amazing coincidence. I found myself chatting with an old friend of my brother's who I had heard about but had never met.

Fix for IBM Communications Program

The following change corrects a problem IBM's asynchronous communications program has with handling backspaces. (IBM apparently forgot there might be more than one character in the input buffer.) To make the change, load the BASIC language, insert the communications program disk, then type `LOAD ''TERMINAL.BAS''`. When the program is loaded, type the following lines:

```
2005 D%=512+ASC(BKS$):CALL SS(C%.T%.D%.E%)
5106 IF RIGHT$(B$.1) <> BKS$ THEN 5110
5107 IF LEN(B$) > 1 THEN B$=LEFT$(B$.LEN(B$)-2) ELSE GOSUB 2720 : GOTO 5200
SAVE ''TERMINAL''
```

The modified program will then be stored on your disk. Line 2005 forces the base program to terminate a buffer read at a backspace character, if there is one, so only the rightmost character needs to be tested in 5106. If there is more than one character in the buffer string, then line 5107 removes the backspace and preceding character before letting the buffer be printed to the screen, otherwise it calls an existing subroutine, which backs up one character position on the screen, prints a space, and backs up again.

With thanks to Morris E. Thompson, Jr. of Dallas, Texas (Source TCS923), who originated this change.

SMAIL

The POST and CHAT introduced me to a group of people, and I began to communicate regularly through a feature called SMAIL—Source Mail. Each subscriber has a mailbox, a 2,000-character storage bank accessed with a simple command. This feature allows for rapid communication of information to an individual or a group of users. There is something magical about this instant communication—about receiving a letter, typing a reply, and knowing it is instantly in another person's mailbox. This feature can be an enormous timesaver and a useful business link. The only drawback I have experienced is similar to that of a traditional mailbox—finding unsolicited announcements and publicity mail.

I WAS shocked but managed to respond to this stranger coming into my home electronically.

The Source was established in June 1979. In October of the following year it was taken over by Reader's Digest Association. Seven mainframe computers were purchased, new data bases added, and response time improved. The user's manual was rewritten and a system of on-screen menus was devised to simplify access to its services.

At this writing The Source says it has 16,786 subscribers, 1,500 added during a recent month. Mike Rawl, manager of corporate communication for The Source, says every month a new subscription record is broken.

I think services such as The Source represent a shift toward more efficient methods of conducting routine business and, more significantly, a change in the way we collect, manipulate, and share information. There are infinite possibilities, and a user may never know them all.

Some Caveats

I doubt, however, that such services will supplant the printed page. There's an optimum amount of time one can spend watching information scroll across the screen. For me it seems to be 60 minutes at a sitting.

Also, the expense of usage can add up quickly. One has to compare the cost of writing text, playing games, and developing programs on The Source against the cost of purchasing equivalent software.

The general novelty of CHAT soon wears off. CHAT is a great equalizer and a means of expanding social networks, but after three weeks I was an old-timer. There are just so many ways you can ask someone, "What kind of computer do you have?"

The future value of The Source depends not upon the company as much as the subscribers. Continued use will be based on specialized interest. It gives us a chance to interact, to present problems, and share solutions.

I view a subscription to The Source as similar to having a million diskettes available for use; a personal storehouse of data on business, finance, science, public affairs, sports, education, and employment; an entertainment library containing 74 games; and six dozen bulletin boards where you can place notices to buy and sell equipment or exchange ideas. With each passing month it seems more evident that my green screen will become an expanding window to the world. /PC

Stuart R. Schwartz, M.D., is a Clinical Professor of Psychiatry at the University of California School of Medicine. He was assisted in the writing of this article by Ellen Wilson, a self-proclaimed cyberphile who is proprietress of The Electronic Cottage, a home-based computer processing service.


IBM

Illustration: Jim Ludke

To sell or not to sell? For many owners of pre-IBM PC computers, that is now the question.

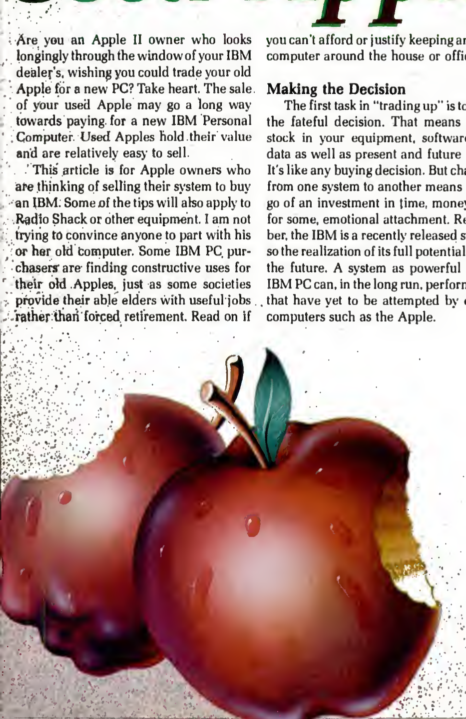
Used Apples

Are you an Apple II owner who looks longingly through the window of your IBM dealer's, wishing you could trade your old Apple for a new PC? Take heart. The sale of your used Apple may go a long way towards paying for a new IBM Personal Computer. Used Apples hold their value and are relatively easy to sell.

This article is for Apple owners who are thinking of selling their system to buy an IBM. Some of the tips will also apply to Radio Shack or other equipment. I am not trying to convince anyone to part with his or her old computer. Some IBM PC purchasers are finding constructive uses for their old Apples, just as some societies provide their able elders with useful jobs rather than forced retirement. Read on if you can't afford or justify keeping an extra computer around the house or office.

Making the Decision

The first task in "trading up" is to make the fateful decision. That means taking stock in your equipment, software, and data as well as present and future needs. It's like any buying decision. But changing from one system to another means letting go of an investment in time, money, and, for some, emotional attachment. Remember, the IBM is a recently released system, so the realization of its full potential lies in the future. A system as powerful as the IBM PC can, in the long run, perform tasks that have yet to be attempted by earlier computers such as the Apple.



Consider the value of your hardware, software, and data. When evaluating software, separate that which you really use from what you have around but hardly care about. If you absolutely need applications that can be run only on the Apple, and there is not yet software that allows the IBM to perform the same task, then the decision to trade is premature. If, on the other hand, your important applications are focused on such tasks as word-processing, budgeting, and data-base management, the IBM may already have as good or better software than what you now have on the the Apple. With the introduction of Baby Blue (see story this issue), the PC can now run most software written for the CP/M-80 operating system. If you are one of more than 30,000 people running an Apple under CP/M, chances are good that you can continue to use IBM versions of your current software.

You should also consider the value of the data you are storing on Apple diskettes. For some users, that can add up to a huge investment. There are ways to transfer that data. Files can be transferred via a communications adapter directly or over the phone. In some cases they can be uploaded to The Source, CompuServe, or some other host computer and then downloaded to your new IBM. ComputerLand dealers sell both IBMs and Apples, so if you buy a PC from them, see if they can help you make the transfer. If worse comes to worse, you can print out all the data and re-enter what you wish to keep.

The price you can get for your used Apple depends, in part, on the new retail value of the components. Many people think the IBM is much more expensive than the Apple II. The difference is less

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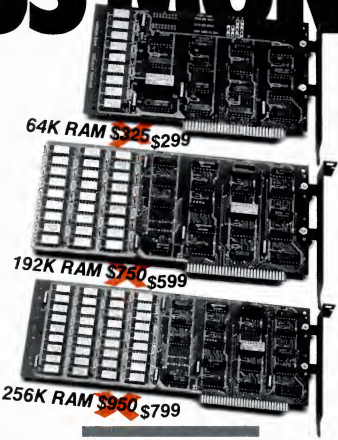

Now you can buy a 64K RAM expansion card for your IBM® Personal Computer for just $299*.

That's less than you would pay any other manufacturer.

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(415) 965-7725

*Davong Suggested Retail Price

than you might imagine, and, in many configurations, an IBM is actually cheaper than a similarly equipped Apple II.

What's the Blue Book?

Of course the value of your Apple depends on how it is equipped and its condition. Because well-made computers deteriorate very slowly, your system is probably as good as new.

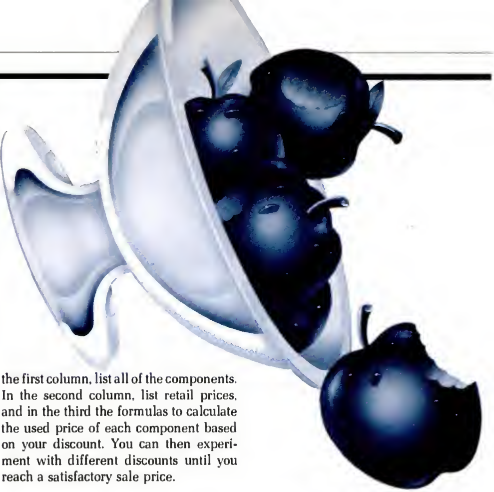
One of the reasons for the Apple II's high resale value is that it is still a production model. Despite the introduction of the Apple III, the II remains a very popular computer. Four years after its introduction as one of the first personal computers, the Apple II is still a sales leader. Apple has reported a 98 percent increase in sales, comparing the first quarters of fiscal 1981 and 1982. The majority of those sales are for the Apple II. As long as dealers continue to sell new Apples at full list price, some people will be glad to pay less for a good used one. That may no longer be true if Apple introduces a replacement for the II. When Radio Shack introduced the TRS-80 Model III, the used value of the Model Is dropped substantially. That's because the Model III was essentially a repackaged Model I with more features and a lower price tag. Apple has not announced any plans to replace the II, but there is speculation they will, at some point, come out with a more powerful computer at a lower cost.

USED Apples are selling for 60 to 80 percent of their initial retail.

The Apple's high resale price is also a testimony to the excellent reputation that it has earned as a versatile and reliable machine.

Used Apples, if you can find them, are currently selling for between 60 and 80 percent of their initial retail value. When you advertise your system, you should probably allow some room for negotiation. People like to bargain. A little flexibility on your part can help clinch the sale.

A *VisiCalc*-type spreadsheet program (or its paper, pencil, and calculator equivalent) can help you price your system. In the first column, list all of the components. In the second column, list retail prices, and in the third the formulas to calculate the used price of each component based on your discount. You can then experiment with different discounts until you reach a satisfactory sale price.



Should You Break Up Your System?

If your system includes a lot of components, you will have to decide whether to sell them all at once or a piece at a time. You are likely to get calls from people wanting an 80-column card, a CP/M board, an extra disk drive, or part of your software collection. Whether you want to break up your system depends partially on how long you want to be in the business of selling used equipment. One solution is to be willing to sell the Apple and disk drives as one package and the components a piece at a time. It's probably a mistake to sell the components before you sell the bulk of the system. Components are easy to sell if you have access to a computer club or electronic bulletin board. Apple owners are always looking for inexpensive ways to expand their systems. But it will take extra time and effort on your part.

Software is more difficult to sell, its selection being more personal than hardware. If you throw it in free as part of your sale, you may be in a more competitive selling position. Or, once you find a buyer for the hardware, you may be able to convince the person to buy some of your software. Sometimes it is hard to convince a buyer of the value of your software. Even though it is an expensive part of the system, people have a tendency to think in terms of hardware and resist paying for software. Nevertheless, millions of dollars are spent each year on software and a current release of a "pre-owned" software package works just as well as a new one. The only drawback to used software is that the new owner may not be eligible for updates and assistance.

Where to Advertise

Chet Lambert publishes the *Computer Trader*, a Birmingham, Alabama based monthly newsletter that brings together buyers and sellers of used computer equipment. He says he recently sold his own dual drive 48K used Apple for $2,100—70 percent of list price. Lambert claims that Apple ads produce almost immediate results.

The *Computer Shopper* is published monthly from Titusville, Florida. The pages of one of its recent issues carries 16 ads for used Radio Shack Model Is and only three for used Apple IIs.

Advertising in a nationally circulated trader directs your ad to a group of highly motivated buyers. National circulation, however, means that you may have to deal with a long-distance buyer. That causes obvious complications, though Lambert claims that his buyers and sellers have always managed to work things out.

For subscribers to CompuServe and The Source, other national outlets for selling used equipment are the electronic bulletin boards provided on these networks.

Subscribers pay only the normal time charges while they send or read ads. These ads are frequently used to sell components or software, but occasionally entire systems are advertised and sold through the electronic classifieds. Like users of the trader newsletters, arrangements must be made to bring together the buyer's money and the seller's equipment.

Community-based electronic bulletin boards provide a free local advertising option. Most large and some small cities have dial-up bulletin boards, some of which are dedicated to specific machines. Contact your computer dealer or clubs for the phone numbers of these services.

Old-fashioned bulletin boards also work. Local colleges are filled with people interested in bargain computer equipment. Don't overlook posting notices in office buildings and supermarkets.

The most obvious place is the classified section of your local paper. If your paper has a computer section, place your ad in that section. Otherwise, try to get the paper to put a bold heading saying "Computer." Some papers have a special classified section for the business community. That's probably a better bet than the general classifieds.

If you live in a town with a computer club, you can put a notice on its bulletin board or make an announcement at its meetings. A lot of would-be Apple owners associate with clubs.

SOFTWARE is more difficult to sell. If you throw it in free, you may be more competitive.

I asked several ComputerLand dealers what they could do for people wanting to upgrade. Though none accepted trade-ins, several said that they would help customers sell their used equipment in conjunction with the purchase of a new IBM. One dealer said he would display the used system as a free service. Another said she would do so for a commission. All the dealers I spoke with said the used Apple market is slanted toward the seller.

Sales Advice From the Pros

Wherever you advertise, give a complete description of your offering and include a price. Chet Lambert of *Computer Trader* says his advertisers who include price are more likely to get calls from serious buyers. It also screens out callers who have no idea what the system is worth. I spoke with one seller who made the mistake of advertising his $4,000 system without a price. He was besieged by callers in the market for a $300 system. Many people have no idea what a fully equipped computer is worth.

If you're paying for your classified by the word or line, you want to keep it short, but it's important that people know what you're offering. Some people think that Apples are just for playing games and are not aware of what can be done with a fully loaded one. Go through your system slot by slot and include each add-on.

People in the market for a used system are, of course, interested in price. Your

RAM+ THE EXPANSION MEMORY FOR THE IBM PERSONAL COMPUTER WITH A BUILT-IN RS-232 SERIAL PORT.

Seattle Computer has a winning card for owners of the Personal Computer. It's RAM+ the new expansion memory that can make your Personal Computer unforgettable by adding up to 256K of memory.

And RAM+ cards can put money on the table. Each comes with a built-in RS-232 serial port—which would cost $150 from IBM. This serial port uses IBM supplied software and can be used as IBM COM1 or COM2 leaving an open slot for further additions—like another RAM+ card.

Available in 64K, 128K, 192K or 256K, RAM+ is expandable, fast and reliable, and is made by Seattle Computer, the creators of the operating system for the IBM personal computer.

Each card comes fully assembled, tested and with a 1-year guarantee. Expansion kits are also available.

How to order: RAM+ is available only through your local computer store. Call us toll free at 1-800-426-8936 for the location of your nearest RAM+ dealer.

The RAM+. A great deal for owners of the IBM Personal Computer.

SEATTLE COMPUTER

1114 Industry Drive, Seattle, Washington 98188 main competition consists of discount mail-order houses that are selling Apples for as much as 30 percent below list price. Apple has recently decreed that it will not permit mail-order sales, but there are some companies that are defying Apple's orders. The chances are good that the used Apple buyer is aware of those discount houses, so you must make your system more attractive. Undercutting the discounters is one way to do that. Another is to make an offer that the mail-order houses can't possibly beat. You can offer your customer free software, free installation, advice, support, and consultation.

One reason for buying new instead of used is warranty. The mail-order houses do offer the typical 90-day factory warranties. But they are of dubious value if local dealers either refuse to honor them or do so grudgingly. You can offer your customer a one-year extended warranty, which you can purchase from an authorized Apple dealer for $225. This gives your prospective buyer a sense of security and a positive relationship with a local dealer. Your customer, in many ways, is better off buying used equipment under these circumstances than buying new through a mail-order house. One dealer I spoke with said that she is much more inclined to provide friendly service to buyers of used equipment than to those who buy through the mail.

ONE PC owner said he wouldn't consider parting with his old Apple.

You can also offer to have the Apple checked out by a service technician prior to the sale. We checked with several, and most offer a complete diagnostic exam for about $40. You can offer your customer written proof that the machine is as good as new.

Letting Go

Perhaps the most difficult part of selling your Apple is the decision to do so. For some people letting go means more than just hardware, software, or data. In our research, we encountered Apple owners with a deep emotional attachment to their computers, just as some people have with their cars. One PC owner said that he wouldn't consider parting with his old Apple. Instead, he placed it in his deceased father's room, supplying it with "lots of games, its own telephone, and plenty of 12-year-olds to play with."

For most users, a computer is a tool, and their buying decisions are based on what the computer and its software can do for them. At some point, most people will reach the moment when it is time to buy their second computer. If you are at that point, you're in a good position to sell.

Anybody want a used Apple? /PC

Lawrence J. Magid is Editor of PC. He is a long-time Apple owner who recently tested the waters by putting his own system on the market.

CLIFFORD BARNEY

Communications Briefs

Source Bulletin Board Devoted to IBM PC

One offering on The Source information utility's smorgasbord of services is a bulletin board for messages about the IBM personal computer. Anyone on-line may post a message; it will be listed for two weeks or until the writer purges it.

Source members may scan these messages in only one way: reverse order of posting. The content is a mixed bag of commercial ads for software and hardware products, and "ham radio" messaging about various aspects of the PC. (Many users are reporting difficulties with the PC's communications package, a topic that *PC* will report on in the next issue.) Microsoft Corp. used the IBM bulletin board to announce plans for a nationwide PC users group.

Source member Chuck Reinbrecht of Potomac, Maryland publishes the on-line *PC Gazette*, an electronic journal. Reinbrecht monitors, edits, and classifies bulletin board items. (He also indexes and comments on the contents of this magazine.) The *Gazette*, which has published a point-by-point comparison of the PC and the Apple II and Apple III, also maintains a list of PC user groups and a price list of IBM products.

EIES Installs More Powerful Host, Plans to Add Uninet Access

The EIES conferencing network last month switched to a bigger host computer, doubling the number of its communications ports to 48, and announced plans to hook into the Uninet packet-switched network in addition to its current carrier, Telenet. EIES is now operating on a Perkin-Elmer 3200 minicomputer with 2 million characters of main memory. Four 256-million-character disk drives serve the computer, two for on-line use and two for backup.

EIES programmers are using their old host computer, a smaller mini, to develop more advanced software for connection to both Telenet and Uninet. Once this software is in place, EIES said, access rates will probably be reduced. They are now $7.50 an hour via Telenet; the Uninet rates have not yet been set.

Prestel Coming For PC

Prestel is one version of a new medium called videotex—a sort of cross between traditional publishing and broadcasting. It lets you use a specially set up, computer-like terminal via your phone line to view "pages" of information and advertising that are "published" by storing them in a central computer. Several versions of videotex are in various stages of experimental or commercial realization, mostly sponsored by national governments or telephone monopolies. Prestel is England's videotex entry, and it may be gaining a foothold in the United States via IBM Personal Computers.

Wolfdata, an Ithaca, New York firm, is planning to sell a plug-in card software that will turn a PC into a working Prestel terminal. President Tom Lonergan says: "We see a long-term potential in the videotex marketplace, with the near-term opportunity being business applications." Lonergan explains that the PC was chosen as Wolfdata's vehicle for moving into videotex because "the PC is the most versatile and capable of the current, intelligent desk-top computers." The company settled on Prestel, a relatively Plain-Jane videotex version, because "the overhead for the more complex versions is just not practical yet." But Lonergan also notes portentiously that IBM already sells Prestel central computer systems in Europe.

Wolfdata's Prestel adapter is scheduled for June introduction at about $1,000, including a built-in connection to your phone line that will receive data at 120 characters per second. A model without the phone connector will sell for $750 but requires that you have an asynchronous communications adapter. Both models require you to have a color display and the color graphics adapter. For $450 more the company will sell you a program disk that lets you compose Prestel pages on your PC—for those who plan to become videotex publishers rather than users. /PC

Making Your Link

How to get your PC communicating: building a bridge during rush hour.

Illustration: Mick Wiggins

The late humorist Robert Benchley professed to be totally mystified as to how one goes about building a bridge. Do you start on both sides of the river and hope to meet in the middle? Do you build the bridge entirely on land and then swing one end out over the water like a fishing rod? To Benchley's nontechnical mind the process seemed unfathomable. Although he did not survive into the age of the IBM Personal Computer, he might well have experienced that old, sinking feeling had he ever contemplated asynchronous communications for the PC. ("Asynchronous" describes the most common approach used to link computers and terminals over phone lines for occasional exchanges of data, and refers to the lack of any requirement that the data be sent within a strict timing rhythm.)

Complaints about communication on the PC have been abundant since its introduction. Many users have reported that the IBM-supplied software is uwieldy and difficult to use despite the clear and exhaustive documentation that accompanies it. Some users haven't even been able to get as far as cursing the software—they can't get the communications card to send signals to the outside world at all.

Peace. There isn't anything wrong with the hardware. And if IBM's software doesn't suit you, new communications packages—some supplied by amateurs and some by pros—are appearing almost weekly. This particular bridge, the communications link, is being built while traffic is already rolling over it, which would have been a new one on Benchley.

The Hardware Question

PC has learned that in some cases the asynchronous communications card will not transmit signals properly to remote devices, thus making all questions of software adequacy moot. We learned this by installing a card into one of our own PCs and trying to communicate. No dice.

The problem, as it turned out, was not with the card but with the cable. And there was really nothing wrong with the cable either; it was a perfectly legitimate 25-pin "RS232" connection with no opens, shorts, or other defects. So what *did* go wrong?

Benchley would really appreciate the answer. It seems that while RS232 is in theory an industry-sanctified standard for electrical connection, with each pin assigned a specific function, in practice there are one . . . two . . . many RS232s.

"There is no such thing as a standard," says Les Fried of Atlanta's Microstuff. "There is no Santa Claus either."

Some manufacturers have taken liberties with the RS232 specs to fit their own needs. So when we have a situation of IBM making the computer, a second company supplying a modem, and a third providing the cable, the potential for confusion multiplies.

This is especially true for the PC, since IBM has implemented RS232 to its fullest extent. "The card is fairly smart," explains David J. Stang of Starware, Washington, D.C. "It wants to send a lot of information on baud rates, start/stop bit options, and so forth. The cables may all look alike, but if any of the pins are crossed or merged, you may have a problem." There's a fair chance, Stang added, that cables bought at a personal computer store won't work.

"It's not the end of the world," says Stang. "You can fix the cable yourself or get someone to do it for you." But if fixing a cable is a close enough approximation of the "end of the world" for you, Stang himself has produced and is selling a workable cable for the PC; so you might consider buying one of his.

Communications Software Choices

The difficulties with IBM's communications software also stem from the elaborate nature of PC communications. Users have to define a lot of details about the communications link—full or half duplex, word length, etc.—and many of them aren't technically skilled enough to feel comfortable doing it.

The IBM package works best with another PC or with one of IBM's model 370 mainframe computers. For communications with networks, or CP/M-based systems, you might want to check out one of the other packages. They're available at every price from a straight giveaway to $150.

Microstuff produces a top-of-the-line package, called *Crosstalk*. It presents onscreen menus that allow the user not only to control parity, data word length, and the other parameters, but also to change them dynamically while on-line. Most important, Fried says, *Crosstalk* has a file transfer mode that is protocol-compatible with an earlier version for the CP/M operating system. Therefore, it can transfer any CP/M file to the PC. Command files won't run, but Microsoft Basic programs probably will "with a little hammering and sawing."

MUCH *free software is available on the Capitol PC Club's bulletin board.*

Fried says. Another commercially available program, *PCModem*, is also reviewed in this issue.

PC's own Andrew Fluegelman has also written a communications package, called *PC-Talk*, which he will send you if you mail him a blank formatted disk and a postage-paid, self-addressed mailing container. The address is Freeware, The Headlands Press, P.O. Box 862, Tiburon, CA 94920. *PC-Talk* works well with a DC Hayes Smartmodem, has built-in access programs for the CompuServe and Source networks, and will print out, on command, your screen contents during the communications process.

Freeware programs are not totally free; the users are requested but not required to send back a modest contribution. Whether or not they do, they are encouraged to copy the program and share it with others.

Much free software, including still another communications package, is available on Wes Merchant's IBMPCUG bulletin board, the communications organ of the Washington area Capitol PC Club (703/560-0979). Merchant says he first became aware of the problems with IBM's communications software when callers began using other personal computers to put messages about it on his bulletin board.

One user, Charles Brandon of Boulder, Colorado, sent him a free communications package, which Merchant makes available to all callers who can overcome the Catch-22 of receiving it via phone link.

So take your pick of communications packages and build your own bridge to the outside world. Even Benchley could probably do it. /PC

Three Communications Go-Togethers

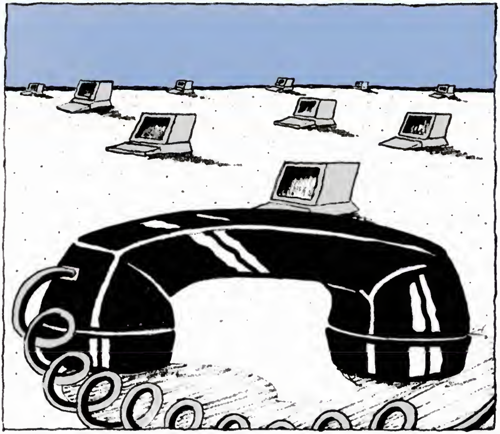
The Hayes Smartmodem, a program to take advantage of it, and a cable to connect it.

Smartmodem $279
Hayes Microcomputer Products, Inc.
5835 Peachtree Corners East
Norcross, GA 30092

PC Modem $49.95
System Software Services
1765 Raleigh Lane
Hoffman Estates, IL 60195

Smartmodem-to-PC Cable $34.95
Starware
1629 K St. NW, Suite 551
Washington, D.C. 20006

Many products for microcomputers offer an array of appealing features. But in the not-yet-standardized micro world, the appeal often gives way to frustration when it proves difficult or impossible to exploit those tantalizing features with your particular system. Following is Richard Steck's report on a triad of products, each from a different company, that work together smoothly to deliver powerful communications capability to your PC. The featured product is the only one we know of that, when someone is calling you on the telephone, will print "RING, RING" on your display screen.



The Smartmodem from Hayes Microcomputer Products, Inc. is a highly innovative product designed to meet the need for flexible data communications. It is a compact, 1½-inch-high box that fits neatly under a standard telephone. There are switches and connectors on the rear and seven indicator lights on the front.

The rear panel contains a power switch, an RS-232C female plug for connection to a computer, a modular telephone jack, and a volume control for a built-in monitor speaker. The speaker on the bottom of the case lets you listen to the dialing process, ringing or busy signals, and the high-pitched tone sent by a distant computer when it answers. These features are particularly useful for hearing if there is a problem or you have misdialed.

Two of the front panel's indicator lights tell you at a glance whether power to your modem is on and whether the serial interface card in your computer is ready. Two others flicker when your PC sends characters to the Smartmodem or when it receives characters over the phone line. The remaining ones tell you whether your phone is functionally "off hook," whether the Smartmodem detects the carrier (high-pitched tone) of the remote modem, and whether you have instructed the Smartmodem to answer your phone automatically.

Connecting the Smartmodem to the phone line is simple for modern phone equipment employing modular plugs and jacks (RJ-11 series). I recommend that you consider an adapter that permits a telephone and the modem to be connected simultaneously to one modular jack. (Attachment of any equipment to the phone lines requires notification and approval of the telephone company. Instructions for such notification are simple and are supplied in the Smartmodem manual.)

To connect a Smartmodem to the Asynchronous Communications Interface of your PC, you will need a special cable. The cable has the familiar RS-232C connectors at each end—one male and one female. You can build your own cable using only three of the 25 pins and supplying the appropriate jumpers to supply certain control signals to the interface. Or you can get a cable that uses, at a minimum, pins 2, 3, 4, 5, 6, 7, 8 and 20. Suitable cables are available from many sources. One is Starware, whose president, David Stang, has worked out a cable expressly for connecting the PC and the Smartmodem, which he sells for $34.95.

Working with the Smartmodem can be an enjoyable crash course in data communications. Compared to using the earlier acoustic coupler-type modem, you can tell the Smartmodem what you want it to do and then monitor, through the indicator lights and the built-in speaker, the process of establishing communications.

The Smartmodem has two operational states: the Command state and the Terminal state. In the Command state the Smartmodem is listening to your commands regarding its operation. In the Terminal state characters are passed through the Smartmodem onto the phone line. Once in the Terminal state, the Smartmodem does not listen for your commands unless you send a special "escape" sequence of characters. You can flip the Smartmodem into Command state from Terminal state by typing +++ from your keyboard. If you don't like this escape sequence, you can change it.

ALTHOUGH the Smartmodem commands are easy to memorize, you can't beat menu-driven single-keystroke operation, and the PC's function keys seem natural for this purpose.

It would be impossible to cover all the features and commands of the Smartmodem in this brief article. Suffice it to say that the Smartmodem is based on the Z-80 microprocessor chip and a 2,000-character built-in control program. A command to the Smartmodem typically consists of several uppercase characters or numbers followed by a carriage return.

You can use the Smartmodem in its simplest form by typing:

```
AT D 5551212 cr
```

This would dial the number 555-1212 and connect you to the remote computer if it answered. The AT is an attention code that precedes every command. The D asks the Smartmodem to dial the number that follows. If you reach the remote modem, the Smartmodem will display "CONNECT" on your screen. If you do not, it will display "NO CARRIER." (If you think of it, you've accomplished a rather interesting feat at this point. Your microprocessor-controlled keyboard is talking to the system-board microprocessor, which is controlling the Asynchronous Communications Adapter microprocessor chip, which is controlling the microprocessor chip in the Smartmodem. You can only imagine how many more microprocessors lie between your keystrokes and the characters echoed to your screen by the remote computer.)

You can issue very complex commands to the Smartmodem. An example in the owner's manual is:

```
AT M2 F0 V1 DT 555-1212; S2=1 0 cr
```

This command would keep the monitor speaker on continuously, set the modem to half-duplex, send plain English Smartmodem command acknowledgments to your CRT, dial 555-1212 using tone-dialing, change the Smartmodem wake-up character from +++ to AAA, and put the Smartmodem on-line to await a carrier.

So much for commands—you get the idea. The repertoire of about 20 Smartmodem commands and the functions of the registers are explained in the Smartmodem owner's manual along with many examples.

Hayes Microcomputer Products says that the Smartmodem works up to 300 baud. This is conservative because users have been known to use the Smartmodem at 450 and 600 baud. I would suspect that the manufacturer has understated its capabilities. The Smartmodem was preceded at Hayes by its original offering, a modem board for S-100 microcomputers, and then by the very popular *MICROMODEM II* for the Apple. A considerable amount of thought and experience must have gone into the design of the Smartmodem.

You can operate the Smartmodem with a relatively simple BASIC program running on the PC. Examples are given in Appendix F of the IBM PC BASIC manual and on the PC-DOS diskette (COMM.BAS). However, using the PC and the Smartmodem without good software will not permit you to take full advantage of either. The examples mentioned above do not permit you to capture or send files. Although the Smartmodem commands are easy to memorize, you can't beat menu-driven single-keystroke operation, and the PC's function keys seem natural for this purpose.

You would not expect one of the first telecommunications programs available for the IBM PC to be quite so good, but anything that follows System Software Service's *PCMODEM* program will have to work quite hard to improve upon it.

PCMODEM, a telecommunications program written by Gene Plantz of System Software Services, is a telecommunications program written primarily for the IBM PC used with the D.C.Hayes Smartmodem. Having used a number of other modem programs, I realized very quickly that all the elements needed for comfortable telecommunications on the PC were available in this program.

IBM's offering, Asynchronous Communications Support Software, works satisfactorily when communicating with IBM mainframes or with another PC, but it is quite disappointing when one learns that to use it with non-IBM equipment, it must be modified. (The code is not particularly easy to follow or change.) Add to this the lack of a stored phone number list, the lack of autodial, and an unfriendly user protocol, and you soon lay the package aside and look for other alternatives.

IN THE COMMAND state the Smartmodem is listening to your commands regarding its operation.

For those of you who have used *CLINK*, *ASCII Express*, *Visiterm*, or *Z-Term*, I would describe *PCMODEM* as having the best of their features with benefits added to complement the features of the PC. For example, the KEY feature is used to continuously display a menu of options available to the user. Since *PCMODEM* runs under BASICA, the user can select features by pressing function keys.

Not much effort is required to install the *PCMODEM*: 64K of memory, a Hayes Smartmodem, an 80-column display, PC-DOS, and BASICA. Customization is pos-

VERY IMPORTANT........

The September 1982 issue of PC will be a special catalog issue, listing every product and service now (or soon to be) available for the IBM Personal Computer. The magazine will have over 300 pages and a circulation of more than 100,000. Products will be listed by type and with brief editorial coverage.*

If you have any products or services for the IBM Personal Computer, send detailed product information, including photographs where appropriate, to:

Kathleen Burton
PC Magazine
1528 Irving Street
San Francisco, CA 94122

The editorial deadline for this important issue is June 15, so please act now.

For advertising information contact Mark Doss at 415-753-8088. Advertising deadlines are July 12 for space reservations and July 19 for materials.

**To the best of our knowledge.*

sible not only within the guidelines suggested by the author but, since the program is written entirely in BASIC, it is quite easy to customize to particular needs. *PCMODEM* is written in as structured a manner as BASIC will permit. Program modules are easily identifiable and program logic flow is easy to understand.

IN THE TERMINAL state characters are passed through the Smartmodem on the phone line.

A session begins by typing <u>PCMODEM</u>, which calls in BASICA and the *PCMODEM* program with the appropriate buffer allocations. At this point, a menu is presented that offers these options:

- Turn Modem Online/Offline
- Switch Between 300, 450, 600 Baud
- Auto-Redial Last Phone Number
- Auto-Dial Phone Number From Menu or Manually
- Display Menu
- Turn Printer On/Off
- Write to Disk from Modem
- Write to Modem from Disk
- Hang Up Modem
- Quit Program
- Switch Between Half and Full Duplex
- Switch Between Touch-Tone and Pulse Dial
- Switch Auto-Answer On/Off
- Change Parity and Number of Data Bits

Having seen this menu, it is difficult to imagine any other features one might need. Each of the above features is accessible through the PC's function keys or through other single keystrokes. For example, depressing function key F4 permits dialing from a stored phone number list or from a phone number entered from the keyboard. If there is no answer, the number may be redialed repeatedly by depressing key F3. The auto-redialing may be stopped by again depressing F3.

PCMODEM is entirely menu-driven and I must admit that I succumbed to my usual practice of running the program first and reading the instructions later (with user-friendly programs this never seems to be a problem). The instruction manual served only to confirm that I was using the program properly.

An important characteristic of any microcomputer communications program is the ability to capture and send files from and to remote computers. These functions are easily accomplished with *PCMODEM*. A file is captured by depressing F7. You are then asked the name of the destination file and that file is opened. Large data-file captures are possible and are limited only by the space available on your diskette. F8 sends files in a similar manner. The communications protocol popular with bulletin boards and many time-sharing services, called XON-XOFF, works with *PCMODEM*. It seems that BASIC does a certain amount of internal bookkeeping that periodically slows it down. *PCMODEM* issues an "XOFF" to deactivate the remote computer during such internal processes and later an "XON" to activate the remote computer. I have neither lost data nor introduced extraneous characters during some rather lengthy data transfers.

At this time there is no provision in *PCMODEM* for block transfers via Christensen protocol (the familiar *XMODEM* programs found on CP/M bulletin boards). The author indicated that this may be available in the near future. Other enhancements may include the use of assembler language modules to permit faster program execution in areas where that might be needed. I do not see either as being necessary for successful use of the program at this time.

PCMODEM has significantly expanded the horizons of my PC. Its ease of use has taken me beyond the facilities I had with previous microcomputer systems, and its author has been helpful whenever minor clarifications of program usage were required. *PCMODEM* is available from System Software Services for $50, and it is well worth the money.

For cable-making advice, drop a stamped, self-addressed envelope to: Richard Steck, Box 642, Lake Forest, IL 60045.

Using Data Files

Ways to store collections of information in disk files with BASIC—Part One: Sequential Access.

A data base is a collection of information organized to help you extract and work with elements of your choice. The IBM Personal Computer's BASIC language includes relatively uncomplicated tools for writing programs that create and use data bases stored on disk. This article is the first in a two-part series offering tips on how to incorporate easily used data files in your programs.

Part one of this series describes and gives examples of an access technique known as the *sequential access method*, which is a straightforward method of storing pieces of data sequentially (one after another as they arrive in the file). Part two will cover another technique known as the *random access method*, which provides faster access and more economical use of storage space. These articles do not teach BASIC programming—you must be familiar with the BASIC programming language on the PC to understand the examples of these techniques.

A data base, no matter how big (the Library of Congress) or how small (a 50-name mailing list) has a certain predetermined organization based on *how you would want to find something*. When you design your own data base, you must first plan its organization according to the ways in which you will access the data.

If your data base is a mailing list of newsletter subscribers, for example, would you want to mail newsletters to specific people on your list (find them by name), or would you want to mail newsletters according to their destinations (sort them by zip code)? If you wanted to do both, you would organize your data base records so that both the names and zip codes are easy to retrieve. You would then use the BASIC access techniques that make it easy to retrieve data in this manner.

There are many factors to consider:

- *The information*: How should information be organized for access? How will users access the data? How will other programs (if any) access the data? Should there be some verification of the information to see if each piece of data conforms to some regulation.
- *The "human interface"*: How will the program accept information from the outside world, and how will it report errors to users (errors in the information, in the typing or other input procedures, etc.)?
- *Memory and storage space*: How much disk storage will you need for the files (including room for expansion) and for "backup" copies of the files (for archives)? How much of the system's active internal memory is needed for "open" files while inputting or updating information, and how much of this active memory is also needed for your program?

SEQUENTIAL access usually means you are processing the information in a stream from beginning to end of the file.

Advanced BASIC programmers looking for specific examples should skip ahead to the "Sequential Access Example: Recording Transactions." Newcomers to BASIC programming or to data base access methods read on.

First you should become familiar with the terms used in this article: *input data* is the information as it is typed, entered, or recorded in the data base; output is the information retrieved from the data base (usually in a readable form, on the screen or in a printed report); and *input/output* or *I/O* routines are BASIC statements that let you store pieces of data in a file and retrieve data from a file.

A *data* structure describes the form of each piece of data. A simple data structure is the integer format in which each piece of data must be an integer. Another simple data structure is a string—a series of one or more characters (letters, digits, punctuation symbols, spaces, etc.) coded in ASCII format.

BASIC Statements for Sequential Access

The BASIC statements INPUT#, LINE INPUT#, and PRINT# offer simple ways to get data into and out of a sequentially organized data base.

You can use these statements to access files that are organized sequentially (or even nonsequential files in order to process the information sequentially). Sequential access to the file usually means that you are processing the information in a stream, as it is stored from the beginning to the end of the file, and that you are processing all of the data in the file from beginning to end.

Sequential access to the information may sound slow, but if the file is small enough, you can retrieve ("read") the entire file sequentially into your computer's internal memory, where your program can process random pieces of the file using any number of data access methods.

A file could contain, for example, the inventory data of a truck rental business of 50 trucks. This inventory data-base file could be organized so that each record holds the information for each vehicle: reservations, maintenance schedule, invoices, etc. Your program could sequentially "read" the entire file from disk into the computer's memory, where it could then update records randomly.

Since the entire file describes only 50 trucks, it would probably all fit in the Personal Computer's user memory. A larger file, describing a rental business that has more equipment, would have to be organized so random access can be gained directly from the disk instead of transferring the whole file to memory. (Part two of this series will deal with the latter case.)

Some data base applications are naturally suited for both sequentially organized files and sequential access. For example, if you wanted your program to "massage" (process or manipulate) data before sending it to a text processor, or before printing the data, you would use sequential access techniques in the program. Other sequential access applications include the posting of cash receipts or transactions, and the processing of scientific and statistical data in "batch" mode (in large packets that follow each other sequentially).

There is one characteristic of BASIC sequential access statements that every BASIC programmer should know: the information stored with PRINT#, or retrieved with INPUT# or LINE INPUT#, is treated as a string of characters. As a result, numeric information takes up more space than if it were stored in the binary format the computer usually uses. For example, the integer 12345 requires only two cells of memory space if stored as an integer; the same number, stored as a series of digit characters, occupies seven cells. The character format (sometimes called ASCII format) must be used for all data—words, letters, digits, spaces, punctuation symbols, etc.

THERE IS one characteristic of sequential access statements that every BASIC programmer should know.

Although the assembly language programmer could implement a faster method of access, the BASIC programmer has the advantage of not having to be concerned with the actual mechanics of "disk I/O" (input/output techniques that handle transfer of data to and from the disk drives and the computer's input/output buffer). Disk BASIC statements, like PRINT#, INPUT#, and LINE INPUT# handle the "disk I/O" routines for you, and they manage the input/output buffer. Your BASIC program interacts with the buffer, a temporary storage place for data on its way somewhere else, using BASIC input/output statements.

In sequential access, you need not con-

Recording Transactions:

An example program

This example records OTC (Over-The-Counter) stock prices and allows records in the file to be added, updated, or deleted. Since the file is sequentially organized, information must be read from beginning to end and rewritten with updated information.

The access technique in this example accumulates all new information into a transaction file (TRANS.DAT) and then merges the transaction file with the "source" file (STOCKS.DAT—the file containing original records from previous transactions). This merging operation actually takes the entire information (old and new information merged together), writes it to a temporary file (TEMP.DAT), and then copies the temporary file's contents into a new "source" file. The temporary file and the transaction file are then deleted, leaving an updated "source" file (STOCKS.DAT).

Statement 140 in the program writes the stock name (a string), and the current bid and asked prices (two numbers). I use a literal comma (",") as a string delimiter (following INCOMP$). The numbers are naturally separated by a trailing space after each number. I use semicolons to prevent extra leading spaces (to save space in both the buffer and the disk file).

Remember, the PRINT# statements as used here do not allow stock names to contain commas. To allow commas in the stock name, you would have to surround the INCOMP$ function with "CHR$(34)" to surround the name with double-quotes (e.g., PRINT #3, CHR$ (34); INCOMP$; CHR$ (34)... in lines 140, 250, 400, and elsewhere).

One convenient aspect of BASIC sequential access statements is that it doesn't matter if you use one PRINT# statement to store the data, or multiple PRINT# statements. For example, the loop at statement 490 could have been written differently, as follows:

```
490 FOR I=1 TO 30 STEP 2:
    PRINT #2,B(I):A(I):B(I+1):A(I+1)::
    NEXT I
```

You may have noticed the variables SN and TN, and wondered about their uses. When there is no more data in either the "source" file or the transaction file, there may be data already read from the other input file, but not yet written to TEMP. To detect this problem the logical variables SN (for "source") and TN (for "transaction") are manipulated and tested to determine whether the data should be written to TEMP.DAT before the file is copied.

The techniques used in this program are typical of techniques used to handle sequentially organized files. If the data in the TEMP.DAT or TRANS.DAT files have archival value (and you want to keep copies), or if you want to add a recovery procedure to retain and store this data, you can delete the copy-back step of the program beginning with line 580, and rename the TEMP.DAT and TRANS.DAT files. Be sure to delete lines 780 and 790 if you want to save TEMP.DAT and TRANS.DAT.

```
1 REM------------------------------------------------------
2 REM   SEQUENTIAL ACCESS METHOD EXAMPLE
3 REM   MODIFY A FILE WITH CURRENT TRANSACTIONS
4 REM------------------------------------------------------
5 REM
6 REM
10 CLEAR 100
20 DEFINT I-N:DIM BID(30),ASKED(30),B(30),A(30)
30 FALSE = 0:TRUE = -1
40 OPEN "I",1,"B:STOCKS.DAT"
50 OPEN "O",3,"B:TRANS.DAT"
60 OPEN "O",2,"B:TEMP.DAT"
70 IC$ = "":INCOMP$ = ""
80 WHILE INCOMP$ <> "QUIT"
90      CLS:INPUT"ENTER COMPANY NAME";INCOMP$
100     IF INCOMP$ <= IC$ THEN
           PRINT "NAME OUT OF SEQUENCE - TRY AGAIN":
           FOR I = I TO 1000:NEXT:
           GOTO 90
110     IC$ = INCOMP$
120     INPUT"ENTER BID PRICE":B(I)
130     INPUT"ENTER ASKED PRICE";A(I)
140     PRINT #3,INCOMP$;",";B(1);A(1);    'WRITE TRANSACTION FILE
150 WEND
160 CLOSE 3
170 OPEN "I",3,"B:TRANS.DAT"
180 IF EOF(1) THEN 380                'SOURCE EMPTY
190 TN = FALSE:GOSUB 250              'READ A TRANS RECORD
200 SN = FALSE:GOSUB 360              'READ A SOURCE RECORD
```

(Continued on page 95)

cern yourself with the buffer and with disk input/output—the BASIC statements simply "read" the next data item in sequence, or "write" the next data item in sequence. With the random access techniques described in Part two, you have to exercise more control over the buffer activities and other disk input/output mechanisms.

The BASIC sequential access statements give you flexibility in the organization of your data—they allow you to store data in any sequential order you choose. Several statements can be condensed and still perform the same function (the statement "PRINT#1,A;B;C;" performs the same function as the statements "PRINT #1,A;:PRINT#1,B;:PRINT#1,C;").

It is up to the programmer to be careful that the program stores data in the same format expected for retrieval. Since all data in sequential access is stored as character strings, you must retrieve them as character strings (unless you are doing something extraordinary and paying careful attention to the results).

BASIC can only separate one character from another if there is a delimiter between them—in our examples, we use a comma as a string delimiter. Numbers (sets of ASCII digits) do not need explicit delimiters between them—a space suffices as a delimiter between numbers.

SEVERAL *statements can be condensed and still perform the same function.*

If you neglect to put a comma between two strings or between a string of characters and a string of digits, you may get errors while trying to retrieve correctly stored data. To illustrate this point, consider the following example:

```
10 A=12.32
20 B$="A YELLOW BASKET CASE"
30 PRINT #1,B$;A;
```

After executing the above statements, the data stored on disk is organized sequentially like this:

```
"A YELLOW BASKET CASE 12.32"
```

In another program, you could use the following BASIC statement to retrieve the data in the above example:

```
INPUT #1,B$,A
```

However, you would get the following data in B$, and an "Input Past End" error for the variable A:

```
"A YELLOW BASKET CASE 12.32"
```

If, on the other hand, you had used a literal comma as a string delimiter between "A YELLOW BASKET CASE" and "12.32" in the PRINT# statement above, you would have correctly retrieved "A YELLOW BASKET CASE" in B$ and "12.32" in the variable A. The PRINT# statement with the literal comma used as a string delimiter looks like this:

```
30 PRINT #1,B$;",";A;
```

Following are hints for using PRINT# to store data in a sequential format:

1. Separate each data item with a semi-

(Continued from page 92)

```
210 IF INCOMP$ > COMPANY$ THEN
        GOSUB 440:                  'WRITE SOURCE DATA
        SN = FALSE:GOSUB 360:       'READ SOURCE FILE
        GOTO 180
220 IF INCOMP$ < COMPANY$ THEN
        GOSUB 480:                  'WRITE TRANS DATA
        TN = FALSE:GOSUB 250:       'READ TRANS FILE
        GOTO 180
230 IF INCOMP$ = COMPANY$ THEN
        GOSUB 520:                 'MODIFY DATA
        TN = FALSE:GOSUB 250:      'READ TRANS FILE
        SN = FALSE:GOSUB 360:      'READ SOURCE FILE
        GOTO 180
240 GOTO 210           'CONTINUE UNTIL BOTH SOURCE & TRANS EMPTY
250 IF NOT(EOF(3)) THEN
        INPUT #3,INCOMP$,B(I),A(1):      'READ RECORD FROM TRANS
        TN = TRUE:
        RETURN
260 REM        END OF FILE ON TRANS FILE - COPY SOURCE FILE
270 IF SN THEN GOSUB 440        'WRITE SOURCE DATA
280 IF EOF(1) THEN 570          'EVERYTHING WRITTEN TO TEMP
290 INPUT #1,COMPANY$           'READ STRING
300 PRINT #2,COMPANY$;",";      'WRITE STRING
310 FOR I = 1 TO 30
320 INPUT #1,BID(I).ASKED(I)    'READ PAIR OF NUMBERS
330 PRINT #2,BID(I);ASKED(I);   'WRITE PAIR OF NUMBERS
340 NEXT
350 GOTO 280
360 IF NOT(EOF(1)) THEN
        INPUT #1,COMPANY$:        'READ SOURCE STRING
        FOR I = 1 TO 30:
           INPUT #1,BID(I).ASKED(I):  'READ PAIR OF NUMBERS
        NEXT:
        SN = TRUE:
        RETURN
370 REM        THERE WAS AN EOF ON SOURCE - COPY TRANS TO TEMP
380 IF TN THEN GOSUB 480
390 IF EOF(3) THEN 570
400 INPUT #3,INCOMP$.B(1).A(1)     'READ TRANS RECORD
410 PRINT #2,INCOMP$;",";          'WRITE STRING PART TO TEMP
420 FOR I = 1 TO 30:                'WRITE 30 ELEMENT ARRAYS
        PRINT #2,A(I);B(I);:
    NEXT
430 GOTO 390
440 PRINT #2.COMPANY$;",";
450 FOR I = I TO 30:
        PRINT #2.BID(I);ASKED(I);:
    NEXT
460 RETURN
470 REM  WRITE TRANS DATA TO TEMP
480 PRINT #2,INCOMP$;",";
490 FOR I = 1 TO 30:
        PRINT #2,B(I);A(I);:
    NEXT
500 RETURN
510 REM  MODIFY THE SOURCE DATA AND WRITE IT TO TEMP
520 IF EOF(1) AND EOF(3) THEN 570
530 PRINT #2,INCOMP$:",";
540 PRINT #2,B(1);A(1):
550 FOR I = 1 TO 29:
        PRINT #2,BID(I);ASKED(I);:
    NEXT
560 RETURN
570 CLOSE
580 OPEN "I",2,"B:TEMP.DAT"
590 OPEN "O",1,"B:STOCKS.DAT"
600 INPUT"DO YOU WANT TO REVIEW THE DATA";R$
610 IF EOF(2) THEN 770
620 INPUT #2,COMPANY$
630 IF R$ <> "Y" THEN 660
640 CLS:PRINT@30,COMPANY$
650 PRINT
TAB(10)"BID"TAB(20)"ASKED"TAB(30)"BID"TAB(40)"ASKED"TAB(50)"BID"TAB(60)"ASK
ED"
660 FOR I = I TO 30:
        INPUT #2,BID(I),ASKED(I):
    NEXT
670 IF R$ <> "Y" THEN 730
680 FOR I = 1 TO 30 STEP 3:
        PRINT
I;".";TAB(10)BID(I);TAB(20)ASKED(I);TAB(30)BID(I+1):TAB(40)ASKED(I+1):TAB(5
0)BID(I+2):TAB(60)ASKED(I+2)
690 NEXT
700 D$ = ""
710 INPUT"DO YOU WANT TO DELETE THIS ISSUE":D$
720 IF D$ = "Y" THEN 610
730 FOR I = 1 TO 1000:NEXT
740 PRINT #1,COMPANY$;",";
750 FOR I = 1 TO 30:
        PRINT #1,BID(I);ASKED(I);:
    NEXT
760 GOTO 610
770 CLOSE
780 KILL "B:TEMP.DAT"
790 KILL "B:TRANS.DAT"
800 END
```

colon. Since BASIC "prints" to a disk file in the same manner that it "prints" to the screen, the semicolon eliminates extra spaces between data items and saves disk space.

2. Unlike numbers (sets of number characters) that are stored with one trailing space to separate one number from the next, strings (mixed sets of letters, numbers, punctuation, etc.) must have an explicit delimiter between them—usually a comma. To place a comma in the data stream between two strings, surround the comma with quotation marks in the PRINT# statement as shown below:

```
30 PRINT #1,A;B;C$;",";D$;",";
```

This statement places a literal comma between C$ and D$, and a comma following D$.

3. If you want to store a string that contains a comma (not being used as a delimiter), you must enclose the entire string in double-quotes. The CHR$(34) function provides the double-quotes in the following example, which stores the entire string "A TISKET, A TASKET" as one string with no delimiter:

> ***THE statements INPUT# and PRINT# offer simple ways to get data into and out of a sequential data base.***

```
10 A$="A TISKET, A TASKET"
20 PRINT #1,CHR$(34);A$;CHR$(34);
```

Were it not for the double-quotes stored on disk with the string, only "A TISKET" would be retrieved with the statement "INPUT #1,A$"; with the double-quotes, the entire string "A TISKET, A TASKET" is retrieved with the statement "INPUT #1,A$".

An example program follows that illustrates uses of PC-BASIC's sequential access statements. /PC

B. Boasso is a computer programmer and author in Newbury Park, California. Tony Bove and Cheryl Rhodes also assisted in the preparation of this article.

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c. program to create sounds or music.
d. customized small business accounting system.
e. program to interface with another computer device.
f. word processing program to print department reports.
g. all of the above, and more.

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Easy-As-Pie Charts

Beyond the straight line—using PC BASIC's graphics power for easy circles and solid colors.

Straight lines seem to pervade typical computer graphics. That's because it is usually easy to plot points, draw lines, and construct boxes using graphics commands found in microcomputer versions of the BASIC language. The IBM Personal Computer's Advanced BASIC lets you transcend lines and boxes using one simple command—CIRCLE. It is not difficult to draw circles in BASIC without a special command, but it is tedious. On the PC, the CIRCLE command makes drawing circles, arcs, and ellipses fast and easy.

Another Advanced BASIC command, PAINT, works especially well with CIRCLE. It fills areas of the screen with solid colors, making it as easy to create discs as it is to create hollow circles.

There are many practical uses of the CIRCLE and PAINT commands. For example, a simple program will plot points and connect the points to form a line graph (Figure 1), but drawing a solid circle at each plotted point enhances the line graph considerably (Figure 2). Circles also depict proportions well. If a circle of one size represents, say, 100, a circle twice as large will visually represent 200, and a circle half as large will represent 50. Figure 3 illustrates a more complex distribution of this type. Of course, the classic way to depict proportional shares of a whole is with a pie chart, which certainly relies on circle-drawing capability (Figure 4). Three demonstration programs (see box) illustrate these uses of circles in graphics.

This article explores the CIRCLE and PAINT commands in practical applications. This is an advanced topic and requires a general understanding of PC BASIC and specific knowledge of PC BASIC graphics capabilities and techniques.

Figure 1: A plain line graph.

Figure 2: Line graph enhanced with CIRCLE and PAINT.

The CIRCLE Command

What are the PC's requirements for circle drawing? First, the computer must be ready to understand the CIRCLE command. That means Advanced BASIC must be in control and the display screen must be in one of the graphics modes. The statement SCREEN 1 selects medium-resolution graphics, and the statement SCREEN 2 selects high-resolution graphics.

Before Advanced BASIC can draw a circle, it needs to know where the circle will go on the display screen, how big to make the circle, and what color the circle should be. Finally, since CIRCLE is a general command that draws partial or whole circles, BASIC needs to know which part of the circle to draw.

Following is a sample statement that

draws a circle in the middle of a medium-resolution screen:

```
CIRCLE (160,100),50,1,0,6.2831
```

The first two numbers specify the coordinates of the center of the circle, namely column 160 and row 100. The third number, 50, determines the size of the circle. The fourth number tells which color to draw in. The last two numbers specify which part of the circle to draw. The statement above draws the whole circle.

The CIRCLE command specifies the center of the circle with standard column and row numbers. Row numbers range from 0 at the top of the screen to 199 at the bottom. Column numbers start with 0 at the left edge of the screen and end at the right edge with 319 in medium resolution and 639 in high resolution. Circle size is measured in the same units as columns. Radius determines circle size, and one unit of radius equals the width of one column. Therefore a circle with a radius of 6 has a diameter of 12 columns. Of course columns and rows are not the same size, nor is the screen square—it is wider than it is tall. The CIRCLE command compensates automatically for these facts. In medium resolution, six columns equal five rows. This means a medium-resolution circle with a diameter of 12 columns also has a diameter of 10 rows. In high resolution, 12 columns equal 5 rows.

The color specification in a CIRCLE command is optional. The following high-resolution example shows the fourth number missing:

```
CIRCLE (160,100),100, ,0,6.2831
```

Notice that the comma for the color specification remains. When the color specification is absent, BASIC draws a circle in the standard foreground color. That is color number 3 in medium resolution, which is white or brown, depending on the active foreground palette. In high resolution, color number 1, white, is the default.

Choices for medium-resolution colors include color numbers 0, 1, 2, and 3. Color numbers 1, 2, and 3 choose a color from the active-foreground palette. Color number 0 is the background color; it is useful for erasing. For example, the following program draws two circles—one cyan and one white—and then waits for someone to

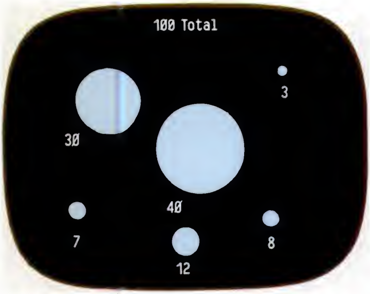

Figure 3: Using circles to depict proportions.

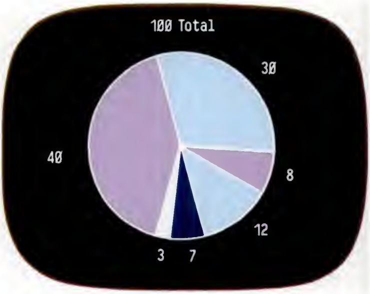

Figure 4: A pie chart.

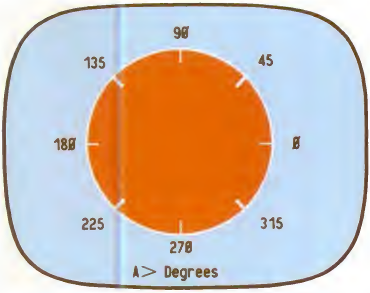

Figure 5a: The 360 degrees in every circle.

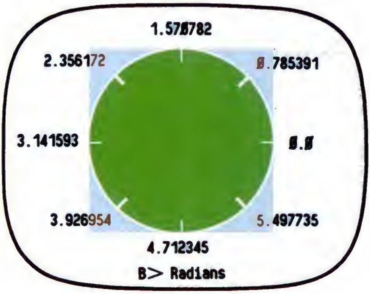

Figure 5b: Circle divided into radians instead of degrees.

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press any key on the keyboard. When that happens, the program erases the white circle by drawing over it with the background color.

```
10 SCREEN 1: REM Set med. res. graphics
20 CLS: REM Clear screen
30 CIRCLE (200,120),25,1,0,6.2831:
   REM magenta
40 CIRCLE (110,140),25, ,0,6.2831:
   REM white
50 A$=INPUT$(1): REM Wait for keystroke
60 CIRCLE (110,140),25,0,0,6.2831:
   REM background
```

In high resolution, an odd color number draws a white circle, and an even color number draws a circle in the background color.

Drawing Arcs

The CIRCLE command can also draw part of a circle. How does BASIC know which arc to draw? The answer relies on a convention of geometry that says every complete circle contains 360 degrees. Think of a compass; it has 360 degrees. Geometry does not number the degrees of a circle the same as a compass, however. It starts with 0 on the right and proceeds counterclockwise, with 90 degrees straight up, 180 degrees at the left, 270 degrees straight down, and back around to 360 degrees at the right (Figure 5a). To further complicate matters, PC BASIC measures circles not in degrees, but in *radians* (Figure 5b). Radians relate to the mathematical constant PI, which is about 3.14159. One half-circle, 180 degrees, is the same as PI radians. A full circle is 360 degrees or 2 PI (about 6.2831 radians). To convert from degrees to radians, multiply by 0.0174532.

To specify an arc, state the point on the circle at which it starts and the point at which it ends. State both points in radians. So far, examples of the CIRCLE command specified the arc starting at 0 and ending at 6.2831 radians, in other words, the whole circle. The following statement specifies just half a circle:

```
CIRCLE (160,100),50,1,0,3.1416
```

One ambiguity remains: The two points that specify an arc actually specify *two* arcs. Draw counterclockwise from the start point and one arc appears; draw

(Continues)

Circles and Solids:

Three Sample Programs.

Enhanced Line Graph Program

The Enhanced Line Graph Program plots 12 points, emphasizes the points by drawing solid circles over them, and connects the points to form a line graph. Figure 2 illustrates program output. The program calculates equidistant column coordinates and reads corresponding row coordinates from DATA statements.

The program begins by turning off the standard bottom-line display of soft-key uses, setting medium-resolution graphics mode, and clearing the display screen (lines 10-30). Next, it computes the current column number (line 40) and reads the current row number from the DATA statements' list of values (line 50). Then the program draws the next segment of the graph (line 60). Variable LC determines the line color. Its initial value is 0, so the first line is in the background color. Next, the program enhances the point with a circle (line 70) and fills in the circle with color (line 80). The value assigned to variable LC on line 100 determines the color of the next line segment. Lines 120 and 130 establish the list of DATA statements' values for the row number of each point.

Proportional Circles Program

The Proportional Circles program will divide a whole amount into as many as six parts and display a proportionally sized circle for each part. Figure 3 shows program output when inputs are 30, 40, 3, 7, 12, and 8. The program is fairly unsophisticated, so it will not work for all input combinations.

The first part of the program (lines 10-40) performs housekeeping chores. Lines 10 and 20 hold the column and row coordinates for each of the six circles that may be output; the first circle is at (85,60), the second is at (175,95), and so on. The first thing the program does is turn off the standard bottom-line display of soft-key uses (line 30). Next it clears the screen (line 40).

Lines 50 through 90 input data. The program user must enter the amounts to be apportioned (lines 50, 60, 70, and 90). Any amount can be 0. While this is going on, the program keeps a running total of amounts entered (line 80).

After finishing the input, the program sets medium-resolution graphics mode (line 100), clears the screen (line 110), and displays a title at the top of the screen (lines 120 and 130).

Finally, the program draws the proportionally sized circles (lines 140 to 220). If any of the six amounts is 0, the program skips it (line 150). For non-zero amounts, the program gets circle coordinates from the data statements (line 160). Next, it computes the size of the circle according to the ratio of the partial amount to the total amount (line 170). Then, in a position near where it will display the circle, the program displays the partial amount (lines 180 and 190). After that, it draws a circle (line 200) and fills it with color (line 210). After displaying all circles, the program moves the cursor to the bottom of the screen (line 230) in anticipation of the Ok message at the end of the program.

IN addition to drawing arcs, the CIRCLE command can draw a ray to either or both endpoints.

Pie Chart Program

The Pie Chart program constructs a pie chart with any number of wedges. The program user must enter the number of wedges and the size of each wedge. Figure 4 shows program output for six wedges: 30, 40, 3, 7, 8, and 12. The program displays the wedge size near the center of the appropriate arc. As an exercise, try changing the program to input a label for each wedge of the pie, and print out the label instead of, or along with, the wedge size (see lines 190-210).

The program begins by performing several housekeeping chores. First, it allocates space for 25 wedges—the practical maximum (line 10). Next, the program turns off the standard bottom-line display of soft key uses, sets medium-resolution graphics mode, and clears the display screen (lines 20-40). Then the program inputs the number of wedges (lines 50 and 60). It inputs the size of each wedge (lines 70-110). During the input phase, the program keeps a running total of wedge sizes (line 100).

When input is finished, the program clears the display screen and displays a title (lines 120-140). It starts the first wedge at 0 radians (line 150) and sets the length of each wedge radius at 90 (line 160). Lines 170-250 display the wedges. For each wedge the program computes the endpoint and midpoint in radians (lines 180 and 190), then, near the midpoint, it displays the wedge size (lines 200 and 210). After that the program outlines the wedge (line 220). Negative start and end points in the CIRCLE statement draw the wedge radii, and subtracting .001 from the start point keeps it non-zero. Line 230 fills the wedge with color, starting near the wedge center. The next wedge starts where the current wedge ends (line 240). After displaying the pie chart, the program moves the cursor to the bottom of the screen (line 260) in anticipation of the Ok message at the end of the program.

Pie Chart

```
10 DIM PART(25)
20 KEY OFF
30 SCREEN 1
40 CLS
50 PRINT "How many parts";
60 INPUT N
70 FOR J=1 TO N
80 PRINT "Size of part";J;
90 INPUT PART(J)
100 TOTAL=TOTAL+PART(J)
110 NEXT J
120 CLS
130 LOCATE 1,15
140 PRINT TOTAL;"Total";
150 STARTPT=0
160 RAD=90
170 FOR J=1 TO N
180 ENDPT=6.283185*PART(J)/TOTAL+STARTPT
190 MIDPT=(STARTPT+ENDPT)/2
200 LOCATE (100-SIN(MIDPT)*(RAD-8))/8,(160+COS(MIDPT)*(RAD+16))/8
210 PRINT PART(J);
220 CIRCLE (160,100),RAD,3,-STARTPT-.001,-ENDPT
230 PAINT (160+COS(MIDPT)*RAD*.75,100-SIN(MIDPT)*RAD*.75),J MOD 4,3
240 STARTPT=ENDPT
250 NEXT J
260 LOCATE 22
270 END
```

```
10 DATA 85,60,175,95,245,35
20 DATA 60,150,165,170,260,145
30 KEY OFF
40 CLS
50 FOR J=1 TO 6
60 PRINT "Amount for part";J;
70 INPUT PART(J)
80 TOTAL=TOTAL+PART(J)
90 NEXT J
100 SCREEN 1
110 CLS
120 LOCATE 1,15
130 PRINT TOTAL;"Total"
140 FOR J=1 TO 6
150 IF PART(J)=0 THEN GOTO 220
160 READ C,R
170 RAD=100*PART(J)/TOTAL
180 LOCATE (R+RAD)/8+2,(C-RAD)/8
190 PRINT PART(J);
200 CIRCLE (C,R),RAD,2,0,6.2831
210 PAINT (C,R),1,2
220 NEXT J
230 LOCATE 22
240 END
```

Proportional Circles

Enhanced Line Graph

```
10 KEY OFF
20 SCREEN 1
30 CLS
40 FOR C=9 TO 319 STEP 26
50 READ R
60 LINE -(C,R),LC
70 CIRCLE (C,R),2,2,0,6.2831
80 PAINT (C,R),2,2
90 LC=1
100 NEXT C
110 END
120 DATA 140,120,110,100,100,100
130 DATA 90,100,80,50,100,70
```

clockwise and a different arc appears. To resolve the ambiguity, BASIC draws counterclockwise if the first arc endpoint is less than the second, but it draws clockwise if the first arc endpoint it greater than the second. Figure 6 shows some sample arcs.

A SOLID circle drawn at each data point makes line graphs look much better.

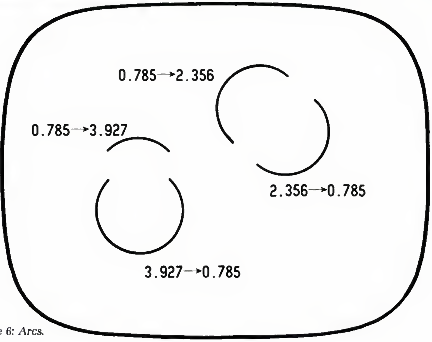

Figure 6: Arcs.

Drawing Rays

In addition to drawing arcs, the CIRCLE command can draw a ray from the center of the arc to either arc endpoint. A negative endpoint in a CIRCLE statement generates a ray to that endpoint. The following example draws a ray from coordinates (40,100) to the second arc endpoint:

```
CIRCLE (40,100),30, ,3,1416,-4.7124
```

The minus sign does not affect the arc. However, the endpoint -0 is not allowed, even though 0 is. To circumvent this limitation, use -0.001 instead of -0.

When both endpoints are negative, both rays are drawn, creating a pie-shape wedge. Here is an example:

```
CIRCLE (240,100),30,2,-3.1416,-4.7124
```

Drawing Ellipses

The CIRCLE command can also draw ellipses. This requires one more piece of information, the *aspect* ratio—the relationship between the height and width of the ellipse drawn. Here is an example:

```
CIRCLE (270,100),50,1,0,6.2831,5/3
```

The extra number at the end of this statement specifies the aspect ratio. The easiest way to understand the aspect ratio is to think of it as a fraction with a separate numerator and denominator. The numerator tells how many rows equal the number of columns specified by the denominator. In medium resolution, an aspect of 5/6 yields a circle, an aspect of 1/3 (or 2/6)

PAINT will not work right unless a single color completely surrounds the area to be filled.

produces a short, wide ellipse, and an aspect of 5/3 (or 10/6) yields a tall, narrow ellipse (Figure 7). In high resolution, an aspect ratio of 5/12 yields a circle.

Decimal fractions make perfectly acceptable aspect ratios too. For example, the ratio 5/6 is the same as the decimal .8333333. It so happens that when the aspect ratio has a value less than 1, BASIC draws ellipses with the same width and varies the height (Figure 8a). On the other hand, when the aspect ratio is greater than 1, the height stays the same and the width varies (Figure 8b).

THE PAINT and CIRCLE commands are electronic replacements for compass, protractor, and a box full of similar tools.

The PAINT Command

PAINT is another graphics command included in the PC's Advanced BASIC. It fills in a selected area on the screen with one of the graphics mode colors. Here is an example:

```
PAINT (150,100),3,1
```

The statement tells the computer to start at point (150,100) and paint the screen color 1 in all directions, and not to stop painting in any direction until it encounters color 3. That means there must be some shape in foreground color 3 surrounding point (150,100).

The fill color can differ from the border color, but the entire area must be bordered by a single color. PAINT will not work correctly unless a single color completely surrounds the area to be filled. If there are gaps in the border color, the fill color will leak out and paint the rest of the screen. This feature of the PAINT command makes it possible to paint the entire background with a foreground color. The following statements paint the entire background area with foreground color 1, then hollow a circle out of it.

```
10 SCREEN 1: REM Set med. res. graphics
20 CLS: REM Clear screen
30 PAINT (1,1),1,1: REM Paint whole
   background
40 CIRCLE (50,150),20,0,0,6.2831:
   REM outline shape
50 PAINT (50,150),0,0: REM Paint circle
```

The PAINT and CIRCLE commands have electronic replacements for a chartmaker's toolbox filled with compasses, protractors, rulers, brushes, palettes, erasers, and the like. It may take you some time to grow facile at their use, but once you do, you'll find them far swifter, simpler, and more reliable than the paper-and-pen tools they replace. /PC

Poole is the author of several books on microcomputer programming, including Some Common BASIC Programs.

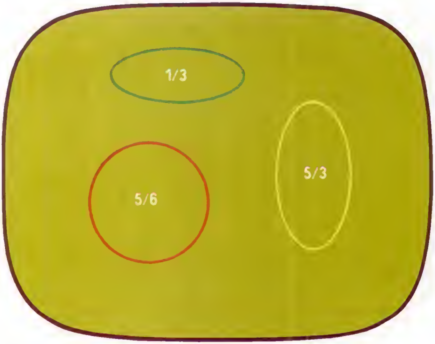

Figure 7: Ellipses in medium-resolution graphics.

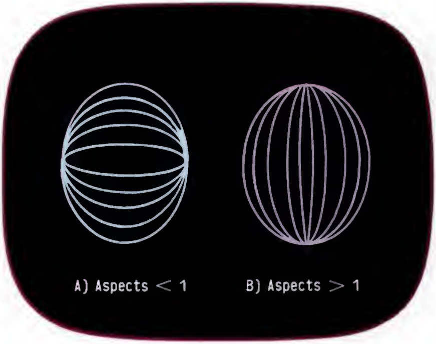

Figure 8: Ellipses.

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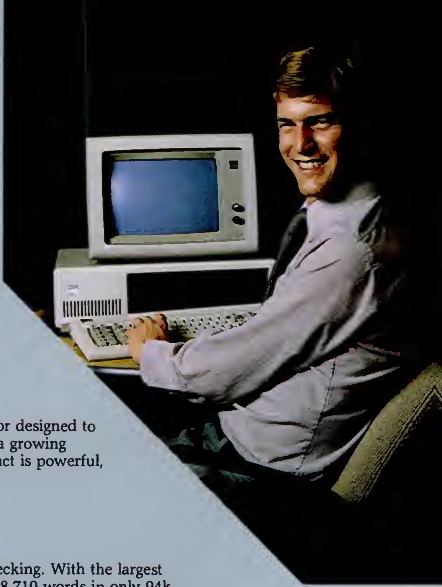

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Bouncin' Along With PChallenge

A video game with color, sound, and fast action—all in 16 lines of BASIC.

In the early 1970s Nolon Bushnell developed o video gome, Pong, that become an overnight success. The company thot grew from Pong, Atari, Inc., mode Bushnell o rich mon. Todoy, the IBM Personal Computer's Advanced BASIC language makes it easy to write games with the same kind of fast action ond sound effects plus color, which the originol Pong didn't hove.

Progromming editor Korl Koessel demonstrotes this point with PChallenge, the BASIC program that oppears below. This Pong-like, one-ployer "video handball" gome is oll done with 16 lines of BASIC code, including scorekeeping. This code is admittedly packed more densely than need be to illustrote how compactly it con be done with so few lines of code.

Following is Koessel's program olong with excerpts from his explonotion of it. You moy find it instructive to figure out the rest for yourself, perhops with help from BASIC's "trace" function (give the commond TRON before running the progrom, ond each line's number will appeor on the screen os it is executed). If you get stumped, see the end of the orticle for how to get o complete copy of Koessel's explonation. PChallenge moy not make you o millionoire like Bushnell, but it will enrich your knowledge of BASIC ond provide you with more fun thon o borrel of quarters.

PChallenge is a ball and paddle game that uses the left- and right-arrow keys to move a paddle toward the bouncing ball. Although it works with a monochrome display, its full glory is revealed by a color display.

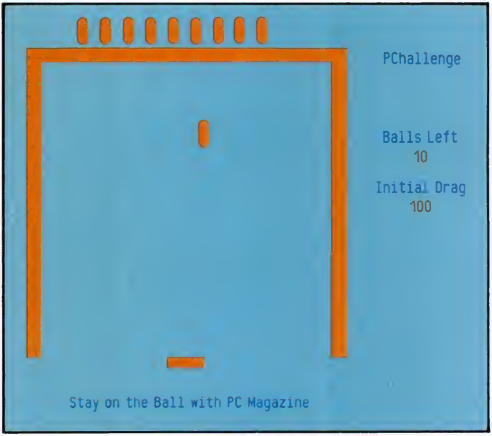
The program begins by skipping to Line 11, which sets the screen width to 80 columns; picks foreground, background, and border colors; clears the display; and turns off the softkeys' display at the bottom of the screen. Defining variables as single-byte "integer precision," when possible, shortens operating time and reduces required memory. Function P is defined to calculate the offset to the start of screen memory for a character at row V, column X of the screen. This function is used later both to check what character is in a particular position on the screen, and to place characters at a particular location. The speed requirement of the program demands working directly with the screen's memory instead of using other BASIC commands, such as LOCATE and PRINT, that would do the same job but more slowly.

Line 13 clears the screen, changes the foreground color, prints the title and other headings on the right side of the screen, gives us a bit of advice, and, after determining (with a pair of statements you may want to use in other programs) whether a color or monochrome monitor is attached, then defines the start of the current segment of memory (for PEEK and POKE functions) to coincide with the start of screen memory (&HB8000 for color and &HB0000 for the monochrome monitor).

Line 14 initializes a couple of variables, builds the paddle (P$), puts 10 balls on the top row, and POKEs the walls ("bricks" of character 219s) around the playing field ("empty" spaces of character 32s).

Line 2 is reached just after printing the ball in a new position. Here we wait a while. How long depends on the value of L, the drag factor. This wait determines the speed of the ball, values of 150 and greater making the speed slow enough for the very young.

Line 5 plays the bouncing tone. The "MB" at the beginning of the PLAY statement's parameter string means Music Background and tells the computer not to wait for the speaker to finish but to keep computing while "singing." If the up/down bounce counter, M, is a multiple of 14 (i.e. M MOD 14 = 0), L, the drag factor, is



decreased by 10 percent and the ball speeds up.

Lines 6-8 contain the subroutines to move the paddle left or right. These are known as key-driven interrupt subroutines. As explained before, each ON KEY (n)—n is one of 14 keys; see your IBM BASIC Manual—statement points to a line to which the program is to GOSUB in response to pressing KEY(n).

All this in just 1¼ screens of BASICA code. I hope you have as much fun with *PChallenge* as I had putting it together.

For the full explanation . . .
To receive a copy of Karl Koessel's complete explanation of how the PChallenge *program works, send a stamped, self-addressed, business-size envelope to: PChallenge, PC Magazine, 1528 Irving St., San Francisco, CA 94122.* /PC

```
1 GOTO 11
2 FOR T=1 TO L:NEXT:POKE FNP(X,V),32
3 X=X+A:V=V+B:IF V=1 THEN A=1-2*RND ELSE IF V=23 THEN 9 ELSE IF PEEK(FNP(X,V))<>
219 THEN POKE FNP(X,V),2:GOTO 2
4 IF PEEK(FNP(X,V-B))=32 THEN B=-B:M=M+1 ELSE IF PEEK(FNP(X-A,V))=32 THEN A=-A E
LSE A=-A:B=-B:M=M+1
5 PLAY"MBC64":IF M MOD 14 THEN 3 ELSE L=L*.9:GOTO 3

6 KEY(12) OFF:KEY(13) OFF:IF D>1 THEN D=D-3:GOTO 8 ELSE 8
7 KEY(12) OFF:KEY(13) OFF:IF D<51 THEN D=D+3
8 LOCATE 22,D:PRINT P$;:PLAY"A64":KEY(12) ON:KEY(13) ON:RETURN

9 KEY(12) OFF:KEY(13) OFF:SOUND 39,11:C=C-1:LOCATE 9,69:PRINT C:IF C=0 THEN 15
10 FOR T=1 TO 2000:NEXT:M=1:RANDOMIZE(C):X=RND*35+10:V=RND*2+2:LOCATE 1,9+C*4:PR
INT" ":KEY(12) ON:KEY(13) ON:GOTO 3

11 WIDTH 80:COLOR 4,3,2:CLS:KEY OFF:DEFINT B-V:B=1:C=11:DEF FNP(X,V)=INT(X+.5)*2
+V*160:ON KEY(12) GOSUB 6:ON KEY(13) GOSUB 7:LOCATE 10,20:PRINT"Left and right c
ursor keys move paddle.":LOCATE 12,15:INPUT"Input drag factor: (100 is Medium...
0 is FAST!)";L
12 DEF FNZ=VAL(LEFT$(TIME$,2))*3600+VAL(MID$(TIME$,4,2))*60+VAL(RIGHT$(TIME$,2))
:B$="   ":LOCATE 14,20:PRINT"Pick a paddle size: (Small, Medium or Large)":A$=IN
KEY$:IF A$=""THEN 12 ELSE IF A$="S"OR A$="s"THEN P=3 ELSE IF A$="M"OR A$="m"THEN
 P=4 ELSE P=5
13 CLS:COLOR 1:LOCATE 24,15:PRINT"Stay on the Ball with PC Magazine";:LOCATE 3,6
6:PRINT"PChallenge":LOCATE 8,66:PRINT"Balls left":LOCATE 11,65:PRINT"Initial Dra
g":DEF SEG=0:IF (PEEK(1040) AND 48)=48 THEN DEF SEG=&HB000 ELSE DEF SEG=&HB800
14 P$=B$+STRING$(P,219)+B$:FOR T=0 TO 9:POKE FNP(12+4*T,0),2:NEXT:FOR S=2 TO 54+
P:POKE FNP(S,1),219:NEXT:FOR S=2 TO 20:FOR T=0 TO 1:POKE FNP(T+2,S),219:POKE FNP
(53+P+T,S),219:NEXT:NEXT:COLOR 4:LOCATE,69:PRINT L:D=25:GOSUB 8:W=FNZ:GOTO 9

15 Z=FNZ:COLOR 1:LOCATE 17,66:PRINT"Time Spent":LOCATE 14,66:PRINT"Final Drag":C
OLOR 4:LOCATE,69:PRINT L:LOCATE 18,65:PRINT USING"#### seconds";Z-W:LOCATE 20,65
:PRINT"Want to play":LOCATE,65:PRINT"again (y/n)?"
16 A$=INKEY$:IF A$="Y"OR A$="y"THEN RUN ELSE IF A$="N"OR A$="n"THEN CLS ELSE 16
```

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☐ LogiQuest II ☐ LogiQuest III

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☐ Complete interface to LogiCalc and Asset (SPI's accounting system).

☐ Report Generator lets user define report formats, headings, page footing, subtotals, level breaks. Built in arithmetic and logic processor enables the user to design very complex reports.

SPI software is also available for: Apple II and III, TRS80 Model II, TI, Phillips and NEC. Commodore, HP, Xerox 820 and others available soon.

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The Arcade Opens

The PC's first good arcade-type game arrives; two others get low scores. Meanwhile, up on Everest . . .

Astro-Dodge, Digital Marketing
Galaxy Master, Info Pros
Set The Hostages Free, TexaSoft
Everest Explorer, Acorn Software Products

Asteroids was one of the first world-class arcade games—complex and fast moving. You were either immune to its appeal or you became an *Asteroids* maniac. Developed by Atari, this game appealed to a much wider audience than had any video game since the novelty of *Pong* wore off back in the last days before the information age, whatever that age was called. In a feature article in *Esquire* magazine, it was noted that three-piece-suited executives, lawyers, accountants and such, could be seen spending their lunch hour and lunch money playing *Asteroids* in arcades around Times Square.

Since then we have seen the arrival of *Space Invaders*, *Missile Command*, the insatiable *PacMan*, and all the rest. The best of these games present graphically a "fundamental psychological condition."

YOU WERE either immune to its appeal or you became an* Asteroids *maniac.

Electronics, which seems to abstract anything it touches, presents, in the good video games, the surreal conditions we experience in dreams: falling from great heights, being pursued or attacked, trying over and over to do something but never quite doing it. With *PacMan* we even get role reversal. The first three games reviewed here succeed or fail to the extent that they are graphic descriptions of the unconscious, or for you computer types, displays of a segment of (buried) memory.

Astro-Dodge is a close relative of *Asteroids* and follows similar products that have been released for the Apple and other micros. While no game is as good on a micro as its dedicated big brother in the neighborhood arcade, *Astro-Dodge* comes as close as possible. It fully maintains the spirit and appeal of the original.

The opening display in *Astro-Dodge* is a small triangle—a spaceship at screen center. Slowly and deliberately closing in on it from all sides are much larger, menacing asteroids—irregularly shaped and apparently mindless. This image of surrounding menace may be the source of *Asteroids'* appeal to professionals whose work is highly competitive and who are still young enough to have rivals and bosses. Further, the good *Astro-Dodge* player may shatter the asteroids into tiny fragments and finally destroy them altogether by shooting them. In the real world he might get a promotion, but in this game he gets more asteroids. (Maybe that is more realistic after all.) He also gets a little flying saucer, which, unlike the asteroids,

IF THE game, like the rat race, becomes too much, you can always hit the hyperspace button . . .

shoots back. If the game, like the rat race, becomes too much, you can always hit the hyperspace button, disappear from your position on the path of doom, and instantly relocate somewhere else—the video world's version of three double martinis for lunch.

Astro-Dodge uses the F9, F10, INS, and DEL buttons for rotating counterclockwise and clockwise, for thrust and for firing, respectively. The space bar, appropriately, hurls you into hyperspace. The asteroids themselves were more round than in the arcade game, without the jagged edges. They looked plump and were yellow (this is a color game, if played on a color monitor). True to their appearance, the asteroids were not all that menacing. This game is also slower than the arcade version and

not as smooth. Sometimes the movements could be seen as stepped, rather than as a smooth flow. This game has two flying saucers instead of one, and the first is not much of a challenge. The second, however, is as deadly as a small mosquito in the tent on a camping trip; you learn to hate it.

Besides its relative slow speed, *Astro-Dodge* has one or two failings. Unlike many games, the high score is not posted—only the score for the present game. On the other hand, the instructions displayed onscreen are clear and easy to read. I was playing on a color monitor with the monochrome monitor displaying the instructions at the same time, which was convenient.

As stated earlier, no micro games can match the arcade version, but *Astro-Dodge* is one of the better ones. I played for an hour and quit only for lack of time. My best score was something over 8,000.

Simple-Minded Galaxy Master

Galaxy Master is not in the same class as *Astro-Dodge*. It is a simple-minded game, though it has modest charm. It is a game, not of psychological states, but of coordination among one's eye, hand, and sense of timing. The display is extremely simple, consisting of very schematic objects. The spaceship looks like a stick character, space garbage like a dim cursor, enemy ships are asterisks, and the Galaxy Master is a symbol similar to the legal symbol for "section."

Galaxy Master, space garbage, and enemy ships move across the screen slowly. Your ship can move in any direction b means of the four arrow keys on the ke pad, at least until your fingers cramp which won't be long. You shoot lasers c photons with the F1 and F2 keys and try t score points by hitting things. The Galax Master is the only one who shoots back and you have two minutes to score 60 points, which will restart the clock or yo lose. You can also lose by shooting whil moving upward, in which case you usuall shoot yourself down. If you don't scor high, you're called a "humorous oppo nent" or "foolish" earthling, or somethin of the sort, a sure sign of amateurish mar keting to go along with simplistic program ming. My best score in about 40 minutes c play was 955, which rates "fair." I like best that you could play the game with o without sound (fitting it's advertisement a an "office game"), a choice more game should offer. It requires Advanced BASI and an 80-column display such as IBM' monochrome monitor.

Tinny Tunes

Set the Hostages Free is the least inter esting of these games. From the disk it wa not apparent who wrote it. It is anothe game of coordinating the movement o something on the screen with the timing o a key press. A space moves around th perimeter of a square. You may move you gun (two hi-res lines) around the outside o the square. You must time your shot to hi the moving space, allowing the bulle through to eliminate one brick in th square, a la *Break Out*, an arcade gam that was intermediate in the line of development between *Pong* and *Asteroids*. When all the bricks are gone, a number of hostages in the center of the square are released. I lost interest before I actually witnessed this. Perhaps the release of the hostages would trigger some unexpected wellspring of patriotic emotion. But I doubt it. This game requires Advanced BASIC and an 80-column display. Just as army generals in the poorest countries wear the most braid and brass, this game had the most tinny tunes accompanying its start.

Because It Was There

Everest Explorer is a game of resource management, not an arcade game, so I asked my colleague, Edmund Hilarious, O.B.E. to review it, as he is much more qualified than I am in these matters. Here is his report:

"Bloody good game, old sport. We left Katmandu in late Spring—Goodwin, Hoskins, and the rest, including that doctor chap—and made base camp in two weeks, with a lot of Sherpa fellows, can't ever remember their funny-sounding names. Spent $80,000 getting there too, don't mind telling you, what with the cost of tents and oxygen bottles, fuel, meals, and of course the bloody Sherpas themselves. Over $1,000 apiece they were, and unreliable at that, as I'll explain in a moment. On the third day one of the Sherpa's was lost in an icefall, poor soul. Name was Ang Phu, Any Phlegm, or something like that. That wouldn't have been so bad, of course, except that the system crashed too, returning me to BASIC against my will and giving me a bloody division by zero, overflow at line number 76 error message. Hardly sporting, don't you know. A rather sudden descent, too. Wonder I didn't suffer severe nosebleed. Of course, I tried the mountain again immediately. Always be an England, hey? This time got Base Two almost supplied. Goodwin was down for a few days with hypothermia, but he is better now. Our progress was no thanks to the Sherpas, by the way, who refused to climb past base camp after one of their number suffered an irreversible loss of life clearing out icefalls from the more difficult Western approach. When I saved all information to disk after an hour of play, the weather was cloudy with light snow and mild winds. I think that once the six of us climbers (I took only a small crew this time) get all the food and fuel to camp two, those cowardly Sherpas will change their tune all right.

SPENT $80,000 getting there too, don't mind telling you, what with the cost of tents and oxygen . . .

"Well, wish me luck old bean. Cheerio for now." /PC

Are Now Available Personal Computer!

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Baby Blue CPU Plus is an accessory printed-circuit board for your IBM Personal Computer and special software on disk.

As far as normal PC DOS operations are concerned, Baby Blue acts just like any other normal, mild-mannered 64K byte random-access memory board.

But when you invoke a CP/M-80* program, Baby Blue becomes a second computer within your computer, letting you run thousands (literally thousands) of programs written for the CP/M microcomputer operating system.

CP/M, the first microcomputer operating system to gain wide acceptance, has been around since 1975. Not only has it played host to a lot of programs, but those programs are among the most useful, most sophisticated, most thoroughly tested and debugged, most proven programs ever written. More than 200,000 computers were field-testing those programs for you before the IBM Personal Computer even existed.

The total CP/M library is immense. It includes the best efforts of thousands of professional and advanced-amateur programmers. There are time managers, spreadsheet manipulators and professional-office packages. Languages — BASIC, of course, ALGOL, FORTRAN, C, Pascal, LISP, COBOL, PILOT, and FORTH, to name a few. Text editors, text formatters, full-blown word processors, spelling checkers and indexers. Utilities that will massage problem files so that they lie back and purr. Games, including chess, Reversi, Adventure and tournament-level Star Trek. Database managers. Accounting packages that can run a million-dollar business . . . Just about anything you can imagine.

The net result is an integration of CP/M programs into the PC environment that's so smooth, so transparent that you won't need to know or care which operating system a program was originally written for.

WordStar*, the popular CP/M word processor is among thousands of programs that can now be run on the IBM PC with Baby Blue.

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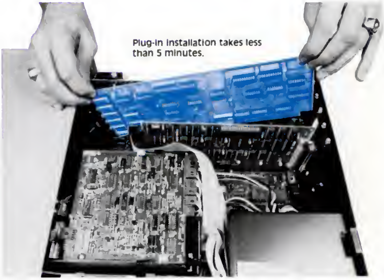


Plug-in installation takes less than 5 minutes.

WordStar* and Mail-Merge are trademarks of MicroPro International Corporation.

CP/M is a registered trademark of Digital Research.
Baby Blue is a trademark of XEDEX Corporation.
Z80 is a trademark of Zilog, Inc.

Marketplace

HARDWARE

Oak Desk
Electroniture is a combination computer cabinet and desk handcrafted of solid oak, which provides a permanent home to the IBM PC.

The unit is "ergonomically human engineered, has a large work surface, a document holder, and space for peripherals and software storage."

The monitor cabinet has a nonglare glass screen that will enhance contrast and color without distortion.

Although the unit has room for a small printer, there is an optional, matching solid oak stand that accommodates both back- and bottom-feed printers using 15-inch and smaller fanfold paper. An optional wire paper bale is available.

Price: Desk Unit $895, Printer Stand $225, Paper Bale $25.
Bench Collection
1387-D Cass Rd.
Santa Rosa, CA 95401
(707/526-1074)

Space Tablet
The Space Tablet is a four-access system digitizer that consists of a pen that can be moved to various locations on an object so as to translate the dimensions into code that can be interpreted by the PC. The product works with both *Chart Pro* and *Slide Pro* software, described elsewhere in this section.
Micro Control Systems
431 Vinyard Point Rd.
Guilford, CT 06437
(203/643-4897)

Screen Cover
A non-glare screen cover that darkens a "too light" background is new from PFM Products. The screen fits the PC monochrome display.
Price: $15.95
PFM Products
9129 Coral Cove
Dallas, TX 75231

Printer "LEGGS"
Argus' "LEGGS" allows you to store paper underneath your Epson or IBM printer. The four legs take the place of the screws under your printer, and can be installed in seconds, providing room for 3 inches of paper.

Requires: Epson MX-80 or MX-100 or IBM Matrix Printer.
Price: $15.
Argus
Box 9777
Baltimore, MD 21204
(301/321-8451)

Print Spooler
Compulink's *SooperSpooler* is an "intelligent printer interface designed to free microcomputers from the mundane task of printing." The device allows you to quickly dump text or other data into a 16K buffer. SooperSpooler sends the data to your printer while you use your computer for something more creative. Other standard features include: pagination, formatting, and headers.
Price: 16K Unit $349. Memory Expansion $159. Serial Port Option $95.
Compulink
1840 Industrial Circle
Longmont, CO 80501
(303/651-2014)

Disk Emulators
SemiDisk is a high-capacity memory board that operates like a 512K disk drive. Like a disk, there is a directory, and files can be written, read, and executed. Because it has no moving parts, it is much faster than a floppy or hard-disk system. Data or programs from your regular disks can be loaded into SemiDisk for instantaneous access.
Price: 512 Kbyte System $1,995. 1 Megabyte System $2,995.
SemiDisk System
P.O. Box GG
Beaverton, OR 97075
(503/642-3100)

Another half megabyte disk simulator is JRAM. The board comes with "a set of software to make that memory directly usable by common software."
Price: $1,200 (with 500K of RAM). $400 (without memory chips).
Tall Tree Systems
1036 Los Altos Ave.
Los Altos, CA 94022
(415/941-8748)

Hard Disks
Santa Clara Systems has announced two hard disks for the PC. Their SCS-MiniMega is a 5¼-inch disk in both 5 and 10 megabyte versions. The SCA-Sabrina Series offers 10 megabytes of storage on a removable 8-inch Winchester cartridge, along with from 10 to 40 megabytes of fixed disk storage capacity.
Santa Clara Systems
560 Division St.
Campbell, CA 95008
(408/374-6972)

Internal Hard Disk
Professional Micro Systems is offering a 5¼-inch 20 megabyte hard disk that fits inside the PC system unit, replacing one of the two floppy disk drives. The hard disk supports PC-DOS and CP/M-86. The company also offers

"New on the Market" does not review products, but reports information provided by the manufacturer. If you have a product that you would like to have included in this section, please send a brief description that includes applications, price, and system requirements to New on the Market, PC Magazine, 1528 Irving St., San Francisco, CA 94122. Photographs and illustrations are run on a space-available basis.

Marketplace

The Independent Guide to IBM Personal Computers

special hard-disk versions of MicroPro's *WordStar* word-processing system, Sorcim's *SuperCalc* spreadsheet program, Systems Plus's *Accounting Plus* and MicroNetics' *Client Write-Up* and *General Ledger*.
Price: Disk Unit $5,995.

AST's new memory board can be configured with 64K to 256K of add-on memory. It also includes a parallel printer port and an asynchronous port.
Requires: 64K.
AST Research
17925 Sky Park Circle, Suite B
Irvine, CA 92714
(714/540-1333)

Communications Port

Persyst has introduced an asynchronous communications controller for the PC that includes a rotating jumper plug to ease communications cabling, programmable baud rates from 50 to 19,200 baud, and dual channel option to allow one card to drive both a modem and serial printer.
Price: Single Channel $130.
Dual Channel $195.
Personal Systems Technology
22957 La Cadena
Laguna Hills, CA 92653
(714/859-8871)

Graphics Digitizer

The Graphic Analysis Package #1 includes a digitizer with 0.001" resolution, a digitizing stylus, a power supply, a communications interface cable, and an operator's manual and necessary software.
Price: Start at $1,419 for 11"×11" digitizer.
GTCO Corporation
1055 First St.
Rockville, MD 20850
(301/279-9550)

Data Base Machine

The IDM 2000 is a combination of relational data base management software and specially tailored hardware. The hardware is designed to enhance the performance of the relational data model. The hardware/software package makes it possible to run applications previously requiring much larger computer systems.
Insac Software
2300 Peachford Rd., Suite 3235
Atlanta, GA 30338
(404/452-7676)

Parallel Printer

The new NEC Spinwriter Model 3550 letter quality printer can be plugged directly to the PC's parallel printer port. A parallel port is included on the card used for the IBM monochrome display. The 3550 printer allows users to select from over 50 print thimbles designed for word and text processing. The printer accepts paper up to 16 inches wide and supports automatic proportional spacing, bold and shadow printing, underlining, super- and subscripting.
Requires: Parallel Port.
Price: $2,250.
NEC Information Systems
5 Militia Dr.
Lexington, MA 02183
(617/862-3120)

SOFTWARE

MBA Is First Software Combo

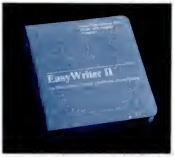
The *MBA* program (695) from Context Management Systems combines a spreadsheet simulator with word-processing, graphics, and data base management. A future version of the program will also include telecommunications software, which the company says it will give free to buyers of the current version.

In a preview for *PC*, the *MBA* program appeared a credible start toward the expected merger of single-purpose programs; but it suffered somewhat from the "jack of all trades, master of none" syndrome. Its word-processor, for example, is very rudimentary compared to programs dedicated exclusively to that job. As is expected for such integrated suites of programs, *MBA* requires a beefily equipped PC—at minimum: 192K of memory, a graphics adapter with high-quality monochrome monitor (the program uses only graphics, not color), two disk drives, and a printer with graphics capability (such as the Epson printer with Graftrax option). *MBA* is written in Pascal for the UCSD operating system, whose "run-time" elements are included on the *MBA* disk.

The centerpiece of *MBA* is its spreadsheet simulator, which is operated using a command set modeled upon and expanded from that of the *VisiCalc* program. Where *MBA* starts getting interesting is that you can fill its spreadsheet cells with values drawn from a data base created using another arm of the program. After twiddling the spreadsheet to your satisfaction, you can then, in the program's terms, "change contexts" to the word-processor and create a memo that leads in to your figures. Then you can change contexts again, to graphics, and order selected rows and columns of the figures interpreted as a pie chart or in other graphic fashion. The text, figures and charts appear together on your screen (which displays text and graphics alike in high-resolution graphics mode), and matching copies can be made on paper if your printer is equipped for it.
Context Management Systems
23864 Hawthorne Blvd.
Torrance, CA 90505
(213/378-8277)

Word-Processing

EasyWriter II. Information Unlimited Software, the producer of IBM's *EasyWriter* has released a totally new word processing package called *EasyWriter II*. Pages appear on the screen just as they appear on paper, complete with headers, footers, onscreen underlining, boldface and double underlining. Printing can be done directly from the editor, eliminating the need to save short memos to disk. The simultaneous print and edit feature makes it possible to route up to ten documents



to the printer while editing another.
Requires: 64K 2 Disk Drives.
Price: $350.
Information Unlimited Software
281 Arlington Ave.
Berkeley, CA 94707
(415/527-9526)

Wordnet86 is a new word-processing program that incorporates data entry and text data merge capacity. Using all the PC's function and cursor control keys, its features include horizontal scrolling, block move and copy, search and replace, and numeric tabbing. Disk file handling, printing, system interaction, and help files are menu driven.
Requires: 64K Two Drives.
Price: $395.
Monoson MicroSystems, Inc.
51 Main St.
Watertown, MA 02172
(617/924-2124)

Finalword is an integrated word-processing system. In addition to standard operating features such as automatic word wrap, global search, and justification, *Finalword* offers several unique text editing and formatting capabilities. "Chapter Command" will center numbers, boldface chapter headings, and create appropriate entries in the Table of Contents. Further, during output, the menu-driven program can create an index, complete with appropriate pagination, and number footnotes. Additional features are split-screen capability, directory access during the editing process, and simultaneous editing and printing capability.
Requires: 56K memory, PC-DOS.
Price: $300.
Mark of the Unicorn
P.O. Box 423
Arlington, MA 02174
(617/489-1387)

Designed for the first time IBM PC user (as well as the expert), the *Volkswriter* word-processor includes an interactive on-screen tutorial and a complete reference manual. It uses 20 function keys with an on-screen reference guide.
Requires: PC-DOS.
Price: $195.
Lifetree Software, Inc.
177 Webster St., Suite 342
Monterey, CA 93940
(408/659-3221)

Spelling Checkers

Easyspeller is an innovative spelling-checker and proofreading package. Using an 88,000-word dictionary, it flags misspellings and offers the user a chance to substitute the correct spelling. The system can also create supplementary dictionaries for jargon and abbreviations. It further allows the user to correct the same mistake within a file by pressing a single key. The system also displays the entire line in which the flagged word appears, enhancing ease of readability.
Requires: PC-DOS.
Price: $175.
Information Unlimited Software
281 Arlington Ave.
Berkeley, CA 94707
(415/525-9452)

Another spelling-checker in the PC marketplace is the updated *Spellguard 86*. Designed for use with a CPM-86 operating system, this version speedily proofreads documents at rates exceeding 20 pages per minute using a 20,000-word dictionary.
Requirements: CPM-86 DOS.
Price: *Spellguard* $295. British Dict. $35 till 6/30; then $125.
Innovative Software Applications
1150 Chestnut Lane
Menlo Park, CA 94025
(415/326-0805)

Mail Management

Two new mail managers geared to the IBM PC user are on the market. *Mail Manager* will create and update address files, create subfiles, merge files, and sort using a variety of key fields. Starware plans on releasing several other IBM PC packages including: *Grodem* for teachers, *Data Analyst*, *Listpro* (for creating custom form letters), and *Pfofsale* (an order-entry package).
Price: $49.
Starware
1629 K Street NW, Suite 551
Washington, D.C. 20006
(202/337-5300)

EZLabel is a mail management program geared to the small business employee and computer neophyte who lacks the time to master a more complicated system. The company will follow this product with a similarly "simple" line-oriented word-processor and home finance program. All are in the lower price range.
Price: $39.95.
Systemics
3050 Spring St.
W. Bloomfield, MI 48033
(313/851-2504)

Communications

Logon, an auto-dial, auto-answer communications software package supporting the Hayes Smartmodem, features menus, directory of frequently called numbers and host computer configurations, automatic retransmission of erroneous data, selectable number of columns (screen width) and ability to "chat" off-line without losing carrier. Written in UCSD Pascal 4.0.
Requires: 64K, Serial Card Disk.
Price: $150.
Ferox Microsystems
1201 N. Ft. Myer Dr.
Arlington, VA 22209
(703/841-0800)

Crosstalk Version 2.0 allows a PC or CP/M computer to access almost any ASCII dial-up computer system. It captures and stores received data and sends pre-edited files to a remote computer system. The company is releasing both PC-DOS and CP/M-86 versions.
Microstuf
1900 Leland Dr., Suite 12
Marietta, GA 30067
(404/952-0267)

PC MODEM communications program for the IBM PC features include: continuous auto-dialing, auto-answering, send-receive ASCII files which can be read from or written to PC-DOS files up to 600 baud, menu drive, and switches between touch-tone and rotary dialing.
Requires: 64K, IBM Communications Adapter (or equivalent), PC-DOS, BASICA, Disk Drive, D.C. Hayes Smartmodem.
Price: $49.95.
System Software Services
1765 Raleigh Lane
Hoffman Estates, IL 60195
(312/843-8584)

ASCOM is an asynchronous communications program for users who routinely send or receive program or data files between a PC and another computer. The PC version of *ASCOM* is compatible with ASCOM on any CP/M system.
Requires: PC-DOS, Serial Communications Module.
Price: $175 including software and manual.
Westico
25 Van Zant St.
Norwalk, CT 06855
(203/853-6880)

Marketplace

Terminal Emulator

R/NET, an abbreviation for Relational Network, was created to allow the IBM PC to connect directly or remotely to minicomputers supporting the ADDS terminal. Because *R/NET* can capture minicomputer data on the PC's disks, it is possible to manipulate data off-line. The system includes software, documentation and a cable to connect the PC to a minicomputer.
Price: $200.
Cosmos
10626 148th Ave. SE
Renton, WA 98056
(206/226-9362)

Phone Log

Phone Chronicle from Sycon logs outgoing calls and is intended for single telephone line users who need to monitor internal telephone use for billing or cost control purposes. The program sorts, organizes, and presents calls in a report format which includes the data, telephone number, time and length of call, and three-digit individual employee/account code. Consisting of a PC board, telephone plug, cable, diskette, and user's manual, the unit has an on-board memory of 100 calls, and signals when memory is reaching the limit. It uses an external A/C adapter to supply power when the computer is not in use. A multi-line version is under development.
Price: $395.
Sycon
3040 Scott Blvd.
Santa Clara, CA 95051
(408/727-2751)

Payroll

Payroll Master can process up to 200 employees on a two-disk PC. It supports six user-defined deduction fields and gives definable pay rates for each employee. Multi-state and mixed-department labor analysis are also offered. A Tecmar hard disk version is also available.
Price: $495.
ASTEC
223 Hunnewell St.
Needham, MA 02194
(617/444-5551)

Dow Jones

Another IBM release, *Dow Jones Reporter* enables an IBM PC user to gather business information from the Dow Jones News/Retrieval Service. It provides access to a variety of information including financial news, stock market quotations, and company profiles.
Price: $100.
IBM
(800/447-4700)

The Personal Investor automatically connects your PC with the Dow Jones News/Retrieval Service giving you access to "the most authoritative financial information in the world." Stories and reports as new as 90 seconds or as old as 90 days can be viewed from *The Wall Street Journal*, *Barrons*, and *Dow Jones News*.

The Personal Investor includes several modules. The "Portfolio Manager" records stock purchases, dividends, and sales of stocks. The "News/Terminal" works with Dow Jones and most other information services. The "Quotes Screen" automatically signs on to the Dow Jones service, collects quotations on preassigned stocks, and signs off. The quotations can be printed or viewed on the monitor, after the Dow Jones service is disconnected. The package includes software and a 58-page manual.
PBL Corporation
P.O. Box 599
Wayzata, MN 55391
(612/473-3769)

Financial and Accounting

The Boss from XEDEX Corporation is a new financial accounting package that includes General Ledger, Accounts Receivable, and Accounts Payable modules. The company plans on releasing several other interactive modules by fall. XEDEX will provide user support via a technical "hotline" service.
Requires: XEDEX Baby Blue. Will work with 5-megabyte hard disk drives or two 8-inch floppy disks with 200K Memory (IBM 5-inch floppy disks will store only 160K each).
Price: $2,495. Combined price with Baby Blue $3,095.
XEDEX Corporation
1345 Ave. of the Americas
New York, NY 10105
(212/489-0444)

Another set of Accounts Payable, Accounts Receivable, General Ledger, and Payroll programs is available from:
Zeta Products
P.O. Box 147
Georgetown, TX 78626
(512/863-3079)

A new series of business programs for the IBM PC includes: Payroll, Job Costing, Accounts Payable, Accounts Receivable, and General Ledger.
Computer Systems Design
P.O. Box 735
Yakima, WA 98907
(509/575-0320)

More Business Tools

IBM has released *Inventory Control* by PeachTree Software to help companies manage their inventory assets. The program is designed to assist a small business improve its merchandise control, reduce inventory investment, and improve customer service and response. The program may be customized to suit a company's needs.
Price: $595.
IBM
(800/447-4700)

Chart Pro produces graphics on the screen (monochrome or color) and the Epson or IBM printers. It can produce charts, bar graphs, and linear data from information you enter directly or through VisiCalc files. A companion program, *Slide Pro*, produces copy that can be thermofaxed for overhead projection slides. The product allows you to move your cursor around, drawing flow charts, block diagrams, and the like. $49.50 for each product.
Price: $595.
Micro Control Systems
431 Vinyard Point Rd.
Guilford, CT 06437
(203/643-4897)

Time Manager from IBM and MicroSoft, Inc. enables the PC user to organize and plan activities while maintaining records for future reference. By recording events as they happen, the user can later retrieve a summary of those events, as well as organize and update data. Totals can be created in several categories for tax verification, expense reports, and project evaluations.
Price: $100.
IBM
(800/447-4700)

MicroGANTT is a project-planning system designed for users who perform time-and-cost analyses. The programs use the Critical Path Method technique to determine task dependencies and project completion dates. When an aspect of a project is modified, the plan is immediately redisplayed to reflect the new schedule.
Price: $395 with Documentation. Manual $25.
Westico
25 Van Zant St.
Norwalk, CT 06855
(203/853-6880)

Business & Engineering

HAL 9000, a new line of Business and Engineering software, has been introduced by Keller. It consists of:

—*HAL 1000* Business Software with General Ledger, A/R, A/P, Inventory and General Business applications.

—*HAL 2000* Engineering Software with Civil, Scheduling, Cost Engineering, and Electrical applications.

—*HAL 3000* Statistical Software with general applications.

Requires: PC-DOS.
Price: Statistical Package $395. Business and Engineering Software $495. Civil Engineering $595. Business Inventory and Cost Accounting $695.
Keller Software
1825 Westcliff Dr.
Newport Beach, CA 92660

Econocomp Services, Inc, is releasing a line of engineering software for the IBM PC. Included are structural, geotechnical, and hydraulics programs.
Econocomp Services, Inc.
89 State St.
Guilford, CT 06437
(203/453-4386)

Insurance

A new line of software geared specifically for insurance agents has been released. Nine modular programs in the series cover wide-ranging aspects of insurance sales: compiling prospect lists, risk analysis, and tracking claims. Word-processing is included.
Requirements: 64K Memory, 2 Disk Drives, Monitor, Printer.
Price: $650.
Metamorphics, Inc.
154 Montgomery Ave.
Bala Cynwyd, PA 19004
(215/668-9000)

Electronic Memo Register was designed especially for insurance agents who have "hundreds of follow-up messages to track."
Metamorphics, Inc.
154 Montgomery Ave.
Bala Cynwyd, PA 19004
(215/668-9000)

Banking

Ampersand Corporation introduced its *Branchbanker* series for financial institutions. The package currently consists of a Master and Individual Retirement Account (IRA) modules.
Requires: 64K, Printer.
Price: $595 (Master Module and One Accessory).
Ampersand Corporation
128 S. George St.
York, PA 17405

Real Estate

The *Quickcalc Real Estate Investor* is a template model for the IBM PC, using either *VisiCalc* or *SuperCalc*. The system displays information in a worksheet format. The residence and income-property models are capable of analyzing variables such as purchase price, financing structure, tax implications, cash-flow and after-sale profitability.
Price: $99.50.
Simple Soft
480 Eagle Dr., Suite 101
Elk Grove, IL 60007
(312/364-0752)

Data Base Manager

EasyFiler is an "information processor" from Information Unlimited Software. The data base management system allows the user to enter, manipulate, and report a variety of data. The software is designed to handle up to 100 megabytes of data, if you can find a disk that will store that much. *EasyFiler* has its own limited editor, so it is possible to create form letters and use the product as a stand-along mail-merge program. Each listing (record) in the data base can have up to 50 items.
Requires: 2 Disk Drives, 64K.
Price: $400.
Information Unlimited Software
281 Arlington Ave.
Berkeley, CA 94707
(415/525-9452)

Disk Library Program

The *Floppy Disk Library* is designed to "take some of the drudgery out of keeping track of floppy disks and files."
Price: $39.95.
Little Bit
469 Edgewood Ave.
New Haven, CT 06511

Spreadsheets

IBM announces the release of *VisiCalc* version 1.1. The revised version of this best-selling spreadsheet program will now accommodate up to 256K of user memory and will support additional parallel and serial printers. *VisiCalc's* producer, VisiCorp, will automatically issue the upgraded version at no charge to all registered owners.
Requires: PC-DOS, One Drive, 64K.
Price: $250. No charge for update.
VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408/946-9000)

Ferox Microsystems, makers of *MICRO-DSS/F*, is offering a menu-driven financial modeling package for the PC. It features "what-if" calculations, 32,000 cell built-in financial functions, and report generation. Includes run-time UCSD Pascal 4.0.
Requires: 2 Drives, 128K.
Price: $1,500.
Ferox Microsystems
1701 N. Ft. Myer Dr.
Arlington, VA 22209
(703/841-0800)

The *SuperCalc* Electronic Spreadsheet for the PC allows users with color monitors to see negative values displayed in red, and formulas in yellow. 256K users will be able to fill in all 16,000 cells of the worksheet with five-digit numbers—enough space to allow 10-year projections by month.
Price: $295
Sorcim
405 Aldo Ave.
Santa Clara, CA 95050
(408/727-7634)

For the Home

Household Inventory enables homeowners to maintain records of their valuable posses-

Marketplace

The Independent Guide to IBM Personal Computers

sions for insurance purposes. The program catalogues and cross-references household items (up to 100 in 25 rooms) keying in such information as serial number, purchase date, and value. Price: $95.

What Do We Name the Baby? draws upon a 2,500-name database to generate lists of names defined by series of parameters chosen by the prospective parents.
Requirements: 48K Memory, Single Disk Drive.
Price: $15.
Metamorphics, Inc.
154 Montgomery Ave.
Bala Cynwyd, PA 19004
(215/668-9000)

Education

Two new software educational packages have been introduced into the marketplace. *Schooldoze* provides the answers to hundreds of arcane and rarely asked questions, and can create a Timeline of any size.
Requires: 32K Memory, Disk Drive, Printer for Timeline Function Only.
Price: $25.
Schooldoze by Metamorphics
154 Montgomery Ave.
Bala Cynwyd, PA 19004
(215/668-9000)

Math Drills offers mathematical exercises geared toward the elementary age group. The program generates problems in many difficulty ranges. A user's scoreboard monitors progress and missed problems and supplies the correct answers.
Requires: 36K Memory, 1 DD, 80-Column Monitor.
Math Drills by Starware
3901 Davis Place N.W.
Washington, D.C. 20007
(202/337-5300)

Games

Space Guardians requires its players to travel the galaxy, searching out and destroying alien warships.
Requires: 64K, One Drive, 80-Character Display.
Price: $29.95.
Omric
1268 Main St., #207
Newington, CT 06111
(203/666-4240)

The makers of *Galaxy Master* have dubbed their new product the "office game" because the user can elect to turn off the sound in an office environment. Movement around the screen is accomplished through cursor controls and the user gets to press F1 to fire lasers or F2 for "photon torpedoes."
Price: $29.95.
Info-Pros
2102 Business Center Dr., #132
Irvine, CA 92715
(714/851-8975)

Keyboard Enhancers

The Keynote Keyboard Enhancer allows the user to specify repetitively typed phrases or control functions with a single key stroke. The strings may contain any legal ASCII characters, thus making it possible for you to re-define many of the PC's keys. The program becomes part of the disk operating system and remains in memory until you reboot or turn off the power. The program allows you to save and complete keystrings (macros) to disk files. Includes a quarterly software newsletter with program enhancements and updates. Quoted price is an introductory offer and is subject to change after July, 1982.
Requires: PC-DOS, One Drive.
Price: $29.95.
Gerard Cerchio System Consultants
1110 Whirlow Pl.
San Jose, CA 95131
(408/923-0911)

Utilities

Note: *Disk Utilities* are tools that aid in the interface between the computer user and the disk operating system; that is, the environment in which computer software operates. Some utilities (like CP+) are for novices and others (like DiskLook and Jools/86) are more suited for programmers or advanced users.
CP+ replaces CP/M commands with a series of "simple, English-language 'menus,' messages and directions." It currently works only with CP/M-80 systems, but its distributors plan to release a version for the Baby Blue (see story this issue) equipped for PC as well as for CP/M-86.
Price: $150.
Taurus Software Corporation
870 Market St., Suite 817
San Francisco, CA 94102
(415/788-0888)

Disklook is a menu-driven set of PC-DOS utilities which allow users to "browse through any file, display any diskette sector, graphically map diskette usage and the location of any file, display erased file names, reveal hidden files, display complete directory information, and enable the user to learn more about how files are copy protected."
Requires: PC-DOS, 64K, One Disk Drive.
Price: $20. *Unerase* (recovers erased diskette files) $20. *PasFor* (formats Pascal programs to user-controlled standards) $20. *TimeMark* (displays time, date, and elapsed time) $5.
Peter Norton
1716 Main St.
Venice, CA 90291
(213/399-3948)

Operating System

The *Oasis 16* operating system turns the IBM PC into a multi-user business microcomputer. It simultaneously coordinates up to three users on a standard system and up to 32 users with appropriate bus expansion. The system provides for private or shared public files, optional passwords, and privileged level security access. It is compatible with Z-80 Oasis Basic and C applications software, making over 500 commercial programs immediately available. Supports Corvus hard disks.
Price: $1,495.
Phase One
7700 Edgewater Dr., Suite 830
Oakland, CA 94621
(415/562-8085)

CP/M Emulator

1-DOS is a version of the native "PC-DOS" operating system for the PC. It supports Professional Micro Systems' 20 and 40 Megabyte 5¼-inch Integral Hard Disks and CP/M-80 and CP/M-86 under the native PC-DOS.

Both CP/M programs or files and PC-DOS programs and files can run in the same "areas" or "volumes" on the disks.

In *1-DOS*' "configure program," the hard disk and floppy disk can be assigned any logical drive letter and "volumes" can be of any size, within disk size constraints.

1-DOS has a menu-driven copy, rename and erase utilities. It has a built-in Communications Program that utilizes Hayes Smartmodem, Novation Modem and other RS-232 Modems.
Professional Micro Systems
Newport Beach, CA 92660
(714/851-8655)

COBOL Language

IBM Personal Computer COBOL Compiler by MicroSoft is a software product that lets the user develop programs in COBOL, a language designed for business applications. The IBM COBOL is a version of the popular ANSI 1974 level standard with extensions that support color and screen formatting.
IBM
(800/447-4700) /PC

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LAWRENCE J. MAGID

Product Reports

Tecmar Proliferates PC Products; New VisiSeries; MicroPro Releases WordStar; and IBM Announces Double-Sided Disk Drives.

Tecmar Proliferates PC Products

Speech Master, PC-MATE, Speed Disk, and More to Come.

Tecmar
23600 Mercantile Rd.
Cleveland, OH 44122
(216/464-7410)

When IBM released the PC in October 1981, several companies jumped on the bandwagon with software and hardware add-ons. None were quite as prolific as Cleveland's Tecmar Industries, which introduced more than 20 PC-related products by the time this magazine's first issue hit the streets in January. Now they're back with several more.

ONE of their new plug-in devices teaches the PC to talk back to you — in audible English.

Talkin' Terminals

One of their new plug-in devices teaches the PC to talk back to you—in audible English. According to Tecmar Vice President Dave Wertman, the Speech Master Board is treated by the PC like a monitor or a printer, but instead of the output being displayed or printed, it is enunciated through the device's on-board speaker or through an amplifier or tape recorder connected to the Board. You can write your speeches in BASIC or in PC-DOS text files that can be created with a word-processing program.

By including a few lines of code at the top of your BASIC programs, you can LPRINT directly to the Speech Master Board, according to a Tecmar spokesperson. But even if you don't know a word of BASIC, you can use a simple PC-DOS command to route text to the speaker. PC-DOS includes a command that allows you to route a file to the screen by typing TYPE FILENAME. If you want that same file printed, you precede the TYPE statement with a CTRL P (for PRINT). With Speech Master, according to Wertman, you type CTRL T (for talk) and the text is spoken rather than displayed or printed. Your Speech Master, in essence, becomes another list device.

Words are pronounced on a "synthesis by rule" basis. If you don't like the machine's pronunciation, you can retype the word phonetically.

A production model was not available for testing as PC went to bed, but we'll soon play with one and let you know what it has to say for itself. Price: $395 for the Board; $95 for software.

Hard Disk/Expansion Chassis

Another new Tecmar product is the 10-megabyte (10-million-character) version of their combination hard disk/expansion chassis. The PC-MATE Winchester/10, like their previously announced five-megabyte hard disk, is enclosed in the PC-Mate Expansion Assembly, which looks remarkably similar to the PC itself and contains its own power supply and six additional expansion slots. Price: $3,995.

Programs Increase Use of Memory Boards

Speed Disk is a program that allows a 192K memory expansion board to simulate a floppy disk. The result is a logical disk device that is "totally compatible for normal system operations and provides speed increases of between 5 and 50 times that of the IBM mini-floppies." Although it was designed to work with Tecmar's PC-Mate Dynamic RAM Option, it should work with any 192K memory expansion board. Price: $40.

Tired of waiting for your printer to let you use the PC? The *RAMspooler* allows data sent to a printer to be buffered, thus freeing the PC to perform other tasks while the printer is busy. Like *Speed Disk*, it requires a 192K memory add-on board.

New VisiSeries

VisiCalc Business Companion Series

VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408/946-9000)

The most expensive element in many computer systems is neither the hardware nor the software. The time and expense of entering data, whether words or numbers, can add up to a very substantial investment. As a result, a company that offers an integrated line of software, able to make several uses of the same data, has a distinct advantage in the marketplace.

THE VisiDex program operates like a giant set of index cards . . .

VisiCorp (formerly Personal Software) is already pre-eminent. Their *VisiCalc* spreadsheet program is the world's best-selling software program.

That's a tough act to follow, but the "VisiSeries" is likely to open up a lucrative after-market from VisiCorp's plentiful supply of *VisiCalc* customers.

The VisiSeries is an interrelated set of business programs for planning, analyzing, forecasting, budgeting, and answering "what if" questions. Along with *VisiCalc*, the series for the PC now includes: *VisiFile*, *VisiTrend/Plot*, *VisiDex*, and *DeskTop/PLAN*.

VisiFile stores business records in a flexible format and can be used either for simple applications such as organizing a mailing list, or complex ones such as inventory management. A single diskette stores up to 12 files. A maximum of 32,000 records can be stored within each file. Users with 64K of memory can specify up to 48 fields per record and 256K users can specify up to 128 fields. The program is menu-driven and includes a "help" feature to aid user understanding. Available: third quarter 1982. Price: $300.

The *VisiTrend/Plot* program allows the user to take data entered through *VisiCalc* and create charts and graphs along with statistical reports including linear regression, standard deviation, mean, median, and the like. Displays may be saved on diskette for later use in presentations. Graphs may be printed with the IBM or Epson MX-80 with graftrax and several other graphic printers. Available: third quarter 1982. Requires: IBM Color Adapter for high-resolution graphics. Price: $300.

THE time and expense of entering data, whether words or numbers, can add up to a very substantial investment.

The *VisiDex* program operates "like a giant set of index cards that may be cross-referenced thousands of ways." Its applications include personnel information, sales reports, financial details, or short reports. Each "card" can be stored on disk and cross-referenced against a number of special words or dates (called "keywords"). Available: third quarter 1982. Price: $250.

The *Desktop/PLAN* program uses a series of menus to guide the user through a financial modeling session. The user creates a model, beginning with row and column titles, inputting initial values, and deciding on row and column formulas for later calculation. The computed-values file can be printed out with headers, footers, pagination, and other formatting aids. The program includes a high-resolution graphing feature that can be used with systems equipped with an IBM Color Graphics Adapter only. Available: May 1982. Price: $300.

MicroPro Releases WordStar

Popular word-processor now available for the PC

MicroPro International
1299 4th St.
San Rafael, CA 94901
(415/457-8990)

WordStar is to word-processing what VisiCalc is to spreadsheet programs—very popular.

Just before press time MicroPro International released its long-awaited PC-DOS version of the *WordStar* word-processing program. Although there was neither time nor space for a full review, we took a quick look at the program. It was tested with only an Epson MX-80 printer (from which the IBM printer was cloned). A more thorough review will be included when PC reviews several word-processing programs.

WORDSTAR *is to word-processing what* VisiCalc *is to spreadsheet programs — very popular.*

The PC version represents at least three firsts for its publisher, MicroPro International: This is the first time Micropro has released a non-CP/M version (it runs under PC-DOS); it is the first time MicroPro has used a computer's function or arrow keys; and it is the first *WordStar* to work with more than 64K of internal memory.

AS *a result, we recommend* WordStar *users have at least 92K of internal memory.*

The standard *WordStar* requires the use of the CTRL keys plus one or more letter keys for everything from a mundane backspace to stellar block moves. For computers other than the PC, even if they have arrow keys, it is necessary to use CTRL S for left arrow, CTRL D for right arrow, CTRL E for up, and CTRL X for down. These CTRL keys will work on the PC version, but they are duplicated by the arrows on the number pad.

The PC's ability to handle more than 64K of memory presents some advantages. We ran *WordStar* on both a 128K IBM and a 64K NorthStar Horizon. The PC was able to print one file while we edited another. When we tried this on the NorthStar, its printer sometimes paused while we typed.

Block moves—moving text from one part of a file to another—were easier on the 128K PC. The PC's extra memory made it possible to move text in larger chunks.

When we tested *WordStar* on a 64K PC, we were disappointed with the small amount of space for block moves and the slow response time when moving the cursor from the top to the bottom on a large file. As a result, we recommend *WordStar* users have at least 92K of internal memory.

WordStar does not make as extensive use of the PC's function keys as do some of the other word-processing programs. But they can be used for help menus, setting tabs, left and right margins, underlining, boldface, block markers, and

sending the cursor to the top or bottom of the file.

The cursor control keys on the numeric pad can be used to move the cursor to the top (home) or bottom (END) of the screen, to scroll up (PgUP) or down (PgDn) one screen full of text, and to move the cursor to the left, right, up, or down. This all may seem unexciting, but to old *WordStar* users it's a great improvement.

Despite the inclusion of some cursor and function keys, it is still necessary to use CTRL keys for a number of functions. To exit the editor and save a file to the disk, for example, it is necessary to type CTRL K D. This sounds cumbersome, but most people get used to it quickly. Nevertheless, one wonders why they didn't make more creative use of the PC's 40 function keys (programmers can hook up F1 through F10 as well as those keys in conjunction with ALT, CTRL, or SHIFT).

Choosing how to use the function and arrow keys is admittedly arbitrary, but I would have done things differently. MicroPro uses F10 to go to the top of the file and F9 to go to the bottom. This seems to be the reverse of what is logical. One would assume that the DEL(ete) key is used to delete the character over the cursor. Instead, it is used as a destructive backspace. The key that IBM designated for destructive backspace is redundant with the cursor to the left key. Price: $495.

IBM Announces New PC Products

Double-Sided Disk Drives, New DOS, and additional software.

IBM
Entry Systems Business
P.O. Box 1328
Boca Raton, FL 33432
(305/998-6007)

The diskette storage capacity of the IBM Personal Computer has been doubled, several new programming and application packages have been added and prices for two attachments have been reduced.

The doubling of diskette storage brings capacity per drive to more than 320,000 bytes. The new programming aids are an enhanced version of the Disk Operating System (DOS), a BASIC language compiler and new inventory control and accounts receivable application programs.

The IBM printer and 160,000 byte diskette drive now sell at IBM Product Centers for $555 and $450, respectively.

THE doubling of diskette storage brings capacity per drive to more than 320,000 bytes.

320K Diskette Drive

The new 320K diskette drive accomodates up to 327,680 characters of programs and data of 5-¼ inch diskettes, enabling users to store and update information on either 320K double-sided or 160K single-sided diskettes.

The greater storage capacity and programming flexibility of the new diskette drive means that applications currently running on the IBM Personal Computer can take advantage of larger data files, providing for future growth. The 320K diskette drive is supported by the new version of the DOS, as well as by the CP/M-86 and UCSD p-System, Version IV.0 operating systems. Price: $650.

New Disk Operating System Version

The Disk Operating System Version 1.1 by Microsoft Corp. supports up to two 320K or 160K diskette drives, or a combination of each. Version 1.1 with Disk and Advanced BASIC includes several enhancements.

With it, information can be written on or read from diskette drives at higher speeds, for faster processing and improved response times. In addition, DOS 1.1 provides asynchronous communications setup and support to direct parallel printer output to a serial printer, or to a remote printer via an available asynchronous communications adapter. The new DOS sells for $40.

INFORMATION can be written on or read from diskette drives at higher speeds, for faster processing and improved response times.

BASIC Compiler

The IBM Personal Computer BASIC Compiler by Microsoft Corp. enables users to write and test programs with the BASIC Interpreter and then compile the programs into machine-level code. This can improve program execution speeds significantly. Once they are distributed, compiled programs cannot be listed or modified. Price: $300.

IBM Announces Additional Business Series Software

Two application packages which can help companies manage inventory and accounts receivable were also announced for the IBM Personal Computer.

Inventory Control by BPI Systems, Inc. provides quick access to the status of any inventory item, including list prices and quantity on hand, enabling sales orders to be checked and changed as they are entered. Customer invoices can be created and stock levels adjusted automatically. In addition to alerting users to items which must be re-ordered, the program can also produce the appropriate purchase orders, as well as log back orders and merchandise received. Price: $425.

Accounts Receivable by BPI Sytems, Inc. helps manage a company's cash flow by tracking current and past-due receivables. In addition to providing information necessary for timely, accurate credit decisions, the program prepares monthly customer statements and past-due notices, eliminating many manual billing procedures. It also prepares monthly aged receivables reports, maintains detailed customer files, and produces rapid analyses of customer account status. Price $425./PC

Going FORTH

A different kind of programming language, PC-FORTH takes some getting used to. But many who learn it love it.

PC-FORTH, Laboratory Microsystems, 4147 Beethoven Street, Los Angeles, CA 90066. 213/306-7412. $100

The new FORTH programming language from Laboratory Microsystems for the IBM Personal Computer, *PC-FORTH*, is a clean, fast, very flexible language, which, if you're familiar with only BASIC and its kin, will take some getting used to. It's an example of what computer scientists call "threaded, interpretive languages" (TILs)—a class becoming more popular for microcomputers, especially in process control and data acquisition systems, because they are very efficient in the use of a computer's internal resources. FORTH runs very fast compared to conventional languages such as BASIC, and it requires less user memory for doing comparable work. It was originally developed by an astronomer for "real-time" control of scientific instruments and for heavy-duty data-crunching. Except by hand-coded assembly language, FORTH is still nearly unbeatable for microcomputer applications of that kind.

GLANCING at the clock, I noticed it was early evening; the next time I looked at the clock, it was early morning!

The one big disadvantage of FORTH is that its code is not easy to read or explain, especially for novices or those used to more conventional languages. It has been used so far mainly by systems programmers, engineers, hobbyists, and others willing to learn its particular idiom, having polarized those exposed to FORTH into either zealous partisans or vehement opponents of the language.

A FORTH program and how it works:

One of the traditional benchmarks used to test programming languages is the Sieve of Erasthotenes algorithm for selecting prime numbers up to a given upper bound. In FORTH it looks like this:

```
( Sieve of Erasthotenes, modified from PC-FORTH demo file )
:PRIME
 DUP 2/ 1+ SWAP ." Starting " CR
 1 DO
   DUP I 1 ROT
   2 DO
     DROP DUP I /MOD
     DUP 0 = IF DROP DROP 1 LEAVE
           ELSE
           1 = IF DROP 1
               ELSE
               DUP 0 > IF DROP 1
                       ELSE
                       0= IF 0 LEAVE ENDIF
                       ENDIF
               ENDIF
           ENDIF
  LOOP
 IF 4 .R ELSE DROP ENDIF
 LOOP
 DROP 7 EMIT CR ."Finished " ;
```

FORTH uses parentheses to delimit comments. :PRIME tells it that everything following up to the next semicolon should be compiled into the definition of a new FORTH word called PRIME.

DUP brings us to FORTH's major peculiarity, the *stack*. Imagine a well holding a spring-loaded stack of plates, each with one number written on it. You can *pop* a plate off the top (revealing the number on the next one down) or you can *push* a new plate with some number on it onto the top (hiding the previous top number), but you can't get at the submerged ones below the top.

FORTH's stack works like this: A number is interpreted as a command to push itself onto the stack, and DUP is a primitive that duplicates the top-of-stack (TOS in FORTH jargon). Thus, if we type `23 PRIME` to FORTH, after DUP the stack holds | 23 | 23 |.

The number 2 pushes itself onto the stack, leaving | 2 | 23 | 23 |. The slash is FORTH's division primitive; it eats the top two numbers on the stack and pushes their quotient, leaving | 11.5 | 23 |. 1+ simply increments the TOS, leaving | 12.5 | 23 |. SWAP switches the TOS with the second-of-stack (called 2OS) leaving | 23 | 12.5 |; point-quote causes characters up to the next double-quote to be output, and CR outputs a carriage return.

DO . . . LOOP is a FORTH control structure resembling the FOR . . . NEXT in conventional languages. The number 1 before it on the outer loop pushes itself, then gets eaten by DO to serve as a lower limit for the loop variable; then the 23 gets eaten to serve as an upper limit. The stack is now | 12.5 |.

I is a word that pushes the value of the innermost current loop counter (let's call it P). I 1 ROT pushes P and 1, then rotates the top three stack entries, leaving behind a stack state of | 12.5 | 1 | P |. This loop executes once for each number to be tested.

The inner DO uses 2 as a lower limit and 12.5 as an upper, leaving a state of | 1 | P |. DROP DUP leaves | P | P |. I pushes the current inner loop counter (the correct try at a divisor); let's call it Q. /MOD pushes the remainder and signed quotient onto the stack, leaving | P MOD Q | P/Q | P |. DUP replicates P MOD Q.

The code 0= IF DROP DROP 1 LEAVE tests P MOD Q to see if it's zero; if so, the stack is popped twice, a 1 is pushed, and the inner loop is left (a divisor has been found so P is non-prime).

If the remainder is not zero, the ELSE branch gets taken; the interpretation of the rest of that IF . . THEN . . ELSE is left as an exercise to the reader. The IF 4 .R ELSE DROP ENDIF prints the number being tested in a 4-character field if prime, else discards it, and the DROP 7 EMIT CR ." Finished " does a beep, a carriage return, and prints a termination message.

PC-FORTH, in fact, developed from an ancestor called *figFORTH*, the creation of a cabal of gifted and zealous partisans called the FORTH Interest Group. They produced a family of good, nearly compatible FORTH versions for a number of popular microprocessors including the 6502, 8080, and Z80 chips, as well as the 8086/8088 pair.

How TILs Work

Threaded interpretive languages operate by simulating a "virtual machine"; they replace hardware instruction sets with higher-level primitives, which are instructions to the imaginary machine simulated in software. By this maneuver, many dependencies on the architecture of a particular microprocessor are eliminated. The nucleus of primitives and a tiny interpreter for them gets written in each processor's machine code, but most of the code in a TIL is then written in the TIL itself. FORTH is the most well known and one of the oldest of the TILs.

The FORTH virtual machine defined by its primitives is often very different from the real machine it runs on, such as the 8088 chip. FORTH's machine has no internal registers for data and memory addresses; instead data is passed around on stacks (see box). It has "virtual memory," which means that it considers both memory cells and disk storage together as a very large memory with average access time slower than the former but faster than the latter. The primitives are much more powerful than machine instructions for the 8088 in that a single instruction can cause processing actions of greater complexity or subtlety, but because of the software "overhead" inherent in FORTH's design, they run somewhat slower.

THOSE exposed to FORTH are polarized into either zealous partisans or vehement opponents.

Above and beyond FORTH's built-in primitives, or words, you can define your own. Your user-defined words—composites of words already defined in the language—amount to mini-programs written for the virtual FORTH machine. Once they are defined FORTH can't tell them from its own predefined composites, and

FORTH will do nicely if you have reached the limits of what BASIC can do.

you can modify FORTH's initialization to include them. Even the FORTH machine's word interpreter can be changed; thus, not only can you write programs in FORTH, you can even gradually customize FORTH itself for your needs. And the customization becomes portable to other machines.

PC-FORTH in Particular

The *PC-FORTH* manual and two disks come in unpretentious but austerely classy packaging that will appeal to hobbyists and technical people. The documentation suggests the same attitude; it's carefully written, concise, and informative, but too short on tutorial material and examples for users with no prior programming experience. Also, no unifying overview of the system was offered to tie the painstaking documentation of individual pieces together (this will be remedied soon; the developer has shown me a draft of a FORTH overview they plan to include with the package).

Despite these problems I found learning the facilities relatively painless. A useful quick-reference card is included. A number of excellent demonstration programs (including a couple of enjoyable games) and systems tools including three editors, a stack tracer, an assembler, and a decompiler are provided. More advanced programming tools will be released in the near future as well as some additions to the documentation. Regular system updates and enhancements will be sent gratis to registered users, an enlightened policy I wish more developers would follow.

Eric Raymond is a freelance journalist and computer programmer based in Philadelphia.

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The Key to the PC

IBM's Technical Reference Manual lets you in on many of the Personal Computer's inner workings.

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IBM Corporation
Boca Raton, Florida
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"Hello?" "Yea, this is Steve from the Sears Business Center. I wanted to let you know that the *IBM Personol Computer Technicol Reference Monuol* arrived today. Since your name was on the waiting list, I thought I would give you a call."

"Great!" I said. "I'll be over to pick it up tomorrow afternoon."

"Well, I would suggest you come right now," said Steve. "You see, the manuals are going like hot cakes . . ."

The salesman was not fooling. When I arrived at the store, there were others ahead of me, each one plopping down $52.49 ($49.99 plus tax) for a fresh new copy of the manual. I noted with interest that one of the fellows purchasing the manual was the president of a company that designs interfaces for minicomputers. I wonder what was on his mind . . .

Arriving at home, I quickly removed the protective wrapping from the manual. As with all of IBM's Personal Computer documentation, the manual is packaged in the familiar "book and binder" scheme. As I removed the manual from its binder, I could feel the excitement building, as if I were about to go on an exciting journey, a journey in which the "treasure" would be the valuable secrets of how the IBM Personal Computer operates. Glancing at the clock, I noticed it was early in the evening; the next time I looked at the clock, it was early in the morning!

The manual is packed with useful information. After the preface, an extensive table of contents, figure listing and table listing, the manual begins with Section One, "Hardware Overview." This section reviews each component of the computer. All information in this section is brief, just enough to arouse your interest. The section ends with a "System Block Diagram," which shows the various options available with the personal computer.

Section Two, "Hardware," begins with a discussion of the main system board, briefly covering each module of importance. Included is something called a "System Board Data Flow" diagram, which shows in detail how all the components on the main system board are connected.

The section then covers the bus signals available on the five card slots on the main system board. Interestingly, IBM refers to the five slots as the I/O (input/output) Channel, a term that is familiar to IBM's mainframe customers. All 62 pins of the I/O Channel are defined with a signal name and description. Also included is a diagram showing the locations of the major components on the main system board.

The next discussion is about the keyboard. The keyboard has some interesting features, including an Intel 8048 single-chip microprocessor. After reading about the keyboard and its "scan codes," I wondered who would be the first to connect a "musical" keyboard to the IBM PC.

The cassette interface and the speaker interface are covered next. The I/O Address Map and the System Memory Map are then introduced. The most striking feature of the Memory Map is all the unused space—waiting for system expansion. Also included is a discussion of the various switches and their settings on the main system board. Finally, the power supply is discussed, including the power supply connectors and pin assignments.

YOU SEE, *the manuals are going like hotcakes . . .*

The remaining topics in Section Two deal with the I/O Channel boards.

First on the list is the IBM Monochrome Display and Parallel Printer Adapter. A discussion of the overall features are presented, including a block diagram. Next, the specifics are covered: signals and loads on the I/O Channel, data rates, interrupt, and DMA response. Information vital to the programmer is also included: modes of operation, programming considerations, memory requirements, and the I/O address and bit map. Specifications of the IBM Monochrome Display are also listed.

The Color/Graphics Monitor Adapter is discussed next, again with the same depth and detail. Next is a discussion of the Parallel Printer Adapter and the IBM 80 CPS Matrix Printer. The 5¼-inch disk-drive adapter, drive and diskettes are discussed. In addition, memory expansion options and the Game Control Adapter are covered. The section ends with a detailed discussion of the Asynchronous Communications Adapter.

Section Three, "ROM and System Usage," is a software developer's dream come true. The most important information here is a discussion of the ROM (read only memory) BIOS (basic input/output system). Parameter passing and interrupts are covered. The information on the interrupt vectors is especially complete, including both discussions and listings. Other topics covered include cassette logic, keyboard encoding, and detailed memory maps. In short, if you plan to write systems software for the PC, this section, combined with Section Two, will save you many hours of "searching through the ROMs."

The manual ends with many useful appendices. Appendix A, "ROM BIOS Listing," is a complete, thoroughly commented source listing of the BIOS. That's right, no more disassembling ROMS to decode the I/O routines; they are already listed for you.

Appendix B, "Assembly Instruction Set Reference," contains both a model of the 8088 registers and a listing of its instructions and op codes. However, no descriptions of the instructions are given, so Intel's *iAPX 88 Book* (or equivalent) may be necessary if you are not familiar with 8088 assembly language programming.

Appendix C, "Of Characters Keystrokes and Color," contains an assortment of tables listing various symbols, keys, and characters with their corresponding hex and decimal codes.

Appendix D contains the complete schematic diagrams for the circuitry of the Personal Computer. This includes schematics for the system board and the plug-in boards now available from IBM. Those interested in computer hardware will have hours and hours of enjoyment studying the schematics.

The manual concludes with Appendix E, "Unit Specifications," a glossary, a bibliography, and an index. That's right, an index, something new to us microcomputer users. Finally, in typical IBM fashion, a product comment form is included. This allows you to comment on the manual and/or offer suggestions for improvement.

Obviously, the *IBM Personal Computer Technical Reference Manual* is packed full of useful information. However, I have heard a few complaints.

For example, although the bus signals are defined, computer hardware engineers point out the absence of any timing diagrams. (A bus timing diagram or "bus spec" defines the best and worst case times allowed for bus signals.) Even so, absence of such information does not seem to have impeded development of products for the Apple II computer, and I doubt that it will for the Personal Computer. Also absent from the manual are parts lists and diagrams showing the exact locations of components on the printed circuit boards. And yes, there are the usual typos, but that is to be expected in a first edition—even in the "computer age."

I am very much impressed with the *IBM Personal Computer Technical Reference Manual*. It is mandatory reading for anyone wishing to work intimately with the PC's extensive hardware and software features. This manual could even serve as an excellent textbook at the college level. Just imagine the student response to a computer engineering or computer science course called "The IBM Personal Computer—Hardware, Software, Applications."

Norman McEntire works with Microman Productions in Dallas.

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Book Briefs

Lay Of The Word-Processing Land

Introduction To Word Processing
Hal Glatzer; Sybex
205 pages; $12.95

Hal Glatzer is a journalist first and a technical type second. He has thoroughly explored the world of word-processing and mapped it out in clear, clean prose. *Introduction To Word Processing* is comforting to the eye, amply illustrated with photographs and uncluttered diagrams. In general, Glatzer avoids descriptions of particular systems; you won't find an analysis of *WordStar* here, for example. Rather than describe individual towns on this map, he is concerned with the lay of the land, tells you what lies in each direction, explains the difference between a large city and a hamlet, gives you a good compass, and leaves you prepared to do more detailed research on your own.

Thus chapter five, entitled "Which Type of Word Processor is Best," climbs from a concise explanation of the workings of electric typewriters with one-line editing and mag-card storage through similar treatments of dedicated word-processors, micros, minis, and mainframes. From the vantage point reached by the end of the chapter, Glatzer points out the pros and cons of each type of system, depending on the user's needs, and offers suggestions for benchmark comparisons.

Other chapters provide similarly informative overviews of the history of word-processing, the kinds of printers available, cost-effectiveness of word-processing, the various functions of word-processors, e.g., insertions, deletions, lexicons, global search, and more.

Introduction To Word Processing has 12 chapters in all plus a good index, a helpful glossary, and, what is most welcome, an 11-page bibliography.

You Don't Own What's In Your Head

Trade Secrets
James Pooley; OSBORNE/McGraw-Hill
213 pages plus appendices; $19.95

James Pooley is an attorney who wrote *Trade Secrets* as a guide to help both employees and employers avoid disputes over "proprietary information."

Trade Secrets is divided into six chapters followed by nine appendices, each an example of a letter or document, e.g., a typical confidentiality agreement.

The book begins by defining proprietary information as "commercially useful ideas." Proprietary information may be a technological breakthrough or a list of customers. The point is that it is an asset and must be protected as such. But first it must be identified. Throughout the book Pooley emphasizes the importance of a firm's keeping a detailed inventory of its proprietary information.

The second major theme of Pooley's book is that appearances are at least as important as fact in deciding trade secrets cases, should they go to trial. According to Pooley, a history of stern warnings to employees concerning the seriousness of secrecy weighs as heavily with judge or jury as the value of the secret itself. If you act as if your secrets are worth keeping, the judge may be sufficiently impressed simply by your earnestness to grant the injunction you want.

Pooley's third major theme is that trade secrets law is relatively new, especially as it applies to rapidly changing technologies, i.e., electronics. Furthermore, many judges and juries do not understand the technologies involved. According to Pooley, judgements are often subjective, based on a judge's biases or even his mood that day. And each judgement is unique to the individual case. No reliable body of precedence has accumulated to guide judges. The upshot is that a trade secrets case is a risky proposition, as well as an expensive one.

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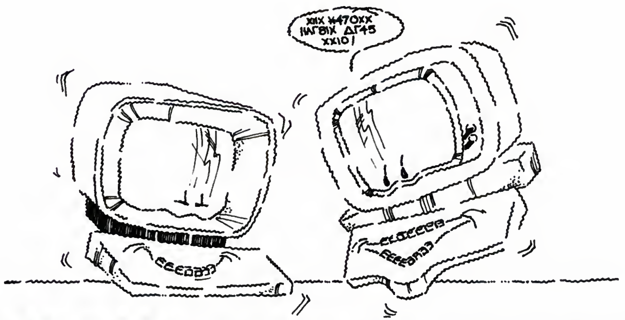

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EDITED BY KATHLEEN BURTON

Club News

New clubs springing up across the land (like crocuses).

PC has received word of five new clubs in the United States and Canada:

Indianapolis: Jo Spangler, IBM PC Users Club, Microbase Software, Inc., P.O. Box 40353, Indianapolis, IN 46240 (317/877-4304). *Northern New Jersey:* Irving Lang, 7 W. 45th St., New York, NY 10036 (212/581-2909). *Ontario, Canada:* Tony Bagshaw, P.O. Box 1376, Station B, Downsview, Ontario, Canada M3H 5V6. *San Francisco Bay Area:* Christian Du Lac, Box 155, San Francisco, CA 94101 (415/668-4647). *Suffolk County, New York:* Marvin Freifeld, P.O. Box 77, Smithtown, NY 11787 (516/724-0574).

Ongoing Clubs

PC has learned from various subscribers that several new clubs have already begun meeting. (Bet there are more acronyms in this section than you can translate.)

Baltimore, Maryland: Future meetings of the Baltimore PC will be held temporarily on the first Tuesday of each month at ComputerLand, 1516 York Rd., Lutherville, MD. Membership is $5. A club newsletter, the I/O News is published monthly.

Penn State: The Microcomputer user Group #18, better known as MUG, will meet regularly with scheduled lectures. For information, contact Penn State University, 215B Computer Bldg., University Park, PA 16802.

Santa Barbara, California: The Santa Barbara Computer Club for IBM PC users would like to affiliate with other user groups. Contact Stu Swartz, Santa Barbara Community College, Computer Sciences Dept., 721 Cliff Dr., Santa Barbara, CA 93109 (805/966-2919).

Stamford, Connecticut: Meetings are held every third Tuesday of the month at ComputerLand, 111 High Ridge, Stamford. Future agendas will include matching users of similar interests. Contact Dave Foulger, 69 River St., New Canaan, CT 06840.

Bulletin Board

For technical information call the BBS, 3277 Victor Circle, Annandale, VA 22003 (703/560-0979). This bulletin board is open 24 hours a day, 7 days a week, and will take messages and disseminate information bulletins.

Autumn Revolution '81 Update

Autumn Revolution '81 is an independent users' group for the IBM PC headquartered in Tulsa, Oklahoma. Organizer Dan Perry has informed *PC* that membership is burgeoning, and a toll-free "technical hotline" is now open. For $1 per minute ($5 minimum), members can call and receive user information from a qualified technical person.

Membership will be accepted over the hotline, with fees of $30 for one year, $55 for two years, and $80 for three years. Besides use of the hotline, membership includes a subscription to the newsletter, access to software and technical libraries, and user training. Contact Autumn Revolution '81, P.O. Box 55329, Tulsa, OK 74155. Hotline number: (800/331-2347).

(Good) Deals

Starware is offering substantial discounts to members of IBM PC user groups on *WordStar*, Maxell Diskettes, Houston Instruments Supplies, and Tall Grass Technologies (202/337-5300).

Consider the Source

PC has learned that an IBM PC *Gazette* is now on The Source. To leave messages, call SMAIL TCS668. (To read the *Gazette*, enter PUBLIC from COMMAND level, Select OPTION 1, and at COMMAND level, enter POST READ IBM.)

Walking Through The Open Door

Frederick Merchant, program creator, and Bob McCullough and associates.

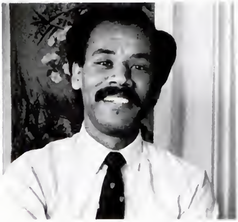
IBM's welcoming of all comers to make products for the Personal Computer has spawned a great deal of invention, both frantic and leisurely. Many of the programmers and hardware manufacturers who've entered this booming business have announced or actually delivered their products; many others are hinting broadly or coyly declining to comment. One result of all this hoopla has been a rumor mill that may perpetually outstrip the real developments in both quantity and quality.

Two of the vanguard in preparing software and hardware products for the IBM PC have delivered known quantities, however. They are Frederick Merchant, whose *Personal Mailer* is a powerful program that handles names and addresses in numerous ways, and Dr. Robert McCullough and his associates at Datamac Computer Systems, whose peripherals for the PC include memory and communications boards and expanded disk storage. These small-scale entrepreneurs are among the pioneers who have brought their products to market within a few months of anyone's having a PC to work with.

A Specialized Data Base

Fred Merchant calls his *Personal Mailer* program a "specialized data base." This description is appropriate, because the program has the sorting and data manipulation features of many data base programs, though it is limited to the name-and-address format. One excellent feature of *Personal Mailer (PM)* is its built-in utilities, which allow the user to transfer an existing name-and-address file to the *PM* file format or to make any *PM* file into a plain file readily accessible through the Personal Computer's disk operating system (PC-DOS). This flexibility means that anyone can take files created with some other program and use *PM*'s features on them or transfer a *PM* file to PC-DOS form for use with a word-processor or other program.

In addition, Merchant's program, written in the BASIC language, contains sort and search features and coding and comment sections in each record, which make it desirable for small-business mailing lists as well as personal name-and-address files. Each record has 11 sections (usually called fields), including last name, first name, an optional line for company name or title, street, city, state, zip code, home and work phone numbers, and the code and comment lines. The length of each of these fields can be varied, with a maximum of 36 characters in any field. Each record is automatically assigned a number, and Merchant has also taken advantage of the PC's "date" utility to date each record when it is entered or revised.



Frederick Merchant

I'D HATE to design something, push it out there, and have nobody want to use it.

Versatile editing and printing controls allow users to change the format of files or update individual records easily, and each file can be protected with a password. All aspects of *PM* are well documented with on-screen menus, and the program is straightforward in organization. In short, *Personal Mailer* promises to be a highly useful program for PC owners, and its preliminary price of "less than $100" should make it affordable for a wide spectrum of businesses and individuals. Initially, Merchant plans to distribute the program through his firm, Computer Age of San Francisco.

Spare-Time Programmer

Fred Merchant estimates that development and in-house (alpha) testing of *Personal Mailer* took him about 250 hours, spread over some three months. He managed to find 20 hours per week for work on the program, which is definitely a secondary career interest for him. His first obligation, and his ultimate profession, is medicine; Fred is currently beginning his third year of medical school at the University of California.

Merchant began his computing career several years ago with one of the early Apple IIs. Interest in medical work was paramount in his first programming effort for the Apple, he recalls. "I got one of the first disk drives and sat down to write a program which I thought could be used in a physician's office for patient recall." The main component of the program was a name-and-address file, which a doctor could use to send reminders to patients who must return for regular checks of their medical status.

"The program evolved over a period of years," Merchant notes, "to become a mailing-list program for an Apple users' group in Seattle, where I lived at the time, and now it's used by many Apple users' groups all over the country." This program, named *Apmail*, was what Fred calls a "first-generation" type of mailing-list handler. His new *Personal Mailer* has features that he developed from feedback to *Apmail* and from his own experience in programming and computing. (Continues)

Would you or someone you know be a good subject for a **PC Profile***? PC welcomes suggestions for people to be featured in this series—anyone whose use of an IBM Personal Computer would prove interesting or helpful to readers. Send your recommendations to PC Profiles, 1528 Irving St., San Francisco, CA 94122.*

Merchant chose the PC to begin his work on a new generation of program. "When the PC became available, it had a lot of power to do a lot of different things, so I wanted to tap that power and try to go into what I call the second- or third-generation type of program. This means it's a lot more user friendly, has a lot more flexibility and portability of files, and is expandable."

Because he had written and refined the *Apmail* program, Fred expected merely to adapt that as the basis for *Personal Mailer.* "I thought it would be easy; I would just slightly redo what I'd done on the Apple for the PC. But things never work that way. *Personal Mailer* is actually a completely rewritten code. It has no resemblance at all to the first-generation mailing program on the Apple."

Thinking on the Bus

The bus plays a part in Merchant's program development, but it's not the cabinet for circuit boards in a computer—it's the city's transportation vehicle. "I'm not so organized that I write everything on a nice, concise flow chart, but I like to take notes. I may be on the bus going downtown or to school or whatever, and an idea will pop into my mind; I'll just jot down something.

We took the cover off and looked at everything.

Later that will trigger my mind as I'm working on the program." Even when he's at the keyboard, Merchant points out, "I'm not one of the programmers who turns on the PC and starts typing. I have to have an outline or concept of how it's going to be done, usually in some sort of modular fashion."

He also makes use of techniques and information that other programmers have developed. For example, in *Personal Mailer* he used an adaptation of the "soundex algorithm," a formula that identifies words or names that sound alike, such as Peterson and Petersen. "I try not to invent the wheel any more than I have to," Merchant observes.

So far Fred Merchant's PC time has been devoted to his mailing-list program, but he expects to keep learning and developing programs for his own use in medical practice and for general use, as well. "I'm very much interested in medical information science—how you can incorporate computers into the medical environment in a friendly sort of way, so that neither the physician nor the patient is apprehensive about using them. I see that as a wave of the future."

Merchant offers one bit of advice to other PC users who are developing programs for themselves or for commercial use. "Become familiar with your machine; learn its capabilities—what it can and cannot do. This necessitates a careful perusal of all the documentation that goes with the PC so that you really get to know it. If you know all the things it can do, you're in a better position to sit down with the computer and come up with a program that you might want to develop."

A Home for Hardware

Becoming familiar with the PC is exactly what the staff members of Datamac Computer Systems were doing when they decided to build a memory board for the new IBM computer. Vice President of Sales Bob Lindgren recalls the firm's original interest in the PC: "Back about the first of October, we looked closely at the IBM announcement, just for our own internal analysis and review, because we have a computer that we market. And we noticed some deficiencies in the IBM product line—the most obvious was the memory."

Computer memory products are nothing new to the Datamac staff. The company's president, Dr. Bob McCullough, was the designer of the first add-on memory for the IBM System/360 and 370 (at an earlier point in his career and when working for another firm), and the other five principals at Datamac have extensive experience in the computer field. So the group knew it could meet the technical challenge of making memory components for the PC; its first concern was with marketing the products if Datamac were to make them.

After talking with people at the corporate headquarters of ComputerLand and determining that the chain's stores could sell products for the PC that were not made by IBM, Bob Lindgren notes that the Datamac crew began to think seriously about making PC memory boards. "Then we thought about how we could do it, technically," Lindgren says. "So Dr. Bob and I went to a ComputerLand store that had a PC and looked at the system. We took the cover off and looked at everything. We also got our hands on the technical manual before that was out officially."

I WANTED to tap the PC's power and go into a second- or third-generation type of program.

Although they didn't have a PC in house yet, the group held a product planning session based on their knowledge of general computer technology, the information in the technical manual, and observations from a peek inside the machine. The session ended with a tentative decision to make memory boards for the PC.

"Dr. Bob went away on a Friday and came back on a Monday with the schematics and everything done," Lindgren remembers. Adds McCullough: "I've had a little practice."

Suddenly a New Division

Bob McCullough had spent a weekend designing the memory board, thereby creating the first offering for his firm's new Peripheral Products Division. Previously Datamac had concentrated on marketing its own microcomputer and planning for another, more powerful micro to add to the product line.

Once the new product's design was worked out, the Datamac staff put together a working board to show ComputerLand headquarters. Concurrently, they sent out announcements of their expandable PC memory boards—available in configurations of 64K, 128K, 192K, or 256K—to individual ComputerLand stores. The response was immediate.

"The day after we mailed out our announcement, we started getting calls with orders for 10 or 20 boards or whatever," Lindgren states. "Then we knew that we really had to start producing."

McCullough recalls that they had not anticipated such an immediate or large demand. "For the first two months we were production-limited. Primarily, ComputerLand stores were selling the board with the computer as it was being sold, as opposed to the computer going out with the end user and then the end user deciding to get a board."

In recent months, Datamac's production and testing facilities have been able to keep up with demand, which consists of orders from individual ComputerLand stores and the corporate division, and from consumers who do not have a retail outlet handy. Lindgren estimates that the firm has sold more than 2,000 memory boards for the PC since late 1981.

Disks and Communications

Datamac's success in selling its memory boards has led to other products for the PC. One of these is a 5¼-inch Winchester hard disk that fits into one of the PC's disk-drive slots; it is available with 6, 12, or 18 megabytes of storage. The hard disk can be used in combination with a floppy disk drive in the other disk slot, and the necessary controller board and cables also fit inside the computer's cabinet. Because the hard disk requires its own power supply, however, a small, thin power unit is attached to the back of the PC cabinet for this purpose.

Dick Andreini, vice president for marketing, points out that this outside power supply requires no modification of the PC's cabinet. "As a matter of fact, there happen to be four screw holes of unknown origin on the back of the PC in that very location. We use those to attach the power supply, so we're not modifying the back of the system or drilling any holes."

Two additional products are in the works for the PC at Datamac. One is software designed to expand disk storage by allowing use of both sides of the disk; this must be used with double-sided drives. The other new development is a communications board, which has the option of a second line, so that a modem and another device, such as a printer, may be used simultaneously.

Bob McCullough is confident that his firm will continue to design and manufacture hardware for the PC, but he is reluctant to predict what those products will be. "The products we make in the future for the PC are going to be primarily market-driven. As an engineer, I hate to design something and push it out there and have nobody want to use it. We're in business to supply things that people need and want. We don't want to get into an engineering sandbox."

For further information:
Frederick Merchant, Computer Age of San Francisco, 825 Masonic Ave. #6, San Francisco, CA 94117 (415/921-7792).
Datamac Peripheral Products Division, 680 Almanor Ave., Sunnyvale, CA 94086 (408/735-0323).

EDITED BY ANDREW FLUEGELMAN

User-To-User

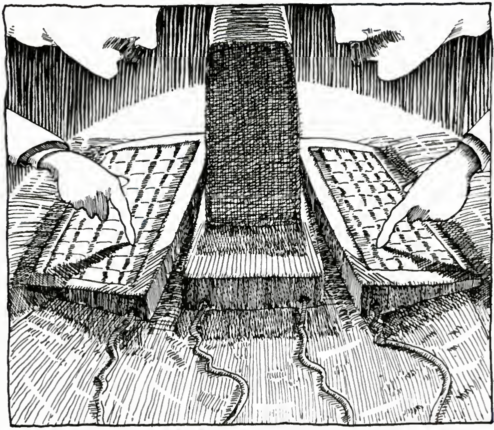
Shared discoveries and questions about IBM personal computers.

An Invitation to Share . . .

This regular "User-To-User" department will pass along field-tested innovations, tips, caveats, and questions concerning IBM Personal Computers, contributed by PC readers. Already there has been a wellspring of insights, a few gripes, and some unanswered questions flooding our mailbox. We have inaugurated this department as a place to share them.

Before sampling this month's offerings, a word might be in order regarding the "philosophy" of this department. We recognize that computer users, like automobile owners, have different involvements with their machines. Some are content knowing how to change a tire or learning how to drive in snow. Others might want to play with adjusting the carburetor. A few might even get down to the grimy business of rebuilding the differential. (At least with computers you don't need a set of Allen wrenches, and you can forget the Boraxo.)

We'll try to serve all interests in this space, but we will avoid purely theoretical discourse. We simply want to pass along whatever makes the little beast work better. If the going gets seemingly technical, don't be put off—better yet, stick with us. Anyone can (and should) learn to change a tire.



Disk Speedup

The undisputed celebrity of this month's user tips is SPEEDUP—14 lines of BASIC program code that will make your disk drives perform their chores in half the time. The program popped up on Wes Merchant's Annandale, Virginia IBM Bulletin Board Service (see *Club News*). It was sent there by Chris Carson of Aurora, Colorado, who found the program circulating in the Denver area, where it evidently originated from the Apparat store there. Good news travels fast. Here it is:

```
05 REM SPEEDUP DISK-ZAP
10 FOR I=1 TO 37:READ N:C=C+N
15 NEXT:READ N: IF N<>C THEN 40
20 RESTORE:OPEN "R",1,"SPEEDUP.COM",1
25 FIELD 1,1 AS N$:FOR I=1 TO 37
30 READ N:LSET N$=CHR$(N):PUT 1
35 NEXT:CLOSE:PRINT "Created":END
40 PRINT "** ERROR - Verify Data **":END
45 DATA 186,18,0,184,30,37,205,33,139
50 DATA 250,190,26,1,185,11,0,243,164
55 DATA 51,192,205,19,139,215,205,39
60 DATA 223,2,37,2,8,42,255,80,246,0,4
65 DATA 3866
70 END
```

Even if you've never touched BASIC, this gem is too good to pass up. To create the program, place the PC-DOS disk into your A: drive and load BASIC by typing Basic and hitting ENTER. Then type each of the lines above, exactly as written. Hit ENTER after each line. When you've hit ENTER following line 70, hit the F2 key to run this short program.

If you get a message saying ** ERROR - Verify Data ** then you've made a mistake copying the numbers in lines 45 through 60. Otherwise, you will have created a new file on your PC-DOS disk called SPEEDUP.COM.

Go back into PC-DOS by typing system and ENTER and run the new program by typing speedup and ENTER. Now load and run any program or PC-DOS utility and be amazed. Your disk drives will miraculously zip along at almost double speed, singing instead of groaning.

Exactly how much faster? Well, for example, to format a new disk with the /s option: 25 seconds instead of 45 seconds. To copy the PC-DOS disk via the "DISKCOPY" command: 42 seconds instead of 83. To copy the entire PC-DOS disk with COPY *.*: 139 seconds instead of 206. If you're a speed and performance fanatic (who isn't?), you've just made up to a 100 percent improvement in your disk operations.

According to Chris Carson, the program works its magic by reloading the diskette parameters table in PC-DOS. IBM programmed the step rate for the machine's Tandon disk drives at eight milliseconds; *SPEEDUP* shortens this to six, still within the Tandon-rated minimum of five milliseconds. The program also sets the head settle rate to zero milliseconds, which is the Tandon minimum rating. (IBM's conservative default setting is 25.)

The obvious question: Will this routine send smoke out of your drives or garble your prized data? I can only report that Chris and his Denver-area friends have been using *SPEEDUP* regularly for several months with no reported ill effects or glitches, and that I've become a total *SPEEDUP* convert. Nevertheless, it should be made clear that neither Mr. Carson, I, nor *PC* magazine warrant this modification. You undertake it entirely at your own risk and, we hope, to your delight.

Note: If you load and run a program by hitting Ctrl-Alt-Del (as you do with *EasyWriter* and *VisiCalc*), the system will reset, and *SPEEDUP* will no longer be in effect. Once you've run *SPEEDUP* and see the PC-DOS A> prompt, insert your program disk in drive A: and type command and ENTER. Your program will load and run its disk activity in about half the time. You can also include speedup as the first instruction in a disk's AUTOEXEC.BAT file (PC-DOS manual, pages 2-16)—provided, of course, that you copied the SPEEDUP.COM file to that disk.

Bug Hunt

Now for the bad news. A number of unnerving reports have surfaced that cast doubt on the ability of IBM Personal Computer BASIC (version D1.00) to calculate and reason correctly. The bug that got the most publicity was reported by Andrew Pollack in the April 5 *New York Times*. It seems that BASIC can't always divide .1 by 10 and come up with the right answer.

IBM Debuggs BASIC

IBM has corrected the BASIC bugs. BASIC 1.05 is now available from IBM dealers.

We contacted David Walonick of Minneapolis, the purported discoverer of the bug, and he provided this test program:

```
5 'Basictst.100
10 DEFDBL A 'defines A as double precision
20 READ A
30 PRINT "A = "; A
40 PRINT "A = ";  :  PRINT USING
   ".###"; A
50 PRINT "A divided by ten = "; A/10
60 PRINT "A divided by ten =    "; :
   Print Using ".###"; A/10
70 END
80 DATA .1

RUN
A=.1
A=.100
A divided by ten = .001
A divided by ten = .010
```

Line 20 reads the value .1 into variable A. Line 30 prints A via the normal PRINT statement and line 40 prints A with PRINT USING. So far so good. But in line 50 we try to print the value of A divided by 10. The answer should be .01—not .001 as the program run indicates.

> ***We shouldn't let the PC's forgiving attitude about lower case lull us into complacency.***

The problem is evidently with the output rather than the calculation, since printing the value of A/10 with PRINT USING does produce the correct result. Also, the bug seems to occur only when double-precision (more than seven-digit) numbers are involved.

My fooling around with this bug disclosed that the problem is not as severe if you assign a value to A directly, as in Basictst.101:

```
5 'Basictst.101
10 DEFDBL A 'defines A as double precision
20 A=.1
30 PRINT "A = "; A
40 PRINT "A = "; : PRINT USING
   ".###"; A
50 PRINT "A divided by ten = ";A/10
60 PRINT "A divided by ten = "; :PRINT
   USING ".###"; A/10
70 END

RUN
A=.1000000014901161
A=.100
A divided by ten=1.000000014901161D-02
A divided by ten=.010
```

The math is accurate this time, although you do get meaningless digits after eight places if you use PRINT instead of PRINT USING. (The math bug will crop up, however, if you use INPUT to get a value for A.)

David Walonick has been asked by IBM to go down to Boca Raton to help smoke out the extent of the problem. Meanwhile, the best advice we can offer is to be very careful using double precision numbers, and experiment to see whether various methods of input or output avoid errors.

This bug led me to experiment further with the way BASIC treats double precision numbers, and I chanced upon more traps awaiting hapless number crunchers. Consider Basictst.200:

```
[ENTERED AS]
5 '  Basictst.200
10 DEFDBL A 'defines A as double precision
20 A=.00000001
30 PRINT "A = "; A
40 PRINT "A = "; : PRINT USING
   ".########"; A
50 END

LIST
5 'Basictst.200
10 DEFDBL A 'defines A as double precision
20 A=1E-08
30 PRINT "A = "; A
40 PRINT "A =   "; : PRINT USING
   ".########"; A
50 END

RUN
9.999999939225290-09
A=.00000001
```

The first listing shows the program as I entered it on the screen. Since A is an eight-digit number, it is properly double precision. When you list the program, however, A has been converted into exponential form. (Note, however, that the designation E is used instead of D, as pages 3-11 of the BASIC manual would lead us to expect.) When we want to display the value of A, the PRINT USING statement is, once again, the only way to avoid meaningless output.

Are you ready now to send your machine into a nosedive? Delete line 10 from the program above. Even without the definition statement, BASIC should make A a double precision number. When we run the modified program, however, the existence of the PRINT USING statement evidently throws the program into a hopeless crash. (The only recovery is a cold start.)

We've saved the most bizarre bug for last. Notice of it came to us from two sources, Chris Kantack of Belle Plaine, Iowa, and Alex C. Seggie of Freelton, Ontario. If you've got your machine up and running again, you can amuse and confound yourself by running Basictst.300:

```
LIST
5 ' Basictst.300
10 INPUT "B = "; B
20 PRINT "A = "; A
30 IF A = 0 THEN PRINT "A equals zero"
   ELSE PRINT "BUG !!!"
40 PRINT : GOTO 10
50 END
RUN
B=? 1
A= 0
A equals zero
B=? 2
A= 0
A equals zero
B=? 3
A= 0
BUG!!!
```

Resetting BASIC for Serial Printers

The following contribution from Dr. Willard A. Brown of Western Washington University might look frighteningly technical if you are new to computers, but it could help enormously if you have a serial-type (RS 232) printer you want to use with your PC. If you have such a printer but are not technically inclined, plunge on fearlessly anyhow: Type in Dr. Brown's two programs letter for letter without worrying what they mean, saving each to disk under the names shown. Then, at the start of every computer session in which you will use the BASIC language, load the disk with these two programs first. They will make your serial printer operate with all the convenience of IBM's standard parallel-type printer.

When I bought my IBM PC I intended to make use of the serial-interface daisy wheel terminal I already owned. Using the RS 232 port with the LIST 10-, COM1:300,N,8,1 statement worked fine (as long as my terminal was set to the "auto line feed" option, and with the slight bug that it wouldn't print the final character in the file.) However, as I became more familiar with the system, I realized some nice features were not available, namely the PrtSc variants at both the BASIC and PC-DOS levels.

With the help of the *IBM PC Technical Reference Manual*, I developed the instructions that follow.

Listing 1 is an automatic-starting set of operating system instructions that makes the usual request for the date, then goes into BASIC to RUN a program, SETUP2, that equips the computer to use the serial printer.

The instructions in the setup program: (1) Supply the needed parameters for opening and initializing the RS 232 port; (2) Establish the WIDTH for the RS 232 port; (3) Change the PC-DOS instructions that start at 60H so that the address for the parallel printer is made to point instead at the RS 232 port; (4) Let the hardware status information at 40:8H "lie" to the system concerning the presence of a parallel printer; (5) Insert a set-interrupt-enable-flag instruction at 100H; (6) Set register AH to 01H to indicate to the RS 232 subroutine that a character is ready to be typed; (7) Branch to the RS 232 subroutine; (8) Change the interrupt vector at 5CH to point to the new instructions at 100H.

YOUR serial printer will operate with all the convenience of IBM's parallel-type printer.

The reason for the somewhat convoluted auto-start routine is that BASIC doesn't sense that its entry parameters have been changed until it is reinvoked.

The two following programs also enable LLIST and LPRINT in BASIC. And if you then use the SYSTEM command, the control-P option is enabled in PC-DOS.

—Dr. Willard A. Brown

LISTING 1

```
AUTOEXEC.BAT
DATE
BASICA SETUP2
BASICA
^Z
```

NOTE: To enter the character shown as "^Z" in the listing above, type F6, then return.

LISTING 2

```
SETUP2.BAS
10 OPEN "COM1:300,N,8,1" AS #1
20 WIDTH "COM1:",80
30 DEF SEG=&H60
40 POKE &HD,&H40 'DOS PARALLEL PRINTER
   VECTOR CHANGE
50 POKE &HE,&H1
60 DEF SEG=&H40
70 POKE &H8,&HF8 'TELL BASIC THAT THERE IS
   A PRINTER
80 POKE &H9,&H3
90 DEF SEG=&H0: POKE &H100,&HFB 'RESTORE
   THE FLAGS
100 REM AN INCONSISTENCY EXISTS IN ROM BIOS
    CONCERNING
110 REM THE MEANING OF THE AH REGISTER IN THE
    RS 232
120 REM AND THE PARALLEL PRINTER PORT
    SUBROUTINES
130 REM THEREFORE THE FOLLOWING LINE
140 POKE &H101,&HB4: POKE &H102,&H1
150 REM THE NEXT THREE LINES SIMULATE THE
160 REM PRINTER PORT INTERRUPT VECTOR
170 POKE &H103,&HEA: POKE &H104,&H39
180 POKE &H105,&HE7: POKE &H106,&H0
190 POKE &H107,&HF0
200 REM NOW TELL THE INTERRUPT HANDLER
    TO JUMP
210 REM TO 100H FOR ITS NEW INSTRUCTION
    SEQUENCE
220 POKE &H5C,&H0: POKE &H5D,&H1
230 POKE &H5E,&H0: POKE &H5F,&H0
240 SYSTEM
```

```
B=? 4
A= 0
A equals zero
B=? 5
A= 0
BUG !!!
B=? 6
A= 0
BUG !!!
B=? 7
A= 0
BUG !!!
B=? 8
A= 0
A equals zero
B=?
```

Since A is not assigned a value in the program, it should be initialized automatically to zero when the program is run. It is, in fact, and the "A=" results so indicate. But for some reason, the accuracy of the logic function in line 30 depends on the value input for B. Simply incredible!

"Aha, but there is a pattern there," you say. Notice that the logic works correctly when B is equal to 1, 2, 4, and 8. Yes, it also works when B is 16, 32, 64, 128, and 256. But it also mysteriously works when B equals 257, and 512 through 515, and 1024 through 1032. We promised no theorizing, so we'll leave you (and the gang at Boca) to figure this one out.

AND THEY ALL point to the fact that we shouldn't let the PC's forgiving attitude toward upper and lower case lull us into complacency.

(Interesting to note that this bug does not crop up if B is assigned its values in a FOR-NEXT loop, or with a READ DATA table.)

Before moving on to more positive matters, a word regarding our editorial stance on glitches and bugs: We at *PC* do not get our thrills being critical of other people's hard work, and, Lord knows, people who have hacked their way developing their own software should be nothing but empathetic toward snafus. In an ideal computer world everything would work perfectly all the time—and we all know it never will. Our sole purpose is to warn users of unexpected pitfalls, do our best to document the bugs, and help their creators get them fixed.

(We have passed all this information on to IBM. Remedies may already be in the works by the time you read this.)

Communications Fix

One feature not provided in IBM's Personal Computer communications programs so far is the ability to produce simultaneous hard copy on your printer while communications are in progress.

If you are using the COMM.BAS program provided on the PC-DOS disk for "dumb terminal" access to networks and bulletin boards, there's a relatively easy fix that will get you a printout. Load the program and then enter and/or revise the following lines:

```
5 REM COMM.BAS Modification to provide
   simultaneous printout
295 IF LEN(B$)>1 THEN IF
   ASC(MID$(B$,2,1))=114 THEN IF
   PRN=FALSE THEN PRN=TRUE ELSE
   PRN=FALSE 'toggles print function
   with Control-PrtSc
405 IF PRN THEN LPRINT MID$(A$,I,1);
462 IF ERR=27 THEN BEEP:PRINT:PRINT
   "===CHECK PRINTER===":
   PRN=FALSE:RESUME'error trapping for
   printer off or out of paper
463 RESUME
```

This modification will let you use the keyboard combination Control-PrtSc to toggle on and off the printer (make sure the printer is turned on).

Capital Offense

Our final offerings come from diverse corners of the computing world, and they all point to the fact that we shouldn't let the PC's forgiving attitude toward upper and lower case lull us into complacency. PC-DOS and BASIC usually don't care whether we converse with them in capital letters, but other machines and programs often do. Witness: Bob Kay of Leading Edge Products, which distributes the C.Itoh Starwriter line, wrote to inform us that the Starwriter can produce sub- and superscripts with *EasyWriter*, contrary to what we reported in the February-March issue of PC. The Control-Q command must, however, be followed by an uppercase D or U.

WITH IT, information can be written on or read from diskette drives at higher speeds, for faster processing and improved response times.

One network novice (who requested that he remain nameless) couldn't get his Hayes Smartmodem to perform at all. After tearing his hair, pulling apart his PC's innards, and trucking his asynch' board and modem back to ComputerLand, he discovered that the Hayes modem, only understands uppercase. /PC

Share Your Discoveries

When you learn something from which your fellow PC users can benefit, pass it on through these pages. You'll encourage others to return the favor, plus we'll pay from $25 to $100 for each tip published. Mail contributions to: User-to-User, PC magazine, 1528 Irving St., San Francisco, CA 94122.

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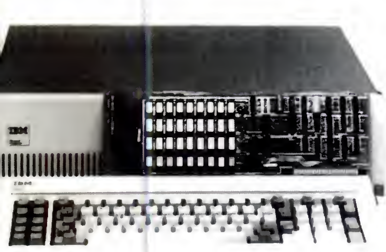

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FOLLOW-UP

The Microsoft/Lifeboat Battle Cry

Software firms back PC-DOS as 16-bit standard.

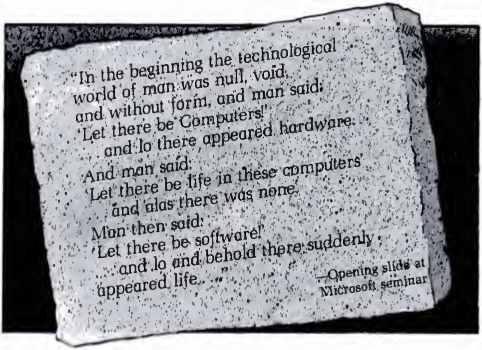

Illustration: Suzanne Anderson

Two major players in the lucrative microcomputer software market, Microsoft and Lifeboat, have announced that they support IBM Personal Computer DOS (PC-DOS) as the "standard" operating system for 16-bit microcomputers.

What this amounts to if you are a CP/M-86 fan is an outright declaration of war by two companies that are probably just as responsible for CP/M's standardization on 8-bit microcomputers as Digital Research, CP/M's creator.

New York-based Lifeboat has published and marketed more CP/M application programs on more 8-bit machines than anyone in the world. Meanwhile, Microsoft is directly responsible for putting CP/M on the Apple by the development of its Z-80 plug-in card.

Microsoft and Lifeboat seem to be saying that just because CP/M became the defacto standard operating system for 8-bit microcomputers doesn't mean CP/M-86 should be the standard on 16-bit micros.

Instead, they say, PC-DOS, developed by Microsoft for the IBM Personal Computer, should be the standard operating system not only for the PC but for all 18-bit micros. The only exception to this would be hard-disk, multi-user microcomputers, which should use XENIX, a Microsoft implementation of the Unix Operating System. PC-DOS and XENIX are further described as being part of a family with PC-DOS being upwardly migratible to XENIX.

In truth, both PC-DOS and CP/M-88 are souped-up versions of CP/M-80, enhanced to take advantage of 18-bit microprocessors. However, neither is compatible with CP/M-80 as many are misled into believing. Without translation, CP/M-80 will not run on either CP/M-86 or PC-DOS.

Confusing as all this is, Microsoft and Lifeboat don't help matters much by the way they dilute the identity of PC-DOS. Microsoft refers to it as "MS-DOS" while Lifeboat calls it "SB-88."

The result of this multiname approach is that we will soon see it in the press referred to as "IBM Personal Computer DOS, aka PC-DOS, aka MS-DOS, aka SB-88."

In the hopes of receiving clarification about all this, *PC* magazine recently attended a seminar in Santa Clara, California (the heart of Silicon Valley), sponsored by Microsoft and backed with blessings and a speaker from Lifeboat. The topic was "16-bit Operating Systems," and it dealt with many of the questions just raised.

Held at the Marriott Hotel, the seminar had about 500 attendees, many of whom were software authors interested in writing programs for the IBM Personal Computer. It consisted of a series of speakers who made slide presentations followed by questions and answers. What follows are highlights from the seminar presentations of two of the speakers, which we think may be useful to understanding this issue and also some of the underlining Microsoft/Lifeboat attitudes.

MS-DOS: Concepts and Features

Excerpts from a presentation by Chris Larson, Microsoft's MS-DOS product marketing manager.

The operating system is at the center of the software universe. It impacts all other software running on the system. The operating system should be the interface between the hardware and both the user and the system's software.

MS-DOS is a single-user, single-task microcomputer disk operating system for the Intel 8088 and 8088 microprocessors. Its purpose is to provide a friendly and efficient interface between the user and the hardware. By standardizing this interface across manufacturers, both the user and software can easily be moved from one manufacturer's machine to another's.

Microsoft developed MS-DOS in order to provide an adequate base upon which to distribute 18-bit software. MS-DOS is owned and licensed by Microsoft. Thus, being independent from any one hard-

ware manufacturer, MS-DOS will continue to grow in the best interests of the industry as a whole.

Chris Larsen's 16-Bit Myths

The first [of five] 16-bit myths says a CP/M-86 machine can run CP/M-80 software. It is often said that the IBM Personal Computer can run existing CP/M-80 programs, simply because CP/M-86 is available as an option, or that CP/M-80 machines run the IBM software because the IBM machine runs CP/M-86.

In reality, 8-bit software is different from 16-bit software. Neither MS-DOS nor CP/M-86 machines can run CP/M-80 programs. Special 16-bit versions of these programs must be created by the manufacturer.

The next myth says there is a vast number of programs running in the CP/M-86 environment.

While there is a considerable CP/M-80

MS-DOS IS A single-user, single-task microcomputer disk operating system for the Intel 8086 and 8088 microprocessors.

library, there is relatively little 16-bit microcomputer software that is specific to any one operating system, whether MS-DOS, XENIX, or CP/M-86. No significant 16-bit software library exists yet.

The third 16-bit software myth says there is something unique about the CP/M-80 library of programs. The myth says if you don't have CP/M, you do not have any applications to run.

Not only are there other libraries of 8-bit software, but much of the 8-bit software packages are available in several of these libraries, so that one does not necessarily need to go from CP/M-80 to Microsoft BASIC, for instance. Many software packages are available under 8-bit operating systems other than CP/M.

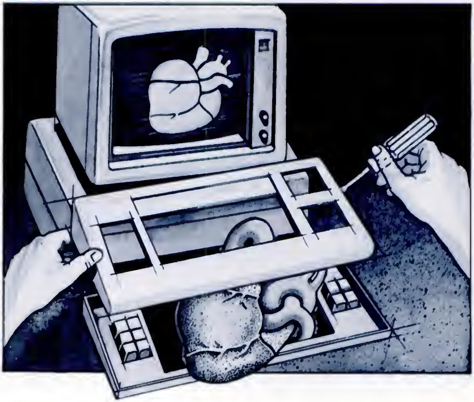

Illustration: Suzanne Anderson

What makes most software available under multiple operating systems is that most software is written in high-level language and is therefore independent of the operating system.

The next myth says that most good 8-bit software is available under CP/M. On the IBM Personal Computer there are two good examples of software packages that have never been available under CP/M, namely *VisiCalc* and *EasyWriter*. And much of the Radio Shack and Apple software bases have never been implemented under CP/M.

Perhaps the most widely believed 16-bit software myth is that there are more CP/M-86 systems in the field than MS-DOS. . . . Recent investigation by Microsoft pegged the MS-DOS marketshare in the desk-top personal computer market at 93 percent.

MS-DOS is IBM's [personal computer] primary operating system. All IBM application software runs under MS-DOS. Only MS-DOS software is supported by IBM, Microsoft, and Lifeboat.

MS-DOS emulates the CP/M-80 system's calls in a much more sophisticated way. Under MS-DOS this emulation of CP/M-80 calls resides on top of its underlying device independent charter I/O calls, and one has the choice of using the CP/M-like calls or the more efficient MS-DOS calls.

Microsoft also provides a translation utility, which translates Z-80 as well as 8080 code to 8086 as part of the MS-DOS package itself. Thus, it is not necessarily more convenient to translate CP/M-80 software to CP/M-86 than to MS-DOS.

Future Plans for MS-DOS or The Bridge to XENIX

Excerpts from a presentation by Paul G. Allen, vice president and cofounder of Microsoft.

It is important to realize that MS-DOS is part of a family of operating systems.

XENIX has over five megabytes of utilities (compilers, assemblers, text processors, etc.) and really should be used with a hard disk. MS-DOS, on the other hand, fits comfortably with all its utilities on two floppy disks. Providing the user with a family of operating system capabilities means a clear migration path from MS-

DOS to XENIX. This means compatibility for both the terminal end user and the systems programmer.

MS-DOS Enhancements Coming

Enhancements added to MS-DOS in version 2.0 to be released in the third quarter of this year emphasize greater user friendliness, standardization, XENIX compatibility features, networking, improvements to the standard utilities as well as the addition of some common XENIX 'filters', and improved disk performance.

The end user interface or 'shell' is the first thing that the user sees when he boots MS-DOS. The shell interprets all commands the user types to the operating system. MS-DOS 2.0 replaces the traditional command-line-oriented shell with a visual shell that shows the user a menu of the most commonly executed applications and utilities.

One very important feature is that the user may customize the shell to his own needs. He may create his own categories, programs, and help files. This could be used to tailor MS-DOS for a particular applications environment or for use in a foreign country.

A standard library for XENIX-86 C will allow compilation of a program on a

PROVIDING THE user with a family of operating system capabilities means a clear migration path from MS-DOS to XENIX.

XENIX system and then execution on MS-DOS. This will allow MS-DOS to tap the already existing library of programs written in C, as well as the generation of new utilities, which can run under either XENIX or MS-DOS.

Networking Stressed

Networking is a key to the success of operating systems like MS-DOS and XENIX in the office automation market.

An enhancement package to MS-DOS will provide local network capability. Microsoft's networking software will encompass both XENIX and MS-DOS. An advanced mail system, file transfer program, and other utilities will sit on top of the basic network services provided by the respective operating systems.

XENIX systems will be able to function as network file servers and MS-DOS systems as application servers for individual users.

Microsoft will continue to provide many enhancements to the basic BASIC compiler, PASCAL, FORTRAN and COBOL compilers, which already run under MS-DOS. These changes will go hand in hand with the improvements to MS-DOS itself. As you can see, the next year will be one of rapid evolution for MS-DOS. We think that with the changes and upgrades we have planned, MS-DOS will become the premier single-user operating system.

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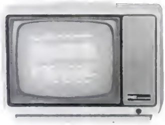

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Software Breakthrough...

NEW *QUIKPRO+PLUS* PROGRAM WRITES PROGRAMS FOR YOU ON YOUR OWN IBM-PC...in minutes.

Technical Review
by Wayne Hepburn

QUIKPRO+PLUS is the name given a new breakthrough in software, for the IBM Personal Computer, by FutureSoft.

Until now, whenever you wanted a new separate BASIC program, you had to spend a lot of dollars to get it, or a lot of hours creating it. That's in the past now.

Anybody who can turn on a computer can write a program, quickly, with this new *Quikpro+Plus* program generator. It's the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you to tap the real power and speed of your computer (and it's about time.)

I located and interviewed him to find out more about *Quikpro+Plus* and pass this valuable information to you. He told me "The best part of this program is that it gives you a separate Basic program, produced in standard Microsoft Basic, every time you use it. What's more, you can list your new program, look at it, see what makes it tick, and modify it."

I found out you can also enhance, alter, and even copy programs you create using *Quikpro+Plus*. I don't think there is any other program available with this much flexibility and ease of use.

The applications seem to be unlimited. Uses occur in Business, Home, Hobby, Educational and Scientific situations. A few examples of what *Quikpro+Plus* can write for you are programs like these:

Financial Forecasting, Expense Planning, Data Access & Retrieval, Modeling, Record keeping of all kinds, Statistical Data Banks, and more. *Quikpro+Plus* cuts program development time to a fraction of what it takes now. It will generate File and Data Entry programs in a standard file format, allowing data to be downloaded to larger hosts or mainframe systems also.

HOW IT WORKS....

The operation of *Quikpro+Plus* is surprisingly simple and easy. Right on your screen you answer questions, and you get error-free Filing and Data Entry programs. This eliminates the tedious development you normally to through in creating a new program. Your instructions are right on the screen so you don't have to be a programmer to use it. Quickly, you have a new program that stands alone. While some generator type programs give you bits and pieces, *Quikpro+Plus* gives you a complete, full running program. Then it will print out the operating manual of the new program for you.

In addition to the functions of Data Entry, Updating, Retrieval and so forth, *Quikpro+Plus* allows you to generate a program that does Reporting on your printer. You can print out in a format different from your File format if you wish, without altering the file or record itself. You can select what portions of which records will print or not print.

Substantial mathematical ability is also incorporated into *Quikpro+Plus* generated programs. You can perform all manner of calculations on various fields of data within individual records. You can selectively do calculations and use the resulting data, or print it, without changing the original base data.

I can't help but tell you I was really impressed with the range of uses and the power of this program. I saw a list of over one hundred applications you could do right now...and of course you can dream up as many of your own as you want.

There were letters from owners who wrote to comment on the program and I read some of them. They came from all kinds of users, doing all kinds of things, with this automatic program generator that writes a separate Basic program for you each time you use it. They had saved a small fortune by getting numerous separate applications from it and they can keep on doing it, year after year. Of course, you can too, once you have a copy of *Quikpro+Plus* to run on your own IBM Personal Computer.

I had checked on some other firms advertising program generators and was disappointed to find out they were running ads but were not ready to deliver. FutureSoft has already delivered and is accepting orders even as I write this report to you. They even give you a full guarantee of satisfaction...allow you to obtain *Quikpro+Plus*, run it on your computer, and if not fully pleased return it within 10 days of delivery. I thought that takes a lot of confidence, but then, they have every reason to be confident based on the remarkable performance of the product.

You get *QUIKPRO+PLUS* by mail or phone direct from FutureSoft. Send mail orders, specifying for IBM-PC, to FutureSoft, Box 1446-PC, Orange Park, FL 32073. Include your check or money order for only $259 (Florida residents add 4% sales tax). Or you can order by phone, Toll-Free 24 hours daily if you have Visa or Mastercard. Call 1-800-824-7888, operator 120, all states except California residents, who should call 1-800-852-7777, operator 120. The operators are not technically competent to answer any questions about the product.

By the way, you Software Dealers reading this report will be glad to know you can handle *QUIKPRO+PLUS* in versions to run on many popular computers. Contact FutureSoft directly, by mail, or phone the office at (904) 269-1918.

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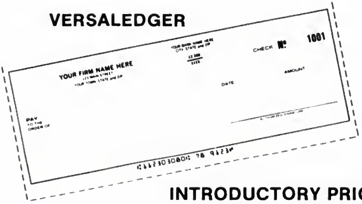

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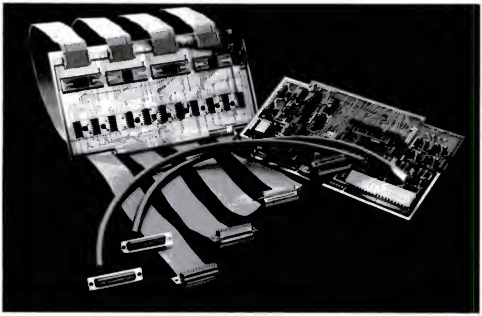

To the hobbyist, a beautiful circuit board was a sight to behold.

The personal computer traces its roots back to the Altair computer, first manufactured in January 1975 by Mits, Inc., a small company that came from the desert sands of Albuquerque, New Mexico. For the next two and a half years, Mits, Inc. so dominated this new-found market that the company literally defined personal computing. David Bunnell and Eddie Currie were both uniquely involved in the beginning of personal computing as Mits' vice presidents. Together in this exclusive PC series, they tell the story of The Age of Altair.

The era of the computer kit builder blossomed rapidly with the advent in 1975 of the Mits Altair computer.

About once a week a phone call would filter through "infinite hold" to Dr. Eddie Currie from an irate customer who had the audacity to claim that Mits' products were fraudulently advertised, poorly engineered, provided with second-hand or otherwise inferior components, and so on. Closer inspection would often reveal that this poor soul had, in fact, purchased, with a significant portion of his or, infrequently, her savings, an Altair computer system complete with disk drives, additional memory and interface circuit boards, and a reconditioned Teletype machine.

Typically a Mits' irate customer had, prior to calling Albuquerque, anxiously assembled one of the many printed circuit cards provided by Mits. As this customer looked up from what three weeks earlier had been the kitchen table, his gaze fell upon a sea of cardboard boxes, plastic bags filled with components of every size, shape, and description; and notebooks filled with page after page of detailed instructions for the assembly of this precursor to the Cray-1.

One Horrible Flash of Insight

It was at this point that the first true realization of what he had wrought came to him in one, horrible flash of insight. The card he had just painstakingly completed was weeks, months, or perhaps years from ever reaching a stage at which it would be capable of joining its counterparts in a synergistic role as part of his "COMPUTER." Should, for reasons perhaps beyond the scope of his understanding, any portion of this monument to technology fail to work properly—or worse, fail to work at all—he was impotent to diagnose or repair it. Most buyers had purchased insufficient memory for serious use; few had any input/output device of greater sophistication than the switches and winking lights of the front panel; and fewer still had oscilloscopes and other weaponry with which to wage an unholy war against bad solder joints, components soldered in backwards, broken wires, defective LEDS, bad switches, etc.—though acid-core solder seemed to be within everyone's grasp.

This poor soul had, in a moment of panic, appealed to the only remedy that could in his mind ease his growing, gnawing feeling that he had crossed the microcomputer Rubicon. Grasping at straws, he decided to blame Mits for all his woes. Fortunately, this scenario was met with sympathetic understanding, and Mits went to extremes to extricate him and his fellow hobbyists.

The Memory is the Thing

The dynamic memory chips that were the basic building blocks for the first "4K memory boards" were incredibly complex devices in and of themselves. In fact, their technology was at least as sophisticated as that of the Intel 8080 microprocessor.

The Monostable Multivibrator

Unfortunately, the monostable multivibrator came into its own about the same time, and this insidious device—claimed by manufacturers to be useful for, among other things, pulse generation of selectable duration—turned out to be better described as an excellent device for the generation of pulses of arbitrary character. This device was joined with carbon resistors and disk capacitors in an unholy alliance that served to determine an initial value of what was to be a random walk through the temporal space of pulse duration.

What the above meant to the unsuspecting hobbyist was that the probability of getting a 4K memory board to work when assembled from a kit was remote. And the likelihood it would continue to work could easily have been rated zero.

AS THIS customer looked up from what three weeks earlier had been the kitchen table . . .

One must recall that the most crucial element in any computer is the memory. Other elements of the system may exhibit obstreperous behavior from time to time that often will remain undetected, but memory failure is an insidious and dreaded malady in any computer system. An assemblage of flaky memory boards can cause even the most enthusiastic hobbyist to question the meaning of life.

Furthermore, the type of failures and aberrant behavior caused by bad memory boards is seldom, if ever, repeatable and therefore virtually impossible to localize. In fact, a musical composition entitled "If I Had a 4K Board" and sung to the music of "If I Were a Rich Man" (which seems a curiously related topic) was soon sung from the rooftops.

Ode to Dynamic Memory

Today I got my 4K board in the mail.
It came to me C.O.D.
The postman said he dropped it only twice.
I plugged my 4K board into my Altair next to the CPU.
I threw the switch.
It worked like a charm
until the 8080 blew.
The smoke poured out
and filled my room.
The CPU turned black.
Then I knew the time had come
to send my Altair back.
The days, the weeks, the months rolled by
and still no word from A-B-Q.
And then one day a letter said
we have bad news for you.
We tried to fix your machine
but we did not succeed.

Chorus:
If we had a 4K board
If we had a 4K board
One 4K that works is all we need
One 4K that works is all we need.

Since reliable, dynamic memory had proved elusive, static memory rapidly came into being. 16K static memory proved to be power hungry, somewhat expensive, but, most importantly, highly reliable. Some dealers would take systems to a potential customer site using static memory for demonstration and then would substitute 4K dynamic memory systems when the sale was consummated.

Manufacturers of dynamic RAMS continued to lobby Mits engineering to produce 16K dynamic memory cards based upon the significantly lower components' cost. However, dynamic RAM cards also required 15 to 30 integrated circuits per 16K board to provide dynamic refresh. This meant lower overall cost but significantly greater complexity. One of the largest semiconductor manufacturers in the world offered to assist Mits with the design. This was the precursor of what was in part to lead the ultimate deterioration of the Altair market.

The Dragon from the Swamp

Following a joint-development effort culminating in the Mits 16MCD (for 16 "K" dynamic memory board), the board was announced at the National Computer Conference (NCC). Shortly thereafter, one of the representatives of the semiconductor manufacturers called to say that the 4K memory chips used in this board had been discontinued. This resulted in a succession of so-called "equivalent components" substitutions. Since these components were not exact equivalents, additional uncertainty was introduced. Thus the groundwork was laid for a dragon that would loom up from the swamp.

It should be noted that the hard-learned lessons of previous computer generations failed to prevail in the exploding microcomputer marketplace. Minicomputer manufacturers had learned long ago that parity checking was a must for any computer system. This is a technique (used in the IBM PC) whereby one may detect whether or not one of the eight bits in a memory cell has changed value. In computer systems it is important always to know when errors occur and, where feasible, to correct them. Error correction in 8-bit systems such as the Altair was prohibitively expensive and therefore not considered. This inability to detect reliably any such errors resulted in endless frustration to all who attempted to use such systems. Since such errors were of the "soft" variety (meaning not permanent failure of a memory chip), these errors were not repeatable, making diagnosis extremely difficult.

Transparent Refresh

Furthermore, dynamic memory required refreshing every two milliseconds. This meant that all memory must be accessed every two milliseconds regardless of anything else that might be occurring. "Transparent" refresh was soon employed in an effort to avoid conflict with CPU attempts to access memory. This board allowed refresh only when the CPU was busy with activities not requiring memory access. Interestingly enough, it was the requirement for "transparent" refresh that was to contribute heavily to the widespread use of the Z-80. This single-power-supply chip provided refresh addressing, which reduced the component count for dynamic memory, and contributed significantly to more reliable dynamic memory designs. Early proponents of this 8080 superset believed that the Z-80's significantly greater instruction set would force the 8080 into obsolescence. These self-styled gurus, who surface again and again in

UNKNOWN TO Mits, he carried with him the seeds of Mits' ultimate destruction.

their role as false prophets of the microcomputer industry, failed to realize that the large investment in 8080 software would not be cast aside.

It was at about this time and against this background that a man appeared at Mits' door wearing gold-rimmed glasses, a dark pin-striped suit, and carrying a small black briefcase. Unknown to Mits, he carried with him the seeds of Mits' ultimate destruction. /PC

Before And After You Buy Your IBM Personal Computer

PC Magazine is packed with information for everyone interested in IBM Personal Computers. Each issue brings you hundreds of colorful pages with evaluations, insights, and straight talk from respected experts—professionals in computer science as well as business, education, law, and many other fields. PC covers software, hardware, applications, and every topic of importance to the thousands of IBM Personal Computer users. For a limited time only, you can subscribe to PC at NO RISK and still receive a 25% discount off the newsstand price. Enter your subscription today. If not satisfied when you receive your first copy, return your mailing label within 15 days for a full refund. Act now so you won't miss an exciting issue. Send $27 for 12 issues or your Visa or MasterCard number plus expiration date to: PC Magazine, 1528 Irving St., San Francisco, CA 94122.

 Illustrations: Sherry Balestra

How Not To Choose A Microcomputer

An Introduction to Microcomputers
Volume O: The Beginner's Book
Adam Osborne and David Bunnell
238 pages; $12.50

This book is uniquely structured to give readers a choice between two reading levels: general interest and beginning technical.

The two different levels are accomplished by dividing the book into two sections and by using boldface type to highlight the book's major concepts. In addition to reading introductory consumer or technical material, you can read on an in-depth level, or you may choose to simply skim through the book.

The book offers a lot of ground to cover and the authors move at a fast pace from printers to memory storage to application software to selecting the right computer system to a beginner's discourse on bits and bytes.

To keep things from getting too serious, the breezy, conversational style of the book is broken for a humorous interlude—the tale of computer hobbyist Susan Kilobyte and her inspired but somewhat bumbling boss, Mr. Fogarty. Through these fictional characters, Osborne and Bunnell explore some of the common pitfalls people experience when they decide to enter the microcomputer age.

The following PC excerpt is from Chapter Three.

CHOOSING A MICROCOMPUTER

Let's take a look at the many types of microcomputer systems that are available today.

In order to help us in this task, meet Susan Kilobyte, a former computer hobbyist who recently started working as a customer service representative for Ace Products.

Back in 1976, when the microcomputer industry was in its infancy, Susan was one of those fearless few who built her own microcomputer from a kit. Since knowledge is worth money, Susan figured that the time and money she spent building a kit was worthwhile. She ended up with an excellent understanding of microcomputers—and a lot of useless computer hardware collecting dust in her basement.

As a result of various misadventures, Susan Kilobyte no longer had a computer she could call her own. It was music to her ears when she heard Mr. Fogarty, her boss, mumble something about it being time that Ace Products got a computer. Mr. Fogarty owned Ace Products, and whatever Mr. Fogarty said, people at Ace Products did.

"Mr. Fogarty, I know all about microcomputers," Susan said. "In fact, I built my own computer once. I'd love to help you get a computer for Ace Products. These days you can get some great microcomputer systems for less than $10,000."

But Mr. Fogarty had his own ideas about economical microcomputers. Reaching into his pocket, he pulled out a page torn from a magazine.

"I don't know about $10,000 systems," he said. "I'm thinking more about spending a couple of hundred bucks."

In dismay Susan Kilobyte watched Mr. Fogarty lay the magazine page on his desk and smooth out the wrinkles. It advertised a Sinclair ZX80 personal computer, costing less than $200.

"Oh, Mr. Fogarty," Susan said. "That's a toy. You can't do a thing with that."

"That's not what the ad says," Mr. Fogarty replied.

"But you need a display. What are you going to use for a display?" Susan asked.

"The ad says I can use a television," Mr. Fogarty replied. "There's that TV set here in my office which I never use. We'll start with it."

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your programs? Or your data?" Susan asked.

"Look, it says right here," Mr. Fogarty stuck his finger into the middle of the ad. "You just use cassette tapes. Get that old tape recorder from the storeroom. Nobody uses it anymore."

"But you'll need a printer. How do you print results?" Susan persisted.

"Printer? Who needs a printer?" Mr. Fogarty asked. "This computer's for Jack. He does all the bookkeeping and all the calculating by hand, and he doesn't get it right every time either. Now the computer can do the calculating, and Jack can write down the results."

"But you don't understand!" Susan Kilobyte wailed. "It doesn't work that way. If you buy a cheap computer, you're just wasting your money."

"Maybe you're right, but if you are, I'm not wasting a whole lot of it," Mr. Fogarty said. "Not like Fred Butler down the road. He bought a computer for more than twenty grand more than a year ago. It still isn't doing anything except taking up space."

UPS delivered Ace Products' microcomputer some weeks later. The ZX80 is the size of a small book.

Mr. Fogarty, murmuring approvingly, hovered over Susan Kilobyte, while she unpacked the box, read the accompanying documentation, and then connected the computer to a tape cassette drive and a television set.

Until the computer actually arrived, Jack had looked upon the whole escapade as the type of a folly bosses indulge in when they have nothing better to do. Apart from a comment that "at least Mr. Fogarty was only spending a couple of hundred dollars," Jack had assiduously avoided involving himself in the harebrained scheme. Now that the computer had actually arrived, he continued to keep his distance; but on a couple of occasions, curiosity overwhelmed his suspicions, and he walked in on the computer installation ceremony on a pretext. On the third such visit Mr. Fogarty spoke up.

"Jack," he said, "I think you should stick around. When Susan has taught you how to use this thing, it will be all yours."

"Not that I ever asked for it," Jack replied, but he stayed.

By now Susan had the computer connected to Mr. Fogarty's television set and tape recorder. They were ready to go.

"Where's the computer?" Jack asked.

"Inside here," Susan tapped the box

He commended Mr. Fogarty for wasting only a couple of hundred dollars on his computer foolishness. But Mr. Fogarty was not convinced.

right behind the keyboard.

"That tiny thing? That's a computer?" Jack exclaimed. "I thought computers had switches and lights and things all over them."

"They did," said Susan, "but no more. Actually, a few microcomputers still have front panels with switches and lights," she added, trying to be very precise. "But that stuff is no longer a necessity. In fact, it costs more to build a front panel than it costs to build a computer."

"Where's the keyboard?" Jack eyed the ZX80 with deep suspicion.

"Right here. Look." The keyboard appeared to be printed on a piece of thin plastic.

"That's not a keyboard! It doesn't have any keys. It's only a picture of a keyboard," Jack protested.

"It's a keyboard," Susan stated authoritatively. "Some calculators have keyboards like this one. Some elevator switches work like this." Jack was not convinced. "It's cheap," Susan added.

"Yes," Jack said very slowly, agreeing for the first time.

Creating a Program and Making it Work

Fred Fogarty decided that Ace Products' microcomputer should begin earning its keep by helping Jack pay bills. To accomplish this task, Susan wrote a program on a piece of paper, using a programming language. The program had to be very small, because the ZX80 microcomputer does not have much memory in which to store programs.

When Susan had finished writing her program on a piece of paper, she entered it into the ZX80 microcomputer's memory via the keyboard. This is a straightforward process on any modern microcomputer. All Susan had to do was connect power to the ZX80 and start tapping keys. The ZX80 assumes that you are entering a program until you tap appropriate keys telling it that you are doing something else.

Things were not always that simple, and creating a program is a good deal more complex on most large microcomputers. (We will discuss the reasons in later chapters.)

Since Susan's program was short, it did not take her very long to key the whole thing into the ZX80 microcomputer. When

> ***IT advertised a Sinclair ZX80 personal computer, costing less than $200.***

the job was done, Susan touched a control key that said RUN on it. This caused the ZX80 to execute her program.

Error Message

A message at the bottom of the screen told Susan that there were errors in her program.

Susan first made sure that the program as recorded by the microcomputer was the same as the program she wrote down on a piece of paper. If Susan had pressed the wrong key at some point, the two programs would now differ.

It is easy to look at programs stored in the ZX80, or in any other microcomputer's memory. On the ZX80 there is LIST key.

Susan touched this key and there appeared as much of her program as would fit on the television screen.

After carefully examining the program as displayed, Susan discovered that she had pressed the wrong key in two different places. The program as displayed was not the same as the program she wrote.

Susan corrected the program as stored by typing correct words in the place of incorrect ones.

Again, Susan pressed the RUN control key and again a message on the television screen told Susan that her program had mistakes in it.

Susan went back to her handwritten program. By now Mr. Fogarty was making Susan nervous, so Susan went back to her office and looked the program over. She promised to call Mr. Fogarty once the program was correct and running.

Debugging

What Susan is doing is referred to as *debugging* a program. Computer programmers refer to errors as bugs; hence the term debugging.

There are many ways in which errors can get into a computer program.

Types of Errors

You might touch the wrong key when entering the program with the keyboard; these errors are the price that Susan and poor typists pay for their lack of keyboard proficiency.

In addition to keyboard errors, most

programs when first written contain simple programming errors, meaning that program statements do not accomplish the task that the programmer intended. This can result from misunderstanding the programming language, or simply not keeping track of details. Now the programmer's task is much like a doctor's; given the symptoms the programmer must find the cause. The program must be rewritten to eliminate problems, and corrections must be typed into the computer—making sure that no new keyboard errors are introduced.

Finally, when the program is running and executing correctly, you may well discover that you misunderstood the problem. The program is wrong, not because it contains any program errors, but because you misunderstood the task. And the whole correction cycle begins anew.

Saving a Program

Although Susan's program was short, she did not want to reenter it via the keyboard (and correct keyboard errors) each time the program was to be run. Instead, Susan saved her program on cassette tape. That way she could load it back from cassette tape into the ZX80 memory before running it. In order to save the program on cassette tape, Susan connected the ZX80 microcomputer to the cassette recorder's microphone input, touched the SAVE key and waited.

At a later date she would be able to load her program from cassette tape into memory by connecting the ZX80 to the cassette recorder's earphone outlet and pressing the LOAD key.

As this simple sequence demonstrates, there is really no difference between recording your voice, or a program, on cas-

Introduction to the Authors

Adam Osborne, who co-authored "An Introduction to Microcomputers; Vol. 0, The Beginner's Book" (excerpted in this month's issue), is renowned in the microcomputer industry as the visionary who created the first portable computer, the Osborne I.

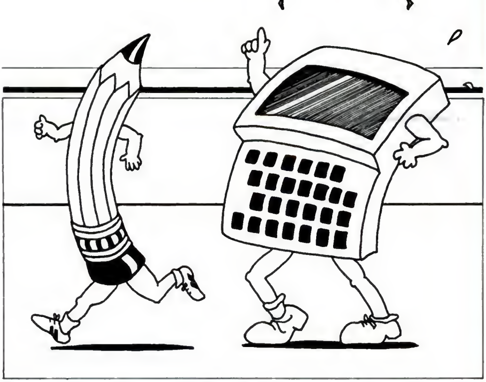
Osborne, 43, was born in Bangkok, Thailand of British, Buddhist-missionary parents. He received his B.S. in Chemical Engineering from the University of Birmingham, England, and his Ph.d. in Chemical Engineering from the University of Delaware.

In 1970 he founded his own computer company, Osborne and Associates. The firm offered programming and technical writing consultation to the microcomputer industry, and also designed micro components into comprehensive systems.

In 1975 Osborne authored "An Introduction to Microcomputers, Volume I," a book that was well-received in the microcomputer and electronics industries. The book acted as a springboard for Osborne Associates to focus on micro-electronics publishing. Over the next few years, Osborne published dozens of seminal and authoritative publications, including "The Business Systems Buyer's Guide," "The Apple II User's Guide", and "The CP/M User's Guide." The company was sold to McGraw-Hill in 1979.

At the end of 1980 Osborne founded the Osborne Computer Company in Hayward, California. The company manufactured the first Osborne I in June 1981, addressing the consumer's need for a low-cost, portable computer. To date approximately 20,000 Osborne Computers have been shipped to firms all over the world.

Adam's co-author, *PC* Publisher David Bunnell, was managing editor at OSBORNE/McGraw-Hill prior to the launching of *PC*. A pioneer in the microcomputer industry, he traces his roots back to the first microcomputer.



sette tape. To record your voice, you use a microphone; to record a program, you connect the computer to the tape drive, as you would a microphone.

ROM

Consider for a moment the many tasks which Susan's ZX80 microcomputer performed automatically. All of the "intelligence" that it, or any other microcomputer, displays is derived from programs that someone wrote and built into the microcomputer as a permanent part of the machine. These programs are stored in Read-Only Memory (usually referred to as ROM). A read-only memory, as its name implies, can have its contents read, but can never be written into. The contents of a read-only memory are defined when the device is manufactured.

System Software

Every microcomputer has built-in programs that give the microcomputer its intelligence. In small microcomputers like the ZX80, all of these built-in programs are provided in ROM. Larger microcomputers have additional programs on floppy disk or cassette that are automatically read into the microcomputer's read-write memory and executed as needed. These programs are collectively referred to as the microcomputer's *system software.*

Applications Software

In contrast, the term *applications software* is used to describe programs you write (or someone writes for you) to make the microcomputer perform your tasks.

At this point there is nothing more you need to know about a microcomputer's system software other than the fact that such programs exist. Later, we will describe in more detail the functions performed and the qualities you should seek in system software.

Running a Program

By the time Susan got her program working properly, the microcomputer had ceased to be a novelty, and Mr. Fogarty was no longer demanding that he be present when anything happened—a development which, as far as Susan was concerned, had not come a day too soon.

Jack's suspicions of the microcomputer were as strong as ever, but he decided that he had better cooperate. So he sat down with Susan, resigned to doing his best.

Susan's program created a list of account information for everyone who routinely sold goods or services to Ace Products. The list was stored on cassette tape. Susan used two cassette tapes, one to hold her program, the other to store account information.

Jack brought a stack of bills and deposited them next to the microcomputer. Here's what Susan had to do. First she loaded her program cassette into the cassette drive. She then connected the cassette drive monitor outlet to the ZX80 microcomputer's earphone input, pressed the ZX80 LOAD key, and loaded her program from the cassette into the ZX80 memory.

Once she loaded her program into memory, Susan had to rewind and remove the program cassette. Then she had to place her account information cassette in the cassette drive.

Susan's program was then ready to run. Her program read account information off the cassette for the first account and dis-

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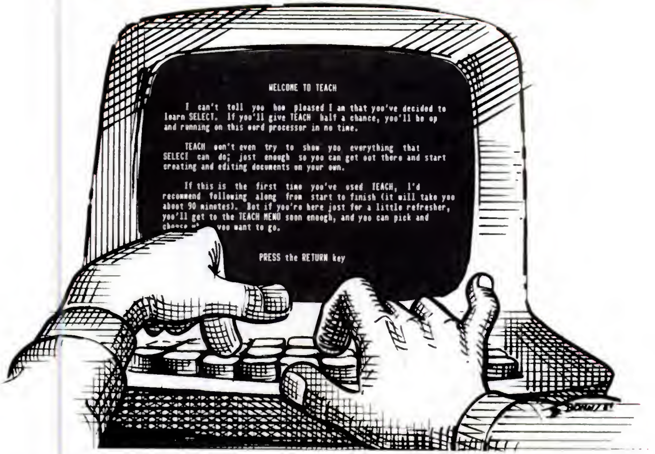

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played it on the television set. Susan updated information for this account showing new bills received and checks paid. Susan was now ready to write the updated account information back to a cassette; this she could do in one of two ways: she could have one cassette per account, or she could keep information for all accounts on a single cassette.

Let's look at the trade-offs facing Susan, depending on which strategy she selects.

Back-up Data

If Susan decides to have one cassette per account, then she can, if she wishes, rewrite the updated account information back to the same cassette from which she has initially read the account information. Why? Because rewriting the information back to the same cassette would be equivalent to erasing everything that was on the cassette and putting all new information onto it. Therefore, no misalignment would be likely to occur. But Susan would not be likely to rewrite new information on the old cassette for a totally different reason: she needs a back-up cassette.

What if a cassette is damaged? Or what if she puts the wrong cassette into the drive at some point? In all data processing applications it is imperative that you keep copies of all data to guard against such disasters. Instead of writing updated account information back over the old account cassette, Susan must write the new information to a new cassette.

The problem with having a separate cassette for each account is that Susan would soon have a closet full of cassette tapes. For example, if Ace Products had 200 active vendors, Susan would need 400 tape cassettes. The cost of the cassettes would exceed the cost of the microcomputer. But far worse, Susan would be faced with problems making sure that she properly labeled all her cassettes. Moreover, she would be presented with an unreasonable number of opportunities to place the wrong cassette in a cassette drive and throw the entire payables operation into disorder.

Susan's alternative solution is to store information for a large number of accounts on a single cassette. Suppose, for example, Susan could store information for 50 accounts on a single 90-minute cassette tape. Information for 200 vendors could then be stored on four cassette tapes, in which case eight cassettes would suffice if Susan maintained back-ups.

Susan chooses to store information for 50 accounts on a single cassette tape. This decision is not based on her knowledge of computer operations; rather, Susan is frightened of what Mr. Fogarty will say when presented with a $1200 bill for 600 cassette tapes.

But after Susan put information for 50 accounts on a single cassette tape, she experienced a nightmare when she ran the program.

Handling the first account was easy; Susan placed the "New Data" cassette in the tape drive, read the first account information off the tape, and removed it. Susan then placed a blank cassette in the tape drive and wrote updated information for the first account at the beginning of this blank cassette tape. This became the "New Data" cassette. The old "New Data" tape became the "Old Data" tape.

Susan carefully took out the new New Data tape without rewinding it. She wanted to put it back in the drive and write the second account's new information immediately after the first account. Susan tried removing the Old Data cassette without rewinding it, so she could immediately read information for the next account. This method worked most of the time, but sometimes she did not stop the tape quickly enough after reading one record. To reposition the tape Susan had to rewind it and read each record up to the one she now needed.

By the time Susan and Jack had looked at five accounts, Jack was convinced that his suspicions of the microcomputer were well-founded. Waiting for the cassette drive was getting downright tedious.

"I don't like this microcomputer thing," Jack grumbled. "I could do the job faster by hand." And for the balance of accounts, he proved his point by doing things the old way while the microcomputer did them the new way. With each new account Jack got further and further ahead of the microcomputer.

At this unfortunate moment Mr. Fogarty walked in to see how things were going.

"Just fine," Jack said, beaming from ear to ear. "I am doing it by hand faster than the microcomputer." Mr. Fogarty laughed nervously, unsure whether Jack was joking or serious. His laugh turned to a sour grin when he realized Jack was serious.

AT this unfortunate moment Mr. Fogarty walked in to see how things were going.

Susan explained the problem. With one cassette drive they had to wait forever while she swapped cassettes. "This," Susan explained, "was because the microcomputer had to read an account's data, update it, then write the data out."

"We need two cassette drives," Susan said, "and the ZX80 doesn't allow two cassette drives. With two cassette drives I could read old records from a cassette in one drive, and write new records to a cassette in the other. Then I could at least keep up with Jack, even if I didn't get ahead of him."

Mr. Fogarty decided to think about this problem. And during the next few weeks Jack presented Mr. Fogarty with an additional problem.

Jack hated the ZX80 keyboard.

Touch Switch Keyboard

Susan explained that it was a *touch switch keyboard.* Touch a key and the microcomputer senses the touch. Jack knew how to type, and typists rest their fingertips on the typewriter keys. When using a typewriter, this causes no problems, but Jack could not rest his fingertips on touch switch keys, because every touch became a keystroke.

Touch switch keyboards are fine for typists who only use one finger, like Susan, but as far as Jack was concerned, the ZX80 had to go.

And there was the problem of a printer.

Reading information off the television screen in order to write checks was very tedious. If the microcomputer was going to keep records, why couldn't it type checks? Furthermore, there was no way Jack could keep all of his accounts payable records on cassette tapes, with no printed copy. What if a cassette tape was damaged? What if the computer stopped working? He insisted on having ledgers that he could read. And he knew that the auditors would insist on such printed records. Thus, Jack had the choice of taking all the information stored on a cassette tape and writing it out by hand—which defeated the purpose of having a microcomputer—or convincing Mr. Fogarty to buy a printer for the microcomputer.

It was becoming clear to Mr. Fogarty that you could not buy a microcomputer for less than $200 and do data processing with it.

I THOUGHT computers had switches and lights and things all over them.

Jack felt that the sensible thing to do would be to take the dumb little computer and throw it out. He commended Mr. Fogarty for wasting only a couple of hundred dollars on his computer foolishness.

But Mr. Fogarty was not convinced.

True, Susan Kilobyte had not succeeded in creating a successful payables system, but computers, like any other products, must offer better models for more money, and Ace Products had certainly started at the bottom end of the economic spectrum. Moreover, Susan had warned Mr. Fogarty that the ZX80 was great for learning about microcomputers, but it was incapable of handling real data processing.

So Mr. Fogarty took the little ZX80 microcomputer home and spent a few evenings playing with it. That was sufficient to teach him what Susan had been saying about computers and programming. He was now ready to explore the market—with Susan Kilobyte's help. /PC

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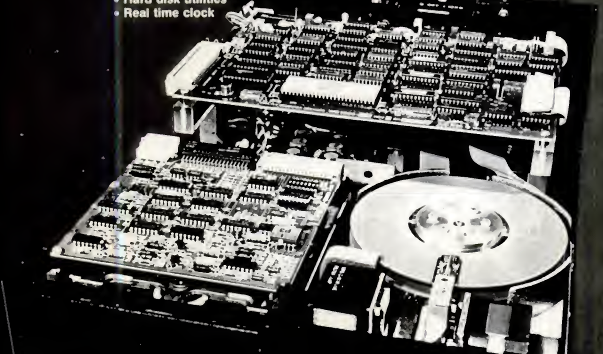

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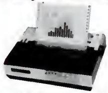

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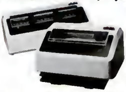

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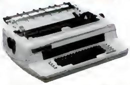

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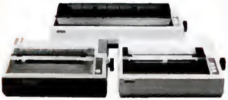

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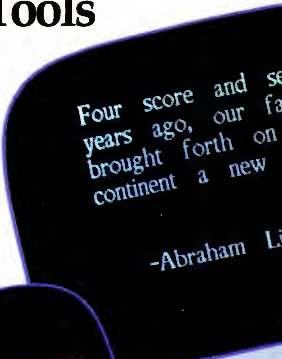
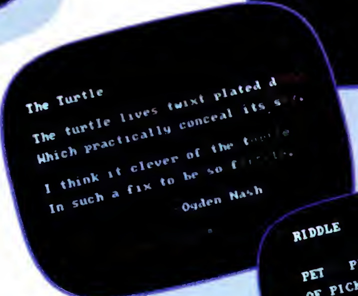
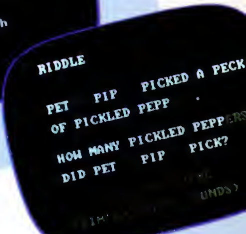


Poet and educator Ed Skellings used to use colored chalks on a blackboard to help his students understand the techniques of the poet's craft. Now, with the help of some graphics and display management programs under development by IBM's Hal Jennings, he has traded in his blackboard for a color video projector connected to an IBM Personal Computer.



The IBM Personal Computer is ideally suited for a systematic enhancement of computer programs which, in the past, were merely monochrome: word-processing, accounts receivable, inventory, graphic plotting, and management information systems generally. But it is in education and training that the system offers some of the most striking possibilities for the functional use of color-coded displays that inform faster and with greater retention.



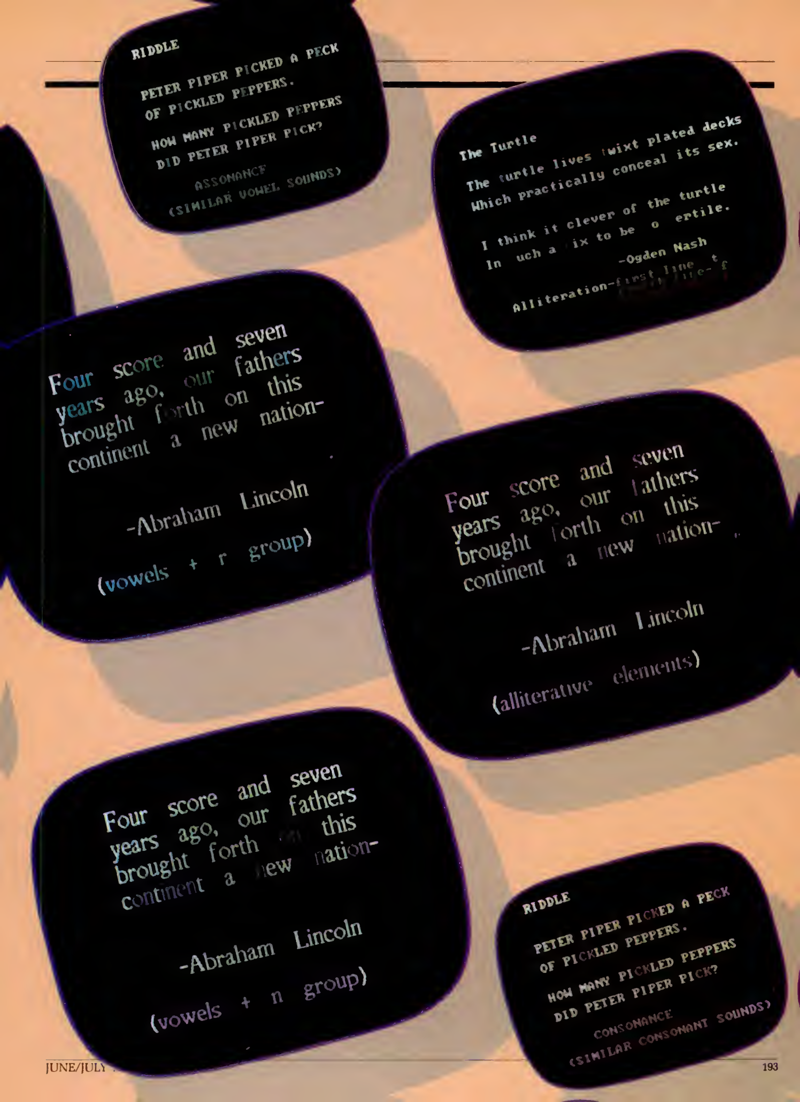
In poetry, text and language appear at their most compressed and words are interrelated in both meaning and sound pattern—much can be demonstrated in a little space. I have attempted in these slides taken from IBM color text displays to illustrate some initial steps toward animated color education.

The Peter Piper slides show various features of why this little riddle has been remembered by generations. Not only the high number of p's, but other patterns as well have worked upon our subliminal memory, especially the falling trochee rhythm pattern, which operates against a language fundamentally iambic and rising, and which has been at work, quietly emphatic.

Even in the more relaxed prose of Lincoln, the patterns that make it truly memorable can be made evident by the skillful application of color to demonstrate why we have held that short speech in high regard for so many years.

There is not a single area in which a serious programmer will not find color immediately relevant to his own application, for color is not simply here to stay; it has been built by nature into the eye itself, ready for the thinker to come designing.

Dr. Edmund Skellings is a professor at Florida International University and the Poet Laureate of the State of Florida. He has also been granted a U.S. patent (#4,270,284) relating to uses of color to communicate information via computer displays.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continent a nation-
-Abraham Lincoln
(vowels + n group)
RIDDLE
PETER PIPER PICKED A PECK
OF PICKLED PEPPERS.
HOW MANY PICKLED PEPPERS
DID PETER PIPER PICK?
CONSONANCE
(SIMILAR CONSONANT SOUNDS)

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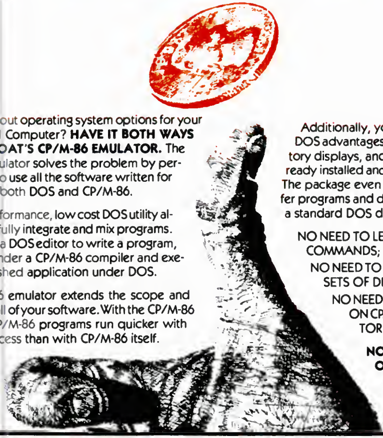

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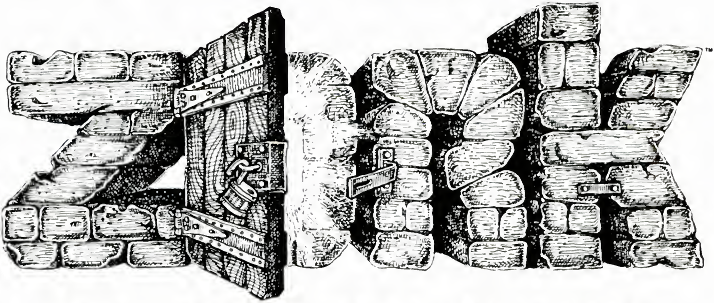

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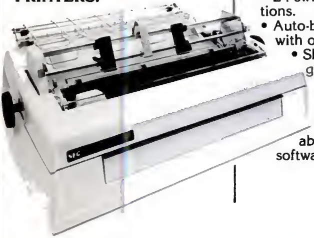

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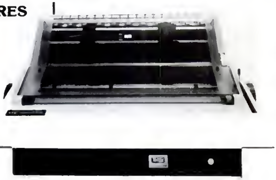

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Licensing Software

Things you should know before getting into a software licensing agreement.

Do you own the latest super software package you purchased for your PC? Maybe. Maybe you just own a license to use it. Licensing is a typical business practice for marketers of computer software, especially with high-powered, big-bucks products. Software for the PC sold by IBM carries a licensing agreement that stares up at you from beneath the plastic overwrap and demands you read and accept it before opening the package. Now that software with four-figure prices is being marketed for the PC, the stakes can be significant, so your acceptance of any software license ought to be an eyes-open proposition. In the following article, attorney Stewart Evans proffers some eye-opening hints.

License agreements for computer software are unusual contracts because they are so carefully tailored to the requirements of the computer industry. "Boilerplate" contract paragraphs, which might be useful in drafting most contracts, are of little help in drafting the computer software license agreement. Due to the uniqueness of computer contracts, it is advisable that anyone planning to enter into a software licensing agreement involving sizeable amounts of money have an attorney review the agreement before it is executed.

Though there are hundreds of danger points in any software licensing agreement, this article will focus on two major ones: software description and acceptance testing.

As a result of either market dominance or the desirability of the software, licensors are very often in so powerful a bargaining position that they can dictate the terms of the software licensing agreement. A prospective licensee may not have the bargaining leverage to negotiate a more protective contract; but aware of the dangers and problems in the contract, one can better assess inherent business risks.

Software Description

There is no easy way to identify a software product in a license agreement. Simply referring to the licensor's name for the software product is, by itself, unacceptable. Instead, the functions and programs that the software can execute should be described in plain English.

Software licensors often prepare brochures, pamphlets, sample computer runs, and other materials that are used to promote the software. The licensee should insist that each item used to promote the software be attached to the software license agreement as an exhibit specifically identifying the capabilities of the software and incorporating these terms into the agreement. These materials will be bulky and difficult to attach to the license agreement, but the effort can make the difference between winning or losing a lawsuit.

THE LICENSEE should insist on a well drafted description of the product and its performance standards.

A judge or jury, who almost certainly will not be familiar with computers, will need a simple, clear, and complete description of what the software is supposed to do, and there is no substitute for providing that description in the agreement. If the licensee can point to a specific portion of the agreement that says the computer software will perform a particular function and then can establish that the software, as installed, is not performing that function, he will most likely win his case.

The Integration Clause

Most contracts contain what is called an "integration clause," which states that the written contract and all of its attachments constitute the entire agreement between the parties. The intent of an integration clause is to prevent oral or written statements made by the licensor, but which are not specifically made a part of the final contract, from being legally binding on the licensor. Suppose a salesperson promises emphatically that certain software performs read-after-write verification, but in fact, it does not. And suppose the license agreement contains an integration clause, but nowhere in the agreement does it describe "read-after-write verification." Legally, it would be very difficult, if not impossible, for the licensee to argue successfully that the oral statements about read-after-write verification became part of the description of the software.

Avoid agreements with integration clauses. Oral statements by the licensor's salespeople often convince licensees that the software can do what is desired.

Acceptance Testing

After describing the software's capabilities, the license agreement should clearly establish a test to determine whether the software product can, in fact, do what it's supposed to do. Many, if not most, license agreements provide either no testing standard or a standard drafted to ensure that the software will never fail the test. In addition, such agreements usually provide that the tests will be conducted on the licensor's premises and will use the licensor's data. This is of little value to the licensee if the software won't operate on the licensee's hardware with his data. Clearly, reasonable testing procedures require that the test use the actual software licensed, the licensee's hardware, and the licensee's raw data.

The technical specifications of the test must be tailored to the software capabilities being purchased. A clear and detailed software description in the license agreement will make designing the test and assessing the software's performance easier. The test should set an objective standard from which to determine whether or not the software product meets the performance standards. Subjective tests are less preferable, since they rely on judgment calls to determine whether the standard has been met. However, subjective tests are often unavoidable, because of both the

nature of the software product being purchased and the expense of establishing the technical specifications for an objective test.

A Nonobjective Test

An example of a nonobjective test standard is one that states: "The software shall be deemed acceptable if it uses the licensee's live data to produce correctly all reports which the software is required to be able to produce under this agreement for 31 days." This kind of test has four advantages: (1) It requires the test to be run on the licensee's premises, using the licensee's software and equipment and the licensee's raw data; (2) It can be used in virtually all software license agreements; (3) It requires that all reports be correctly produced, which sets a very high standard of effectiveness for the software but at the same time contains an implicit "reasonableness element" in that both parties understand that 100 percent accuracy is not required; and (4) Although it is a strong test, licensors' resistance to its inclusion in the software license agreement may be lessened because it clearly states what they themselves feel their product should be able to do.

TOO LITTLE attention is given to the testing standards used in a software licensing agreement.

Too little attention is given to the testing standards to be used in a software license agreement. Often this is because the licensor dictates what those testing standards will be, and there is little room for negotiation. However, just as often, the acceptability provisions of the contract are ignored by licensees because they are unfamiliar with the concept of establishing a performance standard for a product they purchase. For most consumer purchases, a performance standard is unnecessary; in a software license agreement it is the most important provision protecting the licensee.

If It Comes to a Lawsuit . . .

When seeking a remedy or damages for his malfunctioning computer software, the licensee will first have to establish what the computer software was supposed to do as agreed upon in the contract. Second, the licensee will have to establish that the software is not, in fact, performing according to the performance standards set forth in the contract. Meeting both the description and performance requirements will be much easier if they are set forth clearly and completely in the software license agreement.

Because the description of the software product and the performance standards are such critical portions of a software license agreement, the licensee should insist upon a well drafted description of the product and performance standards.

A final word: Another unique aspect of computer software contracts is the important role played by computer technicians in drafting the contract. Technical experts may be helpful in drafting a clause or two in many contracts; however, in computer contracts technical expertise plays a part in almost every clause. Therefore, while the importance of having an attorney review major contracts cannot be overemphasized, it is equally important that the contract be very carefully reviewed by someone with technical expertise.

K. Stewart Evans, Jr. is an attorney with the Fairfax, Virginia law firm of Boothe, Prichard, and Dudley.

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