

INTERFACE AGE

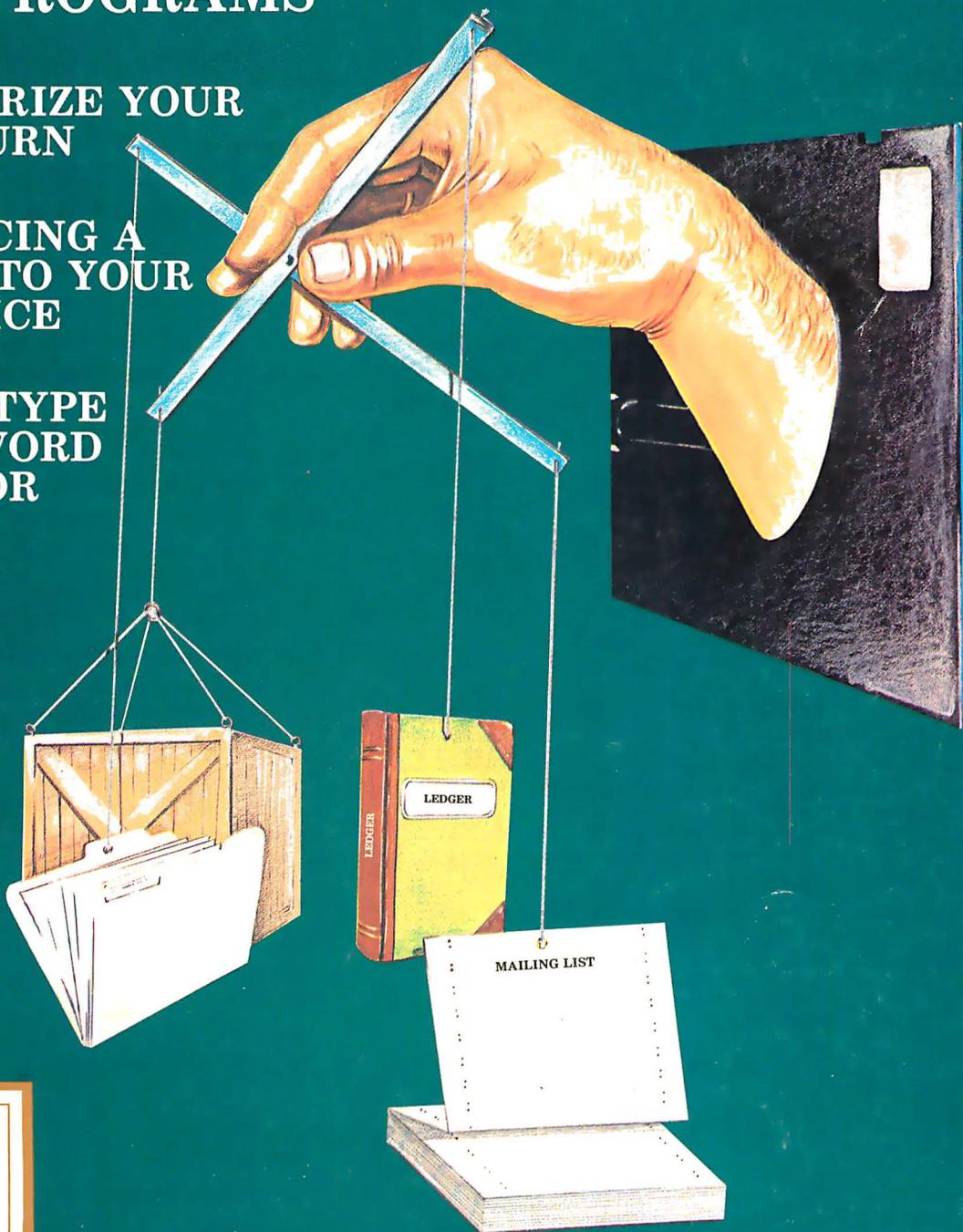
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INTRODUCING A
MICRO INTO YOUR
LAW OFFICE

SETTING TYPE
WITH A WORD
PROCESSOR





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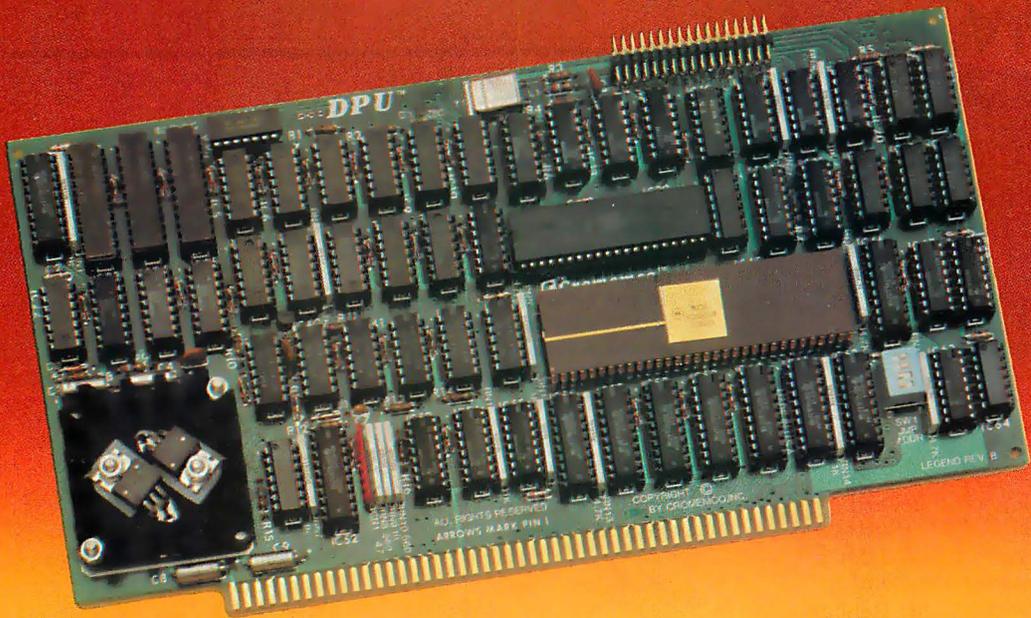
(All software included. Pascal not needed for CP/M.)



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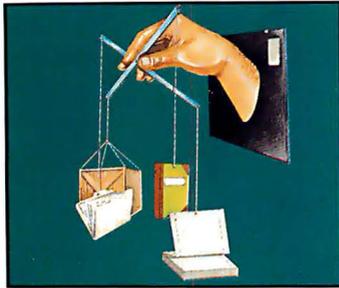


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SPECIAL REPORT

52 Guide to Database System Software *by Carl Heintz*

Database software—and DBMS programs—encompass an enormous range of varying capabilities. It's important to understand all of the diverse features and classes of products in order to make an intelligent purchase decision.

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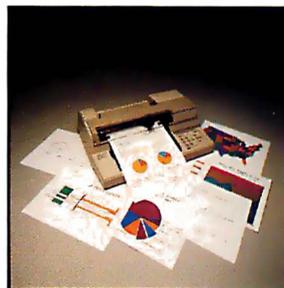
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68 Hewlett-Packard's HP 7470A Plotter

H-P has signalled its intention to compete seriously in the personal and small business marketplace. This plotter represents a commitment to extend graphics capability to this arena.



76 TaxPro: Relief for a Taxing Problem

This tax preparation software package includes the forms and schedules required for most individual income tax returns. It will meet the needs of many professional and personal applications.

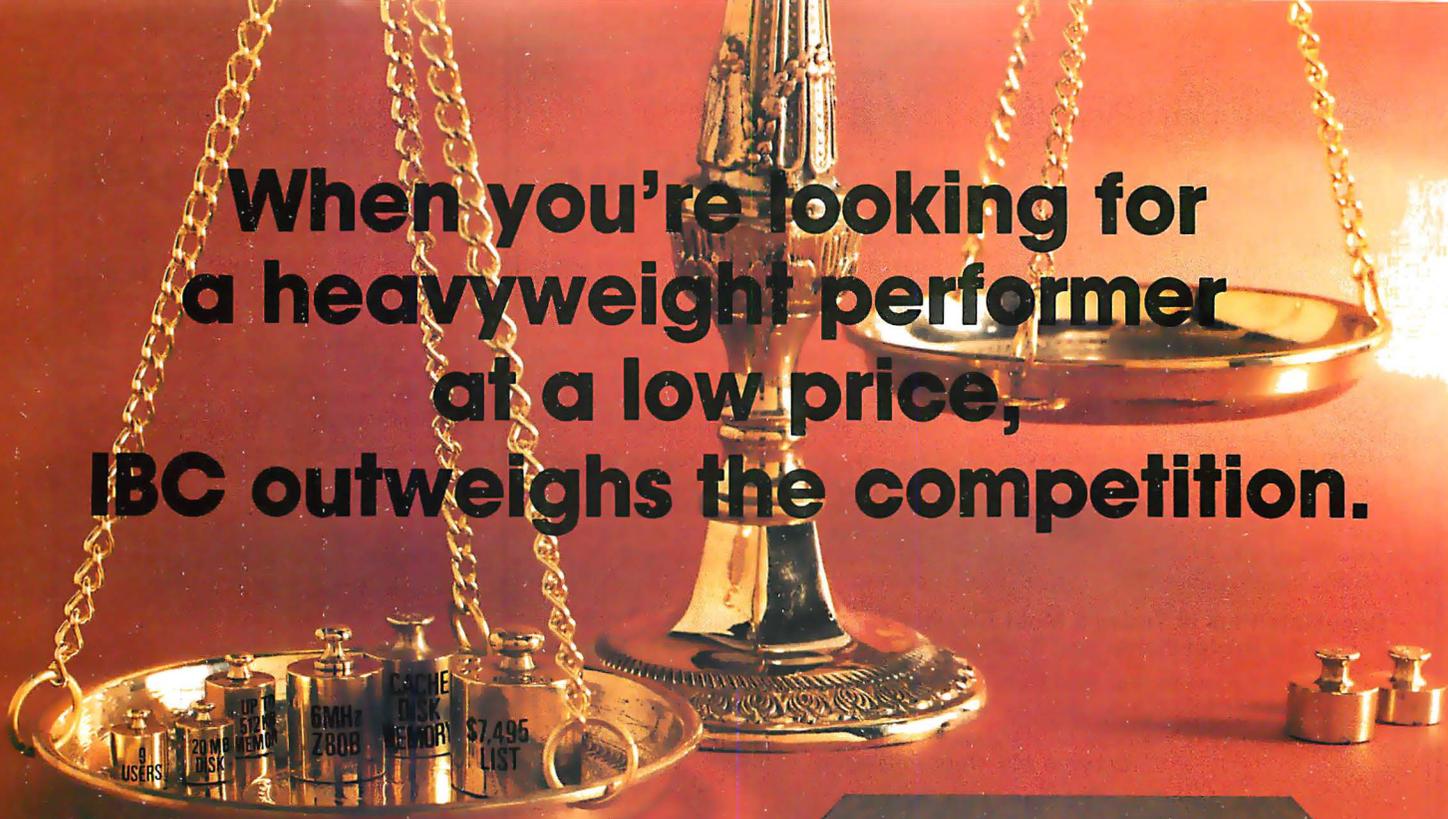


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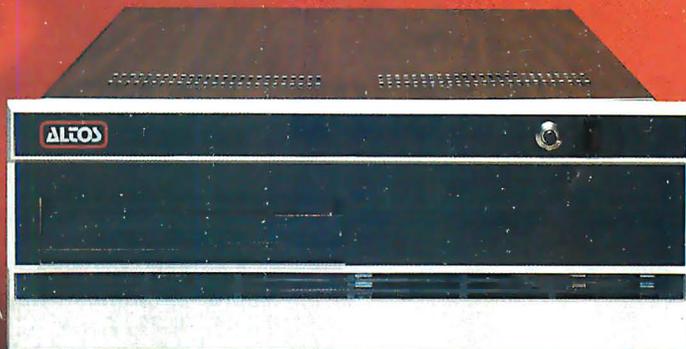
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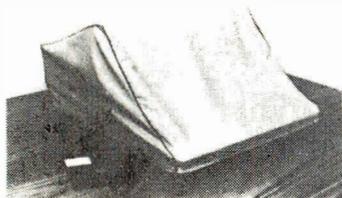
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CREATIVE COMPUTING, Nov. '82 "...While there is no such thing as a free lunch, JRT Pascal at \$29.95 (which includes postage) certainly allows the user to experience champagne and caviar at cafeteria prices..."

INTERFACE AGE, Oct. '82 "...JRT Pascal is following the example set by Software Toolworks (Sherman Oaks, CA) of offering quality software at extremely low price..."

INFOWORLD, Aug. 16, '82 The magazine's 'Software Report Card' rated JRT's

documentation 'good' and performance, ease of use and error handling 'excellent'—the highest rating.

AND NOW: JRT PASCAL 3.0—

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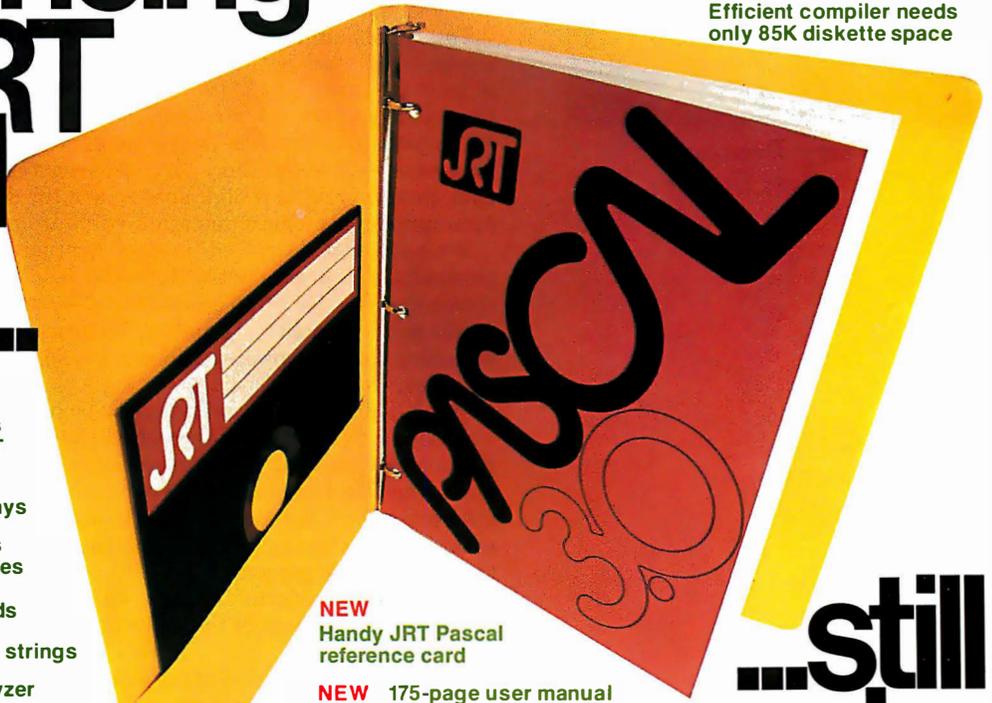
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A 56K CP/M system is required.



Terry Benson
Technical Editor

The paperless society—as with the cashless society—has only been made achievable by the technical advances applied to the computer industry. But even with the multitude of personal computers and word processing systems, we are not necessarily following the right road to minimizing paper—we are just generating more paper easier and faster.

In order for the business community to reduce the amount of paperwork—not create more—there needs to be a systematic plan to replace as many paper-generating functions as possible. Initial strides along this road have been made with multiprocessing and timesharing systems that allow one user to insert information so that another user at a different location can extract that information—perhaps even in a processed form.

A popular use of this capability exists today with on-line inventory control systems. Consider the company that has a terminal in shipping, a terminal in the accounting department and one in the production scheduling department. As the shipping information is keyed-in, the accounting department receives billing notification, while product planning can adjust its schedule to restock its inventory—all of this without any paper being transferred between departments.

Today this kind of system is probably operating on a single, perhaps large, computer system with a substantial investment in software. A system with at least the same capability—maybe a good deal more—could be configured with three independent, low-cost computer systems whether they are from the same manufacturer or not. The only requirement is that they have the ability to communicate with each other. This necessitates a compatible hardware interface that should provide a high speed path for data interchange, accompanied by appropriate intercommunication software packages in each system.

We have just described, in very simple terms, a local area network. More generally, a local area network (LAN) describes communications between electronic systems for up to a distance of 50 miles, though over 60% of these networks will be within one building. Planning these communications systems and designing the appropriate hardware and software are the basis of a well-operating paperless society.

Much of the planning will have to be done not just in the system definition, but also in the determination of what sort of paper can be eliminated. What about phone memos? There are already systems that allow a secretary (or anyone operating at a terminal) to answer a telephone, hands-free, while working with the computer. One such system lets the person temporarily exit the present task, enter a message or mail box task, then leave the telephone message for the appropriate person.

The operator returns to the word processing or other interrupted task and the intended recipient of the call will find the message at his own terminal when he returns.

There are many areas of office productivity that will be improved by the proper interface of office automation equipment. This is in no way restricted to merely word processing tasks. Too many office managers and equipment planners tend to limit the range of paperless support to the more common paper creation chores. Only a few percent of the costs of running a business are actually related to paper processing—and these are usually relegated to lower paid secretaries and office assistants. Over 60% of the costs of business operation come from the higher-paid professionals. If meeting time can be reduced by teleconferencing and if desk work can be simplified via file retrieval through a management workstation, a significant productivity improvement can be realized.

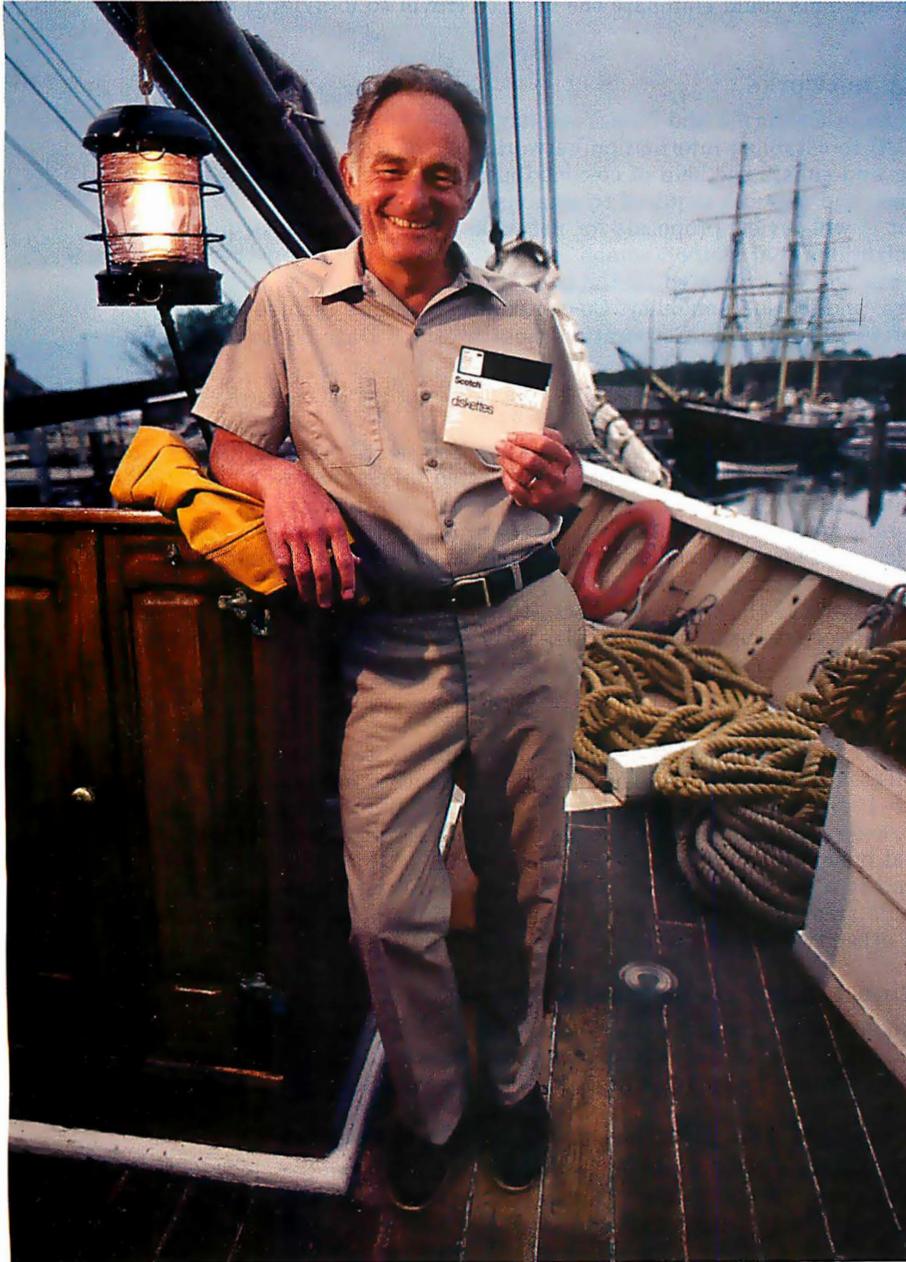
The major roadblock to improving this situation in the near future is the resistance of management to the benefits of a well-organized intercommunication plan for the office. It is imperative that the manager be aware of the areas where he can make efficient use of automation.

There are many courses and seminars that are designed to educate managers and office planners in the development of LANs and related office equipment. One such course is presented by the American Institute for Professional Education (Madison, NJ). The institute offers a number of seminars and workshops.

If we are to be successful in planning more productive offices, we need to educate those who are going to be managing the offices of the future. Let's not stop with the trivial tasks that consume less than 10% of the office budget. The paperless plan needs to begin today!

Terry Benson

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Single location market centers are introduced

Boscom (Boston, MA) and InfoMart (Dallas, TX) are two new permanent exhibition facilities designed to accommodate the information industry. At press time, Boscom listed 60 companies intending to occupy space, InfoMart indicated commitments from 45. These massive buildings will attempt to provide total resource centers for the computer industry, including large permanent showrooms and conference areas. This could eliminate the need to travel to individual vendors, seminars and trade shows.

Apple plants community networks

Eight community organizations in California and New York have received grants from Apple Computer, Inc. (Cupertino, CA) to establish information networks. Under the program, Apple provides equipment and training and enlists the help of co-contributing companies who can provide software, computer accessories, and services required to establish the network.

The company indicates that it will review proposals for networks and award grants quarterly. Typically, three to five organizations that share common information needs join together to submit a proposal. A proposed network will be evaluated on the benefits it provides to the community, its suitability for microcomputers, and its sustainability. Co-contributors to date include Hayes Microcomputer Products, Software Publishing Corporation, Southwestern Data Systems, Tymshare and VisiCorp.

Attorneys meet electronically

The Legal Forum is a new offering from CompuServe Information Service (Columbus, OH). Members of this electronic "Bar Association" are attorneys and interested laypersons who communicate with other members nationwide through their computers. They are able to discuss the latest cases in all areas of the law, share information on law office automation, and review the latest developments on computer-assisted legal research. In addition, the organization offers a number of ongoing departments. The Legislative Action committee reviews proposed legislation in the Computer Law area and makes its recommendations to the other members of the forum and to appropriate legislators. Through a lawyer referral service, users who need legal services can be matched with an attorney in their geographic location who specializes in the user's problem area.

Videotex underway in D.C. suburb

After more than two years of preliminary research and planning, ConTelVision, Inc. (Atlanta, GA), has launched a two-phase videotex pilot operation. The first test, limited to information retrieval, got underway in October with 100 residents in Manassas, VA. For a minimum of six months, these households, selected by a market research firm, will be able to call up a broad array of information provided by local and national business and non-profit organizations.

The second phase will depend to a large degree upon what is learned during Phase I. Current plans call for an expanded geographic area and adding a transactional capability that will allow electronic home banking, shopping and other two-way transactional services.

Federal Office Automation Conference logs record crowds

Attendance of 12,216 was announced for the three-day Federal Office Automation Conference and Exposition (Washington, D.C.). In addition to laser printers, display phones, intelligent typewriters, word processors and other OA equipment and systems, a high profile was held by microcomputers.

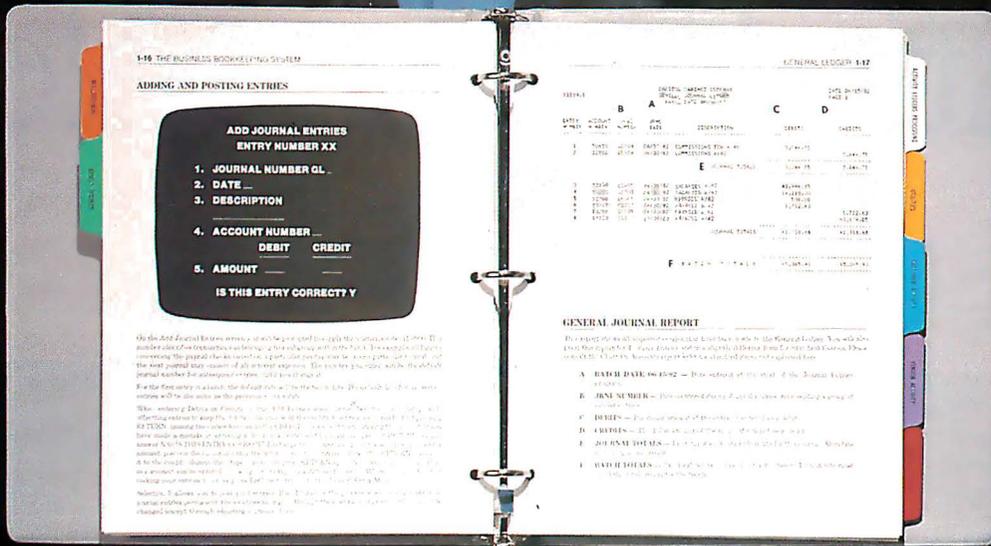
Intel provides software support and distribution of third-party products

Intel Corporation (Santa Clara, CA) is now operating a software distribution and support operation. Says Intel President, Andrew Grove, "The future of the microcomputer industry depends on more than a constantly-accelerating silicon technology. Software and system support will rival silicon technology in importance in tomorrow's microcomputer selection." Support is extended to not only the company's own software products, but for all the third-party software that it distributes.

The software system support is backed up by such features as centralized, toll-free telephone support; annual software directory; newsletters; technical reports; and customized software configuration and consultation at the installation site.

Posh retailer makes its debut

With computer stores becoming as common as fast food franchises, leave it to Beverly Hills, CA, to be the home of what is being called "the Tiffany of computer stores." The Beverly Hills Computer Store features chauffeur-driven limousines to transport customers; jewelry store-like display settings; permanent built-in classrooms with in-house instruction programs; and an elaborate selection of computer software and literature. All software in the store is displayed on black velvet in illuminated glass cases.



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Indexed	yes	no
"How to Use" Illustrations	yes	no
Extensive Error Trappings	yes	no
Toll Free Technical Support	yes	no
Demonstration Diskettes		16
Number of Reports Generated	22	no
Standard Entries	yes	no
Easy Start Up	yes	yes
User Friendly		
Complex Accounting Knowledge Required	no	no
Displays Available	yes	no
Transactions	yes	no
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Summary Reports:	yes	no
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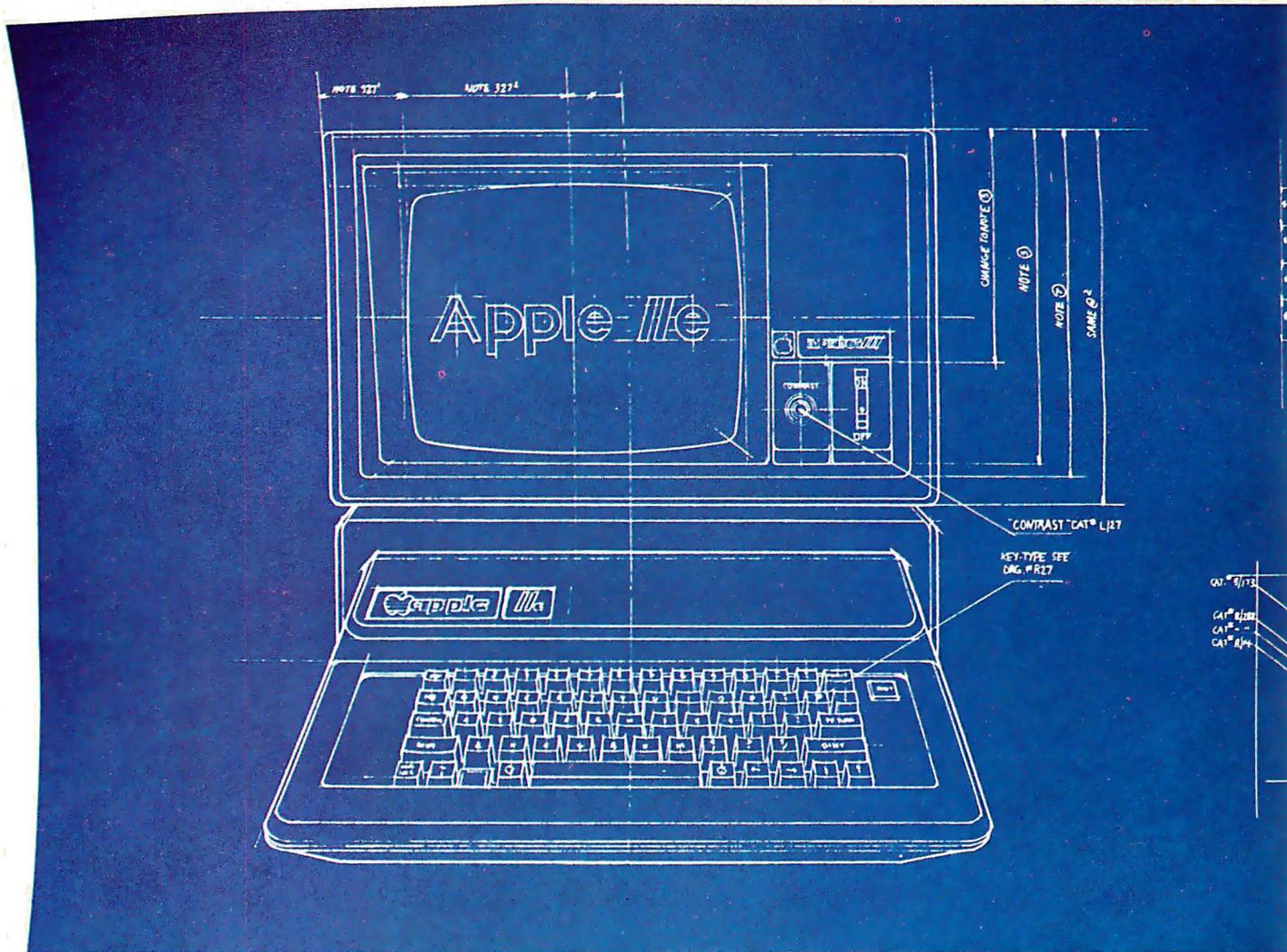
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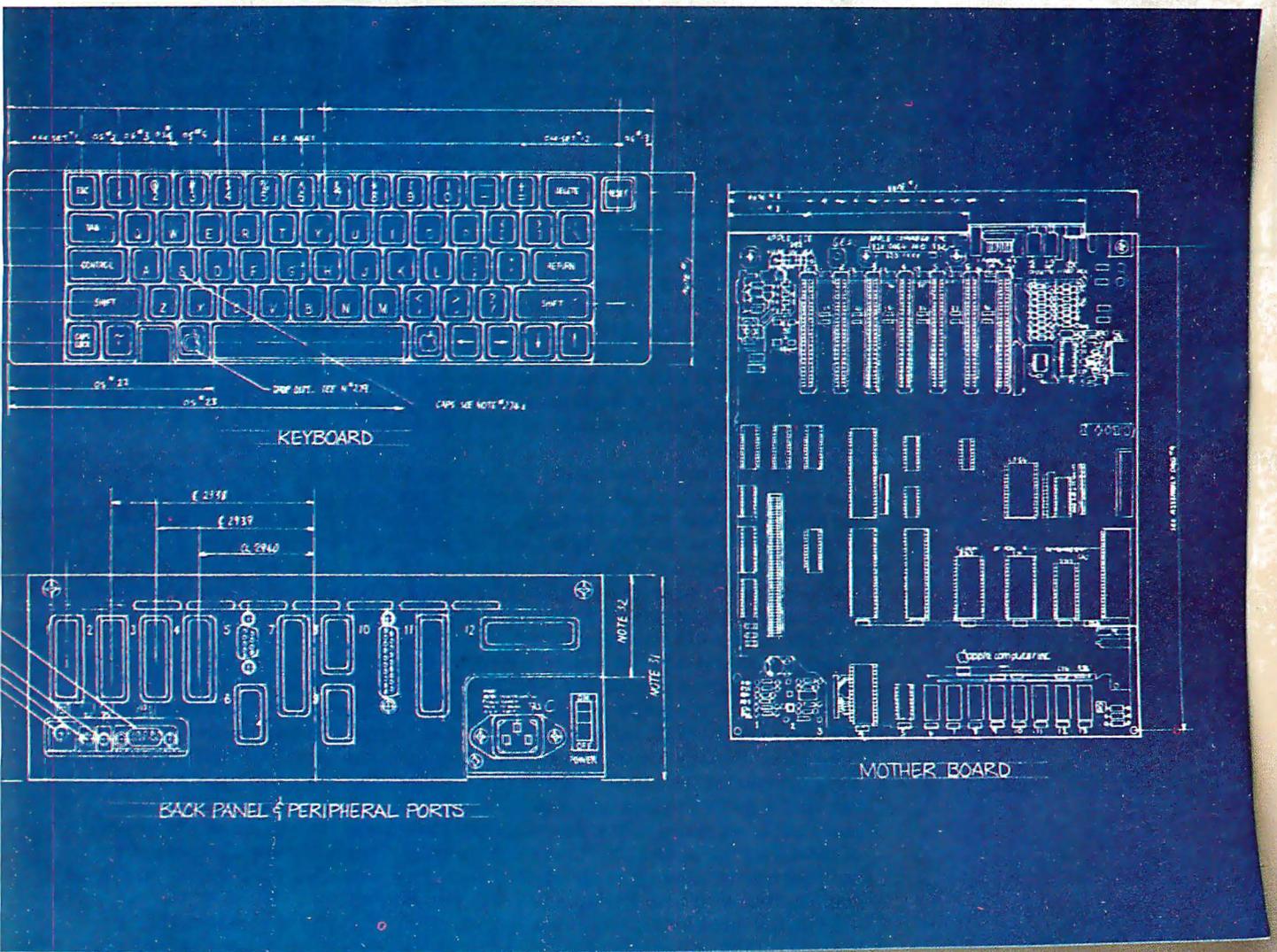
A new, improved keyboard, with a complete set of ASCII standard characters. Plus full cursor controls, programmable function keys, and a rapid auto-repeat feature built into every key on the board.

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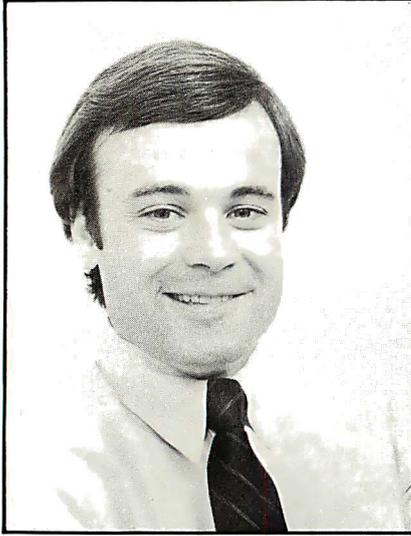
Like the original, it's rather extraordinary. But then some things never change.



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CIRCLE NO. 6 ON INQUIRY CARD



Fred Gibbons
President
Software Publishing
Corporation

For some time now, businesses of all sizes have been purchasing microcomputers laden with rather inelegant software. Much of the software fueling earlier purchases was whipped together by hobbyists to serve some crude purpose. They were the ones who owned the machines and they were the ones discovering the uses for them. Often, only the most basic functions were approached. The needs were simple and the solutions unsophisticated. The growing consumer market was so thirsty for applications that even the most rudimentary programs were readily accepted. Many have been slow to realize that a simplistic approach to programming is not necessarily synonymous with ease-of-use. Only now is the consumer abandoning the wide-eyed "gee-whiz" attitude toward the electronics and taking a more discerning look at real capabilities.

Less than a year ago, if the first time end-user had difficulty achieving success with a commercial software product, the response was typically: "Well, I must be screwing up—this is obviously a wonderful product, but I'm not smart enough to make it work. . . ." Now the pendulum has swung dramatically. More and more users are realizing that if there are deficiencies, they are most likely in the design of the computer system. This is the right attitude. This is the only attitude. Lengthy familiarization periods and mediocre data manipulation should not be tolerated.

Consumers must be discriminating. In fact, they should become aggressive, comparative shoppers. If you can't make a program work in the store—with the salesman's help—it's very unlikely it will perform adequately when you put it on your own desk. In this regard, a computer store demonstration can be an excellent indication of potential useability. Ask for trial runs of the same software application on several machines and look very closely at the user-interface. The good programs are always available on at least three popular computers.

In the course of this evaluation process, it will become necessary to choose a dealer who will conscientiously address your needs and be receptive to your questions. Make no compromises. Find a store with a knowledgeable staff. Spend time only with salespeople who have demonstrated the capacity for communicating very clearly the fit between your conceived needs and the resources a store can access. Usually, the most satisfied customer is the one who walks into the shop, delineates his needs in specific terms and then asks simply, "what can you do for me?" For instance, merely stating that you're interested in a word processor is not enough. You must describe the class of typing you do, the length of most documents and the volume of your work. Personal computer merchants are just now coming up to speed. You might have to visit a few before you're comfortable with one. Perhaps you will not find one.

Even the most formidable investigation might lead you to conclude that nobody is willing or capable of giving the required dose of attention. There's no law that says you can't back out. Everyday people who thought computers were well-suited to their endeavors decide they shouldn't really be in the marketplace today—or even tomorrow. If you don't feel confident that you can be successful in a relatively short period—given the amount of assistance available—suspend your plans for purchase. Wait. Step back for a broader perspective. Reassess your plans. These tools really can be magic alternatives to manual modes of operation, but not if they are harder to operate than the appliances they emulate. For example, a simple card file need not evolve into a complex database; a word processor shouldn't be harder to operate than a traditional typewriter.

Get tough. Make manufacturers and salesmen aware of your real needs.



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CIRCLE NO. 9 ON INQUIRY CARD

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16-Bit Micro with Integral Networking Capabilities

The Altos 586 (Altos Systems, San Jose, CA) utilizes the Intel 8086 processor running at 10 MHz (2.5 times the clock speed of the Z-80), with 256K bytes of RAM, or 512K bytes expandable to 1M byte.

This offers four multi-user/communications technologies: multiple-users on a single computer; high speed twisted pair networking; Ethernet; and mainframe communications.

An integral terminal with an ergonomically-designed keyboard and bit-mapped monitor round out the package. Software includes Xenix/Unix, the microcomputer implementation of Bell Laboratories' Unix Version 7 operating system and Altos' ABS/86 business software package.

Other features on the new computer include battery-backed clock and calendar, Multibus-type architecture, proprietary memory management for system security and faster performance, power failure detection, and internal distributed intelligence allowing low-cost multi-user expansion.

The 586 features six RS-232 ports, upgradable to ten through an integral communications board. The board provides com-

munication with large corporate mainframes—protocols include IBM 2780/3780 (synchronous), 3270, SNA/SDLC and X.25. The board also offers an auto-dial and auto-answer modem.

Up to 32 other 16-bit Altos microcomputers may be networked, using twisted-pair cable. Networking is accomplished using RS-422 cabling connected to an integral interface, and Altos-Net software.

Users can economically upgrade to Ethernet, by the addition of a board slotted into the system's Multibus-type interface. This interface will accommodate the Ethernet chip set when it becomes available. Because Ethernet and Altos-Net share the same software, the upgrade is not complex.

In addition to Xenix/Unix, the system also supports MS-DOS, PICK, CP/M-86, MP/M-86, and Oasis-16 operating systems. Languages include Basic, Cobol, Fortran, Pascal, and C.

The 586 family is currently available in two configurations. The 586-2 offers dual 5.25-in., 1M-byte floppy-disks and is priced at \$4,990. The 586-10 lists for \$7,990 and features 10M byte 5.25-in. hard disk storage with floppy backup. Both models are upgradable to 20M bytes.

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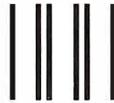


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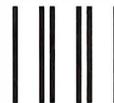
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Vista Da Vinci GREAT INNOVATORS



In Italy in the 15th century Leonardo Da Vinci was a multi-talented genius. Leonardo's ideas and designs were endless. He was always creating new devices to solve the world's problems. Pictured here are many studies for military arms and armor and battlements.

Today Vista is developing many high technology computer peripherals for use with IBM™ and Apple Computers. The final evolutionary stage in Apple disk storage, Quartet offers you the capacity of 4 Apple Disk Drives in the volume of one. Quartet's low profile styling has been developed to blend in with the profile and style of your Apple II Computer.

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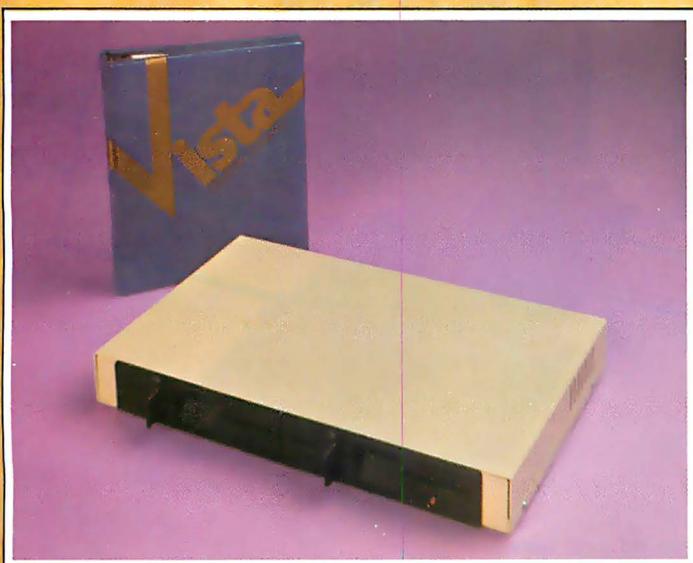
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Vista Quartet

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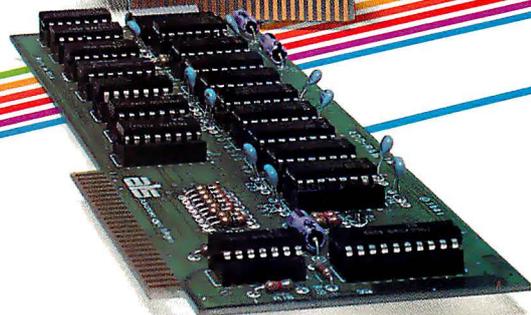
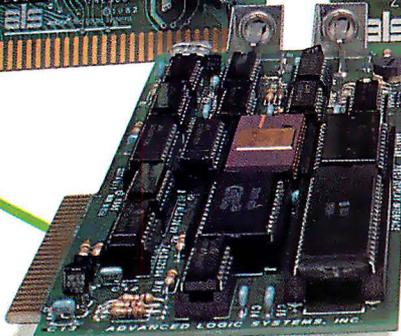
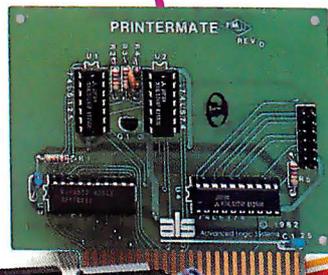
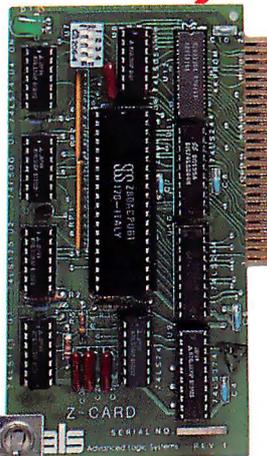
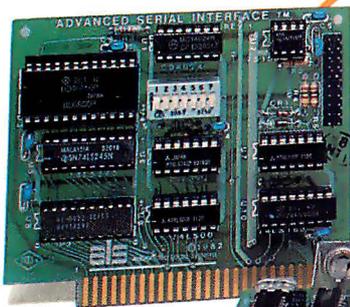
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CIRCLE NO. 1 ON INQUIRY CARD

Format pro and con

Thank you for publishing such an informative magazine. I recognize that one of your aims is to cover the business uses of computers. However, as a land surveyor, I would also like to see some more civil engineering and/or land surveying applications.

I look forward to many more enjoyable hours reading your excellent articles.

Douglas Ford
British Columbia, Canada

As a recent subscriber, I enjoy your magazine, particularly the articles containing programs that I can enter and run on my Heath H-89 (MBasic & CP/M system). The Micro-Mathematician columns, which appeared at one time, were also most interesting, and I hope you will consider resuming them.

Robert L. Anderson
St. Albans, WV

I have been a subscriber to your magazine for about five years, but I must inform you that I'm not going to renew my subscription for another year.

When I first stumbled over your October, 1977, issue in one of the first computer shops in our country, I was really fascinated, started my subscription and even ordered some back issues. The first years, I found your magazine always very interesting, with a lot of useful articles and fascinating concepts (remember Floppy ROM?). As the big small business market got going, your magazine adapted to this market. Though I am a management consultant and not a "hacker," I get more and more tired at reading all those articles about how to select a microcomputer and similar—certainly good—advice to all these businessmen and middle managers who start to discover that there are reasonably-priced computers on the market.

I understand that you have to adapt your style to the changing market, but it seems that nearly everybody does so and gets "respectable." With videotex and similar concepts to tap the consumer market in the wings, and all those kids growing up with computer contact, there'll certainly be a market for a magazine that addresses people who'd like to get a feeling for how a computer operates.

Knowing quite a bit about microcomputers already, I've decided to stay on the sidelines until all those small businessmen start to get fed up with reading articles about how to select a microcomputer. Sorry.

René E. Lüthy,
Zurich, Switzerland

Thanks for your input. Overall, our reader reactions have been overwhelmingly in favor of our business applications coverage—ed

Pocket fans

Being the owner of a PC-1500, I was somewhat disappointed in your recent column ("Portables" *IA* Aug 82) for not mentioning several of the major enhancements over its predecessor, the PC-1211, which I also owned but have since passed onto my son.

For starters is the comprehensive error list provided, which allows for much easier analysis of problems detected. Another is the INKEY\$ statement, which allows for on-going interaction with the keyboard without the necessity to hit ENTER after each input and the PRINT Statement string when followed by a. Still another is keeping the character string displayed, allowing for the makeup of variable messages to prompt inputs.

For Bob McElwain's edification, the port he speaks of on the back of the printer supports currently what is called a software board, which is essentially an input matrix device. It can be considered a 10-by-14 touch panel, which can be used in one of two basic modes with supporting software. The modes equate to a 140-point entry device or 90-point entry plus a 50-point A/N keyboard.

The other use—scheduled to be released sometimes later this year—is an RS-232C interface.

One thing I have learned through my study of the S/W board is the inclusion of an undocumented PEEK statement, which allows one to nose around in the memory of the computer to a certain extent.

Finally, for the sum of approximately \$74.50 (\$1 = ¥255), one can purchase a briefcase specifically designed to hold all the components.

Anthony Whitman
Tokyo, Japan

I was especially pleased to purchase the May issue because of the article featuring the Casio FX-702P Pocket Computer. As with another correspondent whose letter you printed in August, your article contained several points about the device that I had not known before. While I have been extremely pleased with the computational abilities this machine has provided me

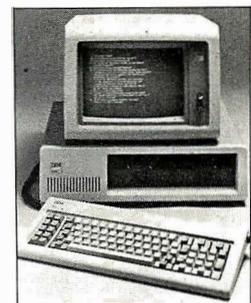
(even allowing me to develop and run a series of "ARIMA" forecasting programs), the fact that I had to learn about its operation from a magazine article rather than the owner's manual points to one very broad area in which the computer is extremely unsatisfactory—manufacturer and dealer support.

In addition to a poor owner's manual; the so-called "program library" included with the computer was apparently rewritten from one used with a previous machine and is basically useless; there is no company sponsored user's group (for program and information exchange); there is no word from Casio yet about the expansion slot in the back, and I suspect there never will be. Worst of all—as I can testify from months of personal experience—the repair service is totally abysmal.

Paul Durrant
Long Prairie, MN

For the record

In the article "The Ten Most Talked-About Products of 1982" (*IA* Dec 82), two products probably received even more talk than anyone bargained for. Photos of the Corvus Concept from Corvus Systems (San Jose, CA) and the Personal Computer from IBM (Boca Raton, FL) were inadvertently switched. The two photos below are provided for clarification.



IBM Personal Computer



Corvus Concept

CALENDAR

Feb 1-5 New York, NY, *Kuwait Info* will encompass diverse areas such as computer software, hardware, peripherals, and office furniture, micrographics, data communications, word processing, dictating systems, information transmission, telephone systems, computer accessories, duplicating and copying, record-keeping and environment controls. Clapp & Poliak Int'l, Box 70007, Washington, D.C. 20088.

Feb 7-9 Philadelphia, PA, *IIE/MHI Material Handling Seminar* will give updates on the state-of-the-art in equipment, systems and components. It will also be offered February 14-16 (Phoenix, AZ). Institute of Industrial Engineers, 25 Technology Park, Atlanta, GA 30092.

Feb 14-17 Orlando, FL, *Eleventh Annual Computer Science Employment Register* aids in matching computer scientists and data processing specialists with employment opportunities. Computer Science Employment Register, University of Pittsburgh, Pittsburgh, PA 15260.

Feb 18 Atlanta, GA, *Systems Development Documentation: Forms Method Seminar* will attempt to reduce the gap between the systems development functions performed by analysts and programmers during the system development cycle and the documentation performed by technical writers. It will also be featured February 21 (Phoenix, AZ), February 22 (Tucson, AZ), February 28 (San Diego, CA), March 1 (Los Angeles, CA), March 28 (Jacksonville, FL) and March 30 (New Orleans, LA). Technical Communications Associates, 1250 Oakmead Pky., Ste. 210, Sunnyvale, CA 94086.

Feb 18-21 San Diego, CA, *Pacific Computer Expo* will feature exhibits on mini and microcomputers, software, graphics, data and word processing, telecommunications, peripheral equipment, supplies and computer services. Judco Enterprises, Box 963, Scottsdale, AZ 85252.

Feb 21-23 Philadelphia, PA, *Office Automation Conference* will feature more than 200 technological exhibits. Technical sessions will explore advanced office technology, communications, current office technology/systems, human factors and social issues, management and organizational issues and systems integration. (See "Expositions," page 162.) AFIPS, 1815 N. Lynn St., Arlington, VA 22209.

Feb 22-25 Barbican, London, *Info '83* will be devoted to information technology within the office environment. BED Exhibitions Ltd., 44 Wallington Sq., Wallington, Surrey SM6 8RG England.

Feb 24-25 San Diego, CA, *Computers in Construction seminars* will assist construction contractors and management firms in acquiring computer systems. It will also be offered March 24-25 (Orlando, FL), April 21-22 (New York, NY) and May 19-20 (Denver, CO). CIP Information Services, 1105-F Spring St., Silver Spring, MD 20910.

Feb 25-27 Orlando, FL, *Computer Expo* will emphasize mini and micro computers, and include hardware, software, word processing, graphics, peripherals, supplies, services and computer furnishings. Tom Blayney, Box 1185, Longwood, FL 32750.

Mar 8-9 Austin, TX, *SIGCOMM Symposium* will cover communication architectures and protocols. Topics will include state-of-the-art network architectures, algorithms and protocols for data communications, theory and practice based on software design for specific applications and/or specific technologies. The Mitre Corp., 1820 Dolly Madison Blvd., McLean, VA 22102.

Mar 10-12 Hartford, CT, *National Topical Conference* will include insight into how microcomputers work; how to evaluate hardware and software; administrative uses; data management; computer-assisted instruction; computer languages; programming and the use of microcomputers to assist the handicapped. The Council for Exceptional Children, 1920 Association Dr., Reston, VA 22091-1589.

Mar 14-17 Washington, D.C., *Federal Office Systems Expo* will cover professional productivity increase through office automation. Sessions are planned for word processing, data processing, records management, micrographics, telecommunications and computer graphics. National Trade Productions, Inc., 9418 Annapolis Rd., Lanham, MD 20706.

Mar 15-18 Washington, D.C., *Computer Graphics Seminar* will include topics on technology fundamentals; raster scan, vector and color techniques; software and hardware availability and selection criteria; and equipment selection and implementation of graphics applications. It will also be offered April 5-8 (Boston, MA), April 26-29 (San Diego, CA), May 10-13 (Philadelphia, PA), June 7-10 (Washington, D.C.) and June 14-17 (San Francisco, CA). Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., Santa Monica, CA 90405.

Mar 16-17 Houston, TX, *Business-Expo* will cover high-technology business products and services in over 200 exhibits. It will also be covered May 17-19 (Detroit, MI), September 21-22 (Boston, MA), November 9-10 (Philadelphia, PA) and December 6-8 (Dallas, TX). Business-Expo, 702 East Northland Towers, Southfield, MI 48075.

Mar 17-19 Tempe, AZ, *Microcomputers in Education Conference* will consist of workshops, demonstrations and presentations designed for anyone interested in microcomputer applications in education. Arizona State University, Tempe, AZ 85287.

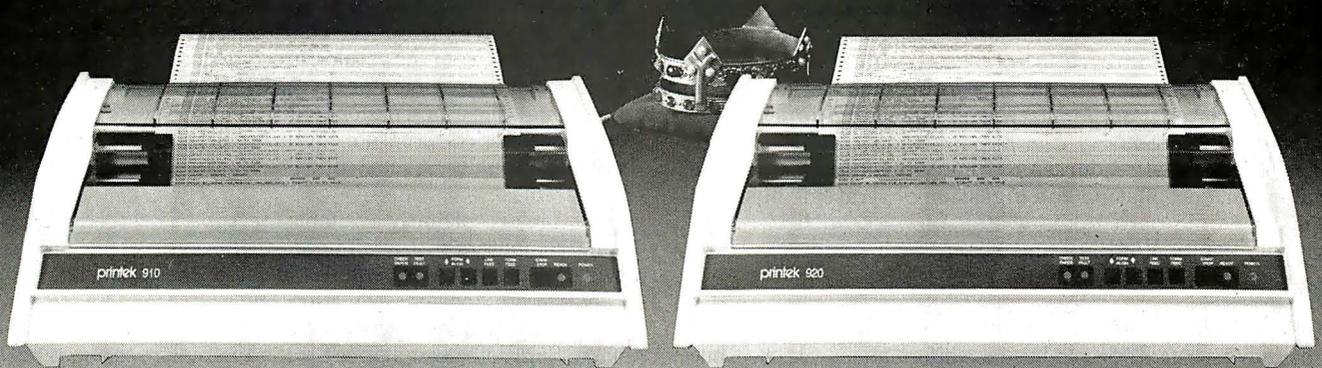
Apr 13-20 Hanover, West Germany, *Hanover Fair* is the world's largest industrial trade exhibition, and will place special emphasis on exhibiting the latest technology in industrial robotics. Hanover Fairs Information Center, Box 338, Whitehouse, NJ 08888.

We invite sponsors of upcoming events to submit notices for inclusion in Calendar. Send a brief description, along with full address, phone number and contact person to: Calendar, Interface Age, P.O. Box 1234, Cerritos, CA 90701. Items must arrive no later than 90 days prior to the event to be considered.

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- Compatible with most computers—easy serial and parallel interfaces.

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- One year warranty on print heads. Under normal use over 250 million ch.
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Online Information Industry's Influence Begins to Spread

In today's business environment, there is little margin for error in decision-making. New technology can give users an edge. Answers to many questions are based on a combination of proprietary information analyzed against the context of the larger economic environment. Providing business information is one of the fastest-growing segments of American commerce.

Obviously, the integration of data resources with the personal computer means that more informed decisions can be made faster. Popular databanks like *Dow Jones News Retrieval*, *The Source*, *CompuServe* and *Dialog* are considered essential resources by many businesspeople. The collection, compilation and digestion of strategic business and economic data takes a step forward with two new developments: VisiLink and CBS/AT&T Videotex.

VisiLink

VisiCorp's (San Jose, CA) new software package, VisiLink, electronically transfers selected business information over telephone lines from a private databank—Data Resources (Lexington, MA), a McGraw-Hill operating unit with over 950 staff members engaged in compiling and analyzing computerized information. The information is in the form of VisiCalc worksheets called DataKits. DataKit worksheets may be used with VisiCalc or other VisiCorp business software products such as the VisiTrend or VisiPlot programs.

DataKit worksheets are national, international and regional in scope and include financial, industrial and special-purpose data. Also available are profit-and-loss statements, income statements and other financial data about public corporations. New worksheets are planned to be added on a quarterly basis.

Many applications include detailed formulas that allow users to apply worksheet information to individual needs. By using

VisiLink to transfer information and models directly in VisiCalc format, the job of integrating external information with proprietary information known only to the manager or executive is simplified. Information and preformulated analytic tools are supplied on the same worksheet.

The VisiLink program operates much like an electronic mail order system. A catalog of available subjects is contained on one of the VisiLink diskettes. The price list and catalog are automatically updated for the user.

The user pays only for the information received; registration and selection from the catalog are performed off-line, so there are no connect-to-computer charges. Billing for the service may be through the user's major credit card or through a DRI user code account. The program automatically uses the lowest-cost method—usually a local phone call—to connect with the mainframes.

VisiLink is currently available for Apple II and II Plus personal computers with a minimum of 48K bytes of memory and two disk drives. Also required is one of these modems: D.C. Hayes MicroModemII, Novation Apple-Cat II or Novation 212 Apple-Cat II. Information is transferred at either 300 or 1,200 baud. Suggested retail price for the VisiLink program is \$250.

Joint videotex field test

CBS and AT&T are testing a new videotex information system that combines the power of the computer with common televisions and telephones. The service is being offered in Ridgewood, NJ, about 25 miles from New York City. It provides an integrated package of electronically-delivered information, advertising, marketing and message services.

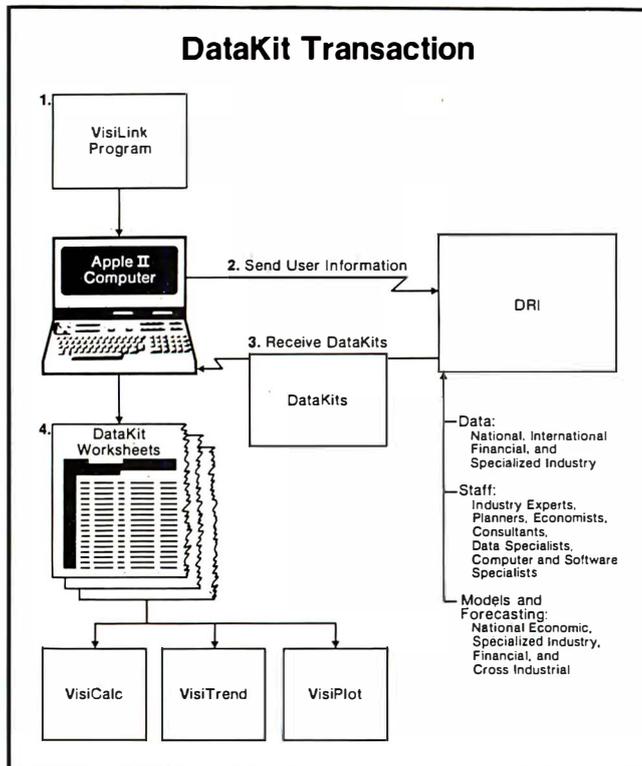
Consumer interest in on-line shopping and banking services is being carefully measured in this experiment. In addition, the three potential sources of revenue—consumer subscription, advertising and transaction fees—are being scrutinized.

AT&T is testing two types of terminals in the Ridgewood trial—one an integrated unit with both color television screen and built-in keyboard, and one in which the participant's home color television set is connected to a separate control unit and keyboard. AT&T is also providing the frame-creation terminals. These devices have sophisticated editing capability that builds the text-and-graphic information and advertising screens—or pages—created by CBS and stored in the computer for delivery to the participants' screens. In addition, AT&T is providing computer facilities and computer software. Transmission facilities linking the mainframe computers and the terminals are provided under tariff by New Jersey Bell.

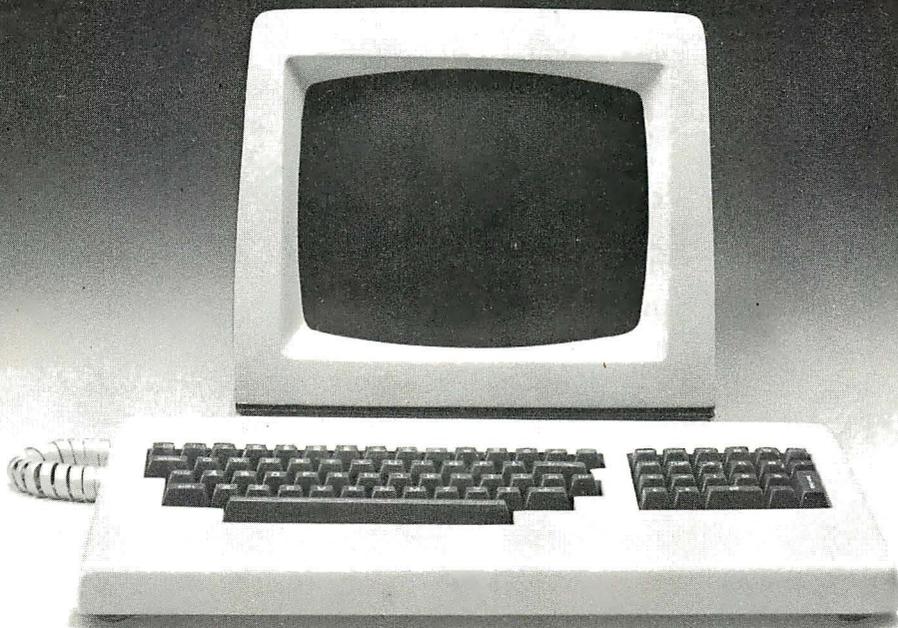
The first phase of the test involved 100 homes. The service is now being tested in a second set of 100 residences—free of charge. A number of unique tributaries are offered including: continuously updated international, national and local news, information weather and sports from more than 60 information providers including *The New York Times*, *The Wall Street Journal*, CBS News, WCBS Newsradio 88, *The Record*, *The Star-Ledger*, *The Ridgewood News* and others. Advertising has been created for more than 80 clients by 16 major agencies. Innovative shopping services enable people to select and order products from 20 retailers and direct marketers, such as J.C. Penney, Saks Fifth Avenue and even King's Supermarket. Home banking service is available through Citizens First National Bank of New Jersey and Fidelity Union Bank.

Primary computer services are provided by Automatic Data Processing. Valuable services, including an electronic notepad for keeping notes, a capability to send messages to other homes with videotex terminals, a storage file for keeping favorite

Continued on page 157



Introducing the Smart Terminal With a Dumb Price



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 - Popular Industry Code Structure
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 - Business Style Keypad
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Now, there's an exciting new attraction in smart terminals. The "Challenger" family of ergonomically-designed Soroc terminals is the result of an innovative commitment to flexible performance and professional user comfort. These features combine to establish a new standard for price/performance comparisons and the ultimate in operator convenience and productivity.

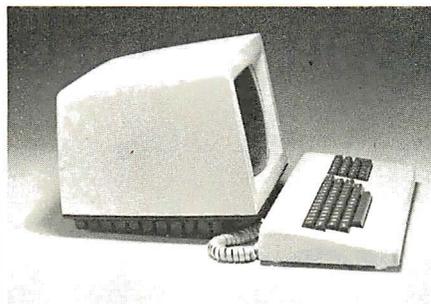
Challenger's unique styling helps increase productivity; non-glare screens help reduce eyestrain—a problem affecting over 80%* of all visual display terminal operators; the detached low-profile keyboard with palm rest helps reduce typing fatigue.

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Challenger is ready to go; and remains in that condition unless you alter it. An industry code structure capability further assures straightforward interconnect.

Challenger comes standard with more features and more flexibility;

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- intelligent flexibility with programmable operational characteristics



- a full range of built-in edit commands
- special graphics characters
- easy-to-use transmit and print functions
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Challenger is produced, tested and must pass stringent quality checks entirely in our Anaheim, California facilities, before it's packaged for shipment. This commitment accompanied by an unmatched 12-month limited warranty and support is backed by an expanding nationwide domestic service organization. These are sound reasons for you to check into all the facts before you make your selection. Once you do, we're confident you'll make the right decision.

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boy are you gonna be sorry.

Epson.

The new Epson QX-10 is unlike any personal computer you've ever seen. It's a computer for people who don't have the time to learn computers; a computer you can be using within minutes.

And fortunately, you don't have to take our word for it. Here's how *Byte*, one of the computer industry's most prestigious magazines, describes the QX-10.

The first anybody-can-use-it computer.

"The Epson QX-10 (is) a computer for less than \$3000 that may well be the first of a new breed of anybody-can-use-it 'appliance' computers ... In addition to being a highly integrated word processing/computer system that offers as much usable processing power as almost any existing microcomputer, the QX-10 ... system is designed to be used by people with minimal technical knowledge. We've certainly heard that claim before, but Epson has delivered on this promise in a way and to an extent that *no* microcomputer manufacturer has done."

That's nice to hear from a magazine like *Byte*, of course, but it doesn't surprise us. It's just what we intended the QX-10 to be all along.

More computer. Less money.

But useability isn't the only thing the QX-10 has going for it. As *Byte* says, "the QX-10 gives you a great deal for your money."

"Help is available at any time through the HASCI (Human Application Standard Computer Interface) keyboard Help key ... Text can be entered at any time just as you would in a conventional word processor. The Calc key turns the system into a basic

4-function calculator. Graphics can be created via the Draw key. The Sched (schedule) key gives you access to a computer-kept appointment book, a built-in clock/timer/ alarm, and an event scheduler."

Advanced hardware for advanced software.

As for hardware, *Popular Computing*, another industry leader, says: "The QX-10 includes ... a number of advanced hardware features ... The basic components of the system are a detachable keyboard, a high resolution monochrome display, and a system unit containing two 5¼ inch disk drives. The drives use double-sided, double-density disks (340K bytes per disk) and are amazingly compact ... The QX-10 uses an 8-bit Z80A microprocessor. The system contains 256 bytes of RAM. Some of the RAM is ... battery powered ... which lets the computer retain information when the power is off."

You won't have to wait much longer.

The new Epson QX-10 may very well be the computer you've been waiting for. And fortunately, you won't have to wait much longer — it will be appearing soon in computer stores all across the country. In the meantime, write Epson at 3415 Kashiwa Street, Torrance, CA 90505, or call (213) 539-9140. We'll be happy to send you copies of our reviews.

After all, as *Popular Computing* puts it, the QX-10 will "do for computing what the Model T did for transportation."

And we couldn't have said it better ourselves.

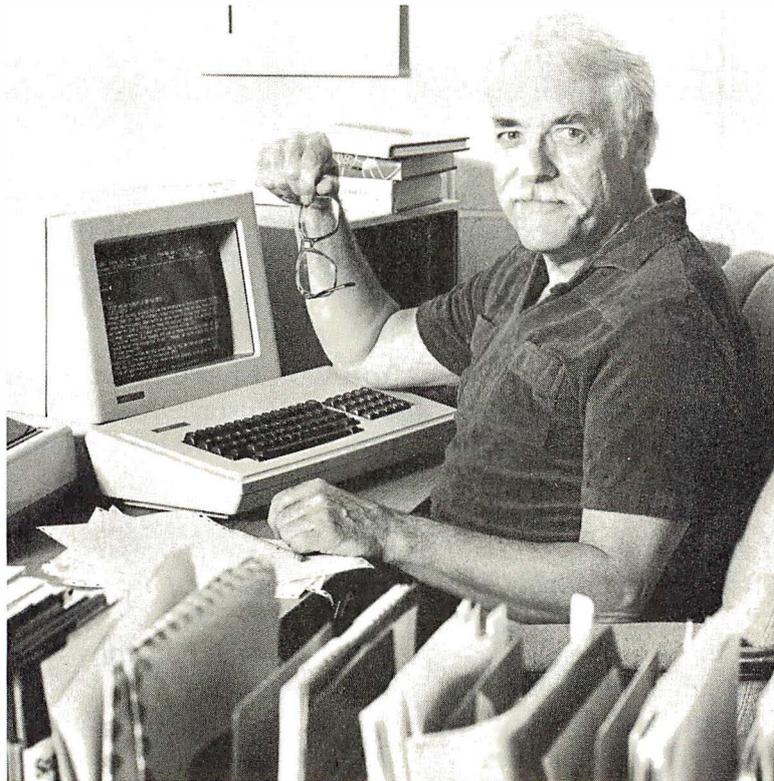


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(Dick Nolan, Columnist, San Francisco Examiner)



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Pros and Cons of Indexing Programs

A program that will generate a table-of-contents and a definitive index for reports, manuals, articles, outlines and books, can be a valuable addition to your software library if it serves your needs adequately and can be quickly implemented.

Who could benefit from an indexing program? Lawyers, authors, students, script writers, word processing services, office managers, executives, publishers, manual writers, journalists—anyone who deals with words to create any formidable bodies of text. How cost-effective are the programs? Just what can they do for you and how easy are they to use? Let's take a look at three index-generating programs.

DocuMate Plus (Orthocode Corp., Albany, CA) works with CP/M on a Z80 or 8080 processor. Minimum of 48K bytes RAM is required. Price is \$165 for versions compatible with either WordStar (MicroPro, San Rafael, CA) or Select (Select Information Systems, Kentfield, CA) word processors. Additional distribution of the program is available through Software Bank (Andover, MA) and Softsell (Inglewood, CA).

WordIndex release 3.0 (from Lifeboat Assoc., New York, NY) also works with CP/M on a Z80 or 8080, with 5.25- or 8-in. disks. Minimum of 48K RAM is required. Price is \$390.

Index Generator, written by Tom Jennings, is in the public domain. It is distributed by Remote CP/M Bulletin Board (Boston, MA). Minimum of 48K bytes RAM is required. Any disk size will work. Anyone may use it—but cannot sell it. Further information is available from Paul Kelley at (617) 862-0781.

All three programs reviewed are written to integrate with WordStar and CP/M-80. Index programs exist for other operating systems and word processing programs; the reader is encouraged to seek them out. The features outlined in the programs may be applied to evaluate others. Some word processing programs include index utilities, and that may be a reason for purchasing one program over another.

All indexing programs do not accomplish the same goals. One is not a substitute for another. You have to decide what tasks need to be accomplished, then choose the package that will meet the requirements.

How do they work?

What are the principles of an indexing program? Nonprinting dot commands are embedded by the user into the text. The index program reads and utilizes these special commands to generate and sort its various lists for a table-of-contents, an index, cross-reference, numbering illustrations or another feature of which it is capable.

DocuMate/Plus reads a WordStar file and generates a new file containing a table-of-contents and/or an index for the document. The dot commands may be added as the document is created so that when revisions are made, *DocuMate/Plus* will be able to update the revisions. The table-of-contents feature is valuable for developing an updated outline of a large text file with many subheads. The commands may be added when the text is completed, then the table-of-contents made from the final draft. There are options for formatting the tables and indexes.

WordIndex is designed to be used *after* editing a document and *before* it is printed out by WordStar. Think of it as proofreader's marks for a typesetter to follow. Before running a document through *WordIndex*, you place dot commands in the document. *WordIndex* then inserts correct print directives, based on these commands so it can

number headings and subheadings. It automatically places underlines, boldface and other WordStar print controls in the text. At the same time, these same controls are used to generate a table-of-contents and a subject index file.

Index Generator is devised to create only an index, but there is no reason the same subject and page number listing could not be used for a table-of-contents. The directives are easy to follow. It could be a convenient program for short documents.

If any of these procedures appear to offer a simple way to deal with your editing/writing tasks, read on. They are not as utopian as they seem. Each requires a good amount of thought, input and time spent preparing the document for its "automatic" generation.

Generating a table of contents

Producing a table of contents is easy to accomplish with *DocuMate/Plus* and *WordIndex*. *DocuMate's* method and results are instantly rewarding. I used it recently to create an outline for a book consisting of 10 chapters and 10-15 subheadings within each chapter. During the rough draft stages of the book, I embedded dot commands on the line above each title and subtitle. As I revised, I would call up the table-of-contents program and quickly have a new list of the arrangement of thoughts in each chapter and their page number. If I changed a page, or moved a section, the table-of-contents was updated each time it ran through the document.

DocuMate/Plus asks only that you embed a three-dot command with a T(title) or Tn after it above the heading to be indexed. On your screen the text will appear as shown in figure 1.

Figure 1.

```
...T
TITLE OF CHAPTER
...T1
First Major Subhead
...T2
The next subhead in importance
...T3
And so on down the line.
```

When the TOC (table-of-contents) is requested in the menu, the page number and headings properly indented are generated in a new file (figure 2).

Figure 2.

```
1 TITLE OF CHAPTER
1 First Major Subhead
1 The next subhead in importance
1 And so on down the line.
```

Changing the format directive by placing "...column width 44" at the top of the file, will yield page numbers following the entry (figure 3).

The program automatically makes a backup of the file it is reading. Any new files may be edited through WordStar. More important is the fact that you see your outline at a glance. You can edit the file or change directives so every heading is consistent.

Continued on page 152



The New Step-by-Step

Sooner or later, most Apple II computer users attempt to learn the primary language of the Apple—Applesoft Basic.

When you get to this point, there are basically two traditional paths to choose from: off-the-shelf tutorial books or classroom instruction. Each of these has its own advantages and disadvantages. Books are inexpensive and allow you to proceed at your own pace. However, they are inherently unstructured and lack the attention-demanding pizzazz of a well-organized class curriculum. On the other hand, the total cost of classroom instruction (registration, parking, texts and transportation) is expensive, but you have the advantage of learning from an experienced instructor who can fill the gaps left by even the best of textbooks. These are your two choices; inexpensive and incomplete or complete and expensive. That is, these *were* your choices until The New Step-By-Step.

The New Step-By-Step from Program Design, Inc. (Greenwich, CT) is an interactive learning system composed of 10 lessons that take place on four audio cassettes, two computer diskettes and a 50 page workbook. It requires an Apple II+, single disk drive and monitor. Each lesson is composed of two parts, with a computer administered mini-quiz at strategic points in each lesson and a larger quiz at the end of each lesson.

The system is an introduction to the Basic programming language and covers everything a beginner needs to know to understand elementary Basic concepts and sound programming in general. Specifically, this includes: special keyboard keys; a definition of machine code and interpreters; the 'print' statement; math symbols and precedence; List; Run; New; Delete; End; Stop; Variables; Input; Gosub . . . Return; Goto; If . . . Then; Counters and counting loops; Nested Loops; Remark statements; Library function like 'Integer' and 'Absolute'; Home, Tab; Read; Data; Restore; One Dimension Arrays; Low resolution graphics . . . and more.

The workbook serves two purposes. First, it is a written summary of each lesson. Second, it provides hands-on lesson assignments that reinforce what has already been presented. This is accomplished by requiring the student to input and then run a short lesson-oriented program.

By the time you get to the workbook, you will be presented with the lesson information from two different media: audio cassette and screen display. While each of these serves to present the lesson through a different sense, the acid test of learning is when you have to do the lesson assignment in the workbook. At this point, the assigned problems are no problem at all.

Although the cassette tapes, diskettes and workbook combine to produce a dynamic learning machine, it is the lesson diskettes that are the most impressive. Their most outstanding feature is that they are professionally-designed with a heavy reliance on graphics and animation for emphasis. For example, to introduce the concept of 'for . . . next loops' the cassette tape does the talking while the computer screen shows a sample program with a loop embedded. When you hit <return>, an arrow charges out of the 'for' line, does a 90-degree turn down to the 'next' line, then comes out the other side and returns to the 'for' line. The cycle repeats until you press <return>. You can't help but be impressed. You learn because you have been verbally, visually and dynamically imprinted with the concept. This kind of coordination between the cassette tape and computer screen runs throughout the system and is the basis for its ability to provide such an excellent learning environment.

Another important feature is the way the series incorporates mini-quizzes at the end of each lesson to test and reinforce what has been presented. For example, as the concept of variables is discussed on the cassette tape, the screen lists three columns of variable types. After the discussion, you are told "Stop the Tape & Press Return." At this point, you are asked questions pertaining directly to what has been presented. "Which of the following is not a valid variable?" You get three tries, then the correct answer is given. At the end of the lesson, you take the lesson quiz, which is graded by the computer.

The combination of audio cassette and use of the computer screen as an electric chalkboard is an effective and dynamic teaching system. Using The New Step-By-Step is much like sitting in a classroom—listening to an instructor while watching him put key ideas on the chalkboard. Like a good teacher, The New Step-By-Step presents information in a clear, patient and professional manner.

This impressive and well thought-out Basic training system is easy to use. You can learn the Basic language at your own pace.

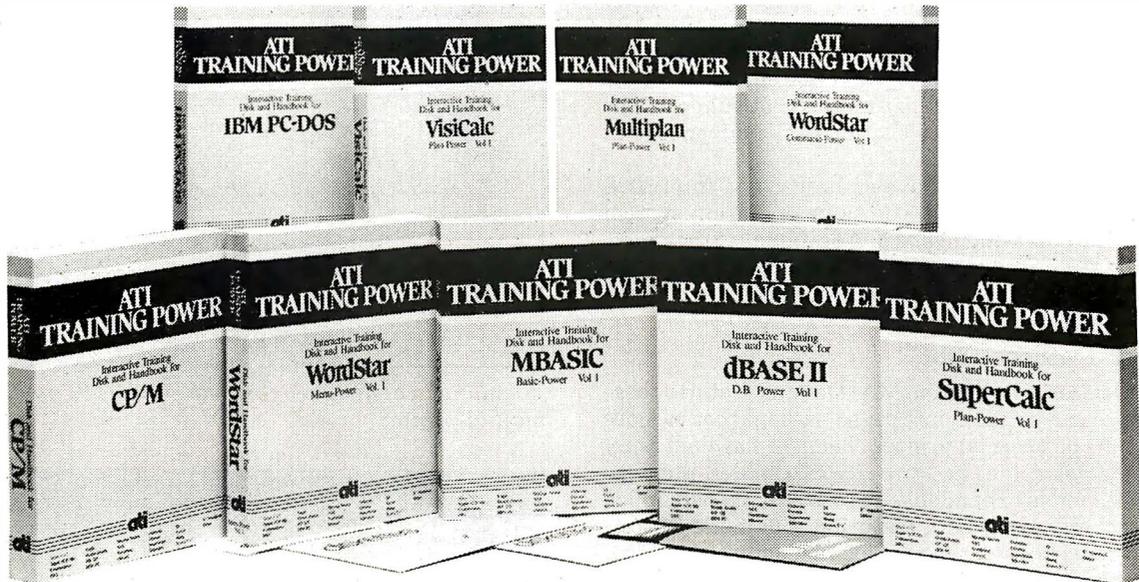
The only problem you might have is if you didn't understand an idea and want to review material just covered. In this situation, you can rewind the tape, but to review the accompanying screen presentations you must drop out of the program, and rerun the entire lesson. Given that each lesson is summarized in the workbook and the fact that each lesson is divided into two parts, this isn't too much of a detraction. However, the program should have a convenient way to review previous screens.

Each of the ten Basic lessons is divided into two parts. There is a computer directed mini-quiz within each part to emphasize and reinforce key ideas and a lesson quiz at the end of each lesson. At the end of the ten lessons, there are two comprehensive quizzes; one over lessons 1-5 and a second over lessons 6-10. The frequent quizzes were extremely helpful in indicating progress and understanding or the lack thereof. With only the previously mentioned minor reservation, this is an impressive and well thought-out Basic teaching system. It combines audio instruction with visual animation and graphics to maximize the effectiveness of the presentation of each lesson concept. Within and after each lesson, there are quizzes that serve as reminders of how well you are doing and a workbook assignment to give hands-on experience. How can you ask for more?

If you want to learn Basic at your own pace, but tend to get stuck or bored with textbooks written by programmers or if you don't want to take an expensive and formal course at a local college or night school, you should consider The New Step-By-Step. It is an extremely easy to use, well thought out, professionally-designed and effective Basic teaching system. □

Contributing editor Ron Exner is a professional accountant and small business consultant residing in Bellingham, WA. He has worked as a cost accountant and stockbroker. In recent years, he has combined his accounting activities with the benefits of computerization.

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Three IBM PC-compatible Portables

The market known as the "IBM World" is lucrative—and becoming more so. Companies are thriving by making products that plug into and run on the PC. A few companies are attempting full-scale emulation of the machine in an effort to capitalize on the vast support. The latest trend is portable units that can take advantage of the third-party software.

Several small computers have embraced the Intel 8088 and licensed Microsoft DOS, the same operating system as the PC DOS operating system. Additionally, they have aimed to be design-compatible with the PC System, so programs that directly manipulate hardware can be used effectively.

Computer Devices' Dot

Computer Devices' (Burlington, MA) Dot unit features these characteristics in a portable, integrated package that includes a built-in 160 cps thermal printer. The Dot has dual Sony micro-floppy disk drives and two RS-232C ports. Memory starts at 32K and is expandable up to 704K. It is equipped with a detachable keyboard, featuring a numeric keypad and ten function keys—these are located across the top of the board, rather than on the left side, like on the PC. The monochrome 5-in.-by-9-in. high CRT incorporates bit map graphics and a choice of character display modes, including 132-, 80-, or 40 characters wide in 25 or 16 lines. Dot provides two IBM bus-compatible card slots, which can accommodate boards up to 10.5-in. long. Also available is a byte-synchronous card to support communications to an IBM host. Mid-range configuration runs about \$4,000.

Although the 3.5-in. drives don't as yet have the market support of the 5.25-in. drives, applications programs available for users will include: an electronic spreadsheet; word processing and business graphics packages; filing and reporting systems; billing, accounts receivable, and general accounting packages; as well as time, record, report and project manager. In addition, a Z80 option allows users to access programs that have been developed for the CP/M operating system.

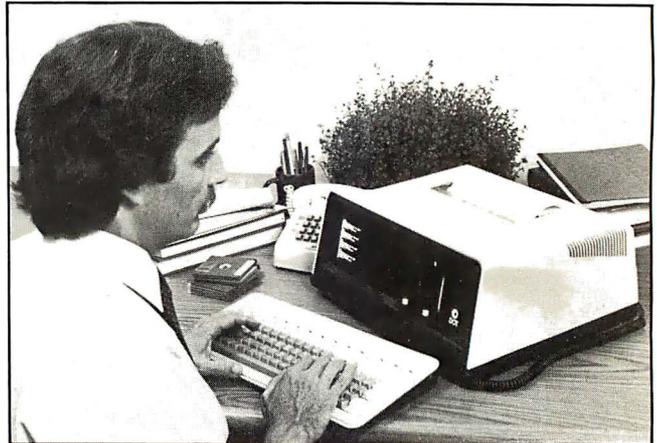
Compaq

The Compaq Computer (Houston, TX) also utilizes the Intel 8088 running under MS/DOS. The basic 128K-byte system includes ports for optional video monitors. It has a parallel printer interface and a socket for an Intel 8087 co-processor. An asynchronous communications interface is optional. Also included are three IBM PC-compatible hardware expansion slots—two more than are available on a comparably-equipped IBM PC.

One of this computer's most distinctive features is the video display unit, which combines the high-quality character font available on the IBM monochrome display adapter and the high-resolution graphics of the IBM color/graphics adapter. It can display IBM-compatible graphics and high-resolution numbers and text on a single monitor. The IBM PC requires attachment of a second video monitor to accomplish that. The basic Compaq sells for about \$3,000.

Dynalogic Hyperion

From Ottawa, Canada, comes the attractive Dynalogic Hyperion. It weighs about 20-lbs. and measures only 18-in.



Weighing in at about 30-lbs., the Dot has 3.5-in. drives and built-in printer.



The 28-lb. Compaq has a 9-in. display and a keyboard remarkably close to the IBM's.



The ultra-light 20-lb. Hyperion features a 7-in. amber screen and 5.25-in. double-sided double-density drives. The shift key is placed more strategically than on the IBM PC.

Continued on page 158

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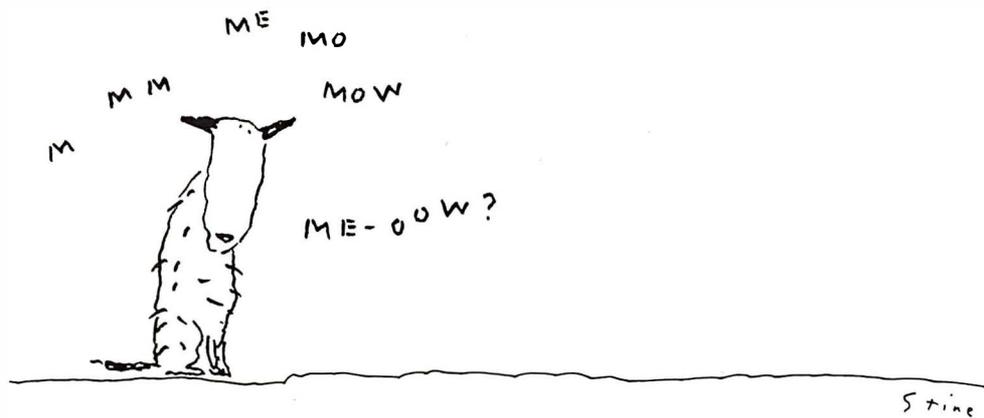
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Consumer Advisor

by Jesse Berst

The ABC's of Evaluating Packaged Software

In this monthly series, Jesse Berst discusses matters of importance to the average microcomputer user. He shares advice gleaned from his interviews with hundreds of computer buyers, consultants, programmers and other experts and from his own years of experience as a computer user—ed.

When a Florida remodeling contractor recently went shopping for a job-costing package, he did so without any game plan. After seeing several sales presentations, he bought the package that appeared to have the most features.

The package certainly had some advanced features. Unfortunately, it didn't have all the basics. For instance, the remodeler discovered that its documentation consisted of a few scanty pages written by programmers. There was no tutorial section to teach the ins and outs. Nor was there a troubleshooting section—each time an error code appeared on the screen, the remodeler had to phone the software company for advice. Often he had to wait days for a return call.

The program was not very "forgiving" and tended to crash whenever an operator made a mistake. Still, the staff eventually learned how to work the program by trial and error. Now that it's up and running, the package has proved adequate—but it took the firm almost a year to get it to full speed.

Our remodeler could have saved time and trouble if he'd known how to evaluate packaged software. Luckily, you don't need a degree in computer science to perform such an evaluation. If you follow a few common-sense principles, it can be as easy as ABC:

- A) Examine the documentation
- B) Examine the support
- C) Examine the program itself.

Software "shopping lists" can help define and summarize your needs. After all, you can't find the right fit until you know what size you are.

Once you've done your homework, you can locate programs that seem to match your needs. *But don't stop there.* Don't buy according to which advertisement has the longest list of features. Before you look at features, verify that a package meets minimum standards. In the rest of this article, I'll show you a simple method to do just that.

With this method, you can weed out inadequate packages early in the game. You evaluate software in three distinct stages: first the documentation, then the support and, finally, the program itself. There is no need to go on to the next stage

You can waste a lot of time and money unless you carefully evaluate packaged software before you buy. No matter how many features a business package claims to offer, it won't be much of a bargain unless it meets certain minimum standards.

if a package fails the one before. In this manner, you save yourself the time of a full-scale test for every candidate.

Evaluate the documentation

Start by examining the documentation. In many cases, you won't need to go any further. If you're buying mail order, it's especially important to look at the manual, even if you have to buy it separately (many vendors sell the manual for \$15-50, refundable if you buy the program).

Without adequate documentation, it's tough to get full value from a package. Moreover, a poor user's manual often signals a poor program. "If they've cut corners on the manual, where else have they taken shortcuts?" asks Nicholas Rosa (Campbell, CA). He and his partner are documentation experts who work for clients like Rolm and North Star. "We assert that a source that takes pains with its documentation probably takes pains on everything else."

How do you spot good documentation? You might start by leafing through the pages to look for sample screens and sample printouts. (A sample screen is simply a "picture" of the video display as it would look.) Such samples make a manual more expensive to produce but much easier to use.

You may also want to take a quick glance at the treatment of error messages. Some manuals don't even list them. Some have a list explaining the messages, but give no clue how to recover. If the documentation doesn't explain how to get back on the track after making mistakes, you're in for certain frustration.

Obviously, good documentation is more than sample screens and well-explained error messages. But if you look for those two items first, you can eliminate many manuals right away. If a manual survives this preliminary scrutiny, you'll want to look it over more carefully. Most good documentations contain these six elements:

- *An overview.* Written to inform, not to instruct, this section acts as the "definition" of the program. It explains benefits and options.
- *A tutorial section.* This portion takes you step-by-step through startup and operation. Here's where you'll find sample screens and printouts. Make sure it's written for the complete novice, so you can give it to beginning operators as their training manual.
- *A command summary.* You don't want to redo the entire tutorial section each time you need to refresh your memory about an advanced feature you don't use very often. The manual should have a separate section explaining each command and option. (Sometimes this is done via a "reference card".)
- *A technical section.* This section should outline the program logic for the benefit of advanced users or programmers who want to modify the package. Even if you never use this section yourself, it's important to have it available if needed.
- *A troubleshooting section.* This part should help you diagnose and solve problems.
- *An index.* Make sure it's comprehensive and complete.

Even if the manual has all six pieces listed above, make sure they've been put together the right way. Pay particular attention to the language. It's a bad sign if the manual starts off with computerese and technical jargon. "Manuals should be written in escalating technicality," says Rosa. "The first parts should be in easy-to-understand English. Later sections can be devoted to the advanced user."

Evaluate the support

If the documentation makes the grade, turn your attention to service and support. Many buyers neglect this aspect when buying software packages. Continuing support is crucial. There is no such thing as an error-free package that has every conceivable option. Since it's impossible to find perfection, look for a company that will correct bugs and provide periodic "upgrades" or "enhancements."

With more and more top-notch companies entering the small computer software field, there's no need to put up with poor service. Here are six things that signal strong support:

- *A hotline.* This is the bare minimum of support. Every software company should have a number you can call to talk to an expert.
- *A warranty.* At the very least, the vendor should guarantee to: (1) replace defective diskettes and (2) refund your money if the program will not run on your machine, even though it is advertised as compatible.
- *A newsletter and/or a users group.* Many companies provide free or low-cost newsletters that tell of updates, bugs, patches and so on. Some companies sponsor or encourage users groups. Newsletters and users groups increase the usefulness and lifespan of a package.
- *Low-cost backup.* A backup disk is a copy of the program to use in case the original fails. Your best bet is a program that allows you to make unlimited back-

ups on your own. If the program doesn't allow copies, it should come with at least one backup disk and have provisions for you to order others at low cost.

- *Local dealer training.* Many of the better software companies now require dealers to attend training classes. Although you may still need to turn to the home office for serious problems, a trained local representative should be able to answer many of your questions.
- *A liberal update policy.* Some companies don't give you any credit for buying an early version of a program. When they come out with the new, improved model, you've got to pay full price again. You're better off with a company that allows you a "trade-in allowance" on your old software.

In the case of accounting and tax preparation software, look for a company that keeps its product up-to-date. Otherwise, your packages become obsolete with each change in federal and state regulations. You want a company that provides annual updates for a set fee.

Evaluate the program

So far, we've discussed six things that signal good documentation and six that indicate good support. If a package still makes the grade after you've looked at documentation and support, you're ready for the final phase. Here's where you will test the program itself.

If the documentation makes the grade, turn your attention to service and support.

That test will include a look at all the features specified on your shopping list. Those features will vary depending on the application. Still, there are certain things common to most good business programs and you should start by looking for those characteristics. The list below sets out seven of the most important:

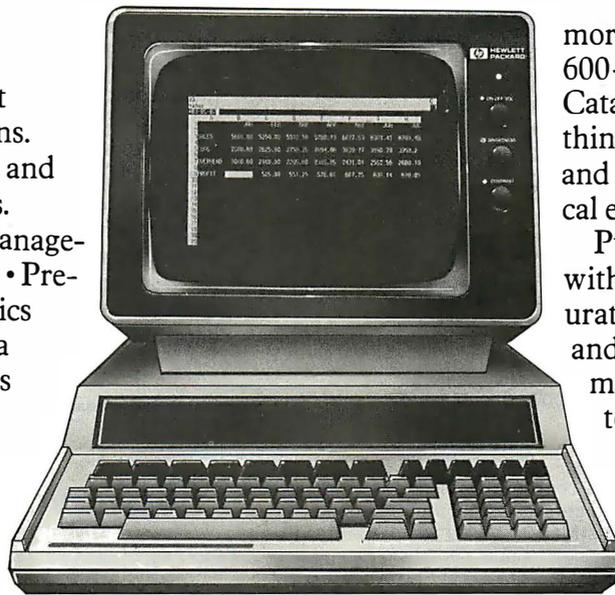
- *Error-trapping.* Good software won't let you make obvious mistakes. You can test for error-trapping by trying out the program and doing everything *wrong*. Enter numbers when the program asks for letters. Choose a menu option that doesn't exist. Hit the "Break" key or the "Return" key while the program is busy working. Leave out the data diskette and see if the program warns you to put it in, or if it simply "dies."
- *English-language messages.* Look for a program that talks to you in English, not in code numbers or symbols.
- *Menu-driven.* Most (but not all) good business programs use menus to make operation simple. You do not need to memorize codes, since at each stage you choose from the menu (a list of options). Although menu-driven programs are fast to learn and easy to use, they can slow down advanced users. Look for some type of feature that allows you to bypass the menus once you've become expert.

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- *Interactive.* This means that data from one program can be used in others. For instance, you might be able to use data from your financial spreadsheet program to create a graph, without retyping the information. Or you might be able to insert that information into a letter you are preparing with your word processing program. Interactive programs are particularly important for accounting applications, where they can save both time and errors. If the entry you make to, for instance, your accounts receivable program automatically updates your general ledger, you don't have to worry about forgetting or about accidentally entering the wrong amount.

*Once you've done your
homework, you can locate
programs that seem to
match your needs.*

- *Standardized.* Questions and messages should always appear at the same spot on the screen. Commands should be consistent. If you use certain keystrokes to delete a character in one portion of the package, those same keystrokes should perform the same function (and no other function) in every other part of the package. Likewise, if the package is designed to interact with others, it should use the same commands as the others in its "family."
- *Many printout options.* Look for programs that let you use your data in many different ways. One way is to provide you with many different options. An even better way is to give you certain standard reports, but allow you the alternative of creating your own (this feature is sometimes referred to as a "report generator").
- *An audit trail.* Accounting programs should produce a paper audit trail that allows you to retrace your steps. Such retracing can be essential at tax time or when trying to locate errors.

After you complete the three steps above, you will still want to evaluate software packages for the specific features on your shopping list. Hopefully, you'll find several packages that meet minimum standards. From there, you can decide which one offers the most for the money.

But consider the basics before you go on to advanced features. You can save yourself time and money if you evaluate packaged software by starting with the ABC's. □

Contributing editor Jesse Berst has worked as Associate Editor of Interactive Computing, the monthly journal of the Association of Computer Users (Boulder, CO). He has co-authored two computer books and makes regular contributions to an array of trade and business journals.

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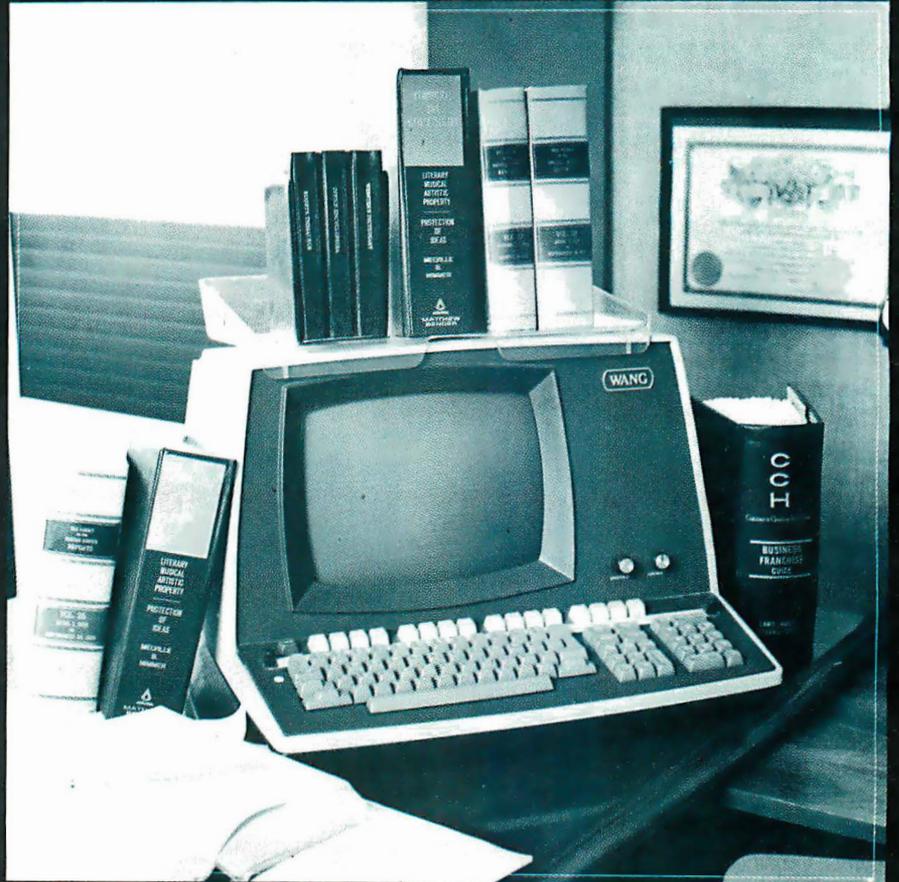
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How to Introduce a Computer into your Law Office

by Brian David Cochran

Most law practices will eventually make the switch to a computerized office. The benefits of automation are plentiful if you plan carefully and shop wisely.



A recent survey disclosed that more than one-quarter of all attorneys have access to some form of word processing. Moreover, spectacular advances in computer technology—both hardware and software—have made automation financially attractive to even a one-person operation. A system can be configured for under \$15,000 that would include legal time and billing, scheduling, financial planning, graphics capability, and word processing on letter-quality output. Clearly, a computer can be a great boon to productivity for the typical law office.

Imagination

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ples of technological innovation. Thirty years ago, most attorneys required their secretaries to take shorthand dictation. Now that requirement is largely confined to senior members of our profession who are unwilling to learn to work with simple-to-operate equipment. Technological advancement in dictation equipment has been remarkable. It has gone from unreliable belt-driven equipment to cassettes and finally micro-cassettes. It is now possible to execute all dictation requirements on handheld equipment. Moreover, if you do not want a handheld unit, the technology exists and has been implemented to allow you to use a touch-tone telephone as a dictation unit. The information can be safely and quickly transmitted over telephone lines and available for processing at your office.



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Within the next couple of years, I envision the more progressive law firms having computer capabilities in every attorney's office and home and at secretarial stations, as necessary. Terminals will probably be cathode ray tube display units or television screens combined with typewriter-like keyboards for data entry. Even those attorneys who lack typewriting skills can quickly acquire them through self-instruction typing software.

Lack of imagination—not financial inability—is the barrier to automation. Lawyers are rigorously schooled to rely on tradition and experience rather than to create novel or imaginative solutions. It is imperative that in use of the imagination, you set aside preconceived roles and capabilities of attorneys, legal secretaries, typing pools, word processing pools and bookkeepers. Those rigid boundaries in our thinking are becoming extinct.

Earlier this year, a system was proposed for a small Century City, CA, law firm. The members accepted the need for automation in their office. However, they did not comprehend the value of having terminals on attorney's desks or in their homes.

After all, secretaries typed, bookkeepers kept books, and attorneys did the thinking and told other people what to do. At least they observed this from their practice and their colleagues. Differences in procedures between the old system and the proposed automated system were reviewed. In the area of bookkeeping under the old system, the bookkeeper set up the initial records, entered attorney's time sheets, ran totals, did the prebilling and typed the final bills. Under the new system, all that was required by way of data entry was an original client information record and the daily time sheets.

By simply giving an instruction through a terminal in his office, an attorney could generate all management reports and bills automatically. This included prebilling, billing, analysis of attorney productivity, work in progress on each account, accounts receivable, aged receivables, and client expenses. It was no longer necessary to put in a request and wait a week or even a month for information to come back from the bookkeeper.

In the area of word processing, the expensive proposition of an attorney hand-correcting typewritten draft documents was unnecessary. An initial draft could be put into the system by a secretary. Subsequent corrections could be done either automatically or by the individual attorney. Obviously,

it was no longer necessary to get a hard copy, make corrections, have a secretary input corrections, then check secretarial work for further corrections—and eventually send the material back to the secretary again. Many word processing packages contain extensive spelling lists that automatically check for spelling errors. Moreover, software exists for an attorney to identify syntax and grammatical errors in his work.

Admittedly, the potential created by having a home terminal was more remote in their thinking. Suppose your office is in a building with automatic air-conditioning control and a surcharge is imposed for weekend operation. Or imagine you live a half-hour from your office and lose an hour driving in on the weekends or if you need to return at night. Under these circumstances, it is easy to understand how a home system can be cost-justified.

An attorney could generate all management reports and bills automatically.

Although work can be taken home, having a computer terminal at home operates as a two-way street. We all recognize that attorneys perform a certain amount of personal business at the office. This may include balancing the checkbook, financial planning, writing articles, or even getting the children's term papers produced. Realistically, the home terminal might make the individual attorney more efficient in his personal matters at home so that fewer personal tasks consume office time.

Imagination can be triggered by informal visits to other attorney installations and attending automation seminars. Computer magazines and books are additional sources of information and inspiration.

People

A successful computer implementation requires the involvement and support of everyone—from the lowest messenger boy to the senior partner. Fundamentally, all personnel should receive a basic orientation in the operation and system capabilities. Distrust, ignorance, and suspi-

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cion are generated if only a few are elected to become computer-literate. For example, in one Los Angeles law firm, none of the attorneys were instructed in the use of the word processing equipment or allowed hands-on operation during the weekend hours when the facility was not staffed by clerical personnel. The result—not surprisingly—is that the system is totally under-utilized.

While orientation classes and subsequent commercial instruction are necessary, there are other techniques that should be employed. The simplest technique is to place computer games on the system. In one manufacturing company, all personnel were given access to terminals and allowed to play computer games. These games could be played on the system at all times of the day with permission of one's supervisor. After a month of operation, the rules were refined to allow game-playing before and after work or during lunch hours. By that time, everyone was proficient in the capabilities of the system. Why not allow attorneys to utilize the system at off-hours for

processing and printing personal business? Most attorneys have only a rudimentary knowledge of accounting or financial projections. They also have a limited understanding of word processing capabilities. If they are free to utilize the system at what they perceive to be the firm's expense, this might provide the incentive for self-education. The actual cost to the firm is minimal.

Software

Software selection is a more important consideration than hardware. An appropriate procedure is to compare, evaluate and select billing, ledger, accounting, word processing, financial planning and graphics packages before selecting a system on which to run them. Once the software packages are identified, the next step is to identify the operating system with which they are compatible. An operating system is the job control language placed into a computer to tell what to do—whether to process a software program, operate the printer, or put material into computer memory.

While there are at least 10,000 commercially-available application packages, there are only a few dozen operating systems available. The more popular operating systems are CP/M, MS-DOS, MP/M, Oasis and Unix. Many of the larger computer manufacturers have proprietary operating systems. The same is true of dedicated word processing companies. Within the next few years, the number of operating systems will probably be reduced. The value of a hardware system is a byproduct of software availability. If a manufacturer has selected an operating system unpopular with software publishers, it will have fewer customers.

An essential step is to try each program out for "user-friendliness." You may go to a software vendor and obtain the use of a program on a trial basis at a nominal charge or test a software program on the vendor premises. You should be particularly attentive to the quality and care given to the menu or instructions contained within the software program displayed on-screen during operation and the written instruction book that accompanies the software.

Hardware

Computer hardware consists of the mainframe or central processing unit (CPU) and peripherals. The peripheral equipment may be a monitor, a printer, a keyboard for data entry, an optical character reader for reading pre-printed documents and mass data storage.

Assuming you have done preliminary needs analysis for the office, the best starting place is to review current and back issues of principal computer magazines. These will provide objective comparisons of system capabilities and deficiencies. It would be a sad mistake to rely upon manufacturer advertising, sales pitches and name recognition.

Most manufacturers indicate they can do everything; they will not tell you what cannot be done. Similarly, when you buy a well-known hardware system, you are probably paying a premium for performance. Guiding criteria should be more in the areas of warranty, service facilities, reliability and flexibility.

One initial decision is between buying a dedicated word processor or an information system capable of doing accounting as well. Word processors have some of the logic hardwired into the system. Although they may be capable of doing a limited amount of accounting work, ordinarily they may not be programmed by the individual user. Conversely, an information system has greater flexibility and allows programming by the user. Word processors had their first application in the legal profession in the early 1970s. Within the last two years, sophisticated accounting and billing packages have emerged for law offices. The computer industry seems to be heading away from producing dedicated word processors. My observation is that a firm desiring flexibility would be better off purchasing a highly sophisticated word processing package and running it on an information processor that can accommodate accounting functions as well.

Members of the firm shouldn't be apprehensive about the personal handling of the modern computer systems. They no longer require special air-conditioned rooms with differential air pressures. The equipment is usually housed in impact resistant plastic material designed to withstand the shock of short falls and accidental bumping.

If you run a law practice, there is undoubtedly a computer in your future. By planning well in advance, you can ensure a smooth and successful transition. □

Brian David Cochran is a practicing Los Angeles lawyer and a former IBM Systems Engineer. He is a state bar panelist on law office automation and a Continuing Education of the Bar lecturer. His education includes a BA, MBA and doctoral studies in accounting at UCLA. He received his JD from Southwestern University.

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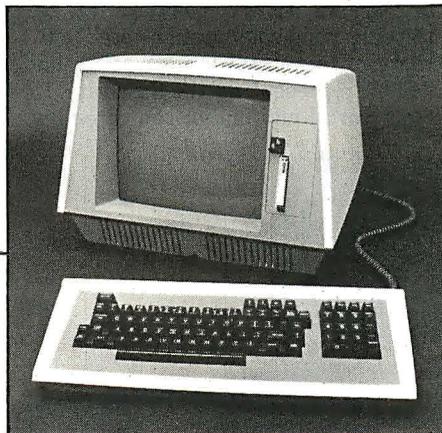
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16-bit processor	Std.	Std.	Std.	Std.
Multi-user	Std.	Opt.	No	Std.
Multi-programming	Std.	Opt.	No	Std.
Hard disk	10MB Std.	8.6MB Std.	8MB Std.	20MB Std.
Tape backup	Std.	No	Opt.	Opt.
Floppy disk	No	Std.	Std.	Opt.
Standard memory	128KB	32KB	256KB	256KB
Maximum memory	1024KB	256KB	1024KB	1024KB
Single desk top unit	Std.	No	No	No
Memory Speed	300ns	600ns	Unkn.	480ns
Memory ECC	Std.	No	No	Std.
15" screen	Std.	No	Std.	No
Cost	\$12,995	\$18,465	\$20,460	\$46,000
Extra cost items	lang.	os, lang.	lang, opts.	lang, opts.
Price of each system configured to 128KB RAM, 6 serial ports, 4 user terminals, 10MB hard disk, tape backup:	\$14,495	\$33,205 ¹	\$32,750 ²	\$54,000 ³

¹8.6MB disk drive, no tape, floppy backup

²8MB disk drive, no tape, floppy backup, network configuration, 256KB RAM

³20MB disk drive, no tape, disk pack backup, 256KB RAM



Interactive Systems Technology, Inc.
5259 N. Tacoma Ave., Suite 11
Indianapolis, IN 46220
(317) 253-5760



The closest competition isn't even close.

Floppy Disk Backup

by Carl R. Payne

If your IER is low enough for your reliability requirements, you need no additions to your system. If the IER is too high, it may be reduced by the use of an error-correcting code. An error-correcting code transmits extra bits called check bits along with the data bits. The transmitted byte then consists of d data bits and c check bits, all subject to random errors. The check bits are used to detect and correct one or more errors. The simplest codes correct only one error. The effect is a reduced error rate. The price that must be paid for this effective decrease in error rate is increased code. The ratio of total bits to data bits is referred to as redundancy, r :

$$r = (d + c) / d.$$

Generally, greater reduction in error rate requires greater redundancy.

For example, it is possible to correct one error in an 8-bit data byte by transmitting 12 bits: 8 data bits and 4 check bits. For short, call this an 8:4 code. This code, which is an example of a Hamming code, treats the data a byte at a time and has a redundancy of 1.5. Hardware is available to process the data for both

Last month's installment of this two-part article described a method for determining inherent error rate (IER) of your cassette back-up system and for evaluating the results. This installment describes error-correcting code.

transmission and restoration. The chief deficiency of this scheme, besides the hardware cost and the increased transmission time, is its inability to handle burst errors. Since this code corrects only one bit per byte, it neglects this most common type of error. Codes similar to this that could treat burst errors would require complex hardware beyond practicality, and the redundancy would be many times more than 1.5.

A 1:2 error-correcting code

The method proposed here for decreasing the IER of your cassette back-up system corrects the data a bit at a time using two check bits for each data bit, a 1:2 error-correcting code. Both check bits are identical to the data bit; i.e., the only valid combinations are "000", representing the data bit "0", and "111", representing the data bit "1". An error in any one of the three bits

is correctable. Suppose a received message is "010". This invalid code could be the result of a single error transforming "000" to "010"; or it could be the result of two errors, transforming "111" into "010". Since the former is much more likely, the received message is "corrected" to "000". This correction process amounts to changing the lone bit in a 3-bit group to match the two like bits, which may be thought of as a 2-out-of-3 voting scheme. It is actually the simplest Hamming code of all, although it is not usually thought of as a Hamming code. The effective error rate is about $3 \cdot (\text{IER})^2$. (This is the minimum achievable for any scheme that corrects only one error.) If your IER were 10^{-5} , you could achieve, effectively, an error rate less than 10^{-9} .

To create a back-up copy, simply record a block of data three times in succession on different segments of tape. Since the check bits are identical to the data bits, no special hardware or software encoding procedure is needed to generate the check bits. Burst error protection is achieved by the wide physical separation of data bits from their corresponding check bits. The transmission time redundancy factor for back-up is three, compared to the 1.5 redundancy of the 8:4 code. The additional time required is not critical, even at cassette transfer rates, when back-up is performed routinely at the end of a reasonable period, such as a day or week.

To restore a program or data to the disk, a simple program is used to process and correct the incoming bytes. Data blocks are read three times, once for each of the three previously-recorded segments of tape. Corresponding bits from the three reads are compared. If they are all alike, that bit is used. If two bits are alike and the third differs, the two like bits determine the bit stored. The transmission time redundancy factor for restoration



There is a word that describes your choices in flexible disks today. That word is "ordinary." The woods seem to be full of offerings of middling quality, neither good nor bad, not necessarily cheap but not overly expensive for the most part, products that are just so-so, just average, just...well, just ordinary.

But now there's a new word in flexible disks. Ultra Magnetics. A word that redefines the state-of-the-art in flexible disk price performance rather than reinforcing the current state-of-the-marketplace. By itself, *Ultra* means "extra ordinary." And by itself is where you'll place the Ultra Magnetics product when you have a chance to compare it to others.

The superb engineering and meticulous manufacturing of each Ultra Magnetics disk clearly shows. A proprietary jacket provides more consistent jacket dimensions and lower torque that result in better auto-loading and longer life. A special lubricant built into each disk surface enhances both disk and head durability. And

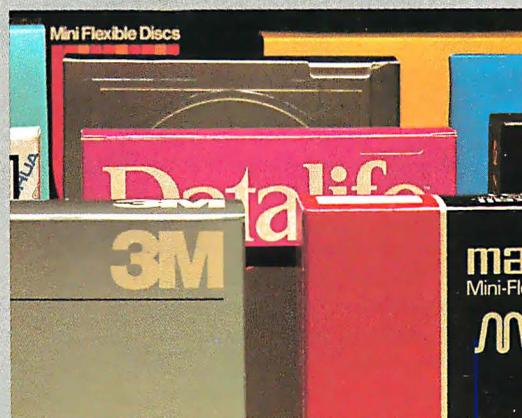
100% surface testing of each and every Ultra Magnetics disk ensures the highest data reliability. Our Ultra Magnetics product line currently includes single- and double-sided 5.25-inch disks. Soon, it will feature 8-inch disks as well. For a fact, they are more expensive than some of the garden variety alternatives. But considering the performance and the reliability, Ultra Magnetics is a surprisingly attractive value.

Here's the bottom line. You no longer have to put up with what you may have sadly come to expect from flexible disks. And we encourage you to take the next logical step from the usual to the remarkable—from the ordinary to the extraordinary. Call your local supplies distributor and ask for Ultra Magnetics.



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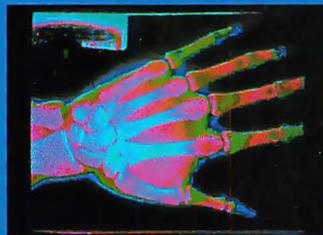
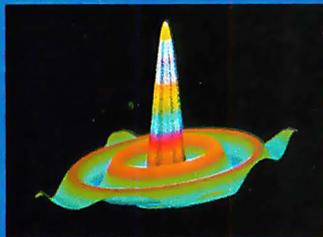
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CIRCLE NO. 28 ON INQUIRY CARD

Floppy Disk Backup
Continued from page 46

Block Size	Inherent Error Rate					
	-5	-6	-7	-8	-9	-10
K bytes	10	10	10	10	10	10
4	.720592	.967763	.996729	.999672	.999967	.999997
8	.519253	.936565	.993468	.999345	.999934	.999993
16	.269624	.877155	.986978	.998690	.999869	.999987
32	.072697	.769400	.974126	.997382	.999738	.999974
64	.005285	.591977	.948922	.994771	.999476	.999948
96	.000384	.455467	.924370	.992166	.999214	.999921
128	.000028	.350436	.900453	.989569	.998952	.999895
256	--	.122806	.810815	.979247	.997905	.999790
512	--	.015081	.657421	.958924	.995814	.999581
1024	--	.000227	.432203	.919535	.991646	.999161
2048	--	--	.186799	.845546	.983363	.998324

Figure 1. Reliability R for a system with no error correction

Block Size	Inherent Error Rate					
	-5	-6	-7	-8	-9	-10
K bytes	10	10	10	10	10	10
4	.999990	1	1	1	1	1
8	.999980	1	1	1	1	1
16	.999961	1	1	1	1	1
32	.999921	.999999	1	1	1	1
64	.999843	.999998	1	1	1	1
96	.999764	.999998	1	1	1	1
128	.999685	.999997	1	1	1	1
256	.999371	.999994	1	1	1	1
512	.998742	.999987	1	1	1	1
1024	.997487	.999975	1	1	1	1
2048	.994979	.999950	.999999	1	1	1

Figure 2. Reliability R for a system using the 1:2 error-correction scheme

Text continued on page 140

IF YOU'RE CONFUSED PERSONAL COMPUTER,

At this moment, there are no less than 50 personal computers on the market. And more are being introduced every day.

On one hand, having all those options is a good thing. On the other, it can make picking the right one pretty difficult.



*Computers come in two parts.
You have to buy both.*

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstra-

tion, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.



Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn. Some people, however, will tell you that software has to be complicated to be powerful. Nothing could be farther from the truth. Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

The PFS family is designed the way we think all software should be: simple, straightforward and powerful.

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With REPORT, you get presentation-quality reports—sorted, calculated, formatted and printed—automatically, in seconds.

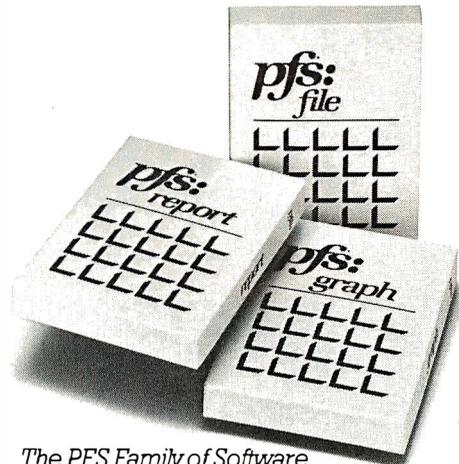
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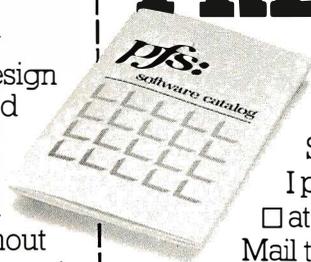
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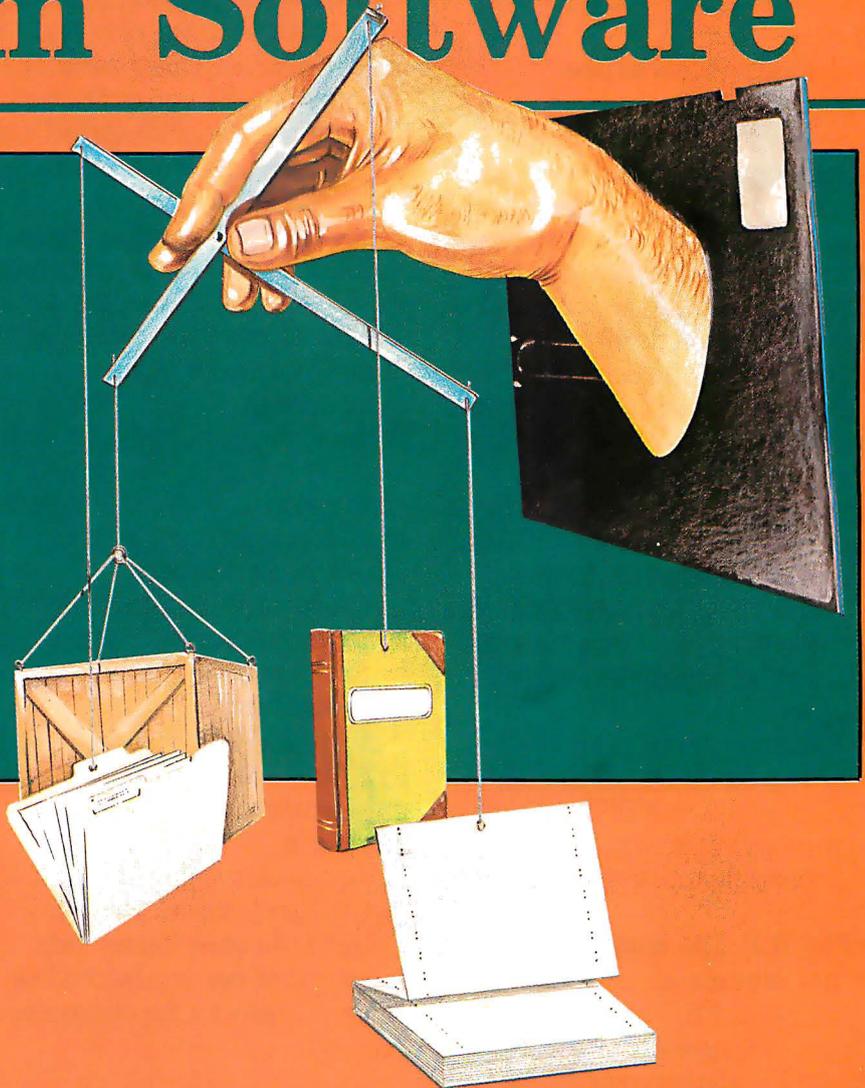
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INT 2/83

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Guide to Database System Software

Database programs encompass a wide range of capabilities. Careful comparison shopping is necessary in finding the program most appropriate for your particular needs.



Our latest software report will present an overview of many popular database programs. The accompanying charts were prepared almost entirely from information provided to us by software vendors. While we believe the data is accurate, any potential user of a software program should investigate the software carefully before purchase to determine its suitability for his application. One of the best ways to do your own in-depth review is to select several promising candidates, then invest in a demo copy of the software. Using the software is the ultimate test of the system's acceptability.

While providing a comprehensive cross-section of products, our charts are not intended to include every product on the market; this is beyond the scope of a single article. In future updates to our software comparison series, we will include products omitted from this article.

What is a database?

Everyone who has purchased a micro-

computer has heard the term "database" but there remains an amazing amount of confusion as to what a database really is. Quite simply, in the world of microcomputers, a database is a program that allows users to create and utilize files to maintain information in an organized fashion. In the world of mainframes, the definition is substantially more rigid, including requirements regarding the manner in which data elements are related to each other. Strictly speaking, a database is defined as a collection of occurrences of a number of records that are interrelated by logical relationships. Another definition might be that a database consists of a collection of interrelated data. In

both of these definitions, the emphasis is upon a common pool of information that is shared by users.

Through common abuse and misuse in the microcomputer community, the term database has come to have a broad meaning. Unfortunately, just about every program seems to claim some form of database organization. How is a user to differentiate?

A program should have some common characteristics in order to be classed as a database. Most importantly, a database is a general program, as opposed to a specific application, such as accounts receivable. The database program allows the user to create files with parameters that he defines.

by
Carl Heintz, CPA

Further, it should allow the user to update and inquire of those files, with the ability to create reports and lists that are organized based upon selection criteria of the user. More importantly, the concept of a database implies that the data elements are somehow related to each other—i.e. that they share some common relationships.

There are a number of ways in which these interrelationships can be expressed—one of the popular expressions in the micro community today is “relational.” Unfortunately, not many users nor vendors have a good idea of exactly what the term means—like many buzzwords that are obscured by over-use and abuse. In theory, a relational database is one in which each data element (field) is an independent data element that corresponds to every other related element by a series of complex links.

Consider an accounting system, for example. Each invoice represents a number of data elements, which are linked together by a common customer, a common invoice number and a common date. There are other data elements in the system as well, such as inventory items, customer lists and addresses, general ledger accounts, etc. All of these elements represent a common pool (in simple form, one big pot full of data), from which the user extracts, updates and adds to. When any transaction updates a particular data element, the system automatically updates all other related elements. So, for example, the inventory records would consist of data elements updated automatically by the sale of product, which also would be reflected in the customer's accounts receivable data elements and the sales elements. A true database allows the simultaneous update of numerous different types of information, because they are all part of one giant database, related to each other through logical relationships.

These kinds of programs are scarce in the micro environment, due in part to the substantial processing power and large memory requirements necessary to effectively implement the kinds of data structures required. To effectively implement

Additional Products to Consider

The following database programs are also worthy of consideration. Specifications for inclusion in our accompanying charts were not available by press time.

Dataflex

Dataflex, from Data Access Corp. (Coral Gables, FL), is one of those Z80 CP/M database programs that can be used as a program generator or as a stand-alone inquiry program. The capacity of the program is up to 64,000 records in a file, with each record having a maximum of 255 fields, and up to 4,000 characters total. Such impressive capacity is obtained by using packed binary format. Other programs can access the database, but only after “translation” by an intermediate program.

The input edit functions available include most of those expected, and some good conditional logic tests. The input data can be used to update up to six files concurrently, and the update function can include math calculations and logical comparisons.

Searching through the files can be done by record number, in either direction by increment, by a search and compare, and searches using “wild cards.” A simple on-line order entry system is included as a sample application to demonstrate some of the unique features of the system.

Dataflex can be used as an application programs generator. In other words, a user can create a custom software program using the Dataflex programs, which will run just about like an off-the-shelf product (although this is more difficult than it appears).

Dataflex has good report-writing capability, and is capable of producing custom reports and even printing on checks or other forms.

The system uses multi-key ISAM (known as Indexed Sequential Access Method), which replaces the need to sort files, assuming that no new indexes or re-indexing of the files is necessary.

Jinsam Executive

Jinsam, from Jini Micro Systems (Riverdale, NY), is one of the few DBMS programs that is designed for the Commodore KCBM 8000 or 9000 series of microcomputers. A similar version runs on the IBM Personal Computer. It's one of the few database programs that includes a regular

newsletter.

Jinsam is designed primarily as a database inquiry program; that is to say that it was not intended to be used to generate separate user programs. The CBM version allows up to 100,000 records in a file (65,000 for the IBM PC version), which can have up to 150 fields (255 for the IBM PC version).

The records created by the system can be accessed directly by other programs, since they are stored in ASCII format. Although up to five indexes are maintained automatically, the system has no limit on the number of indexes that can be created.

Jinsam comes with some rather useful utilities, including an executive (for batch processing), a statistical package, a text editor, an interface to VisiCalc, and a general-purpose report generator. The report functions of the program can be used to create free-form reports, such as invoices and billings, or to print upon checks.

Jinsam has over five years of exposure in the hands of users, and is designed for immediate use by people otherwise afraid of computers or those who cannot afford programmers to finish a program. Designed to accommodate large record sizes, unlimited report handling, help commands, prompting menus, applications included and interfaces to other programs.

Tiger Database

Tiger Software (Newport Beach, CA) has a new product for the IBM Personal Computer. The program is written in assembler, so its fast. Designed to handle up to 32,000 records in 32,000 fields per record, data is stored in ASCII format.

The program includes extensive input edit functions, among them some of the more unusual, such as Social Security number and Julian Date. Conditional logic (If, And, Or etc.) is fully supported. Once records have been entered, they can be read and searched by relative record number (next, previous), by absolute record number (example: go to record 346), by attribute, or by partial attribute with a wild card (example: list all names with first letter of S). The system has one unique feature: a “sounds-like” search, which allows users to go to the general direction of data without actually knowing the parameters (excellent for a name and address file). Data encryption is supported.

The system comes with 100 sample databases. The program is not

The DBi Flagship !!

The commander of the DBi fleet is the DATA BASIC language. But this commander needs only 30 simple commands. Learn these and you're writing your own computer programs. But there's more. One of these commands is BAS; Use it and in the wink of an eye you're in BASIC. Write a BASIC statement and jump back into DATA BASIC. It's a totally open ended system; the simplest and most powerful language you can find.

But that's not all. Taking commands from this flagship is a mighty fleet. Led by the Advanced SystemPac™, they sail over the sea of computer confusion like a breeze. Aboard this lead ship is a Data Base Management System that's not only user friendly, it's easy to use. It calculates, sorts, searches, deletes records, restores records, creates alternate keys and much more. The crew of this mighty vessel is made up of utilities like AutoEdit, who defines procedures and automatically runs them at your command; Menugen, who creates menus; Fastsort, who alphabetizes lightning fast; Append, who attaches files with comparable fields to one another; and Screengen who creates screens for inputting and updating data.

The remainder of the fleet is evergrowing and includes General Ledger, Ledger Extension, Payroll, Receivables, Payables, Data Merge, Order Entry Invoicing, Printer's Bid System, HUD Property Management and Loan and Investment Analysis. Each of these takes orders from the flagship and they sail together in total integration. Each ship can communicate with any of the others.

On what seas does this fleet sail? Any computers with CP/M operating systems as well as IBM-PC™ and Apple II™. But if your seas change, all DBi software and its data are transportable to the new machines of the future.

Shouldn't you be the captain of this fleet?? Anybody can be. The flagship does the work for you!! Tickets on the command ship start at \$149.95 and the rest of the fleet start at \$99.95.

Ask your local computer store to put you at the helm of the DATA BASIC flagship. Become the CAPTAIN OF THE FLEET!



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CIRCLE NO. 26 ON INQUIRY CARD

a true database requires considerably more horsepower than the typical micro has, and a degree of programming prowess substantially in excess of the average user. What a team of 10-20 experienced programmers take literally months to construct on a mainframe is not about

Program Generators

These programs are designed to generate application programs for end-user use. At the other extreme are purely "inquiry" programs, which are not designed to be used in a "production" environment, or to be customized for specific end-user applications.

For the Apple:

The Tool*, Systems II, PFS: File, The Data Machine, IFO-Version II

For CP/M machines:

MAG/Base*, dBASE II*, Data Plan, FMS-80*, The Quad, Microbase, MDBS*, MicroRIM, The Knowledge Manager*, Personal Pearl*, InfoStar, Selector

For other machines:

Waloss II, Control*, ANDI*, Savvy*

*Allows user to create custom menus

to be found in a \$695 package that requires only 48K bytes and two disks. Nonetheless, the basic concepts of a database can exist in some elementary form in the micro environment. The potential user needs to keep in mind, though, that on a microcomputer, a database will likely consist of an elegant file handler more so than the implementation of a real database, as that term is understood in the mainframe mainstream.

There are two general classes of databases—those that are closer to real databases, and those that are in essence what we have labeled file handlers. The difference lies in the manner in which the files are manipulated by the user. In a file management system, the programs do not use sophisticated indexes or pointers within the records. In other words, each record is not "related" to another record through an index or pointer. Information from a file management system is generally extracted as the result of sorts of one type or another. In a true database, however, the records contain information that link each record with another, creating a "relational" arrangement of data.

There's nothing intrinsically better about either of these arrangements, although some purists would disagree.

Another method of differentiating programs is by their use. Some database programs are intended to be used to create application programs. They are essentially "code-generators," which create custom applications programs to create specific database applications. In many cases, these programs are essentially file management programs that can be specifically configured for a particular application. The more generic database refers to a program that is much more general in nature and application.

Factors to consider in purchase

There are many factors that should be considered in the purchase of a database program. First and foremost, of course, is the intent of the user. Does the user wish to create a custom applications program, and thus desire a database program that creates an application? Or does the user want a program that can be used primarily as an inquiry program from the console? Before embarking on the purchase of a program, the user's application should be re-examined. Remember that many databases are—by their very nature—general and not suitable for tailoring to replace specific applications programs. Other programs are designed expressly for that purpose.

One way to slice the pie of database programs is according to their difficulty of use. Many database programs are de-

Video Attributes

The following programs support Reverse Video, Blinking Cursor and Underlining:

For the Apple:

List Maker
The Data Machine

For CP/M machines:

MAG/Base, Data Plan, FMS-80,
The Quad, MDBS, Personal Pearl

For other machines:

Control, ANDI, The Organization Analyst

signed for those who have a good understanding of computers and programming concepts. FMS-80, dBASE II and DMA are examples of programs that just won't be acceptable for novice users. They require what some call "computer sense"

designed to be used to create stand-alone applications. Although the user can format menus and can create input screens, the main system must always be brought up before any user system can be run.

The system does not allow more than one file to be open at any one time, nor does it allow one database to operate upon another. These design limitations essentially prohibit the use of the system for complex accounting functions. The reporting features are excellent, including the ability to create custom outputs. Thus the system could be used to output upon pre-printed forms, as well as prepare the more traditional lists and reports.

First-time users will appreciate the fact that to use the system, it is not necessary to read the manual. The system is designed to run "first time through" without the need to master a complex syntax or technical jargon.

Condor RDBMS

The Series 20 RDBMS, from Condor Computer Corporation (Ann Arbor, MI), was one of the first relational database products to become available on microcomputers. The system is designed for Z80 microcomputers, and is intended to be an inquiry type program.

RDBMS has a self-contained English-like language. It does not require another language, such as Basic to run. Users can develop applications using only Condor's database program, something that Condor has more than enough experience at doing: the parent version of RDBMS has been running on micros since 1977.

One unique feature of the RDBMS system is the Data Dictionary schema, which provides synonyms for database names, as well as different entry and display formats for the same database. Data entry and updating provides the user with CRT screen format and editing criteria that can be set, including minimum and maximum values (range editing). The creation of a new database is simple and relatively straightforward, and once a database has been created, it can be joined or compared to existing databases. A select command allows a user to sift through a database to extract data based upon up to 32 criteria.

The system is loaded just like a language such as Basic would be

to operate. Other programs fall into a class more oriented towards the novice user. Examples include TIM-III, Control and Whatsit.

Documentation is a critical part of any database system, or any computer program for that matter. An otherwise powerful system will remain useless without the proper documentation and instructions for use. The importance of documentation in a database program is even more important. With the possible

Input Edit Functions

Input edits are the internal "tests" that a program can apply to data input to prevent "garbage" from being entered in the file. The programs surveyed, with some exceptions, all had "tests" for: Field Length, Alpha versus Numeric Field, and Date.

There were some exceptions:

Product	Missing tests
<i>For the Apple:</i>	
Quick File III	Length, Alpha/ Numeric Field
Information and Data Master	Date
PFS: File	Length, Alpha/ Numeric
Datadex	Length
Complete Mailing Label and Billing	Length
<i>For CP/M machines:</i>	
Friends Report Writer	Date
<i>For other machines:</i>	
Waloss II	Date
Personal Database	Date
File/idea	Date
MIS Builder	Length, Date
IDM-X	Alpha Field
The Wiz	Numeric Field, Date

exception of a few programs, the database program is normally not a menu-driven system. While some databases may allow their users to create prompts and menus, the user must write his own. Thus documentation is critical. Some of the features to look for include adequate indexing and a table-of-contents, a tutorial, examples in the manual, installation instructions including specific instructions regarding

different computers, and sample applications (actual programs). While the length of the manual may not be governing, it's a sure bet that any database manual of less than 100 pages represents less than adequate explanation, or a program that is extraordinarily sparse in features.

Database Structures vary widely among programs. In some cases, a fixed maximum size of records in files exists. Most systems have a limitation in the number of fields per record, or in the field size. Of particular interest to the user should be the way files are stored on disk. If files are in packed binary format, they will be inaccessible to the user from other than the database program. Some systems include utilities that allow the user to translate database files to forms that can be accessed by other programs, or allow the database program to absorb files created by other programs.

Indexes or pointers are internal file components that are used to relate one record to another, and used to locate records within the file. The number of indexes that can be used by the program simultaneously indicates the number of different "keys" upon which the database can be accessed. In some cases, the files can be re-indexed at will upon different keys: this is generally a lengthy process that is better handled by sorting the file directly.

Input/Output functions are important features to consider in any database evaluation. The database should allow the user to establish specific parameters regarding data input. Without "input edits," the system is liable to become GIGO (garbage in, garbage out). A good database system will allow for input edits based upon length of the field, alpha vs. numeric, and dollars-and-cents. The more sophisticated will allow range tests (>X but < Y) and conditional tests (IF/AND/OR logical tests). Data output features of the program should include the ability to create lists on the system printer with totals and subtotals, and should provide for some "formatting" of data, such as dollars and cents, or right or left justification. Some of the more sophisticated systems also allow the user to create complex forms, such as an invoice or a statement.

Update capability can be a good measure of the flexibility of the program. For example, if the program has the ability to simultaneously update more than one file, the user has a better chance of creating a closer simulation to a real database than with a program that allows only one file to be updated at a time. A good system will also allow some sort of mathe-

matical calculations on input data and some logical comparisons of input data after input edits but before update. A classic case might be the updating of sales records, where the system checks to be sure that the invoice being entered has not already been entered, and that the number is the correct sequence [i.e. the last number entered plus 1].

Levels of Subtotals

To create the kinds of reports that rival dedicated applications packages, a program must have the ability to create several levels of subtotals. The programs that have the most flexibility in this capacity are listed below (all those programs that have capacities of greater than two levels of subtotals):

Product	Levels of Subtotals
<i>For the Apple:</i>	
Versa Form	3
The General Manager	4
Data Perfect	4
DB Master	6
The Data Machine	40
I/O-Version II	40
<i>For CP/M machines:</i>	
Selector	5
The Quad	5
Data Plan	8
MAG/Base	9
InfoStar	9
Personal Pearl	9
Analyst	10
MDBS	65,535
FMS-80	65,535
The Knowledge Manager	65,535
<i>For other machines:</i>	
ANDI	10
Control	16
MIS Builder	34
Data Design	40
The Wiz	unlimited
Savvy	unlimited
The Organization Analyst	unlimited

Inquiry functions are important aspects to the systems ability to function as an on-line information source. Perish the thought of putting all that data into the computer, then not being able to access it when needed. A good inquiry function

allows the user to search on a record-by-record basis (i.e. by going through the records from a specified start point, either forward or backwards), on a field basis (comparing to a user supplied match) or on a logical comparison basis (data element either <or> or <>).

Special sub-programs should include necessary utilities to sort the database or in some other way reorganize or re-index it. Additionally, some flexibility in modifying the database is extremely useful to allow users to add additional types of data (new fields), delete fields or modify the size of fields. (Consider the frus-

Creating Data Input Screens

The use of an ordinary text editor (like WordStar) to create data input screens allows a user the capability to prepare formats that are generally much more visually appealing and professional in appearance.

These programs allow the user to use an ordinary text editor to create input screens:

For the Apple:

The Data Machine
Complete Mailing Label and Billing System

For CP/M machines:

MAG/Base
The Quad
dBASE II
MDBS
FMS-80
The Knowledge Manager
Friends Report Writer

For other machines:

Control
ANDI
IDM-X
Data Design

tration of a database system that doesn't allow the user to change the size of the zip code.)

Code generator programs are a generic class of programs that create or generate "code" or other programs that can be run by the user. In other words, the system creates an applications program for the user to employ. Programs such as *The Last One* (IA Jan 83) and *The Formula* (IA May 82) represent the typical code-generating applications package. These programs often are in essence file management packages with user customiza-

loaded before program execution. When resident, the user interacts with the system either through commands made by the operator, or by menus. It is possible to create a series of batch commands that allow RDBMS to be used just like a programming language.

Informix Relational DBMS

Informix, from Relational Data Base Systems (Sunnyvale, CA), is designed for the Unix-based 16-bit low-end mini and high-end microcomputer market.

Written in C, Informix provides the user with the tools necessary to produce and maintain databases, including a comprehensive report writer. The system is capable of supporting multiple users, and offers interactive query features, as well as screen-oriented data entry, dynamic database restructuring, transaction logging and automatic recovery. Interfaces to several programming languages are available, permitting applications programs to pass data back and forth.

Idol

Idol, from SMC Software Systems (Bridgewater, NJ), is a Unix-based database system, that can handle up to 8,300,000 records per file, with each record being limited to 80 fields size of 89 characters. Characters are stored as ASCII, so that other programs can access the data without the necessity of any file "translation utility." Files are indexed by relational tags.

The program supports just about every sort of input edit imaginable, including time, date (regular and julian), social security number, telephone number, conditional logic, length of field, and range of data.

The program is capable of performing calculations on data input, and can update more than one file at the same time. In fact, up to seven files can be open at any one time. This feature is especially useful in the preparation of reports, an area in which *Idol* is particularly versatile. The program has an unlimited number of subtotal levels, and has print masks for most of the common report needs. The user creates a report format, using a text editor that is part of the program. The resultant output can be used to print on checks or other pre-printed forms, or to create custom billings, invoices or other reports.

Visifile

Visifile, from VisiCorp (Sunnyvale, CA), is a program for the Apple computer that is designed to create an "electronic" filing cabinet with the Apple computer. The system can accommodate approximately 1,000 mailing list records per diskette, as a rough measure of capacity. The program features multiple indexes per file, and the ability to create new files whenever needed. The user can also define a structure of an existing data file that was created by some other program. With the "DIF" file format, the user can transfer files and data between Visifile and other programs that run on the Apple, such as to VisiCalc (spreadsheet calculations) and Visitrend (graphics).

Visifile is more along the lines of a traditional file management system, and the program makes no pretensions of being a complex database management system. It has all of the features necessary for data entry and manipulation: the user can access the data in a number of different ways with other VisiCorp programs: it all adds up to a very usable and user-friendly software program.

Visidex

Visidex is another of the VisiCorp programs designed to allow novice computer users to access the power of their Apple computers. The Visidex program is essentially an electronic "index file." The system is basically a narrow subset of the more general file management packages, a specialized version of Visifile.

Visidex is intended as a keeper of lists—a small amount of data, comparable to what one might put on a single index card. The program can retrieve the data based upon a sequential order, or a search that can be in any order. The user can specify ranges of data to be retrieved, or even retrieve data by date. One of the unique features of the system is a keydate calendar that allows the user to create "tickler files" and calendars of to-do items. A sort program is included, so that the system can be used as a stand-alone data management system.

TCS Simple

Simple, by TCS Software (Houston, TX), is a database management sys-

tem that uses the "language" format. It consists of simple commands, much in the same fashion as Condor RDBMS or dBASE II. The system is designed to be a file management system, allowing users to create and manipulate data in a multiple sort index file system. The system is compatible with all of the other TCS application packages (Accounts Receivable, Accounts Payable, Payroll, Inventory, and General Ledger), thus allowing the user the freedom to use a pre-packaged and de-bugged applications package for the entry of data, and Simple for the extra reports and special analyses necessary. Simple is unique from this standpoint, in that it is one of the only database programs that is fully supported by stand-alone professionally packaged specific applications packages.

Simple is designed for CP/M machines and comes with features that allow it to be used to read files created by other programs and translate them into Simple format.

TIM

The TIM (Total Information Management) database program, from Innovative Software (Kansas City, MO), is a very easy-to-use program, designed for use by someone with little or no real computer knowledge. It is one of the few database programs that is menu-driven and is written in Basic (Microsoft 5.2). From a purely technical standpoint, it's questionable whether the TIM programs really constitute a database—they are probably more of a file management system. From a user standpoint, though, it makes no difference. The TIM programs work, and without a lot of fuss. They don't require the user to learn everything about programming either. TIM is designed for simple business applications—the report functions are basically what would be expected of an entry-level system. The manual assumes the user doesn't have the slightest knowledge of what a database is all about, and includes step-by-step implementation guides.

The program requires at least 48K bytes of space, and the CP/M operating system. The files created by TIM can have up to 32,000 records, with a maximum of 24 data fields per record. The total length of all fields together is 250 characters, and any one field can be no longer than 40 characters. The field types include one unique type—an inverted name field

that is used to prepare alphabetical listings of names, but still print the first name first. The system also has a dollars-and-cents field type that automatically inserts the commas, dollar signs and commas (one of the few databases that contains this feature).

The records created by TIM may be sorted with up to 24 sorted orders per file. Additionally, each sort may have up to 24 keyfields deep. A rather unique feature of the system is the maintenance of libraries of previously-created screens, forms, data layouts, etc., so that creating additional databases or modifying existing ones is easily facilitated. The report generator includes some rather unique features, including statistical functions (such as mean, variance and standard deviation), minima and maxima, and total record count. Additionally, field summaries can be calculated on up to three different fields. A form letter subsystem is included in the system.

DataFax

DataFax, by Link Systems (Santa Monica, CA), is a free-form relational file system designed for a 64K Apple II, an Apple III, or an IBM PC. The system is designed to create and maintain a filing system that is organized according to key-words. The system is not oriented towards a production environment and would not be appropriate, for example, for designing an accounts receivable program. On the other hand, DataFax is just the sort of program that someone wishing to organize his index file of customer contacts would use.

DataFax utilizes a full screen "electronic index card." The user enters data on these cards in whatever form and in whatever order desired. Data items that are to be used as indexes or to record a particular "card" are designated by the user as key-words. The system automatically indexes and creates relational tags between key-words. The user can recall the electronic index card by reference to a key-word or part of a key-word (for example all the names that begin with "S"). Additionally, a user can create a search that is conditional. In such an arrangement, the user could specify, for example, all names that begin with "S" and additionally lived in New York City.

DataFax is a good program for a user that doesn't need the cost complexity or power of a full database system. □

tion routines added. The real key to whether they represent database implementations is whether or not they allow the user to retrofit an existing database to accommodate a change in user needs.

Ranking by Ability to Have More Than One File "Open"

The ability to have more than one data file open is important in complex data file operations when more than one file is used, as in such accounting operations as posting or updating inventory records.

Especially when a complex report is being prepared, where data must be accessed from several different sources, the ability to have more than one file open is important. Most Basic languages allow at least three files to be open at one time. (Products not listed here allow only one file to be open.)

Product	Number of files open at one time
<i>For the Apple:</i>	
The Tool	10
The Data Machine	2
<i>For CP/M machines:</i>	
dBASE II	2
Data Plan	2
MAG/Base	5
Personal Pearl	5
Selector	6
The Quad	10
FMS-80	19
InfoStar	limited by memory
The Knowledge Manager	limited by memory
MDBS	255 (max theoretical of a CP/M system)
<i>For other machines:</i>	
IDM-X	2
MIS Builder	4
Wordbase	10
Control	16
Savvy	255
ANDI	up to 255

In other words, does the program allow the user to modify the types of data elements in the file? Can he add or change a field?

Sometimes a system creates a program that can be run completely independently of the database program packages. Other

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packages require that some sort of runtime module be present in order for the system to be functional.

Reports and their flexibility are an excellent measure of the power of a database program. After all, if the program can't get the data out in the fashion required, there's no sense in using it. Report functions that allow users to draw upon more than one file at a time are best. In a real-life installation, it is often necessary to include information from more than one file in a report, as in the case of a receivables collection report, which includes the customer, the accounts receivable amount and the customer's address and phone number. Typically, this information would be stored in at least two different files. Unless the system allows the user to get into those files and extract data, the report will be impossible.

Print masks and formatting are important elements in producing readable, professional reports. A system should allow for dollars and cents to be properly formatted (with commas, please), for dollar signs and double-underlining. Some levels of subtotals should also be available.

In many cases, reports from database systems end up being simply lists or columnar reports. In a real business environment, though, other forms of reports are often necessary. If the database is to be effectively used in an applications environment, it should allow for formatted output, such as printing checks or printing invoices.

Data integrity is very important in a database, because if even one element in a database becomes corrupt, the entire structure of the database is jeopardized. Therefore, it is essential that a good system has protections and safeguards. These begin in the input function, where the system should have the capability to perform validity checks on the data. Once the data is in, there are any number of ways in which Dr. Murphy can mess it up. Often the corruption does not occur in the data itself, but in the keys or indexes that relate the data elements. A good database should have a method of restructuring the database, either by re-indexing or by evaluation of the existing keys or pointers.

One clever way to cause disarray in a database system is to abort the program in the middle of an update. All it takes is a slight push on the "reset" button to completely disorganize things. The system should have some way of extricating itself from the situation, which can also occur as the result of the power going out or a transient power glitch. The more elegant systems allow the user to backtrack to the correctly-linked transaction. In the

"good-old-days" when sequential files were used in many programs, corrupt data could be fixed with a text editor. Unfortunately, in the case of random files, this is usually impossible due to the packed format in which they are stored on disk.

Finally, *performance* is the key to any effective installation. Performance can be measured with one attribute: speed. There are a number of technical problems that the database program designer has to face. The basic architecture of the database has a lot to do with the efficiency with which the system deals with the relationships between data. Terms such as CODASYL-network, shallow-network, hierarchical DBMS and B-Tree structures all refer to the architecture of the system. The manner in which these different design philosophies are implemented, whether they be in Basic or assembly language, determine the ultimate user satisfaction with the system. Unfortunately, there is no way to really know if a particular system will perform acceptably unless you try it—with a reasonably realistic file size. Every system will be lightning fast with a three-record file. When the database has 3,000 records, the differences will appear.

One technical element of design that will impact the speed of the database program is the ability of the system to recognize and eliminate redundancy. The application of a name and address application is a good example. A simple system will create a new data element for each city name entered. If 3,000 New York City addresses are entered, there will be 3,000 redundant "New York City" data elements. A sophisticated system would recognize the redundancy and create only one "New York City" data element, placing pointers in all the records pointing to it. This sort of program will run much faster than the simpler one, plus use substantially less storage space. Few, if any, programs are this sophisticated. □

Contributing editor Carl Heintz has spoken on microcomputers before discussion groups of the California Society of CPAs. He has taught accounting at both USC and UCLA and received undergraduate and graduate degrees in business administration from the former. He has made numerous presentations on business topics before civic and business groups, including a series to the American Management Associations. In addition to many articles, Mr. Heintz has authored two books.

Chart 1. Company and Configuration Data

COMPANY NAME AND ADDRESS	PRODUCT NAME	PRICE	HARDWARE REQUIREMENTS	OPERATING SYSTEM	WRITTEN IN	HARD DISK COMPATIBLE	MULTI-USER COMPATIBLE
<i>For the Apple</i> Apple Computer, Inc. 20525 Mariani Ave., Cupertino, CA 95014	Quick File III	\$100	128K Apple III, external drives	Apple III SOS	Pascal	y	n
Applied Software Tech. 14125 Capri Dr., Ste. 4, Los Gatos, CA 95030	Versa Form	\$389/\$495	Apple II (64K), 2 drives	UCSD Pascal	Pascal	y	y
Avant-Garde Creations Box 30160, Eugene, OR 97402	Complete Mailing and Billing System	\$75	Apple II	Apple II	Basic	n	n
High Technology Software Products Box 14665, Oklahoma City, OK 73113	Information & Data Master	\$100/\$150	48K Apple II, 1,2 disk drives	Apple DOS	Applesoft Basic	n	n
Information Unlimited Software 2401 Marinship Way, Sausalito, CA 94965	Datadex	\$150	Apple II (48K) 1 drive	DOS 3.3	Applesoft	y	y
LJK Enterprises, Inc. Box 10827, St. Louis, MO 63129	Data Perfect	\$100	48K Apple	DOS 3.3	Machine	n	y
Pascal Systems, Inc. 830 Menlo Ave., #109, Menlo Park, CA 94025	The Data Machine	\$625	Apple II/III, IBM PC (128K)	UCSD 2.1 and 2.4	UCSD Pascal	y	y
Readers Digest (Microcomputer Division) Pleasantville, NY 10570	List Maker	\$98	48K Apple II/II+, TRS-80 I/III	depends on version	Basic/Assembly	n	n
Sierra On-Line, Inc. 36575 Mudge Ranch Rd., Coarsegold, CA 93614	The General Manager	\$230	48K Apple II	Apple DOS	Assembly/Basic	y	n
Silicon Valley Systems 1625 El Camino Real, #4, Belmont, CA 94002	List Handler	\$90	48K Apple, 1 disk drive	DOS	Assembly	n	n
Software Publishing Corp. 1901 Landings Dr., Mountain View, CA 94043	PFS:File	\$125/\$175	Apple II (48K), Apple III (128K)	Apple's UCSD-p	Pascal	y	n
Software Technology for Computers 430 A Main St., Watertown, MA 02172	IFO-Version II	\$200	Apple II/II+ (48K) 2 drives	DOS 3.3	Assembly	y	n
Stoneware, Inc. 50 Belvedere St., San Rafael, CA 94901	DB Master	\$229	Apple II, 1-4 drives	n/a	Basic	y	n
Westware, Inc. 2455 SW 4th, Ontario, CA 97914	Systems II	\$425	Apple II (48K), 2 drives	DOS 3.3	Applesoft	y	n
<i>For CP/M computers</i> Ashton-Tate 9929 West Jefferson, Culver City, CA 90230	dBASE II	n/a	Z80, 8080, 8085/6/8	CP/M, MSDOS (16-bit)	Assembly	y	n
Chang Laboratories, Inc. 10228 N. Stelling Rd., Cupertino, CA 95014	Data Plan	n/a	CP/M	CP/M	n/a	y	n
Compumax Box 7239, Menlo Park, CA 94025	Microbase	\$149	Z80	CP/M	Basic	y	n
DJR Associates Inc. 303 S. Broadway, Tarrytown, NY 10591	FMS-80	\$500-\$990	48K RAM	CP/M, MP/M, Turbo Dos	Assembly, C	y	y
Friends Software Corp. Box 527, Berkeley, CA 94701	Friends Report Writer	\$295-\$495	56K bytes, 2 drives	CP/M	Assembly	y	n
International Software Enterprise, Inc. 85 W. Algonquin, Arlington Hts, IL 60005	MDBS	\$1500-\$5000	Z80, 8080/5/6/8 PDP-11	CP/M, MP/M, PCDOS, MSDOS	C	y	y
Micro Ap, Inc. 7033 Village Parkway, Dublin, CA 94568	Selector	\$900	52K working space	CP/M, MP/M, (80-86)	CB80 Machine	y	y

y = yes; feature is included
n = no; feature is not included
n/a = information not available

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Chart 1. Company and Configuration Data (continued)

COMPANY NAME AND ADDRESS	PRODUCT NAME	PRICE	HARDWARE REQUIREMENTS	OPERATING SYSTEM	WRITTEN IN	HARD DISK COMPATIBLE	MULTI-USER COMPATIBLE
<i>For CP/M computers (continued)</i>							
Micro Applications Group 20201 Sherman Way #205, Canoga Park, CA 91306	MAG/Base	\$295-\$795	48K, Z80, 8080, 8086	CP/M, MP/M	CBasic/CB80	y	y
MicroPro 33 San Pablo, San Rafael, CA 94903	Infostar	n/a	48K, dual floppies	CP/M-80	8080 Assembly	y	n
Micro Data Base Systems Box 248, Lafayette, IN 47902	The Knowledge Manager	\$250	Z80, 8080/5/6, PDP-11	CP/M, PCDOS, TRSDOS	Assembly, C	y	n
MicroRIM, Inc. Box 585, Bellevue, WA 98009	MicroRIM	\$795	Z80, CP/M, 8080/5/6	CP/M	Fortran	y	n
Pearlsoft Box 13850, Salem, OR 97309	Personal Pearl	\$295	Z80, 8080, 8086	CP/M, SOS, MSDOS	Pascal	y	y
Quanteckna Research Corp. 6902 220th S.W., Mountlake Terrace, WA 98043	The Quad	\$495/\$595	Z80, 8080, 8085	CP/M, MP/M	CB-80	y	y
Structured Systems Group 5204 Claremont, Oakland, CA 94618	Analyst	\$250	48K RAM	CP/M	CBasic 2	y	y
<i>For other machines</i>							
American Planning Corp. 4600 Duke St., Alexandria, VA 22304	MIS Builder	\$495-\$5000	North Star Horizon/ Advantage	North Star DOS	APC Basic	y	y
B&B Software Box 2090, Ann Arbor, MI 48106	Corp	\$195	TRS-80 I/II/III	TRSDOS	Basic	y	n
Cado Systems Corp. 2771 Toledo St., Torrance, CA 90510	Wordbase	varies	Cado Computer System	Cado OS	Cado4	y	y
CRS Associates Box 40283, Philadelphia, PA 19106	Waloss II	\$250	64K, 1 drive TRS-80 II/III	TRSDOS	Basic	y	n
Dravac Ltd. 16 Muller Rd., Oakland, NJ 07436	ANDI	\$2500	AM-100, 32K, CRT	AMOS	Assembly	y	y
Insoft, Inc. 10175 SW Barbur Blvd #202B, Portland, OR 97219	Data Design	\$225	IBM (8088), 2 drives	MSDOS	Basic	y	n
Micro Architect, Inc. 96 Dothan St., Arlington, MA 02174	IDM-X	\$399-\$598	TRS-80 II, IBM PC	TRSDOS, PCDOS, CP/M 2.2	Basic	y	n
Phase One Systems, Inc. 7700 Edgewater St. #830, Oakland, CA 94621	Control	\$695	48K	Oasis	Basic/Assembly	y	y
Programming Technology 1417 Bridgeway, Sausalito, CA 94965	The Organization Analyst	\$287	IBM PC (64K+) 2 drives	IBM DOS	Pascal/Macro	y	n
Savvy Marketing, Int'l. 100 S. Ellsworth 9th floor, San Mateo, CA 94401	Savvy	\$950	n/a	Savvy	Fortran	y	n
Super Soft, Inc. Box 1628, Champaign, IL 61820	Personal Data Base	\$125	IBM PC (48K)	IBM PC, DOS	Basic	y	n
Tamarack Software Water Street, Darby, MT 59829	The Wiz	\$130	Commodore 8032, 8050	Manufacturer	Basic/Assembly	y	n
Threshold Software, Inc. 1832 Tribute Rd., Ste. E, Sacramento, CA 95815	File/idea	\$250	HP-85, 1 drive	HP-85 (proprietary)	Basic	y	n
Vector Graphic 500 S. Ventura Park Rd., Thousand Oaks, CA 91320	Data Manager	\$495	Vector (64K)	CP/M (Vector only)	Basic	y	n

y = yes; feature is included
n = no; feature is not included
n/a = information not available

Chart 2. An Overview of Database Structure

PRODUCT NAME	MAXIMUM NUMBER OF RECORDS PER FILE	FILES HAVE FIXED OR VARIABLE RECORD SIZES	MAXIMUM NUMBER OF FIELDS PER RECORD	MAXIMUM FIELD SIZE IN CHARACTERS	FORMAT OF STORED FILES (i.e. HOW THEY ARE STORED ON DISK)	CAN NON-DATA-BASE PROGRAMS ACCESS FILES CREATED BY THE DATA-BASE PROGRAM?	HOW ARE DATABASE FILES INDEXED?	MAXIMUM NUMBER OF INDEXES	SPECIAL FEATURES AND PROGRAMS
<i>For the Apple Quick File III</i>	30K-110K	variable	15	76	packed binary, ASCII	y*	other	15	
Versa Form	300	variable	50-75	78	non-std. Pascal files	y*	sep. indexes	1	
Complete Mailing Label and Billing System	1,200	variable	17	28	Apple random text	y	sep. indexes	17	name, phone, zip lists, 2-level search, alphabetic directory
Information & Data Master	100	variable	20	99	ASCII	y	sep. indexes	5	
Datadex	n/a	either	50	38	ASCII	y	other	1	user-written programs can be used on data and called from program
Data Perfect	variable	either	32	127	Text files	y*	relation tags	variable	can design specialized screen masks
The Data Machine	32,767	either	40/100	60	packed binary, ASCII	y	sep. indexes	1	DIF-file interface, Pascal Utilities
List Maker	250	either	12	30	ASCII	n	sep. indexes	3	
The General Manager	16M bytes	variable	99	39	packed binary	y	relation tags	1	Interface to most databases
List Handler	3,000	variable	250	250	Nibble format	y*	other	unlimited	label, list and letter printer
PFS:File	1,000-3,200	variable	1,600-3,200	839-1,679	packed binary	y	relation tags	n/a	
IFO-Version II	1,600	either	40	1,440	packed binary	y	relation tags	2	Phonetic search capability
DB Master	<5M bytes	either	200	220	packed, binary	y*	sep. indexes	10	utility and stat programs
Systems II	700	variable	40	25	ASCII	y	sep. indexes	1	
<i>For CP/M computers</i>									
dBASE II	65,535	variable	32	254	ASCII	y*	other	7	
Data Plan	64K	variable	32	99	ASCII	y	sep. indexes	n/a	
Microbase	4,000	variable	50-600	29	packed binary, ASCII	y	sep. indexes	1	backup, reload, mailing label
FMS-80	65,535	either	255	255	packed binary, ASCII, other	y	sep ind.; rel. tag	unlimited	report generator, menu creator, "Transform" utility
Friends Report Writer	65,000	either	ltd. by memory	256	packed binary, ASCII	y	other	n/a	reads many other database files, has multi-dimensional cross tabulation
MDBS	unlimited	variable	65,535	65,535	special internal form	y	other	unlimited	manipulation language, retrieval system generates output
Selector	99,999	variable	89	screen width	ASCII	y	sep. indexes	99	auto-pilot

The "raw power" of a database program can be measured by the capacity of the system. The differences in the systems can be seen in the maximum field size, and the format of stored files. The number of indexes available is a measure of how many ways of organizing the data can exist simultaneously. (In other words, a sales file could be indexed or "ordered" by invoice number, date, customer and salesman, if four indexes were simultaneously available.) The ability to access database files with non-database programs allows a user to create custom applications and possibly interface with other packaged software.

Key

y = yes; feature is included n = no; feature is not included n/a = information not available *non-database programs can access these files, but only with the aid of a "file translation" program.

Chart 2. An Overview of Database Structure (continued)

PRODUCT NAME	MAXIMUM NUMBER OF RECORDS PER FILE	FILES HAVE FIXED, OR VARIABLE RECORD SIZES	MAXIMUM NUMBER OF FIELDS PER RECORD	MAXIMUM FIELD SIZE IN CHARACTERS	FORMAT OF STORED FILES (i.e. HOW THEY ARE STORED ON DISK)	CAN NON-DATA-BASE PROGRAMS ACCESS FILES CREATED BY THE DATA-BASE PROGRAM?	HOW ARE DATABASE FILES INDEXED?	MAXIMUM NUMBER OF INDEXES	SPECIAL FEATURES AND PROGRAMS
<i>For CPM computers (continued)</i>									
MAG/Base	2,500	either	999	35	ASCII	yes	rel. tags, sep. indexes	99	screen formatting, file management
Infostar	ltd. by disk size	variable	255	120	ASCII	y	sep. indexes	1	
The Knowledge Manager	65,535	either	265	65,535	packed binary, ASCII, other	y*	sep. index, other	unlimited	integrated spreadsheet, table processing & programming, language
MicroRIM	999,999,999	either	127	254	MicroRIM binary	y	other	127	direct access to database
Personal Pearl	no limit	variable	250	screen width	variable length	y*	sep. indexes	unlimited	sort, file maintenance, compress data, rebuild index.
The Quad	65,535	variable	30	30	ASCII	y	relation tags	2	payroll, linking, data conversion
Analyst	ltd. by storage	variable	50	1-255	ASCII	y	sep. indexes	n/a	create, modify, print, select
<i>For other machines</i>									
MIS Builder	disk limited	fixed	99	40	ASCII	y	sep. indexes	15	access data files, full system utilities
Corp	n/a	variable	n/a	30	packed binary	no	relation tags	n/a	
Wordbase	4,194,303	fixed	240	255	packed binary	y	sep. indexes	1	any sub-program may be encoded in Basic language and invoked by DBMS
Waloss II	variable	either	25	250	packed binary	y	sep. indexes	1	
ANDI	65,535	fixed	63	9,011	float, binary, ASCII	y	sep. indexes	unlimited	maintenance utilities, program generation sub-systems
Data Design	65,000	variable	40	79	packed binary	y	sep. indexes	26	backup, restore, form letter programs
IDM-X	30,000	variable	60	255	packed binary, ASCII	y	other	1	text formatter, full utilities
Control	65,535	either	170	60	packed binary	y	sep. indexes	1	forms option
The Organization Analyst	unlimited	variable	ltd. by memory	256	Pascal formatted	y	other	1	
Savvy	20,239	n/a	255	255	ASCII	y	sep. indexes	255	Robot programmer
Personal Data Base	unlimited	variable	20	50	packed binary	no	sep. indexes	unlimited	
The Wiz	300,000	variable	64	78	ASCII	y*	other	n/a	
File/idea	2,000	variable	25	95	ASCII	y*	sep. indexes	5	
Data manager	disk limited	variable	99	70	ASCII	y*	sep. indexes	3	

The "raw power" of a database program can be measured by the capacity of the system. The differences in the systems can be seen in the maximum field size, and the format of stored files. The number of indexes available is a measure of how many ways of organizing the data can exist simultaneously. (In other words, a sales file could be indexed or "ordered" by in voice number, date, customer and salesman, if four indexes were simultaneously available.) The ability to access database files with non-database programs allows a user to create custom applications and possibly interface with other packaged software.

Key

y = yes; feature is included n = no; feature is not included n/a = information not available *non-database programs can access these files, but only with the aid of a "file translation" program.

Chart 3. Update on Updates

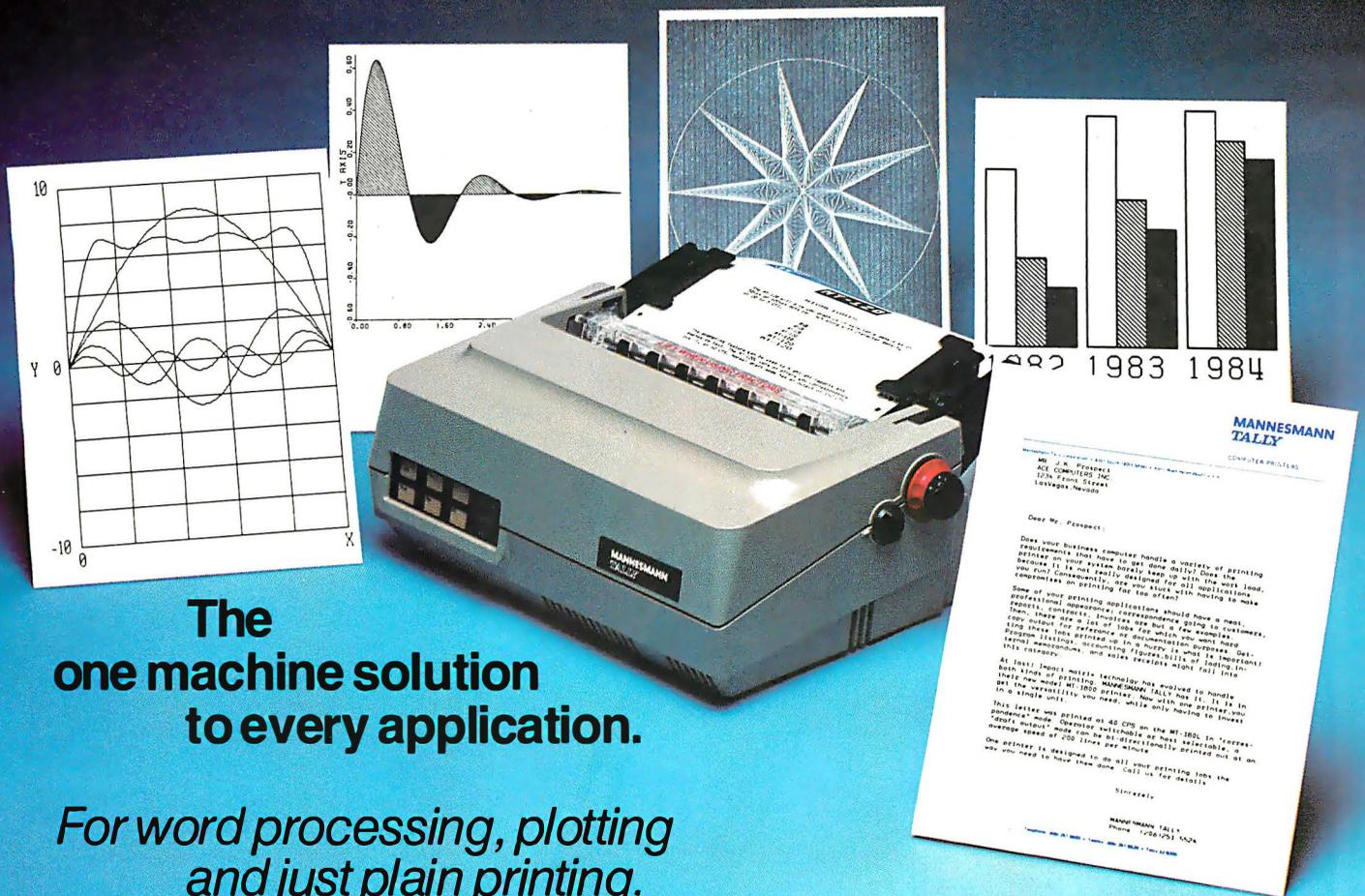
PRODUCT NAME	ABILITY TO UPDATE MORE THAN ONE FILE SIMULTANEOUSLY	ABILITY TO UPDATE FILES SELECTIVELY	ABILITY TO PERFORM MATH CALCULATION WITH UPDATE	CAPABILITY TO PERFORM LOGICAL COMPARISON IN UPDATE FUNCTION	CAN ONE DATABASE OPERATE (OR UPDATE) ANOTHER?	
					MERGE	APPEND
<i>For the Apple:</i>						
Quick File III	n	y	n	n	n	n
Versa Form	n	y	y	y	n	n
Complete Mailing Label and Billing System	n/a	n/a	n/a	n/a	n	y
Information & Data Master	n/a	n/a	n/a	n/a	n	y
Datadex	n/a	n/a	n/a	n/a	n/a	n/a
Data Perfect	n	y	y	y	y	n
The Data Machine	n	y	y	y	y	y
List Maker	n	y	n	n	y	y
The General Manager	n	y	y	y	y	n
List Handler	n	y	n	n	y	y
PFS:File	n	n	n	y	n	y
IFO-Version II	n	y	y	y	n	n
DB Master	y	n	y	n	y	n
Systems II	n	n	y	n	n	n
<i>For CP/M computers:</i>						
dBASE II	n	y	y	y	y	y
Data Plan	n/a	n/a	n/a	n/a	y	y
Microbase	n	y	n	n	n	n
FMS-80	y	y	y	y	y	y
Friends Report Writer	y	y	y	y	y	n
MDBS	y	y	y	y	n	n
Selector	y	y	y	y	y	y
MAG/Base	y	y	y	n	y	y
Infostar	y	y	y	y	y	y
The Knowledge Manager	y	y	y	y	y	y
MicroRIM	y	y	n	n	y	y
Personal Pearl	n	y	y	y	y	y
The Quad	y	y	y	y	y	y
Analyst	y	y	y	n	n	n
<i>For other machines:</i>						
MIS Builder	y	y	y	y	y	y
Corp	n	y	n	n	n	n
Wordbase	n	y	y	y	y	y
Waloss II	y	y	y	n	y	n
ANDI	y	y	y	n	y	y
Data Design	n	y	y	n	n	n
IDM-X	n	y	y	y	y	y
Control	n	y	n	n	n	n
The Organization Analyst	y	y	n	n	y	y
Savvy	y	y	y	y	y	y
Personal Data Base	n	y	n	n	n	n
The Wiz	n	y	n	n	y	n
File/idea	n	y	y	n	n	n
Data Manager	n	y	y	y	n	y

The ability of a database program to update or modify a database file from another database file is important in many business applications. For example, an accounts receivable transaction file may be updated by sales transactions and cash receipts transactions (two separate files). When creating an application with a database management program, the systems designer should have some flexibility. The several different kinds of "update" capabilities are summarized above. Manufacturers of programs with "n/a" notations had no response to these survey questions about updates.

Key:
 y = yes; feature is included
 n = no; feature is not included
 n/a = information not available

Continued on page 148

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REVIEW

Hewlett-Packard's HP 7470A Plotter

by Roger H. Edelson



H-P has signaled its intention to compete seriously in the personal and small business marketplace; this plotter represents a commitment to extend graphics capability to this arena.

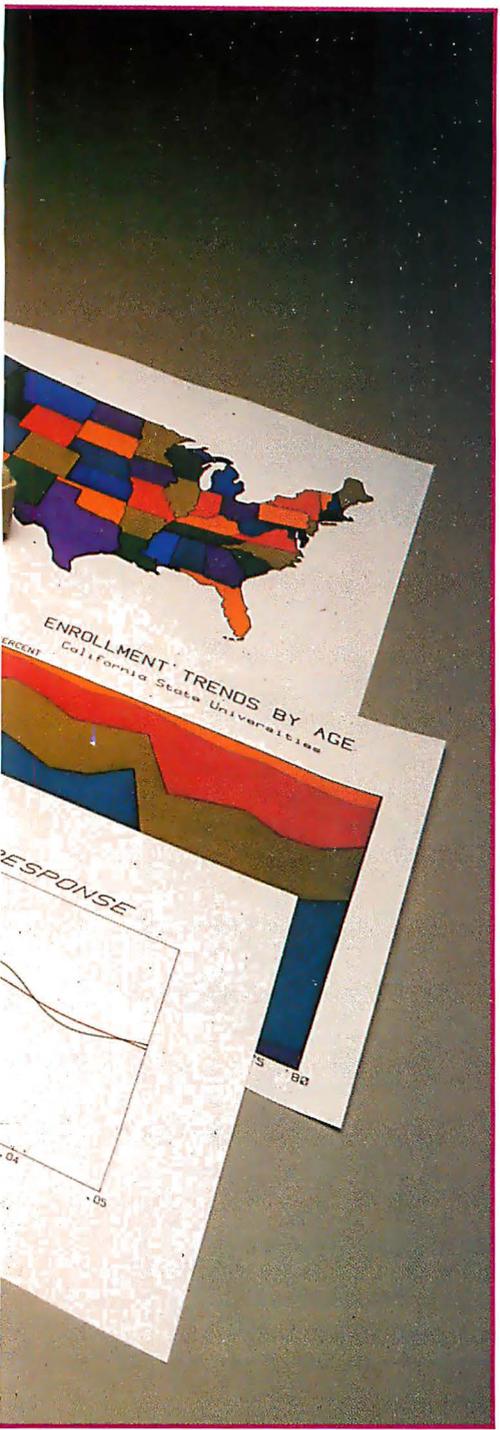
Hewlett-Packard (Palo Alto, CA) has, of course, been making plotters for the industrial and engineering marketplaces for years, but the introduction of the 7470A plotter represents a significant departure from previous products. Besides being compatible with all H-P computers, the 7470A is designed to be used with most personal and small business computers, particularly those from IBM, Apple and Commodore. As the marketplace for small business and personal graphics is expected to show continual growth, this entrance into the high-volume, low-price competition should be a wise move—if the product is accepted.

A quick look at the specifications and capabilities of the HP 7470A (figure 1), available for just \$1,550, suggests that this fast (15-in./second) and attractive plotter will only receive user acceptance. The high pen-down speed—and an even faster pen-up velocity of 20-in./second—are achieved by scaling

down large plotter technology. Instead of trying to move the pen in two directions, the paper, or transparency material, is moved along the X-axis, and the pen is only required to move along the Y-axis. This technique was originally developed to allow plotting on over-size paper (larger than 11-by-17), where it would have been next to impossible to provide sufficient pen range in the X-axis. When applied to small-format plotting, it provides a method of minimizing the inertia of the plotting mechanism to the mass contributed by only a single pen, and the drawing medium, thereby allowing even complex plots to be created without a lot of wasted time.

To maintain a neat, controlled line on transparency material, the plotter can be slowed down to half-speed (or any speed in the range of 3.8 cm/s to 38.1 cm/s) by means of the velocity set (VS) instruction. One other advantage of the design is low noise. When in operation, the plotter makes an unobtrusive office companion, and is even acceptable in the home where noise levels are significantly less than found in the typical office environment. The unit is not entirely silent; it does emit a weird assortment of squeaks and groans, as it moves to the pen limits or picks up a new pen color, but compared to some other plotters that move the pen in both directions, it is most pleasing.

In the pursuit of high-speed plotting, this new intelligent, small-format, two-pen (but multi-color) plotter has not sacrificed resolution and repeatability. Using a system referred to as "a micro-grip drive," the 7470A provides a resolution of .001-in. and can plot the same point repeatedly within .004-in. The micro-grip system consists of an aluminum-oxide-grit coated drive wheel and a rubber pinch-



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MP/M 86	Yes	—	?
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¹For comparison purposes, typical professional configurations consist of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232 Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent.

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CIRCLE NO. 12 ON INQUIRY CARD

roller. There are two of these drives, one on each side of the paper, and not only do they move the paper in the X-axis direction; they also serve to prevent the paper from buckling and migrating away from the left hand edge of the platen. This effect is achieved by tapering the pinch wheels such that the outside edge is slightly larger than the inside edge. The tapering causes each side of the paper to pull away from the center, and by increasing the pulling force on the left-hand roller, the paper maintains its position against the left side. A careful balance must be maintained between these forces (left drive vs. right drive) to achieve reliable, repeatable, positioning in the Y-axis, and H-P seems to have met this requirement.

The micro-drive assembly not only positions the paper, but also forms a part of the accurate—and easy-operating—paper loading mechanism. To load the paper, it is only necessary to insert the plotting medium until it touches the small grey plastic paper stop and rests against the platen's left edge. The paper-loading lever is then moved to the "PAPER HOLD" position, which lowers the pinch wheels, and the paper stop, allowing free movement in the X-axis. The paper-loading lever should always be moved to the "PAPER LOAD" position at the end of each session before turning off the plotter power. When this is done, the plotter will replace the pen it was last using, thereby capping both pens and preventing tip drying. While it seems like a small point, this feature is a great piece of ergonomic design—it allows the pens to remain in the plotter until another drawing is required. This significantly reduces the amount of human inertia involved in using a plotter. There is a problem associated with this arrangement, however—when changing pen colors, the pen-well must be cleaned to assure no absorption of the previous color by the new pen tip.

To move the paper, the sharp edges of the aluminum-oxide grit slightly penetrate the back of the paper or transparency medium. This allows the paper to be realigned automatically with the wheel as it is moved back and forth. It is quite a kick to watch the plotter whip the drawing medium through, and back, under the plotter arm, maintaining excellent registration no matter how many passes are required to complete the plot. H-P states that the grit produces only microscopic indentations in the paper, and I can verify this claim, as it was impossible to see the slight marks without the use of magnification. The edge of the pinch

rollers does leave a very slight, unobjectionable, ridge, however.

One step that must be done before plotting is to set the paper-size DIP switch on the rear deck of the plotter. The plotter accepts only two sizes of paper, the 8.5-in. by 11-in. U.S. size, and the European A4 size (210 by 297 mm.). It is necessary to inform the plotter of the paper size, even though they are both very similar, in order to establish the maximum plotting limits.

The details of the HP 7470 plotting area are shown in figure 2, which also indicates the position of P1 and P2, the two limits of the plotting area. During the plotter

- 8.5- by-11-in. (A/A4) color plotter
- Resolution: 25 μ m (1/1000-in.)
- Repeatability: 100 μ m (4/1000-in.)
- Pen acceleration: 2Gs
- Pen velocity: 38 cm/sec (pen down)
50 cm/sec (pen up)
- Internal vector generation
- 5 internal character sets
- "Scaling" ability
- Two standard interfaces (HP-IB or IEEE-488, and RS-232C/CCITT V.24)
- HP-GL command language
- 17-in.-by-14-in.-by-5-in. (43 cm-by-36 cm-by-13 cm); weighs 12-1/2 lbs.
- 25 watts maximum power consumption

Figure 1. HP 7470A Specifications

confidence test (which is initiated by depressing the "PEN UP" button while turning on the plotter power), the plotter will move paper to these two points. The confidence test essentially consists of picking up and storing both pens and drawing a line of asterisks with pen 2, starting at point P1. H-P indicates that a successful confidence test gives a high probability that the plotter is operating properly.

Once you have begun the confidence test, according to H-P, you can only stop it by turning off the plotter power. This method does work, but I also found you can half the test by simultaneously depressing the "ENTER" and "VIEW" buttons. (I don't know if this procedure is recommended, but it seems to do no harm.) It is not necessary to describe the rest of the paper and pen-positioning system. Suffice it to say it works well—and reliably. There is one more nice touch to the design—H-P has added a well-de-

signed damper to the pen lift mechanism. This damper allows the pen to be quickly placed down on the paper without splattering the ink, and dulling the pen point.

Interfacing the plotter to a specific computer or interface bus is easy. A 12-page booklet called the *Interface Guide* is dedicated to that task. Both the RS-232C serial interface (Option 001), and the HP-1B interface (Option 002), which is also known as IEEE-488, are covered, as are Apple II, Commodore Pet, and the H-P-series computers (HP-85, HP-87, and HP 9826A). Using the more familiar RS-232C interface, the 7470A can communicate with the host computer at baud rates from 75 to 9600 baud, with parity defined as required. The plotter supports hardware handshaking (the DTR line is used), and both X-ON/X-OFF, or ENQ/ACK software protocols, making it compatible with almost any host system.

If the *Interconnection Guide* is not sufficient, another 50 pages in the *Interface and Programming Guide* are devoted to both HP-1B and RS-232C interfacing, and even covers the HP-IL interface. The RS-232C interfacing section covers interconnection of the HP 7470A with personal/small-business computers, and use of the plotter in a remote facility environment. The RS-232C connector (a standard 25-pin DB socket is used) is very conveniently mounted on the right rear apron, next to an extremely available DIP switch assembly that sets up the Serial protocol. (One switch segment is used to set the paper size.) The plotter is intelligent enough to detect—and report—transmission errors in the RS-232C interface. If an error occurs in the data transmission, the 7470A will light the "ERROR" light on the keyboard panel and provide an error number that is transmitted to the host system upon receipt of an "ESC. E" instruction. Figure 3 gives a complete list of the error conditions that the plotter can detect, and the error number it provides.

The built-in microprocessor that provides the intelligence in the plotter interface also allows features such as built-in character generation, vector plotting and internal stored line-styles. This processor also allows the plotter to automatically reconfigure (scale) a graphic, or character, to fit a certain area. The plotter will condense, expand, enlarge or reduce all images and characters as required. These features greatly simplify the amount of programming required to produce graphs and plots. Further reducing the CPU, and software development burden, the HP-GL interface instructions and character sets are permanently stored in the 8K-byte ROM.

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Back to the subject of manuals, a three-volume set is provided with the plotter—the *Operator's Manual*, the *Interfacing and Programming Manual* and the *Interconnection Guide*. The first contains general information allowing the new user to gain familiarity with capabilities and operation of the plotter in all its options. It covers plotter operation, setup, the coordinate system, trouble symptoms and maintenance. While the programming language used by the plotter (HP-GL) is introduced, this subject is only mentioned here, and it is fully covered in the larger *Interfacing and Programming Manual*.

One nice feature of the *Operator's Manual* is the complete list of accessories supplied and other optional items available. The list of accessories takes two full pages, and includes a Service Manual, a Digitizing Sight, at least 20 different pen packages (10 colors, two line widths—0.3 mm and 0.7 mm, transparency inks), six paper options and an Overhead Transparency Kit. This kit (Part Number 17057A) was provided with my review plotter and it is complete. Everything required to produce high-quality transparencies is included (16 pens—8 colors, two widths) and 50 sheets of 8.5- by 11-in. paper-backed transparency film, plus excellent instructions on the inside of the attached, fold-up top. The available accessories list also includes the *Interface and Programming Manual*, but it is supplied as a standard item with the RS-232C interface (Option 001).

As mentioned previously, the *Interfacing and Programming Manual* fully covers HP-GL, the programming language used to control the 7470A plotter. This language consists of two-letter mnemonics that are usually followed by numeric parameters. HP-GL is not only used by the HP 7470A, but is the graphics language that is used to communicate with all of Hewlett-Packard's scientific and engineering plotters, making the 7470A compatible with any H-P test instrument equipped to produce graphic output. A complete list of plotter instruction set and the HP-GL syntax is presented in figure 3. There are 14 additional instructions (called device control instructions), which are required to establish the RS-232C output and handshake protocol. These instructions consist of a three-character sequence (the first two characters must be "ESC" and ".") and are pertinent only to the RS-232C option. If, after reading the *Operator's Manual* and the *Interfacing and Pro-*

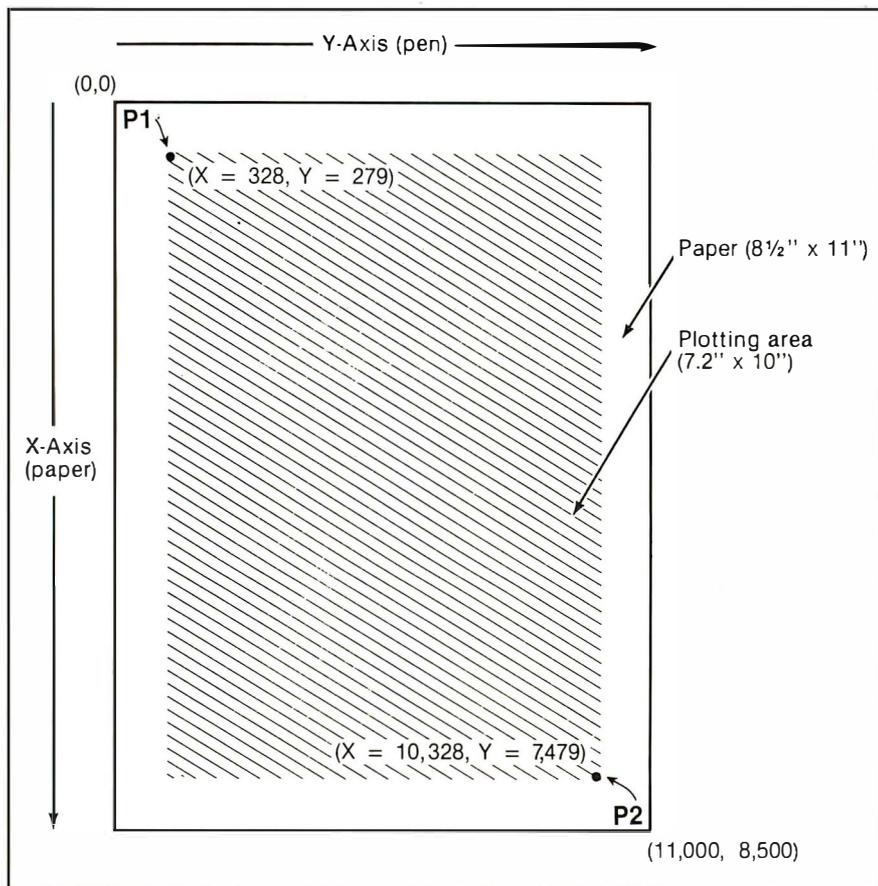


Figure 2. Details of the HP 7470 plotting area

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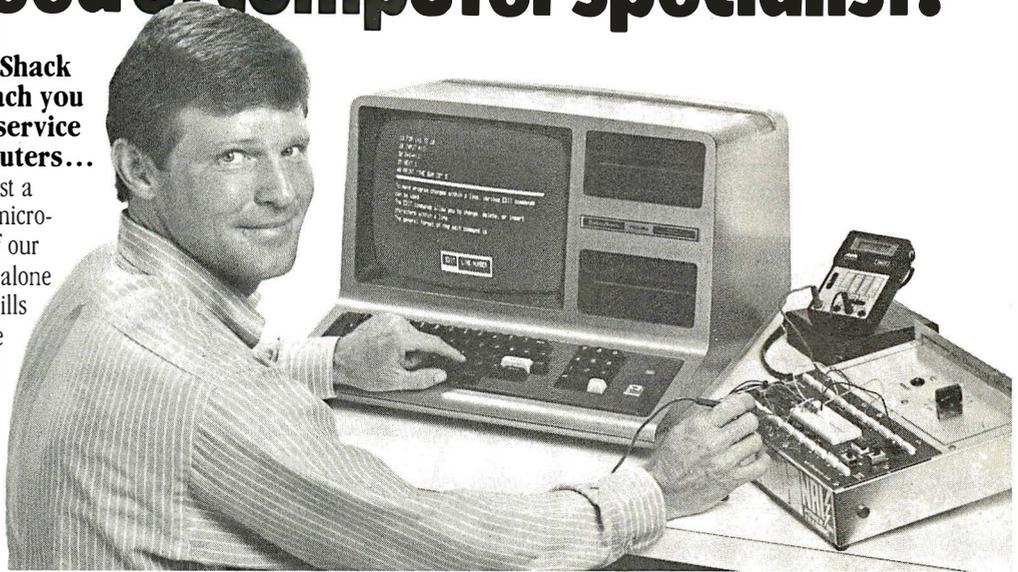
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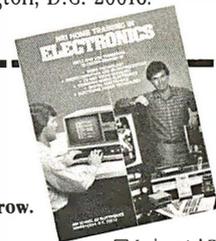


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CIRCLE NO. 111 ON INQUIRY CARD
74 INTERFACE AGE

HP-GL Error Messages

error 0	No error	error 10	Output instruction received while another output instruction is executing. The original instruction will continue normally; the one in error will be ignored.
error 1	Instruction not recognized. The plotter has received an illegal character sequence.	error 11	Invalid byte received after first two characters, ESC., in a device control instruction.
error 2	Wrong number of parameters. Too many or too few parameters have been sent with an instruction.	error 12	Invalid byte received while parsing a device control instruction. The parameter containing the invalid byte and all following parameters are defaulted.
error 3	Bad parameter. The parameters sent to the plotter with an instruction are out of range for that instruction.	error 13	Parameter out of range.
error 4	Not used.	error 14	Too many parameters received. Additional parameters beyond the proper number are ignored; parsing of the instruction ends when a colon (normal exit) or the first byte of another instruction is received (abnormal exit).
error 5	Unknown character set. A character set out of the range 0 through 4 has been designated as either the standard or alternate character set.	error 15	A framing error, parity error, or overrun error has been detected.
error 6	Position overflow. An attempt to draw a character (LB or UC) or perform a CP that is located outside the plotter's numeric limit of -32 768 to +32 767.	error 16	The input buffer has overflowed. As a result, one or more bytes of data have been lost, and therefore, an HP-GL error will probably occur.
error 7	Not used.		
error 8	Vector received while pinch wheels raised.		

RS-232-C Error Messages

error 0 No I/O error has occurred.

Figure 3. Error Messages

gramming Manual, you can't hook up and use this plotter, you probably shouldn't own a personal/small-business computer.

By design, the plotter is remarkably easy to interface and use, and has operated flawlessly throughout my two-month review period. If there is one thing H-P is noted for, it is quality and reliability, as borne out in its fine line of handheld calculators and test equipment. This tradition is continued in the HP 7470A, while still enabling the company to compete in the low-cost high volume arena. In order to provide a reliable product at a competitive price, the HP 7470A uses only 160 parts (none of which are painted or machined), and requires no adjustments, expensive stepper motors, paper sensors or cooling fans. The chassis consists of a one-piece molded plastic (high durability Norel) with glass and carbon fibre additives for stability and conductivity. Its low profile (only 17-in. wide by 14-in. deep, and 5-in. high), light tan silhouette is both attractive and practical. It requires

only 25 watts to operate.

The HP 7470A combines outstanding features and an affordable price to produce an extremely competitive product. The additional pluses of traditional H-P reliability, coupled with the extensive sales and distribution network established for their engineering/scientific calculators make this unit an outstanding selection. In addition, should service be required, the same H-P network stands ready to make this an almost painless experience. □

Contributing editor Roger H. Edelson's experience in the electronics industry has included analog circuitry, analog computation, digital design and, most recently, design and development in the field of microwave communication circuitry. He has been with Hughes Aircraft for more than 20 years, during which time he has been Group Head of the Memory Circuits Group, and Senior Project Engineer with responsibility for the technical and financial development of the F-14 Computer Subsystem.

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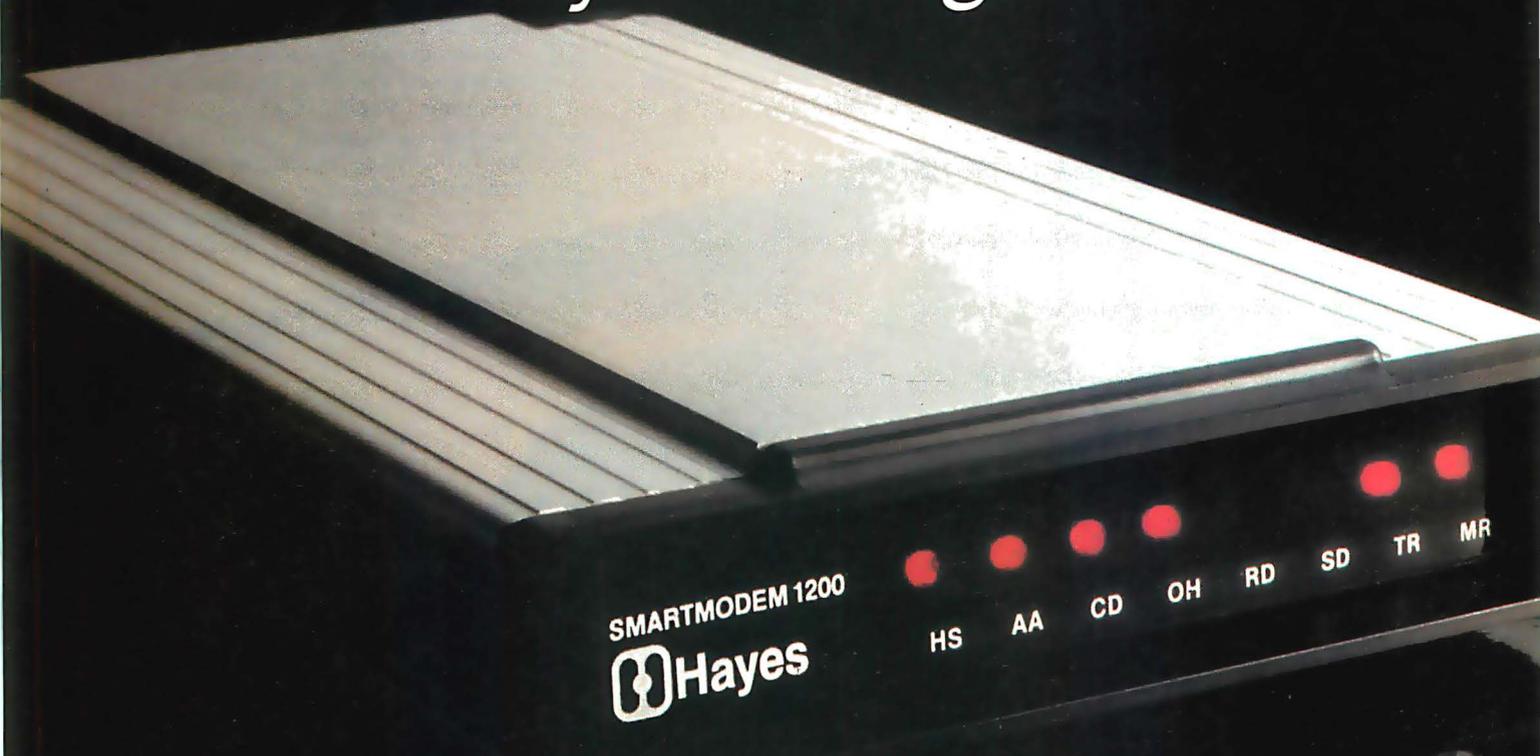
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TaxPro

This tax preparation software package includes the forms and schedules required for most individual income tax returns. It will meet the needs of many professional and personal applications.

There have been several attempts to write programs to prepare income tax returns using desktop computers. Most of these attempts have fallen far short of meeting the needs of those individuals who have income from several sources. Only a very few have even *approached* meeting the needs of a small tax office. The programmer who attempts the task of writing a tax program is soon frustrated by the limited capacity of microcomputers, the frequent and massive changes in reporting requirements, and the small market for such programs. TaxPro (Contract Services Associates, Anaheim, CA) is one of the few to face these restrictions and to offer practical solutions.

The program retails for \$940



Relief for a Taxing Problem

by Richard Green

in a version for the TRS-80 Models I and III. Another version—for the IBM Personal Computer and TRS-80 Model II—is priced at \$1,230.

TaxPro is a massive program, consisting of over 600K bytes of code. This is nearly 10 times the capacity of a typical desktop computer. Obviously, all this cannot be in the computer's memory at the same time. To get around the memory restrictions of the computer, TaxPro is written in "modules," or small sections of computer code that each do part of the tax return. All of the program is kept in the disk drive, and only that portion actually in use is in the computer's memory at any given time.

The main program consists of a control module and the program to complete the 1040 form. When the program begins, the control module menu is presented upon the screen (figure 1). The normal entry begins with form 1040. Personal data, consisting of the taxpayer's names, addresses, social security numbers, filing status, and number of dependents is entered first.

TaxPro then proceeds line-by-line along the Federal 1040 form. As each schedule is required, the program allows it to be called into the computer. The schedule is then completed and a printout is made. Information that is to be entered upon the 1040 is automatically carried back to the main program and inserted at the appropriate line of the 1040 form.

For example, if the taxpayers have more than one source of wages or salaries (both husband and wife work or one has more than one job), then at line 7 of the 1040—wages, salaries, tips, etc.—the program allows you to go to a module entitled DETAIL. Information from the W-2's is typed in. The program then automatically totals wages, withholding, state tax withholding and social security payments for each taxpayer. If there is excess social security withheld, it is automatically computed and carried back to line 59 of the 1040. The total of wages is inserted on line 7, and the total of withholdings is taken to line 55 of the 1040 form.

Each schedule supported by Tax-

Pro is handled in the same manner. If a particular schedule is not required, typing the return (or "enter") key will cause the program to insert a zero or a blank on that line and go on to the next line of the form being done.

TaxPro is a "smart" program to the extent that it will not allow you to skip required data on any of the forms. Nor will it allow you to enter excluded information. An example of this is Schedule D, capital gains/losses. Part V of this schedule is for Capital



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IRS-Enrolled Agent Chuck Bouse of Ontario, CA, does an income tax return with TaxPro for a local businessman client.

loss carryovers. You cannot get into part V unless there is a loss in part III that exceeds the allowable deduction for the year. If there is a loss to carry forward, then the program automatically enters Part V and figures the carryover.

TaxPro is not a "smart" program to the extent that it "knows" the tax laws. TaxPro will allow you to take a deduction for the family dog, to not report the sale of your airplane or generally to lie and cheat as you please. This should not be considered a flaw, however. Internal Revenue has acres of computers at its command and has been unable to develop a program that "knows" the tax laws. That's one reason there are still Internal Revenue Agents!

TaxPro includes the forms and schedules required for most individual income tax returns. (A complete listing of the forms and schedules supported is shown in figure 2.) Needed forms that are not included are form 4562—depreciation—and form 4684—casualty losses. There are other schedules that would be convenient to have, but are seldom used.

TaxPro does not support Form 1120, Corporation Income Tax Return. Nor does it include Form 1065, Partnership Return. However, certain forms such as Form 4797, supplemental gains, are used with both individual and corporation returns. All forms that may be used with both returns can be completed as stand-alone forms. All information can be entered directly into that form and the print-out can be attached to the form 1120.

Print-outs are controlled by a machine-language printer driver that is part of the TaxPro program. This is new in the 1982 release. Prior to this, printouts used the printer routine that was part of the disk operating system, or "DOS", of the computer being used. Because of the differences among DOS's and printers, results were sometimes unpredictable. This required the user of the earlier TaxPro systems to "customize" the program to the peculiarities of his printer and disk operating system. The inclusion of the printer driver should minimize this problem.

Internal Revenue requires that the 1040 and 1040A, individual tax returns, be printed upon the exact format furnished by the government printing office. This includes all the lines, boxes, cross-hatching, and notes. All other forms and schedules may be printed on either lined or color barred paper, as long as the format of the print-out is approved by the IRS.

TaxPro gives you four options to meet these requirements. The simplest way is to use two printers: one with pre-printed 1040 forms, the other with color barred or lined paper. The least expensive way is to use blank white paper to print all forms and schedules. A clear plastic overlay is furnished that is an exact copy of the 1040. By putting the overlay into a copier with the printout, a completely acceptable copy of the 1040 is produced. There is also an overlay that has lines every half-inch that is used with all other forms and schedules. Alternately, you can buy pre-printed 1040's on fan-fold paper and print directly upon them; then change to lined paper and print the other schedules. If none of these options are accept-

able to you, the program allows the use of single sheet paper. If you have a printer that will accept single sheets, pre-printed 1040 forms and single sheets of barred paper may be used. This is much slower than any of the other three methods.

TaxPro is not a difficult program to learn, nor to use. However, a prior knowledge of both the operating system of your computer and of income tax preparation is essential.

Documentation is furnished in an attractive ring binder. There are 53 pages of written instructions that explain the preparation of each form and schedule that is supported. These instructions are a rarity for computer program documen-

check of the program. Step-by-step instructions guide you through this. Your print-out is compared to one that is furnished in the manual to confirm that the program is working as it should.

There is no disk operating system included with the program. It is written to function with the DOS of each computer for which it is supported. For the IBM computers this is PC-DOS; for the TRS-80s it is the various versions of TRSDOS.

TaxPro does not load automatically on any of the computers except the TRS-80 Model II. You must bring your computer on-line; select "basic"; load TaxPro; then run the program. The specific details of how this is accomplished are different for

changes have been required.

It is because of the requirement for frequent large changes that TaxPro is written primarily in Basic. The sheer magnitude of the annual rewriting would overwhelm anyone using assembly language. Additionally, the existence of programs to translate Basic programs from one computer to another relieves the need for writing revisions more than once. An added advantage for TaxPro is that small changes can be made by the users of the program.

The use of Basic is a mixed blessing to the user of TaxPro. Disk access under Basic is quite slow. The time that it takes TaxPro to find and load a schedule pro-

```

*** CONTROL MODULE ***
1= CHANGE PREPARER'S ID          R= CLEAR DATA & RE-START
Q= QWIKTAX COMP

3= FORM 1040, PAGE 1             12= DETAIL (W-2'S, ETC)
4= SCHEDULE A                   13= SCHED SE
5= FORM 1040, PAGE 2           14= FORM 2106
6= SCHEDULE B                   15= FORM 2210
7= SCHEDULE C                   16= FORM 2441
8= SCHEDULE D                   17= FORM 5695
9= SCHEDULE E                   18= FORM 3468
10= SCHEDULE F                  19= FORM 4797
11= MIN/MAX TAX

20= PRINT 1040 & SCHEDULE A
21= RECORD OR READ-IN RETURN

ENTRY ? .

```

Figure 1. Control Module Menu

tation. They are written in clear, simple English with very little use of "computerese". It is obvious that great care was taken in the preparation of this manual. There are no misspelled words nor grammatical errors. The instructions are easy to understand. They follow the preparation of a typical return line-by-line, using examples to clarify many points.

The only shortcoming of the documentation is the lack of index tabs. A set of 24 index tabs that costs about 49 cents at a discount store will save much page flipping.

There is no index with the manual, but because of its small size and because of the inclusion of a complete table-of-contents, it really isn't missed.

TaxPro is shipped with a sample tax return in the program. After reading the manual, you are instructed to make a print-out of this return as a validation

each computer.

Corrections for TaxPro are often furnished as printed pages of program lines. When this is done, you must be familiar enough with your computer to be able to get into the program itself to enter the corrections. During 1981, this was done only once. This was to correct a single error on one schedule. Three other modifications were furnished on disks. There is no charge for corrections.

Updates for TaxPro are produced annually to keep it in compliance with the frequent changes in Internal Revenue code and regulations. These annual updates cost \$37.50 for each schedule that is changed. The Economic Recovery Act of 1981 required changes in nearly all of the schedule programs. The Tax Equity and Fiscal Responsibility Act of 1982, while smaller in effect, has also required several changes. In earlier years, fewer

gram ranges from 30 to 45 seconds. In a return that requires several schedules, this delay can add minutes to the time taken to complete a return. On the other hand, if you are at all familiar with Basic programming, it is a simple matter to modify the program if you desire. For example, by adding six program lines to the client billing program, you can automatically produce two copies of the bill and include your telephone number in the heading.

TaxPro now has more than 3,000 users. Most of the users are small-to-medium sized tax offices that each do about 500 returns annually. TaxPro claims that over 5 million error-free returns have been prepared using the program.

There are some areas where TaxPro could be improved. One great improvement would be to include more "escape points," or places in the program where

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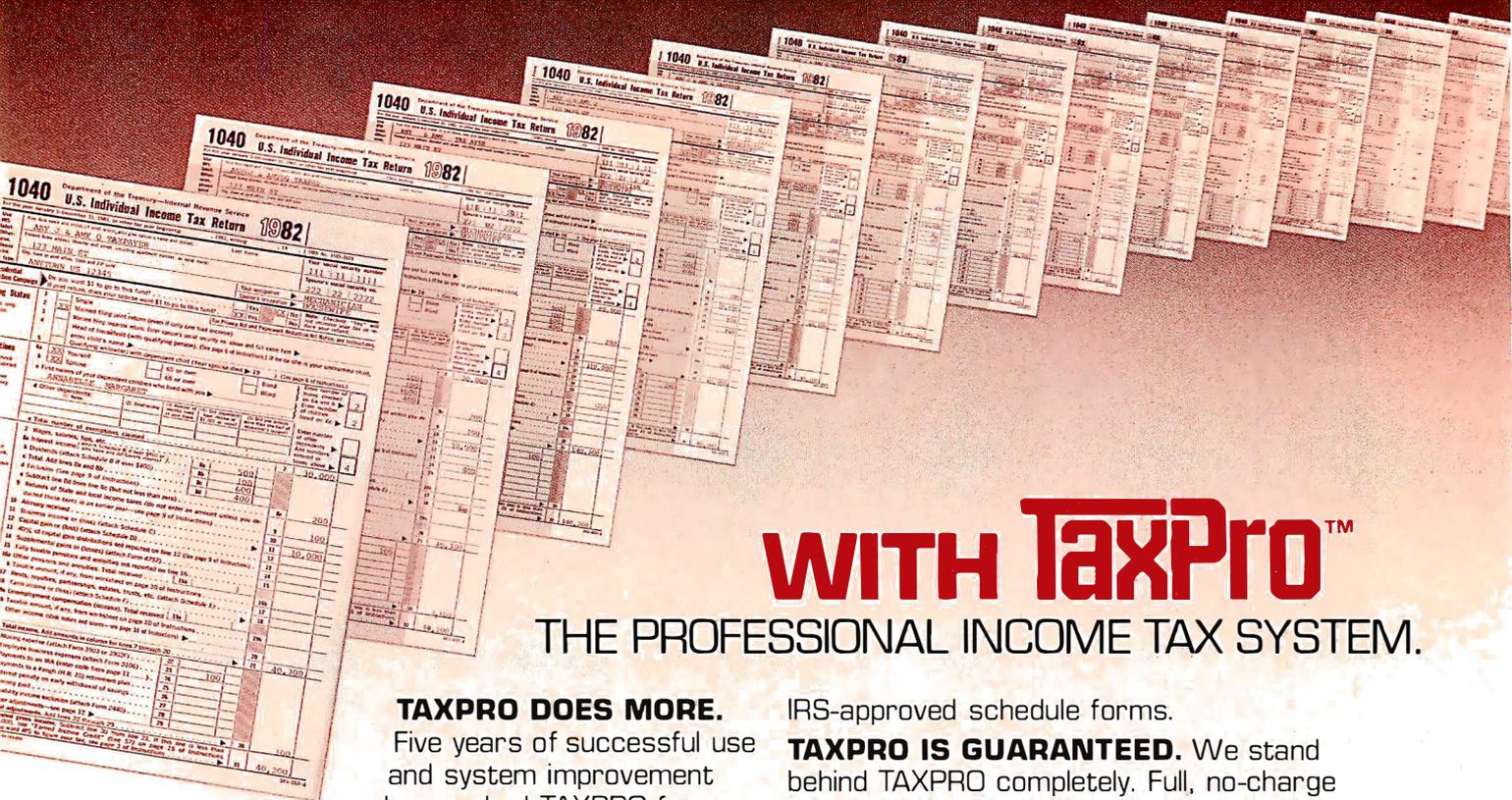


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you could go back to the control module. I've found that in using the program there is often a need to return to control. The only way to get there is to go through the form line-by-line until one of the escape points is reached. This can be an aggravation when you are completing several schedules.

Another great improvement would be to go from one schedule directly to another. Now it is necessary to return to the Form 1040 form each schedule before you can go to another schedule. Because of the time involved in disk operation, it can take as long as a minute to go from one schedule to another.

There is no use of graphics in TaxPro. The instructions suggest keeping handy a copy of the form being done and referring to it to keep from becoming confused. This is rarely necessary after you gain familiarity with the program. However, the judicious use of graphics would certainly improve the ease with which the program can be used.

An automatic mailing list would be helpful.

There are a few other improvements that could be made to TaxPro. It would be very helpful to be able, while using the program, to read the disk directory, then return to the program without losing data. Also, when a tax return that has been stored on disk is read into the program, there is no check to see that the right program has been read. You must return to the 1040, and go to the personal information summary to check the client's name and address. This is unnecessarily cumbersome, since the name and address of the client could be displayed as soon as the return has been loaded.

It would also be convenient to have a program included that could read the files of tax returns that have been recorded and make a mailing list from them. The address of each client is recorded with the return. At this time, however, there is no simple way to extract this information from the files.

To effectively use the TaxPro system,

you must know how to do tax returns without a computer. If you do have tax knowledge, the speed and ease with which tax returns can be done is truly amazing. Returns that would require hours of manual computation can be done in minutes using TaxPro.

TaxPro is a good program that will meet the needs of tax offices that primarily do individual taxes. It also is an excellent tool for personal financial

advisors and for persons specializing in tax planning. □

Richard Green is a professional pilot, currently on leave from a major airline. He is presently working as an income tax consultant, and also provides advice to small businesses in the areas of business start-up, aviation and office automation. He has previously written articles for business and aviation publications.

Form 1040	
Form 1040W	Working couple return
Schedule A	Itemized deductions
Schedule B	Interest & dividend income
Schedule C	Profit/loss from business
Schedule D	Capital gains/losses
Schedule E	Supplemental income
Schedule F	Farm income
Schedule G	Income averaging
Schedule SE	Self employment tax
Form 2106	Employee business expense
Form 2119	Sale of residence
Form 2210	Underpayment of estimated tax
Form 2441	Credit for child/dependent care
Form 5695	Residential energy credit
Form 3468	Investment credit
Form 4136	Credit for special fuels
Form 4625	Minimum tax for individuals
Form 4726	Maximum tax on personal service
Form 4797	Supplemental gains & losses
Form 6251	Alternative minimum tax

Figure 2. Forms and Schedules included in TaxPro

Assignment: Benchmark

IBM Personal Computer

by Hillel Segal

The Personal Computer from IBM (Boca Raton, FL) is a significant new product in many ways. It represents the beginning of a new generation in processor technology with the 8088, which offers more memory addressing range and a bigger internal data bus. It assimilates a number of design lessons learned over the past few years: a low-profile detached keyboard, modularity in components, and a choice of a color and/or monochrome display.

No less significant is the approach IBM has taken in developing and marketing the Personal Computer. In contrast to the fortress-like mentality of its data processing division, IBM designed and built the PC with the help of many outside microcomputer experts and is welcoming independent software vendors with open arms. It also chose to let ComputerLand be the principal vendor to the end user, with Sears Computer Stores also starting up. In this respect, IBM has chosen to follow the marketing technique of Apple rather than that of Radio Shack, which sells only through its own stores and offers only its own software and accessories.

The result has been undeniably phenomenal success. ComputerLand is selling the PC at a very rapid rate, and software are becoming available for the system even faster. Customer and industry acceptance is very high, and competitors introducing new products are now finding it tough to get a foothold in the market.

Mixed benchmark results

Despite its advanced processor, the IBM failed to shine on the accounts receivable benchmark test—one of three real-life application problems the computers run. Its time of 9 minutes, 21.8 seconds was near the bottom of the group. But in other testing, conducted for the ACU by the University of Colorado's Business Research Division, it performed much better. In both CPU and disk I/O related tests, it was better than average. Why a slow time on only one test? We don't know; factors internal to the system, including the language and operating system design can cause unexpected results.

Since IBM announced its personal computer in August of 1981, the system's popularity has eclipsed that of any newly-introduced computer.



The system as tested costs \$4,550 and includes 64K bytes of user memory, two minifloppy disk drives holding a total of 320K, keyboard, green-tint monochrome display, and the modified Epson MX-80 printer that is sold under the IBM label. The IBM DOS operating system was used; standard software includes Basic (located in permanent read-only memory), file handling utilities and a screen-based program editor.

Two significant options have been added to the system since it was originally introduced. IBM now offers a 256K memory card; previously the optional card held only 64K. Disk drives holding 320K each—twice as much as before—are

also now available. The improved drives are capable of reading the 160K diskettes as well, so compatibility is not a problem.

The system's best and worst features are probably both on the keyboard. The good points of the keyboard are its low-profile design, which works well on a conventional desktop, the large number of different keys (83 in all), the fine scultering and texture of the keytops, and the light but crisp feel when pressing a key.

The bad points are some of the key placements and the use of international keytop symbols on the return, shift, tab and backspace keys. These labels are initially somewhat confusing for the U.S. user. The position and size of the return

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EasyFiler has a number of features which will help you increase the power and performance of your IBM PC. It is com-

patible with BASIC, which means you can transfer information to or from an IBM BASIC file. EasyFiler also includes a built-in calculator, which enables you to compute data during the entry of information or during report generation. Through "Soundex," another built-in feature, you can retrieve information even if you don't know the exact spelling of a word.

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Vector Graphic 3005	2:26.9*	\$11,150
Smoke Signal Chieftain	1:40.7	\$ 8,149
Commodore CBM-8032	3:36.0	\$ 4,085
SD Systems SD-200	6:16.4	\$12,300
Billings BC-12 DF2M	5:09.2	\$12,395
Dynabyte 5300	4:38.0	\$ 7,735
NEC Astra	5:10.8	\$ 9,890
Altos ACS8000-15	3:52.7	\$ 9,875
Wang 2200SVP	2:23.0	\$14,600
Pertec PCC 2000	6:04.3	\$12,470
North Star Horizon	1:57.7	\$ 6,911
Cromemco System Two	2:48.0	\$ 9,275
Texas Instruments 771	3:38.1	\$12,100
Vector Graphic System B	5:56.5	\$ 8,995
DECstation 78	4:21.5	\$10,495
Radio Shack TRS-80 Model II	3:38.6	\$ 7,609
Apple II+	6:17.4	\$ 4,330
Digital Microsystems DSC-2	3:28.8	\$ 9,015
Ohio Scientific C3-A	15:49.3	\$10,940
Alpha Micro AM-1011	3:25.3	\$15,605
Data General CS/10 Model C1	2:40.3*	\$13,400

*Time obtained using hard disk

Benchmark comparison

and shift keys are especially questionable, since they force the typist to slow down in order to avoid making mistakes. The shift keys are both small, and on the left side; the shift key is separated from the "Z" by another key instead of being flush against it. The return key is also small, its keytop is halfway between two rows, and it is the fourth key to the right of the "L" rather than the second or third. About the best that can be said for all this is that like anything, you can eventually get used to it.

Another drawback frequently cited is the inclusion of only five expansion slots in the system's chassis. IBM already offers more than that number of optional modules, so you can't have everything at once. Something—perhaps the game paddle interface, the communications adapter or additional memory—has to be left out. In a typical business application, four slots are used: one each for the disk adapter, extra memory, the monochrome display/printer adapter and communications. In a color configuration, the printer adapter is a separate module, and something has to be given up in order to allow the addition of the game paddle adapter.

Despite these problems, many users are obviously satisfied with the overall system. Because IBM did not supply any names of users, we didn't run the usual survey, but a check with several local purchasers turned up general approval, though at the time, the system had just been made available and little software was yet out.

IBM's service policy is an unusually clear and explicit statement of their intentions. The system comes with a 90-day warranty that is extendable into a service contract at extra cost. One to two-day turnaround is promised on repairs, which can be made either through a local factory-trained service center or by sending the system to a national repair center.

The system documentation also gets high marks. The setup instructions are clear and well-illustrated, and the operation manual is exemplary.

Both system and application software continue to come out quickly. Aside from DOS, there is now CP/M-86 and the UCSD P-system. In the area of languages, IBM now offers compiled Basic, Pascal, Cobol and a macro assembler. With the

UCSD P-system, Pascal and Fortran are available. A version of Logo is reported to be under development.

The list of IBM-supplied and outside vendor software is too long to include, but a recent check at a ComputerLand outlet showed about 50 different items of professional software on the shelf, with a dozen or so games on display separately. Every major software vendor is making its wares available for the IBM. In fact, the abundance of ready-to-run software that will be available for this system is a greater selling point than any single feature.

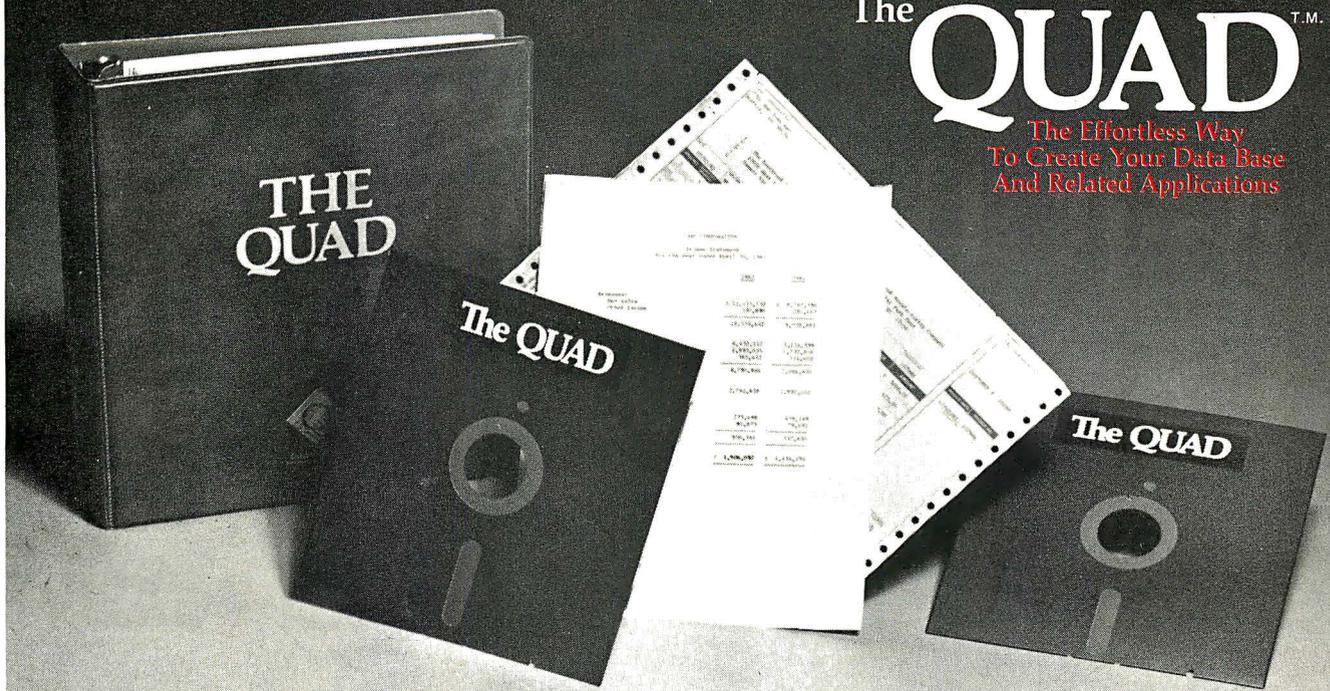
Correction: the time listed in the accompanying scorebox for Altos ACS8000-15 is the correct run-only time. Previous issues listed the combined compile plus run time. □

Research Associate: Vic Schoenberg

Hillel Segal is president of the Association of Computer Users, a nonprofit association with members all over the U.S., Canada and several other foreign countries. A complete package of information about membership is available from ACU, P.O. Box 9003, Boulder, CO 80301.

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- retrieve records in sequential or indexed order
- perform processing based on comparison of data such as nested IF THEN logic

PRINTING DATA

- utilize your printer's capability by printing on any size paper anywhere on the page
- print checks using the English equivalent for dollar and cent values
- specify content of page headings, control headings and footings, detail lines and total lines
- pause between printing of forms

SAMPLE REPORT

ABC CORPORATION 1700 American Way Seattle, WA 98105 06/15/82		AGED RECEIVABLES				
CUSTOMER #	CUSTOMER NAME	CURRENT	30-90 DAYS	60-90 DAYS	90 & OVER	TOTAL
0110	ABC Manufacturing	1,000.00	500.00			\$ 1,500.00
0210	Blue Fabrication	4,750.87	750.00			5,500.87
1054	Black Krome	8,000.00	1,500.00	400.00	800.00	12,700.00
1020	Redwood Docks	714.80				714.80
2041	Yellow Sky Boat Co.	14,700.00				14,700.00
	TOTAL RECEIVABLES	\$ 28,165.67	\$ 2,750.00	\$ 400.00	\$ 1,200.00	\$ 32,515.67

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- utilize your terminal's video capabilities when creating your terminal update screens

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- edit each data field for items such as phone numbers, numeric data, alphanumeric data, date, time, social security number, etc., or your own defined edits
- IF-THEN logic available during both terminal and batch updating

SAMPLE SCREEN

06/06/82	ABD Order Entry Information	0 # 75 Records
Order Entry Line Item:	ICU: CUSTOMER # 1005	Klassik, Korns
	Customer's P.O. Number	4325
Salesperson #	15	Martin Smith
Item #	C8507	QTY 100.00
ITEM	Nuts&Bolts	Chkg# 50
	Extended	50.00
Press [ESC]H for Help		

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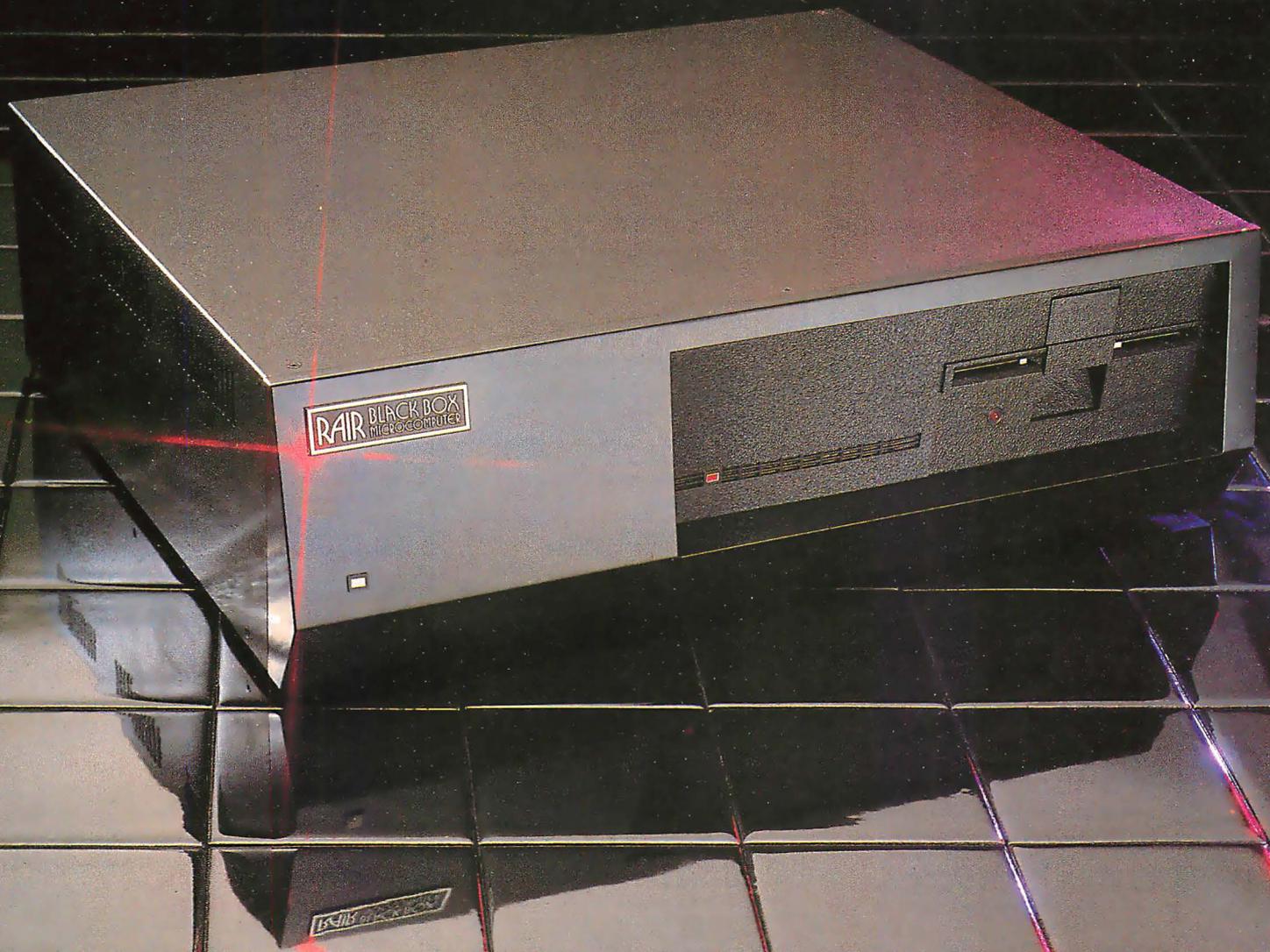
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REVIEW

Rair Black Box 3/50

by Tom Fox



The Black Box is one of the most sophisticated multi-user desktop computers on the market.

Rare is the business microcomputer from England. It can very nearly be said, in fact, that Rair is *the* business microcomputer from England—for there are few other contenders. The only other British micro that comes immediately to mind is the pocket-sized Sinclair, distributed in the U.S. in great quantity by Timex Corporation (Waterbury, CT). But the Sinclair is a different class of machine, which promises but a fraction of the performance offered by the Rair Black Box 3/50 that we recently tested.

In business for over 10 years, London-based Rair Ltd. has recently established a factory in America's silicon valley (Santa Clara, CA) to manufacture a competent, complex and compact desktop business microcomputer. The Rair Black Box 3/50 is the latest in a progression of 8-bit microcomputer designs. Originally CP/M-based, the latest Black Box offers MP/M II+, a British-embellished version of Digital Research's (Pacific Grove, CA) popular multi-user operating system. The vehicle designed to carry MP/M II+ is a finely-tuned collection of hardware that takes advantage of virtually all of the recently available designs to optimize computer performance.

Don't overlook 8-bit units

Those who are turning to the new generation of 16-bit microcomputers because they consider current 8-bit offerings too restrictive for their sophisticated requirements would do well to take a last look at the Black Box. For Rair has been able to squeeze performance out of the ubiquitous 8-bit Intel 8085 chip that goes far beyond most users' expectations. They do this with exotic hardware additions and a careful consideration of the interplay between operating system and digital electronics. As you would expect, you have to master a better-than-average understanding of its capabilities in order to take full advantage of these modern tricks. But once the effort is expended, you can be rewarded with one of the most sophisticated multi-user desktop computers available in today's crowded market.

In one respect, at least, Rair need not

fear the Truth in Advertising laws: the Black Box is exactly that—a box-shaped rectangle coated with the darkest, blackest paint you ever saw. Fabricated from substantial aluminum and steel sheet metal, the Black Box is recognizable as a computer only by those who can spot a modern 5.25-in. disk drive for what it is. From a styling standpoint, Rair has



The Rair line includes a number of separate disk drive configurations.

managed an understated, elegant appearance that would look good in any business setting.

Inside the box is more black: a black power supply of the efficient switching type, along with a black card cage that will hold up to eight plug-in circuit boards. This is a "bus" computer; one whose major electronic elements are contained on cards that plug into the common bus of a mother board. In the basic 3/50, five of the eight slots are filled, leaving three for future expansion.

Spurning the several available bus standards, Rair has designed its own—an 84-pin special. The plug-in cards measure 4.75-in. by 10-in.—a little smaller than the common S-100 boards. Even so, Rair's cards seem sparsely-populated with integrated circuit chips and discrete components. This is evidence to the fact that full advantage has been taken of

today's super-dense electronic circuits.

The main logic card contains an 8-bit 8085AH-2 central processing unit. It operates at 5.0 MHz—five million cycles per second. This is 25% faster than most Z80 computers running CP/M and MP/M programs these days. The main processing chip is supported to handle four interrupt levels, as well as four channels of direct memory addressing. For really exotic applications, a hardware option is offered that will perform arithmetic operations on 16- and 32-bit floating point operands. It would take some very special software to take advantage of this, however.

Main memory comes in boards containing 256K bytes each. These modules utilize the popular 64K-bit dynamic RAM chips. Up to four such memory boards can be fitted into a single 3/50. Half of that (.5M-byte) can be allocated to the operating system and user memory. Bank switching into the 64K-byte address space is offered in the much-copied Cromemco fashion. Users planning to transport CP/M applications onto the Black Box should be aware that the more complex MP/M II+ operating system requires more memory space—only 48K bytes of memory are available for each user.

The other two memory boards have a special function, called by Rair a "virtual disk RAM." It's really a fast, volatile memory space that acts as a very fast disk drive. This has some interesting uses, as we shall see.

Central to Rair's use as a multi-user computer is the multi-port I/O board. It was fitted as a 4-port unit in our test sample, but simply inserting more integrated chips will double that number. Each port will connect to a terminal, printer or modem whose interface conforms to the EIA RS-232 serial standards.

The 3/50 comes equipped with two disk drives, both utilizing 5.25-in. media. Each requires its own plug-in board in the main card cage. The main storage is a 16M-byte Winchester hard disk unit. Its three platters and six heads will store away nearly 16 million characters of information—equivalent

to about 8,000 pages of double-spaced typewritten copy.

In addition, the 3/50 includes a single 1M-byte minifloppy diskette drive. This is a double-sided, quad-density unit to be used for backing up the information on the non-removable hard disk. A Winchester full of data will, of course, require up to 16 floppy diskettes to contain a complete backup. Many of the details of this operation are handled nicely by a special BACKUP.COM program that comes with the system. This is a multi-talented software tool that manages the transferral of data to the diskettes, compressing it a modest 5.15% as it does so. The user can build lists of files to be backed up under various circumstances, and the process can be initiated with minimum fuss.

Eight-bit microcomputers are often maligned because they cannot handle multiple users properly—that they are fundamentally too slow to handle a lot of activity at once. Rather than accept this as a fact of life, the Rair engineers implemented two exotic tricks to alleviate one of the major bottlenecks of typical systems: the relatively slow main disk drive. Since the read/write heads of the drive can be in only one position at a time, it's common for several users to wait on each other to move the head over their spread-out data files. This is called disk contention, and is a major problem with all multitasking computers, large and small.

Rair's memory-implemented pseudo-disk drive is another, similar, trick to reduce the disk's workload. This is either a 256K- or 512K-byte solid-state memory that is typically 10 times faster than the Black Box's hard disk drive. Programs or data that have been loaded into this special area can thus be accessed far more quickly, without making any demands on the actual spinning disk.

The programmer's manual suggests an interesting use for the solid-state disk. Occasionally, an applications program needs to hold a big array for mathematical manipulation or as a look-up reference. In many such cases, the program performance has to be compromised because insufficient space exists in the user's memory area to define a usefully large array. In the Black Box, this array can be opened as a data file on the solid-state disk. Data can be read and written to the file as if it were a real disk file, but at much faster direct memory speeds. When the program is finished, the array can be written to an actual disk file. This is necessary because the solid-state disk drive is afflicted with utter amnesia whenever the power switch is turned off.

The result of this exotica is a multi-user computer that offers, on average, much better performance than the typical MP/M system. Unfortunately, our standard speed-testing benchmarking pro-

A Black Box 3/50, equipped for four users, lists for \$8,500. This includes 256K bytes of RAM, four serial ports, 16M-byte Winchester and 1M-byte floppy disk drives and the MP/M II+ operating sys-

Eight-bit microcomputers are often maligned because they cannot handle multiple users properly. Rair has found ways to alleviate this problem.

gram (IA Aug 81) does not exercise the disk-handling aspects of a computer. Using that test, the Black Box turned in a result of 666 seconds to compute all prime numbers up to 1,000. This puts it in the middle of the pack with other 8085-equipped, Microsoft Basic computers. Two terminals running the test simultaneously took 1,407 seconds, suggesting that MP/M II+ extracts about a 5% overhead from the total capacity of the processor.

Documentation pros and cons

The manuals provided with the Black Box are excellent, so far as they go. There are three that come with the system: MP/M II+ System Guide, MP/M II+ User's Guide and MP/M II+ Programmer's Guide. The System Guide, in particular, is well-written and full of practical knowledge. The chapter concerning the transporting CP/M programs onto MP/M, in particular, is the clearest exposition we have yet seen on this often-underestimated problem.

Unfortunately, there are no hardware manuals, or books introducing the reader to the computer as an integrated system. For this reason, we would not recommend that a first-time computer purchaser attempt to utilize a Black Box without planning on a lot of hand-holding by the local dealer. To date, most Black Boxes have been integrated into turnkey working systems by the sophisticated sort of computer dealer called a systems house. The user manuals are certainly suitable for the sort of person employed by such a dealer.

tem. A seven-user system, which includes double the RAM space and four more serial ports, costs \$2,000 more.

Hardware options include the virtual disk RAM (\$1,500 for 256K bytes), an IEEE-488 interface card (\$400) and hardware arithmetic unit (\$500). Up to three 16M-byte Winchester drives can be added at \$3,500 each. For a means of backup that's more convenient than the floppys, a 20M-byte streaming tape drive can be added to the IEEE-488 bus for \$4,500.

Only one kind of software option is offered: additional high-level programming languages. Microsoft's compiling Bascom-80 is listed at \$450, with Fortran, Cobol, Pascal and PL/1 at prices ranging up to \$850 each. Rair doesn't offer applications software; this must be supplied by your local dealer.

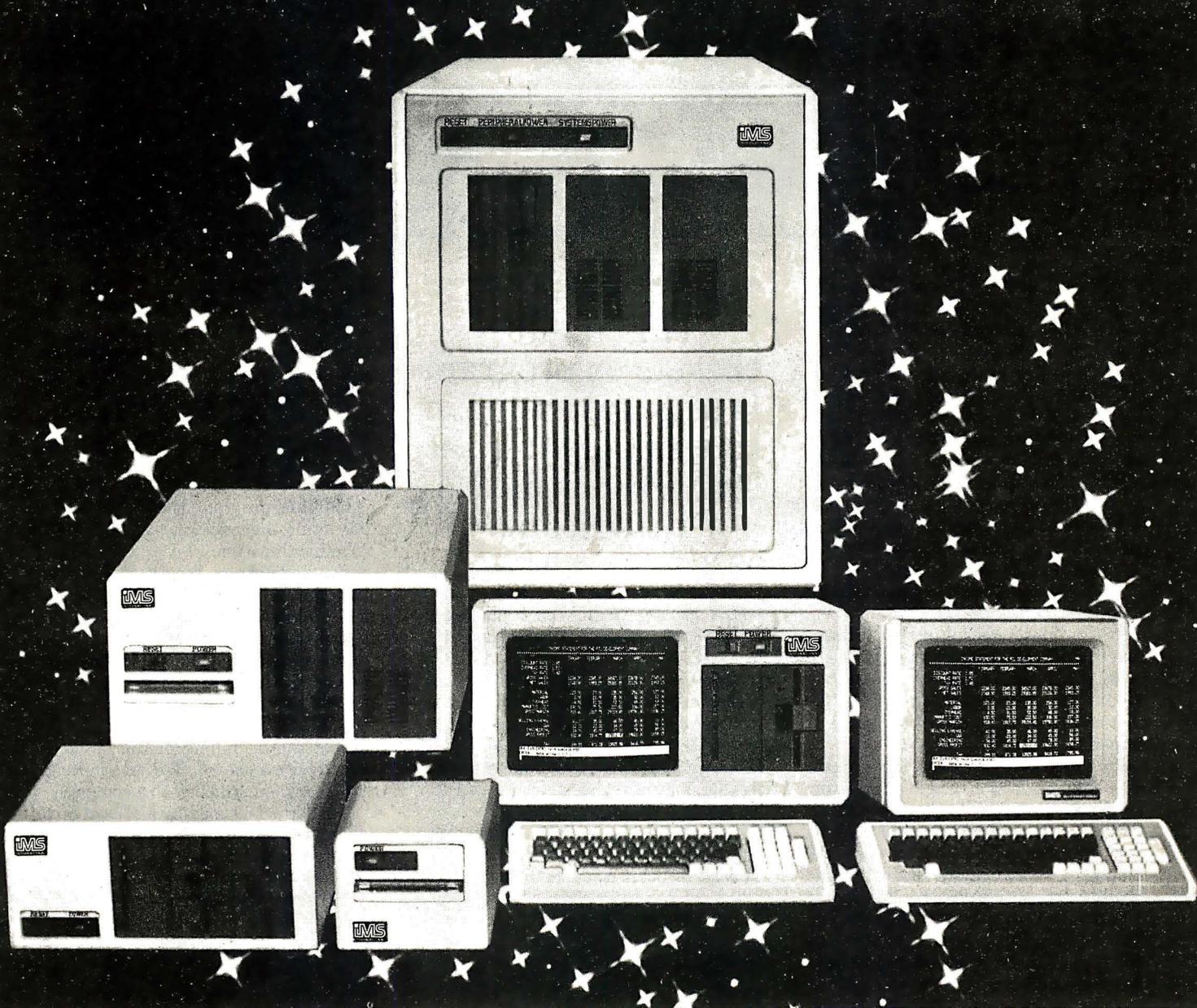
If you don't need the multi-user capabilities of the 3/50, smaller Black Boxes are available. The baby of the line is the 3/20, a single-user CP/M system with dual floppy disk drives, 64K bytes of memory and two serial ports. This costs \$3,500. None of the prices listed here include the all-important display terminal or printer. Rair doesn't make these devices, but your local dealer is sure to have a good selection, ranging from approximately \$700 each. □

Technical Editor Tom Fox has authored over 50 articles and editorials for IA since May 1979. He has spent his entire 21-year career in the field of electronics, with the last 14 years devoted to computer systems and their application to business and industry.

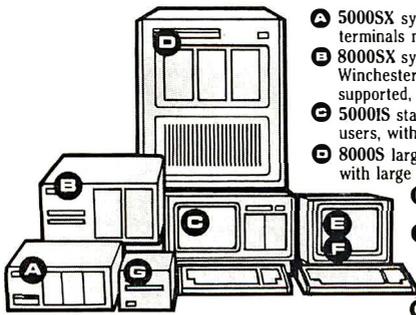
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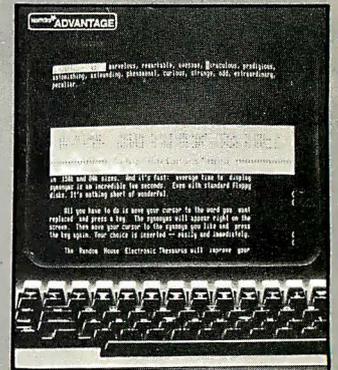
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Random House Electronic Thesaurus

by Alan R. Miller



The Random House Electronic Thesaurus (Dictronic, Tijeras, NM) confirms the fact that software has come a long way in the last few years. The first microcomputer editors were line-oriented because the teletype was used as the standard terminal. The first big improvement came when MicroPro (San Rafael, CA) offered us WordMaster, a full screen text editor. This was a great improvement for writing and editing computer programs, since alterations could be made by moving the cursor anywhere on the screen.

The next major improvement was called Electric Pencil (IJG, Inc., Upland, CA). This is a full-screen editor that formats text while it is being entered from the console. MicroPro created a more elaborate version called WordStar (IA Mar 81) that is also a full screen editor and text formatter.

Programs that check spelling were the next major addition. SpellGuard (from Innovative Software Applications, Menlo Park, CA; IA Jun 81) was one of the first; now there are others such as the Word Plus (Oasis Systems, San Diego, CA) and SpellStar. Since SpellStar is offered by MicroPro, it is integrated with WordStar. Spelling checkers would not be very useful if they simply provided a list of correctly-spelled words. In this case, it would be easier to look up a word in a regular dictionary. Consequently, spelling checkers also incorporate a proofreading program that compares each word in the document against its own dictionary. At the end of the proofreading step, the spelling checker presents each suspicious word to the user for action.

Another useful product for authors is called Grammatik (from Aspen Software, Tijeras, NM; IA May 82). This program complements a spelling checker by reviewing a document for syntax. It flags incorrect constructions such as "can not", wordy phrases such as "in the range of" (vs. between), doubled words "and and", as well as unbalanced quotation marks and parentheses. Grammatik combined

This on-line thesaurus program is a useful addition to the growing set of tools available to writers.

with a spelling checker can dramatically improve the quality of a manuscript or letter.

Now the Random House Electronic Thesaurus represents a third type of program that can be very useful to anyone who writes letters, reports or books. It is neither a spelling checker nor a syntax checker, but rather an on-line thesaurus. The price is \$150. The standard version of the thesaurus contains 60,000 words and requires 232K bytes of disk space. This represents a text compression of 4 bytes per word. By contrast, the Spellguard dictionary requires 3 bytes per word. Abridged versions are available for smaller capacity disk drives.

Direct word access

Words can be looked up directly in the disk version of the thesaurus by executing a program called *RHT* (for Random House Thesaurus). However, this is not a very convenient method. It would be much easier to use a regular thesaurus (a book) instead. The Random House Electronic Thesaurus becomes truly useful when it is coupled with WordStar (version 2.6 or 3).

A program called MODIFY must be executed just once. This step combines WordStar with the thesaurus operating program. WordStar version 3 is about 16K bytes long and the alteration adds about 12K more bytes. Consequently, the combination package is about 28K bytes

long. Of course, the words of the thesaurus are not included in this part.

Several options can be selected during the modification step. These include the name and disk drive location for the modified WordStar package and the disk drive location for the very large thesaurus file. (The modified WordStar and the thesaurus file can be on different drives.) The name WST.COM is suggested for the modified program. Detailed instructions guide the user through each step of the modification.

After modification, WordStar performs all the tasks it did previously. Of course, since it is now 12K bytes larger, there is less working space in memory. Consequently, large files will be paged through memory a little more frequently.

There are two methods of moving blocks of text with WordStar. With either method, the beginning of the block is marked with a control-K,B and the end of the block is marked with a control-K,K. One method for moving blocks of text is useful when the block size is small and the distance to the moved is also small. In this case, the cursor is moved to the new location and the block is moved directly with the control-K,V command.

Large blocks must be moved differently. After the block is marked, it is written to a new disk file by giving the command control-K,W. The original block is deleted with the control-K,Y command. Then the cursor is moved to the new location and the block is read back from the separate disk file with the control-K,R command.

Because there is less memory available with the modified version of WordStar, it may be necessary to use the latter method for moving large blocks of text. Alternatively, it may be better to exit the modified version of WordStar and use the smaller original version when large blocks of text must be moved.

It is extremely easy to use *RHET* from the modified version of WordStar. However, it is best to select a help level of 0, 1, or 2, so that the WordStar

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The image shows a stack of various business forms. From top to bottom, they are: W-4/EE'S WITHHOLDING, INVOICE, AIRBILL, STATEMENT, COMMISSION REPORT, and PURCHASE ORDER. Each form is partially visible, showing its header and some content.

```

*****
NEW CUSTOMER
*****
CUSTOMER NAME: ;Customer$          DATE: @Date
MAIL ADDRESS:  ;Addr1$;30
CITY:          ;Addr2$
STATE:         ;Addr3$      ZIP: ;Zip1:5
SHIP ADDRESS:  ;Addr4$;30
CITY:          ;Addr5$
STATE:         ;Addr6$      ZIP: ;Zip2:5
DISCOUNT CATEGORY: ;Rate!
THE CODE FOR THIS NEW CUSTOMER IS @CustCode.

Row 17, Col 36
    
```

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help menus aren't displayed on the top half of the screen.

The modified WordStar is used in the usual way. While editing a document, you can see a list of synonyms for any word in the file. Place the cursor over any letter of the desired word or on the space that follows the word. Then press the escape key twice. The letters of the chosen word dim to half intensity or are converted to reverse video, depending on how your WordStar was initially configured.

The chosen word is also displayed at the top left corner of the screen in uppercase letters and highlighted either with reverse video or half intensity. The list of synonyms follows. For example, suppose that the cursor is initially placed on the word "review" when the escape key is pressed twice. In response, the *RHET* shows the following list of words at the top of the screen:

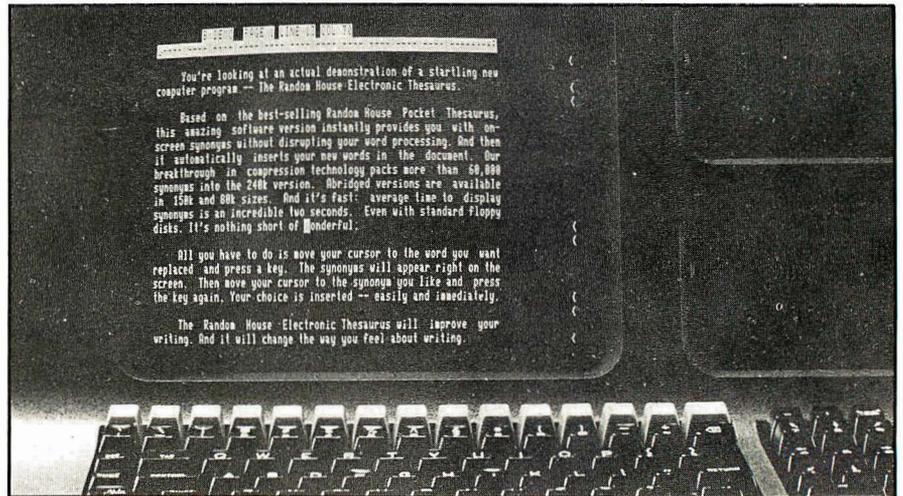
REVIEW—(n.) critique, criticism, judgment, survey, study, inspection, examination, investigation. (v.) inspect

The cursor is automatically moved from its initial position in the text to the first word in the synonym list. The directions for this phase are given immediately below the list of synonyms. The original text follows the directions. For this step, the directions are:

SPACE BAR	Move cursor to next word
BACKSPACE	Move cursor to previous word
ESCAPE	Replace original word with synonym
RETURN	Return to text without change
CONTROL-W	Scroll synonym list up
CONTROL-Z	Scroll synonym list down

If the first synonym in the list is the one that is wanted, just press the escape key. However, if another one of the synonyms is preferred instead, the cursor is moved to the desired choice by pressing the space bar. When the escape key is pressed, the new word marked by the cursor replaces the original word highlighted in the text. Then the screen returns to its usual form.

If the *RHET* cannot locate the original word in the thesaurus, a list of several dozen words is taken from the thesaurus and presented at the top of the screen. This list is arranged alphabetically and is chosen so that the original word falls in the center of the group. The cursor is automatically placed in the middle of the list,



On-screen help aids make the Random House Electronic Thesaurus easy to use.

on the word closest to the chosen word.

Suppose, for example, the word "assigned" is selected. This word is not in the *Random House Thesaurus*. Consequently, the *RHET* responds with the statement "assign is not listed." Then it presents a collection of 23 words ranging from "assembly" to "asylum." The cursor is automatically positioned on the middle word of the group, "assign." The cursor may be moved to any other word in the list using the space bar or the backspace key. When the escape key is pressed again, the list disappears and the synonyms for the selected word appear in their place. For example, if the word "assign" is chosen, the following list of synonyms is presented:

distribute, allot, apportion, allocate, measure, appoint, designate, specify, fix, pinpoint, attribute, refer, adduce

One of the words in this list may be selected by positioning the cursor and pressing the escape key. Alternatively, pressing the carriage return returns control to WordStar with no change in the text. Notice that this was a two-step process. The *RHET* first presented an alphabetical list of thesaurus entries, then one of these words is chosen to give a list of synonyms.

While the *RHET* is not supposed to be a spelling checker, it can sometimes help find the correct spelling of a misspelled word. For example, if the word "accommodate" is incorrectly spelled with one m rather than two, the *RHET* will display a list of its closest words. The cursor will actually be positioned on the word "accommodation". The desired word is located immediately prior to it. The *RHET* has shown the correct spelling for the

word. Unfortunately, however, it is not possible to automatically correct the misspelled word simply by pressing the escape key at this point.

Once WordStar has been modified to work with *RHET*, it is easy to use the combination. The six *RHET* commands are always displayed each time a list of words is presented. Nevertheless, the *RHET* package includes a help file called *TEACH.RHT*. This ASCII file cannot be viewed while a document is being edited. However, *TEACH.RHT* can be displayed from the CPM system level by giving the command:

```
TYPE TEACH.RHT
```

This help file can also be seen from the no-file level of WordStar by executing the program *SHOW (IA Nov 81)*.

The *RHET* is available on most popular CPM formats including 8-in. single density and North Star quad-density disks. An abridged thesaurus is available for use with smaller capacity disk such as the North Star double-density, single-headed format. These smaller drives typically have a capacity of less than 200K bytes. A version for the Osborne I computer will be available when the double-density drive option is released. It is expected that the *RHET* will also be available for other popular systems such as the IBM Personal Computer. □

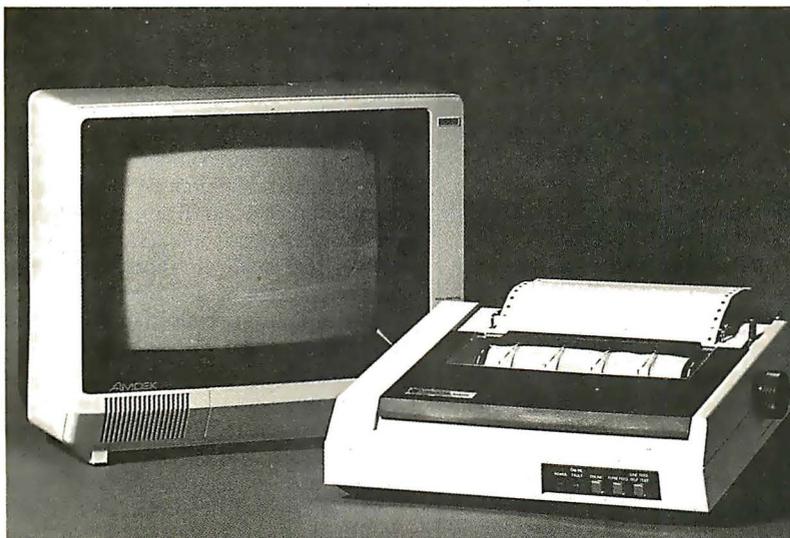
Contributing editor Alan R. Miller is a Professor at New Mexico Institute of Mining and Technology, where he has taught materials engineering, thermodynamics and programming methods since 1967. He received his Ph.D from the University of California in Berkeley. He has authored five books dealing with computer languages.

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The Timex Sinclair 1000

by John C. Nash and Mary M. Nash

The Timex Sinclair 1000 is a useful learning tool and a calculating device. It is a low-cost alternative for simple applications.

Timex Corporation (Waterbury, CT) has joined the ranks of manufacturers offering personal computers by making a close relative of the Sinclair ZX81 under an agreement with Sinclair Research (Boston, MD).

Like the ZX81 (IA Oct 82), the TS1000 uses a Zilog Z80A or equivalent processor with clock speed of 3.25 MHz. It has the same small pressure-sensitive membrane keyboard. Those who are used to regular keyboards will find it annoying, but novices will find it easy enough to use. The TS1000 has an "enter" key instead of the ZX81's "newline."

We found no differences between the Basic interpreters on the two machines. The display—black-on-white—is generated by the internal RF generator. As with the ZX81, this tends to roll and pitch a little—a problem all Sinclair users seem to complain about. (See IA Oct 82.)

The TS1000 comes with a 2K built-in memory, twice the size of that in the ZX81. Clearly, the manufacturers have realized that 1K was just too small for any worthwhile programs. The 2K workspace allows serious calcula-

tions to be performed. All this is not a bad value at the \$99.95 listed price. The memory expansion to 16K lists at \$49.95. (We suspect this is the same as the ZX81 RAM pack, which seems to contain 15K.)

The TS1000 comes with a starter program tape containing the game of Life, a simple Math tester and a program for calculating Averages. All seemed to work as claimed, though the instructions are printed so small they will boost the business of the ophthalmic profession. The programs are presumably included to show novice users some of the capabilities of the TS1000.

The TS1000 will no doubt run any peripherals designed for the ZX81 such as the printer and forthcoming modem. We cannot be sure what will happen if any of the third-party memory packs are attached, but we suspect that they will work

satisfactorily.

The new machine can be faulted for using the same loose jacks as the ZX81 for power and cassette connections. We experienced one or two glitches, due to jacks being only partially seated. This could be especially difficult to sort out for the novice user. Similarly, the adjustments to the television set may be quite complicated. We had to adjust the brightness, contrast, fine tuning, horizontal hold and vertical hold—in short, everything but vertical height and linearity.

To give an appreciation of the serious capabilities of the TS1000, we can best present some examples. First, we have found it possible to put the Hooke and Jeeves functions minimizer ("Micro Mathematician" IA Mar 82) into the TS1000 without need of the extra RAM pack. However, we did drop REMs and also simplified the PRINTs. The resulting program can minimize simple functions of up to 20 param-



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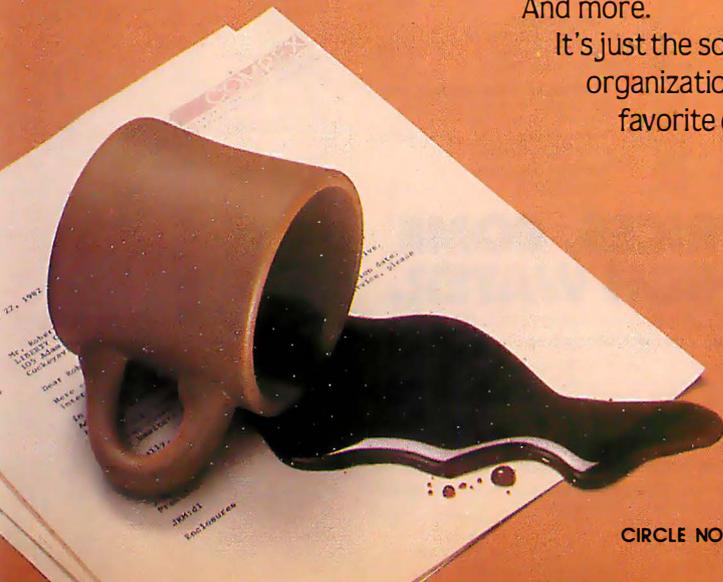
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eters. More complicated functions reduce the space to hold data, thus reducing the number of parameters allowed.

Running in FAST mode, the TS1000 approaches function minima at a respectable speed. Moreover, its arithmetic—using 4 bytes for the mantissa and one byte for the sign and exponent—usually allows functions to be accurately evaluated. This is not the case for many, much more expensive, personal computers. The IBM PC running Microsoft Basic, for example, cannot compete for function accuracy (in single precision at least) with the TS1000/ZX81 in such calculations as $\log(1 + \epsilon)$ or $\sin(n\pi + \epsilon)$, where ϵ is very small and n is a whole number. This is simply because the arithmetic used in the Microsoft Basic has a smaller mantissa, so that the calculations used in approximating \log or \sin cannot be carried out without losing accuracy.

Another calculation that fits easily into the TS1000 is quadrature—the evaluation of definite integrals. An important integral is the one defining the area under the normal distribution:

$$P = C \int_a^b \exp(-0.5 * z^2) dz$$

with

$$C = 1/\text{SQRT}(2 * \text{PI})$$

P gives the probability that a random normal variate having mean zero and variance 1 will lie between a and b . Any random normal variate x , having mean M and standard deviation s can be transformed to

$$z = (x - M)/s$$

Meanwhile, a definite integral

$$I = \int_a^b f(z) dz$$

can be approximated by a summation Q . There are many formulae of varying complexity. If we decide to use m evaluations of $f(z)$ and want to use equispaced $z(i)$, $i=1,2,\dots,m$ that is,

$$z(i) = a + (b - a) (i - 1)/(m - 1)$$

one straightforward quadrature formula is

$$Q = (T + \sum_{i=1}^{m-1} F(i)) (b - a)/(m-1)$$

where

$$T = \{ 5 (F(1) + F(m)) + (F(m-1) + F(2)) \} / 12 \text{ and } F(i) = f(z(i))$$

By careful programming, we do not have to store the m function values, but can calculate them as needed. The whole program for m —as large as desired—can be easily fitted in the TS1000.

For smooth functions such as the normal distribution, m need not be large. The TS1000 can compute normal probabilities in a few seconds, even in slow mode. For functions with many ups and downs, m will have to be correspondingly larger.

To test accuracy and timing we computed the integral of

$$f(x) = \text{SIN}(\text{PI} * x)$$

from 0 to 1. This integral has the value $2/\text{PI}$. We observed the results in the following table.

m	Error in approximation	Time (secs)	
		fast mode	slow mode
10	-1.40E-4	1.4	5.6
20	-7.26E-6	2.0	10.2
50	-1.64E-7	4.4	24.0
100	-1.00E-8	8.0	46.4

The third program used to test the performance of the TS1000/ZX81 was a numerical linear algebra package. Here we needed the 16K RAM pack. The machine was then capable of handling quite large problems (up to 20 by 20 matrices) requiring the solution of: linear equations; linear or nonlinear least squares; matrix inverses or generalized inverses, and matrix eigenvalue problems.

This program package was implemented on the ZX81 first, but loaded on first try in the TS1000. It is worth noting that we tried putting these programs on such small machines only as a test of capacity. The use of tokenizing in the Sinclair Basic is such that a 16K memory on the ZX81/TS1000 allows user programs to operate that could require twice that memory on other microcomputer systems. The success of the ZX81 implementation was such that we took it to the Society for Industrial and Applied Mathematics (SIAM) Linear Algebra Meeting, where it attracted much interest.

The Timex Sinclair 1000 adds to the range of microcomputers available to consumers. Its strength are the solid Basic interpreter, a well-prepared manual, good computing speed and low price. Its

weaknesses—the same as those of the ZX81—are the flimsy hardware and awkward keyboard. The lack of true data storage is also an obstacle to data processing, such as bookkeeping or text editing. The TS1000 will certainly find a use as a learning tool and as a calculating engine. Buyers who purchase it for these purposes will probably be well satisfied with its value for money. □

Dr. John C. Nash is the author of many works on the applications of small computers, including a book on compact numerical methods. He consults in computation and mathematics and teaches statistics and forecasting at the University of Ottawa, Canada.

Mary M. Nash has a B.Sc. in Chemistry from the University of Calgary and library qualifications from the University of Alberta and the University of Wales. She is currently a consultant and writer in the field of information science, specializing in new information technologies and applications.

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Discovery System from Action Computer

by Terry Benson

Action Computer Enterprise, Inc. (ACE; Pasadena, CA) considers itself to be "the multiprocessing company" and the Discovery System certainly supports that slogan. Up to 16 users, each with an independent microcomputer board, can be utilizing the shared resources of this state-of-the-art multiuser system.

When first introduced four years ago, there was a limitation on the amount of hardware integration available, thus requiring multiple boards to support a single user. The original system was limited to six users, but two years ago, the company introduced a single-board computer based, as was its predecessor, on the IEEE 696/S-100 bus. With the new board consisting of a 4 MHz, Z80 microprocessor and 64K bytes dynamic RAM plus a serial I/O port, it now only requires one board to support each terminal.

The present Discovery Multiprocessor System consists of a 20-slot motherboard plus a hefty power supply to back up a full-capacity system. While a single-user system (\$2,740) is available, most buyers will opt for a multiuser system for as few as two users (\$5,925), but any configuration can be expanded one user at a time. Each additional Z80-based user will add an extra \$1,295, but an 8086-based board is offered for only \$1,990.

The Discovery System's multiprocessing capability offers several benefits—including compatibility with CP/M software currently being used on single-user systems.

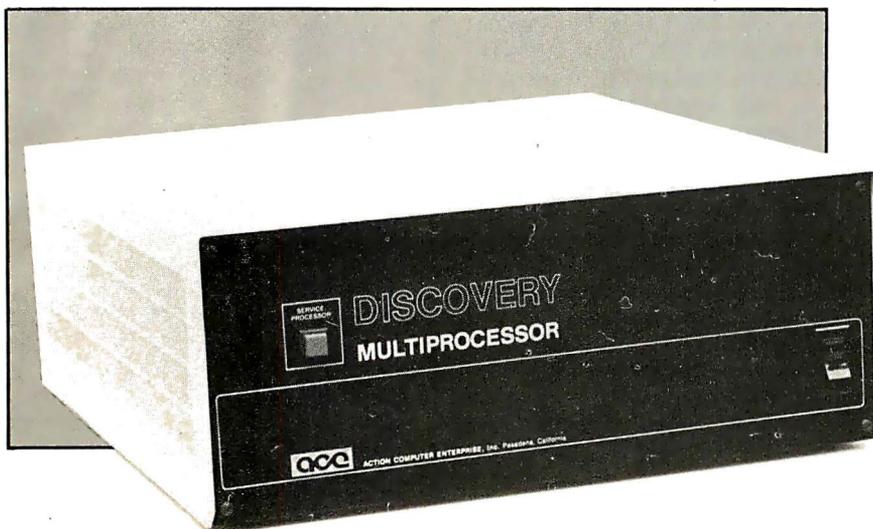
Since this is indeed a multi-processor system, each user operates independently of all other users with the popular CP/M operating system. This scheme provides a number of advantages, not the least of which is the compatibility with any existing CP/M software that you might have been using on a single-user system. With the popularity of CP/M and the hundreds of application programs available for it, it seems ACE made a worthwhile decision in choosing CP/M as the individual user operating system.

Special operating system

In order for CP/M to access the shared resources of the computer system, ACE has developed a special-purpose distributed-processing computer operating system (dpc/os). This operating system is the traffic director for all data flow within the system. It runs on its own Z80 board (which is identical to the other

user processors) but in conjunction with an auxiliary board. The pair (dpc-280) communicate via an expansion bus on the top edge of the boards and operate as the system service processor. This manages up to 16 users in addition to all shared system resources, including the mass storage devices, the printers, and any other peripherals attached to the system bus. It even allows inter-processor communication. This unique feature offers a sort of electronic mail capability by allowing a user to send messages to any other user connected to the system bus. More importantly, one can submit tasks to an idle processor, thereby unburdening the user's CPU, while a lengthy operation can be taking place in a batch mode on an otherwise unused processor. This is certainly a significant aspect of the system that should be noted when considering the computing power of a business computer system.

One of the more visible shared peripherals of any system is the printer. It is frequently the major bottleneck encountered even on single-user systems, let alone on a multiuser system like the Discovery. This problem is alleviated by the service processor which, through dpc/os, provides print spooling for up to four printers, so that a user requiring printed output need not wait for the printer to become available. A user's print file is automatically passed through the service processor to the print spooler using standard print commands. The dpc/os will then print the data on a first-come, first served basis while buffering the data on a system disk. Other computer systems offer a similar capability, but few allow multiple printers to be operating simultaneously.



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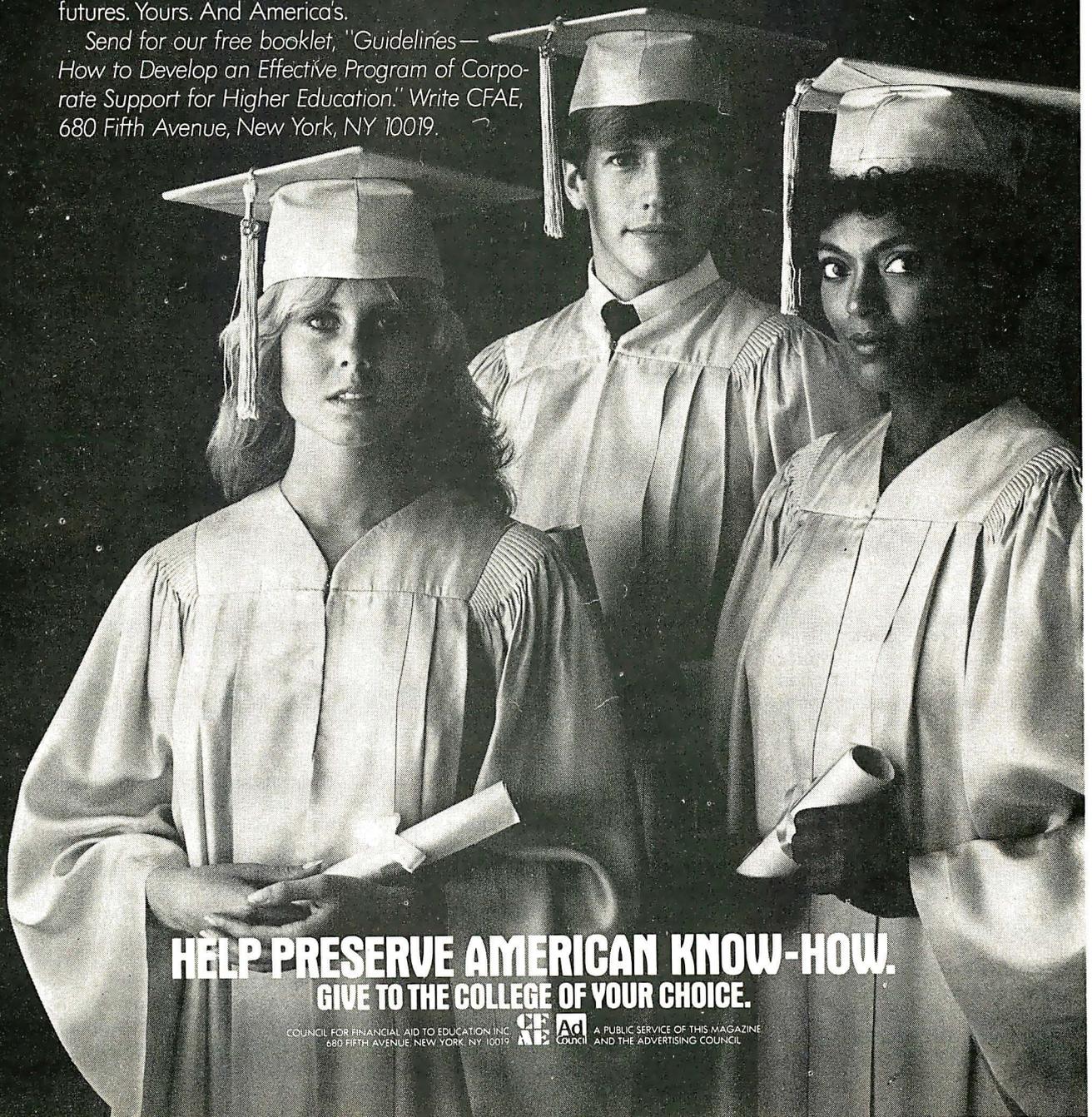
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Even though the system supports up to four shared printers, any printer can be assigned to any particular user providing a local, non-spool printer for that processor. The selection is made through the CP/M STAT command. This flexibility enables a critical print task to be handled independently from any spool printer tasks that may be in process on another printer.

The shared resources carry over from the hardware into the software. Each user maintains a private directory of software files, but there are also public files that can be shared with other users or locked out from other users as required. There are file locking and unlocking procedures available to manage the public files plus the ability to use passwords to restrict access to separate files and programs.

In addition to the customary Z80 user processors, the company also offers an 8086-based 16-bit single board computer (dpc-186). In this way, the Discovery system can support not only multiple users, but multiple processor types with up to a total of 16 users in any combination of 8- and 16-bit microcomputer boards. An uncommon feature of dpc/os allows CP/M or CP/M-86 to be automatically downloaded to the appropriate computer board. With this ability, you not only can add users as your requirements expand, but you can also add 16-bit power when performance demands it.

The dpc-186 is a single-board computer based on the 8086, which operates at a 5 MHz clock rate. The board contains 128K bytes of RAM, but with external expansion boards, the capacity can be increased to a full 1M bytes. Two serial ports are incorporated, each with programmable baud rates. The 8087 numeric data processor (\$595) can optionally be added to the board to provide superior arithmetic performance. As with the rest of the system, this board is compatible with the IEEE-696/S-100 bus.

Although this second generation 16-bit single-board computer is designed to operate in a multiprocessor system, it could also be used in a single-user system; however, it must be controlled through the two-board dpc-280 service processor. Memory expansion is provided via the dpc-mx boards. The dpc-mx1 (\$1,095) includes 128K bytes of RAM along with two serial I/O ports and two parallel I/O ports. The dpc-mx2 (\$2,395) contains 384K bytes of user RAM. A maximum of three expansion boards can be connected to one dpc-186 through top edge connectors. You

should be aware, however, that each expansion board occupies the space available for one user processor, thus reducing the maximum number of users in the system without expansion to an external bus.

Even though the object code for the Z80 and the 8086 are not compatible, they share the same storage media and the same file-naming conventions. This can become quite frustrating when trying to determine which processor invokes which file name. It is particularly annoying when the first-time user who is unfamiliar with the company's file names or functions tries to access unexecutable "COM" files. In some cases, using the file name with the number 86 will help to alleviate the problem (e.g. DMBS.COM or DBMS86.COM). Another approach is to dedicate one of the 16 logical disk drives to the 8086 and separate all of its files from the 8-bit storage areas. The problem is probably short-term—but something that the user should be made aware of.

Two floppys recommended

Most users will configure the Discovery System with both a hard disk and at least one floppy disk, though two are suggested. If the table-top configuration is desired, allow the space of a full-sized standard desk for the three system elements: CPU, floppy disk drives and Winchester disk drive. The table-top arrangement may not be aesthetically pleasing to some users, since there is little uniformity in the packaging of the three separate boxes. Though the front of each has the ACE logo on it, it is obvious that no effort was made to standardize the packaging. One other difficulty in this arrangement is the placement of power switches. Two of the units have the power switch on the front panel, while the Priam hard disk has the power switch on the rear of the unit. This is significant because the manufacturer recommends that the power for the hard disk system be applied after all other units have been powered. The documentation indicates, however, that in the rack-mount unit, appropriate power surge production is provided, so that the sequencing of power is not critical. This suggests that it may be worthwhile to consider rack-mounting the entire system to reduce the amount of floor space, improve the visual appearance and solve the power problem. The accompanying photo shows an alternate in-

Continued on page 107

FEBRUARY 1983

COMPUTER FITNESS™

A monthly newsletter from the Association of Computer Users

“ACU answers questions without the muddle of a vendor's sales pitch.”

John A. Koziol,
Manager, Systems & Processing
Continental Materials Corp.

“I need to know what is state-of-the-art today, and ACU is doing a great job of keeping me informed.”

John J. Stewart,
Office Manager
Van Ert Electric Company, Inc.



HILLEL SEGAL'S

COMPUTER FITNESS™

NEWSLETTER
Published by the
Association of Computer Users

ACU Volume 8, No. 10 -- December, 1982

I ALWAYS WANTED A MENTOR...

"Mentoring" is a pretty neat management concept. One more experienced executive merely takes another less experienced one under his or her wings, becomes the "mentor," and both acknowledge the fact.

More than once in my career I greatly admired a particular person in the company I was working for at the time, but unfortunately the person was too busy to be interested in me. And more than once I could have become someone else's mentor, but it never worked out.

The problem is that it almost never works out for most people who try it. The idea makes sense, but it doesn't seem to work in practice.

On the bright side, however, is the fact that you can sometimes find people who have "been through it before" and are willing to share their experiences. When it comes to business computers, maybe I can be your "mentor" -- in a limited fashion, of course -- through this newsletter. I may be only a year or two ahead of you, but how I wish I'd had someone who was just a year or two ahead of me in times past.

Hillel

HOW TO DETECT COMPUTER PRODUCTS THAT ARE NOT "USER FRIENDLY"

In a movie a few years ago the main character announced "I'm mad as hell, and I'm not going to take it anymore." He was not talking about computers, but it sure fits this industry in many ways. Even though the users of small computers haven't yet gotten to that point, too many manufacturers and software companies are still making products for programmers, not end users.

That's what I mean by products that are not "user friendly," they are not easy to use without programming experience. In most cases, the computers or software programs have had only minimal field testing (sometimes called "beta testing") before they are shipped to customers. The common attitude of many suppliers is "let's wait for complaints and then we'll cope out with an improved version later on."

In short, in their rush to get to market, they make the users the guinea pigs. Here are some examples of especially "unfriendly" behavior:

- **Inconsistencies.** It might be impossible to back up files after you fill up an entire floppy disk. Partial disks, no problem; full disks, disaster. Or some commands don't work if you type them in upper case. These are the kinds of things that would drive most first time users right back to their manual systems.
- **Calculation Errors.** Strange as it may seem, computers are perfectly capable of calculating things wrong. Rounding

“Where else can one get such user-oriented information for such a small membership fee?”

D. T. Wu,
Research Fellow
E. I. DuPont DeNemours & Co.

“ACU is one of the most worthwhile associations I ever belonged to.”

Paul Thoppil,
Engineering Systems Project Leader
RTE Corporation

Written especially for business men and women by Hillel Segal, President of the Association of Computer Users, the Computer Fitness Newsletter distills the experiences of thousands of small computer users. ACU's motto is "It's smart to learn from your mistakes, but it's even smarter to learn from the mistakes of others."

FOR MEMBERSHIP DETAILS & SPECIAL BONUS OFFER

CIRCLE NO. 21 ON INQUIRY CARD

Association of Computer Users
**OFFICIAL
 CONSUMER
 GUIDE**
 to business computer systems

2 SPECIAL BONUS THE ASSO

Just published
 by Prentice-Hall
 and available
 for \$22.95/each
 through most
 book stores

Frustration. Aggravation. Confusion.

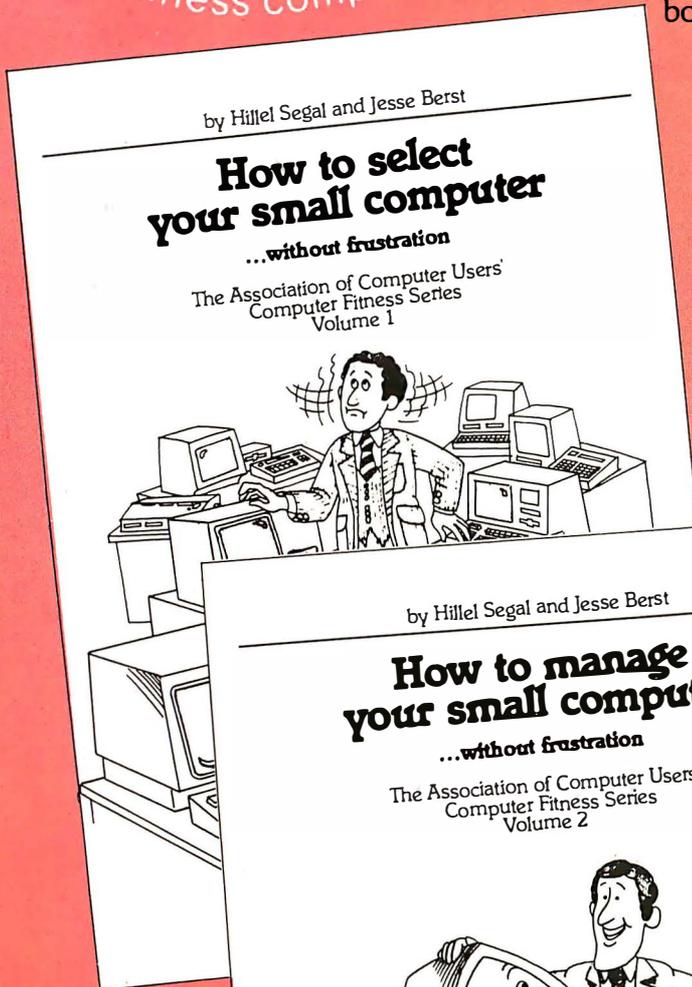
These are the words most people use to describe the process of selecting and managing a small computer. Unhappily, frustration and confusion often lead to expensive mistakes. Whether a computer will generate profit or problems depends on how carefully it is selected and managed—as thousands of users have learned the hard way.

“... invaluable tools for the computer purchaser. We used the worksheets almost verbatim and were very satisfied with the results ...”

George N. Dumas,
 Executive Vice President
 Penfield and Smith

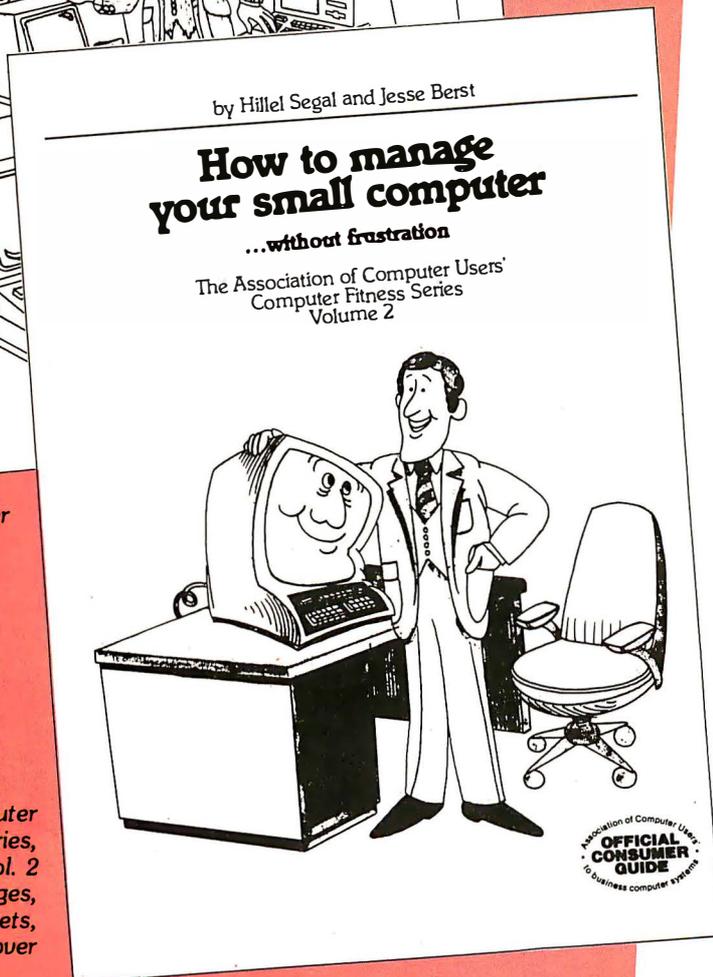
If you prefer to learn the easy way, these consumer guides are designed to help. They take you step-by-step through the buying and managing process, answering such questions as:

- Should I buy now or wait?
- How much computer do I need?
- How do I find the right software?



ACU Computer
 Fitness Series,
 Vol. 1
 200 pages,
 18 worksheets,
 hard cover

ACU Computer
 Fitness Series,
 Vol. 2
 246 pages,
 13 worksheets,
 hard cover



FREE: Both new books are included with your ACU membership at no extra charge

BOOKS FOR NEW MEMBERS OF ASSOCIATION OF COMPUTER USERS

“With the worksheets, checklists and concrete user-oriented advice, your books are the best of their kind that I’ve found. I have a bookshelf filled with similar books, but yours are the ones I’m using. That speaks for itself.”

Lindon Doerr,
Treasurer
Shamrock Chemicals Corp.

-
- *What hardware features are essential?*
 - *How can I crime-proof my small computer?*
 - *How should I effectively manage a programming project?*
 - *How can I earn extra income from my small computer?*

No matter what your question, chances are that one of our members has already found the

“... an excellent guide in a lucid, easy-to-read style. My students, mostly local business people, will definitely benefit from it.”

Frank Yeager,
Associate Professor of Business
Jamestown Community College

answer. We are the Association of Computer Users (ACU), a non-profit user’s organization, and we are dedicated to learning from each other—instead of continually reinventing the wheel. That’s why we created these two volumes, which include tips and case histories from thousands of users who have been through it all before.

“So many businessmen who come to me for advice have already made the mistakes you so clearly caution against. They wasted hundreds and sometimes thousands of dollars needlessly . . .”

Roger C. Levit,
Computer Consultant

Each book contains simple, fill-in-the-blank worksheets for every phase of the selection and management of your small computer. And each one is filled with side articles entitled “Ideas You Can Use,” “Consumer Alert,” “Tipoffs,” and “Case Histories.”

“I strongly recommend that all users follow these guidelines. I wish we had your books before we originally installed our equipment . . .”

Robert J. Brasier,
Data Systems Manager
Tipp Machine and Tool, Inc.

In addition to the books, members of ACU receive the monthly “Computer Fitness Newsletter” authored by Hillel Segal. It takes up where the books leave off, with insights and user comments about the latest hardware, software and management tips. It’s hard-hitting and always written with the end user in mind.

“... The chapter on disaster planning is worth the price many times over . . .”

Stephanie M. Campbell,
Systems Analyst
Real Estate Analysts of Newport
Newport Beach, CA

FOR MORE INFORMATION



Join today to receive the full benefits of membership in ACU

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by Hillel Segal and Jesse Berst
How to select your small computer
...without frustration
 The Association of Computer Users' Computer Fitness Series
 Volume 1



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by Hillel Segal and Jesse Berst
How to manage your small computer
...without frustration
 The Association of Computer Users' Computer Fitness Series
 Volume 2



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Please enter my membership in ACU for the 1983 Calendar Year.

Membership includes "Hillel Segal's Computer Fitness Newsletter," published monthly, and the Prentice-Hall editions of *How To Select Your Small Computer . . . Without Frustration* and *How to Manage Your Small Computer . . . Without Frustration*.

Please Print: Check for \$65 enclosed Charge my MasterCard, Visa or American Express

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IA0283

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Mail to: Association of Computer Users/4800 Riverbend Road/P.O. Box 9003/Boulder, CO 80301

Discovery System

Continued from page 103

stallation that is probably suitable for most offices—just remember the power-surge protection.

For such a complex system, it is customary to have the dealer configure the hardware and install the software prior to delivery. If you wish to purchase the components and assemble the entire system, the company provides a set of step-by-step instructions for at least the hard disk. The installation guide describes physical and electrical set-up, along with a description of the software booting procedures. Other documents show how to configure each board and connect some of the peripherals. Even if you feel competent at connecting the hardware together, you should at least have the company set up the software definitions to minimize the usual start-up problems.

Though there are some single-point failures that could cause the entire system be down, there is much redundancy in this type of distributed processing system. If one of the user processor boards fails, it is probable that no effect would be seen by the other users. Failure of one of the common system elements such as power supply, system service processor or peripherals would—on the other hand—be no worse than with a single user system—except everyone is down at once. One major shared resource that needs to be protected by appropriate backups is the hard disk. This backup requirement is the major reason for inclusion of the floppy disks in the system. The company does offer tape cartridge (\$3,285) and nine track tape (\$6,160) subsystems for backup purposes if high-capacity and speed are required.

Since reset buttons for each processor have not been implemented in this version, the operating system allows a user to reset his own processor through the terminal keyboard. This is accomplished by pressing the escape key plus a special control key. This sequence of characters is recognized as a remote reset any time the user processor is executing a program. The reset operation does not affect other users on the bus; it only affects the one user. The only physical reset button in the system is for the system service processor. Pressing this button resets, whether they like it or not, all user processors connected to the bus. Be careful when pressing this too-easily-accessible switch.

The system is designed to tolerate users who inadvertently try to access

the incorrect file or otherwise misjudge the intention of a particular command... with *one* exception. If a user references a physical disk drive that—for whatever reason—is inaccessible, the system will hang up. This may occur if the floppy drive has no diskette inserted or simply if the directory of the diskette cannot be read. The only way to cure the problem is to reset the system service processor. This can be a serious problem not only for the one who causes the problem, but also for everyone else on the system. I would like to see some sort of timeout in the disk controller that would look for data within a certain time limit, then return control to the operating system. This way, the system bus would not be tied

in getting to the heart of any board-related problems. Each manual is furnished in a three-ring binder, though no external label is visible to distinguish one from another.

The system user's guide describes the features and functions of the dpc/os, but only an overview of CP/M is provided. The management of system resources is discussed, but not enough examples are provided to suit my taste. The experienced user will have no trouble in following the information, but the novice may have to work with the system for awhile to understand some of the concepts. Even though the user's guide is indexed, I had difficulty in merging the information from release 2.1 into the original 2.0 manual, since

A fixed rate fee of \$100 per board for any repair is guaranteed after the initial warranty period of six months.

up indefinitely and no other user would even be aware of the problem. It is something that each user must be conscious of, so that a requested access to a floppy disk will be carefully considered before pressing the RETURN key.

ACE provides a six month warranty for parts and labor and guarantees a fixed rate fee of \$100 per board for any repair after the initial warranty period. While it is not encouraged, it is possible for the user to repair the board, since all components are socketed—making it easy to exchange components to locate the faulty device. For the more technical owners, the company includes schematics of each board and does a fairly good job at describing the major board functions. This may be useful in just determining which board is faulty so the bad one can be swapped with a good one until repairs are made.

Adequate documentation

When purchasing any computer system, the documentation should be considered. In the case of this system, have no fear. The documentation is adequate, but not necessarily overbearing. The hardware reference manuals describe the features and system set-up plus a variety of technical details. In the 8086 documentation, a theory of operation is provided to assist one

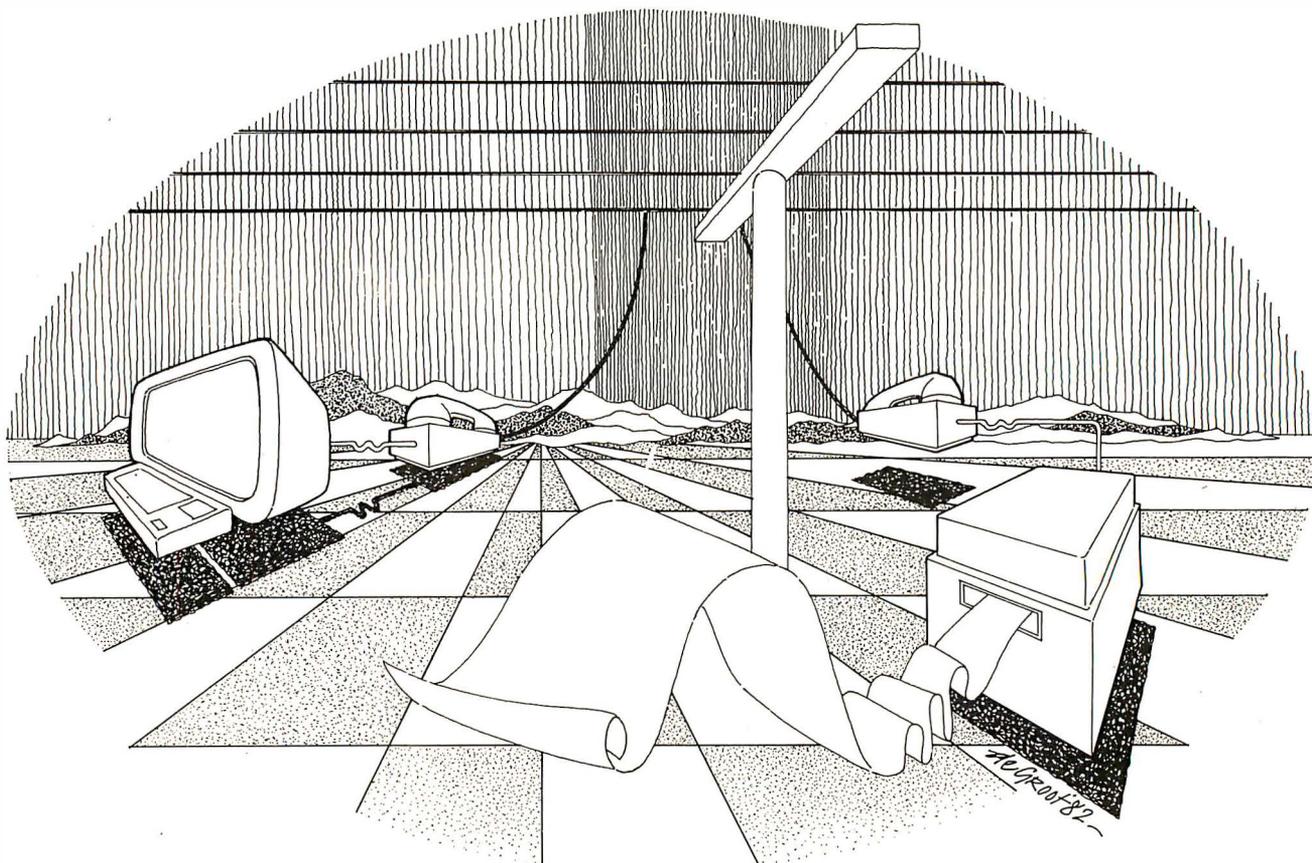
each is in a separate document. The revision corrects errors in the earlier release and adds some new features. Hopefully by the time you read this, the company will have merged all information into one indexed document.

A typical four-user system utilizing Z80 processors, two double density single sided floppies and a 33M-byte Priam hard disk with an Alloy Engineered controller plus CP/M lists at \$16,405. This averages about \$4,100 per user, but with additional users, the price-per-station can be further reduced. For example, with 16 users the price per user is only about \$2,000. Note that these figures include neither the user terminal nor printers, so the actual installed cost will be somewhat higher. Comparing these prices with alternate approaches should help to demonstrate the value of a multi-user/multi-processor system.

Technical editor Terry Benson has generated numerous articles for IA, almost since its inception. For almost five years, he provided technical assistance to many Intel Corp. customers throughout the Western U.S. as a field application engineer. Since leaving Intel, he has been working as an independent consultant supporting a wide range of microcomputer applications.

Computer Press: Setting Type with a Word Processor

by Ken Barnes



Armed with word processing software, small computers are rapidly supplanting typewriters as the primary means of preparing text for all kinds of publications—ranging from home-spun newsletters to professional books and magazines.

Setting type with a word processor is a great boon to publishing endeavors. Because an author's original copy never needs to be re-typed, there are tremendous efficiencies over use of a typewriter. Extensive editing may occur—but this editing is the bread-and-butter domain of the word processor's automatic features: search and replace, block move, spelling check, etc. Only the edited changes need to be proofread a second time. Text proceeds all the way to the final printed result without further

human intervention (and thus without the opportunity for inadvertent errors).

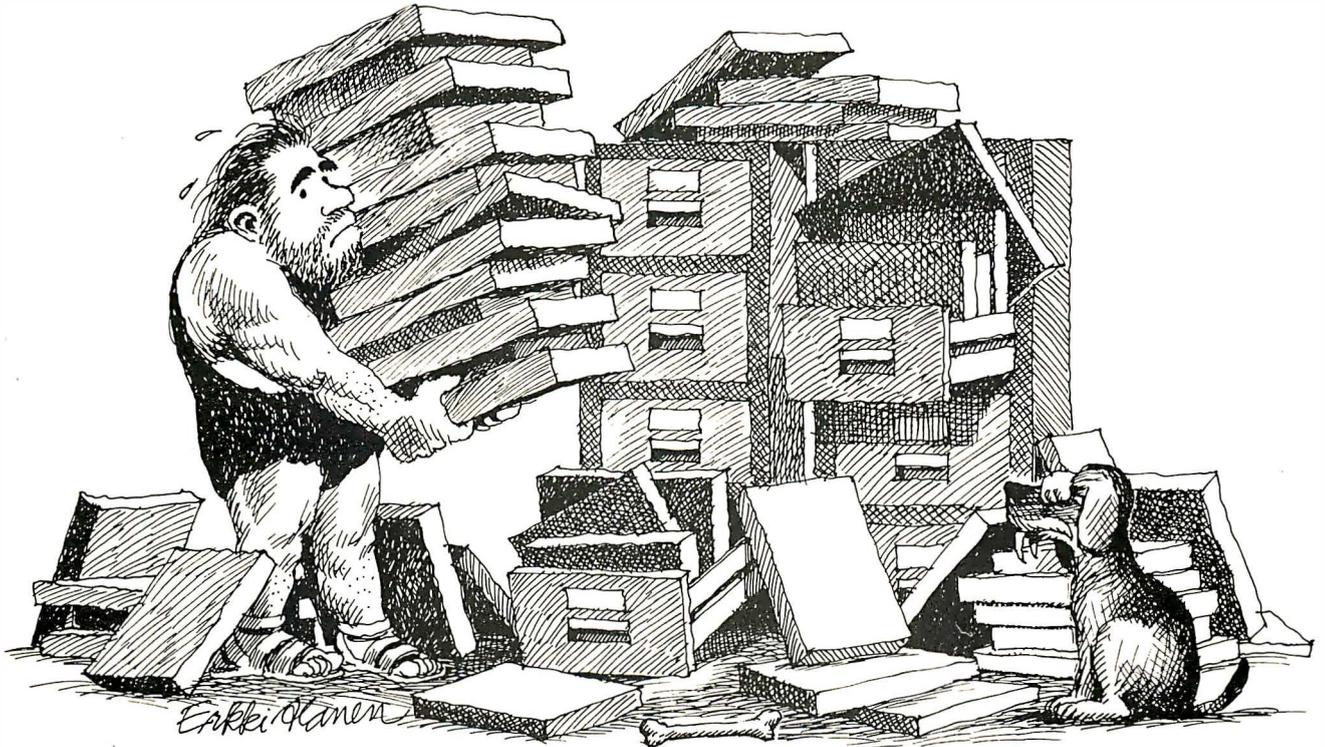
With the automated process, personal computer owners can produce professional newsletters and announcements. Small businesses can save time and money by preparing their own advertising, spec sheets and price lists. Reduced production time is a big benefit for authors and publishers of books.

Newspapers and magazines—old hands at automated publishing—can manage databases of stories. Schools and univer-

sities can automate production of educational materials and research publications. Producers of computer programs may achieve a marketing edge by offering typeset manuals and sales literature—yet easily modify their text to keep up with new product changes.

A representative word processor-to-typesetting system is Computer Press (CP), offered by Techni Service Corporation (Los Altos, CA). CP produces high-resolution type suitable for formal publication in books, magazines,

KEEPING UP WITH FILING SPACE DEMANDS CAN BE TOUGH.



WITH DB MASTERTM IT'S EASY.

It seems to happen before you know it. The business is growing and, naturally, so are your files. But the more room you need for files the less there seems to be. You've added more people, more equipment, more capacity. The trouble is, you're trying to add more file space, when what you really need is more *work* space. Those filing cabinets full of folders are costing you too much—in time, in space, in money.

That's where DB MASTER comes in. It provides plenty of expansion capability to meet the needs of most normal growing businesses that use an Apple II. The floppy diskette version, for example, can be expanded to contain up to 387,000 individual records. Need more? The DB MASTER Special Edition For Hard Disk can be expanded to contain up to 7 million individual records.

Of course, the number of records you may store in your particular business depends on several variables—like the number of characters in each record and the kind of information storage you require. Ask your dealer to spell out for you just how much DB MASTER can help your operation.

We designed DB MASTER to make your life easier. Sure, there are other data base systems for your Apple II. But if you're not using DB MASTER, you're

simply not getting all you could from your data base management program.

And there are three powerful accessory programs available to complement DB MASTER's capabilities. UTILITY PAK #1, for

example, allows you to access other standard Apple files (including VisiCalc), and even recover damaged files. UTILITY PAK #2 allows you to edit or change up to five "fields" in a single pass through your files. And STAT PAK performs statistical analyses on data in your DB MASTER files. Of course, there's considerably more capability in each of our accessory paks than we have room to talk about here. Ask your dealer for the full details.

Stoneware backs up DB MASTER with a support staff second to none. Just give us a call. We can help solve your problems. After all, that's what Stoneware and DB MASTER are all about.



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CIRCLE NO. 80 ON INQUIRY CARD

newspapers, and product material. It is designed for use on small computers that do not have special printing or typesetting hardware. Computer files containing the final text are sent to the service in the form of floppy disks, by direct telephone communication, or through a timesharing service. Techni Service uses the files to operate typesetting equipment, producing photographic press-ready proofs that are returned to the user. Proofs can be taken to any print shop—or submitted to newspapers and magazines as final advertisements.

Users can select several thousand type styles. These range from Times Roman (a la newspaper and paperbacks) to more colorful Grouch, Harry Fat, and Balloon. Each style is available in 15 different sizes, ranging in height from about 1/12-in. up to 1-in. You can change freely between styles and sizes—with changes occurring in the middle of a line or word, if needed. One limitation is that an individual text file can reference a maximum of five styles. A sixth font is always available for unusual punctuation marks, math symbols, Greek characters and language accents.

CP may be operated in automatic, manual or advanced coding modes. These modes offer alternative ways to control type styles, sizes and page layout. Automatic mode works directly from word processor files. Manual and advanced coding allow the user to insert typesetting commands in text files.

Automatic mode

If you'd like to use computerized typesetting—but don't have time to learn how—then automatic mode is for you. The service will pre-set the necessary code translations for your editing or word processing program. Then you can elect automatic coding mode and never have to learn a single typesetting command.

Before using automatic mode, you must describe your type styles and column arrangements. Your description may be as simple as requesting only one style, one size and one column width. You can use cut and paste methods to assemble proofs into final pages. At the other extreme, you can specify a complex page layout with multiple columns, bold face, italics, varying designs of titles and sub-headings, automatic page numbering, inserts and other features.

More complex arrangements are described in written correspondence, a dummy design layout or examples of previous publications. For simple projects, one command—`/#e`—may be used. The “e” stands for “editor's” comment. With `/#e`,

free-form comments are inserted in the word processor file. These comments are ignored during final typesetting, but can be used to convey simple requests for type styles, sizes and layout. The comments are scanned by the typesetting operator, who adjusts the equipment accordingly.

When automatic mode is used to produce moderate and complex page arrangements, Techni Service will pre-assign marking point codes to specify the start or end of a specific feature of the layout. An “@” (“at” sign) is usually used, followed by a number. For example, “@1” might mark the point where a new chapter begins. “@24” might indicate that the following phrase is not part of the normal text—but is instead a subheading to be printed in larger, bolder type, preceded and followed by vertical spacing.

As you enter or edit text for complex projects, you insert marking point codes by referencing previously typeset sample pages that have been prepared by Techni Service specifically for your layouts. The sample pages show the appropriate “@” codes superimposed over corresponding layout features.

Following such examples, an author or editor can control the pagelayout according to preset specifications—without ever having to think about the mechanics of type styles and sizes, line spacing or column width. Publishers of books and magazines can use automatic mode to manage their design standards. Automatic mode will re-format each author's text, so that it matches the publication's layout.

Automatic mode is capable of ignoring or translating CONTROL characters. Word processing programs and printers use CONTROL characters to control printer features. These characters may not print on the display screen, but are nonetheless embedded in the text file.

A common example is the CONTROL-L, as specified by the American Standard Code for Information Interchange (ASCII). CONTROL-L tells a computer printer to advance to the top of the next page. Computer Press' advanced coding mode usually ignores CONTROL-L, since page breaks on word processor drafts usually do not correspond to page breaks in the finally typeset version. However, certain other control characters may be used to control typeset output.

For example, a CONTROL-E might be used to turn on a word processing printer's underline mode, while CONTROL-F might turn underlining off again. Computer Press can (at the customer's option) switch to italic type when en-

countering CONTROL-E, and back to normal (Roman) type upon CONTROL-F.

One of the nice features of CP is its ability to translate control sequences of more than one character, with any mixture of CONTROL or printing characters. One popular small systems printer, for example, switches to superscripts with a rather long coding sequence: CONTROL-[, S, CONTROL-@. CP can accept this sequence.

For new users, copies of an example project are provided that illustrate how marking points are placed in a file. This material relates the computer file to copies of final printed pages. (The automatic mode example package is available by writing directly to Techni Service—and enclosing \$1.25.)

Manual mode

Manual mode is for those who want “hands-on” control of typesetting actions, but don't want to spend lots of time learning the codes used by professional typographers. When you send for CP's information package on manual mode (also \$1.25), you receive a mailing that includes a clearly-worded, non-technical, four-page reference guide. This guide explains each manual mode command.

Like the ignition, steering wheel, accelerator and brake on your car, four basic controls (size, style, width, and line depth) do most of the work in setting type in manual mode. For example, most of the column text for this magazine could be produced simply by inserting four commands at the beginning of the files, or just at the beginning of the first file of a series. Except for making the ends of paragraphs, these four commands would do the trick.

Manual mode commands can be entered anywhere in a text file. Each command contains at least one slash (/) character, to help identify if from normal text. (To actually typeset a “/”, you enter two “//”.) Commands are always typed in lower case. In this article, I'm showing commands surrounded by quotes. In actual CP coding, the quotes aren't included.

CP measures things in picas and points. These archaic units of measure are the jargon of the printing world. They're “the way it's done” by professional publishers—but for the lay author or editor, they take a little getting used to. Fortunately, the concept is simple and easy to learn. Once learned, you can hold your own in many back-shop press room conversations. A pica, very simply, is one-sixth of an inch. A point is a much smaller unit: one-twelfth of a pica. The type that you're reading in this magazine is about 9 points high (measured from the bottom of a

descending stroke to the top of a capital letter). This column is about 20 picas wide.

The four most important commands are those used to select type style, type size, column width, and line spacing.

Style. Choice of type style is set by typing the word "style", followed by a slash and a number. For example, if you specify that Times Roman should be style number one, "style/1" will cause the following text to be set in Times Roman. (You would identify Times Roman with the number "1" (one), either on your CP order form, or by free-form comments at the front of your file.)

Size. The size command consists of the word "size" followed by a two-digit number, indicating the type height in points. For example, "size/10" will cause subsequent text to be set in 10-point type, until a different "size" command is encountered.

Width. Column width is set with the "width" command, using a four-digit number. The first two digits are picas. The last two digits are additional points. The command "width/2000" sets the column width to exactly 20 points.

Line depth. The "line/depth" command is available to set the vertical displacement between subsequent lines of text. It uses a 3-digit number to indicate line depth in points (the first two digits) and optionally an extra one-half point (the last digit).

Each command remains in effect until changed to a different value. Frequently used commands have abbreviated forms. For example, "s/1" is equivalent to "style/1".

The command sequence to produce column text for a publication similar to this magazine would probably be "style/1 size/10 width/2000 line/depth/110". Italic or bold face phrases can be started and stopped with embedded "style" commands—say, "style/2" for italic, "style/1" to return to regular text.

For those who need or want to do fancier things, a variety of commands are available for special purposes. The flat right margin effect can be changed by a series of commands that control line length logic. Normally, the typesetter's software determines how many words will fit on each line, in order to produce a flush right margin. Like proportional-spacing word processing printers, the spacing between letters and words of each CP typeset line is carefully graduated to give an even appearance. Spacing is set to the natural width of each letter.

When it's necessary to increase inter-word spacing to produce the flat right margin, each inter-word space is increased

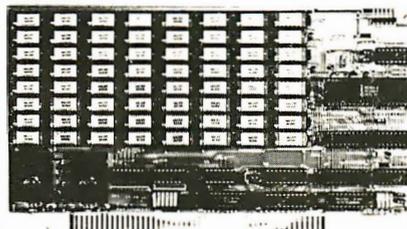
by very fine increments. In this way, all inter-word spaces on the same line have the same width. If needed, the space between letters will be increased slightly (evenly across the line). In some cases, words will be hyphenated by the typesetter's software. Behavior of the CP logic can be altered by commands designed to produce a ragged right margin (similar to typewriting), a ragged left margin, or both

ragged left and ragged right margins.

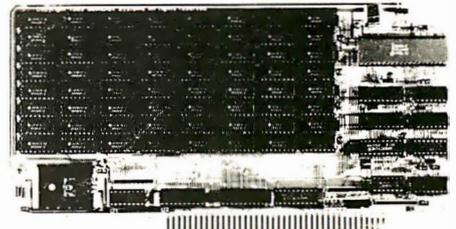
Additional commands control the use of superscripts (for footnote references), subscripts, paragraph indentations, positioning of title lines and other features. Style position six is used to produce special characters not present on standard keyboards. For

Continued on page 137

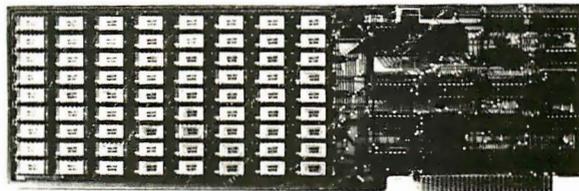
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CIRCLE NO. 75 ON INQUIRY CARD

Labels Anyone?

by John Martin

The accompanying program is written for the IBM Personal Computer with color monitor board, PC-DOS, IBM Basic, and has printer commands for an Okidata Microline 82 printer. It will enable the printing of small, two-line labels similar to those used for Pendaflex file folder labels, as well as a larger label suitable for standard file folders.

On screen format control of the labels before they are printed is possible and, except when printing the mailing labels, there is a choice of two character fonts with a cutting guide printed on the paper to aid in cutting them out. The mailing and small labels are printed using a three-across format, while the larger labels are printed two across allowing printers without adjustable tractor feeds to print these labels on 9.5-in. wide paper.

Literal display of label appearance is possible because the IBM Advanced Basic contains a powerful tool known as the DRAW command, allowing you to guide the cursor over a path that you specify to create any image desired.

On line 430, the command "BM80,110" tells the cursor to move to the graphics pixel in column 80 and row 110 (not to be confused with text pixel). The B in the command specifies that this movement be made without drawing a line from the previous cursor position; the M**,** specifies an absolute move (to a particular pixel). If there had been a "+" or "-" sign in front of the numbers the movement would have been relative to the last position. On line 1160, the command DRAW "R84 U2 D2 R84 D20 L40 D3 U3 L88 D3 U3 L40 U20" creates a rectangle on the screen with ticks denoting the center and each third of the label. This command is comprised solely of controls to move an imaginary

Here is a program that allows you to print labels for disks, letters, file folders, and file drawers. It can be easily modified to operate with different printers and can be adapted to operate on many computers.

pen across the screen to create the specified pattern. The letter in the command denotes the direction ("R" moves right, "U" moves up, "D" moves down, "L" moves left, "G" moves diagonally down and left, and so on) while the numbers after the letters specify the number of units to move. The number of pixels moved per unit can be specified in each command by using the letter S and a number to set the scale (4 pixels/unit is the default). DRAW also allows you to assign names to each command string, enabling storage of the commands for drawing whenever desired.

Throughout the program are other, more common commands that are denoted differently in IBM Basic. The Locate command, for example, specifies the row and column for the cursor (and can also set its size); the CLEAR command resets all variables (and arrays) to zero; the SCREEN command selects the mode of display. SCREEN 0 is text (40 or 80 column, selected by the WIDTH command); SCREEN 1 is low-resolution graphics; SCREEN 2 is high-resolution graphics. The IBM allows text to be displayed while in any of the graphics modes, allowing the use of graphics commands—like DRAW—to create the outline of the label, then enter text inside this outline.

This program has been written in three independent sections. The first, entitled "Small File Folder

Labels" prints small, two-line labels. The second prints mailing labels and the third prints large file folder labels.

In the first section—and throughout the program—the variable "NUM" is the number of labels you wish printed. The arrays TOP\$ and BOT\$ contain the information for the top and bottom lines respectively. Due to the physical limitations of these small labels (1.25-in. wide), the number of letters that can be squeezed on a line is limited to 19 when printed in compressed font and 11 in normal font. Lines 490 and 550 check the length of the line entered against the variable LNTH, and if greater, requires you to reenter the label. This rarely causes a problem with the on-screen label display.

The printer command on line 750 sets condensed font (16.5 characters-per-inch) if desired; and line 760 sets print with 8 lines-per-inch. Lines 790 to 820 and lines 950 to 980 print a dotted line above and below the labels for ease in cutting the labels from the paper. Additionally, the CHR\$(213) command on lines 850, 860, 910 and 920 print a vertical line (with a graphics character), marking the left and right edges of each label.

The most unusual aspect of this program is the method of print formatting shown on lines 840, 850, 900 and 910. A variable C is used to denote the difference between the maximum number of characters

allowed per line and those entered. This difference is used to print spaces after the text on each line, so each label is the same size and so the top and bottom lines are positioned properly.

The second part of the program entitled "Mailing Labels" is essentially the same as the first, except for the method of printing and the names of some variables. The labels are printed with four lines of text and the variables correlate, somewhat, with what you would normally enter on each line. "NME\$", the top line (usually used for the persons NAME); "CMPY\$", the second line (for CoMPanY); "STRT\$", the third line (for STReeT); and "TWN\$", the fourth line (for ToWN).

Since mailing labels will be printed three across, the maximum number of characters-per-line of normal font is 24. Condensed font could have been used to increase this, but such small print decreases the legibility to a point where the added few characters may not outweigh the possibility of having a label misread. Lines 1530, 1590, 1650 and 1710 check for the maximum allowed line length and require you to reenter the label when a line is too long.

The actual printing is fairly straightforward with the TAB command, moving the print across the page by Tabbing to the start of each label. On line 1930 (as with 1990, 2050 and 2110), the TAB stop "T" is set to 3 to start print of the left-most label at the appropriate spot. On line 1970 (also 2030, 2090 and 2150), the TAB stop is incremented by 26 to account for the width of the labels (and the spaces between labels).

The third section, entitled "Large File Folder Labels" is really a mix of the first two. Here you have a choice of normal and extra wide font with printing done using the TAB commands, as in the second section. The variable FOLD\$ is the information to be printed on the label. FONT is used as a flag to tell the printing section which mode (normal or wide) to use for proper formatting. The only new command in this section is the WIDTH "LPT1:", 135 command on line 2880. This command (and the similar command on line 3070) tells the printer not to return the carriage (causing unwanted word-wrap) until after printing more than 135 characters of text (the default value is normally 80). The variable TB determines the amount to tab dependent on the font selected and is not a constant, as when printing mailing labels, due to the different fonts available. As in the first section, dotted lines and vertical dividers are provided for ease in cutting out the labels.

PRINTER COMMAND CODES [LPRINT CHR\$(xx)]		
Function	Okidata 82	IBM dot matrix
Line Feed	10	10
Carriage Return	13	13
Normal Font	30	18
Compressed Font	29	15
Wide Font	31	14
Wide Font Off	30	27 + 20
6 Lines/Inch	27 + 54	27 + 50
8 Lines/Inch	27 + 56	27 + 48

Figure 1. Substitute Okidata and IBM commands

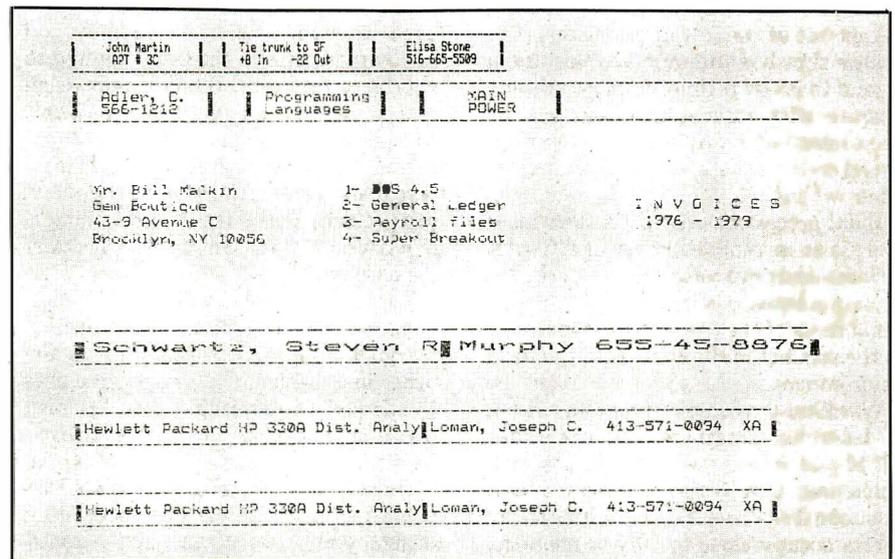


Figure 2. Sample labels

Since the program was written to run with an Okidata Microliner 82 printer, the print commands are somewhat different than with the IBM dot matrix printer or other printers. Figure 1 is a list of the corresponding Okidata and IBM commands for substitution in the program.

This program can be modified to run on IBM PCs without the color graphics board or the disk based PC-DOS by removing the DRAW commands. You will obviously lose the on-screen image of the label; in the place of the DRAW

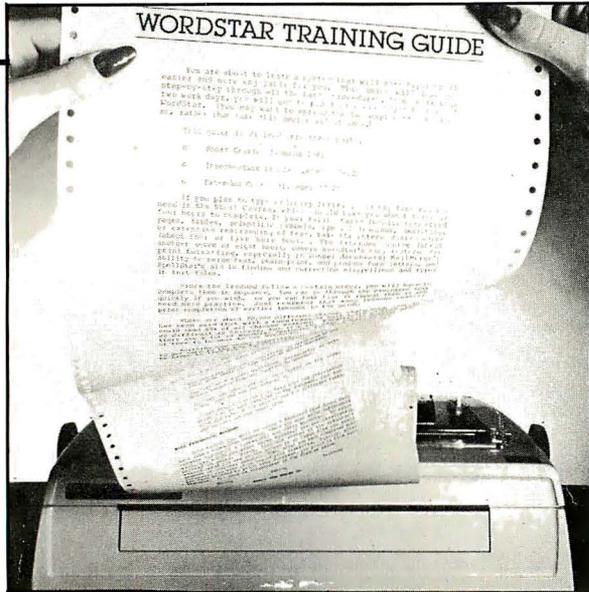
commands, colons or periods could be used to form the outline without the necessity of the graphics mode. This could be tedious to set up, but the effort would probably be well worth the trouble involved. □

John S. Martin is a Radio Engineer with the NBC Radio Network. He attended the State University of New York at Stony Brook where he studied Computer Science.

Program listing on page 146

WordStar Revisited

by Carl Heintz, CPA



There is no doubt that WordStar is an excellent program—it does everything a good word processor should do. To do nothing but heap praise upon the program, though, doesn't help a potential user evaluate whether or not it is right for his application.

WordStar from MicroPro (San Rafael, CA) is one of the few applications programs that has managed to become a legend in its own time. Almost anyone literate with microcomputers has at least heard of WordStar. Most experienced users have a working acquaintance with it.

Word processors are a little like wine—there is an incredible variety at different qualities and price ranges. Some are better in certain situations than others. The personal taste of the user must be matched to the product in the context of the total environment.

WordStar is a complex program written in assembly language. It runs under CP/M and is designed for systems with a minimum 32K bytes of memory, and at least one disk drive. The programs themselves occupy close to 80K of memory, so a 100K disk drive system (like the Osborne) is just about the minimum configuration.

Since WordStar is such a huge program, it employs a nice little scheme called "program overlays" to accomplish the task of putting an 80K program into a 32K program area. When loaded, only the basic "kernel" of the program is resident. Should the user wish to employ any of the special functions of the program, be they underlining, bold print or complex editing features, such as search and replace, the program must go out to the disk and "overlay" the appropriate program segment.

This method does have its disadvantages, though. The most obvious and annoying relates to the time required to overlay a program. While it may seem reasonable that an overlay takes 2 or 3 seconds to accomplish, in use, those seconds may become annoying. With a fast disk system, there's not too much of a problem. Perish the thought, though, of having to wait 4 to 6 seconds on slower disk systems.

The ultimate solution is to use a hard disk. In such an environment, an overlay becomes essentially transparent. In any other installation, the prospective user is advised to determine that his disk drives are fast enough to handle the overlays with a reasonable degree of speed.

One of the best features of WordStar is embedded in its very philosophy of design: you see what you get... almost. In many word processors, such as Memorite, the format of what appears on the screen bears little or no relationship to the finished hardcopy product. For many reasons, this isn't comfortable for many end-users. WordStar formats the CRT display in virtually the same fashion as the finished product. Page demarcations are delineated with a dashed line, and the position of the cursor on the page is tracked by a status line that indicates the file name, page number, line number and column number. It is possible to change line spacing from single-spaced to double- or triple-spaced. The screen will reflect the

changes. Similarly, through other commands, the margins may be altered, and again, the CRT screen will reflect format changes.

To be entirely consistent would be somewhat boring, and of course, WordStar has a whole class of commands that are not reflected in the CRT image. These so-called "dot commands" are appropriately named because they are delimited by a "."; can be used to change the line spacing incrementally, the margins, the page lengths, even the spacing between characters. The presence of the two classes of commands is really not contradictory. One might think of the "dot" commands as being a second and more sophisticated level of word processing functions. The more simple and direct commands are accessed via menus appearing at the top of the screen. With every command, a new menu is overlaid with several sub-commands or alternative choices. This constitutes true "top-down" programming. Even the menus can be modified. There is a command for setting the "help" level from a very extensive menu presentation to almost nothing.

Good error-handling

Error recovery is well-implemented in the WordStar program, although in some implementations, it is possible to get the program confused at times. For example, in some cases if the operator hits the wrong combination of keys at the wrong time, it is possible to insert erroneous con-

trol characters into the file. Additionally, there are some absolute things that can make the program blow. On some Osbornes, for example, a "A." at the right place in the file will do it. A guaranteed problem occurs when you replace the disk used for data storage, then attempt to save the file. Once the disk has been removed, putting it back again doesn't help—WordStar remembers, or forgets, as the case may be. For a user of a small system with limited storage, that can be a real headache. This is especially true when the disk being used has 10K bytes left and a 20K file is created. When the user learns how to use block commands, the problem disappears because those commands can be used to write out data to a new file on a new disk.

Those are the only bugs that we've found in over a year and a half of almost constant use. They really aren't bugs—since they don't affect program operation in the ordinary course of business.

The documentation for WordStar is awesome—a good inch thick of single-spaced typewritten documentation. There is a good index, a reference manual with extensive discussions of each and every command, procedure, screen and option. It is well-written, but exhaustive. The beginner can skip most of the manual though, since the help screens are good enough to lead the user through rudimentary word processing. The commands are not that hard to get to know, and to make it even easier, the MicroPro people have included a set of stick-on key-caps that can be used by those who won't read the manual and get confused with the help menus. They have also included a helpful reference chart containing most often-used comments and explanations. The command documentation is so good it's almost overkill. Finding something in the manual is a breeze—it has a table of contents, and an extensive index.

Recently, micro users have been subjected to a new buzzword—ergonomics. This refers to the science of designing products so that they are "human-engineered." WordStar is well-designed in this regard, although, like any other program, it requires some user adaptation.

For systems with fast disk drives (especially hard-disks), WordStar features a print spooler. This feature allows a user to be editing one file while printing out another. In most systems, though, the disk and processor speed are such that this feature cannot be utilized with too much success. WordStar does not allow the user to print the file under edit while it is being edited. Printing can only be invoked on a completed and closed file. Only very occasionally is this somewhat

of a disadvantage—say, for example, when working on a draft of an article and a print-out of the completed work is desirable.

One of the great advantages to a "you-see-what-will-be-printed" program is the ability to hyphenate words correctly. WordStar alerts the user when a word at the end of a line is too long to fit within the line and allows the user to hyphenate it if desired. Alternatively—and in the case of most lines—where smaller words are used, the system automatically word wraps from one line to the next. Justification can be turned off or on.

Most word processors scroll vertically. WordStar scrolls both vertically and horizontally—allowing the user to edit large documents such as spreadsheets of up to 255 spaces. With word wrap-off, it is theoretically possible to have about 32,000 columns.

WordStar is very helpful in preparing columnar worksheets. The system has the capability of dealing with columns of figures or text. The system does not allow the user to create multiple columns of justified text (as in the case of a newspaper or magazine), but the system does allow the user to manipulate columns of text that have been created manually.

Many of the sophisticated stand-alone word processing systems have the ability to handle mathematics within columns of figures. Some systems such as the NBI or Wang have features that add up columns of figures. WordStar does not include these features.

The printing features of WordStar are outstanding, allowing the user to do just about anything and everything that can be done with a printer. Some of the features include:

Underscoring; Multiple striking; Strike-outs; Change Character pitch; Subscripting and Superscripting; Changing ribbon color; Bold-facing, and Change lines per inch.

In addition to the standard commands, there are several user-modifiable and special features that can be configured for specific printers. WordStar supports bidirectional printing for printers capable of that function.

New programs can be difficult

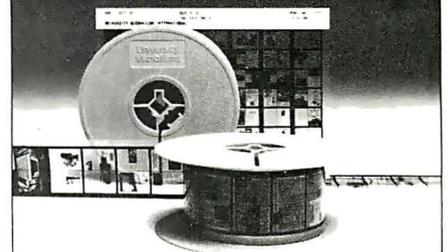
Setting up a new program can be a traumatic task for users. Even those familiar with computers and programming can be baffled by some installations. WordStar's installation program is totally menu-driven and tailored to guide the user in the right choice. The system allows a user to run the soft-

ware even if a terminal is not selected. A printer can be attached with only a minimal knowledge of printers or confusing protocols. On the other hand, the technical whiz can have a field day exploring the many options available. WordStar's install program is amazingly simple considering the power of the program and the complexity of options available.

One of the most effective uses of a word processing program is to handle the drudgery of producing form letters. WordStar has a separate program, called Mail-Merge, which is intended to produce form letters from a data file of addresses and names.

An overall conclusion about WordStar is simple: the software is elegant, complete and well-executed. The system is truly the Cadillac of word processing programs. However, it's not the easiest for the beginner to use. All of its capabilities can be intimidating to a beginning user. Finally, the system does not have any graphics capabilities, nor does it contain "split-screen" characteristics, which some of the newer products on the market are featuring. As an all-around example of mature software, WordStar is hard to beat. □

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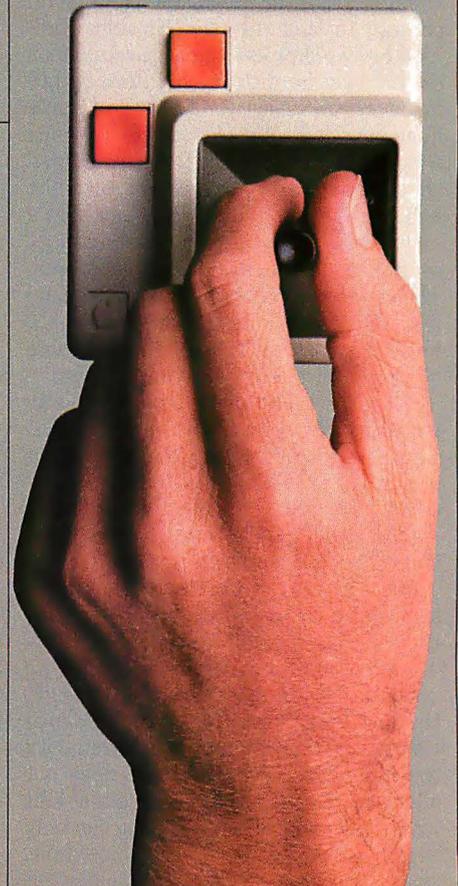
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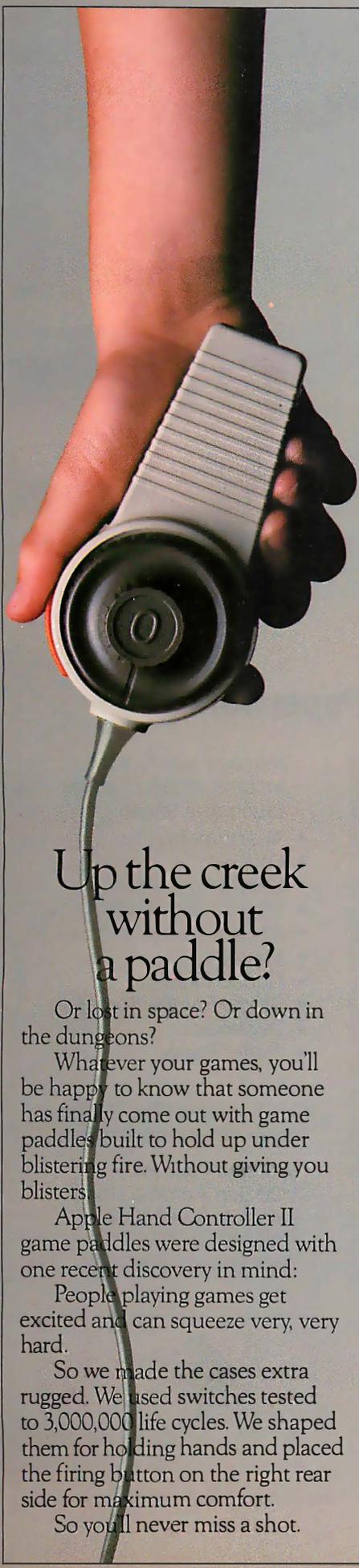
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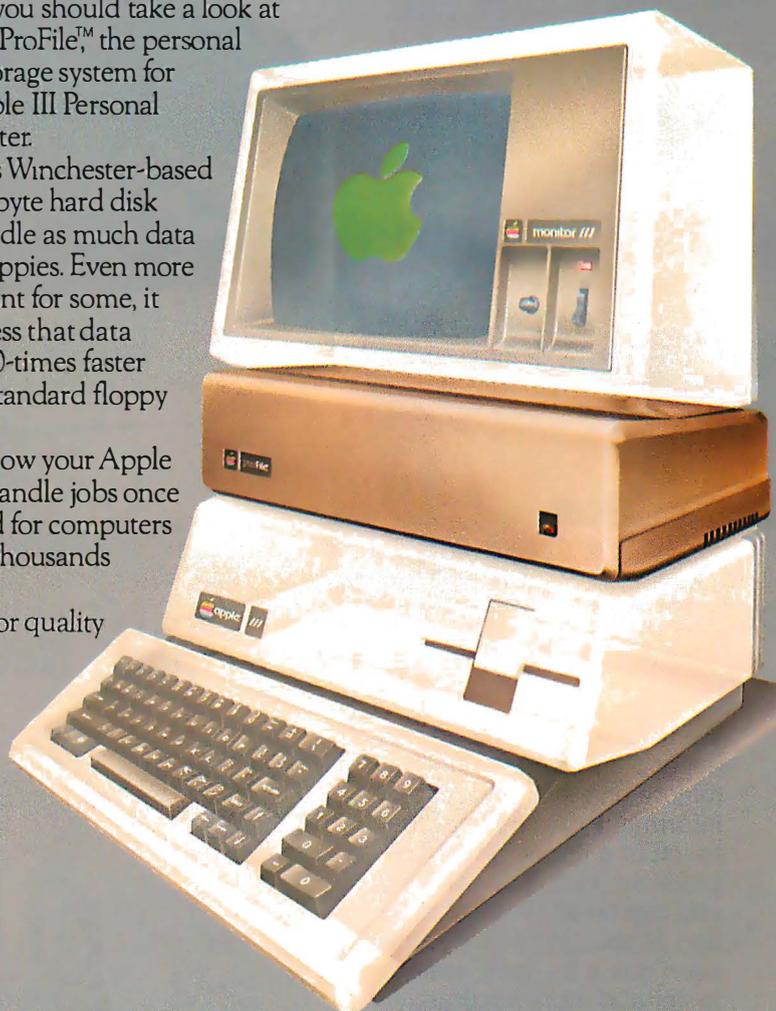
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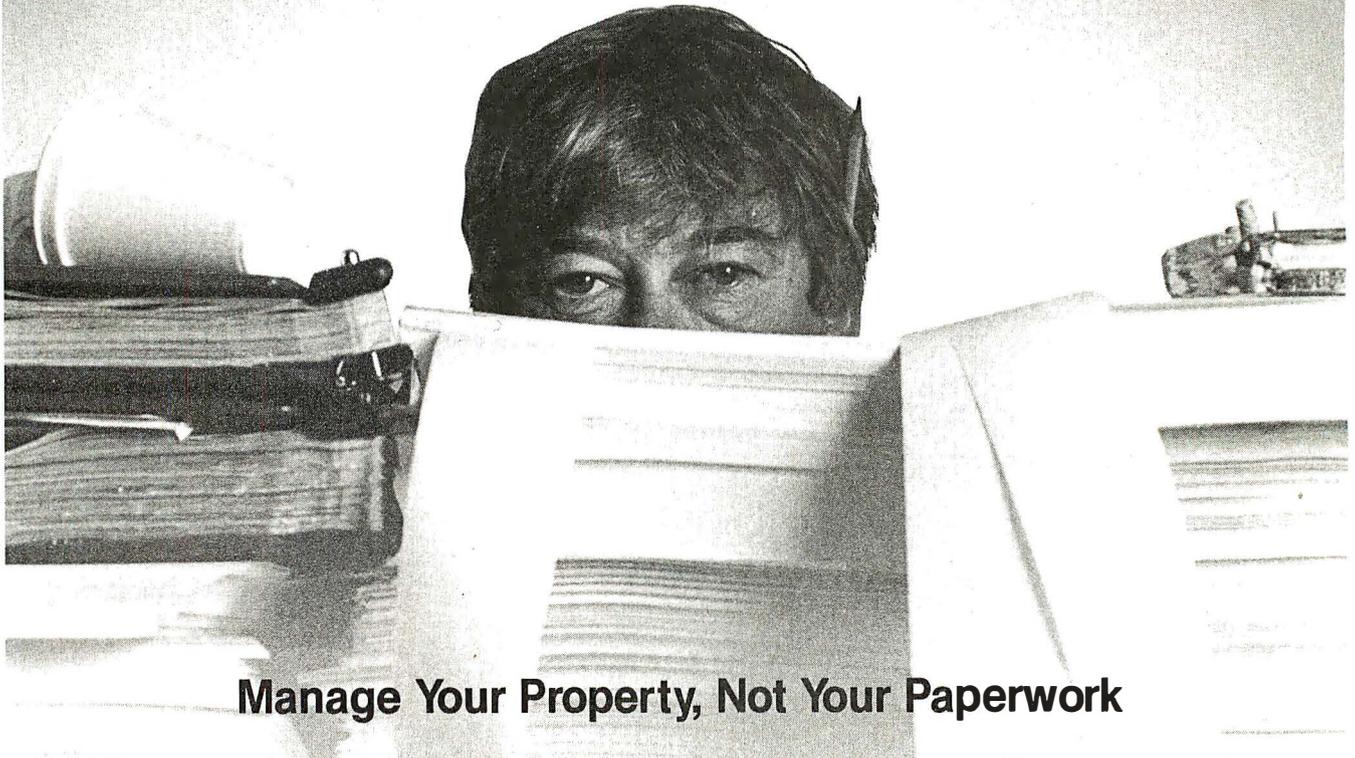
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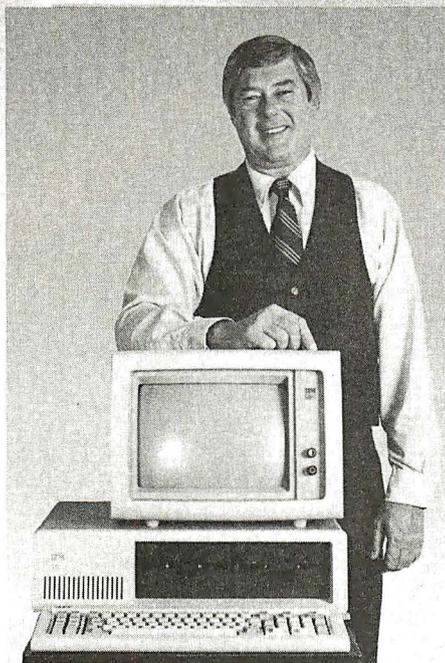


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Techniques to Enhance Data Entry Routines

by Jerry Kovacic and William Sit

In last month's introduction to this two-part article, a general scheme for data entry and correction on the TRS-80 was offered (listing 1). The scheme used concepts of flags and variables as sentinels. We also showed how to transform the BREAK key on the TRS-80 into a special function key by making it generate an error, which then can be trapped by means of standard error-trapping techniques.

In this concluding installment, we first discuss the technique of using the deliberate error generated by the BREAK key as a sentinel. Next we demonstrate the use of the BREAK key to exit "infinite" loops by a checkbook reconciliation program (listing 2). Finally we present two elegant implementations (listing 3 and 4) of the user-controlled data entry and correction scheme, one using deliberate syntax errors in the Basic program to control program flow, while the other is based on co-routines.

This is the conclusion of a two-part article. The program offered here will allow for easy correction of data entry errors.

The break key as error generator and sentinel

We are now in a position where we can make the BREAK key into a sentinel. The simple program in figure 1 demonstrates the structure and allows for experimentation. Note: Level II users should replace 17170-2 (lines 5, 10 and 110) by 16396-8.

Run this program, entering various things in response to the ? prompt. The BREAK key creates "Unprintable Error" because of the POKEs in line 10. Because of line 20, this error is trapped by the routine starting at 100. At 100, we test for this error (external code 20, ERR 38). If we find it, we immediately RESUME 130, thus exiting the error trap. If we happen to find some other error, we fix up the BREAK vector (line 110), turn off the error trap and stop. This can be tried by deliberately creating an error in the program.

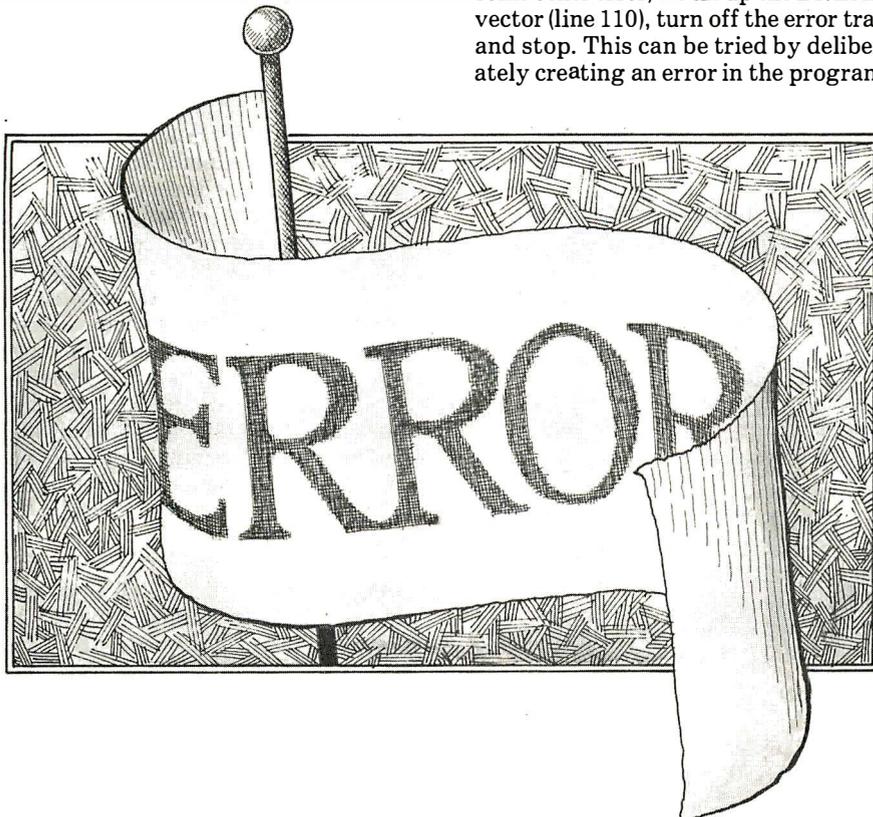
For example, change the colon in line 30 to a semi-colon. The ENTER key alone in response to the ? prompt gives nice exit from the program. It causes a jump to line 110, where the Break vector is restored and the error trap turned off. We can't stress enough the necessity of restoring the BREAK vector and turning off the error trap before exiting a program.

Break key to exit an infinite loop

The example just cited demonstrates the use of the BREAK key to exit an infinite loop (lines 30 to 60). This is not only a programming convenience, but also an operator convenience. Consider the poor clerk punching the day's invoices into the machine. Breathing a sigh of relief, he punches in the last invoice. Now what? The instruction book, which is piled under the sea of invoices, must be consulted. What was the exit code? Was it 999? or END? When in doubt, hit the BREAK key!

As another simple example, we present a checkbook reconciliation program (listing 2). First all the check information is entered. After hitting the BREAK key, the deposit information is requested. The next time the BREAK key is pressed, a summary of the account is displayed.

Only a couple points of the coding need explanation. On line 100, we immediately exit the error trap. Recall that an error within an error trap will stop the program execution. Since we immediately exit the trap, the next "error" (i.e. the BREAK key) will cause transfer to the new ON ERROR block, as we desire. Note that we do not check the type of error involved. That is because this particular program is bug-free. (Aren't they all?) Since typing mistakes are always possible, we explain how to debug this, and similar constructions, below. On line 110, we reset the ON ERROR block for the next press of the BREAK key. At line 150, we restore the BREAK vector and turn off the error



trap. Line 230 prints a row of 11 "underlines," ASCII code 95; this is the same as the usual cursor. The 4 PRINT statements on line 260 merely cause the READY prompt to be printed low on the screen, so as not to mess up the tabular display.

Since this program is written in modular structure, it is not difficult to debug. One merely debugs each module separately. To debug the first module (lines 40 to 90), merely omit lines 20 and 30 and replace line 100 with END. To debug the second block, restore lines 20, 30 and 100. Instead of line 110, put the code of lines 150 and 155 in that place. Finally replace line 150 with END. The last block may be debugged by restoring all the code as in listing 2.

Break key for data correction

The techniques to use the BREAK key and a deliberately-created error to play the role of a sentinel and invoke a subroutine call is illustrated by listing 3, which essentially is equivalent to the program in listing 1, but avoids some of the problems mentioned earlier. The BREAK key is simpler to use and can be used any time, even after data entry for the item is completed and processing has started, if you are fast enough! It does not change the value of any data variable, and thus can be used during a correction.

To use the program, the user simply enters data as prompted. He can direct the program to go back to any previous item by hitting the BREAK key any time during data input. The user thus has full control of the data entry process. Note that the main data entry routine is much simpler and more straightforward than its corresponding part in listing 1. It does not have distracting flags, testing of the sentinel and GOTOS. These instructions are now neatly grouped into one ON ERROR block.

Let's follow the logic of the program more closely. After each data entry and perhaps after processing, the ON ERROR block (starting at line 1000) is invoked, either because the BREAK key is pressed or because of a deliberate syntax error (the comma at the end of lines 50, 70, 90, 140, and 160). In the former case, we simply save the data item number where the user, hit the BREAK key (line 1030), thereby setting the flag. The user then chooses the item to which he wants to make a correction. In the latter case, the program tests the flag and determines which data item should be prompted next (line 1010), resets the flag and branches accordingly. Note that as in listing 1, a correction can be initiated (BREAK key)

in place of data entry for any element of the array (item 4), but the program will only return to the beginning of item 4 after a correction.

The program in listing 3 is very easy to code and read. After saving and fixing the BREAK vector, we simply code the instructions for data input and processing for each item, ending with a comma. These commas can be omitted entirely (for example, during debugging) and the data items will then be prompted in the order they are listed after a correction. Thus even without these commas, the user will still have the option to make corrections and to use the BREAK key to direct the program to branch to any data item. Note also the scheme used in listing 3 requires only one ON I GOTO statement (line 1100). The advantage is that if additional items are needed, it is only necessary to insert the corresponding data entry and processing instructions and to alter the one and only ON I GOTO statement. Since we do not need to explicitly count or order the data items, insertions and deletions of data items can easily be achieved.

A simple modification of listing 3 will allow one to make corrections to a group of data items instead of a single one. For example, if we want to correct items 2, 3 and 4 together, we can use a plus sign (+) instead of a comma to create a different error (missing operand error, ERR 40) at the end of items 2 and 3, thus:
70 PRINT "PROCESS ITEM #2"+
90 PRINT "PROCESS ITEM #3"+
Note that a colon is not needed. In general, the last item of a group should end with a comma, thus line 140 remains the same. The only modification to the error control routine is an additional line:
1006 IF ERR = 40 THEN I=I+1:
RESUME 110

Another way to achieve the same effect, without any modification to the program in listing 3, is as follows. (This is the answer to the quiz on listing 1. Enter the sentinel, 999, instead of the BREAK key for listing 1.)

- Step 1. Hit BREAK key (any time).
- Step 2. Answer "WHICH ITEM DO YOU WANT TO ALTER?" with the first item of the group to be corrected.
- Step 3. Hit BREAK key when prompted with the item.
- Step 4. Repeat Step 2.
- Step 5. Make correction.

The data items will be prompted in sequence. To get out of this mode, hit the BREAK key, enter data item number, hit the BREAK key again when prompted with the data item, enter the data item number again and continue normally.

Data entry with subroutines

The scheme demonstrated in listing 3 can be implemented using subroutines. Although we are convinced that our version in listing 3 executes faster and requires less memory, we shall discuss the method so that we can have a better understanding of the structure of the scheme itself.

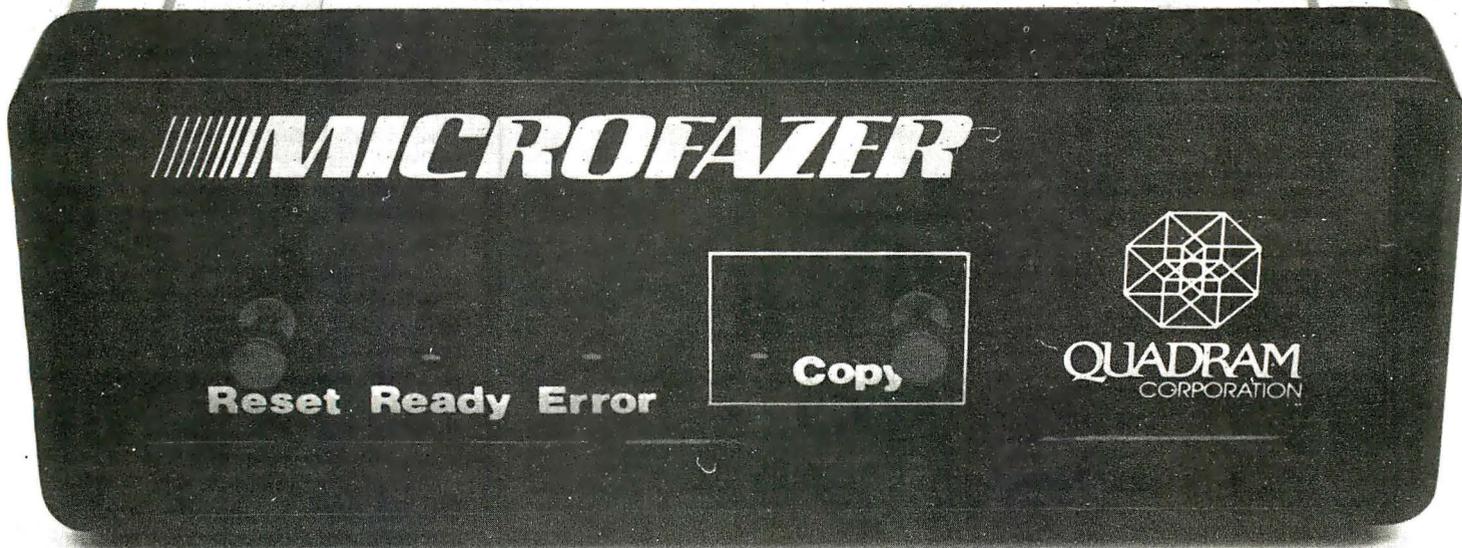
The data entry with user controlled correction program requires that each sequence of instructions for a data item and associated processing be executed under three distinct circumstances: 1) during normal data entry; 2) during a user requested correction, and 3) resumed data entry after a correction. It is natural, therefore, to implement each sequence of instruction for a data item and associated processing in the form of a subroutine. These subroutines can then be called by three control routines, represent the three circumstances mentioned above (these are called co-routines, since they pass control to and from one another). Listing 4 illustrates an implementation of the program of listing 1 in this manner.

Listing 4 is functionally equivalent (more or less) to both listing 1 and 3. It uses the BREAK key in the same way as listing 3. The routines for normal data entry and resumed data entry after correction are combined in lines 50 to 70. The correction routine starts at line 1000. A few points need to be explained.

First, a FOR-NEXT loop is used in lines 50-70. It is unusual because not only does the BREAK key cause a transfer out of the loop (to the correction routine) but after the correction, the loop is resumed! Lines 1100 and 1115 do the trick. Remember that at the time the BREAK key is hit, the program is in one of the data entry subroutines and a RETURN is therefore missing. Line 1115 supplies this RETURN. The counter variable I is decremented unless the data item corresponding to the value of I has just been corrected (that is, I1 equals I). Thus the user is returned to where he left off when he resumes the FOR-NEXT loop. Note that such construction violates two important DON'Ts: don't transfer into a FOR-NEXT loop and don't change the counter variable.

Second, a debugging aid is included in listing 4. Lines 1120 to 1150 show how one can display a normal error during execution (that is, ERR not equal to 38). In line 1140, we fix the Disk Basic bug mentioned earlier. (Level II users must omit that line.) The program as listed is bug-free, so these lines are never executed. However, since transferring in and out of FOR-NEXT loops and GOSUB-RETURNS can cause unexpected errors if

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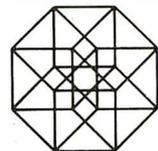
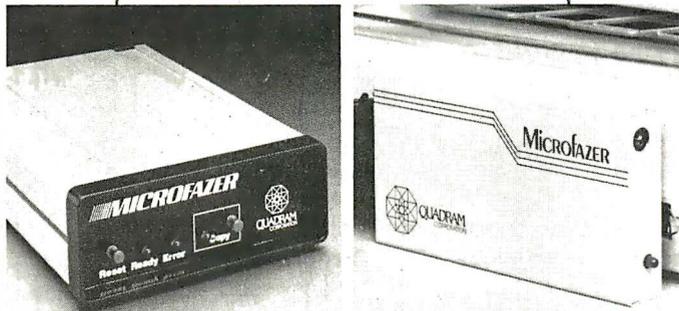
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one is not careful, such a debugging aid is strongly recommended. One can test this portion by entering a very large number to the INTEGER prompt, thus causing overflow.

Third, in order to allow for the use of the BREAK key during correction of a data entry, a counter variable 12 is used to count the number of pending RETURNS. When 12 equals zero, RETURN (line 1115) acts like a GOTO 60. When 12 is not zero, RETURN acts like GOTO 1095. Thus there is no restriction on the use of the BREAK key.

Fourth, it would be very difficult to use a numeric or string sentinel to replace the BREAK key.

Comparing listing 3 with listing 4, we can now see their similarities and thus be able to better understand how the scheme in listing 3 works. In listing 3, all three co-routines are combined into one, and the program distinguishes the three by means of the BREAK key, the comma and the value of FLAG. The sequence of instructions for each data item actually forms a subroutine, with the comma playing the role of a RETURN. Except for the first data item, these sub-routines can be placed anywhere and need not be in the order listed. The data items derive their order from line 1100 (listing 3) only. Because the Basic ROM processes errors and error traps faster than subroutine calls, listing 3 is both memory and time efficient.

To demonstrate the last statement, run and time the two programs in figure 2. Get out your stopwatch. (DOS users can, of course, use the TIME\$ function before and after the loop.)

The timings we obtained were 56 seconds for Program A and 22 seconds for Program B. When I was replaced by 1% in both programs, the timings were 47 seconds and 14 seconds. □

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Continued on page 138

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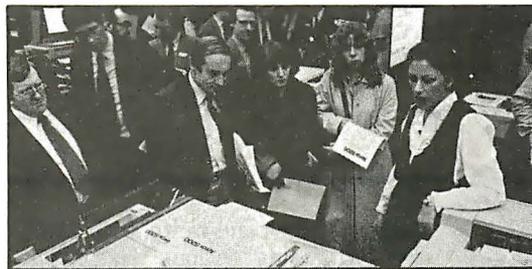
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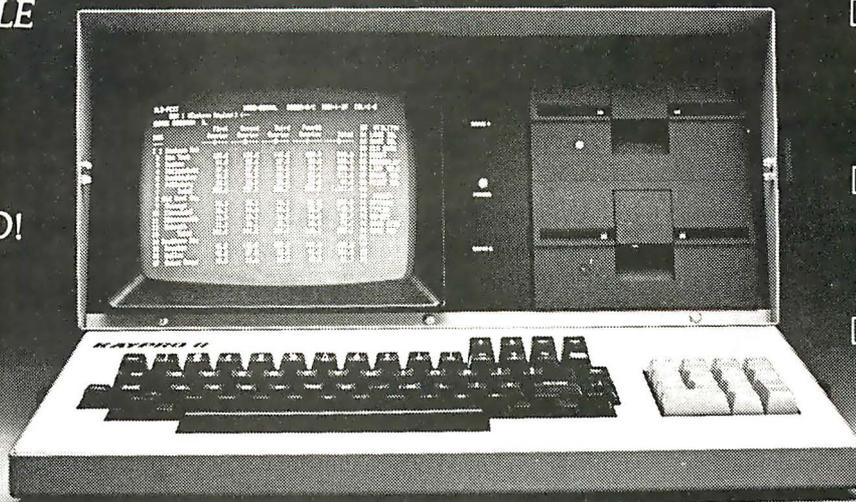
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15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345

Please complete the following information: (ONE check per question)

- 1 My field is:
 - Accounting
 - Business
 - Engineering
 - Finance
 - General
 - Health
 - Home
 - Industrial
 - Insurance
 - Law
 - Life Sciences
 - Marketing
 - Medicine
 - Military
 - News
 - Other
- 2 My profession is:
 - Accountant
 - Architect
 - Attorney
 - Engineer
 - Executive
 - Financial
 - General
 - Health
 - Industrial
 - Insurance
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 - Military
 - News
 - Other
- 3 I need the information for:
 - Personal use
 - Business use
 - Research
 - Reference use
- 4 My application is:
 - Accounting
 - Business
 - Engineering
 - Finance
 - General
 - Health
 - Home
 - Industrial
 - Insurance
 - Law
 - Life Sciences
 - Marketing
 - Medicine
 - Military
 - News
 - Other
- 5 I use my computer for:
 - Accounting
 - Business
 - Engineering
 - Finance
 - General
 - Health
 - Home
 - Industrial
 - Insurance
 - Law
 - Life Sciences
 - Marketing
 - Medicine
 - Military
 - News
 - Other
- 6 My computer budget is:
 - \$0 - \$100
 - \$100 - \$200
 - \$200 - \$300
 - \$300 - \$400
 - \$400 - \$500
 - \$500 - \$600
 - \$600 - \$700
 - \$700 - \$800
 - \$800 - \$900
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for use with the program will be available, each of which will contain several predefined models to solve particular problems in a given field. The products will initially be available for the IBM PC and the Apple II, with other versions to follow.

Software Arts, Wellesley, MA.

CIRCLE NO. 201 ON INQUIRY CARD

Application versatility

VisiON (Operating eNvironment) allows any personal computer user to easily work with a number of application products at one time. Applications are displayed on a screen that corresponds, visually and dynamically, to a business professional's desktop. Each application, presented like a piece of paper, appears on the screen as a window. The user accesses one or multiple applications and transfers data between them with a pointing device called a mouse. The mouse responds easily and moves the screen cursor as if it were an extension of the user's arm. Once users learn the simple command technique and the basics of any application, they can readily apply that knowledge to any other application. One window may show a current word processing



draft while a second may display related spreadsheet calculations. Users can view simultaneously the separate results of each application and combine them into a single document. Users working on one application and wishing to begin another simply move the mouse to the desired window, push the select button, and open that window and its related application. To open new windows or close existing windows, users move the cursor to the appropriate command located on the command line at the bottom of the screen. Multiple windows can be sized and relocated on the screen using the Frame command, and data can be moved from one window to another using the mouse and the Transfer command. The product is an open-ended operating environment, which is machine and operating system independent. It is not an operating

system, but an applications environment, designed to run on top of the underlying host operating system. It will support multiple application products. The host layer provides the means of adapting the VisiON environment to other processors and operating systems. Therefore, VisiON will be portable across a broad spectrum of manufacturers' hardware and can run a wide range of applications products. The initial VisiON offering will include the key application products, e.g., spreadsheet, word processing, database management and graphics.

VisiCorp, San Jose, CA.

CIRCLE NO. 202 ON INQUIRY CARD

Word processors

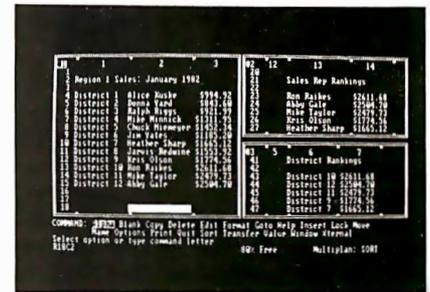
VisiWord and VisiSpell word processing programs are designed to take full advantage of the IBM PC. The VisiWord program provides a number of features and menu selections that virtually eliminate the need for a reference manual. The VisiSpell program is a companion spelling checker, which adapts its correcting technique to each user. Both products are designed to integrate with the VisiSeries business programs. The products include features that make it easy to incorporate VisiCalc models into finished documents. Functions such as "Column Copy" and "Column Move" make it easy to manipulate this spreadsheet material. Users can relearn quickly both VisiWord and VisiSpell. All functions can be selected either by pointing at the menu using the cursor keys or by using programmed function keys that are clearly labeled. VisiWord has all of the standard features of word processors, including word-wrap, auto-correction, and justification. It dynamically justifies and formats text so what the user sees on the screen always corresponds to what is printed. It includes powerful document formatting features that allow users to change vertical and horizontal spacing, margin settings and justification throughout the document. It fully supports a wide range of popular printer models and allows automatic bi-directional printing, underlining, bold face, superscript, microspace justification and user-defined setup strings. It also supports spooling. The VisiSpell program includes a dictionary of over 100,000 words and a word "guessing" feature that adapts to the errors most common for a particular writer. The dictionary can be supplemented with words used frequently by each individual.

VisiCorp, San Jose, CA.

CIRCLE NO. 204 ON INQUIRY CARD

Spreadsheet for IBM

The electronic worksheet, Multiplan, is now available for the IBM PC. Working closely with IBM since the Personal Computer's inception, Microsoft furnished the original operating system, the Basic interpreter and compiler; three other languages (Fortran, Pascal and Cobol); a macro assembler and four other application packages. Multiplan will have the full capability of the planning and modeling software



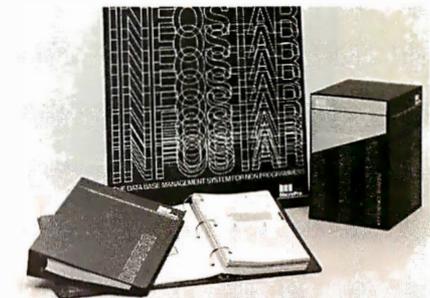
tool. In addition, it has been customized to take advantage of the full IBM keyboard, including function keys. Users also have the added capability of "painting" blocks or windows of information, selecting from a pallet of 16 colors.

Microsoft, Bellevue, WA.

CIRCLE NO. 205 ON INQUIRY CARD

User-friendly DBMS

InfoStar provides easy-to-use on-screen menus in simple English, which guide the user through each step of data entry form design and detailed report generation. Other command-driven DBMS products require the user to master a complex set of programming procedures. Four levels of help menus are provided to assist the novice as well as the sophisticated computer



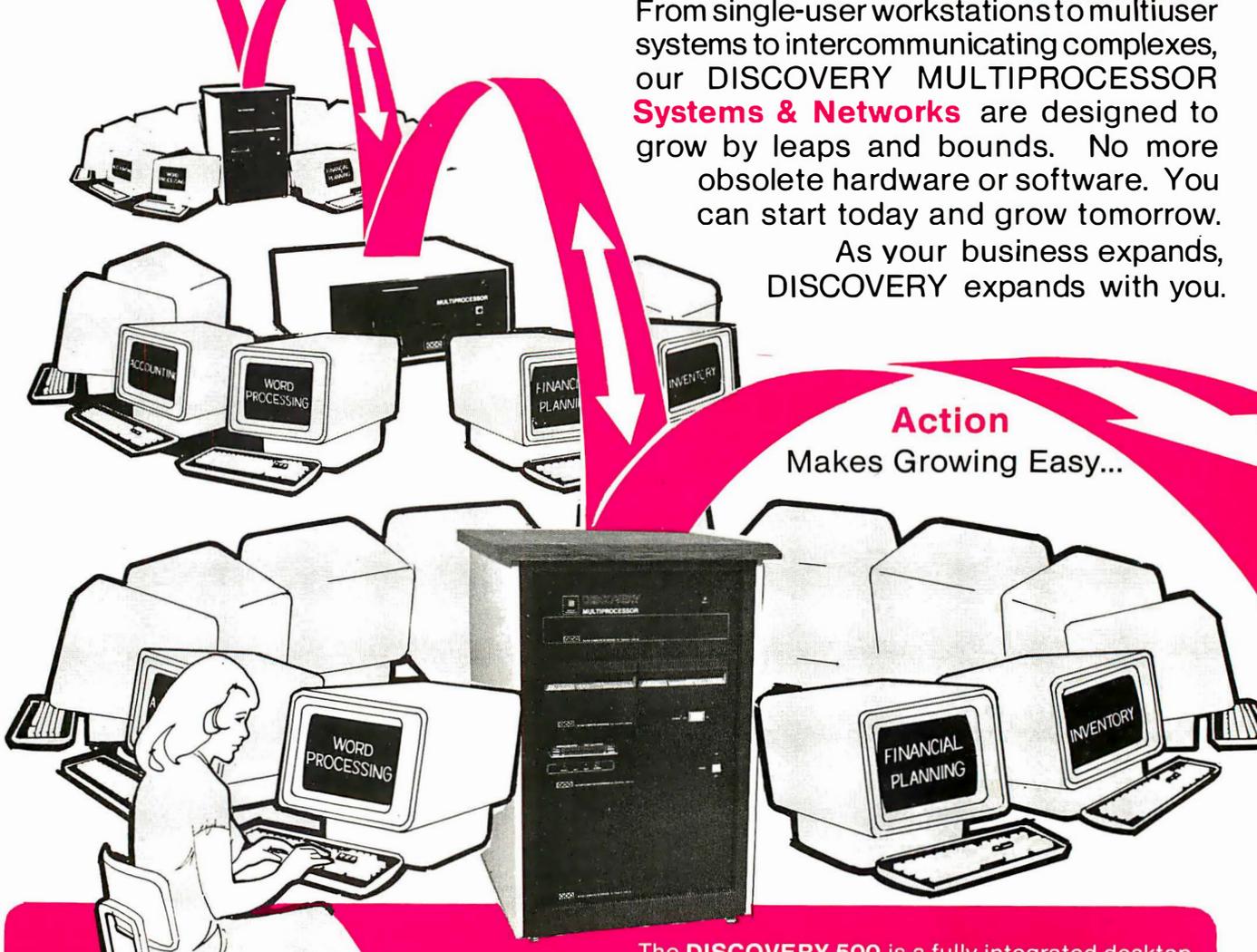
user. To provide additional help in report generation, the program offers an index from the help screens to the user reference manual. Other advanced features include a powerful form generator and a sorting facility. Specifications include: variable length records; 65,535

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maximum records per file; 120 maximum characters per key field(s); 254 maximum characters per non-key field; 255 maximum fields per record; nine control breaks; 32 sort fields; 200 maximum data edit/mask combinations; files created can be used with WordStar; can use files created with CalcStar; operating system: CP/M 2.2 or higher; 48K bytes minimum user memory; dual floppy drives or single floppy with hard disk recommended; can be used with dot matrix or letter quality printer.

MicroPro, San Rafael, CA.

CIRCLE NO. 206 ON INQUIRY CARD

File management

SuperData-File Manager is a CP/M-based program. The program performs many time-consuming office chores—filing, searching, information organization, invoice arithmetic and printing, etc., even mail-list generation. In effect, it is an electronic file cabinet, in which detailed information can be stored for later recall and by which information can be sorted, compiled, and otherwise manipulated from a keyboard. The program permits up to 40 fields, a record size of 1023 bytes and 32,000 records per file. Among the capabilities, the user can add or delete information at will, or simply browse; search for and update stored data; sort up to 16 fields at once; and link files as desired to form larger, more complete structures. Another capability is that it can create the same field twice in a screen, so that the user can keep a name on-screen while bringing up other information.

Sorcim, San Jose, CA.

CIRCLE NO. 207 ON INQUIRY CARD

Graphics package

SuperChart runs under the CP/M-80, CP/M-86, or MS-DOS operating systems. The program generates presentation-quality line graphs, bar charts, and pie charts, in color or monochrome. It supports a variety of output devices, including graphics terminals, plotters, color and monochrome printers, and direct graphics memory. The program provides its user with automatic access to SuperCalc files and plots data from them, using that spreadsheet's row and column designations. It also offers highly flexible ways of specifying labels, legends, etc., as well as automatic formatting, scaling, and pattern-fill. Other major features are full-time availability to help menus and texts (with Sorcim's AnswerKey); a capability for multiple plots, with user-specified plot windows for them; full exploitation

of pointers; full control of axes, grid, ticks, box, legend and label display; and multiple character fonts for labeling, with full control of character size and position.

Sorcim, San Jose, CA.

CIRCLE NO. 208 ON INQUIRY CARD

Sophisticated text processing

SuperWriter is a full-featured word processing system, and also incorporates mailing-list/form letter generator capabilities and a dictionary for the checking and correction of spelling and typographical errors. SuperWriter is easy-to-use and comprehensive, offering all the functions needed to set words into print. With it, a user can create, edit, proofread, and print reports, letters, and other documents, error-free and without repetitive text entry. The unique command structure, shared across the SuperWare product line, allows users to easily interface with other programs without having to learn new commands and codes. The recently-introduced SuperData Interchange (SDI) is also included within SuperWriter. SDI allows any Sorcim or CP/M-based product to share information with SuperWriter and vice-versa. The program runs under the CP/M-80, CP/M-86, MP/M and MS-DOS operating systems. A minimum of 56K bytes of microcomputer internal memory is recommended. Most popular terminals are supported by the program; it also supports a broad array of dot-matrix and letter-quality printers.

Sorcim, San Jose, CA.

CIRCLE NO. 209 ON INQUIRY CARD

Programmable spreadsheet

EasyPlanner is aimed primarily at middle management users in the general business audience. However, it is also applicable to professionals such as physicians and attorneys, whose financial analysis applications are often too complicated to be performed efficiently in a step-by-step manual system. Unlike other spreadsheet programs, EasyPlanner is programmable, allowing the user to specify the steps he needs to take in performing financial worksheet calculations. It is also powerful in its ability to combine and consolidate worksheets. Employing this feature, a divisional manager in an organization can work out his budget, then have an assistant consolidate it into the overall corporate budget without having to do that himself.

Information Unlimited Software, Sausalito, CA.

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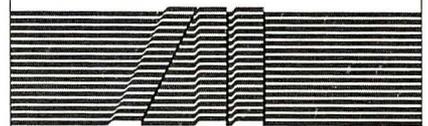
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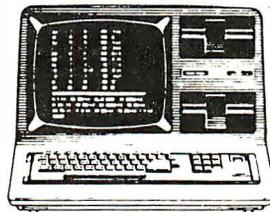
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Multiple applications

The Incredible Jack is an integrated personal filer, calc analysis, word processing, and mailing list management package for the Apple computer. The program allows users to create letters and reports with embedded calculations. The word processing capabilities enable the creation of neatly-formatted records and can include items that are automatically calculated as the document is being prepared. Users can arrange information in files they design themselves using Jack's personal filer. As many as 1,000 records can be stored on a single disk. The calc features enable users to build decision-making logic into their files. With English language calculation rules and a powerful if/then/else function, it is possible to perform complex calculations instantly. The inexpensive program requires an Apple II with 16K memory extension (64K total memory) and two disk drives.

Business Solutions Inc., Kings Park, N.Y.

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Business analysis

The Bottom Line Strategist was developed to serve Fortune 1000 forecasting needs. The Strategist, a visual econometric forecasting tool, provides bottom-line answers for future business ventures—without programming, using formulas or complex spreadsheets. With complete and sophisticated models, The Strategist easily allows business executives to analyze and track intricate business scenarios. The Strategist employs simple and direct user input of business assumptions and displays 11 different types of financial and marketing forecasts. Key strategist considerations include how profitable business will be, how much

money is being risked, and when break-even points will be established. Ashton-Tate, Culver City, CA.

CIRCLE NO. 213 ON INQUIRY CARD

Report writer

The Team Manager is a report writer and data formatter. The product allows a user to create new reports using the data files from Open Systems' accounting applications. In addition, the program can reformat data from the accounting applications for use by popular word processing, spreadsheet and database management systems. The program will be available in Business Basic running under CP/M, MP/M, CP/M-86, MP/M-86, MS-DOS, PC-DOS and Xenix. The product will be available for single- and multi-user configurations. The program also interfaces with Open Systems' Software Fitness Program accounting applications for creation of simple and complex reports. It provides a method of formatting the Basic accounting files to interface to other popular applications including word processing, spreadsheets and database management systems. It allows simple graphic representation of data, and provides a method of formatting the accounting data files to allow micro-to-micro, micro-to-mainframe and network data transfer.

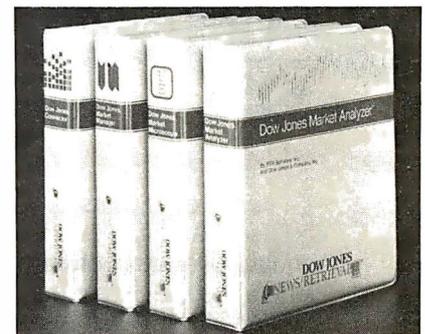
Open Systems, Minneapolis, MN.

CIRCLE NO. 214 ON INQUIRY CARD

Investment software

The Dow Jones Market Analyzer automatically collects, stores and updates stock market data that can be used to construct charts for technical analysis. The Dow Jones Connector provides the user with easy access to the news, facets and data contained in the Dow Jones News/Retrieval databases. Two

other products are available: the Market Microscope sorts and ranks companies and industries by 68 financial indicators; the Market Manager automatically updates and monitors investment portfolios. All four packages feature easy access to the Dow Jones News/Retrieval Service, which now has more than 50,000 users. The Dow Jones Connector is designed for use with



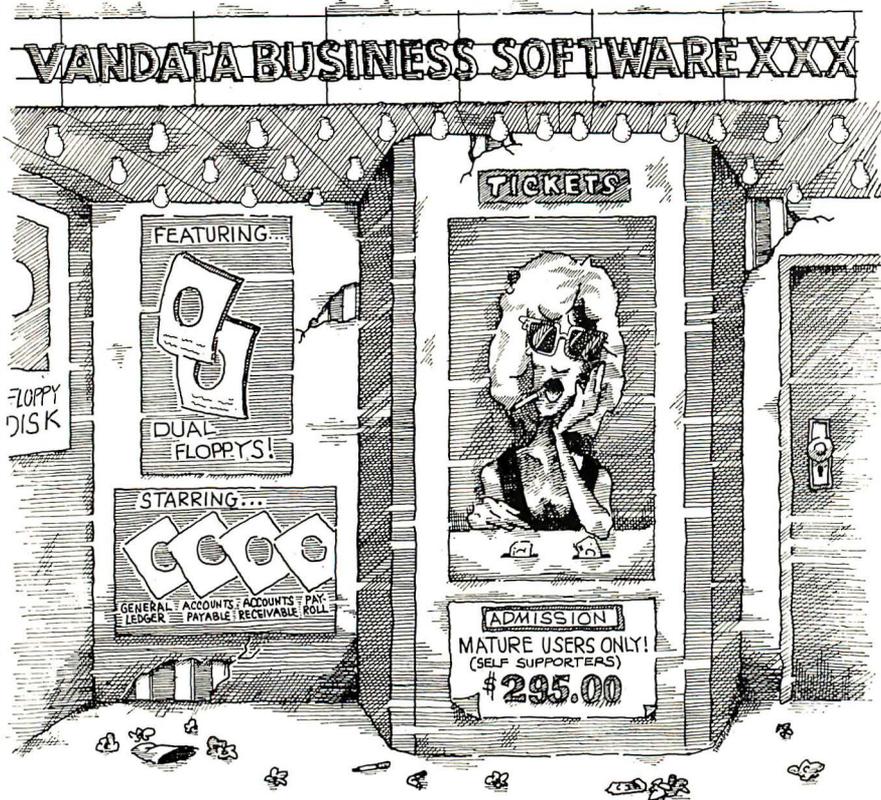
personal computers, plus word processing or standard time-share terminals with telecommunications capability. The Market Analyzer, Microscope and Manager are designed initially to work with Apple II and Apple III computers. Dow Jones and Company, New York, NY.

CIRCLE NO. 216 ON INQUIRY CARD

Medical/dental accounting

Medical and Dental Receivables Management packages are available with source code written in dBASE II running under CP/M, MP/M-I, or MP/M-II. The package can be customized or integrated with other software to include word processing, spreadsheets and other applications. The packages include normal account billing, payment-contract account billing, automatic finance charge, automatic aging of balances, co-insurance coverage, automatic recalls, patient records and

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Data Systems Northwest, Chehalis, WA.

CIRCLE NO. 217 ON INQUIRY CARD

BUSINESS SYSTEMS

16-bit desktop

The Mad-1 computer is designed to run a future generation of innovative, powerful software. The system operates on Concurrent CP/M-86 and MS-DOS, which allows access to the largest library of microprocessor software applications. The system presents a unique appearance with its highly-stylized, modular design. Its four basic, low-profile units, the Data Module, the Computing Module, the keyboard, and display station, can be arranged to the user's preference. The modularity of the system permits the user to take only what he needs for present requirements. As these requirements grow, he



can add capabilities. There are two board slots for additional functions in the CPU Module, and four in an Expansion Module. Planned future features include networking, mathematics processing and typewriter-oriented processing. The system processes with an Intel 80186, and its 128K bytes of dynamic RAM. The Data Module, which measures only 12.5-by-15-by-2.3-in., houses half-height disk drives. A user may have one floppy drive, or two floppies, or one floppy and a hard disk. The hard disk is available in both fixed and removable media. The system supports an external add-on disk of 5-, 10- or 25M bytes capacity.

Mad Computer, Santa Clara, CA.

CIRCLE NO. 218 ON INQUIRY CARD

Multiuser desktop

Seiko Series 8600 is a 16-bit, Intel 8086-based multiuser desktop system offering two single-user and four multiuser operating systems supporting six standard languages and numerous



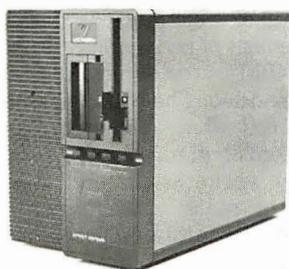
applications. Positioned as a desktop, terminal-based, one- to four-user system, the minimum practical multiuser Series 8600 configuration offers 128K bytes of memory, one 640K-byte diskette, a 10M-byte hard disk with one terminal, and multiuser operating systems software. An average three-user configuration offers 256K bytes of memory, one 5.25-in. diskette offering a 640K-byte capacity, a 10M-byte hard disk, four RS-232C serial I/O ports, and a Centronics-compatible parallel port, plus a typical multiuser operating system.

Sci-Com Computer Systems, Bridgewater, NJ.

CIRCLE NO. 219 ON INQUIRY CARD

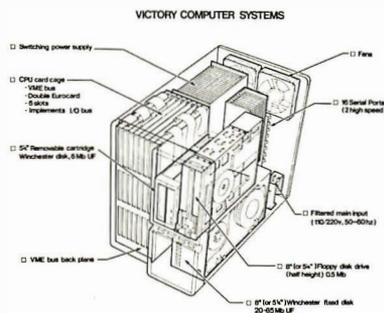
Multi-user supermicro

The Victory Spirit series is an Intel 80186-based system supporting CP/M-86, MP/M-86, and CP/M-80 operating systems for up to 16 fully supported



users. The Spirit is targeted to professional, legal and financial services firms with requirements for powerful, reliable, growth-oriented computing. The product line combines functionally dense single-board computer (SBC) architecture in conjunction with the new VME bus, a joint standard of Motorola, Philips/Signetics and Mostek

corporations. The high-speed VME bus makes possible the combination of



multiple 8, 16, and 32-bit microcomputers with high performance peripherals in a modular, desktop multi-user system. The union of bus and board technologies facilitates system performance, maintenance and expansion.

Victory Computer Systems, Campbell, CA.

CIRCLE NO. 220 ON INQUIRY CARD

IBM PC-compatible computers

Corona PC line shares complete software and hardware compatibility with the IBM PC, while also offering capabilities for extensive expansion not available in the IBM version. Standard unit includes a 320K half-height diskette drive, a high resolution green-phosphor monitor, 128K bytes of memory, both a serial port and a parallel port, high resolution graphics, MS-DOS, Basic with graphics commands, and a spreadsheet software package. A second half-height floppy diskette drive and/or a



10M-byte hard disk can be added. In the standard-size Corona PC, two floppies and the hard disk can be installed directly into the computer, with no external attachments. The Corona PC family employs an Intel 8088 microprocessor, as does the IBM PC, to provide 16-bit computing capabilities for individual users. An optional 8087 floating point co-processor is available for even higher speed in applications involving a great deal of floating point arithmetic. The standard monitor is a very high-resolution, high-contrast



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CIRCLE NO. 50 ON INQUIRY CARD

monochrome display. In conjunction with this monitor, monochrome high resolution graphics are a built-in feature in every system, costing no extra and not utilizing an expansion slot. Graphics are displayed directly on the standard monitor, rather than requiring a second screen, as does the IBM PC. Graphics can be mixed with standard text on the screen, enabling software to intermix descriptions and callouts with graphics presentations.

Corona Data Systems, Westlake Village, CA.

CIRCLE NO. 222 ON INQUIRY CARD

Apple II- and CP/M-compatible system

The Ace 1200 features 128K bytes of RAM, a disk drive, disk controller, 80-column card, CP/M card, upper and lower case capabilities, a serial/parallel interface and color graphics. The unit has true upper and lower case capabilities. The 72-key keyboard is laid out in typewriter-style, making it easier



to learn and faster to use. It includes up/down and left/right cursor control keys, an alpha lock key, a numeric pad and keys with designations frequently used with VisiCalc. The serial and parallel interfaces permit the Ace 1200 to be connected to local and remote printers, display terminals and other computers and accessories. The 80-column card expands the display capabilities to a full 80 columns-by-24 lines. It operates automatically, switching between 40 and 80 columns to suit the program in use.

Franklin Computer Corp., Pennsauken, NJ.

CIRCLE NO. 223 ON INQUIRY CARD

Upgradeable computers

Voyager 4000 Series computers are complete with bundled software consisting of word processing, spreadsheet with graphics, database management, mailing list, payroll, Telex, executive time management and CP/M operating system. The basic Voyager system combines two 5.25-in. double-sided, double-density floppy drives (1.2M bytes), with

an 8085-based CPU, addressing 64K bytes of RAM upgradeable to 8085/8088, 8/16 bit co-processor addressing 1,000K bytes of RAM. Up to 20M bytes of plug-in hard disk storage is available. RS-422 and RS-232C ports are included. The system is a compact, ergonomically designed self-contained unit with a desktop non-glare and unusually sharp 12-in. video monitor. The monitor has its own memory and uses an 8-by-12 matrix on



a 10-by-14 grid (80 column-by-24 lines) with a choice of three display colors. Voyager's monitor adjusts up/down and rotates 359 degrees. Its detachable keyboard has 100 five function definable keys and a 10-key calculation pad.

Voyager Systems, Newbury Park, CA.

CIRCLE NO. 224 ON INQUIRY CARD

Battery-powered portable

The Athena I features 512K bytes of solid-state storage. This "pseudo-disk" storage allows very high performance with no moving parts. The dual low power NSC-800 processors allow for use of the CP/M operating system. The



system includes 64K bytes of main memory for computation and 4K bytes of memory for communications. A full-size, high-quality keyboard and a four line-by-80 character display make the 15-pound computer easy to use. A full 24 lines-by-80 characters of information are held in memory. This allows the four-line display to act as a window to look at any desired area at will. A 5.25-in. floppy disk drive and power supply/recharger are included. The floppy disk

drive allows easy loading of software and backup of data. The power supply and recharger for the computer operates on 120 VAC or 9 to 35 volts DC or AC (45 to 500 Hz). Up to 15 computers may be connected in local networks.

Athena Computer & Electronic Systems, San Juan Capistrano, CA.

CIRCLE NO. 225 ON INQUIRY CARD

Dual processor-based micro

The System 816 family is configured around an 8085/8088 CPU, and offers performance capabilities ranging from a single-user workstation to a high performance multi-user system supporting 16 users under MP/M 8-16. The System 816/A includes CompuPro's 8085/8088 CPU board running at 6 and 8 MHz, 128K bytes of high-speed RAM, four serial ports, one parallel and one Centronics/Epson port, and two 8-in. floppy



disk drives storing 2.4M bytes. CP/M 80, CP/M-86, SuperCalc-86, and dBASE II are standard software offerings. The System 816/B provides the same CPU board and software as the System 816/A, but contains 256K bytes of RAM and six serial ports, to support additional user workstations and a wider complement of peripherals. For example, up to 40M bytes of hard disk storage can be added. The top-of-the-line System 816/C offers even more flexibility of system configuration for supporting 16 user workstations and a complete range of mass storage peripherals. MP/M 8-16 is offered standard with this model, which also incorporates 384K bytes of RAM, nine serial ports and 2.4M bytes of floppy disk storage. As with the other two versions, this multi-user configuration is expandable to 1M-byte of RAM, 4.8M bytes of floppy disk storage, and up to 40M bytes of hard disk storage. SuperCalc 86 and dBASE II, CP/M-80, and CP/M-86 also are standard.

CompuPro, Oakland Airport, CA.

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Ashton-Tate

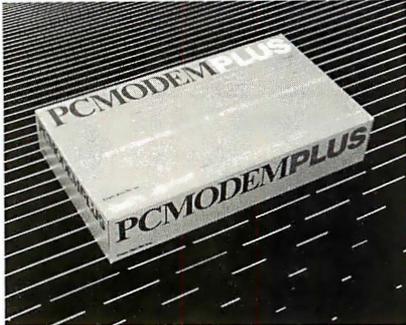
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CIRCLE NO. 85 ON INQUIRY CARD

DATA COMMUNICATIONS

IBM PC communications

The PC Modem Plus is a communications package for the IBM PC. The package contains everything needed to communicate with independent infor-



mation services such as The Source, Dow Jones News Retrieval services and to send electronic mail. Everything comes in one box: a microprocessor-based, auto-answer/auto-dial 300 baud

modem complete with a buffer, an extra serial port and high speed expandability; full-service, menu-driven communications software; complete instructions and a standard modular phone cable. The modem is expandable to 1200 baud full duplex (212-A compatible) communications with the addition of a piggyback card.

Ven-Tel, Santa Clara, CA.

CIRCLE NO. 229 ON INQUIRY CARD

Communications processor

The Professional Communications



System (PCS) includes a Bell 212A or

Bell 103-compatible modem and up to 64K RAM of message buffer. The PCS/1200 and the PCS/300 provide unattended, scheduled, error-free message reception and transmission even while the personal computer is running other applications such as word processing or VisiCalc. The PCS is designed primarily for use in medium to large corporations, or by individuals who want to share files with other personal computers and who want access to centralized databases or public information utilities.

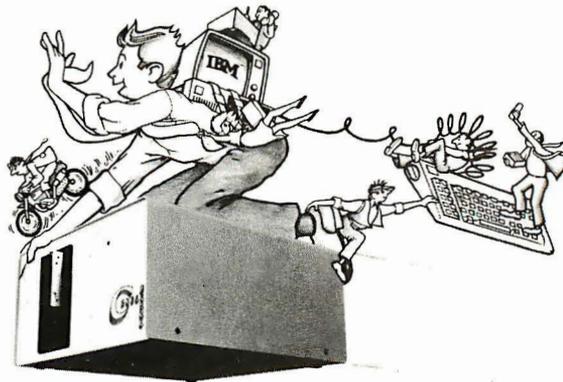
Microcom, Norwood, MA.

CIRCLE NO. 230 ON INQUIRY CARD

Local area network

LINC (Local Interactive Network Communications) utilizes inexpensive telephone wire to interconnect the Vector 4 family of single-user microcomputers into a flexible and expandable multi-user system. The LINC network can be installed simply and easily and permits the sharing of large disk files, high-speed printers, communications facilities and electronic mail service by

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The software is available on a variety of industry-standard Operating Systems including CP/M⁵ - MP/M⁵ (both -80 & -86), OASIS⁶, PC DOS, and UNIX⁷. Inquire for specific details and prices.



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any Vector 4 Company Computer attached to the network. Each workstation can support an individual printer and retains full capability as a stand-alone word or data processor for non-network functions while connected to the network. LINC is a high-speed,



token-passing network, using a distributed control technique that eliminates the need for a costly dedicated master station or a file server. A Vector 4 becomes LINC-compatible by simply installing a SABER-Net controller board into one of its card slots. A LINC-enhanced version of the Vector 4 CP/M operating system is also required. The Vector 4 is then connected to the network by simply plugging it into the wall-mounted LINC modular socket. Because of the simple plug-in concept, a workstation can be quickly disconnected from the network and moved to another location reconfiguring the system.

Vector Graphic, Thousand Oaks, CA.

CIRCLE NO. 231 ON INQUIRY CARD

CP/NET version

CP/NET Version 1.2 extends the power of CP/M into a networked environment. It provides the user with the ability to share common information and resources, while at the same time maintaining the convenience and privacy of a single-user operating system. The CP/NET operating system allows several CP/M systems to access and share resources over a network at the same time. Like CP/M, CP/NET is divided into a set of system-independent modules and a set of physical drivers. Using this approach, CP/NET can be run on any 8080-, 8085-, or Z80-based system, and can use virtually any network hardware to achieve network communication between computer systems. CP/NET includes several utilities for managing a network environment and handling electronic mail. CP/NET now provides CP/M many of the capabilities of the MP/M II operating system. These include support for shared files, record

lock and unlock primitives, enhanced error handling, and password protection of files. These capabilities allow virtually all CP/M applications and even many MP/M II applications to run in a networked environment.

Digital Research, Pacific Grove, CA.

CIRCLE NO. 232 ON INQUIRY CARD

GRAPHICS

Graphics for IBM PC

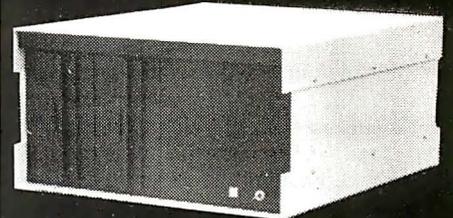
BPS Business Graphics is primarily a tool for management. It enables IBM PC users to create a variety of multi-color charts and graphs using simple, English-language commands. Data for the graphs may be entered directly from the keyboard, or extracted from VisiCalc and SuperCalc models, accounting



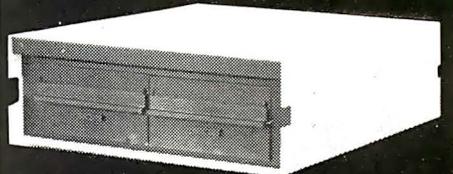
reports, and word processing documents. Hard-copy output may be obtained from any of 40 printers and plotters. BPS Business Graphics can create graphic formats that include lines, horizontal and vertical bars, multiple bars (up to four sets), pies, partial pies, areas, points, and any combination of these on the same axes. Users can create horizontal and vertical grid lines as well. In addition, the commands that generate frequently-used graphs can be stored on diskette, enabling PC users to create or update standard graphic reports automatically. Adding to its decision support utility, BPS Business Graphics can perform several statistical functions: moving average and exponential smoothing; curve fitting and specification by constant, line, logarithm, parabola, and sine; and calculation of minimum, maximum, sum, mean variance, and standard deviation. Hardware requirements include an IBM PC equipped with 128K bytes of main memory, two disk drives, a color graphics adapter, and a standard video monitor. With this package, users can generate graphs on the console and create hard-copy output on any of more

Main/Frames Main/Frames from \$200

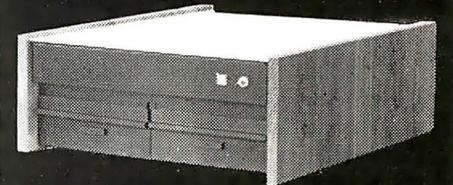
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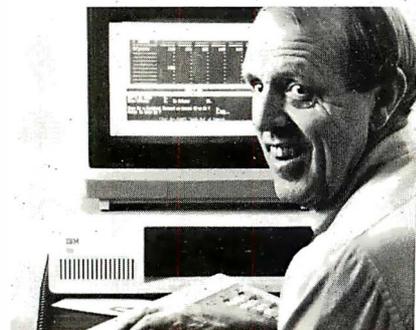
than 40 printers and plotters.

Business and Professional Software, Cambridge, MA

CIRCLE NO. 233 ON INQUIRY CARD

Decision support system

Graph 'n' Calc for the IBM PC is designed as a low-cost business graphics system with an advanced calculation facility. It is an ideal extension of a VisiCalc or Desktop Plan financial modeling system. It provides advanced statistical and financial functions, like multiple linear regressions, net present value, internal rate of return and exponential smoothing, that the standard spreadsheet programs don't have. All these functions are menu-driven and presented in a well-organized table on the computer screen. Because the IBM



PC supports high-resolution color graphics, a user can use Graph 'n' Calc to make detailed line charts, side-by-side and stacked bar charts, high/low/close/volume stock market charts, and a variety of labelled pie charts from Graph 'n' Calc or DIF files. DIF files, an acronym for Data Interchange Format, are a means of passing data from one Visi-series program to another, e.g. from VisiCalc to Desktop Plan to Graph 'n' Calc. To make these charts even more accessible, Graph 'n' Calc can organize them in a slide-show fashion, allowing a user to call up from a diskette a whole series of charts on an elapsed time or individually-keyed basis. Hardcopy can be produced on Epson MX-series printers with the Graphtrax option or with low-cost color pen plotters by Hewlett-Packard.

Desktop Computer Software, Santa Cruz, CA

CIRCLE NO. 234 ON INQUIRY CARD

Graphics for Advantage

The North Star Graphics Family will run under the version of CP/M that is especially designed for the Advantage. The products include BusiGraph II, an upgrade of North Star's current business graphics package; ImageMaker, which allows the creation of free-form graphics from scratch; GraphMate,

which provides interfaces with business application packages such as MicroPlan and dBASE II; and GraphicsLibrary and GraphicsLibrary-16. One of the most important features of the new software is its ease of use and flexibility. Secondly, the interfaces provided by GraphMate eliminate re-keying of data, which reduces the possibility of error and dramatically increases productivity. The ImageMaker package gives business users access to presentation-quality graphics. BusiGraph II is the heart of the family, offering all standard graph and chart types, a user-determined number of graphs per page, and 16 texture patterns for filling in the graphs. This offers the user a degree of dynamic interaction and visibility that cannot be achieved with tables of numbers.

North Star Computers, San Leandro, CA

CIRCLE NO. 237 ON INQUIRY CARD

PFS:Graph on Apple III

PFS:Graph is available for the Apple III. It is the first graphics package that can work alone or directly with PFS:File or VisiCalc to produce bar, line or pie charts of presentation-quality in minutes. Line and bar graphs can be mixed and matched, and up to four graphs can be displayed on a single set of axes. Bar graphs can be stacked or comparative. Other features include automatic formatting, scaling, legend labelling and pattern fill. It interfaces with a variety of popular graphics printers as well as the low-cost HP 7470A plotter. In addition, a picture file can be saved for use with printers not supported by PFS:Graph.

Software Publishing Corp., Mountain View, CA

CIRCLE NO. 238 ON INQUIRY CARD

MISCELLANEOUS

English language commands for 16-bit micros

CP+ is a control program providing micro operators with ready-to-use menus of English language commands. A new version of it can run on most of the 16-bit systems that carry the CP/M-86 operating system. The operator using a system with stack CP/M-86, who wants to copy a file called FILENAME.TXT from disk drive A to disk drive B must type this precisely-punctuated command: A>pip B:FILENAME.TXT=A:FILENAME.TXT[V]. The same file-copying operation under

the control of CP+ is accomplished by answering YES or NO to a series of English language prompts. The files available for copying are automatically presented and no filename typing is required. Keyboard work can continue while printing, and a queue of several files can be lined up for printing automatically. Job-streaming can link several programs automatically in a batch.

Taurus Software, Lafayette, CA

CIRCLE NO. 239 ON INQUIRY CARD

Sophisticated entertainment

Flight Simulator is a new program for the IBM PC that provides users the experience of flying a single engine plane (Cessna 182). It is designed for both the novice and experienced pilot. As the user progresses in skill, he can add various conditions, such as time of day, cloud cover, different seasons, wind shear forces and a reality mode that requires attention to finer details of flying such as trim, carburetor icing and fuel usage. It even includes the ability to radio-navigate. The out-the-window three-dimensional perspective view, full instrumentation, plus real-time control of the aircraft in a variety of flight conditions, give the user experience in navigating to and from 23 airports in four geographic regions: Seattle, Los Angeles, Chicago and New England. It requires PC-DOS, a color/graphics card, 64K of memory and at least one disk drive and a video monitor. A standard composite color monitor makes the fullest use of the program's graphics, but a black-and-white or RGB monitor can also be used.

Microsoft Corporation, Bellevue, WA

CIRCLE NO. 240 ON INQUIRY CARD

Computerized speech system

Speechware combines low-cost hardware with voice-quality software suitable for all microcomputer applications. It is capable of storing about eight hours of continuous speech on a 20M-byte disk. The added voice capability will make existing software easier to use by shortening learning time and improving training. A user needing assistance or additional information to execute a program can get the information verbally, eliminating the need to go to a second recurring screen. The feature will initially be compatible with the IBM PC. It uses regular digital files that can be created, edited and accessed just like any other file.

Peachtree Software, Inc., Atlanta, GA

CIRCLE NO. 243 ON INQUIRY CARD

Computer Press

Continued from page 111

example, "style/6 a" will typeset the Greek letter alpha.

Advanced mode

Advanced mode lets you use the professional command language that operates Mergenthaler Linotype phototypesetting equipment. To use advanced mode effectively, one must master a variety of specialized codes. However, advanced mode provides the means to completely control sophisticated typesetting features. This mode lets the user program multiple column layouts, statistical tables, mathematical equations, and pagination.

If manual mode provides the ignition, steering wheel, accelerator, and brake, advanced mode is like having access to an auto mechanic's entire tool shop. Advanced mode would likely be the choice of users who had professional typesetting experience.

Advanced mode suffers from a lack of documentation written at a level that can be helpful to first-time users. There's abundant documentation in the Advanced Coding Manual, but it is very technical. To make matters worse, some copies of the advanced manual include a few pages that are reproduced rather poorly, so that it's hard to see some of the symbols used in command codes. Techni Service makes up for this by offering to prepare examples of specific coding features, and by providing liberal amounts of free telephone consultation.

Using new computer products can be a task of putting round pegs in square holes (or the reverse). Sometimes, that ideal program or process that you saw another company or individual use on their computer won't run on your equipment. The operating system may be wrong, or the disk drives won't match,

or whatever.

There are few compatibility problems with Computer Press. Most word processors and computer systems will work. Since the actual software that translates typesetting commands is operated on computers outside the customer's system, there's no need to transplant program code from one system to another. The software automatically translates or ignores word processor and printer control codes. CP accepts text that's recorded on a variety of floppy disk formats—or text that's transmitted over ordinary personal computer modems. Techni Service will also help you obtain translation services for use of magnetic tape, optical character reading and other media.

Unless altered by special request, CP logic re-formats the number of words per line, and ignores extra blank lines and spaces in the word processing file. This gives you lots of freedom in typing your text. You can leave extra spaces to improve appearance on the CRT screen. You don't have to worry about how many words appear on each line, or whether you've indicated a left margin.

CP's limitations include lack of automatic underlining. In practice, this limitation isn't serious. Typeset publications usually use italics or bold face for phrase emphasis, and thus do not require an underlining feature. Horizontal ruling is available, however—for use in forms, box heads, and equations.

If you want to typeset copy within narrow columns that have flat right margins, you'll have to tell Techni Service where you want to allow so-called "soft" end-of-line hyphenation. Soft hyphenation occurs when it's necessary for the typesetting program to break a word so a line can fit properly in the designated column width. Lacking specific guidance from the user, CP software will use a vowel and consonant algorithm to determine the hyphenation point. The algorithm isn't always right. One notorious example is the hyphenation of the word "called": "cal-led".

In the worst cases, inability to define allowable hyphenation points could make it necessary to re-set up to 10% or 15% of your text. However, low processing costs and fast turnaround make it possible to live with the hyphenation annoyance. Customers have the option of using a discretionary hyphenation "dictionary" file to designate allowable hyphenation points. The typesetter will automatically refer to a hyphenation dictionary, but the listing of entries for the dictionary is the customer's responsibility. Whenever a dictionary entry indicates how to hyphenate a word or root, CP will use the dictionary entry rather than vowel and consonant logic.

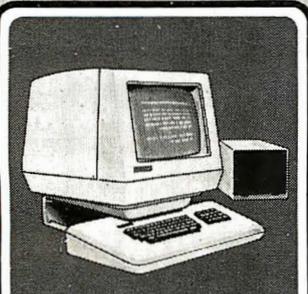
You can't use CP to display your page layout on the CRT screen before having it typeset. More sophisticated systems can do this, but they require specialized CRT terminals having high screen resolution and multiple character fonts. Despite these limitations, CP is an excellent tool for almost anyone with a small computer system and the need to prepare typeset copy for publication. Automatic and manual modes are easy to use. A full range of advanced features are available for those who need them. Resulting output is of high quality. Inherent efficiency of the process lets typesetting fit within the smallest of pre-publication budgets. □

Ken Barnes has over a decade's experience developing applications for time-sharing and microcomputer systems in the fields of engineering, business and publishing. Currently a staff planning analyst for United Airlines—and a consultant to small publishers—Ken has contributed to many publications.

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Data Entry Routines
Continued from page 122

Figure 1. Demonstration of program structure

```

5 K1 = PEEK(17170) : K2 = PEEK(17171) : K3 =
  PEEK(17172)
10 POKE 17170, 195 : POKE 17171,3 : POKE
  17172,32
20 ON ERROR GOTO 100
30 AS = "" : INPUT AS
40 IF AS = "" GOTO 110
50 PRINT "YOU ENTERED:";AS
60 GOTO 30
100 IF ERR = 38 RESUME 130
110 POKE 17170,K1 : POKE 17171,K2 :
  POKE 17172,K3
120 ON ERROR GOTO 0 : END
130 PRINT : PRINT "YOU HIT THE BREAK KEY!"
140 GOTO 30

```

Figure 2. Two samples for timing

Program A	Program B
10 FOR I=1 TO 10000	10 ON ERROR GOTO 100
20 GOSUB 100	20 FOR I=1 TO 10000.
30 NEXT : END	30 NEXT: ON ERROR GOTO 0 :
100 RETURN	END 100 RESUME NEXT

LISTING 1

A hypothetical program requiring five data items, the fourth of which is an array whose dimension is given by the second item.

```

10 CLS
20 I=1: FLAG=0
30 INPUT"ITEM #1, STRING";AS
40 IF A$="999" GOTO 1000
50 IF FLAG>0 AND FLAG<>I THEN ON FLAG GOTO
  20,60,100,140,200,240
60 I=2: FLAG=0
70 INPUT"ITEM #2, INTEGER";B%
80 IF B%=999 GOTO 1000
90 IF FLAG>0 AND FLAG<>I THEN ON FLAG GOTO
  20,60,100,140,200,240
100 I=3: FLAG=0
110 INPUT"ITEM #3, REAL";C
120 IF C=999 GOTO 1000
130 IF FLAG>0 AND FLAG<>I THEN ON FLAG
  GOTO 20,60,100,140,200,240
140 I=4: FLAG=0
150 FOR J=1 TO B%
160 PRINT"ITEM #4, INTEGER ARRAY,
  ELEMENT";J
170 INPUT D%(J)
180 IF D%(J)=999 GOTO 1000
190 NEXT
195 IF FLAG>0 AND FLAG<>I THEN ON FLAG
  GOTO 20,60,100,140,200,240
200 I=5: FLAG=0
210 INPUT"ITEM #5, DOUBLE PRECISION";E#
220 IF E#=999 GOTO 1000
230 IF FLAG>0 AND FLAG<>I THEN ON FLAG

```

```

GOTO 20,60,100,140,200,240
240 REM print out data entered for verification
250 CLS: PRINT "ITEM #1, A$=";A$
260 PRINT "ITEM #2, B%=";B%
270 PRINT "ITEM #3, C=";C
280 FOR J=1 TO B%
290 PRINT "ITEM #4, D%('";J;")=";D%(J)
300 NEXT
310 PRINT "ITEM #5, E#=";E#
320 I=6: PRINT
330 F$="NO": INPUT"DO YOU NEED ANY
  CORRECTIONS";F$
340 IF F$="YES" OR F$="999" GOTO 1000
350 REM computation and output routines
360 END
1000 REM data reentry control routine
1010 FLAG=I: REM saves where user left off
1020 REM display menu
1030 CLS: PRINT"ENTER 1 FOR ITEM #1"
1040 PRINT" 2 FOR ITEM #2"
1050 PRINT" 3 FOR ITEM #3"
1060 PRINT" 4 FOR ITEM #4"
1070 PRINT" 5 FOR ITEM #5"
1080 INPUT"WHICH ITEM DO YOU WANT TO
  ALTER";I
1090 ON I GOTO 30,70,110,150,210
1100 GOTO 1030

```

LISTING 2

A checkbook reconciliation program to illustrate the use of the BREAK key to exit infinite loops.

```

10 CLS : PRINT TAB(15) "CHECKBOOK
  RECONCILLIATION" : PRINT
15 K1=PEEK(17170) : K2=PEEK(17171) :
  K3=PEEK(17172)
20 POKE 17170,195 : POKE 17171,3 : POKE 17172,32
30 ON ERROR GOTO 100
40 ST = 0 : S = 0
50 INPUT "SERVICE CHARGE PER CHECK (ENTER
  IF NONE)"; S
60 PRINT : PRINT "ENTER THE AMOUNT OF EACH
  CHECK THAT":
  PRINT "HAS NOT YET CLEARED THE BANK" :
  CT# = 0
70 PRINT : INPUT "AMOUNT OF CHECK"; C#
80 CT# = CT# + C# : ST = ST + S
90 GOTO 70
100 RESUME 110
110 ON ERROR GOTO 150
120 CLS : PRINT "ENTER THE AMOUNT OF EACH
  DEPOSIT THAT":
  PRINT "DOES NOT YET APPEAR ON THE
  STATEMENT" : DT# = 0
130 PRINT : INPUT "AMOUNT OF DEPOSIT"; D#
140 DT# = DT# + D# : GOTO 130
150 POKE 17170,K1 : POKE 17171,K2 : POKE
  17172,K3 : RESUME 155
155 ON ERROR GOTO 0
160 CLS : INPUT "CLOSING BALANCE AS SHOWN
  ON STATEMENT"; B#
170 F$ = " $$$#.###.###"
180 CLS : PRINT : PRINT
190 PRINT "STATEMENT BALANCE: "; : PRINT

```

```

    USING F$; B#
200 PRINT "OUTSTANDING CHECKS: "; : PRINT
    USING F$; CT#
210 IF ST <> 0 PRINT "SERVICE CHARGES: "; :
    PRINT USING F$; ST
220 PRINT "OUTSTANDING DEPOSITS: "; : PRINT
    USING F$; DT#
230 PRINT TAB(26) STRING$(11,CHR$(95))
240 B# = B# - CT# - ST + DT#
250 PRINT "CHECKBOOK BALANCE: "; : PRINT
    USING F$; B#
260 PRINT : PRINT : PRINT : END

```

LISTING 3

Data entry with BREAK key and error trap.

```

10 ON ERROR GOTO 1000
15 K1=PEEK(17170) : K2=PEEK(17171) :
    K3=PEEK(17172)
20 POKE 17170,195 : POKE 17171,3 : POKE 17172,32
30 CLS : I=1
35 REM Commas at the end of lines 50,70,90,140 and 160
    are deliberate
40 INPUT "ITEM #1, STRING"; A$
50 PRINT "PROCESS ITEM #1" : ,
60 INPUT "ITEM #2, INTEGER"; B%
70 PRINT "PROCESS ITEM #2" : ,
80 INPUT "ITEM #3, REAL"; C
90 PRINT "PROCESS ITEM #3" : ,
100 FOR J=1 TO B%
110 PRINT "ITEM #4, INTEGER ARRAY,
    ELEMENT";J
120 INPUT D%(J)
130 NEXT
140 PRINT "PROCESS ITEM #4" : ,
150 INPUT "ITEM #5, DOUBLE PRECISION"; E#
160 PRINT "PROCESS ITEM #5" : ,
170 REM Print out data for verification
180 CLS : PRINT "ITEM #1, A$="; A$
190 PRINT "ITEM #2, B%="; B%
200 PRINT "ITEM #3, C="; C
210 FOR J=1 TO B%
220 PRINT "ITEM #4, D%(";J;")="; D%(J)
230 NEXT
240 PRINT "ITEM #5, E#="; E#
250 F$="NO" : INPUT "DO YOU NEED ANY
    CORRECTIONS"; F$
260 IF F$="YES" GOTO 1030
265 REM Restore BREAK vector
270 ON ERROR GOTO 0
280 POKE 17170,K1 : POKE 17171,K2 : POKE 17172,K3
290 REM Computation and output routines
300 END
1000 REM Error trap / Data re-entry control routine
1005 IF ERR=38 RESUME 1030
1010 IF FLAG>0 AND FLAG<>I THEN I=FLAG
    ELSE I=I+1
1020 FLAG=0 : RESUME 1100
1030 FLAG=I : CLS
1040 PRINT "ENTER 1 FOR ITEM #1"
1050 PRINT "    2 FOR ITEM #2"
1060 PRINT "    3 FOR ITEM #3"
1070 PRINT "    4 FOR ITEM #4"
1080 PRINT "    5 FOR ITEM #5"
1090 INPUT "WHICH ITEM DO YOU WANT TO

```

```

ALTER"; I
1100 ON I GOTO 40,60,80,100,150
1110 GOTO 170

```

LISTING 4

Data entry and corrections using subroutines.

```

10 ON ERROR GOTO 1000
20 K1=PEEK(17170) : K2=PEEK(17171) :
    K3=PEEK(17172)
30 POKE 17170,195 : POKE 17171,3 : POKE 17172,32
40 REM Normal data entry and resumed data entry after
    correction
50 CLS : FOR I=1 TO 5
60 ON I GOSUB 300, 400, 500, 600, 700
70 NEXT
80 REM Print out data for verification
90 CLS : PRINT "ITEM #1, A$="; A$
100 PRINT "ITEM #2, B%="; B%
110 PRINT "ITEM #3, C="; C
120 FOR J=1 TO B%
130 PRINT "ITEM #4, D%(";J;")="; D%(J)
140 NEXT
150 PRINT "ITEM #5, E#="; E#
160 F$="NO" : INPUT "DO YOU NEED ANY
    CORRECTIONS"; F$
170 IF F$="YES" GOTO 1020
180 REM Restore BREAK vector
190 ON ERROR GOTO 0
200 POKE 17170,K1 : POKE 17171,K2 : POKE 17172,K3
210 REM Computation and output routines
220 END
300 INPUT "ITEM #1, STRING"; A$
310 PRINT "PROCESS ITEM #1" : RETURN
400 INPUT "ITEM #2, INTEGER"; B%
410 PRINT "PROCESS ITEM #2" : RETURN
500 INPUT "ITEM #3, REAL"; C
510 PRINT "PROCESS ITEM #3" : RETURN
600 FOR J=1 TO B%
610 PRINT "ITEM #4, INTEGER ARRAY,
    ELEMENT"; J
620 INPUT D%(J)
630 NEXT
640 PRINT "PROCESS ITEM #4" : RETURN
700 INPUT "ITEM #5, DOUBLE PRECISION"; E#
710 PRINT "PROCESS ITEM #5" : RETURN
1000 REM User requested correction
1010 IF ERR=38 THEN RESUME 1020 ELSE 1120
1020 CLS : PRINT "ENTER 1 FOR ITEM #1"
1030 PRINT "    2 FOR ITEM #2"
1040 PRINT "    3 FOR ITEM #3"
1050 PRINT "    4 FOR ITEM #4"
1060 PRINT "    5 FOR ITEM #5"
1070 INPUT "WHICH ITEM DO YOU WANT TO
    ALTER"; I1
1080 IF I1 <0 OR I1 >5 THEN 1020
1085 I2 = I2 + 1
1090 ON I1 GOSUB 300, 400, 500, 600, 700
1095 I2 = I2 - 1
1100 IF I > 5 THEN 80
1110 IF I1 <>I AND I2 = 0 THEN I = I - 1
1115 RETURN
1120 REM Restore BREAK vector
1130 POKE 17170,K1 : POKE 17171,K2 : POKE 17172,K3
1140 POKE 22537,234 : REM Fix disk basic bug
1150 ON ERROR GOTO 0

```

Floppy Disk Backup

Continued from page 49

is three. Since restoration is performed less often than back-up, this redundancy is not as critical.

Back-up program using 1:2 code

The accompanying program is for backing up disk files on cassette and restoring them, using the 1:2 Hamming code scheme. It was written for the TRS-80, level II, with mini-disk and at least 32K bytes of memory. It handles random and sequential data files, and program files saved with the "A" option. Records should have a maximum length of 249 characters. Initialize Basic for one file and maximum available memory.

The program instructs the user as it runs. In the back-up mode, the program requests the specification of a file to be backed-up. When this is found on the disk, the program outputs a header to the cassette, identifying the file, then out-

puts each record of the file three times in succession.

In the restore mode, the program reads the tape header, displays the file spec, and asks if the user wishes to restore the file. If the file is already on the disk, the user is given the option of replacing it or leaving it. During restoration, the three copies of each record are read into memory, and the 2-out-of-3 voting procedure is performed. The corrected record is then stored on the disk.

This program has been used effectively on my TRS-80, where severe error problems had existed previously. The IER of my system was lowered from 10^{-6} to an effective error rate too low to measure. Error-free back-up and loading became the rule rather than the exception.

You can achieve a high probability of error-free loading with this "2-out-of-3" procedure. Use figure 2 to find the reliability you would get for your IER and

block size. Considerable improvement is evident when you compare that reliability with the corresponding value from figure 1, which assumes no error correction. It is interesting to note in figure 1 that a system with a very low IER doesn't need any modification to provide high reliability. Figures 1 and 2 provide a quantitative measure of the value of error correction. This kind of evaluation does not seem to have received adequate attention in the literature, but it appears to be worthwhile. □

Carl R. Payne is a professor at California State University, Long Beach, where he teaches statistics and business computer methods. He has a BS in physics from Case Institute of Technology, an MBA from CSULB, and a Ph.D in business administration from UC Irvine. He has several years' industrial experience in basic research on computer memory devices and circuit design.

Program listing

```
200 / MAIN PROGRAM
201 /
205 CLEAR 0: I%=MEM-3000: CLEAR I% /ALLOCATE STRING SPACE
210 DEFINT I-N: DEFSTR A-H, R-Z
215 LS=FRE(Y)-3000: KM=LS/255 /ALLOCATE FILE SPACE
220 DIM A(KM), C(3)
225 IF KM < 1 THEN PRINT "INSUFFICIENT MEMORY":
      STOP
230 S="*": HI="#####": CMD "T": CLS
235 INPUT "TODAY'S DATE (MMDDYY)": TD
240 INPUT "BACKUP (B) OR RESTORE (R)": D
245 IF D <> "R" THEN D="B"
250 IF D="B" THEN GOSUB 300 ELSE GOSUB 400 /INITIALIZE TRANSFER
255 IF IR=0 THEN GOSUB 800 /TRANSFER FILE
260 GOSUB 950 /REPORT RESULTS
261 /
265 INPUT "WISH FURTHER PROCESSING": X
270 IF X="Y" OR X="YES" THEN CLS: GOTO 240
275 / CLOSE: CMD "R": STOP
298 /
299 /
300 / SUBROUTINE TO INITIALIZE FOR BACKUP
301 /
305 IR=0: INPUT "FILE SPEC": F
310 ON ERROR GOTO 605
315 OPEN "I", 1, F
317 /IF FILE IS NOT ON DISK, ERR=106 AND
318 /CONTROL JUMPS TO ERROR ROUTINE - BACKUP
319 /
320 /IF FILE IS ON DISK, PROGRAM CONTINUES
321 /
325 NR=0 /COUNT RECORDS AND
```

```

330      NR=NR+1: INPUT #1, Y: GOTO 330                'FIND END OF FILE
331      'ERR=102 IF FILE IS RANDOM
332      'ERR=124 IF FILE IS SEQUENTIAL
333      'CONTROL JUMPS TO ERROR ROUTINE - BACKUP
334      /
335      'RESUME FROM ERROR ROUTINE IF FILE IS ON DISK
340      ON ERROR GOTO 0
345      MW=2: BD=TD                                  'SET I/O SWITCHES
350      IF T="R" THEN E="R": MR=3
355      ELSE E="I": MR=1
360      GOSUB 570: KT=1000: GOSUB 685
365      FM="SET TAPE RECORDER TO RECORD": GOSUB 650
370      H=HI+F+S+T+S+STR$(NR)+S+TD                'COMPOSE HEADER
375      PRINT# 404, "WRITING HEADER"
380      PRINT #-1, H, H, H                          'WRITE HEADER ON TAPE
385      SM="BACKING UP "
386      RETURN
390      'RESUME FROM ERROR ROUTINE IF FILE NOT ON DISK
395      ON ERROR GOTO 0: IR=1: RETURN
400      /
405      SUBROUTINE TO INITIALIZE FOR RESTORATION
410      IR=0
415      FM="SET TAPE RECORDER TO PLAY ": GOSUB 650
420      PRINT# 404, "READING HEADER"
425      INPUT #-1, C(1), C(2), C(3): GOSUB 700      'READ AND CORRECT HEADER
430      'DECODE HEADER
435      Y=LEFT$(C(0), 7)
440      IF Y < HI THEN IR=2: RETURN                'VERIFY HEADER ID
445      C(0)=RIGHT$(C(0), LEN(C(0))-7)
450      FOR I=1 TO 3
455      J=INSTR(C(0), S): C(I)=LEFT$(C(0), J-1)
460      C(0)=RIGHT$(C(0), LEN(C(0))-J)
465      NEXT
470      F=C(1): T=C(2): NR=VAL(C(3)): BD=C(0)      'SET FILE DATA
475      GOSUB 570                                  'DISPLAY FILE DATA
480      INPUT "WISH TO RESTORE": X
485      IF X="Y" OR X="YES" THEN 495
490      IR=3: RETURN
495      MR=4                                        'SET I/O SWITCHES
500      IF T="R" THEN E="R": MW=6
505      ELSE E="O": MW=5
510      'SEE IF FILE IS ON DISK
515      ON ERROR GOTO 635
520      OPEN "I", 1, F

```

```

516         ^IF FILE IS NOT ON DISK, ERR=106 AND
517         ^CONTROL JUMPS TO ERROR ROUTINE - RESTORE
518         ^
519         ^IF FILE IS ON DISK, PROGRAM CONTINUES
520         ^
521         ON ERROR GOTO 0: CLOSE 1
525         PRINT "FILE IS ALREADY ON DISK"
530         INPUT "WISH TO REPLACE? "; X
535         IF X="Y" OR X="YES" THEN KILL F: GOTO 550
540         IR=4: RETURN
541         ^
545         ON ERROR GOTO 0
550         CLOSE 1: SM="RESTORING ": RETURN
568 ^
569 ^
570 ^ SUBROUTINE TO PRINT FILE DATA
571 ^
575     CLS: PRINT "FILE SPEC: "; F
580     PRINT "FILE TYPE: "; T
585     PRINT "# RECORDS: "; NR
590     PRINT "BACKUP DATE: "; BD
595     RETURN
598 ^
599 ^
600 ^ ERROR ROUTINE
601 ^
605     ^BACKUP
610         IF ERR=106 THEN RESUME 390             ^FILE NOT ON DISK
615         CLOSE 1
620         IF ERR=102 THEN T="R": RESUME 335
625         IF ERR=124 THEN T="S": NR=NR-1: RESUME 335
630         ON ERROR GOTO 0
634 ^
635     ^RESTORE
640         IF ERR=106 THEN RESUME 545             ^FILE NOT ON DISK
645         ON ERROR GOTO 0
648 ^
649 ^
650 ^ SUBROUTINE TO FLASH MESSAGE
651 ^
655     CLS: I=0: KT=100
660     PRINT@ 467, "PRESS ^ENTER^ WHEN READY"
665     PRINT@ 338, FM: GOSUB 685
670     IF I=1 THEN CLS: RETURN
675     PRINT@ 338, STRING$(30, " "): GOSUB 685
680     IF I=1 THEN CLS: RETURN ELSE 665
684 ^
685 ^ SUBROUTINE DELAY
686 ^
690     FOR J=1 TO KT: IF INKEY$ <> "" THEN I=1
695     NEXT: RETURN

```

```

698 /
699 /
700 / SUBROUTINE TO CORRECT ERRORS
701 / PERFORMS 2/3 VOTE ON STRINGS IN
702 / C(1) - C(3), PUTS RESULTS IN C(0)
703 /
705 / IF C(1)=C(2) OR C(1)=C(3) THEN C(0)=C(1): RETURN
710 / IF C(2)=C(3) THEN C(0)=C(2): RETURN
715 / G=""
720 / L1=LEN(C(1)): L2=LEN(C(2)): L3=LEN(C(3))
725 / LM=L1: IF L2 > LM THEN LM=L2
730 / IF L3 > LM THEN LM=L3
735 / FOR J=1 TO LM
740 / U=MID$(C(1), J, 1): IF U="" THEN U=CHR$(0)
745 / V=MID$(C(2), J, 1): IF V="" THEN V=CHR$(0)
750 / W=MID$(C(3), J, 1): IF W="" THEN W=CHR$(0)
755 / IF U=V OR U=W THEN G=G+U: GOTO 780
760 / IF V=W THEN G=G+V: GOTO 780
765 / K1=ASC(U): K2=ASC(V): K3=ASC(W)
770 / X=CHR$((K1 AND K2) OR (K1 AND K3) OR (K2 AND K3))
775 / G=G+X
780 / NEXT
785 / C(0)=G: RETURN
798 /
799 /
800 / SUBROUTINE TO TRANSFER FILE
801 /
805 / OPEN E, 1, F
810 / IF T="R" THEN FIELD 1, 255 AS B
815 / CLS: PRINT@ 276, SM: F
820 / L=0: LF=0
825 / PRINT@ 468, "READING RECORD "
830 / KN=KM
835 / FOR K=1 TO KN
840 / L=L+1
845 / IF L>NR THEN L=L-1: KN=K-1: LF=1: GOTO 865
850 / IF FRE(Y)<255 THEN L=L-1: KN=K-1: GOTO 865
855 / PRINT@ 484, L: M=MR: GOSUB 900
860 / NEXT
861 /
865 / IF KN=0 THEN 890
870 / PRINT@ 596, "WRITING RECORD "
875 / FOR K=1 TO KN
880 / PRINT@ 612, L-KN+K: M=MW: GOSUB 900
885 / NEXT
886 /
890 / IF LF=0 THEN 825
895 / CLOSE: RETURN
898 /
899 /
900 / SUBROUTINE FILE I/O

```

```

901 /
905 /   ON M GOTO 910, 915, 920, 925, 935, 940
906 /
910 /   LINEINPUT #1, A(K): RETURN           'READ SEQUENTIAL FILE
911 /
915 /   FOR J=1 TO 3: PRINT #-1, A(K): NEXT: RETURN 'WRITE TAPE
916 /
920 /   GET 1: A(K)=B: RETURN                'READ RANDOM FILE
921 /
925 /   FOR J=1 TO 3: INPUT #-1, C(J): NEXT  'READ TAPE
930 /   GOSUB 700: A(K)=C(0): RETURN         'CORRECT ERRORS
931 /
935 /   PRINT #1, A(K): RETURN               'WRITE SEQUENTIAL FILE
936 /
940 /   LSET B=A(K): PUT 1: RETURN          'WRITE RANDOM FILE
948 /
949 /
950 /   SUBROUTINE TO REPORT PROCESSING RESULTS
951 /
955 /   PRINT@ 850, STRING$(40, " ")
960 /   ON IR+1 GOTO 965, 970, 975, 980, 985
961 /
965 /   'FILE PROCESSED
966 /   PRINT@ 850, "FILE "; F; " TRANSFERRED": GOTO 989
967 /
970 /   'FILE TO BE BACKED UP NOT FOUND ON DISK
971 /   PRINT@ 850, "FILE "; F; " NOT FOUND ON DISK"
972 /   GOTO 989
973 /
975 /   'FIRST TAPE RECORD NOT HEADER
976 /   PRINT@ 850, "HEADER NOT FOUND": STOP
977 /
980 /   'OPERATOR INSTRUCTIONS TO SKIP FILE
981 /   GOSUB 992
982 /   PRINT@ 850, "FILE "; F; " SKIPPED": GOTO 989
983 /
985 /   'TAPE FILE ALREADY ON DISK
986 /   GOSUB 992
987 /   PRINT@ 850, "FILE "; F; " SKIPPED - ALREADY ON DISK"
988 /
989 /   KT=1000: GOSUB 685: CLS: RETURN
990 /
991 /
992 /   SUBROUTINE TO SKIP A FILE ON TAPE
993 /
994 /   CLS: PRINT@ 404, "SKIPPING FILE "; F
995 /   FOR J=1 TO NR
996 /   FOR I=1 TO 3: INPUT #-1, U: NEXT I
997 /   NEXT J: RETURN
999 /   END

```

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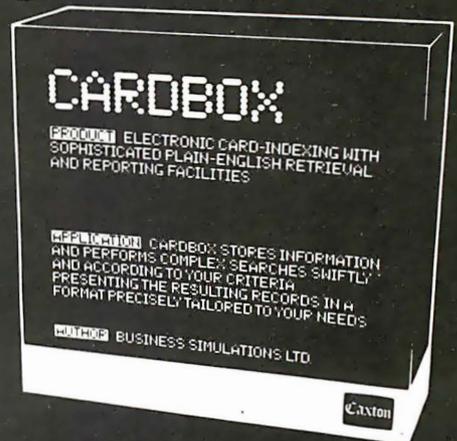
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CARDBOX works on most popular CP/M machines including those with special screens, eg Osborne. Use the CARDBOX Tutorial to learn all about this simple, fast aid to better record management. Study the detailed Reference Manual to take full advantage of its sophisticated features.

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Program listing

```

10 '
20 ' The IBM PC LABEL MAKER
30 '
40 ' by: John S. Martin 9/82
50 '
60 SCREEN 2 'set high res graphics
70 CLS: LOCATE 3,5: BEEP
80 PRINT "Which kind of labels would you like. "
90 LOCATE 5,5
100 PRINT "Please hit the [S] key to make small labels"
110 LOCATE 6,5
120 PRINT "Please hit the [M] key to make mailing labels"
130 LOCATE 7,5
140 PRINT "Please hit the [L] key to make large labels"
150 I$ = INKEY$
160 IF I$ = "S" OR I$ = "s" THEN 250 'small labels
170 IF I$ = "M" OR I$ = "m" THEN 1340 'mailing labels
180 IF I$ = "L" OR I$ = "l" THEN 2400 'large labels
190 GOTO 150
200 '
210 '
220 ' Now begins the Small file folder label section
230 '
240 '
250 CLS: BEEP
260 LOCATE 3,5
270 PRINT "You have selected to make small labels "
280 LOCATE 4,5
290 PRINT "Please enter the number that you desire made. "
300 LOCATE 6,5
310 INPUT NUM 'number of labels
320 BEEP: CLS: LOCATE 3,5
330 PRINT "Would you like to use compressed printing?"
340 I$ = INKEY$
350 IF I$ = "Y" OR I$ = "y" THEN FONT = 16.5: GOTO 380
360 IF I$ = "N" OR I$ = "n" THEN FONT = 10: GOTO 380
370 GOTO 340
380 OPTION BASE 1 'all arrays start at one
390 DIM TOP$(NUM) ,BOT$(NUM) 'top and bottom line
400 FOR IN = 1 TO NUM 'repeats for number of labels
410 CLS : LOCATE 3,5 : BEEP
420 PRINT "Please enter the top portion for label #";IN
430 DRAW "BMB0,110" 'sets start of box
440 IF FONT = 16.5 THEN GOSUB 1160 'draws big box
450 IF FONT = 10 THEN GOSUB 1210 'draws smaller box
460 LOCATE 15,12
470 LINE INPUT TOP$(IN) 'input top line
480 BEEP
490 IF LEN(TOP$(IN)) > LNTH THEN 410 'check line length
500 LOCATE 3,5
510 PRINT "Please enter the bottom portion for label #";IN
520 LOCATE 16,12
530 LINE INPUT BOT$(IN) 'input bottom line
540 BEEP
550 IF LEN(BOT$(IN)) > LNTH THEN 410 'check line length
560 LOCATE 3,5
570 PRINT "Was the label typed correctly ? "
580 I$ = INKEY$
590 IF I$ = "Y" OR I$ = "y" THEN 630 'correct continue
600 IF I$ = "N" OR I$ = "n" THEN 410 'NOT correct redo
610 GOTO 580
620 BEEP
630 NEXT
640 '
650 ' Now the printer gets set up to print
660 ' Small file folder Labels
670 CLS
680 LOCATE 3,5 : BEEP
690 PRINT "Press any key when ready to start printing"
700 I$ = INKEY$
710 IF I$ = "" THEN 700
720 CLS : BEEP
730 LOCATE 3,5
740 PRINT "Please stand by during printing"
750 IF FONT = 16.5 THEN LPRINT CHR$(29); 'set compressed
760 LPRINT CHR$(27); CHR$(56); 'set 8 lines/inch
770 FOR PR = 1 TO NUM STEP 3 'labels three across
780 IF NUM - PR < 3 THEN P = NUM ELSE P = PR + 2
790 FOR BB = 1 TO 75 '
800 LPRINT "-"; 'print upper cutout guide
810 NEXT BB
820 LPRINT
830 FOR FM = PR TO P
840 LET C = LNTH - (LEN(TOP$(FM))) 'spaces for tabbing
850 LPRINT CHR$(213); " "; TOP$(FM); SPC(C+1);
860 LPRINT CHR$(213); " "; 'top line
870 NEXT FM
880 LPRINT
890 FOR FB = PR TO P
900 LET C = LNTH - (LEN(BOT$(FB))) 'spaces for tabbing
910 LPRINT CHR$(213); " "; BOT$(FB); SPC(C+1);
920 LPRINT CHR$(213); " "; 'bottom line
930 NEXT FB
940 LPRINT CHR$(13); 'carriage return
950 FOR BB = 1 TO 75 '
960 LPRINT "-"; 'prints bottom cutout guide
970 NEXT BB
980 LPRINT
990 NEXT
1000 LPRINT CHR$(30); CHR$(27); CHR$(54); 'reset printer
1010 CLS: BEEP: LOCATE 3,5
1020 PRINT "Would you like to make another copy of those ",
1030 PRINT "labels just printed? (Y/N)"
1040 I$ = INKEY$
1050 IF I$ = "Y" OR I$ = "y" THEN 660

1060 IF I$ = "N" OR I$ = "n" THEN 1080
1070 GOTO 1040
1080 CLS: BEEP: LOCATE 3,5
1090 PRINT "Would you like to print any more labels? "
1100 I$ = INKEY$
1110 IF I$ = "Y" OR I$ = "y" THEN CLEAR: GOTO 10
1120 IF I$ = "N" OR I$ = "n" THEN SCREEN 0: END
1130 GOTO 1100
1140 '
1150 ' Subroutine for drawing large box
1160 DRAW "R84 U2 D2 R84 D20 L40 D3 U3 L88 D3 U3 L40 U20"
1170 LNTH = 19
1180 RETURN
1190 '
1200 ' Subroutine for drawing smaller box
1210 DRAW "R52 U2 D2 R52 D20 L26 D3 U3 L54 D3 U3 L26 U20"
1220 LNTH = 11
1230 RETURN
1300 '
1310 ' Now begins the mailing label section.
1320 '
1330 '
1340 CLS: BEEP
1350 LOCATE 3,5
1360 PRINT "You have decided to have mailing labels made"
1370 LOCATE 5,5
1380 PRINT "Please enter the number of labels desired "
1390 LOCATE 7,5
1400 INPUT NUM 'num is desired amount of labels
1410 BEEP
1420 OPTION BASE 1
1430 DIM NME$(NUM) ,CMPY$(NUM) ,STRT$(NUM) ,TWN$(NUM)
1440 FOR IN = 1 TO NUM
1450 BEEP
1460 CLS : LOCATE 3,5
1470 PRINT "Please enter the top line for label #";IN;" "
1480 DRAW "bmb0,106" 'initial point for square
1490 DRAW "BMB0,106 R208 D43 L208 U43" 'draw square
1500 LOCATE 15,12
1510 LINE INPUT NME$(IN) 'input first line
1520 BEEP
1530 IF LEN(NME$(IN)) > 24 THEN 1460 'length 24 maximum
1540 LOCATE 3,5
1550 PRINT "Please enter the second line for label #";IN
1560 LOCATE 16,12
1570 LINE INPUT CMPY$(IN) 'enter second line
1580 BEEP
1590 IF LEN(CMPY$(IN)) > 24 THEN 1460
1600 LOCATE 3,5
1610 PRINT "Please enter line three for label #";IN
1620 LOCATE 17,12
1630 LINE INPUT STRT$(IN) 'enter third line
1640 BEEP
1650 IF LEN(STRT$(IN)) > 24 THEN 1460 'check length
1660 LOCATE 3,5
1670 PRINT "Please enter line four for label #";IN;" "
1680 LOCATE 18,12
1690 LINE INPUT TWN$(IN) 'enter fourth line
1700 BEEP
1710 IF LEN(TWN$(IN)) > 24 THEN 1460
1720 LOCATE 3,5
1730 PRINT "Was the label written correctly? "
1740 LET I$ = INKEY$
1750 IF I$ = "Y" OR I$ = "y" THEN 1780 'correct
1760 IF I$ = "N" OR I$ = "n" THEN 1460 'NOT correct
1770 GOTO 1740
1780 NEXT
1790 '
1800 ' Now the printer starts printing the mailing labels
1810 '
1820 CLS: BEEP: LOCATE 3,5
1830 PRINT "Please align the labels with the paper cutter"
1840 LOCATE 4,5: PRINT "Hit any key when ready"
1850 I$ = INKEY$
1860 IF I$ = "" THEN 1850
1870 CLS: BEEP: LOCATE 3,5
1880 PRINT "Please stand by during printing"
1890 LPRINT CHR$(30); 'normal font
1900 LPRINT CHR$(10); CHR$(13); 'vert tab to start
1910 FOR PR = 1 TO NUM STEP 3 'labels are three across
1920 IF NUM - PR < 3 THEN P = NUM ELSE P = PR + 2
1930 T = 3 'resets tab to start
1940 FOR FM = PR TO P
1950 LPRINT TAB(T); NME$(FM); 'prints first line
1960 IF FM = P THEN LPRINT CHR$(13); 'end of line cr
1970 T = T + 26 'labels are 26 characters long
1980 NEXT FM
1990 T = 3 'resets tab to start
2000 FOR FA = PR TO P
2010 LPRINT TAB(T); CMPY$(FA); 'prints second line
2020 IF FA = P THEN LPRINT CHR$(13); 'end of line cr
2030 T = T + 26 '26 spaces between labels
2040 NEXT FA
2050 T = 3 'resets tab to start
2060 FOR FC = PR TO P
2070 LPRINT TAB(T); STRT$(FC); 'prints third line
2080 IF FC = P THEN LPRINT CHR$(13); 'end of line cr
2090 T = T + 26
2100 NEXT FC
2110 T = 3 'resets tab to start
2120 FOR FB = PR TO P
2130 LPRINT TAB(T); TWN$(FB); 'prints fourth line
2140 IF FB = P THEN LPRINT CHR$(13); 'end of line cr
2150 T = T + 26
2160 NEXT FB

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2170 LPRINT CHR$(13); CHR$(10); 'space vert btw labels
2180 NEXT PR
2190 CLS: BEEP: LOCATE 3,5
2200 PRINT "Would you like to make another copy of those ";
2210 PRINT "labels just printed? (Y/N)"
2220 I$ = INKEY$
2230 IF I$ = "Y" OR I$ = "y" THEN 1800
2240 IF I$ = "N" OR I$ = "n" THEN 2260
2250 GOTO 2220
2260 CLS: BEEP: LOCATE 3,5
2270 PRINT "Would you like to print any more labels?"
2280 I$ = INKEY$
2290 IF I$ = "Y" OR I$ = "y" THEN CLEAR: GOTO 10
2300 IF I$ = "N" OR I$ = "n" THEN SCREEN 0: END
2310 GOTO 2280
2400 '
2410 '
2420 ' Now begins the Large file folder label section
2430 '
2440 '
2450 CLS: LOCATE 3,5: BEEP
2460 PRINT "You have selected to make file folder labels"
2470 LOCATE 4,5
2480 PRINT "Please enter the number you desire to make. "
2490 LOCATE 6,5
2500 INPUT NUM 'the number desired
2510 CLS: LOCATE 3,5: BEEP
2520 PRINT "Would you like to use expanded font? (Y/N)"
2530 I$ = INKEY$
2540 IF I$ = "Y" OR I$ = "y" THEN FONT = 5: GOTO 2570
2550 IF I$ = "N" OR I$ = "n" THEN FONT = 10: GOTO 2570
2560 GOTO 2530
2570 OPTION BASE 1
2580 DIM FOLD$(NUM)
2590 FOR IN = 1 TO NUM
2600 CLS: LOCATE 3,5: BEEP
2610 PRINT "Please enter the information for label #";IN
2620 DRAW "BM03,110" 'sets starting point for box
2630 IF FONT = 5 THEN GOSUB 3230 'draw small box
2640 IF FONT = 10 THEN GOSUB 3280 'draw large box
2650 LOCATE 15,12
2660 LINE INPUT FOLD$(IN) 'input line spaces and all
2670 IF LEN(FOLD$(IN)) > LNTH THEN 2600 'check length
2680 LOCATE 3,5: BEEP
2690 PRINT "Was the label typed correctly (Y/N) ? "
2700 I$ = INKEY$
2710 IF I$ = "Y" OR I$ = "y" THEN 2740 'correct continue
2720 IF I$ = "N" OR I$ = "n" THEN 2600 'wrong do over
2730 GOTO 2700
2740 BEEP
2750 NEXT IN
2760 '
2770 '
2780 ' Now the printer starts printing Large file labels
2790 '
2800 '
2810 CLS: BEEP: LOCATE 3,5
2820 PRINT "Press any key when ready to start printing"
2830 I$ = INKEY$
2840 IF I$ = "" THEN 2830
2850 CLS: BEEP: LOCATE 3,5
2860 PRINT "Please stand by during printing"
2870 IF FONT = 5 THEN LPRINT CHR$(31); 'set wide font
2880 IF FONT = 10 THEN WIDTH "lpt1:",135
2890 LPRINT
2900 FOR PR = 1 TO NUM STEP 2 'labels 2 across
2910 IF NUM - PR < 2 THEN P = NUM ELSE P = PR + 1
2920 FOR BB = 1 TO TB * 2
2930 LPRINT "-"; 'print top cutting border
2940 NEXT BB
2950 LPRINT
2960 T = 1 'set beginning tab point
2970 FOR FM = PR TO P
2980 LPRINT TAB(T); CHR$(213); FOLD$(FM);
2990 T = TB + T 'set tab to next label
3000 IF FM = P THEN LPRINT TAB(T); CHR$(213)
3010 NEXT FM
3020 FOR BB = 1 TO TB * 2
3030 LPRINT "-"; 'prints bottom cutting border
3040 NEXT BB
3050 LPRINT
3060 NEXT PR
3070 LPRINT CHR$(30); WIDTH "lpt1:",80 'printer reset
3080 CLS: BEEP: LOCATE 3,5
3090 PRINT "Would you like to make another copy of those ";
3100 PRINT "labels just printed? (Y/N)"
3110 I$ = INKEY$
3120 IF I$ = "Y" OR I$ = "y" THEN 2800
3130 IF I$ = "N" OR I$ = "n" THEN 3150
3140 GOTO 3110
3150 CLS: BEEP: LOCATE 3,5
3160 PRINT "Would you like to print any more labels?"
3170 I$ = INKEY$
3180 IF I$ = "Y" OR I$ = "y" THEN CLEAR: GOTO 10
3190 IF I$ = "N" OR I$ = "n" THEN SCREEN 0: END
3200 GOTO 3170
3210 '
3220 ' Subroutine to draw smaller box
3230 DRAW "R158 D10 L158 U10" 'draws box
3240 LNTH = 18; TB = 19
3250 RETURN
3260 '
3270 ' Subroutine to draw larger box
3280 DRAW "R290 D10 L290 U10" 'draws box
3290 LNTH = 35; TB = 36
3300 RETURN

```



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Chart 6. Inquiry Functions

PRODUCT NAME	A) Read and search						Miscellaneous			
	LAST RECORD	PREVIOUS RECORD	NEXT RECORD	SEARCH FOR RECORD NUMBER	SEARCH WITH FIELD	COMPARE	B) USES WILD CARDS	C) READ AND PROCESS DATA	D) BUILT-IN HELP SCREEN	D) HELP SCREEN USER-DEFINED
<i>For the Apple:</i>										
Quick File III	y	y	y	n	y	y	y	y	y	n
Versa Form	y	y	y	y	y	y	y	n	y	n
Complete Mailing Label and Billing System	n	n	n	y	n	y	n	n	y	n
Information & Data Master	y	y	y	y	y	y	y	n	n	n
Datadex	y	y	y	y	n	n	n	y	n	n
Data Perfect	y	y	y	y	y	n	y	y	n	y
The Data Machine	n	n	y	y	y	n	y	y	y	n
List Maker	y	y	y	y	y	n	n	n	y	n
The General Manager	n	n	y	n	y	y	y	y	y	y
List Handler	n	y	y	y	n	n	y	n	y	n
PFS:File	y	y	y	n	y	y	y	y	n	y
I/O-Version II	y	y	y	y	y	y	y	n	y	n
DB Master	y	n	y	y	y	n	y	n	y	n
Systems II	n	n	n	y	y	y	n	y	n	n
<i>For CP/M computers:</i>										
dBASE II	y	y	y	y	y	y	y	y	n	n
Data Plan	y	y	y	n	y	n	y	y	y	n
Microbase	n	n	y	n	y	y	n	n	y	n
FMS-80	y	y	y	y	y	n	y	y	y	y
Friends Report Writer	n	n	n	n	y	y	n	y	y	y
MDBS	y	y	y	y	y	y	y	y	n	y
Selector	y	y	y	n	y	y	n	y	y	n
MAG/Base	y	y	y	n	y	y	y	n	y	n
Infostar	n	y	y	n	y	y	n	y	y	n
The Knowledge Manager	y	y	y	y	y	y	y	y	n	y
MicroRIM	n	n	n	n	y	y	n	y	y	n
Personal Pearl	y	y	y	y	y	y	y	y	y	y
The Quad	y	y	y	y	y	y	n	y	y	n
Analyst	y	y	y	y	y	y	y	y	n	n
<i>For other machines:</i>										
MIS Builder	n	n	y	y	y	y	n	y	y	n
Corp	n	n	n	n	y	n	y	y	n	n
Wordbase	y	y	y	y	y	y	y	n	y	y
Waloss II	y	y	y	y	y	y	y	n	n	n
ANDI	n	n	y	y	y	n	y	y	y	y
Data Design	y	y	y	y	y	y	y	y	y	n
IDM-X	y	y	y	y	y	y	n	y	y	n
Control	n	n	n	y	y	y	y	y	n	y
The Organization Analyst	n	n	n	y	y	y	y	y	y	n
Savvy	y	y	y	y	y	y	y	y	y	y
Personal Data Base	n	y	y	y	y	n	y	n	y	n
The Wiz	y	n	y	y	y	y	y	y	y	n
File/idea	y	y	y	y	y	n	y	n	y	n
Data Manager	n	n	y	n	y	y	n	y	y	n

- (A) The ways a user can inquire of the database vary between systems. Ideally, a user should have as many ways as possible to "move around" in the database, while searching for information. If a system has only a limited search capability, the user may well become frustrated in an attempt to locate information within the database.
- (B) A wild card, like CP/M's "*" allows a user to search for records when only incomplete information exists. For example, if all persons in a customer file with last names beginning with "S" were desired, the wild card could be used to specify them as follows: "S*".
- (C) The ability of the inquiry function to read and simultaneously process data can be extremely valuable in creating systems that minimize storage space requirements. A code or abbreviated key for a field may be used in place of a full data item and the correct data item interpreted or calculated at inquiry time. A practical use of this type of "read and process" data function occurs when "multilayer" prices are used in an inventory file. Rather than store each price, the system may store only one price, with several discount percentages. Upon inquiry, the system will calculate dollar prices for user viewing.
- (D) Built-in help screens allow the user to use and access the database system without constant reference to the instruction manual. The ability of a user to create his own help screens is an important part of a fully "user-friendly" customized application package.

Key:
 y = yes; feature is included
 n = no; feature is not included

Chart 7. Input Edit Functions

PRODUCT NAME	UNUSUAL INPUT EDIT ATTRIBUTES (TESTS FOR FORM)						CONDITIONAL LOGIC			
	TIME	JULIAN DATE	SOCIAL SECURITY #	TELEPHONE #	WHOLE #	DOLLARS & CENTS	NUMERIC		ALPHA	
							IF/AND/OR	RANGE	IF/AND/OR	RANGE
<i>For the Apple:</i> Quick File III	y	n	n	n	y	y	y	y	y	y
Versa Form	n	n	y	y	y	y	n	y	n	y
Complete Mailing Label and Billing System	y	n	y	y	y	y	n	n	n	n
Information & Data Master	y	y	y	y	y	y	n	n	n	y
Datadex	n	n	n	n	n	n	n	n	n	n
Data Perfect	y	y	y	y	y	y	n	n	n	n
The Data Machine	n	n	n	n	n	n	y	y	y	y
List Maker	y	n	n	n	n	n	n	n	n	n
The General Manager	n	n	n	n	n	y	n	n	n	n
List Handler	n	n	n	n	y	y	y	y	y	y
PFS:File	y	n	y	y	y	y	y	y	y	y
IFO-Version II	y	n	y	y	y	y	y	y	y	y
DB Master	n	n	n	y	y	y	n	y	n	n
Systems II	y	n	y	y	y	y	n	y	n	y
<i>For CP/M computers:</i> dBASE II	y	y	y	y	y	y	y	y	y	y
Data Plan	n	n	y	y	y	n	n	n	n	n
Microbase	y	y	y	y	y	y	y	y	y	y
FMS-80	y	y	y	y	y	y	y	y	y	y
Friends Report Writer	y	n	y	y	y	y	y	y	y	y
MDBS	n	y	n	n	n	n	n	y	n	y
Selector	y	n	y	y	y	y	y	y	y	y
MAG/Base	y	y	y	y	y	y	y	y	y	y
Infostar	y	y	y	y	y	y	y	y	y	y
The Knowledge Manager	y	n	n	n	y	y	y	y	y	y
MicroRIM	y	y	y	y	y	y	y	y	y	y
Personal Pearl	y	y	n	y	y	y	y	y	y	y
The Quad	n	n	n	n	y	y	n	y	n	n
Analyst	y	y	y	y	y	y	y	y	y	y
<i>For other machines:</i> MIS Builder	n	n	n	n	n	n	y	y	y	y
Corp	y	y	y	y	y	y	y	y	y	y
Wordbase	n	n	n	n	n	n	y	y	y	y
Waloss II	n	y	n	n	y	n	n	y	n	y
ANDI	n	n	n	n	n	n	n	y	n	n
Data Design	n	y	y	y	y	y	n	y	n	y
IDM-X	n	y	n	n	y	y	n	y	n	y
Control	n	n	n	n	y	y	y	y	y	y
The Organization Analyst	y	y	y	y	y	y	y	y	y	y
Savvy	y	y	n	n	y	y	n	n	n	n
Personal Data Base	y	n	y	y	y	y	n	n	n	n
The Wiz	y	y	y	y	y	y	y	y	y	y
File/idea	y	n	n	y	y	y	n	n	n	n
Data manager	y	n	y	y	y	y	n	y	n	y

Many programs offer special "tests" that check for data format, data range, or data content. A few programs even allow for "conditional logic" of the order "if/and/or" for user-specified parameters. These extra "tests" are an integral part of an error-free database program application, and become even more critical in a multi-user complex environment.

Key:
 y = yes; feature is included
 n = no; feature is not included

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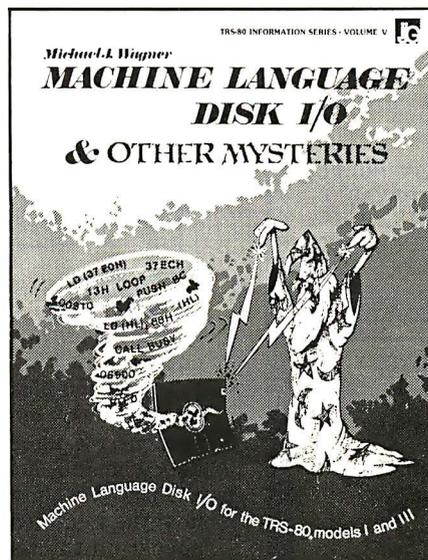
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Word Processing

Continued from page 27

WordIndex procedures for generating a table-of-contents require the placement of two dots (instead of three) followed by a masterspace "@" and a letter A, B, or C on the line above appropriate heads and subheads. In addition, WordIndex permits you to place directives for boldface (b), underline (u), so you don't miss entering the pairs (one of the frustrations of printing out WordStar APB and APS commands). Double spacing (s) between letters can also be requested.

Figure 3.

TITLE OF CHAPTER	1
First Major Subhead	1
The next subhead in importance	1
And so on down the line	1

Remember, WordIndex is meant to be used immediately before a document is printed. After you have added the print directives to create the table-of-contents, chapters, sections and graphics, all will be numbered automatically for printout. If, after running the document through WordIndex, you find you have missed something, a subsequent rerun can result in double entries. A safeguard backup file is recommended that should contain the original directives should it be necessary to change any of them. Mistakes are easy to make. The marked text would look like that depicted in figure 4.

Figure 4.

..@A b s	(indicates chapter, boldface, double space)
TITLE OF CHAPTER	(Title)
In this chapter	(Text)
..@B	
First Major Subhead	
..@C	
The next subhead in importance	
..@A	
SUBJECT INDEX	

The program generates two new files. One is the table-of-contents with print directives placed for WordStar reading, and page numbers added. (See figure 5.) But it prints out as shown in figure 6.

The second file is FILENAME.WI. It contains the newly-modified copy of the original document with the chapters, sections, etc. numbered. When you so specify, and additional dot commands are embedded, a subject index will be created and placed at the end of the document. Figure 7 demonstrates how the modified file containing the print directives will appear on the terminal.

Generating a subject index

So far, we have looked at the ability of the programs to



Figure 5.

TABLE OF CONTENTS	
.cp4	1. TITLE OF CHAPTER
3	
.cp3	1.1. First Major Subhead
3	
	1.1.1. The next subhead in importance
3	
.cp4	2. SUBJECT INDEX
3	

create a table-of-contents. Can an alphabetically-arranged, page-numbered, referenced index be generated readily at the end of a document? Is it possible to overcome the tedium of indexing a book-size manuscript and banishing forever the mountain of 3-by-5 index cards?

Figure 6.

TABLE OF CONTENTS	
1.	TITLE OF CHAPTER 3
1.1	First Major Subhead 3
1.1.1.	The next subhead in importance 3
2.	SUBJECT INDEX 3

Unfortunately, generating a subject index for a large text file is neither easy nor as efficient as one might fantasize. The procedures are fine for a short document, but indexing an entire book could be a downright drag and perhaps not a good enough substitute for the old fashioned method. What's the problem?

Figure 7.

..@A b s	1. TITLE OF CHAPTER
	In this chapter. . . .
..@B	1.1. First Major Subhead
..@C	1.1.1. The next subhead in importance
..@A	2. SUBJECT INDEX
And in printout:	
1.	TITLE OF CHAPTER
	In this chapter. . . .
1.1.	First Major Subhead
1.1.1.	The next subhead in importance
2.	SUBJECT INDEX

Imagine typing in dot directives containing the word or phrases to be indexed on every page where that word or phrase appears. Imagine how many times you have to retype every word and phrase and be sure it is cross-referenced

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in its many varieties. (With an index card, you write an entry only once and keep adding page numbers).

Example: To index the words in the three lines of copy in the following two sentences on two separate pages requires that the dot directive "...X", followed by the words to be indexed, be placed at the top of the page or above a line of copy containing the word. On screen the prepared text would appear as in figure 8.

Figure 8.

...x computers, phenomenon, 80's

Computers are a phenomenon of the 80's. Each time a person spends
.pa

...x computer

...x Information, revolution

his money to purchase a computer, he is contributing to the information revolution.

After answering the questions asked by the DocuMate/Plus menu, the following would be generated in a new file:

computer, 2
computers
phenomenon
80's, 1
information
revolution, 2

Various formats and references may be accomplished using:

"...R" to produce
80's, see *computer*
or "...A" to produce
80's see also *computers, phenomenon*

Commas and quotation marks may also be included. After all these indexed words are placed in a document, should you change page numbers with the .PN command or revise, DocuMate/Plus will pick up the new page number and perform correctly. However, should it be necessary to reformat text, it must be done carefully or the result can be a total mess because dot commands may merge into the paragraphs.

A plus feature is that it is possible to have cross references for any entry, and several levels of indexing so that a listing would be:

computer, 2
information revolution 2
phenomenon 1
80's, 1

WordIndex provides a hard-copy subject listing as a result of your embedding double dot commands for each word or two-word phrase you want in the index at the top of each page on which the terms appear. Only two levels of indexing can be accomplished using a ..@I directive for phrases and ..@M for words (figure 9).



Figure 9.

```

..@M Computer
..@I Computers, phenomenon 80's
Computers are a phenomenon of the 80's. Each time a
person spends
.pa
-----
..@M Computer
..@M Money
..@I Information, revolution
his money to purchase a computer, he is contributing to
the information revolution.

```

The subject index generated is alphabetized and the on-screen version is shown in figure 10.

Index Generator is designed only to create an index. It too scans WordStar files for dot commands. The first must be .index at the top of the initial document page so Index Generator knows what it is looking for.

Only two directives are required: ^PAK and ^PAP, which show in the text as AK and AP.

Figure 10.

```

.cp5           M
C              Money, 5
Computer, 4, 5
.cp3           The print out final index will be:
Computers     C
  phenomenon 80's, 4 Computer, 4,5
.cp5           Computers
I              phenomenon 80's, 4
               I
.cp3           Information
Information    revolution, 5
  revolution, 5 M
.cp5           Money, 5

```

AK is placed in front of each word to be indexed.

AP marks a phrase and must appear at the beginning and end of the phrase (This could be used to generate a single level table-of-contents.) The on-screen text preparation would be as shown in figure 11.

Index Generator works within a new file it names INDEX.\$IS and the original is in the back-up. It sorts in ASCII order: digits, quotes, parenthesis come before letters. Each entry will begin with a capital letter.

This program could adequately generate a one-level index. It would be practical to use in conjunction with a spelling program that marks the front of a word. One could generate a list of all words in the text to be indexed, then use the mark facility on those words. Use the word processors, global search and replace them as necessary with the AK or AP the first time they appear on each page and delete the mark elsewhere.



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Figure 11.

AKComputers are a AK phenomenon of the AK80's. Each time a person spends .pa

his AKmoney to purchase a computer, he is contributing to the APinformation revolutionAP.

The hard copy subject index will appear at the end of the copy as:

80's	1
Computers	1
Information revolution	2
Money	2

Documentation

All three manuals are reasonably good. They become clearer as you add commands to a sample text, run the program and observe what happens. All have helpful on-screen documentation. Potential errors are clearly defined. No installation is required.

DocuMate/Plus suggests that you print out the various formats it is capable of producing via CP/M's "type" and "print" utility so that the actual placement of control commands will print. (They are WordStar non-print dot commands.) Instructions are given in the READ.ME file.

WordIndex provides a printed manual. Two versions of the manual (before and after the text was modified by the program) are on disk files for on-screen viewing. By studying the placement of dot commands and marking the manual with the directives, the commands become efficient and provide a visual reference. (You may discover many dot commands that you may never think of using.) Only WordIndex reports any technical data or even the system size requirements. It states "On a 4MHz 8080 computer with 8-in. drives, depending on the type of document, WordIndex processes about 12-20 pages per minute. As table titles, figure titles and keywords are kept in RAM, the amount of RAM places a limit on the number of entries. With 64K of RAM, you can have about 700-800 different keywords and approximately 25 figures and/or tables."

Index Generator's documentation is on the disk and it may be printed. There are a READ.ME file explaining how the program works, and the INDEX.COM file.

Whether one of these programs fits your needs is a decision only you can make. The present programs can be advantageous in their automatic generation of a table-of-contents. For an index, an inordinate amount of time may be needed to prepare a lengthy document—and this must be weighed against the time it might take to generate the output in the old-fashioned ways. The goals are good, but I'll keep watching for a better implementation for generating an index than re-typing or flagging words on every page of a document. □

Contributing editor Dona Z. Meilach is the author of over 65 books and hundreds of magazine articles on a variety of subjects. Her first book in the computer field, Before You Buy A Computer (Crown Publishers), was inspired by an article she wrote for IA. She is currently writing two additional computer books.



Data Communications

Continued from page 22

videotex pages, and Fast Track—a personal retrieval package that allows the user to view a predetermined sequence of screens of information—are also integrated. The system provides instant access to news and data that until now has been available only by thumbing through numerous periodicals and books or consulting a diverse collection of organizations and services.

As stated, the real objective is to explore public demand for information delivered to the home by a computer-type terminal and determine the specific kinds of information the consumer would like to have available on demand. Another goal is to demonstrate the advantages of being able to call up news and information instantly—in effect, to become one's own news editor—without regard for newspaper delivery times, magazine printing schedules or television broadcast schedules. The system provides a continuously-updated supply of news, sports, weather, business updates and information about science and

technology. On a more intimate level, the user can find out about his own community.

Data networks are spreading throughout the industrial world. They are becoming increasingly accessible to many people and eliminating the drudgery of research. There are essentially three ways in which pages of data can be transmitted to a terminal: broadcast through the air, transmitted via the telephone system or via cable.

Although the few existing commercial information systems are proving technically successful, further refinements are inevitable. Realistically, they will only become more common if the material offered meets specific user needs. This means a great diversity of material must be established. The information providers themselves will only invest capital in the services if there is significant interest in their product. As others have observed, this follows the "Catch-22" evolutionary patterns of most preceding communication services. Initially, few people really wanted television because there was little to view until programs were produced. At first, telephones were unpopular because there was nobody to call. At present, the terminals are still expensive, subscription fees steep, geographic coverage limited and formation and maintenance extremely costly. The last point stifles smaller entrepreneurial information providers—at present, only powerful companies like AT&T, CBS, Reader's Digest, Dow Jones, McGraw-Hill and Lockheed are willing to take the chance. □

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Portables

Continued from page 30

wide by 10-in. deep by 8.5-in. high. Like the other two packages, it yields IBM-PC-like architecture. It has a built-in 300-baud modem, as well as RS-232C, RS-423, and parallel printer ports. This unit is being heralded by many as the supreme PC-compatible unit. It'll set you back at least \$5,000.

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Statistics With a Graph

Elementary statistical methods are used in a surprising variety of applications. However, small business people may have overlooked this powerful tool. The pocket computer program that follows provides for gathering data into table form, finding the mean (average) and standard deviation (measure of dispersion from the mean) and displaying a graph of data entered.

Given the mean and standard deviation of this data set, certain actions can become clear. For example, suppose the mean (average) sales is \$30,000 and the standard deviation has been computed as \$8,000. Because of what is known about standard deviation, this means approximately two-thirds of the customers bought between \$22,000 and \$38,000 (within one standard deviation, plus or minus \$8,000, of the mean). Note that plus or minus 9000 would include more than two-thirds, perhaps three-fourths.

Interpretation of these results will vary. It's likely that since the bulk of business is coming in the range above, the major sales effort should be directed at these customers. Those in the lower one-sixth (half the remaining one-third) may be ignored or selected customers targeted for a special sales effort. Obviously, those customers in the upper one-sixth need special attention. The sales effort here will be different from the principal effort directed at the majority of customers.

For business people interested in applications such as the above, pick up a book on statistics for business people. But read a few pages to see if it's understandable. Some developments of even simple topics are very difficult to follow. What's required are solid examples of practical value.

Program limitations

Since methods of interpretation and use of statistical results vary widely, what's presented here may seem elementary. (e.g. No consideration has been given to degrees of freedom.) However, there is ample room to add sophisticated computation, while taking advantage of the data gathering and graphic routines.

A word of caution seems in order for those unacquainted with the fine points in statistical work. Although well-trained in mathematics, I'm sometimes baffled and frequently amused by differing opinions among experts. Their erudite discourse often seems built on shaky foundations. For example, there are usually errors in the data set and methods of collection are frequently suspect. Thus the importance of many profound details seems lost. For those content with day-to-day practical applications, an elementary approach, as used in this program, may be best.

Program notes

As listed, there is space for additional code to produce more comprehensive results. The entry and graph routines should not need change. Computation begins in Line 400. As the table is read, the product of the interval midpoint and frequency is accumulated in E. The product of the square of the interval midpoint and frequency is accumulated in K. (See line 405.)

The standard deviation and mean are computed in line 415. A variety of formulas may be used alternately; most will require changes in values to be accumulated. Note that this formula for standard deviation uses an assumed mean of zero.

If variables are added above M, be sure to increase the size of F in Line 100. As code is added, decrease the possible number of intervals in Line 120.

For personal use, I add a second print statement in line 615 to output the actual tally along with the graph: PRINT A(J+F+7):PRINT J;" ";M:NEXT J

The entry routine will accept data out of range and adjust the value upwards/downwards to the first available interval. Some users may want a test on entry to ignore such items. Add: FOR J=1 TO A: M=A(J+F+7): PRINT J;" ";M: NEXT J.

If implementing this program on the Casio FX-702P, it may be interesting to use string \$ and use a greater number of X's for the maximum interval. The graph will be more meaningful. With the Sharp 1500 or Radio Shack PC-2, use the plotting features to produce a histogram. ROTATE can be used to print the interval midpoint and tally vertically (horizontal to the finished graph). □

Contributing editor Bob McElwain is a graduate of Pepperdine College with an MA in Mathematics from Boston College. He works with Los Angeles City Schools as a computer science instructor, and as a software consultant for business and industry. He's the owner of Hanco Software (Sylmar, CA), specialists in software for handheld computers.

Variable names

- A = Number of intervals
- B = Lower bound of first interval
- C = Width of interval
- D = Arithmetic Mean
- E = Accumulate for mean; then mean
- F = Number of program variables
- G = Number of data items
- H = Count of tally in interval with greatest tally; then number of data items required for one "X" of output
- J = Temporary value
- K = Accumulated for standard deviation; then standard deviation
- L = Temporary value
- M = Temporary value
- A(1)-A(F): Program variables as defined above
- A(F+1)-A(F+7): Output strings for graph
- A(F+8)-A(F+A+7): Accumulated tally of data items



Program listing

```

100: PRINT "STAT"
    - Be certain to "RUN X", where X is
      the required line number, if data
      is to be retained.
: CLEAR
    - Set number of program variables.
      Change as program modified.
: F=13
    - Load output strings.
: A$(F+1)="X":A$(F+2)="XX":A$(F+3)="XXX"
105: A$(F+4)="XXXX": A$(F+5)="XXXXX"
: A$(F+6)="XXXXXX": A$(F+7)="XXXXXXXX"
    - Get lower bound of first interval.
110: INPUT FIRST BOUND? ";B
    - Get interval width.
115: INPUT "INT WIDTH? ";C
    - Get number of intervals.
120: INPUT "# OF INTS? ";A
    - Test to see memory is not exceeded.
      Room for 104 intervals as listed,
      13 variables not used plus 91
      memories.
: IF A>104 THEN 120

*** ACCUMULATE TALLY OF DATA ***
    - Initialize for count of items.
200: G=0
    - Initialize for accumulation of data
      for arithmetic mean.
: D=0
    - Get a data item.
205: INPUT "ITEM? ";M
    - Exit must depend on a data item that
      will not occur in set. Zero is
      convenient, or -1.
: IF M=99999 THEN 300
    - Increase count.
210: G=G+1
    - Accumulate value for arithmetic mean
: D=D+M
    - Find index to interval for tally.
: L=INT((M-B)/C)+1
    - Correct if out of range, low.
: IF L<LET L=1
    - Correct if out of range, high.
215: IF L>A LET L=A
    - Tally.
220: L=L+F+7
: A(L)=A(L)+1
    - Return for next item.
: GO TO 205

```

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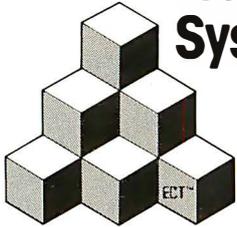
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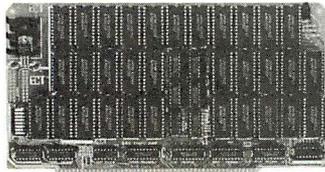
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Program listing (continued)

```

- Find Arithmetic Mean, rounded to
  two decimal places.
300: D=INT (100*D /G+.5)/100

*** COMPUTE STATS ***

- Initialize to find interval with
  greatest tally. (Need for graph.)
  This value is the mode, if only one.
400: H=0
- Initialize to accumulate for comput-
  ed mean.
: E=0
- Initialize to accumulate for stand-
  ard diviation.
: K=0
- Loop through data tallied for mean
  and standard diviation.
: For J=1 TO A
- Find frequency this interval.
: M=A(J+F+7)
- Hold this frequency if greater than
  previous.
: IF H<M LET H=M
- Find midpoint of interval.
405: L=B+(J-1)*C+C/2
- Accumulate for mean.
: E=E+L*M
- Accumulate for standard diviation.
: K=K+L*L*M
: NEXT J
- Compute required number of tallies
  for one "X" in graphic output.
410: H=INT(H/7)
: IF H<1 LET H=1
- Compute standard diviation.
415: K=√((K-E*E/G)/G)
- Round to hundredths.
: K=INT(100*K+.5)/100
- Compute mean and round to hundredths.
: E=INT(100*E/G+.5)/100

*** OUTPUT RESULTS ***

500: PRINT "A. MEAN=";D
: PRINT "C. MEAN=";E
: PRINT "# OF ITEMS=";G
505: PRINT "S.DIV=";K

*** OUTPUT GRAPH ***

- Initialize for lower bound of inter-
  vals. Note: Can use midpoint of in-
  terval by starting with M=B-C/2.
  Round to nearest tenths.

```



```

600: M=INT((10*(B-C/2)+.5)/10
      - Loop through tally.
      : FOR J=1 TO A
      - Get lower bound.
      : M=M+C
      - If interval empty, need blank.
      : IF A(J+F+7)=0 LET L$=""
      : GO TO 615
      - Find number of X's to output.
605: L=INT((A(J+F+7)-1)/H)+1
      - Correct if greater than allowed.
      : IF L>7 LET L=7
      - Select output string.
610: L$=A$(F+L)
      - Output.
615: PRINT USING "####.#";M; USING;" ";L$
      : NEXT J
999: END

```

Sample run

```

STAT
(Enter lower bound of first interval.)
FIRST BOUND? 0
(Subsequent lower bounds are computed by
adding a multiple of interval width.)
INT WIDTH? 10
(Number of intervals must not exceed 13
plus the number of memories available with
the program loaded.)
# OF INTS? 6
(Enter data.)
ITEM? 8
ITEM? 17
:
:
(Balance of data is: 54,42,37,12,59,46,
45,21,36,27,29,32,34. Exit on 99999.)
ITEM? 99999
(Arithmetic Mean.)
A.MEAN=33.27
(Mean computed on interval midpoints.)
C.MEAN=33.
# OF ITEMS=15.
(Standard Deviation.)
S.DIV.=14.24
(Graph.)
5.0 X
15.0 XX
25.0 XXX
35.0 XXXX
45.0 XXX
55.0 XX

```



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CIRCLE NO. 10 ON INQUIRY CARD

Fourth Annual Office Automation Conference

The fourth annual Office Automation Conference (OAC) will be held February 21-23 at the Civic Center in Philadelphia, PA. The event is sponsored by AFIPS (The American Federation of Information Processing Societies; Arlington, VA).

The three-day conference exposition will address all areas of office automation, surveying its impact on business efficiency. Over 50 technical sessions will cover a range of topics from first-time computer usage to applications for sophisticated and highly experienced users.

Selecting a System (Integration Strategies) will present a step-by-step procedure for integrating automation—from its primitive stages to a full-blown computerized office environment. This session will be chaired by Amy D. Wohl, President of Advanced Office Concepts.

Productivity will explore managerial skills required in setting up a successful quality-controlled office environment. It is to be chaired by Dr. Milton Silver, Department Head and Professor of Drexel University.

User Experiences: Plus and Minus will review the experiences of three major organizations in implementing their computerized office systems. Goree E. Waugh, Advisory Systems Analyst for Office Automation of Missouri Pacific Railroad, is chairman.

Advanced Communication Technology, chaired by Norm Vogel of IBM, will explore the communications industry—including local networks, satellite links and facsimile techniques.

Many other seminar discussions will be held under the following main topic headings: Advanced Office Technology, Communications, Current Office Technology, Human Factors and Social Issues, Management and Organization Issues,

and Systems Integration.

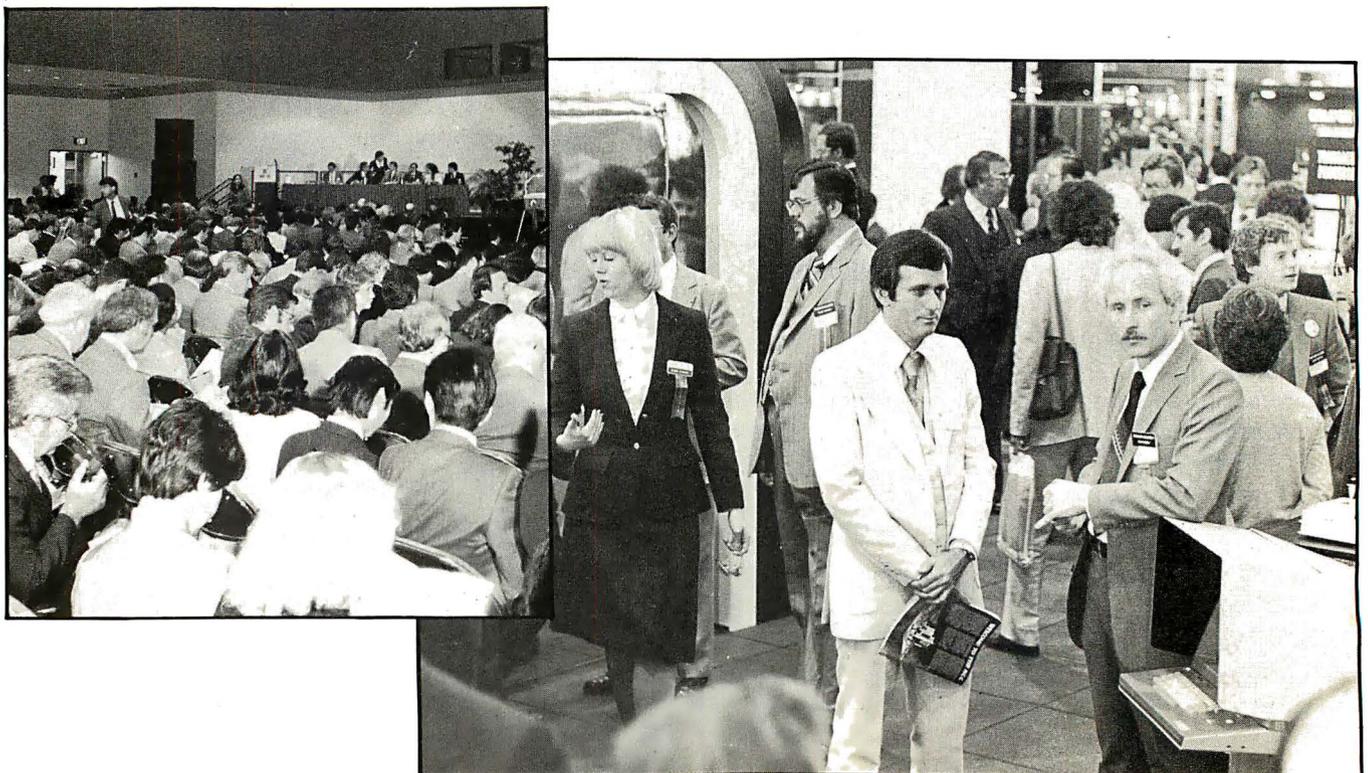
Among the most popular events at past OACs, the traditional luncheon workshops will once again be offered this year.

The topics and chairpersons are: Insurance (by Douglas C. Walters and Chester Gladkowski of Reliance Group, Philadelphia, PA); Banking (by Anne M. Roberts, First Pennsylvania Bank, Philadelphia, PA and John K. Easton, Jr., Provident National Bank, Philadelphia, PA); Law (by Robert Hendel, Davis-Polk and Wardwell, New York, NY); and Medicine (by Albert A. Sinisi, Thomas Jefferson University, Philadelphia, PA and Carl S. Witansky, Shared Medical Systems, Malvern, PA). Each of these four professional disciplines will be explored in regards to office automation techniques. Each session includes a box lunch for each participant, a presentation by the panel and an open discussion. They will run concurrently on Wednesday, February 23, beginning at noon.

A noteworthy event will be a special panel discussion by a quartet of *Newsweek* editors. On Tuesday, February 22, from 2-3 PM, the editors will convene to discuss topics of interest to the attendees. Appearing will be a Senior Editor from National Affairs, Washington, D.C.; a Senior Editor in Foreign Affairs; a Senior Editor in Business, and a correspondent from the magazine's international headquarters.

For prospective buyers, the OAC will include product exhibitions by over 150 companies.

According to OAC spokespeople, attendance at the annual event climbed from 6,000 attendees in 1980 to 18,000 in 1982. The 1982 figure was double that attained in 1981. With the skyrocketing office automation market, there's every reason to expect that the 1983 edition will, once again, draw a phenomenal and record-breaking crowd. □



One good thing deserves another

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TRS-80 Graphics for the Model I and Model III

by David A. Kater and Susan Thomas

Radio Shack, Fort Worth, TX

Reviewed by Chris Gundlach

This book is written in a light, friendly, non-jargon style. On every 8½ by 11-in. page is a wide right margin for personal notes and symbols the authors have used for reminding you to save your programming at certain points. In overall style, this book is very much like the Level I Basic book by Dr. David Lein. It's a decent companion for the beginning programmer desiring to reach that magical plateau of "advanced" standing.

Dot-matrix print is used to illustrate program lines and textual computer output. Screen photos are used to show many graphics examples. Pictures of the models I and III appear where the authors have highlighted features peculiar to one machine or the other.

Two chapters cover screen coordinates for graphics, explaining the relationships of the picture elements. In preparation for later chapters, the authors show some plotting methods using normal text characters combined with functions such as TAB, PRINT AT, SIN, COS and SQR. The book offers many program examples.

All of the commands used for the examples are well-explained. The authors try to give the reader flexibility in choosing from the programming statements already known.

Another chapter elaborates on building graphic elements into string variables. The presence of all possible SET/RESET pixel combinations as ASCII codes in the TRS-80 is shown, along with the special characters that Model III's have. The authors describe how to use the EDIT mode of the computer to keyboard in cursor-control codes so you can create multi-line graphics as one string variable.

One chapter illuminates the speed differences of various graphics methods. It gives a clear explanation of the string-reorganization hangup that the TRS-80 goes into when you're about to run out of string memory, and ways to prevent this. By the time this chapter is completed, one is pretty aware of how Basic in the TRS-80 works for graphics even though one doesn't know a NOP from an LD in machine language.

The final chapters are devoted to applications, encompassing geometrics, statistics graphing, computer-aided instruction, visual aids on the TRS-80, games, animation and artwork. Animation is shown using multiple figure-parts. An extensive program called Ultrasketch is given, too. It permits on-screen drawing and subsequent storage.

There are six appendices and a comprehensive index.

I was pleased with this text. Some of the books previously obtained from Radio Shack have been rather ordinary reprints of older computer-science texts for Basic programming. Many past publications have been disappointing because of their lack of the many inside secrets on the TRS-80 that can be used effectively. This one reaches a new level of competence.

287 pages \$10.95

How to Buy a Personal Computer

by Carlton Shrum

Mayfield Publishing, Palo Alto, CA

Reviewed by Louis F. Sander

This little book is a first-class exposition of practical facts, figures and decision points for the prospective computer buyer.

The first four sections describe and define the range of personal computers, tell why you might want to buy one, describe the common hardware and software variations, and discuss system requirements for specific applications. They are packed

with wide-ranging practical guidance useful to any potential consumer. For example, the "Do You Need a Printer?" section of the "Why You Should Buy a Personal Computer" chapter includes capsule discussions of upper case only vs. upper/lower case, 8.5-in. wide paper vs. 14-in. wide, thermal vs. impact, matrix vs. letter-quality, printer speed, proportional spacing vs. strict columns, and single-sheet vs. continuous-form printing. If you don't think that covers the waterfront, there's even a miscellaneous section that concerns itself with such things as color printing and maximum number of copies.

The final section is a comparison table of personal computers, listing the important attributes of 26 machines from the Sinclair ZX81 to the North Star Advantage. I can't think of an important machine that's been left out, and I couldn't find any technical errors—but there might be some in there somewhere. Twenty-five attributes of each machine are reported, from graphics resolution, to price, service and support. There is a Comments section in the table, with informed words of wisdom on software support, vendor reputation, etc. Everything is positive, and as far as I can see, the evaluator has hit 26 nails right on the head. Any prospective computer buyer should be able to use this table to narrow his choice down to a handful of machines for further investigation.

This is a useful and well-written booklet on a subject of interest to us all. The writer knows his material, and communicates it meaningfully to non-technical readers.

64 pages \$2.95

Developing Computer Solutions for your Business Problems

by Henry Petersohn

Prentice-Hall, Englewood Cliffs, NJ

Reviewed by Dan W. Post

Problem-solving based on computer applications delegated from executives to data processing personnel can be the subject of much miscommunication. This book attempts to show how to effectively explain needs to DP people after the objective has been defined. An emphasis is placed on saving time and bucks. Auditing, privacy, security and backup requirements are delineated. The text, which has apparently been generated with a word processor, is not as attractive as typeset copy, and the outline format of much of the book does not lend itself to easy reading. Nonetheless, in situations where it is not practical to buy or lease a computer, and the manager is going to let someone else do the programming of an application, this material can provide some valuable insights.

157 pages \$14.95

How to Break into Data Processing

by Laura Steibel Sessions

Prentice-Hall, Inc., Englewood Cliffs, NJ

We've all heard how data processing is forecast to be one of the higher-paying and faster-growing fields for career opportunities during the next decade. What most of us don't know, though, is how to train for and acquire a job in it. This short book addresses that void. Written by a data processing recruiter, it offers an overview of the DP field and guidelines for getting a job and becoming a junior programmer. It's loaded with common-sense hints and tips for those considering a DP career—some of which is comparatively generic advice on such things as professionalism during interviews and coping with personnel departments.

—DWP

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More Cubes

Even before the national mania for the *Rubik's Cube* began, early cubemeisters were combining the cube and the computer writing cube-solving programs for private use. Commercial cube programs started appearing about a year and a half ago. Today there are programs for almost every model of microcomputer. They approach the cube from a range of different directions. Among the three programs that we are looking at this month, one is a cube emulator, one is a cubesolver, and the third is a cube-programming system.

Color Cubes

Color Cubes by Robert G. Kilgis is for the Radio Shack Color Computer. It is available as a ROM cartridge through Radio Shack stores.

This program is a *Rubik's Cube* emulator. It imitates on the two-dimensional screen what the three-dimensional cube does. It gives you an isometric view of the cube; the hidden faces are not displayed. In other words, you can see as much as—but no more than—what you see when you hold a cube in your hand, without turning it. To see the other sides of the cube, you must tell the computer to turn it.

Color Cubes uses the keyboard of the Color Computer in "calculator mode." The operations are key-driven, which means that each key is assigned a specific function. For example, pressing the "N" key will always cause the front slice of the cube to rotate clockwise. Likewise, each of the other eight possible moves is operated by a specific key. The other moves are related to the "slices" of the cube. There is a top, middle and bottom slice, reading the cube top-to-bottom; there is a left, middle and right slice, reading the cube from left-to-right; there is a front, middle and back slice reading the cube from front-to-back. Since each of these nine slices can be rotated either clockwise or counterclockwise, there are 18 different keys assigned to slice-rotation. To make it easier for you to remember which key does what, there is a very nice multi-colored plastic overlay that fits around the keys.

You start with a solved cube on the screen, and proceed to mess it up by rotating various slices. Cube purists have more formal names for what you're doing, but that's how it comes out. What's the advantage of that? We don't know! We guess if you decide you want to go back to the solved cube, or would like to figure out how you got that nifty picture of Winston Churchill in red cubes on the blue face, you can see what all the prior steps were by backing up one step at a time, and seeing it done on the screen. Cube purists will not like this program, because it does not indicate moves using Standard Cube Notation. The cube notation, in two years, has become as graven-in-stone as chess notation, which took centuries to develop. If you want to copy down the steps made in Standard Cube Notation, this program makes it no easier than using your own cube without a computer.

You can also start this program with a non-solved, known cube. One of the advantages of the cubememory feature is that when you are trying to solve a real cube, and have gotten about six moves into a Serious Mistake, you are stuck unless you can remember every move that got you into the Mistake. A systematic person would write everything down on paper as it's being done. Sounds easy, huh? Many is the time we *thought* we had every move written down, only to find that we were *wrong!* A non-systematic person better use a computer. The Radio Shack Color Computer program

allows you to back up as far as 255 moves, which should be plenty for most of us.

If you want the computer to solve your cube, you're out of luck with this program. It's a fine program for what it does, which isn't solving cubes. When we wrote the column on interfacing a *Rubik's Cube* as an input device (*IA* Dec 81), this is just the sort of program we envisioned as using that input device. It does exactly what we thought a cube-input program should do, except that it uses the keyboard as an input device, instead of the cube. This means you serve as the cube-to-computer-to-cube interface.

Rubik's Cube Unlocked

Rubik's Cube Unlocked by Jeff Gold (Double-Gold Software, Saratoga, CA) is a cube-solving program. It is a machine language program for the Apple II computer with 48K bytes Applesoft, and DOS 3.2 or 3.3. It has excellent high resolution graphics for either color or black and white monitors.

Like many of the solutions found in paperback books, this program uses a fixed method for solving all cubes. It starts with the top edges, then proceeds to the top corners, middle edges, bottom corners, and finally the bottom edges. The program makes an excellent, infinitely-patient teacher. If a cube can be solved, that is, if it hasn't been taken apart and put back together wrong, *Rubik's Cube Unlocked*, will eventually solve it for you. If you enter the colors placed in each square on the faces of a cube, and goof it up—for instance, coloring a corner 'cubie' with two or three red faces—you, too will have a red face, because the program will be unable to solve it (it better not be able to!). The graphics screen layout does a very good job of presenting all the information you need in order to follow the program's instructions for solving a cube. The screen shows an isometric view of the cube, a two-dimensional view of each of the six sides and a two dimensional view of the side to be turned both before and after the move is made.

Mr. Gold's program allows for several different modes of use. The program has a short demo with some nice graphics. If you have a cube you wish to solve, you can enter that cube into the computer, and the program will show you how to solve it. Once you have your cube solved, you can use the "Patterns" option to let your computer teach you how to create several different designs. If you want a challenge, the program will create a cube for you to solve; you decide how many random moves the computer will use to make the random cube. Once a random cube has been formed, you can either have the computer solve it, or you can use the "Play" option, which lets you enter commands to tell the computer how to solve the cube. As you enter the commands, the computer will display the cube as it looks after the move.

This is an excellent program. It can and does solve any legitimate cube. It will also teach you how to solve a cube by a fixed routine, and it will help ease the frustrations of looking at an unsolved cube, but it will not make you a "Cubemeister." Since the program uses a fixed routine for solving a cube, it may take many more moves to solve a cube than it took you to mess it up in the first place. Even operating as fast as it does, this program could probably be beaten by an expert Cubist. This in no way detracts from the value of the program, but does indicate the vast superiority of the human mind in grasping complex patterns and identifying optimum solutions.

Programmable Cube

The Programmable Cube by Metacommet Software (Hartford, CT) is also for the Apple II. Like *Rubik's Cube Unlocked*, this program includes a cubesolver. However, it is much more than just a program to solve a Rubik's Cube. It is a complete



programming environment for writing programs in a high-level "cube language."

All six sides of the cube are displayed in color or black-and-white. The three sides that would be normally shown are visible in an isometric view, and three hidden sides are shown as if three mirrors were placed behind the cube to show each unseen side. Graphics and animation are not quite as good as those on the Color Computer. Because the Color Computer program is not trying to show as much at one time, it can show what it does in more detail. That's not the point, however. A program with detailed graphics that doesn't *do* much of anything isn't much good. The resolution isn't as important as what it does.

You can use this program in a "calculator mode", like both of the programs already described. Commands are entered using Standard Cube Notation (which should make it acceptable to cube purists). Example: If you want to rotate the front slice one-quarter-turn clockwise, you type:

```
F+ <RETURN>
```

"F+" is standard notation for this operation. As you type in commands, they appear to the right of the cube. When you press the <RETURN> key, the command is executed and the slice-rotation is animated on the screen.

Commands do not have to be executed one at a time, as with "calculator mode" programs. They can be made into a routine, with the list of commands you decide on being named as a subroutine, callable by name. For example:

```
DEFINE DIAGON REPEAT 3 F+ B+ R+ L+ END
```

defines a routine called DIAGON, which repeats the sequence, (F+, B+, R+, L+) three times, then ends the routine. To execute this routine, you simple type:

```
DIAGON <RETURN>
```

As suggested by its name, the program puts a diagonal pattern on four faces of the cube. It is its own inverse, and if executed again, returns the cube to its original state. At a later time, if you want to use DIAGON in part of another routine, it has now been defined as a new command for that purpose. For example:

```
DEFINE NOTHING REPEAT 2 DIAGON END
```

defines a routine called NOTHING that will flip the cube all around and end up just the way it started. You can use this routine to impress the toenails off your friends.

If you need to, a routine can be edited, as is the case with other high-level languages. Routines can be saved, deleted, renamed and loaded from disk.

Conditional tests permit you to examine individual "cubies" for purposes of controlling the execution of different routines. This IF...THEN structure is an essential feature of a complete programming language.

The "solver" program included with the system is a program written in "cube language," and a complete listing of the program is given at the back of the 50-page user's guide. You are expected to write your own routines; eventually you should be good enough at it to optimize the "solver" program with your own custom routines. Solver, for instance, required 12 moves, 111 tests, and took four minutes solving a cube we gave it that was already solved! It was not smart enough to "see" a solved cube at the beginning, or, when it was one move away from a solved cube, to "know" the one move that would get it back.

Writing the perfect "solver" program is only one of the "objects of the game" for the prospective cubologist. Another possibility is finding routines that are their own inverse, or

ones that lead to the starting position after being repeated a number of times. The DIAGON routine mentioned above is an example of a routine that is its own inverse. If it is repeated twice, the cube will return to its initial state. Finding other routines that are their own inverse is only one of the many "objects of the game" for the dedicated cubologist. Another is finding routines that will return the cube to its original state if repeated "n" times. Since the Programmable Cube language allows you to define your own routines, finding ones that return to the solved state after a fixed number of repeats becomes as easy as typing in the name of the routine.

For example, the sequence of moves (R- F+ R+) will return the cube to its original state after four repeats and the routine (F+ B+ R+ L+) will return the cube to its original state after six repeats. Are there any routines that will return the cube to its original state after an *odd* number of repeats? If repeated enough times, will *any* sequence of moves eventually return the cube to its original state? Leah has done an (R- F+) 126 times, and has gotten the cube back to its original state. (Unfortunately, the same can't be said for her hand.) For the "cubologist," the *Programmable Cube* can be a powerful tool for uncovering new "principles of cubology," without developing "Cubist's Thumb" syndrome.

This program reminds us of Silas Warner's *Robotwar*, (from Muse Software, Baltimore, MD; see "Game Corner" *IA* Nov 81), a program that also defined a "game language," was programmable, and involved a "compiler" and debugging tools. While *The Programmable Cube* is not as fancy, it does embody many of the same concepts, and its designers envision its use as an aid to teaching programming concepts, just as we did for *Robotwar*. The educational aspect of *The Programmable Cube* is one of its strongest points. Since the object of the game is so different from "build a robot that can blast the other guy's robot," the motivation and the type of programmer it attracts, is also probably quite different. The robot language was more like Basic, while the cube language is more structured, like Pascal. In fact, the files saved by the *Programmable Cube* are standard Apple Pascal text files, which means they can be edited by the Pascal text editor.

The Programmable Cube and *Robotwar* could be used together in a training curriculum. Such a curriculum would introduce its students to a wider variety of programming concepts and philosophy than would be possible with either game alone. "Learning through gaming" might be an important approach in programmer-training of the future. It might provide an impetus for the "arcade generation" of today to get into the "programmer generation" of tomorrow with a minimum of motivation.

One more thought: If the Solver program were already perfect, and Warner's robot-programs were already unbeatable, there wouldn't be any challenge left to motivate the user to write programs in these languages. Since these are single-purpose languages, with a specific goal in each case, it follows that the user, if given "the solution" to these problems, would lose interest in programming in the language. Fortunately neither building an unbeatable robot nor solving a cube optimally is such an easy task to specify. There may not even be one "best" solution to either of these problems. It's like having a language for writing chessplaying games.

More cube thoughts

Over the past year, several mutations of the basic cube have appeared. There is the *Pocket Rubik's Cube*, which is a 2-by-2-by-2-cube. You might consider this as a "starting" code for smaller cubists, although straightening a "scrambled" 2-by-2-by-2 *Rubik's Cube* is not trivial by any means. If you have cube



reflexes developed on a 3-by-3-by-3 cube, they won't help you much on the *Pocket Rubik*. Your 3-by-3-by-3 cube reflexes will do you more good on the *Rubik's Revenge*, a 4-by-4-by-4 version of the cube. (Ideal Toy has even started a club for Cubefiends: the Rubik's Cube Club, Box 72, Hollis, NY 11423.) We wonder when a general program for an N-by-N cube (any number of rows and columns) will appear. No doubt, someone is working on it right now. Of course, there is a difference between the cube on the computer screen and the cube in your hand. There may be cubes (or other shapes) that just can't be built to rotate freely along every axis. That is mechanics, and requires someone clever to do the engineering design that makes such rotation possible. On the other hand, "screen cubes" can do anything. The computer is not limited to things that can be physically built.

An even more general case of the *Rubik's Cube* would involve alternate geometries. There are a number of Platonic and other geometric solids that can be cubed. The Pyraminx, which uses a tetrahedron, comes to mind, and there are "cubes" that are octahedral, cylindrical and icosahedral figures. Using the computer to simulate the rotations of some of the more challenging Platonic or Aristotelian solids would be a worthwhile goal, especially since some of these may be mechanically impossible to rotate. That's no big problem if your computer simulation does the rotating.

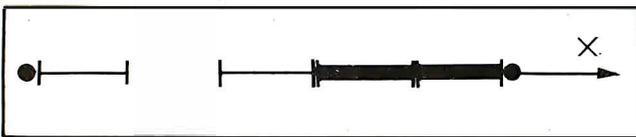


Figure 1. Line puzzle

Another in a group of impossible cubes would be the geometry of spaces with more or less than three dimensions. A zero-dimensional "cube" is a point in space; it has no dimensions and no extension. If you move the point in some direction "X", imagining that it leaves some sort of a trace behind itself from its starting point to its ending point, you will have a line-segment marked out along the "X" direction. A line-segment is a one-dimensional "cube." If the line segment is lifted out of the line it is a part of and moved in some direction "Y"—at right angles to the line "X"—it will trace out a square (provided that it is moved a distance equal to its length). The square is a two-dimensional "cube."

If the square is lifted out of the X-Y plane it is resting on, it will trace out a cube, provided it is moved in a direction—called the Z direction—at right angles to the surface, and moves a distance as long as the edge of the square. The three-dimensional object thus formed is a "real" cube, and is the only one of these objects that could be constructed in the real three-dimensional universe we inhabit. Going further in a fourth dimension—Minkowski tells us it should be called the "T" axis, and represents motion into the past or future—if we drag the cube into the past or future exactly a distance equal to the length of the cube's edge, we get an object called a tesseract. This would be a fourth-dimensional analog of a cube. Beyond the fourth dimension, there are probably five, six, and N-dimensional cubes, but I don't know their names, or what we would use for the dimensions along which we would construct them.

Also according to Minkowski, motion in the time-dimension would be measured in units of "T" (seconds) times "c" (the velocity of light) times "i" (the square-root of minus-1). This works out to a foot of distance being about 1 nS (one billionth of a second) of time. Our timepieces measure distance along the "T" axis in very long pieces, indeed . . .

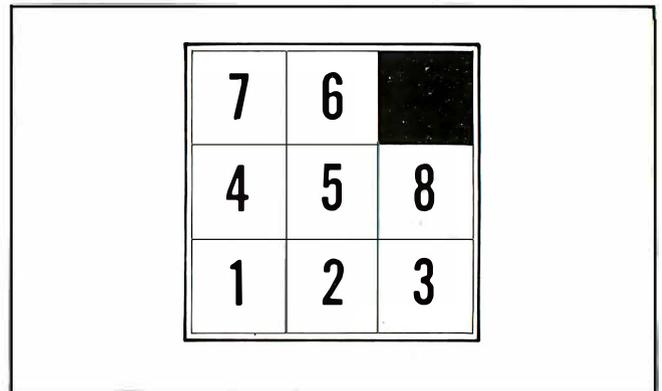


Figure 2. 2-D puzzle

What would *Rubik's Cubes* in these various dimensions be like? Forget cubes of dimension zero—they're so uninteresting that we're sure Rubik would never have bothered with them, and Ideal Toy would have trouble marketing them, anyhow (packaging wouldn't be a problem). The one-dimensional *Rubik's Cube* would probably consist of a group of short, colored line segments (can one-dimensional objects have color?) with a gap somewhere in the line. The object of the game would be to slide the segments up and down the line until the ones of the same color were together (figure 1).

Since they couldn't be slid *past* each other, this would be even less interesting than a game of musical chairs, with more chairs than people. Two-dimensional *Rubik's Cubes* have existed for years. They are called Sliding Puzzles (figure 2).

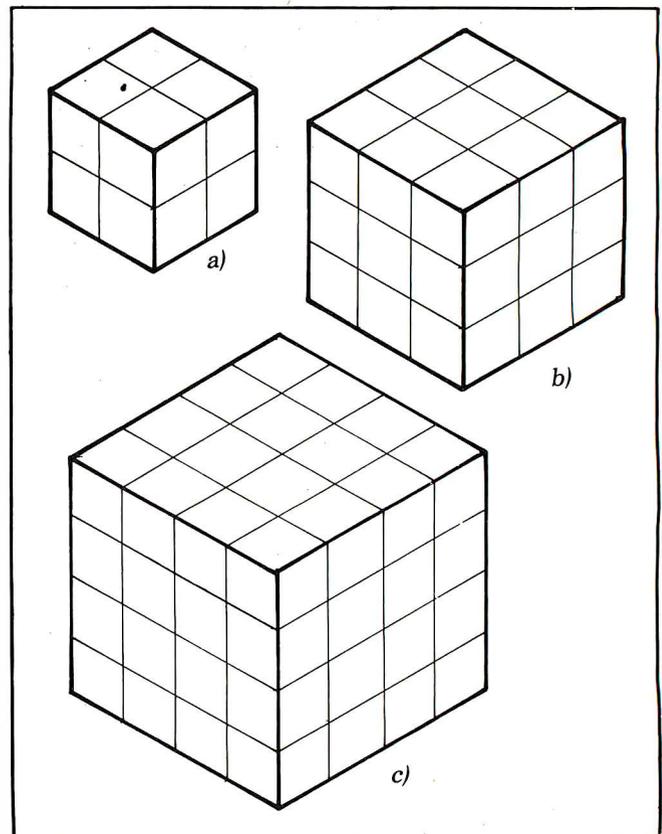


Figure 3. 3-D puzzles

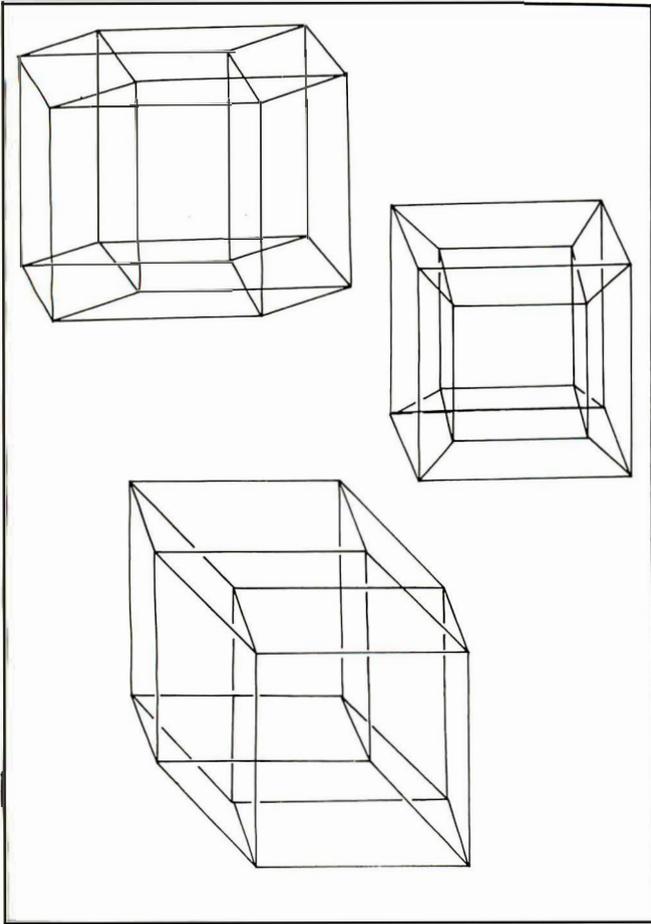


Figure 4. Several views of a tesseract

A Rubik's version of the sliding puzzle would probably use colors. One missing square is needed to permit sliding the other squares around inside a square frame. The puzzle game called 'Whip-it' is a puzzle like this wrapped around a cylinder, with rotation added, and limits placed on the direction in which sliding is permitted. The game called Missing Link is another variation, with the puzzle wrapped around a square prism. The three-dimensional *Rubik's Cube* comes in 2-by-2-by-2, 3-by-3-by-3, and 4-by-4-by-4 versions at this writing (figures 3a, b, and c respectively).

In the two-dimensional and three-dimensional forms, building a real model is mechanically possible. For a four-dimensional one, only a computer model could be built.

A two-dimensional cube has one surface, the three-dimensional real cube has six surfaces, and the four-dimensional *Rubik's Tesseract* would have 24 surfaces to keep track of. Here is how we figure that out.

At each end of the "trace" that marks out the tesseract, there is a cube with six surfaces (total = 12) and each edge of the cube we started moving in the "T" direction traces out another surface to its final destination. There are 12 edges on the cube, so they trace out 12 more surfaces (total = $12 + 12 = 24$). That's four times as many surfaces to keep track of as in a 3-D cube. Although there's no way to visualize it in three dimensions, the tesseract's 24 surfaces will all be outside surfaces. Using a computer screen, there's no way to really depict a three-dimensional cube, so a four-dimensional one should be a real challenge.

What do we do to make a cube appear three-dimensional on a two-dimensional video surface? The answer: we project a picture of a cube onto the surface. For a four-dimensional object, its projection into three dimensions would be confusing to a three-dimensional observer, because its shape would constantly appear to be changing as it was viewed from different directions. The changes in shape would not appear to make sense to us. Likewise, the changes in the shape of a cube projected onto a flat plane would make little sense to an inhabitant of Flatland. "How can that parallelogram be a square?" a Flatlander might ask. It would be hard to explain concepts like foreshortening and perspective to a two-dimensional being. Similarly, we have difficulty seeing all the shapes in a 3-D model of a tesseract as cubes (figure 4).

A projection of a four-dimensional cube onto a two-dimensional video screen is likely to be even more confusing than the various projections of a cube onto such a screen (translation: totally incomprehensible). Therefore, our Super-Cubist will probably benefit from an "exploded view" of the tesseract. To illustrate this point, remember that we can't even see all six surfaces of a 3-D cube on the screen at once. Figure 5 shows an exploded view of the 3-D cube.

What the 4-D cube might look like is a solution left to you. We suggest starting with a 2-by-2-by-2-by-2 tesseract—color it complicated. We'd like to see suggestions from our readers how the final form of a *Rubik's Tesseract* game might look. The best descriptions received by April will be the subject of a future column.

Like Spock's 3-D chessboard, the thing is a natural next step in the development of "cubography." Pity we can't actually hold one in our hands. . . . □

Contributing editors Patrick and Leah O'Connor reside in Chicago, IL. Patrick has held the position of professor of digital electronics at DeVry Institute of Technology for 14 years. Leah does freelance computer programming and technical writing for a number of Chicago-area companies including the Image Producers in Northbrook.

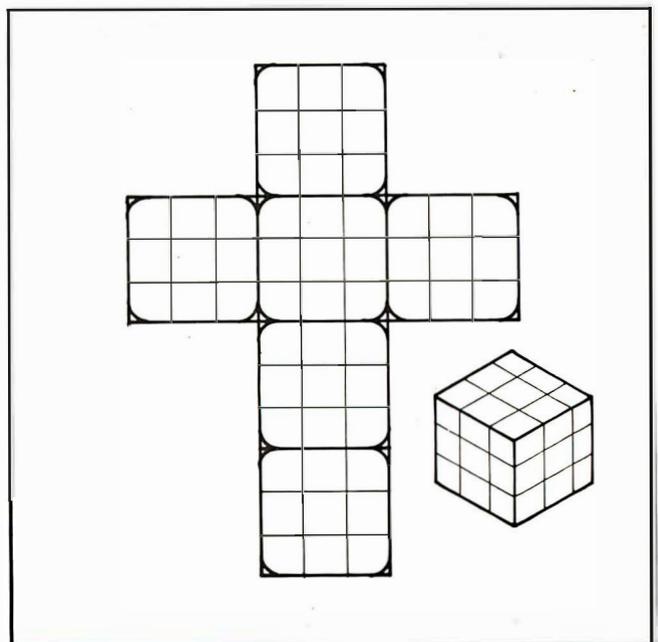
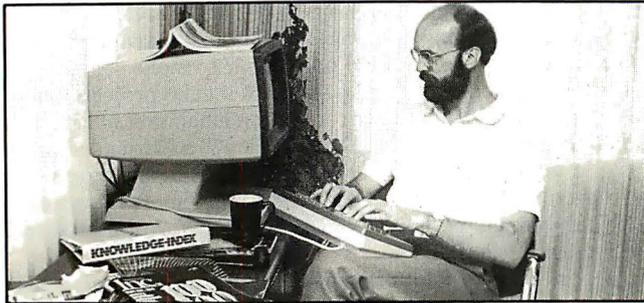


Figure 5. Exploded view of 3-D cube



Research database

With local phone calls, subscribers to *Knowledge Index* can use personal computers to access information from more than 10,000 publications covering computers, electronics, engineering, medicine, agriculture, business, psychology and education. Simplified search procedures allow rapid searching of many sources. The service is available at nighttime and on weekends.

Dialog Information Services, Palo Alto, CA.

CIRCLE NO. 161 ON INQUIRY CARD

CP/M-compatible software

The popularity of a product sometimes creates problems for the interested user. In the case of CP/M, the most widely-used microcomputer operating system, there are hundreds of software products available, but too little information on how to obtain them. Few people know how to go about ordering the right software for their application—let alone what's available.

Digital Research has helped to alleviate this glut-of-software problem by compiling a list of independent software vendors. *The CP/M-Compatible Software Catalog*, published twice a year by the company, contains a list of over 350 separate vendors plus addresses. A brief description accompanies each product to assist the interested user in obtaining the optimum set of software for his application.

Included in this edition is a directory of CBasic, CBasic-86 and CB-80 software vendors. A smaller list of PL/I-80 and Pascal/MT+ completes the language section. The applications portion classifies each product under major headings to make it easy to locate a particular software package.

Digital Research, Pacific Grove, CA.

CIRCLE NO. 162 ON INQUIRY CARD

Software-buying cooperative

The Software Co-op, a members-only consumer buying cooperative, has been formed to assist microcomputer owners in obtaining ready access to a wide range of software at members-only prices. The catalog offers a complete assortment of entertainment, adventure, and educational software for Apple, Atari, and TRS-80 users.

All software is priced at 15-to-30% below retail prices. A small membership fee entitles members to product reviews, a quarterly catalog and newsletters as well.

The Software Co-op, Evergreen, CO.

CIRCLE NO. 163 ON INQUIRY CARD

Electronic publication

The NewsNet system database contains current and back

issues of nearly 100 business-oriented newsletters, with full keyword search and find capacity. The recently-introduced NewsFlash service constantly monitors all additions to the database for any references to user-specified keywords and immediately delivers them on-line automatically to individual users.

To initiate NewsFlash, users create an interest profile consisting of up to 10 keyword phrases. The NewsNet computer can be ordered to monitor a specific newsletter, a specific industry or the entire NewsNet information base. Then—when an article is published containing the requested information—the user is automatically notified of the NewsFlash “match.” Usually, this will occur long before the article is available in print.

Independent Publications, Inc., Bryn Mawr, PA.

CIRCLE NO. 164 ON INQUIRY CARD

Magazine indexes on-line

Two databases covering microcomputer magazines and mini and microcomputer software have been announced.

The Microcomputer Index is a subject and abstract guide to such journals as *Byte*, *Interface Age*, *Infoworld*, *Personal Computing* and 30 others. Database records include a short summary or abstract and complete source information (author, title, journal, date, etc.) plus subject indexing aids. Material indexed includes general articles about microcomputers, software and book reviews, applications and new product descriptions.

Dialog Information Services, Palo Alto, CA.

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Software newsletter

Microcomputer Software Letter is a newsletter directed to the business microcomputer user.

The contents will cover four basic areas each month: important trends and user tips to enhance productivity; a review of the top five or six software packages in each major business area (e.g. word processing, spreadsheets, etc.); a summary of important articles appearing in 45 publications that cover the micro area; and a listing of resources important to business users, such as training packages, seminars, directories, catalogs, etc.

Microcomputer Software Letter, New York, NY.

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Letter on Graphics

The Purcell Letter on *Graphics For Management* demonstrates better graphs for business planning on your microcomputer. Based on the publisher's experience teaching over 100 courses on graphics for management, it explains how to develop and use graphs that analyze future possibilities for profit and cash flow. It shows how to summarize and compare dozens of possibilities on a single neat graph in order to pinpoint the best plan, and how to produce these graphs with low-cost computer equipment.

Graphics For Management, Columbus, OH.

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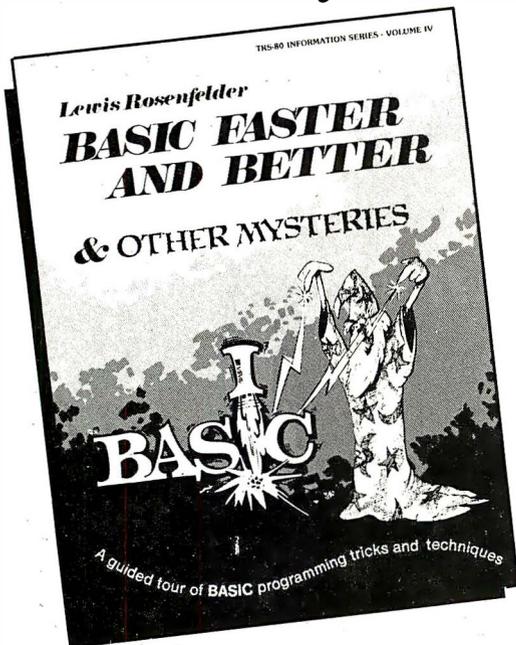
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Dataguard, Fort Lee, NJ.

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Graphics report

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Datapro Research, Delran, NJ.

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Business database services

A broad range of microcomputer-based services, initially including business applications for information management, financial modeling and analysis, data entry and word processing have been announced. The services will integrate microcomputer-based applications software with an expanding universe of databases and remote computing services available through the Tymnet data communications network.

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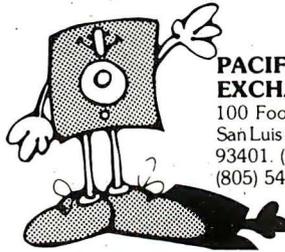
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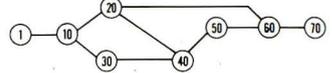
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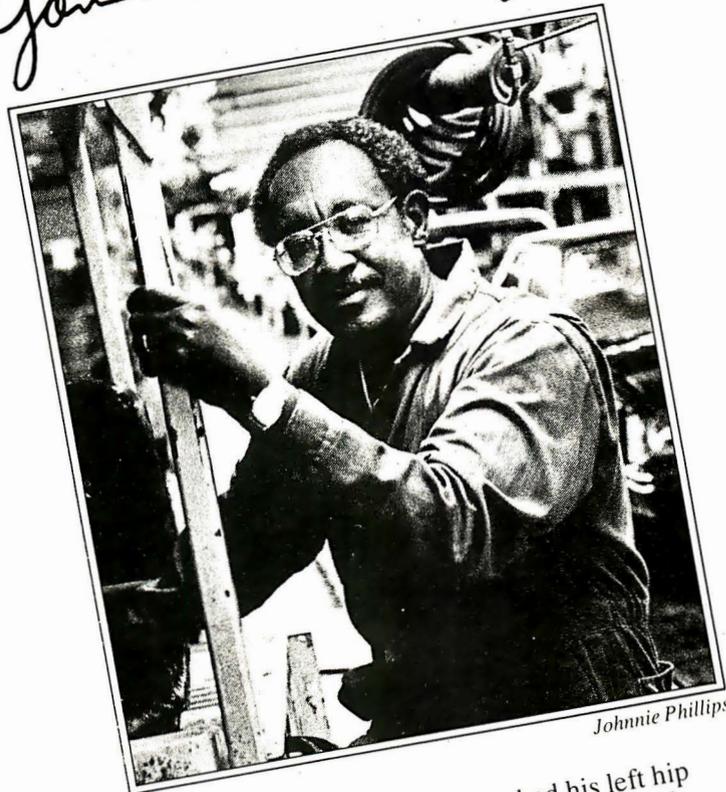
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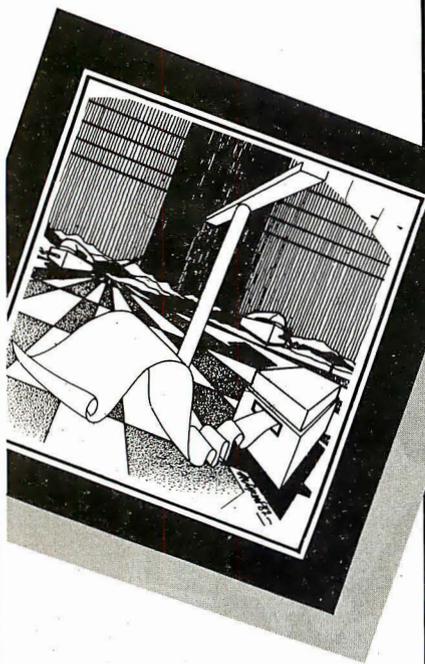


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- F) Administrative Clerical

3. I Need This Information For:

- A) Immediate Purchase
- B) Purchase 30-60 days
- C) Evaluation/Comparison
- D) Company Reference File
- E) Other

4. My Main Product Interest Is:

- A) Hardware
- B) Software
- C) Peripherals
- D) Data Communication

5. My Computer Application Is:

- A) Accounting/Finance/Payroll
- B) Process/Industrial Control
- C) Distribution/Inventory
- D) General Office Wordprocessing
- E) Design/Development Scientific
- F) Instructional/Educational
- G) Other

6. My Computer Software Budget Is:

- A) \$ 50 \$ 499
- B) \$ 500 \$ 1,999
- C) \$ 2,000 \$ 4,999
- D) \$ 5,000 \$ 9,999
- E) \$ 10,000 \$ 20,000
- F) Over \$20,000

7. My Computer Hardware Budget Is:

- A) \$ 250 \$ 1,499
- B) \$ 2,000 \$ 4,999
- C) \$ 5,000 \$ 9,999
- D) \$ 10,000 \$ 20,000
- F) Over \$20,000

8. My Company Size:

- A) \$250,000 to 1.5 million
- B) \$1.5 million to 10 million
- C) \$10 million to 25 million
- D) \$25 million to 75 million
- F) Over \$75 million

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Please complete the following information: (ONE check per question)

I need more information on: 346 Computer Systems 347 Applications Software 348 Peripherals 349 Operating Systems Software

1. My Field Is:

- A) Professional
- B) Scientific/Engineering
- C) Business
- D) Industrial
- E) Banking/Finance
- F) Government
- G) Consultant
- H) Other

2. My Position/Title Is:

- A) President/Owner
- B) General Manager/Partner
- C) Supervisor/Manager
- D) Group Section Leader
- E) Member Staff Department
- F) Administrative Clerical

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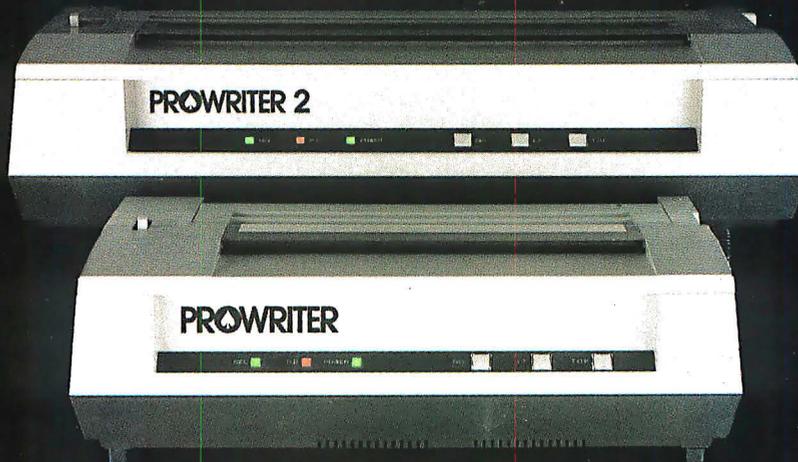
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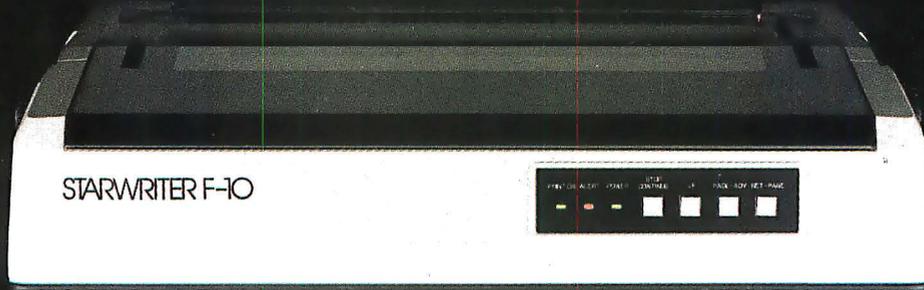
Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode. Parallel or serial interface.



THE STAR.

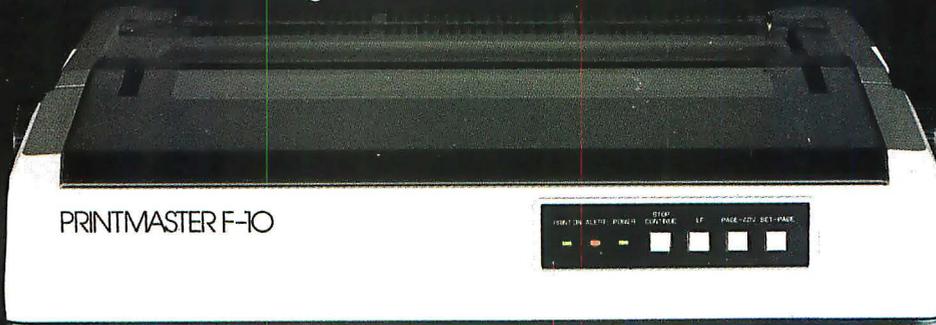
The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing.

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PROWRITER: Parallel and serial interface standard.

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