COMPUTING FOR BUSINESS AND HOME

INTERFACE AGE™

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THE COMPUTERIZED LAW OFFICE

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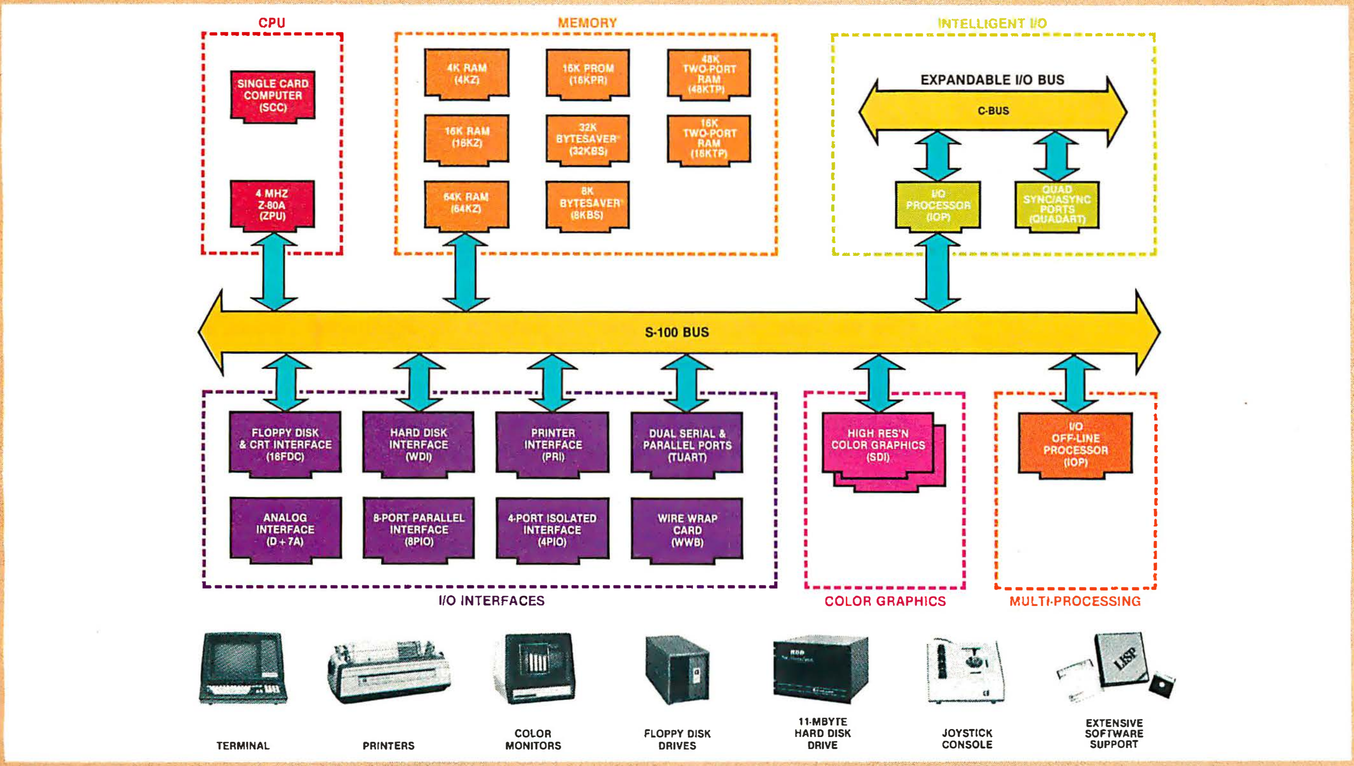

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These are all cards that plug into our S-100 bus microcomputers.

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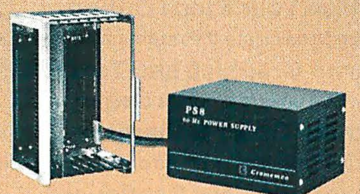

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These days you often want lots of disk storage. So you can select from our disk controller card which will operate our 5" and 8" floppy disk drives (up to 1.2 megabytes). Or select our WDI interface to operate our 11-megabyte hard disk drives.

POWERFUL SOFTWARE AND PERIPHERAL SUPPORT

There's much more yet you can do with our cards. And, of course, there's an easy way to put them to work in our 8-, 12-, and 21-slot card cages. Our PS8 power supply makes it simple to get the system into operation.

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CONTACT YOUR CROMEMCO REP

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CROMEMCO COMPUTER CARDS

- **PROCESSORS** — 4 MHz Z-80 A CPU, single card computer, I/O processor • **MEMORY** — up to 64K including special 48K and 16K two-port RAMS and our very well known BYTESAVERS® with PROM programming capability • **HIGH RESOLUTION COLOR GRAPHICS** — our SDI offers up to 754 x 482 pixel resolution. • **GENERAL PURPOSE INTERFACES** — QUADART four-channel serial communications, TU-ART two-channel parallel and two-channel serial, 8PIO 8-port parallel, 4PIO 4-port isolated parallel, D+7A 7-channel D/A and A/D converter, printer interface, floppy disk controller with RS-232 interface and system diagnostics, wire-wrap and e tender cards for your development work.

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SINCE DECEMBER 1975

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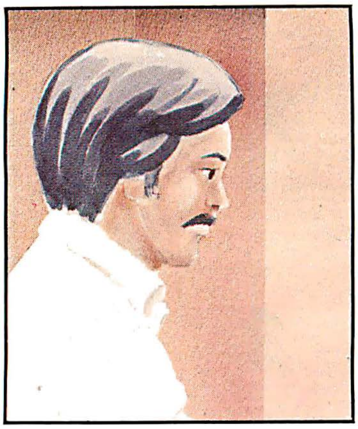
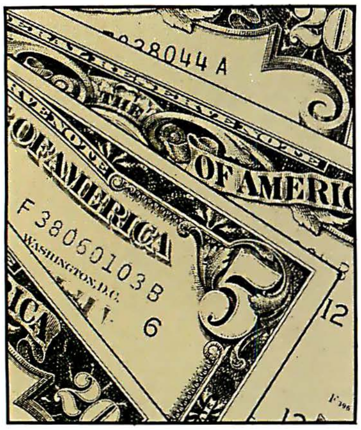
INTERFACE AGE™

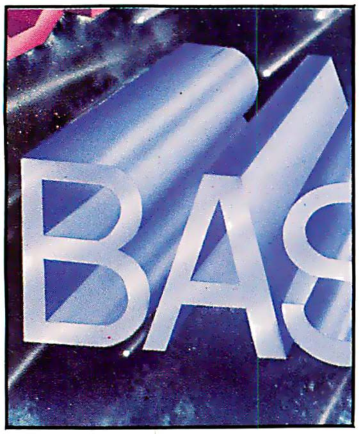
COMPUTING FOR BUSINESS AND HOME APPLICATIONS



Spanish-to-English Compiler 66



Law Office Billing System 70



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COLUMNS

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Contact authors of monthly columns by writing to them at INTERFACE AGE, P.O. Box 1234, Cerritos, CA 90701 in care of their respective columns.

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EDITOR'S NOTEBOOK

Ignorance is not bliss

"Sire, the messenger bears bad news." "Off with his head!" said the princes of ComputerLand.

We're deeply involved in the microcomputer business, and we love every minute of it. The world of micros provides fresh, vital solutions to the kinds of problems the human race has been facing for eons.

Computers are more readily available than ever before to prospective buyers. Clever men and women have labored long, hard hours to improve merchandising techniques. The computer-buying public is the better for these efforts.

But a recent experience brought our attention abruptly to an attitude that threatens this entire free-wheeling structure. Poking around in one of the few dark caves of the industry, we awakened a snarling, ugly bear of a mind-set. We thought you should know about it.

Celebrating the enterprising spirit of our industry, our March issue focused on all available alternatives. We talked about timesharing as opposed to purchasing; about leasing vs. buying; about the Request for Proposal method... among other options. We also wrote an article called *Computers by Mail*, which describes an increasingly popular computer purchase alternative: through mail order catalogs.

The day the March issue hit the stands, our phones started ringing. On the other end of the red hot lines were computer store owners, upset at us for calling attention to the fact that computers can be procured from sources other than their local shops. Some even cancelled their contracts to sell our publication in their establishments. The calls were followed up with letters, evidence that the sentiments ran deep.

What's wrong with this? Nothing, so far. No one makes a universally-loved product. We shouldn't let the heartbreak of rejection ruin our whole day. But as the calls came in, and the letters arrived, a curious pattern emerged: they were *all* from ComputerLand stores!

A coincidence? Maybe so. By most accounts, ComputerLands are the most successful of their genre, so maybe it was natural that they would dominate the returns. Possibly, but that wasn't the reason.

We started asking the callers if they had actually read the article. A frequent reply: "No. I just saw the cover."

Comparing notes, we observed an odd sameness to the calls and letters. They appeared as if they had been scripted by the same person. "(The article) is telling your readers, not to buy computers at their local retailers, but to buy through mail order catalogs" was a common theme. So was, "Let's see if you can sell your magazine mail order. We certainly don't intend to help you." And, "...we will not subscribe to any publication that does not follow a code of ethics."

Harsh words. From whence did they come? From one source, it turns out: a store proprietor, by means of a memo that begins "Dear Fellow ComputerLand Franchisee:". (This person, incidentally, has not mailed his thoughts to us directly.) The memo opens with the (incorrect) interpretation that we are "...promoting the idea to those that read their magazine that they are far better off to purchase NOT from their local retailer but through mail." It goes on with the plea to "join together as a unified body and return ALL *Interface Age* magazines..." Finally, ComputerLands everwhere are rallied together with the cry that "...we are the leaders in this industry, so it is up to us to set the standards. If we allow this type of publication to go on, it will cause nothing but trouble for us in the future."

Several responded to the call, cancelling their distribution contracts with us. (One manager reversed his stand after a week's rumination.) You will no longer be tempted by *our* forbidden thoughts in those places.

How about other stores? What has been the response from Byte Shops and MicroAge stores and thousands of other independent computer retailers that grace our industry? Nothing. No reaction at all. Zip. Curiouser and curiouser, as Alice said whilst following a white rabbit into a strange land that made no sense at all.

Being journalists, we are concerned with following a set of principles—particularly those that challenge our First Amendment rights. From a practical standpoint, we aren't risking too much in this instance. After all, more than a thousand issues of IA are snapped up each month for every ComputerLand store in the world.

No, we aren't bothered by what these stores are doing to us, but what they are *trying* to do to the microcomputing industry. They are attempting to shape it; to mold it into their own idea of what computer retailing should be. They are banding together, using their collective fiscal influence to divert the forces of free enterprise to their own ends. They clearly want computers and computer products to flow to end users through their stores (or at least their kind of stores), and not out of mail-order warehouses.

And what is the tool they choose to wield to shape our industry? Forced ignorance. *Your* forced ignorance. In the idyllic ComputerLand of milk and honey, you won't be told about mail order computer catalogs, thus you won't be tempted to shop by that means. You will be forced to go to the local computer store, since they run the only game in town *that you know about*. And we, the trade press, are being coerced, by means of organized, collective economic action, to create this heaven of consumer ignorance. Not bloody likely.

Robert S. Jones, our publisher, says: "We are dedicated to our readers and responsive to their editorial needs as we know them. In so doing, *Interface Age* thereby provides a showcase for its advertisers and a saleable product for our distribution channels." In simpler terms: We write for our readers' benefit. It is our mission to inform, educate and entertain small computer users.

Two more things need to be said. First, this action did not appear to originate at ComputerLand's corporate offices. When asked to comment, ComputerLand's president Ed Faber said that "(the mail order article) did not bother me. It was about as balanced an article as you could get." He stressed that each ComputerLand store is owned by an independent local businessman, and each is free to display its own choice of magazines, or none at all. Fair enough.

(Curiously, shortly after this interview, the corporate ComputerLand office also cancelled its distribution order.)

The second thought is that we find ourselves generally in sympathy with computer stores and their "mail order problem." The height of frustration must be to spend days or even weeks demonstrating a computer to a client, rooting out his or her needs, and educating the customer about the field of computing—only to have the prospect slip out and buy the same product at a cheaper price via the mails. It just isn't fair. But it's legal, and it's our free enterprise system in action. Do not, however, expect that dealer to be particularly accommodating to your future needs. And don't fool yourself: the needs will be there. The microcomputing business is still in an embryonic stage, and our industry desperately needs more, not fewer, high quality computer stores. If your neighborhood enjoys a good one, it is deserving of your support —even if your initial outlay is a few bucks greater.

—TF

Time & Money. Commodore®, Atari® & Apple® users get more with VisiCalc™ software.

A financial VP in Massachusetts is cutting the time it takes to prepare month-end reports from three days to three hours.

A California company is replacing most of its time-share computer service with a personal computer and VisiCalc, saving at least $30,000 the first year.

Thousands of other personal computer users are also sold on how VisiCalc is increasing their productivity. Besides saving time and money, they're simplifying their work and getting more information that helps them make better decisions. A typical user reaction comes from a New York dentist:

"VisiCalc has become an integral part of my business."

VisiCalc displays an "electronic worksheet" that automatically calculates nearly any number problem in finance, business management, marketing, sales, engineering and other areas. The huge worksheet is like a blank ledger sheet or matrix. You input problems by typing in titles, headings and your numbers. Where you need calculations, type in simple formulas (+,−,×,÷) or insert built-in functions such as net present value and averaging. As quickly as you type it in, VisiCalc calculates and displays the results.

"I am extremely impressed with VisiCalc's capability, flexibility and orderly presentation of instructions."

So writes the director of a New York corporation. He appreciates VisiCalc's powerful recalculation feature. Change any number in your model and instantly all numbers affected by that change are recalculated and new results are displayed. You can ask "What if . . ?," analyzing more alternatives and forecasting more outcomes. It really increases your decision-making batting average!

When you finish, you can print a copy of the worksheet just as it appears on the screen and/or save it on diskette.

"I like VisiCalc's ease of use."

That response comes from a Utah businessman using VisiCalc for production forecasts, financial report ratio analysis and job cost estimating. Ease of use is VisiCalc's best-liked feature. It's designed for a non-programmer, and has an extensive, easy-to-understand instruction manual.

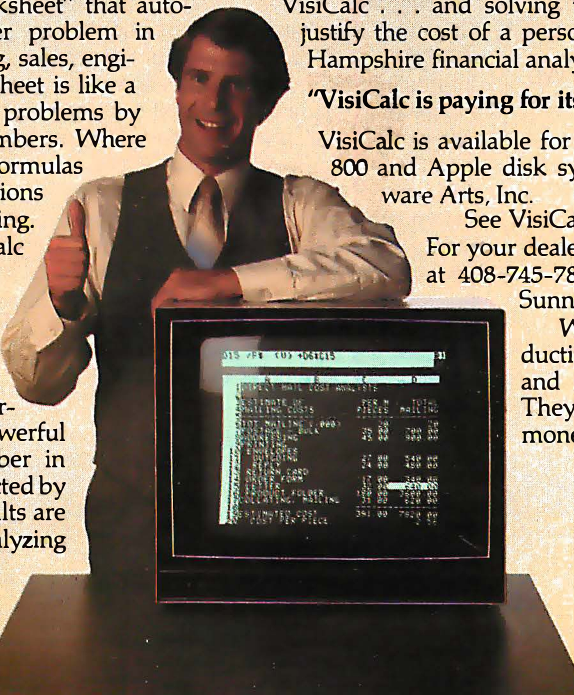
Users also like solving a wide variety of problems with VisiCalc . . . and solving them their way. VisiCalc can even justify the cost of a personal computer, according to a New Hampshire financial analyst:

"VisiCalc is paying for itself over and over."

VisiCalc is available for 32k Commodore PET/CBM, Atari 800 and Apple disk systems. VisiCalc is written by Software Arts, Inc.

See VisiCalc at your Personal Software dealer. For your dealer's name, call Personal Software Inc. at 408-745-7841, or write 1330 Bordeaux Drive, Sunnyvale, CA 94086.

While there, see our other Productivity Series software: Desktop Plan and CCA Data Management System. They're like time on your hands and money in the bank.



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Commodore is a registered trademark of Commodore Business Machines Inc., Atari is a registered trademark of Atari Inc., Apple is a registered trademark of Apple Computer Inc.

CIRCLE INQUIRY NO. 72

LETTERS

Revelations

I have waited a long time for a professional evaluation of the Pascal Microengine. No one said much about the company's initial problems until Tom Fox's article (IA Feb 81). Thanks for the revelation.

Several questions: 1) Can a Digital Equipment Corp. PDP-11/03 or Heathkit H11 be reconfigured to a Pascal Microengine directly by exchanging chip sets? 2) What version of UCSD Pascal is used? Is it the latest implementation? 3) Is it necessary to use the floppy disk if you are just executing a Pascal program? 4) Has the Microengine been used in a real time business/scientific/engineering operating system environment? 5) Does Western Digital Corp. plan to implement Ada on the MFP-16000? When? For what price?

Marshall Chee
Los Angeles, CA

Taking your questions in order: 1) We don't know anyone who's tried this, but suspect serious incompatibility problems with the support chips (DMA, etc.). 2) Version 3.0, Western Digital Release HO. 3) No. A P-Code module burned into PROM should run. We haven't heard of anyone trying it, however. 4) Little or no activity in this area. The new F4 board should allow this kind of application, since it is the first version to support external interrupts. 5) The Ada Microengine was introduced at the Ada/ACM User's conference on 12/8/80. ACI's ME-1600 is available in limited quantities (128K-byte RAM, two floppies at $7,590). **—TF**

Prime question

Your use of the "Prime Number Cruncher" benchmark test (most recently in "Personal Computers" IA Apr 81) are interesting, but raise some questions. In machine language on my 6800 system, 1MHz clock, all prime numbers up to 1,000 can be derived in about 30 Ms. In TSC Basic, a simple program derives the primes up to 1,000 in 8 sec, displays them in 8 additional seconds or derives and prints them on my matrix printer in 25 seconds. That is about half the time listed for a PDP 11/70. I suggest the algorithm used in the comparison was quite poor, say about 2,400 times too long.

Joseph L. Pentecost
Atlanta, GA

We are delighted you felt challenged by the benchmark results. It was, of course, unfair, to publish them without revealing the algorithm; but we are constantly working under space restrictions.

We have received several letters in the same vein: faster methods exist to compute prime numbers; therefore the test is not valid. I'm afraid the point is being missed about the function served by benchmarks. Since the results of such runs are "throwaways" (after checking the results), it makes little difference whether or not the task performed was meaningful in an overall sense. The only function of the selected algorithm is to exercise some aspect of a machine's performance in a way that can be compared directly with that of another computer.

The "Sieve of Eratosthenes" program is indeed far more efficient than the one we have been utilizing. We noted, however, that it took nearly ten times the memory space, illustrating the speed/memory trade-off that is almost an axiom in computing. **—TF**

Curious omission

I read with interest your review of small computers (IA Jan 81). Since I recently read that Digital Equipment Co. has, by far, the largest proportion of the small computer business, I am puzzled that they do not appear on your list. Specifically, I am interested in your evaluation of the PDP 8 and the WT 78 modification of the PDP 8.

Thomas C. King
New York, NY

Mention the PDP 8, and you're talking history. This 12-bit machine, dating back to the sixties, was important because it was the first really popular minicomputer. *Its capabilities are easily matched by many of the new generation of lower cost* microcomputers. *Some of the more up-to-date D.E.C. minis were highlighted in the article* Make Way for Minis *(IA May 81).* **—TF**

Reader interface

I am considering buying a home computer. Since most of the smaller home computers use cassettes for storage, how difficult would it be to interface with an Akai 635-D reel-to-reel tape deck to use the remote facilities on it for fast forward, pause, etc?

John Q. Seville
SSgt, USAF
Box 166, 435 SUP
APO New York, NY 09057

I bought a control box and AC adapter called CompuChess. This is used with the conventional board to play chess. It has 4 LED readouts and a large keypad

Corvus Lowers the Price of Admission to the Winchester Club.

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You can start with 5 million bytes, then expand the system with up to three add-on drives of 5, 10, or 20 million bytes. Our 5 million byte system has all of the advanced features of the larger capacity Corvus systems, including our low cost MIRROR back-up and multi-user CONSTELLATION network that allows up to 64 computers to share the Corvus data base and peripherals such as printers.

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Financial statements, inventory reports, labels and more are printed at data processing speeds from 165 cps to 250 cps.

Fully adjustable tractors and a friction feed platen provide precise forms handling for pin-feed and single sheet paper.

Complete "Dot Control" graphics is standard with resolution to 120 x 144 dots per inch.

Interfacing is easy with both E.I.A. RS-232C serial and an ASCII parallel port.

LETTER QUALITY WORD PROCESSING

The Dual-Mode 200 also features letter perfect print you will be proud to use for business letters and reports. Letter Mode speeds range from 42 cps to 60 cps.

The standard Titan 10 pitch font is complemented by an array of optional fonts including Elite 12 pitch, italics, proportionally spaced, OCR-A, scientific and foreign character sets.

Up to 12 font selections may be stored in the printer and interchanged while printing.

The Dual-Mode 200 accepts standard daisy-wheel print commands for word processing system compatibility.

It's the perfect solution for the two printer problem.

The Dual-Mode 200 Printer for the one printer office.

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of 16 keys that have dual notation. As I bought this second-hand at a Ham Fest, there were no instructions and I have been unable to find the manufacturer's name. I would be very grateful for any assistance.

Dan Quinn
Rt. 3 Box 74-B
Palatka, FL 32077

I have an S-100 logic analyzer called Datalyzer made by Databyte, a company that went out of business. I'm trying to compile a list of users that could act as a user's group. Could any readers who have a Datalyzer please drop me a line?

Bob Marsolais
16121 Atglen St.
Hacienda Heights, CA 91745

We are contemplating our first micro to take over our company's routine bookkeeping (GL, AR/AP, payroll, etc.). We want to purchase interactive business software that includes the source code, so we can make minor changes ourselves. From reading your magazine, the Osborne software seems to fit the *bill*. We are thinking of the TRS-80 II for hardware. Since we see several different companies offering the Osborne programs on disk at various prices, and since there are many CP/Ms and CBasics to choose from, we would appreciate hearing from readers who have had experience in these areas.

Tom Brown
Picture Land Studio
201 Metro Plaza
Mondawmin Mall
Reisterstown & Liberty Heights
MD 21215

Update

The following statistics on the ComputerLand franchise chain are more current than facts reported in the March article, *Looking at Computer Store Franchising.*

Currently, the number of ComputerLand operations totals 129 in the U.S. and 27 in other countries. The present goal is to continue opening stores at a rate of six per month.

Don McConnell, not Michael McConnell, is marketing vice-president.

Corporate sales in 1979 and 1980 ran 65-70% to business and commercial (including educational) purchases. During the holiday season in December, the ratio normally does a flip-flop, with 65% of the products going to the consumer. Thus, the chain cannot be considered predominantly a home, hobbyist and educational market, as stated in the article.

Terminal introduced to increase data security

Computer criminals may be facing a setback or two with the recent introduction of a crime-resistant terminal.

Computer Transceiver Systems, Paramus, NJ, has announced the Execuport portable terminal, a device with the unique ability to transform computer communications into virtually unbreakable code.

Utilizing the Sherlock encryption system, developed by Analytics, Inc., McLean, VA, the unit employs fully automatic encryption and decryption. Messages are sent in plain English. Data transmitted from terminal to terminal, or from terminal to computer is unintelligible to unauthorized recipients.

Each unit incorporates a randomly-operated master key. Units with the same master key, unknown even to the operator, can communicate with each other. The only existing record is encoded and stored in vaulted facilities.

At the beginning of each transmission, the master key sends out an encoded message to synchronize the units involved, and automatically establishes a session key to encrypt the communication that follows. The session key coding, selected from trillions of possible combinations, changes with each new transmission. A computer capable of performing up to one million mathematical operations per second could take as long as 300 years to determine the key used for a particular data transmission.

The system, employing the Data Encryption Standard algorithm approved by the National Bureau of Standards, can help banks, oil companies, brokerage houses, insurance companies and other industries protect their sensitive data from theft. Computer crime is generally considered to be the biggest industrial security problem of the 80's.

Favorable outlook for daisywheel teleprinters

The market for letter quality teleprinters is on an upward swing, according to a recent study by Venture Development Corp., Wellesley, MA. The study forecasts a growth of fully-formed character teleprinters at over 15% through 1985.

The growth of this market is a result of the increased use of word processors. By 1985 word processing will be the most popular application for teleprinters, according to the report.

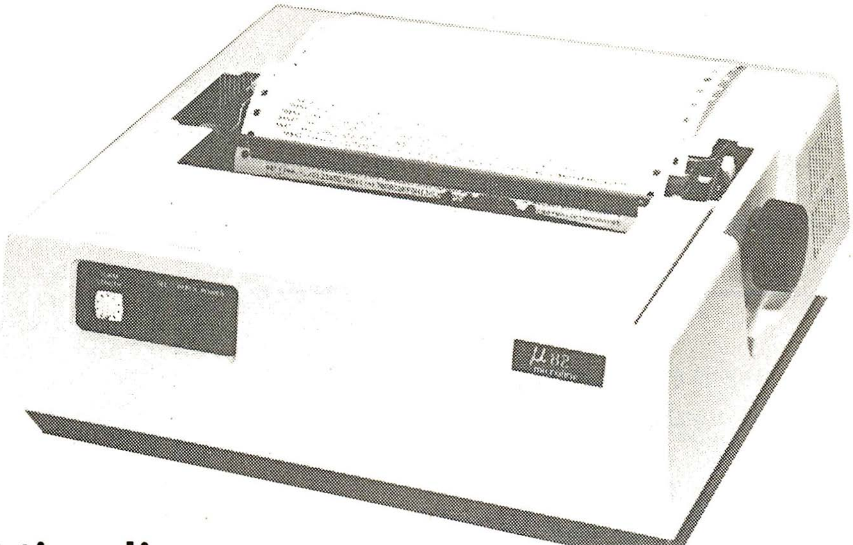
The U.S. fully-formed character teleprinter market is headed by three companies who comprise over 50% of 1980 fully-formed character teleprinter shipments. Certain Japanese manufacturers are also strong contenders in this market. It is rumored that they are manufacturing letter quality teleprinters that are faster and cost less than those manufactured in the U.S.

A possible threat to the daisywheel teleprinter market is posed by high resolution dot matrix and ink-jet technologies. Both are still in the early stages of development and will require a lot of R & D before they can print reliably at correspondence quality.

High resolution dot matrix teleprinters will require large matrices to fill the spaces left between dots. The problem with this method is that by passing over a line several times, the print speed is reduced to that of a daisywheel, therefore producing a character of lesser quality at the same speed.

Ink-jet technology looks very promising, with growth rates of over 400% quoted by industy analysts. Problems

DISPOSABILITY or RELIABILITY
The Choice is Yours



OKIDATA Microline printers

were not built with disposability in mind . . .
but if RELIABILITY is what your looking for — stop looking . . . your search has ended! **Microline** printers are field proven reliable and most affordable. You really can't afford to own anything less!

SPECIFICATIONS:

	MICROLINE 80	MICROLINE 82	MICROLINE 83
Print Speed	80 CPS	80 CPS	120 CPS
Print Technique	Unidirectional	Bidirectional	Bidirectional
Logic Seeking	N.A.	Standard	Standard
Columns	80 / 132	80 / 132	136 / 132
Friction Feed	Standard	Standard	Standard
Pin Feed	Standard	Standard	N.A.
Tractor Feed	Optional	Optional	Standard
Character Widths	3	4	4
Parallel Interface	Standard	Standard	Standard
Serial RS-232C Interface	Optional	Standard	Standard
Paper Path	Rear	Rear	Rear / Bottom
Maximum Paper Width	9.5″	9.5″	15″
Self Test	Internal	Standard	Standard
64 Block Graphic Shapes	Standard	Standard	Standard
Vertical Format Unit	N.A.	Standard	Standard
Top of Form	N.A.	Standard	Standard
Vertical Tabbing	N.A.	Standard	Standard
Print Head Warranty	200,000,000 characters*	200,000,000 characters*	200,000,000 characters*
MTBF	3,000 hours	3,000 hours	3,000 hours
MTTR	15 minutes	15 minutes	15 minutes
Extended Warranty-Option*	Yes	Yes	Yes
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*Normal warranty 90 days labor / 1 year parts. Add 10% for 1 year parts and labor warranty with ink-jets include plumbing and ink clogging up the nozzles of the print heads. This makes an unreliable product at the moment that cannot compete with daisywheels in the area of reliability.

The study reports, however, that there is a good possibility that these problems may be overcome in the next five years, at which time ink-jets and high resolution dot matrix teleprinters may begin cutting in on the daisywheel teleprinter market.

Minicomputer network monitors quality of sewage dumped into S.F. Bay

To assure that the sewage overflow being dumped into the S. San Francisco Bay by surrounding communities remains consistent with Clean Water Act and Environmental Protection standards, a network of minicomputers and electronic sensors has been developed to continually check the sewage as it moves through pipelines and processing plants on its way to the bay.

The waste water control system is being developed by Process Control Equipment Co. (Proco), San Leandro, CA, for the East Bay Discharger Authority's new super sewer—an Environmental Protection Agency project that collects waste from San Leandro, Castro Valley, Livermore, Hayward, Dublin, and The City of Pleasanton for final processing and discharge into the bay via a single pipeline.

Proco has developed a telemetry and multiplexing system that operates on three levels to monitor water quality, according to Bulent Celebi, manager of research and development and systems engineering. The project, which will cost in excess of $200,000, is a prototype that could become a model for other communities, governments and federal agencies, Celebi said. He indicated that the same basic system, with software programs and existing hardware could be used in any type of industrial environment where centralized and distributed control of an overall system is required.

"Any operation—such as a food processing plant, soft drink plant or a distillery, for example—could use this system the way it's designed. No real extensive modifications would be required," he remarked, "the possibilities of adapting it to any number of different environments and applications are virtually endless. The basic parameters have already been established."

Programs for handicapped being solicited

A nationwide search is underway for ideas and inventions to aid the handicapped through personal computing programs. The search is sponsored by grants from the Tandy Corp. and The National Science Foundation.

Entrants in the competition, which will be conducted by Johns Hopkins University, are eligible for awards including a $10,000 grand prize (given by Radio Shack), a TRS-80 and other computer systems.

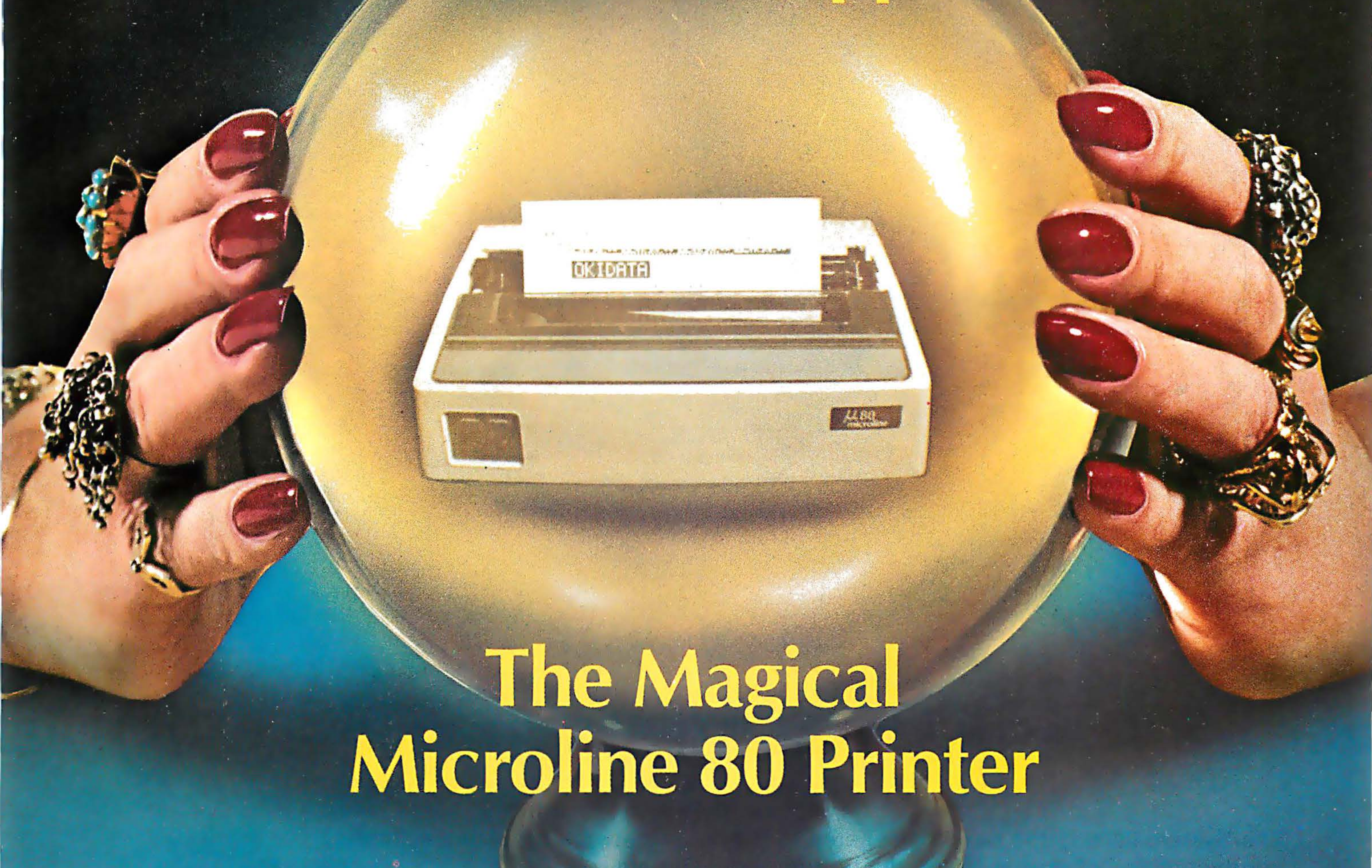
"The contest will be a unique opportunity that can lead to wide acceptance and use of the new computing technology," says Paul L. Hazan, director of the project.

Contestants have until June 30, 1981 to prepare and submit their entries. National awards will be presented at a banquet in Fall 1981 in Washington, D.C.

Further information is available at Personal Computing to Aid the Handicapped, Johns Hopkins University, Box 670, Laurel, MD 20810.

 CIRCLE INQUIRY NO. 78

What has nine lives, three forms, multiple faces and a price tag that almost disappears?



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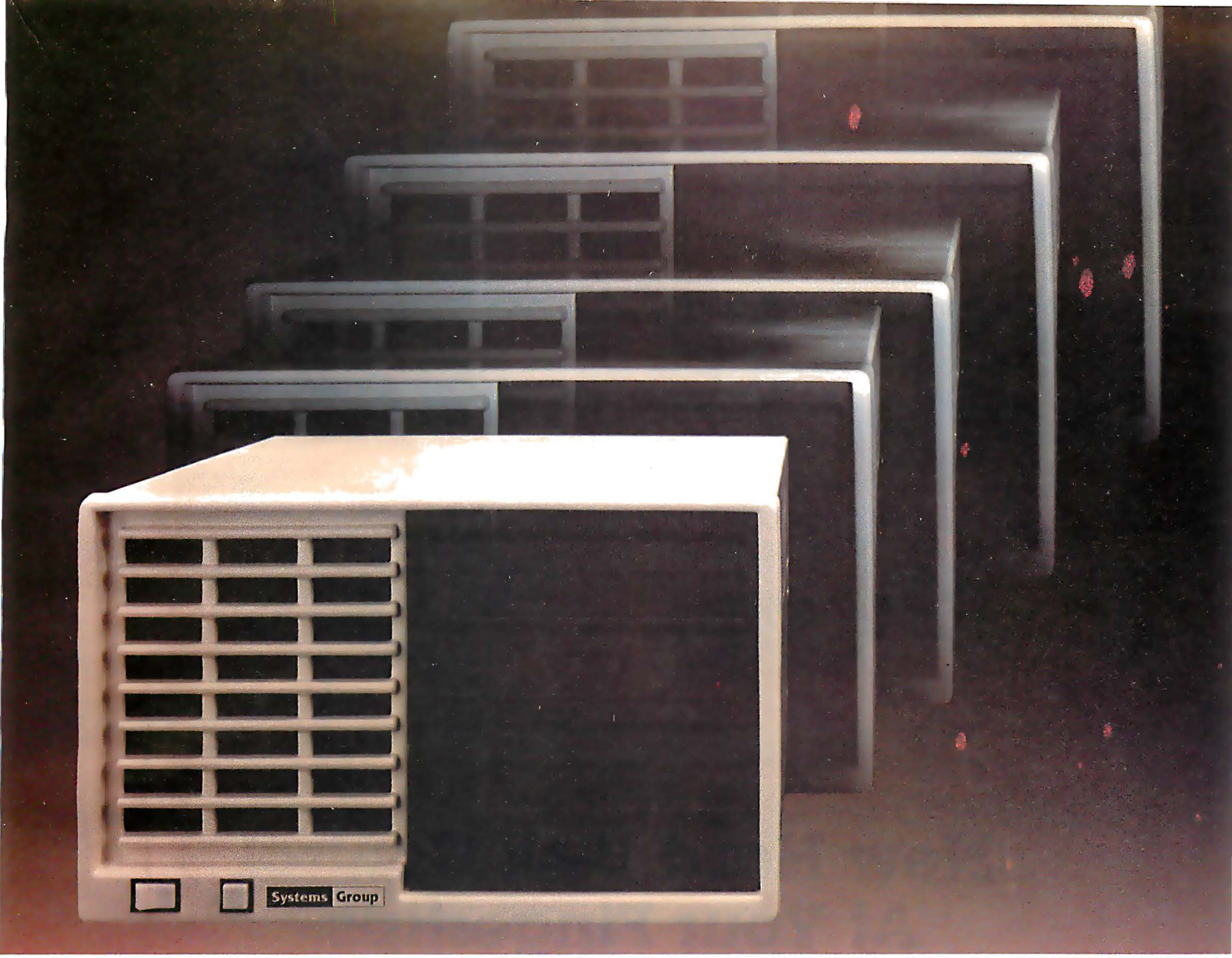

enhanced XIOS. The CP/M based System 2800 provides improved diagnostic reporting capability and increased sector sizes of 1024 bytes yielding disk performance throughput increases up to 400% over standard unblocked systems.

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Also available is the OASIS operating system with ISAM files, automatic record locking and multiple-user print spooling.

All operating systems are available in either floppy or hard disk configurations. The disk drive selection includes single or double sided, double density 8-inch floppies with up to 2.52 megabytes of formatted storage per system, expandable to 5.04 megabytes, and an 8-inch 10 megabyte winchester hard disk.

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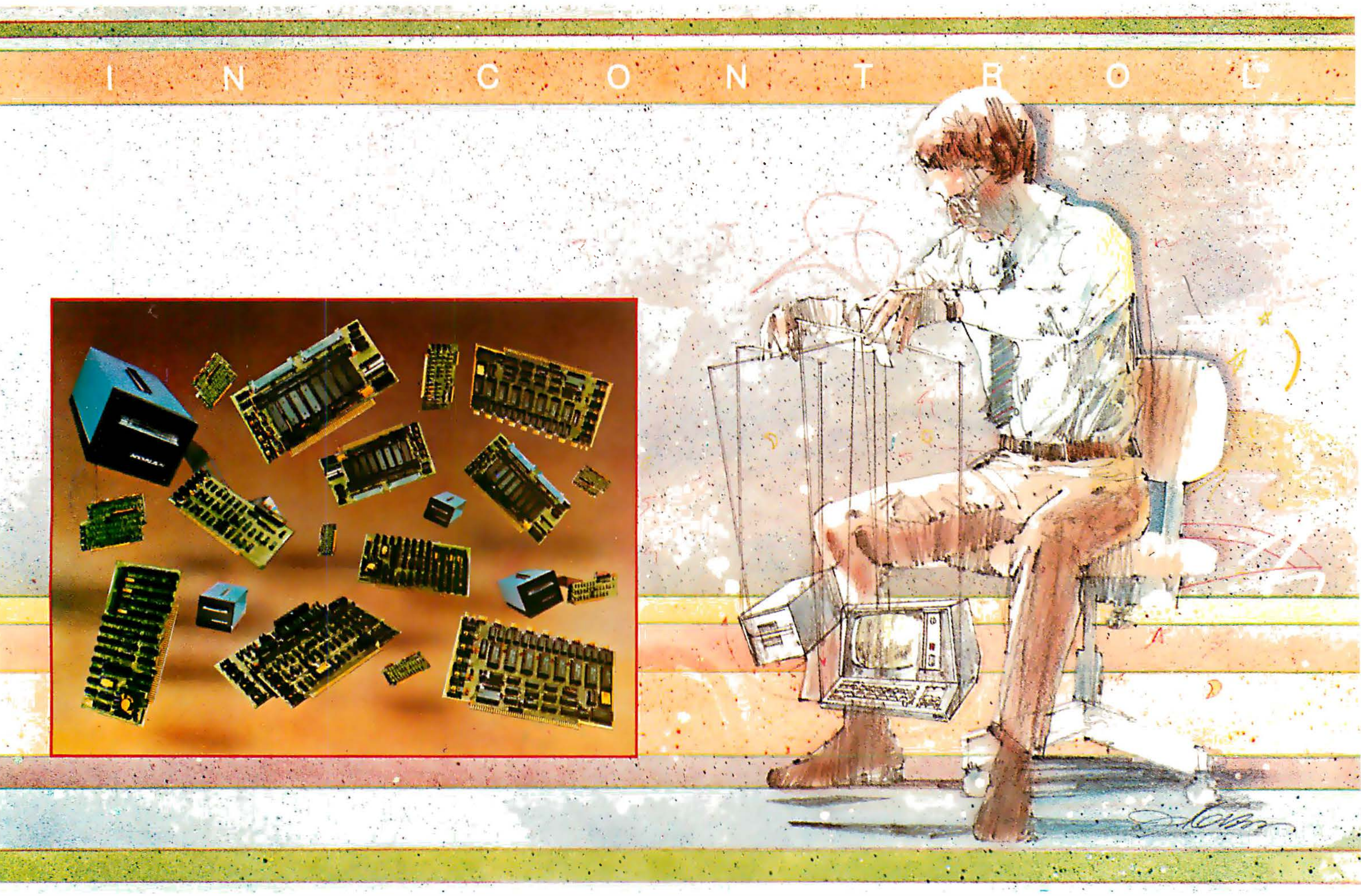

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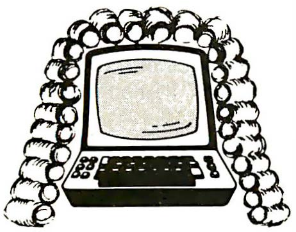

By Elliott MacLennan
Attorney at Law

Leasing Used Computers and Electronic Equipment

In a landmark ruling that will favorably impact the domestic electronic and computer industry, the IRS has announced that obsolete scrapped printed circuit boards that are salvaged and reconfigured into a new computer system qualify for investment tax credit "pass-through" to users leasing computer systems.

An investment tax credit offsets taxes dollar for dollar. A deduction virtually never produces the same dollar saving as compared to an investment tax credit, because a deduction saves tax dollars only to the extent of the taxpayer's bracket. For example a taxpayer owing $10,000 in tax who has an investment tax credit of the same amount pays no tax. A taxpayer in the 50% income tax bracket would need a $20,000 deduction to produce the same result as a $10,000 investment tax credit.

To qualify for an investment tax credit, a taxpayer must run a gamut of incredibly complex qualifications and timing requirements. Bypassing these important but over-technical niceties, three primary requirements must be satisfied to obtain an investment tax credit:

1) The property must be used in the taxpayer's trade or business. A microprocessor purchased for personal use will not qualify.

2) The property must have a useful life in the taxpayer's trade or business of at least three years.

3) The property must be tangible. Hardware is tangible; software, trade secrets and secret processes are not. Where software is "bundled" with the hardware (purchased, that is, where cost allocation between hardware and software elements are not separately stated on the sales invoice), investment tax credit is allowed on the software as well.

Failure to bundle hardware and software is a frequently overlooked tax reduction device. The decision to bundle is a tactical business decision: it involves management policy, cash flow analysis, future income projections and is not always advisable.

When a vendor bundles a system containing both hardware and software and elects to pass-through the investment tax credit to the user, adverse tax consequences will result if: 1) the user has a business operating loss or 2) the sales or use tax authority imposes a tax on the bundled software that would not ordinarily be taxed if a separate cost breakdown were made for its acquisition. Massachusetts, for example is attempting to impose such a sales tax. California has been imposing sales tax on bundled sales tax for nine years.

A vendor who has configured a system from original-equipment-manufacturers may elect to pass-through an investment tax credit to the lessee or retain the credit itself. The economics of retention or pass-through depend upon the agreement reached between the parties to the lease. Typically, a vendor who elects to pass-through an investment tax credit will seek to exact an increased or accelerated rental charge in amount of the credit. A lessee who has a business loss carryover eliminating any tax liability in the year the computer system is acquired would not gain any present economic value from the pass-through of the credit. The pass-through election acts as a conduit of a substantial tax benefit: use of this conduit principle can place the tax benefit into the hands of the person or entity who can realize the greater leveraged economic impact.

Regrettably, some vendors and many users are either unaware of the investment tax credit conduit or, worse, do not know how and when to use it. This omission or improper use of the pass-through decision is quite understandable due to its complexity.

Investment tax credit pass-through is available to a purchaser-user whether the system purchased is new or used equipment.

An important distinction between purchasing and leasing a system is that investment tax credit pass-through is available only with new equipment. The legal question is: what's "new" equipment? This question arises because, even though a purchaser-user receives investment tax credit on either new or used equipment, certain amount limitations are imposed on used equipment purchases. The IRS, in a number of rulings, has stated that reconditioned equipment qualifies as new, thus avoiding the amount limitations imposed on used equipment purchased.

The IRS, however, has drawn the line of the pass-through or reconditioned property in leasing transactions. No pass-through is permitted for leasing operations in these instances.

In its new ruling, the IRS has reversed its position with respect to computer hardware. Specifically, newly designed computers containing salvaged and reconditioned printed circuit boards will qualify for the credit when released to end-users, if they satisfy the following conditions. They must go through a complete assembly process wherein the reconstructed circuit boards are reworked, tested and modified to perform a specific function in a new computer that has performance characteristics different from the computer from which the salvaged circuit boards were extracted.

The legal question is: What's "new" equipment?

A correct translation of the ruling into terms that have techno-economic significance to the electronic and computer industry would be to not necessarily require a printed circuit board reconditioning, but only an extraction, movement and rewire of the integrated circuits themselves, including the addition of new circuitry. This interpretation, I believe, is sustainable by the discussion in the ruling of the importance of the integrated circuit to the computer as a whole. Such circuits are not only important to a computer, they are integral and essential. Integrated circuits are not restricted to computer applications: they have successfully infiltrated virtually every electronic system where switching, counting and memory function are cost effective at low power consumption rates.

The rationale behind the ruling is that a computer product becomes obsolete because of improvements in computer design. Design improvements causing obsolescence must be distinguished from components that become economically obsolete in their present configuration, but not necessarily technologically obsolete.

A computer, peripheral or electronic manufacturer must incur research costs in redesigning a new computer system from salvaged components, as well as the addition and configuration of new circuitry. The costs, excluding testing and quality control are properly classifiable as research and development expenditures.

In addition to the presently available methods of writing off such expenditures, pending tax legislation has proposed a 25% credit for new R&D expenditures. Well placed rumor in the tax trade has it that the new R&D credit, if enacted, will be retroactive to Jan. 1, 1981.

A manufacturer engaged in leasing operations may, assuming the passage of the pending legislation, reap the benefit of receiving the 25% credit and be placed in the unique position of electing to retain or pass-through the investment tax credit to its lessee. This gives incentive to the manufacturer, providing him with a financially flexible tool in the pass-through conduit provisions to the lessee-user, thus permitting him to be more financially accommodating to his customers.

Leasing may be separate

Where management is engaged in or planning to engage in leasing operations, a decision may be set in motion to isolate the leasing branch of the manufacturer's business operations to a subsidiary or separate entity, thus establishing the classic parent-child relationship. Isolating the leasing operation may prevent financial injury to the parent, until such time as the leasing operation can fend for itself. Furthermore, an allocation of R&D costs to the parent may produce a decrease in the parent's tax burden, where an allocation of R&D costs to the leasing operation may not produce any presently realizable tax benefits.

The creation of a subsidiary leasing operation may not require substantial capital to initiate operations. This pleasant result is also based on another IRS ruling providing for a double pass-through from parent as lessor to subsidiary leasing operation, as sublessor to end-user as lessee.

Many end-users like to acquire used computer and electronic equipment, often due to the substantial price discounts available. An end-user who can lease such equipment, thus avoiding an initial cash outlay required for a purchase, and obtain an investment credit pass-through will be provided with a triple financial incentive, until recently unavailable.

When management decides to financially isolate the leasing operation and yet provide R&D tax benefits to its parent—while structuring its leasing operation to produce low profit generation that permits the lessor to pass-through the investment tax credit without financial injury, simultaneously increasing cash flow—the company is placed in an enviable competitive position.

Creating or modifying a leasing operation to make offensive use of the new pass-through ruling can produce a new and positive business option. To the extent that the present administration desires to increase business incentives that will probably fall into three main areas: business tax cuts, increased depreciation methods and deductions and increases in the investment tax credit areas, the investment tax pass-through provisions achieve even more favorable economic impact.

For the new businessman, first commencing R&D work prior to engaging in business operations, it is essential to be classified as "being in a trade or business." The outcome of this test determines whether a businessman can take tax deductions for expenses incurred in the ordinary course of business and when the deduction may be taken. Under the decision in the *Snow* case, decided by the Supreme Court, it is always easier for new ventures to qualify for business expense deductions when their initial operations consist of R&D projects.☐

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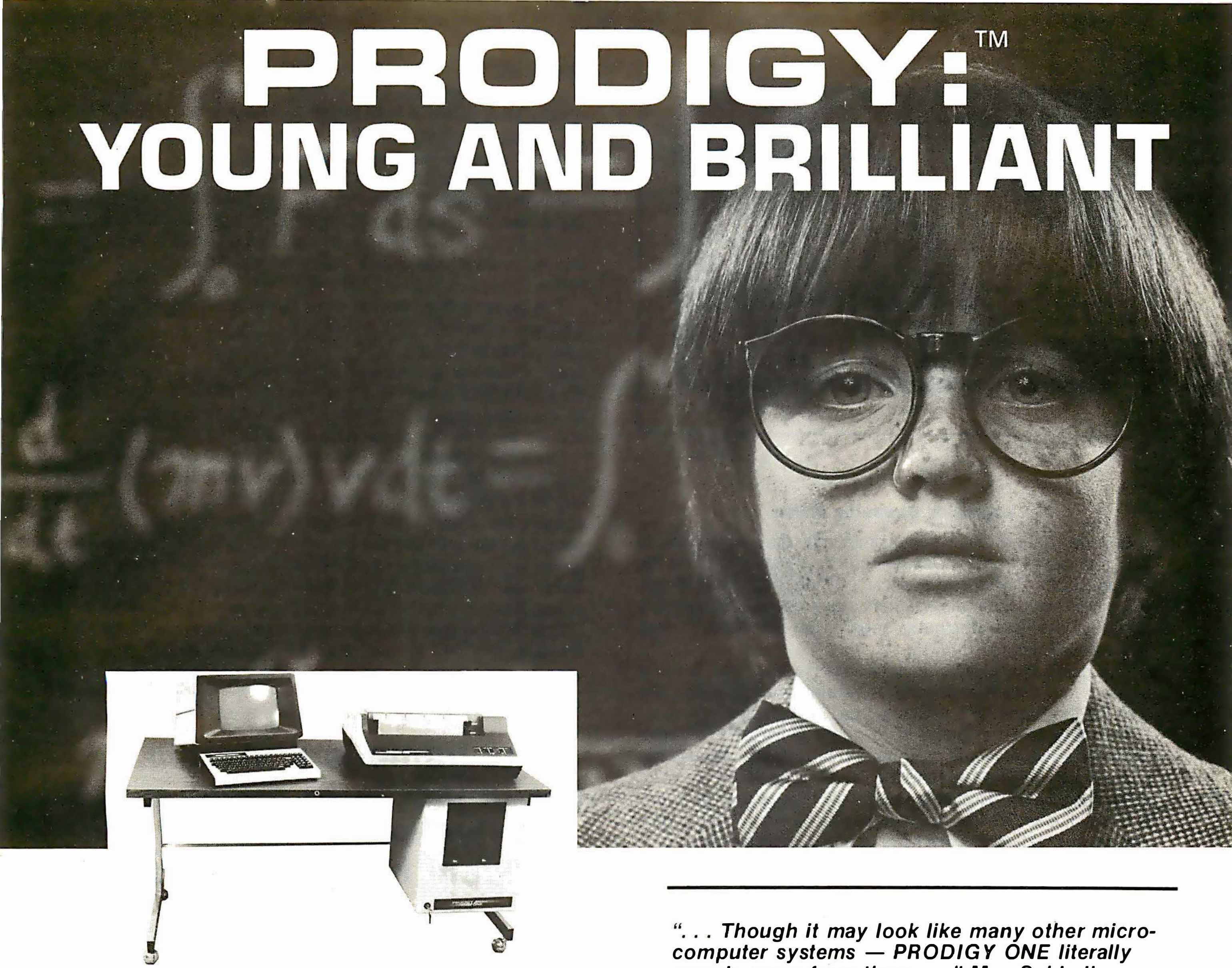

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AL BAKER'S GAME CORNER

Logicolor Guessing Game

Several readers have complained that they would like to play the games I present each month but they can't find the TRS-80 Color Computer joysticks at their local Radio Shack store (or they can't afford them right now). This month's game for the color computer doesn't use joysticks; it uses arrow keys instead.

The game is a classic. Invicta sells it under the name of Mastermind. Several computer versions exist under the names Pico-Ferml or Bull-Cows. I call it Loglcolor.

The object of the game is to guess a list of five colors chosen at random by the computer. The computer can use any of the colors in table 1 to form the list, but it can't use any color more than twice. Red-blue-red-yellow-blue would be okay, but red-blue-red-yellow-red would not. To make your guess, use the left and right arrow keys to select the color placed on the screen. When the color you want to guess is shown, press the ENTER key to go on to the next color in the list.

As soon as you have picked five colors, the computer will use clues to tell you how well you did. It displays a yellow box for each color that was correctly guessed. If you guess the right color, but put it in the wrong place, you get a red box. Ignore the order of the yellow and red boxes. This isn't a clue. The computer always puts the yellow boxes first. You have 13 tries to win. If you fail, the computer shows you the answer. To play another game, press BREAK and run the program.

Lines 90 and 100 clear the screen to black and display the game title. Then the computer places a list of five random colors in "P" on lines 100 and 120. Line 115 isn't part of the logic of the game and can be removed. But don't. It adds sparkle and makes the game more fun. Kids of all ages like a game that has lots of beeps in the right places. Lines 100 to 120 don't prevent the computer from choosing the same color more than twice.

This is corrected in lines 170 to 190. Here the computer checks all possible sets of three colors in the list. If any three are found to match, line 210 changes one and the entire series of tests is repeated from the beginning.

The remainder of the program handles the player's 13 guesses. Lines 270 and 570 form the guess loop. Line 272 computes "S", the screen location where each guess begins on the TV. The first guess starts at location 1*32 + 36 or 68, and each additional guess starts 32 positions, or one line, further down.

The player's five choices for a guess are handled on lines 280 and 340. Line 283 displays a color box for the current color choice and line 284 makes a unique sound for that color. The color is displayed on the line of the current guess (S) and in the position of the current choice (G*2). Referring to the third column in table 1, line 283 uses the formula implied to show the correct colored box.

Once the current color choice is displayed, the player can change or use it through the keyboard. Line 285 waits for a key to be pressed. If it is the ENTER key, the player has chosen the color. Line 290 goes to line 320 and 330 to sound out the fact and put the color's number in the player's guess list. If the player uses the left arrow key and the lowest color was not chosen (A>1), the next lower color is picked in line 293.

Line 300 handles the reverse situation. If the right arrow is pressed and "A" is less than 8, the next higher color is chosen. In both cases, the computer goes back to line 283 to redisplay the new choice. If some other key was pressed, or if a higher or lower choice than is possible was made, line 310 ignores the key and the computer waits for a new one.

The game is a classic... the object is to guess a list of five colors chosen at random by the computer.

Once the player has picked all five colors for his guess, the computer adds a black space on the screen in line 345. This adds some distance between the guesses and the computer's clues. The first clues the computer provides are for accurate guesses. These are found by lines 375 to 420. For each of the five choices, if the computer's color in "P" matches the player's guess in "G', a sound is made (line 403) and a black space and yellow box are shown (line 410). If a guess is accurate, line 400 prevents it from being found as an inaccurate guess later.

This is done by removing the guess and turning the computer's color into a negative number. Line 405 keeps track of the number of correct guesses. If this number is ever five, the player has discovered the computer's list and won. Next, lines 460 to 520 give the player clues for near misses. If a correct color is found in the wrong position, line 505 sounds off and line 510 prints a black space followed by a red box.

If the player has won, T = 5 in line 560. Line 660 prints the game results at the bottom of the screen and line 670 forces the game into a loop. If T is less than 5, lines 563 to 570 make sure that all the numbers in "P" are made positive and has the computer wait for the player's next guess. Once the player has used up all 13 guesses, lines 580 to 620 print the correct answer. First, line 580 sets the screen position to the line below the thirteenth guess. Then, lines 590 to 610 convert each of the computer's five color numbers into the correct colored box on the screen. □

Table 1

Number	Color	Box Equation	Box Number
1	Green	CHR$(127+1*16)	143
2	Yellow	CHR$(127+2*16)	159
3	Blue	CHR$(127+3*16)	175
4	Red	CHR$(127+4*16)	191
5	Buff	CHR$(127+5*16)	207
6	Cyan	CHR$(127+6*16)	223
7	Magenta	CHR$(127+7*16)	239
8	Orange	CHR$(127+8*16)	255

Color selection chart

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Logicolor program listing

```
10 REM      LOGICOLOR
50 REM SET UP PLAYING FIELD
60 REM AND MAKE PROBLEM
70 REM
80 CLS 0
90 PRINT"      THE GAME OF LOGIC           ";
100 FOR I=1 TO 5
110 P(I)=RND(8)
115 SOUND 250-P(I)*10,1
120 NEXT I
130 REM
140 REM ALLOW NO MORE THAN TWO
150 REM  OF SAME COLOR
160 REM
170 FOR I=1 TO 3
180 FOR J=I+1 TO 4
190 FOR K=J+1 TO 5
200 IF (P(I)<>P(J)) OR (P(J)<>P(K)) THEN 230
210 P(K)=RND(8)
215 SOUND 250-P(K)*10,1
220 GOTO 170
230 NEXT K,J,I
240 REM
250 REM THIS IS THE GUESS LOOP
260 REM
265 A=4
270 FOR L=1 TO 13
272 S=L*32+36
280 FOR G=1 TO 5
283 PRINT@S+G*2,CHR$(127+A*16);
284 SOUND 260-A*10,1
285 A$=INKEY$: IF A$="" THEN 285
290 B=ASC(A$): IF B=13 THEN 320
293 IF (B=8)*(A>1) THEN A=A-1: GOTO 283
300 IF (B=9)*(A<8) THEN A=A+1: GOTO 283
310 GOTO 285
320 SOUND 150,1:SOUND 160,1
330 G(G)=A
340 NEXT G
345 PRINT CHR$(128);
350 REM
360 REM LOOK FOR EQUAL
370 REM
375 T=0
380 FOR I=1 TO 5
390 IF G(I)<>P(I) THEN 420
400 G(I)=0:P(I)=-P(I)
403 SOUND245,2
405 T=T+1
410 PRINT CHR$(128);CHR$(159);
420 NEXT I
430 REM
440 REM LOOK FOR WRONG POSITION
450 REM
460 FOR I=1 TO 5
470 FOR J=1 TO 5
490 IF G(I)<>P(J) THEN 520
500 G(I)=0:P(J)=-P(J)
505 SOUND205,2
510 PRINT CHR$(128);CHR$(191);
520 NEXT J,I
530 REM
540 REM HANDLE LOOP, WIN, OR LOSE
550 REM
560 IF T=5 THEN 660
563 FOR I=1 TO 5
565 P(I)=ABS(P(I))
567 NEXT I
570 NEXT L
580 S=484
590 FOR I=1 TO 5
595 A=P(I)
600 PRINT@S+I*2,CHR$(127+A*16);
610 NEXT I
620 GOTO 620
630 REM
640 REM THE WINNER
650 REM
660 PRINT@491,"YOU WIN!";
670 GOTO670
```


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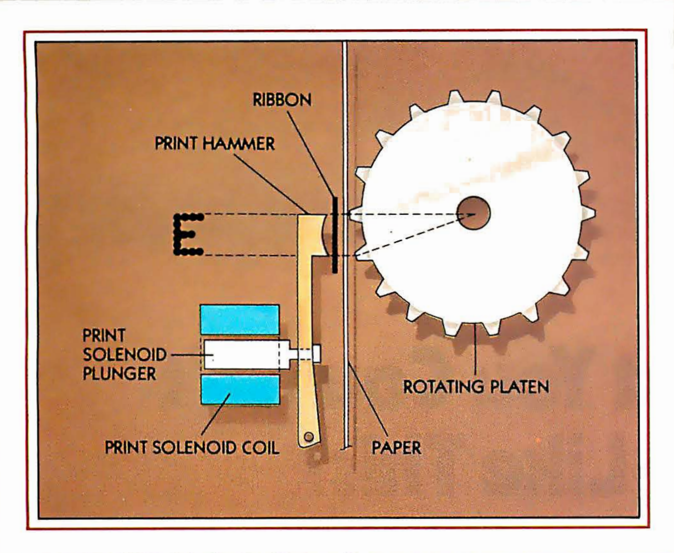

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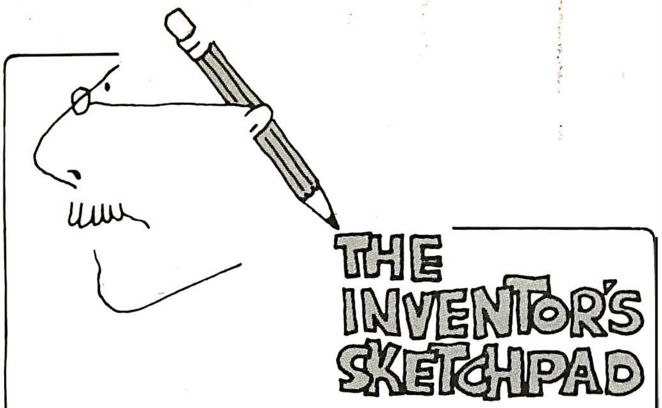


by Roger C. Garrett

Data Compression Techniques

More and more personal computer users have been adding modems to their systems so they can communicate with other computers and with time-sharing systems such as the Source over standard telephone lines. Due to many factors, such as cost and the poor quality of telephone lines, most modems operate at a relatively low transmission speed, often 300 bps (bits per second). That works out to about 30 characters per second, figuring 8 bits of code plus a start and stop bit for each character. When compared with more expensive modems utilizing dedicated lines that can get 9600 bps and higher, you quickly realize how slow your "personal size" modem really is.

Is there any way to increase the speed without increasing the cost? Redesigning the hardware doesn't seem fruitful; that leaves the software. But how, if the modem can only transmit 30 characters per second, can software have any effect? The secret is to increase the information transfer, not the data transfer.

Let's say my computer sends a string of 8 bits to your computer. Those 8 bits constitute one piece of data. When your computer receives that piece of data and interprets it as an ASCII code representing, say, the letter A, that data becomes information. The data code is not in itself the letter A, rather it *means* the letter A, and the receiving computer understands this. If each piece of data corresponds to one piece of information, we have a one-to-one information/datum ratio, or an information/datum factor of 1. Since we cannot increase the number of bits per second sent over our modem link, let's increase the amount of information sent by increasing the information/datum factor.

In order to do this, we'll use a few of the 256 possible 8-bit codes as special purpose codes. The most important code in our scheme will be the one we will call ASSOCIATE. An ASSOCIATE code will always be followed by a sequence of additional codes and will have the following general form.

ASSOCIATE special-code code-count code-sequence

The code-sequence will be a string of one or more ASCII character codes. The code-count specifies how many codes are in the character string and the special-code is an 8-bit code that is to be associated with that character string. Let's say that we define our ASSOCIATE code to be the value 001 (octal). Send the following sequence of codes.

001 103 005 201 205 214 214 217

By doing this, we would be telling the receiving computer to associate the code 103 with the sequence of five (005) codes consisting of 201, 205, 214, 214, and 217, which corresponds to the character string "HELLO". So the receiving computer associates the single code 103 with the entire word "HELLO". Since there are 256 possible codes in an 8-bit byte, we could conceivably make 256 such associations.

We will need some way of distinguishing between, for example, a 103, which means a standard ASCII character code and a 103, which means HELLO, so we'll need two more special codes in addition to the ASSOCIATE code. We'll call these ASCII_FOLLOWS and SPECIAL_FOLLOWS. Each of these special codes will be used to tell the receiving computer what to expect in subsequent strings of codes. The format for the ASCII_FOLLOWS string is:

ASCII_FOLLOWS code-count code-sequence

and for the SPECIAL_FOLLOWS string is:

SPECIAL_FOLLOWS code-count code-sequence

In each case, the code-count is a single numeric byte that specifies how many 8-bit codes follow in the code-sequence. In the ASCII_FOLLOWS form, the code-sequence consists of standard ASCII codes. In the SPECIAL_FOLLOWS form, the code-sequence is made up of special codes, those that have previously been defined to the receiving computer by means of ASSOCIATE strings.

Let's look at how all of these codes can help us increase the information/datum factor. Assume we have a large text file consisting of English prose, perhaps a report that must be sent to corporate headquarters across the country. We're going to send it via a modem hookup but, since telephone time is rather expensive, we want to send it as quickly as possible. Our file is, say, 18,000 characters. At 30 characters per second, that comes to 10 minutes of transmission time. In order to cut that time down, we run a special program that analyzes the text file and identifies high-frequency text strings, i.e. words, phrases and sentences that appear often in the file.

To the 256 most common text strings, the program assigns code numbers. It then searches the text file again and "translates" it into a new text file. This new file contains all the same information as the original file but, where possible, the strings of words and phrases have been replaced by strings of special codes. Each such special-code string is preceeded by a SPECIAL_FOLLOWS code and a code-count. ASCII text strings that cannot be replaced by special codes are each preceeded by an ASCII_FOLLOWS code and an appropriate code-count. At the beginning of the file, the program places the necessary ASSOCIATE strings that define how to substitute ASCII strings for the special codes.

This newly produced file will be considerably smaller than the original file, since we have replaced multi-code strings with single codes throughout. Since most people have a working vocabulary of only a few hundred words and an average English word contains seven letters, we can compress any prose text file down to about 1/7 of its original size. Yet, since the association data also resides in the compressed file, none of the original information is lost.

It is this compressed file, then, that is transmitted to the receiving computer. Since only 1/7 of the original number of characters will be sent, it will take only 1/7 of the original estimate of 10 minutes, or about 1.3 minutes, for transmission—a very impressive savings. The receiving computer must understand the format of the data it is receiving and appropriately decompress the information.

This kind of savings is not limited to text files consisting of English prose. Computer programs can be compressed in the very same manner. Indeed, most personal computers that run

We can compress any text file down to 1/7 of its original size.

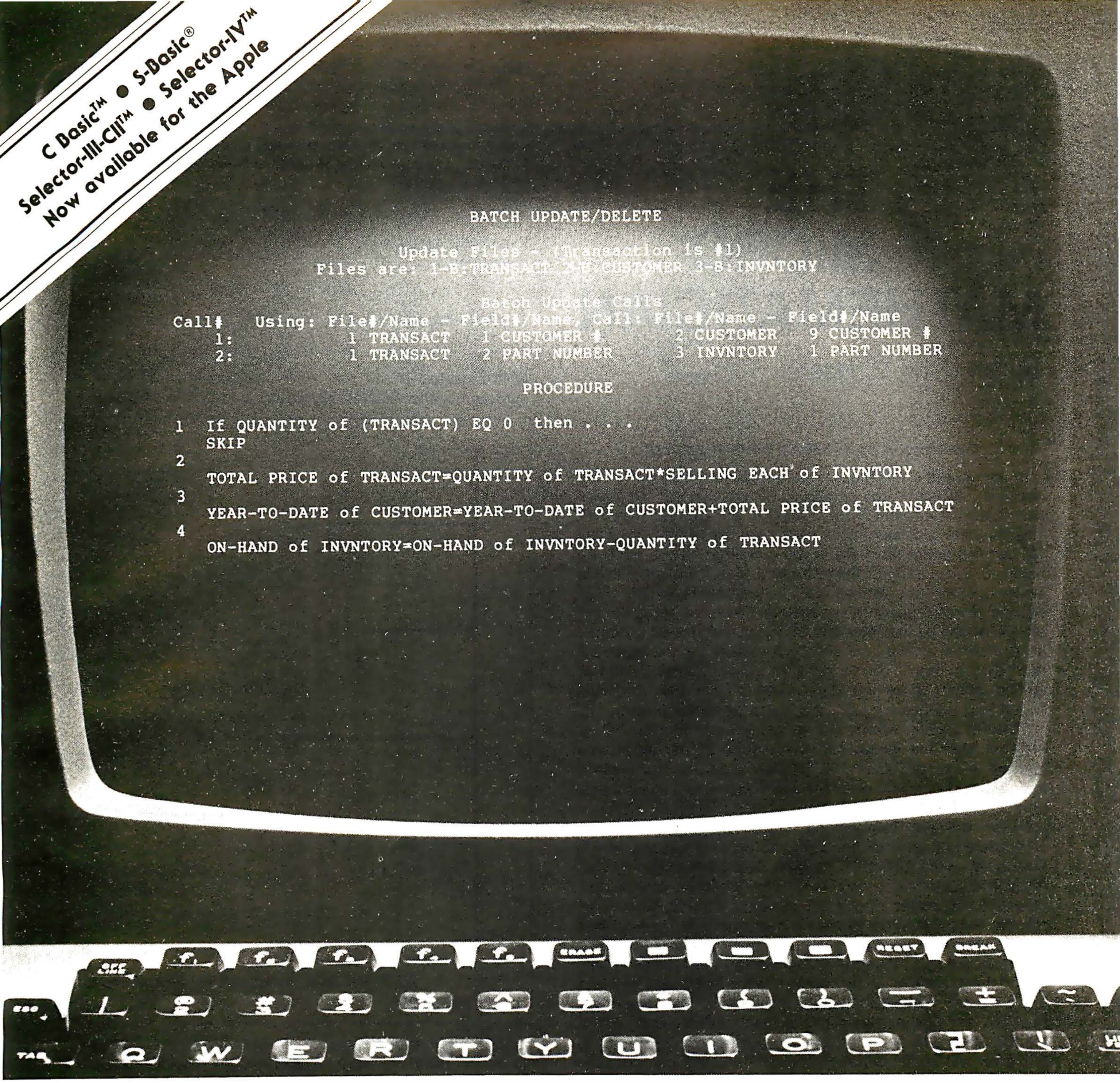
Basic use just such a technique in saving memory space by compressing the keywords like PRINT and GOSUB into single byte codes, often called tokens. The difference between the way Basic interpreters compress data and this proposed method is that with the Basic interpreters, the knowledge of how tokens are associated with strings is built into the program or exists as a special table that cannot be extended. In my method, the association information that defines the strings associated with the tokens exists as part of the source text file itself. If we wrote a Basic interpreter that understood and handled this, much larger programs could fit into our program space. Note the following statements.

```
REM PLOT THE POINT ON THE CRT
GOSUB 2050
```

Each time they are written, the entire REM statement would occupy only one byte and the entire GOSUB statement would, likewise, occupy only one byte, since the actual statements need appear only once in the association table. Those familiar with the Forth language may recognize this as a form of threading.

Finally, suppose we apply this technique to word processing systems. Instead of maintaining an entire source file, the text that's typed in can be maintained in a compressed file. Every time you type in a line, the association table would be checked to see if any of the words, phrases, or sentences have already been entered. For those that have, only the existing associated token (special-code) is entered into the source file.

For the remaining words, phrases and sentences, new associations are entered into the table and the newly created token codes are entered in the appropriate positions in the source portion of the file. Since the memory savings should be tremendous, we should be able to maintain tremendous files directly in RAM and not have to constantly perform disk operations as we move through the file. We would probably be able to make do with a 5¼-in. disk rather than the more expensive 8-in. So, we would get savings all around.□



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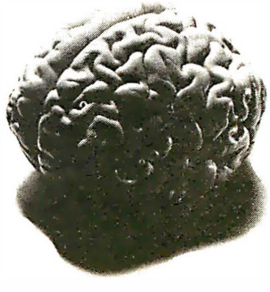

MICRO•AP

THE MICRO-MATHEMATICIAN

by Dr. John C. Nash

Operations on Floating-point Numbers

In last month's column, we presented the concept of the machine precision—the smallest positive that can be added to 1.0 to give a result in the computer still greater than 1.0. The machine precision gives us a measure of how precisely we can represent numbers in the machine, before we even begin to calculate with them. Indeed, it is frequently at this stage—before calculations begin—that some of the most serious errors creep into our results. We have, for instance: errors caused by the limitations of the measurement process, be it physical or statistical; others caused by the incorrect recording or entry of the data, (e.g. digit transposition in writing down or keying data); and others that occur in converting the numbers to machine representable form.

This last class of errors, that of input conversion, should be at most one unit in the last place (ulp) if the conversion method is correct. Sadly, a number of popular computers have sloppy compilers or interpreters with errors in the input/output conversion routines that may occasionally cause a disaster for our calculations. Fortunately, many microcomputers use decimal floating-point representations, which effectively avoid this difficulty. The IEEE Draft Floating-Point Arithmetic Standard prescribes a binary representation, but specifies that conversion of decimal input shall be such that a number is represented by the nearest representable number to it on the real scale. Let us hope that the implementations of this standard (e.g. the Intel 8087) perform to specification.

For the purposes of discussion, we will assume that our input is exact up to the moment we enter it. Then there is a possible error proportional to the machine precision, which we will denote B, as in the previous column. In a number X, this error will be such that:

$$\mathrm{ABS}(X - \mathrm{fl}(X)) \leqslant \mathrm{ABS}(x) * B$$

That is, the absolute relative error may be as large as B, the machine precision. Once again, fl ( ) will denote the floating-point representation of the quantity within the parentheses. In machines that round, B can be replaced by B/2 in the above expression, since a smaller error will be possible.

We now wish to consider operations with numbers. Even if these are exactly represented, operations with them will create some rounding or truncation error. For example, in a four digit decimal machine:

$$\mathrm{fl}(1000 + 0.4999) = 1000$$

In a rounding machine, we make an error of at most 0.5 in the last place in the result (half an ulp). Since B should be 1 ulp relative to 1.0, we write:

$$\mathrm{ABS}(\mathrm{fl}(X + Y) - (X + Y)) \leqslant \mathrm{ABS}(X + Y)*(1 + 0.5*B)$$

It is not too hard to show that:

$$\mathrm{ABS}(\mathrm{fi}(X \bullet Y) - X \bullet Y)) \leqslant \mathrm{ABS}(X \bullet Y)*(1 + 0.5*B)$$

where • represents any of +, −, *, or /. However, this only describes the individual operations and not their combinations.

Most students of engineering or physics are aware of the rules for combining error bounds on quantities already known to be subject to error or uncertainty. To review these, consider that X is subject to an error as large as e, Y to one as large as f. That is, the true values of the quantities we are dealing with lie in the intervals:

$$[X - e, X + e] \text{ and } [Y - f, Y + f].$$

It is fairly easily seen that the true value of (X + Y) lies in an interval:

$$[(X + Y) - (e + f), (X + Y) + (e + f)].$$

Also that the true value of (X − Y) lies in the interval:

$$[(X - Y) - (e + f), (X - Y) + (e + f)].$$

In this case, we see that while the quantities X and Y are subtracted, the absolute errors are added. (See figure 1.)

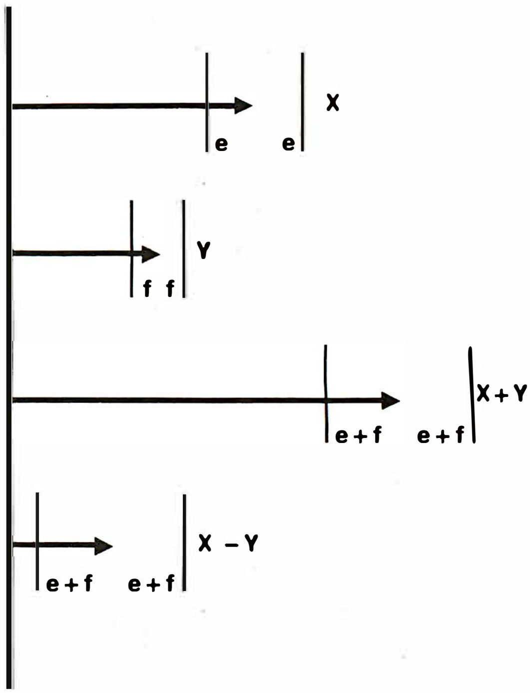

Figure 1. Addition and subtraction of numbers having errors.

Multiplication and division are slightly more complicated. To simplify matters, we take all quantities positive. (In a strict analysis, one keeps absolute value symbols throughout.) For multiplication, the new interval is:

$$[\, XY - Ye - Xf - ef,\ XY + Ye + Xf + ef \,].$$

Scaling this by XY (i.e. dividing through) gives:

$$(XY) * [\, 1 - e/X - f/Y - (ef)/(XY),\ 1 + e/X + f/Y + (ef)/(XY) \,].$$

If we ignore ef as being small relative to 1 (this is reasonable if X and Y are greater than 1 and e and f are of a magnitude similar to the machine precision), we see that the deviation in the true XY is described by the sum of the relative errors (e/X) and (f/Y). A similar approach shows that the deviation in a quotient is described by the sum of the relative errors in its parts.

To summarize: 1) the deviation in a sum or difference is given by the sum of the absolute deviations in the numbers; and 2) the relative deviation in a product or quotient is given by the sum of the relative deviations in the numbers.

Note that relative errors can be converted to absolute errors. In the product example:

$$r = (e/X) + (f/Y)$$

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which is the relative error in XY, gives the absolute error in this product as r(XY). What about a function of X? Can we estimate the error in say:

$$Z = g(X)$$

where X has an error bounded by e? Clearly, Z has an error as large as d, where d is given by:

$$d = \max(g(t)) - \min(g(t))$$

for all t in the interval [X − e, X + e]. Usually, one is not this strict, and assumes that the function g(X) is relatively smooth, so that it may be approximated by its tangent in the region of interest. The tangent is described by the first derivative of the function, g'(X), and the interval for Z is then:

$$[\, g(X) - e*g'(X),\ g(X) + e*g'(X) \,].$$

(See figure 2.)

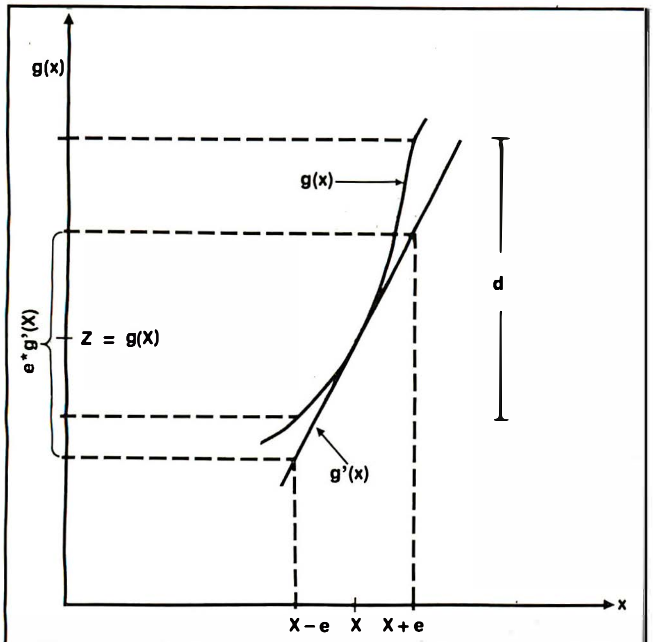

Figure 2. Deviation in a function given a deviation in its argument x.

The interval analysis we have been considering can be automated, but it has proven very expensive and difficult to carry out for real-world calculations. It is but one example of forward error analysis, which follows a calculation step by step to obtain error bounds on the results. This is very useful when one must know the limits on the results, but usually bounds obtained in this way are too conservative. That is, they usually indicate that very large deviations are possible in an answer, when the probability of ever having the errors combine in such a perverse way is infinitesimally small. In reality, errors may cancel each other, and the computer answer is frequently quite close to the exact result desired. The difficulty, of course, is that we cannot be sure how close we are to the wanted result without a lot of analysis. However, with the introduction of directed rounding (that is, up or down or both) in the Draft Floating-Point standard, it is likely that a lot more interval analysis will be performed.

Instead of looking at the estimation of errors in this forward analysis, one can consider a backward error analysis, which looks at the results and tries to find a neighboring problem that would give the same results if exact arithmetic were used throughout. This type of analysis is usually easier to carry out than the forward variety, but requires more attention to the mathematics.

Consider as an example the product of four numbers, X, Y, Z, and W. Taking the three products in order, we find:

$$fl(XY) = X\,Y\,(1 + s)$$
$$fl(XYZ) = X\,Y\,(1 + s)\,Z\,(1 + t)$$
$$fl(XYZW) = X\,Y\,(1 + s)\,Z\,(1 + t)\,W\,(1 + u)$$

where s, t and u are now exact perturbations in the result. We know that:

$$\mathrm{ABS}(s), \mathrm{ABS}(t), \mathrm{ABS}(u) \leqslant 0.5\ B$$

by our previous analysis. Thus, we want to find a bound for e, where

$$\mathrm{ABS}(\mathrm{fl}(XYZW) - XYZW) = e\ \mathrm{ABS}(XYZW)$$

so

$$e = \mathrm{ABS}(\ (1 + s)\ (1 + t)\ (1 + u) - 1).$$

Using the bounds on s, t, and u, we have:

$$e \leqslant (1 + 0.5\ B)^3 - 1.$$

By making some very reasonable assumptions about the size of B and performing some algebra, it can be shown that:

$$e < 1.06 * 3 * 0.5 * B = 1.59 * B.$$

Since 0.5 * B measures the relative error in any floating-point number that we attempt to store in the machine, and the factor 3 * 1.06 = 3.18 is the multiplier of this tolerance in the formation of the product, we will want to know such multipliers for all the algorithms we use. These multipliers are called condition numbers. For a particular method (algorithm) we have an induced error which may be as large as:

$$C_A * u$$

where now u = 0.5 * B. If C_A is large, we say that the method is unstable or that the results will exhibit induced instability. Additionally, however there is a condition number for the problem, call it C_P, which measures how difficult or ill-conditioned it is. If the input data has a possible error, r, the overall condition number of problem and method is:

$$C_P * (r + C_A * u)$$

Note that the values of C_P and C_A depend on the input data.

Either the problem or the method may give rise to unsatisfactory results for some values of the input data, while remaining perfectly all right for others.

How does all this help someone trying to get answers to problems with a computer? Or should we give up and play Star Trek? Principally, users of numerical methods need to know when they have an acceptable answer, the value of error analysis—be it forward, backward or sideways—is to place limits on the wrongness of answers. There are, however, some particular operations which simple analyses can warn us to avoid where possible.

1) *Subtraction of nearly equal numbers.* As we have already observed by interval analysis, the uncertainty or error in the result of a subtraction is the sum of the uncertainties in the number entering the calculations. But by a simple example:

$$9999 - 9991 = 8 \text{ or } \_\ \_\ \_\ 8$$

we see clearly the danger of digit cancellation. In such cases, information is lost in that we now have one digit where previously we had four. An error of one unit in the last place (i.e. 1 in this case) is large relative to the size of the result. In consequence, we would hope that, say, the directional heading for the airplane in which we are traveling was not calculated by such a method.

2) *Unnecessary squaring of numbers*. This is dangerous primarily because it often leads to the subtraction of nearly equal numbers at a later step in a calculation. Nevertheless, many results can be expressed by using the squares of quantities at intermediate stages. Statistical calculations, in particular, frequently make use of a table of numbers called the sum of squares and cross-products matrix. Unfortunately, our error analysis shows that the relative errors must be summed in squaring a number that is, after all, only a special case of multiplication. Thus, in squaring a number, we double the possible relative error. Another way of looking at this is to notice that a four decimal digit computer will give the same square to 4039 and 4040 after rounding.

Frequently, our goal is to evaluate an expression of the form:

$$(a + b)^2 - a^2$$

(though the actual formulas will not present this clearly). If we can rewrite the expression in the form:

$$2\,a\,b + b^2$$

we avoid the subtraction and a potential source of error.

3) *Add small numbers to big ones*. Consider the evaluation of the sum of all terms:

$$T(i) = 1/(i*(i + 1)) \text{ for } i = 1 \text{ to infinity.}$$

We can easily show that:

$$T(i) = 1/i - 1/(i + 1)$$

so that the first few terms are:

$$T(1) = 1/1 - 1/2;\ T(2) = 1/2 - 1/3;\ T(3) = 1/3 - 1/4; \ldots$$

The sum is therefore just 1, since everything else cancels. However, a computer is not this smart, and when it tries to compute the sum directly, a result somewhat less than 1 is produced because the partial sum after k terms, call it S(k), is such that:

$$\mathrm{fl}(S(k) + T(k+1)) = S(k)$$

(Remember the machine precision?) If we decide to stop the summation at this point, having converged to a stable result, we will have left off an infinite number of very small but positive terms, which can amount to a serious error in our result. Note that this can be a disaster in a business trying to keep track of a large number of small sales if the accumulation is not properly organized.

These themes of avoiding the subtraction of nearly equal numbers, unnecessary squaring, or adding small into large will recur in this column in a variety of guises as different problems and methods are examined. □

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GENERAL LEDGER (PTREE)
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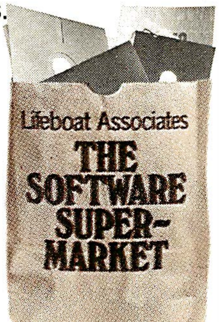

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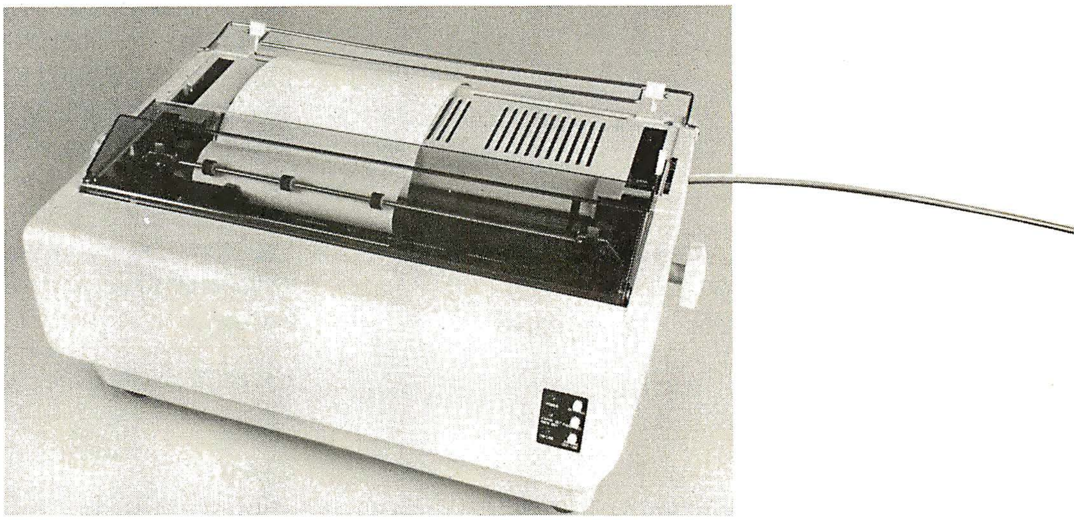

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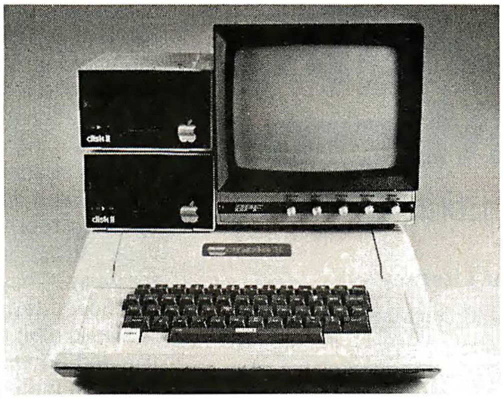

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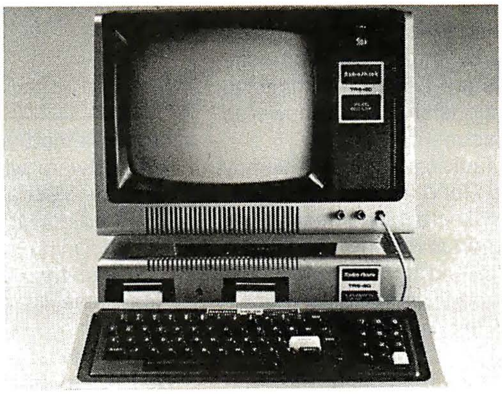

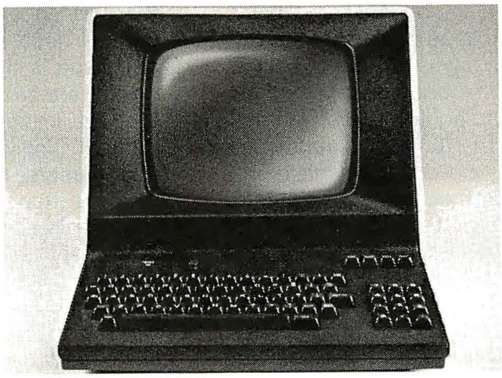

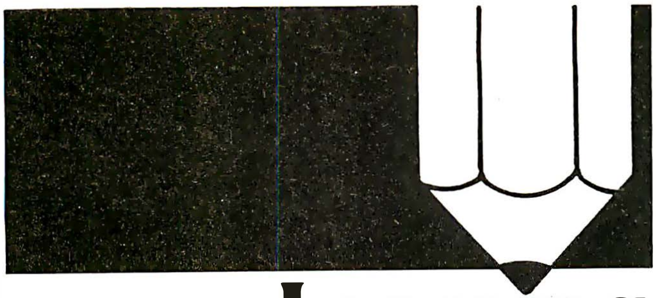

Learning with Micros

by Louis E. Frenzel

More on Computer Literacy

In talking with teachers, school administrators, computer manufacturers and publishers, I get the feeling that computer manufacturers are attempting to create the market for computers in schools, rather than responding to a real need.

With the small business market well on its way, the hobbyist market nearing saturation, and the failure of the consumer home market to develop more rapidly, manufacturers have turned their attention to education. With additional software, support publications, and even special purchasing deals, manufacturers are going after the school market full force.

Many schools are buying micros to implement computer literacy programs. They are doing this in the hope that, eventually the computers will prove useful in other respects, such as administrative and record keeping purposes. Or, teachers may learn to write their own CAI (computer-aided instruction) for self paced learning. The schools are jumping on the micro bandwagon in response to the manufacturer's pitch or peer pressure—not so much because of a real interest in computers.

It doesn't appear as though the schools have adequately thought through the whole issue. Why should the microcomputer be taught? What grade levels are best for introducing it? These and other important questions should be answered before a school makes a major investment.

Perhaps the major concern is the fact that computer literacy will probably replace other subjects. I tend to favor the "back-to-basics" approach that many schools are taking these days. Over the years, there has been a serious deterioration in the ability of students to read and write and do arithmetic. The trend in college entrance exams scores dramatically reveals the poorer performance of students in basic areas, compared to their performance ten years ago.

We should get back to teaching the fundamentals rather than loading the curriculum with a lot of specialty topics. Students can learn computers in college or on the job. But, they won't learn the basic subjects anywhere but in school.

One can argue that computers are becoming part of the basics. Computers are very widely used nowadays, and their application will be even greater in the future. There is some truth to the argument that we may be doing our children a serious disservice if we don't teach them about computers.

But, take a close look at just where in the life of a student the subject should be taught. Surely students shouldn't have to endure multiple levels of computer literacy from elementary school through high school. Yet, the idea seems to be to flood the schools with computers and teach literacy at all levels.

It almost appears as though the schools are trying to outdo one another by introducing micros first or having more and better micros. Computers represent a status symbol to teachers and administrators. No one wants to get left behind.

This whole phenomena is a repeat of the movement that occurred in the late 60s and early 70s when minicomputers were so popular. The arguments and rhetoric were the same. Many studies and tests were conducted, but there is some question as to whether anyone ever determined how or where to use computers in the schools. The big difference was that minis did not flood the schools because of their high cost. Their use was limited to colleges and universities and very affluent public schools. But, virtually every school can afford a micro. That's why it's so important to find the best ways to use them.

Micros are not only devices to be taught, but also are dispensers of education, just like audio/visual devices. They can be used to teach any subject by CAI. In this application, the micro is nothing more than a sophisticated presentation device, like a video tape recorder or a film projector. As long as educational software is available or teachers develop their own teaching programs, the micro will be a useful supplementary teaching device.

But will it turn out to be more of a fad than a long term teaching tool? Look at the use of a popular media such as video; VCRs and video teaching materials have been around for years. They have, in fact, become more widely available. But how often is video actually used in schools?

Film is a bit different; schools still widely use 16mm sound film and 35mm slides and film strips. However, they are not the main method of teaching.

All of these A/V materials are supplementary. Most teachers still teach like they have always taught—they lecture, draw on the blackboard, hand out assignment sheets, and attempt to initiate dialog and discussions. This will continue to be the main method of teaching. Even the microcomputer with plenty of software will be just a supplementary teaching tool, just like the VCR and slide projector.

Computers represent a status symbol to teachers and administrators.

Right now it's difficult to get a clear picture as to just how micros will be used in schools. What will their status be after the initial wave of euphoria and drum beating is over? It's inevitable that we will continue to see micros in schools performing useful functions. But, overall, their impact and significance will be minimal compared to the main curriculum.

While most of this interest is being focused on the schools, there is an even more important audience. The greatest current need for learning about microcomputers and programming is by individuals in business and industry. Microcomputers are becoming so widely used in these fields that they are immediately impacting the jobs of many people. In order for individuals to perform competently or advance in their careers, they absolutely must know how to use micros.

Some attention has been given to this need, but the problem is not really solved. An assortment of books on microcomputer fundamentals and Basic language programming have been published. A variety of resident classes and seminars have been conducted in computer stores, evening adult education classes and in-house company training programs. Yet, there still seems to be a need for more and better materials and programs. Who will be the first to create a really effective product or service to address this market? A business/industrial version of Apple Computer's Appleseed program or a similar variation could turn out to be the CP/M or VisiCalc of educational software.☐

Books for Tomorrow

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TRS-80 BASIC
By Bob Albrecht, Don Inman & Ramon Zamora
Order No. 11,065 336 pages $8.95

This book's unique self-teaching format requires no previous familiarity with computers. Packed with exciting games and computer graphics, the book also includes learning activities in math and language art applications for home management, financial computations, and household record keeping.

The S-100 & Other Micro Buses
By Elmer C. Poe & James C. Goodwin, II
Order No. 10,033 144 pages $5.95

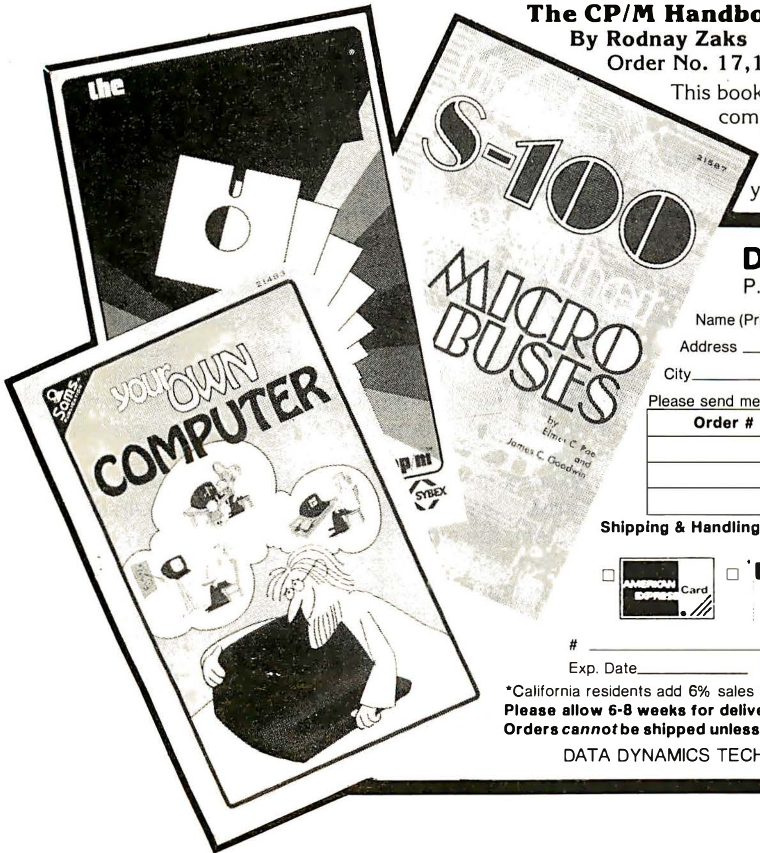
The bus, the key to system expansion in a microcomputer through which the microprocessor communicates with the system components, is thoroughly examined in this book. From discussing the basics of buses to examining in detail the various ways to convert different bus signals to S-100 signals. This guide covers it all!

Your Own Computer
By Mitchell Waite & Michael Pardee
Order No. 10,004 80 pages $1.95

This book can be your key to the fascinating world of home computers. Now that computers are available for about the price of a good stereo system, personal computers will soon be used to regulate energy in the home, to regulate spending habits, and even to provide entertainment for the family.

Computer Graphics Primer
By Mitchell Waite
Order No. 10,043 184 pages $12.95

Describes one of the most exciting developments in the new home computer products, computer graphics. Computer graphics is the ability to create complex drawings, plan, maps, and schematics on the screen of a television set.



The CP/M Handbook with MP/M
By Rodnay Zaks
Order No. 17,105 321 pages $13.95

This book is intended to teach you how to use CP/M and its resources. No prior computer knowledge is needed. It is assumed that you have access to a computer system equipped with CP/M. Depending upon the application programs that you execute on a computer, will depend if you use all or part of the resources provided by CP/M.

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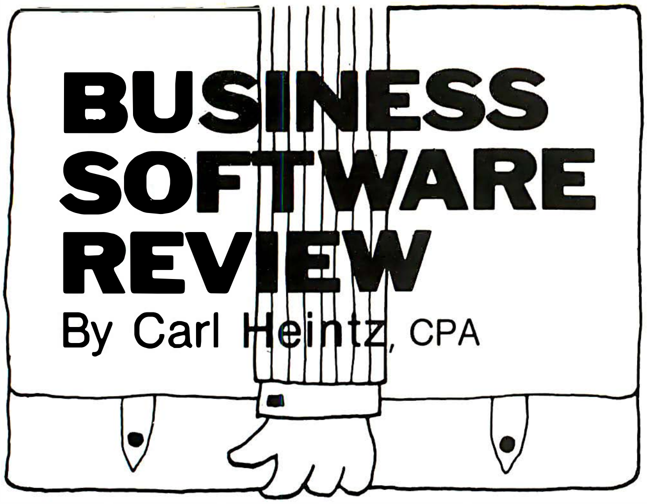

BUSINESS SOFTWARE REVIEW

By Carl Heintz, CPA

A Comprehensive Accounting Package

Accounting Plus from Systems Plus, Mountain View, CA is a set of integrated accounting programs designed as a complete accounting system. To use the system, the host computer can be any 8080, 8085 or Z80 processor with CP/M, MP/M or CDOS and 56K capacity. An 80-character terminal is necessary, with at least 24 lines. A printer with 132-column capacity is needed and at least two floppy disks are required. CBasic version 2.07 or 2.37 is necessary.

The packages are compiled in a binder with several single density 8-in. diskettes. They include sample data files to acquaint the prospective user with the system's major features.

To evaluate such a complete system is not possible here—it is too complex and interrelated. What will be examined, however, are basic features and some strengths and weaknesses of the system.

One nice feature is the ability to enter data on one system and have it update the other systems. The cash receipts, for example, update the receivables and the general ledger files.

The set-up program is complex, due to the nature of the programs. Not all modules must be used to run the system. Parts can be automatically deleted from the main menu. Later, modules can be added, if desired. Thus, a service company does not have to implement the inventory system, nor does a small retail store have to include the sales and order entry to have a viable system. Other features include the ability to set up beginning balances as the programs are configured, a useful step in getting a clean cut-off.

The manual is almost 200 pages long. In general, it is very well organized, easy to read and offers a concise explanation of the system. Missing, however, were items that prompt a clearer understanding of the entire system, such as a system flow chart, a programmer's aid and details about the programs' operational philosophy.

Sales order entry

This system is among the best available in a micro-oriented package. The menu has the following options: sales order entry, sales order inquiry, sales order printing, sales order maintenance, sales order shipping/invoicing, sales order status by sales order or part number, and end-of-month processing. The order entry routine is at the heart of the system.

The customer code is its key. When the code is entered, the computer will display customer name, address, salesman and terms, along with the customer address. You cannot enter new customers at this time. This is somewhat of an inconvenience, since it requires that all customers have pre-assigned customer numbers, an unfeasible situation in some applications. Once entry has been completed, the system will ask whether to accept, edit or reject it. Upon acceptance, the computer will ask for part number, description, price and order quantity and due dates for the merchandise being ordered.

If the part number maintenance option has been elected, the operator need only enter the part number and the computer will do the rest (except for the due date). The program allows for stock and non-stock items so that a combination of inventory stock and non-stock items can be entered at once.

At the time the parts are entered, the computer will compute the extended price plus the current accounts receivable and the back-order amount to determine the total credit limits extended to the customer at the current time. If the total is over the credit limit, a warning message will be printed and the operator will have to manually indicate that the overage is acceptable.

The sales order inquiry program fills the screen in a fashion similar to the sales order entry—a user indicates the desired sales order number and it is retrieved. The sales order maintenance is essentially an editing program allowing the user to edit, line by line, any of the information entered in the sales order entry procedure.

Another sales order function is the shipping procedure. This basically involves indicating by sales order number what has been shipped and the dates. The system will also produce invoices that look just like they came off an IBM 3033.

Various sales order/shipped reports can be generated, including: sales order detail by order number, customer ID number or part number, sales analysis by customer number, salesman or part number. The reports all include monthly summaries, and details of billed versus booked, and compute a booked/billed ratio useful for statistical comparisons. The reports are easy to read and are well organized.

Accounts receivable system

The A/R system is on-line and interactive. Cash receipts entry, unapplied check entry, invoicing and customer inquiry are accomplished with instant file updating. Either an open-item or balance forward system can be used. An open-item system is one wherein each customer's unpaid invoices remain until it is paid. A balance-forward system, which is much simpler to program and maintain, has only the ending balance from last month's accounts receivable and the balance outstanding. The open-item system is preferred for good accounting controls. The menu includes: customer maintenance/listing; automatic customer billing; terms update; invoicing and billing; cash posting and miscellaneous entry; customer statements; accounts receivable aging; accounts receivable detail and end-of-month processing. The customer maintenance/listing option also allows the user to get a professionally laid-out report of all the customers on file.

One application frequently needed in an accounts receivable installation is the ability to bill customers automatically, on a periodic basis, for the same amount each time. The system allows this, and permits a variable number of billings for each customer. The amount of the bill, descriptions and up to four different A/R accounts may be affected.

Invoicing and billing functions are organized around the customer number. Invoicing is accomplished through entry of the customer number, which then prompts a screen somewhat similar to the customer file, except that it concentrates on the shipping and billing aspects of the A/R function. The user can enter new data or use information already on file. (This is especially useful in the case of customers with many shipping sites.) After the header information is accepted, the system asks for descriptions, prices, etc.

A careful examination of the sales order-entry menu will indicate that the system also has an invoicing function. In the sales order system, the part numbers are used primarily as a key to update the inventory and sales order records. The receivables invoicing system is somewhat of an ancillary system that can be used for items for which there is no part number (it isn't asked for in the entry sequence) or for situations wherein the sales order entry system is not implemented.

Cash posting and the miscellaneous entry section are excellent. Cash receipt is by customer number; receipts must be pre-coded. The same program is used for payments,

credit and debit memos, and to apply open credits. The date and number of the received check is entered to serve as a reference. The system allows the user to enter cash receipts classified as one of two methods: 1) applied to a specific invoice, or 2) unapplied credits.

When a credit is entered, the invoice number is checked against the A/R file to ascertain that the invoice does, in fact, exist. The system allows for discounts taken by customers. Multiple distributions of amounts are possible.

Many embezzlements have been perpetrated through creative use of credit memos.

One drawback is the failure to prepare transaction detail reports, so that a total deposit posted against A/R can be reconciled to the amount deposited for that day. While it's possible to get the numbers in another way, this is a gaping internal control weakness that should necessitate some external, manual controls. In many systems, the posting of cash receipts is integrated with the preparation of the deposit slip for the bank.

Another problem is the failure to integrate cash receipts from sources other than A/R. In the best A/R systems, all forms of cash receipts can be entered. This is a good accounting control since, in the ordinary course of business, there may be many cash receipts which are not A/R.

Another weakness is the use of the same program for cash receipts and the credit memos on the same entry cycle. This invites the replacement of a check with a credit memo. The use of credit memos is an area in which accountants must exercise extreme caution and tight internal controls. Credit memo lists should be generated in a batch format whenever applied, and a computer list compared with the actual credit memos issued. Many embezzlements have been perpetrated through creative use of credit memos. The system *should have had* a summary transaction list for: total billings, total cash receipts by day (or period entered) and total automatic billings this period. Some of these figures are included in the totals of the accounts receivable detail report. However, there is no batch by batch totaling, and the cash receipts and credit memos are combined.

General ledger system

This system uses double-entry accounting, can have up to 10,000 general ledger accounts, and can accept up to a 6-digit account number. Options include: print chart of accounts; update chart of accounts; enter daily transactions; print income statement; print balance sheet; print trial balance; print detail journal and reset all balances.

Setting up the system is rather simple. Statement formatting is done by indicating what kind of account the entry is (asset, current asset, liability, etc.). Upon entry of any account number, the system searches to determine whether the account exists, and, if not, asks the user whether it should be set up.

The system has only one type of data input: the designers planned that the other modules would be used for cash receipts, disbursements and so forth. The only entry capability for the general ledger itself is for general journal entries. The system forces one to stay in balance, taking all information for each voucher and totaling it as the user goes along. Up to 28 characters of description are included.

One failing is the absence of a transaction list. When transactions are entered, you cannot get a replay of what you entered. This is a flagrant lack of audit trails that could and should be corrected. Once the data is entered, the system essentially goes ahead and posts it to the general ledger accounts. While this is simple, and straightforward, it misses the point that most accountants need a trial balance.

Financial statements

These are simple, presentable and workable, but the user does not have much to say about how they are laid out. This is unfortunate, since, in many cases, users need to format their statements—especially when there are many similar accounts which should be grouped together under one heading. These systems do not allow for this subheading. Nor do they allow the user to establish his own columns, elect to drop the pennies, put in dollar signs, or show subtotals. In this respect, they are inferior to other programs. The income statement does include month- and year-to-date figures, however.

Accounts payable system

This system, like the A/R, operates on an on-line basis, with much user interaction. The system can maintain files on up to 10,000 vendors. It provides open accounts payable reports sorted by vendor, can print the checks and allows for hand-written checks. The system accepts partial payment of vendor invoices, and unapplied credits. Options include: vendor maintenance/listing; terms code update; automatic A/P maintenance; accounts payable entry; select invoices for payment;

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check generation (printing); accounts payable aging; accounts payable detail and end-of-month processing.

This system in some ways mirrors the A/R system. Everything is centered around the vendor number. For each vendor, much information is on file, including the year-to-date purchases, the open credits, priority, times, amounts payable, terms and so forth. The year-to-date amounts paid and the year-to-date purchases are kept automatically by the system. Like any good accounts payable system, the programs will allow for discounts that are subsequently calculated.

Entry of invoices is relatively simple and the process is rapid. The system allows for invoices that have already been paid to be entered for the purpose of affecting the distribution of amounts. This practice can introduce some accounting problems, but the system seems to have them pretty well under control.

The system allows a user to select individual invoices for payment out of the accounts payable files, schedule them for payment and write the checks. As in the A/R system, provisions are made for automatic items.

The system is excellent except when it comes to details concerning transactions. It needs to produce transactions listings by entry batch to have an effective system of internal controls. The most glaring problem is the absence of a check register. Accounting internal controls are weak and the opportunities for fraudulent use abound.

An effective system would contain provisions for the production of listings of all inputs, changes (such as "dr" or "cr" memos) and disbursements. The check register should be a central part of the system.

Purchase order system

This allows the user to order inventories or non-inventoried products from vendors set up in the accounts payable program. It allows the entry of a purchase order and automatically updates purchase order and inventory files. It prints confirming purchase orders, and keeps track of all purchase orders outstanding at any one time. It automatically interacts with the inventory system changing "on-hand" and "on-order" quantities.

The system functions somewhat like a sales order unit in reverse—since it keeps track of what you are purchasing. Such controls can be vital to effective management over purchasing activities.

Provisions for printing purchase orders on standard forms is included plus a report is generated that shows the status of all open purchase orders. Additionally, reports are generated that show the variance between what was ordered and what was received.

Inventory control system

This system interacts with the sales order entry system and the purchase order entry system. It maintains the quantity on hand, on-order and allocated. It also maintains a standard cost and the retail cost of the inventoried items, and has provisions for any adjustments as a result of physical count. The system can maintain a list of up to 10,000 parts, a history of usage of all inventoried items, and can display the year-to-date issues, receipts and variance quantities.

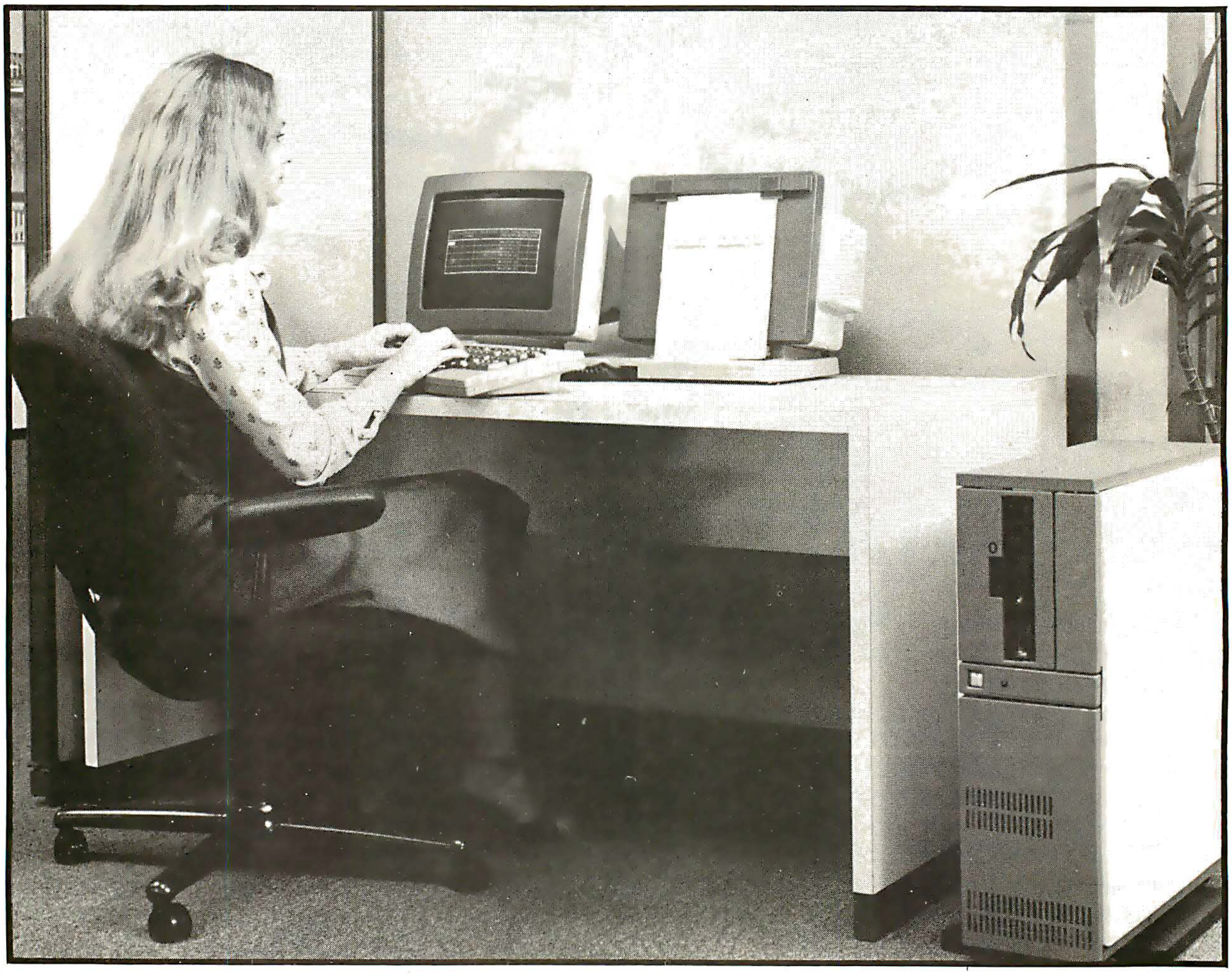
Additionally, the system maintains an accounting of unit cost and provides usage and margin analysis. The transaction update interacts with the sales and purchase systems, so that everything concerning the inventory is automatically updated. The system even generates a worksheet that compares physical inventory with the book and makes book-to-physical adjustments.

The Accounting Plus packages are among the most complex pieces of software on the market. All packages interact and the developers obviously had a grand plan in mind when writing the software.

It is a good package, overall. The basic philosophy of an on-line system is valid, as long as the necessary provisions are made to include "batch-type" output, an essential element in accounting internal controls. □

CIRCLE INQUIRY NO. 23

Convergent Technologies' CT-2100



by Tom Fox

Convergent Technologies is a new company; its products are just beginning to come off the Santa Clara, CA production line. The company is concentrating heavily in two areas: the design of a radically different computer system, and a production/quality control facility nearly fanatical in its attention to product reliability.

Convergent is almost unwavering in its policy to sell "OEM only," not just to anyone who knocks on the door. OEMs, by Convergent's definition, are those firms that add value to the computer (usually in the form of applications software), and re-sell the resulting system to end users. Convergent has declared that the company will never offer applications software as a part of their package, in keeping with this sales policy.

In an effort to give its products a distinctive appearance, Convergent has nearly succeeded in making them unrecognizable as computers. The basic CT-2100 is a typical example, in that it consists of five distinct boxes, all connected together by cables or articulated swivel joints. There is a detachable keyboard, with a generous length of coil cord that disappears into a thin table-mount plastic slab. On top of this are two of the major elements of the computer: a cathode-ray tube (CRT) display terminal on the left and what looks like a matching vertical copy stand on the right. The copy stand is certainly one of the most intelligent to be found, since it also encloses the bulk of the computing electronics for the system.

A slim vertical stand on the floor rounds out the equipment list. It contains the disk drives, along with the supporting power supplies and electronics. In the CT-1100, this is a pair of Shugart single-density, single-sided 8-in. floppy disk drives. The CT-2100 contains a single 8-in. drive, as well as a 10M-byte sealed Shugart Winchester hard disk drive. In the latter case, the 500K-byte floppy serves to back up the data on the hard disk, as well as providing the mechanism for transporting programs and data between this and other computers.

Back to the table-top pieces: The CRT is definitely one of the fancier ones we've seen, with a host of interesting software features. It swivels on a ball joint to face the operator and reduce the glare from overhead lights, a task that is further aided by the camera lens-style optical coating on its screen face. The copy stand is placed at the same distance from the operator's eyes as the CRT, keeping the eyes from re-focusing every time they flick from one surface to the other. It's a simple trick, but an example of the way the company has gone back to the first principles in computer design.

Behind the copy stand lurk the brains of the system. This takes the form of three plug-in circuit cards containing the central processing unit (CPU), video display control and combination memory and input/output (I/O) board. There is room for one more board, as well as two additional cards that conform to Intel's Multibus standards. This box also contains an integral high-efficiency switching power supply.

The computing parts are connected together via two busses: one by Convergent design and one Multibus extension. This opens the door for adding hardware boards from other manufacturers. The main microprocessor is Intel's 8086, a 16-bit chip finding much favor in today's newer products. It processes at a 5 MHz rate, and is bolstered by an 8087 high-speed mathematics processor. Additional help is found in the form of 8/16-bit 8088 micros scattered around in various places, such as the disk controller. Hardware interrupts play an important part in this system; no fewer than 36 levels of external interrupts are supported.

Impressive memory capabilities

The basic array of random-access memory (RAM) will hold 128K bytes. The chips are dynamic units (as opposed to static ones), and the boards feature parity detection of memory errors. Read-only memory (ROM) is also supported, with space available for up to 80K bytes of this item. Convergent-supplied ROM, however, occupies but 4K bytes; most of the systems software resides in the main RAM area, in traditional style.

Each computer comes with two serial I/O ports and one parallel port. Both serial ports will connect to EIA RS-232 devices, with bit transfer rates software controllable from 110 to 19,200 baud. In addition, one of them can double as an RS-422 port, giving speeds up to 615K baud and/or operating at greater distances than that supported by the earlier RS-232 standard. The parallel port is intended for connection to Centronics-compatible printing devices.

The impressive power of this computer's electronics are visibly hobbled by Convergent's selection of disk drives. The floppy drive design is at least two generations behind the state-of-the-art in data density. The hard disk, moreover, is only a low- to medium-performing unit with an average access time hovering around 70 mS. This is nearly four times faster than the floppy, but not up to the capabilities of other (albeit more expensive) hard disk machinery.

A computer's operating system is that portion of the systems software that defines the "personality" of the computer. This operating system (CTOS) ranks with the most sophisticated available. It is designed to be modular, meaning that a given implementation may use only that portion of CTOS's capabilities that are meaningful in a particular instance. For example, a remote processor/terminal may be intended

Behind the copy stand lurk the brains of the system.

to connect to a central disk-management processor. The diskless remote's CTOS would simply not be equipped with all of the disk file handling modules, which it could never utilize.

CTOS is fundamentally a multi-tasking operating system; thus many of its trickier aspects center around the management of many jobs at the "same" time. A single CPU (such as the 8086 micro used here) can really only execute one program at a given instant in time. A portion of CTOS has the chore of switching the attention of the CPU around to the various tasks at hand, giving each the appearance that it has the full concentration of the processor. The simplest of operating systems manage this "time sharing" by allocating each task a slice of time, usually measured in hundredths of a second or less. The time allocation is often done on a round-robin basis, so each job gets an equal amount of the computer's resource. CTOS, however, keeps a list of the relative priorities of the tasks, and apportions the CPU's time rather undemocratically. A task can be allocated one of 255 priority levels to assert its ranking in relation to the other work to be done.

Once a task gets the CPU's attention, it keeps it until bumped by a higher-priority one, or gives up the processor on its own account. Both the hardware and software are highly interrupt driven, so most tasks have lots of logical stopping places. Some examples: waiting for keyboard input; waiting for a printer to notify that the last batch of characters sent to it have been printed; waiting until a read head arrives at its commanded position over the selected track on the disk. In a computer's way of reckoning, delays like this can take eons—equivalent to many millions of processor cycles. CTOS recognizes this, and uses those cycles to perform useful work for the other waiting tasks.

Managing the disk space is another important job handled by the operating system. In the CTOS world, a physical whirling disk is called a volume. Each volume can contain a number of directories; each one, a collection of files. These numbers are flexible, and are limited more by the physical size of the disk than any artificial constraints within CTOS. The control records that manage this arrangement are placed on the disk in such a way as to minimize read head movement. (Some of it is even held in two physical spots on the disk, insurance against the day that data contamination makes the primary copy unreadable.) Certain of this information is held in RAM all the time a particular volume is on line, further speeding up the file accessing process.

Volumes, directories and files can each be protected with their own passwords. In addition, the passwords can be declared to apply individually to read or write activities on an individual file basis. A file can have a generous 50-character name, if needed. Each file is made up of one or more 512-byte disk sectors, and the size expands and contracts automatically as data is added or deleted from each. Files are fundamentally of the direct-access (random) type, although a simplified sequential access mode is available. A multi-keyed indexed-sequential access method (ISAM) is also managed by the CTOS software. ISAM is the heart of Convergent's data base management system (DBMS) and sort/merge facilities.

CTOS has other tricks up its sleeve for managing communications between tasks and with other elements of a multi-processor master computer. All in all, it's a highly complex operating system. Those familiar solely with simpler ones (such as the single-user CP/M operating system) have a lot of study to do before they will be able to comprehend it—let alone efficiently utilize it.

Most of the high-level computer languages used by today's applications programmers are available on the system. Even more, the individual dialects are sure to be familiar to many, since most were developed by Microsoft. Apple and TRS-80 model II programmers, for example, will be right at home with Convergent's Basic. Pascal and Fortran, as well, are straight out of Microsoft's Seattle cellars. Convergent has tapped the Microfocus shop for its version of Cobol.

Compiler implementations favored

Wisely, Convergent has opted for the most widely recognized standard versions available for each language. All but Basic are true compiler implementations, thus maximizing the execution speed programs written in them. This was revealed when we ran our Prime Number Cruncher benchmark program (IA Jun 80) in both the Pascal and Basic forms. Whereas the chore took 752 seconds to complete on the Basic interpreter, the compiled Pascal program took a scant 9 seconds to do the same work.

For assembly-language programmers, Convergent has its own set of programming tools. First is the Editor, a program used to enter the source program. More than just a programming tool, this particular editor has features that make it compare favorably with most of today's available word processing editors. It is character-oriented, and takes full advantage of the hardware's memory-mapped display screen and special keyboard.

Once a program is written in assembly language, it is run through the Assembler and Linker programs. The Assembler has several time-saving features, such as a conditional INCLUDE facility. For those few whose programs don't run correctly the first time, a symbolic debugger will help find the problem. This includes features that allow the testing of simultaneous multiple-process tasks, including those interfacing with the full range of external hardware interrupts.

The display tube on the company's products is one of the most appealing aspects. The 15-in. screen (with roughly 50% more area than the most popular CRT terminals) glows with a pleasant saturated green hue. The normal display format is 34 lines of 80 columns each, and a 34 by 132 array is available under software control. This is typical of other user-alterable aspects of the display, which are traditionally locked in by hardware design. The type font utilized, for example, can be changed. An extra-cost font design program is available, allowing you to draw, dot by tiny dot on a 10 by 15 field, the shapes of 255 definable characters. Alternate pre-defined fonts may be invoked at will by simply recalling them from a disk file. The standard font as furnished with the equipment includes a good selection of special characters for drawing such things as forms and bar charts on the screen.

Characters can be displayed individually in normal or reverse (black on a green background), and can be underlined and/or blinking. Half intensity can be commanded for either the characters or their backgrounds, if reverse display has been selected. The screen area may be broken up into an almost unlimited number of windows, each with its own cursor, and each displaying the output of a different process. The hardware almost gives the programmer too many choices; the professional world will have to do some adapting before the full capabilities are realized.

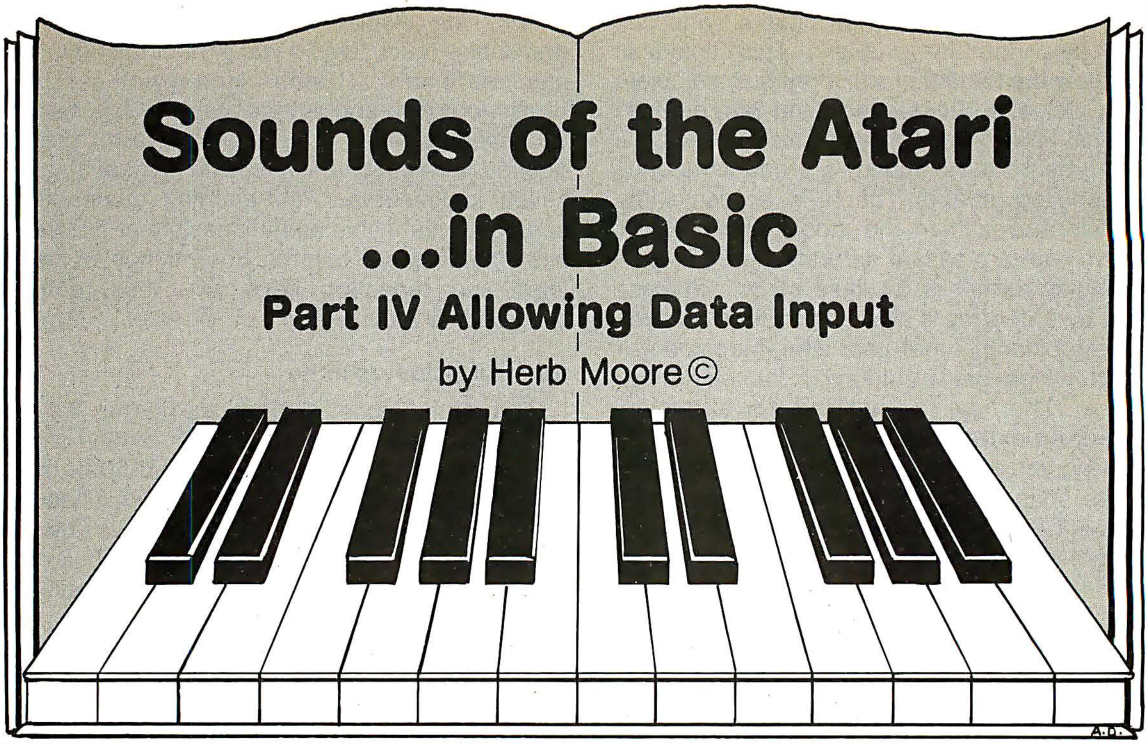
With the display screen so pliable to the programmer's touch, would you expect the keyboard to be any different? Using Honeywell's Hall-effect technology non-contact mechanism, this item features 98 separate keys. Ten are set aside for programmer-defined functions. *Each* of the 96 keys, as well as seven key-mounted light-emitting diodes (LEDs), is separately definable and accessible at a lower level of systems software control. Such things as key rollover logic and repeating keys will, thus, submit to a programmer's control.

Several price options

The stand-alone system carries a list price of $18,500. This includes 128K bytes of RAM, a 10M-byte Winchester disk drive and 500K-byte floppy disk drive for backup purposes. If your needs can be met by a floppy-only system, a dual drive (1M-byte total capacity) CT-1100 can be had at a savings of $5,000. Another 128K bytes of memory for either system costs $1,950. Individual work stations, including the CPU and memory but forsaking any sort of disk drive, are also available. OEM pricing for the simplest of these is $3,990 each in 25-unit lots.

The operating system comes with hardware, but other software is priced separately. Languages range from $1,000 for Basic to $2,500 for Cobol or Pascal. Other utilities such as ISAM, the display font designer and communications packages range from $1,000 to $3,500 each. Applications software will come from your local systems integrator, and is likely to add to the system cost. □

CIRCLE INQUIRY NO. 4



Sounds of the Atari ...in Basic

Part IV Allowing Data Input

by Herb Moore©

In the first three articles in this series, we've discussed how to create programs that will produce various sequences of sound and color graphics. Thus far, all program information has been predetermined, so that a specific pattern of graphics and sound occurs. This installment will show how to develop a program that allows someone to input data that effects the outcome of the program while it is running.

To begin with, note this short listing:

```
10 PRINT "TYPE A NUMBER BETWEEN"
20 PRINT "0 AND 255 THEN PRESS RETURN"
30 INPUT N
40 SOUND 0,N,10,10
50 FOR T=1 TO 1000:NEXT T
60 SOUND 0,0,0,0
70 GOTO 10
```

When this program is run, it will execute the PRINT statement in lines 10 and 20, followed by a question mark, and then wait. So the screen will look like this:

```
ENTER A NOTE VALUE BETWEEN
0 - 255 AND PRESS RETURN
```

Now when you type a number and press RETURN, the machine will input the number as N. The variable N can then be used in the same way as a variable that you have given an assigned value in the program. In other words, the only difference between this and a line like:

```
30 N = 121
```

or

```
30 N = 96
```

is that, in this case, the user gets to input the value of N while the program is running.

To get an idea of how N can be used as a variable in different ways, try adding some graphics statements that make use of the value N. For example:

```
32 GR. 22
33 COLOR 1
34 SETCOLOR 2,4,8
35 PLOT N/2,N/3
```

When the program is run and someone enters a number between 0 and 255, the machine will remember that value of N and use it in both a SOUND statement and a PLOT statement.

You can use more than one input statement in a program also. For example, if you wanted to have the user be able to input note values for more than one voice, you could write a program something like this:

```
10 PRINT "ENTER A VALUE FOR N0"
20 INPUT N0
30 PRINT "ENTER A VALUE FOR N1"
40 INPUT N1
50 PRINT "ENTER A VALUE FOR N2"
60 INPUT N2
70 SOUND 0,N0,10,10
80 SOUND 1,N1,10,10
90 SOUND 2,N2,10,10
100 FOR T=1 TO 300
110 NEXT T
120 SOUND 0,0,0,0
130 SOUND 1,0,0,0
140 SOUND 2,0,0,0
150 GOTO 10
```

The input statement allows you to set up the program in such a way that a person can easily enter specific information, in order to create their own sound and graphics.

So far, though, you've only been able to input numbers for the variables. If, for example, you tried to type the letter c for a note value, you'd get an ERROR message.

Letters or combinations of letters and numbers are called strings. For example, the letter C is a string. D4##6 is also a string.

A program can be written that allows you to input string variables. A string variable is defined by the forms N$ or F2G$. That is, an alphanumeric character followed by a $ sign indicates a string variable.

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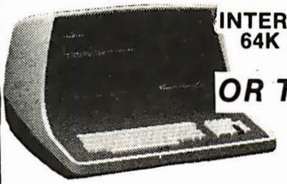

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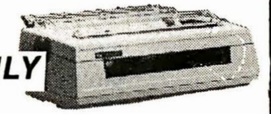

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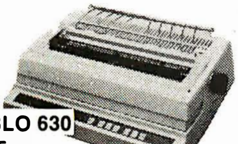

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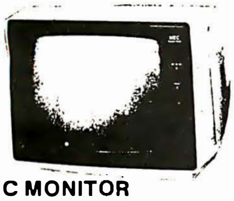

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One necessary step is that string variables must be dimensioned. You must reserve a space in memory for the maximum number of characters required.

The command looks like this: 10 DIM N$(10).

This tells the computer to dimension a string of up to 10 characters for N$. You can use N$ in an input statement. The upper limit for a string variable is 100 characters.

To get a feeling for this concept, try this short program:

```
10 DIM N$(5)
20 PRINT "TYPE UP TO 5 CHARACTERS"
30 PRINT "AND PRESS RETURN"
40 INPUT N$
50 PRINT "YOU SAID"
60 PRINT N$
```

The program dimensions a string of 5 characters with line 10. It then executes the PRINT statement in 20 and 30 and waits for you to input a string at line 40. Once the string is entered, it executes the print statement in line 50; at line 60 it prints the string you have entered.

The goal is to create a program that allows the user to input a note name line C of F# and have the computer make use of the appropriate value for that note in a sound statement. In order to accomplish this, you need one more statement: IF-THEN. The following program demonstrates the usage of string variables and IF-THEN decisions.

```
10 DIM N$(3)
20 PRINT "TYPE C,D,E, OR F"
30 PRINT "AND PRESS RETURN"
40 INPUT N$
50 IF N$ = "C" THEN NO = 121
60 IF N$ = "D" THEN NO = 108
70 IF N$ = "E" THEN NO = 96
80 IF N$ = "F" THEN NO = 91
100 SOUND 0,NO,10,10
110 FOR T = 1 TO 500: NEXT T
120 SOUND 0,0,0,0
150 GOTO 20
```

Lines 10 through 40 should be clear, since they are essentially the same as the beginning of the previous program. For the sake of illustration, assume that when the program is run, the user types the letter E at line 40. The computer remembers: N$ = E.

In line 50, it compares N$ with the letter C to see if they are the same. Since you've typed E, it sees that it's not the same and goes on to line 60, where it makes a similar comparison. It's still not the same. At line 70, it sees that the string typed by the user is the same as the string you're telling it to compare with.

Since line 70 is a proper match, it gives NO the appropriate numeric value (i.e. 96) which can then be entered in the sound statement or used however else we want in the program. In this case, it plays the note; then, line 150 tells it to go back and ask for another note.

If you tried to type a letter other than C,D,E, or F, you may have discovered a bug in this program, though. If, for example, you type a letter S, the first time through, it won't play a note. That's because in lines 50 through 80, it won't be able to establish a value for NO. However, if the first time through, you type D and the next time S, it will play D both times. This is because it has entered a value of 108 for NO.

Try putting this line in the program: 35 NO = 0. If you type S or P or some letter other than C,D,E or F, the machine will print it, but won't play a note.

While we're cleaning up this program, here's another little trick that can come in very handy. In case you haven't discovered how to clear the screen without using the SYSTEM RESET key, you can also use the SHIFT and CLEAR keys together for this purpose. If you wish to have the machine clear the screen while the program is running, first type: 15 PRINT ". Then press the escape key, labeled ESC at the left of the keyboard. Type SHIFT and CLEAR together. You should get something like 15 PRINT ". Press RETURN. Change line 150 to: 150 GOTO 15.

Try entering this information in the program you've got so far. Now when you run it, the screen will be cleared after each note is played so that the instruction:

```
TYPE C,D,E, OR F
AND PRESS RETURN
```

will remain at the top of the screen.

In order to see another way in which an IF-THEN statement can be used, make the following additions and changes in the program. Change line 70 to: 70 IF N$ = "E" THEN 200 and add

```
200 SOUND 0,96,10,10
210 SOUND 1,121,10,10
220 FOR T = 1 TO 500
230 NEXT T
240 SOUND 0,91,10,10
250 FOR T = 1 TO 100
260 NEXT T
```

```
270 SOUND 1,108,10,10
280 FOR T=1 TO 300
290 NEXT T
300 GOTO 15
```

Line 70 is not telling the machine that if you type the letter E, it is to skip down to line 200. It will then execute lines 200 through 300, which play a sequence of notes. At line 300, the loop is completed and it goes back to line 15 to start over.

Two possible results of an IF-THEN decision are that it can determine the value given to a particular variable or it can determine which line of the program is to be executed next. In this way, a set of different loops can be established using IF-THEN decisions to choose which loop is to be executed next.

There are a number of other comparisons besides equality that can be made with IF-THEN decisions. Some possible choices are:

IF A = B THEN	
A < B	(A is less than B)
A > B	(A is greater than B)
A <> B	(A is not equal to B)
A ≥ B	(A is greater than or equal to B)
A ≤ B	(A is less than or equal to B)

Here's the skeleton of a program using IF-THEN decisions that you can fill out to provide various choices of phrases of sound and graphics.

```
5 REM *** INPUT NOTES
10 DIM N$(3)
30 GRAPHICS 6
40 COLOR 1
50 SETCOLOR 0,2,8
60 PRINT "TYPE A LETTER FROM"
70 PRINT "A TO G AND PRESS RETURN"
80 PRINT
90 INPUT N$
100 IF N$="A" THEN 500
110 IF N$="B" THEN 510
120 IF N$="C" THEN 520
500 N0=72:GOTO 1000
510 N0=64:GOTO 1000
520 N0=60:GOTO 1000
1000 REM ** NOTE SEQUENCE
1010 SOUND 0,N0,10,10
1020 GOSUB 2000
1030 SOUND 1,N0/2,10,10
1040 GOSUB 2000
1050 SOUND 2,N0/3,10,10
1060 GOSUB 2000
1070 SOUND 3,N0*2,10,10
1080 GOSUB 2000
1200 SOUND 0,0,0,0
1210 SOUND 1,0,0,0
1230 SOUND 2,0,0,0
1240 SOUND 3,0,0,0
1300 GOTO 60
2000 PLOT 100-N0,N0
2010 FOR T=1 TO 50
2020 NEXT T
2050 RETURN
```

The loop beginning with line 1000 and going through line 2050 can, of course, contain whatever information you wish. This is the type of structure you can create using input statements and IF-THEN decisions. □

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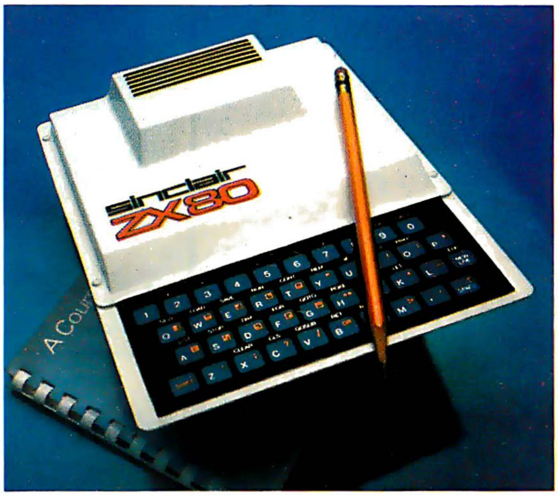

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Pertec PCC 2000

Multi-User Business System

	C-3 Accounts Receivable Time	Current Price
Pertec PC 2000	6:04.3	$12,470
DECstation 78	5:04.8*	$10,495
Vector Graphic System B	5:56.5	$ 8,995
Texas Instruments Model 771	3:38.1	$12,100
North Star Horizon	1:57.7	$ 6,911
Cromemco System Two	2:48.0	$ 9,275
Radio Shack TRS-80 Model II	*to be covered in future issues*	
Apple II Plus		
Digital Micro Systems DSC-2		

*Includes both compile and run time

by Hillel Segal

When it comes to business applications, the use of computers can prove infectious. You might start out with one terminal dedicated to a single job, but pretty soon more work turns up for the computer—and you need more terminals, more disk storage...on and on.

It used to be that such expansion was outside the realm of microcomputers. But now, designers are shoehorning much more into the single-chip computer that revolutionized system design in the 70s. Pertec of Los Angeles, CA has taken a second-generation microcomputer chip (the Intel 8085) and teamed it with a multi-user operating system. The result is a business computer that can handle up to five terminals and five separate tasks at once.

While not as inexpensive as some systems we've discussed in reviewing the Association of Computer Users' Benchmark Reports, the Pertec PCC 2000 has capabilities that set it apart from the Apple/TRS-80 class. In addition, it's marketed differently: Pertec emphasizes the system as a business computer and offers a full-scale accounting and reporting software package to go with it. The firm gives customers training and software support to enable them to use this predeveloped package, rather than encouraging independently-written programs.

While we examine the PCC 2000, we should keep in mind the end user's point of view. In this case, it's most likely to be a businessman whose approach to computers is very solution-oriented. The user is probably more concerned with the total hardware/software system as it relates to his own accounting system than with specifics of design or performance. Nevertheless, our benchmark testing process remains effective in identifying price/performance factors.

Our accounts receivables test simulates an actual accounting program in that it creates a file of 50 records, each with 10 fields for information such as the customer identification, salesman and payments. After updating the file according to a standard script, the system prints (In this case to the screen) a report detailing the status of the hypothetical company's accounts.

By running similar programs on different systems (after appropriate modifications for language or operational Idiosyncracies), we can approximate the speed of the computer for a similar application or mix of tasks. The accounts receivable program emphasizes file creation and modification, with both arithmetic computation and disk read/write included. No hard copy Is involved in the times reported here, although a separate run that produces a printout is described in the full reports.

The system was tested in its standard configuration, which costs $12,470 including a Centronics 702 printer. Other hardware features are 64K bytes main memory, two dual density 8-in. floppy disks with 600K bytes of storage each, and a green phosphor CRT screen with detachable keyboard. The CRT displays a 24 by 80 character page with upper and lower case alphanumerics and special forms characters. The keyboard has a separate numeric keypad and cursor control area.

Most significant among the hardware options are two types of hard-surface disk drives. Housed in one or two separate cabinets, these can add up to 80MB of storage to the system. Either 10MB or 20MB disk subsystems can be used; the 10MB drive has 5MB disk and three fixed 5MB disks. The maximum configuration consists of four of the 20MB drives.

The auxiliary terminals offered are similar in appearance and keyboard layout to the Integral system terminal. These communicate to the master at 9600 baud through a 25-foot standard cable.

Although Pertec primarily markets the multi-user MTX operating system, programmed in Basic, the company offers three others. The MT2 system adds Assembler to an extended version of Basic, and a third offering combines Pertec Extended Basic (an earlier version) with a single-user operating system.

Also available Is a standard CP/M operating system that can be teamed with Microsoft Baslc-80, Fortran-80 and Cobol-80, as well as numerous off-the-shelf languages.

With the MTX operating system, each terminal can be running an active task as well as a background task. Different programs can share a common group of disk files. They can be concurrently updated from various programs and users with the help of a lockout feature, operating on either the record or file level.

At the time the system was tested, the single-user 2000 Basic operating system was being supplied to customers along with a number of application packages that run under that system. It was used In running the benchmark tests, so the time indicated (6:04.3) for the accounts receivable test reflects use of that language and operating system.

While the accounts receivable time was in the bottom half of the 12-system group, Pertec engineers have pointed out that their computer incorporates "read after write" instructions in its disk-handling routines, a data safety feature that slows the system down. Furthermore, they note that the single-user Basic operating system was not optimized for file-handling as is the newer MTX system. "We're running business applications software, which means we lean heavily towards data file manipulations...reading and writing, etc. Those are the areas that were greatly improved," ACU was told.

While the engineers say it will run business programs "significantly faster" under MTX, no hard figure was offered. The effect of operating system and language changes on a computer's overall throughput is very difficult to accurately predict, and variables such as these are best measured by benchmark testing—a key reason we feel the tests are a better measure of speed than conventional indicators such as CPU cycle time or memory access rate.

Widely compatible software

The software package is called Magic (Managerial Accounting for Generalized Information Control). It is a comprehensive business package that includes sales and general accounting. Under sales accounting are such aspects as order processing, invoicing, accounts receivable, sales analysis, and inventory management. The company notes that this is designed primarily for use by wholesale distributors, but says it can be used in some cases by retailers, manufacturers and service firms.

The general accounting features can be used by almost any company, according to Pertec, and include such functions as payroll, accounts payable and general ledger.

Our survey of customers found that most were using a turnkey system rather than doing any programming themselves. A wide cross-section of business ranging from TV stations to hospitals and CPA firms were using the system, and generally expressed satisfaction with it. "What I like best is the fact that the computer is a compact, self-contained unit, yet expandable in terms of additional storage devices and terminals," commented one.

Dealer support varied somewhat from place to place, as evidenced by occasional mixed reviews from the customers. The company's distribution network is expanding, however, and now includes some 20 branch offices and 100 independent dealers in the U.S. Pertec products are distributed abroad in 40 countries through various marketing arrangements. □

Hillel Segal is president of the Association of Computer Users, a non-profit association with members all over the U.S., Canada and several other foreign countries.

One of the association's key activities is the publication of its Benchmark Reports. Each month a new report is produced covering a computer system.

In addition, ACU publishes seven bimonthly newsletters for users of small computers, midi computers, large computers, time-sharing systems, distributed processing systems, word processing systems and home and hobbyist computers.

A complete package of information about membership is available at P.O. Box 9003, Boulder, CO 80301.

dBASE™ II vs. the Bilge Pumps.

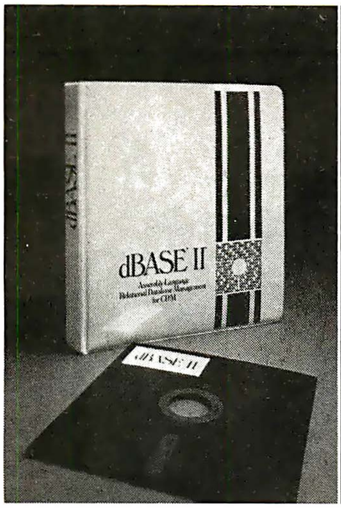
by Hal Pawluk

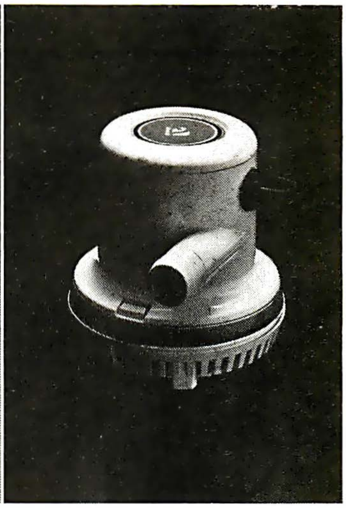
We all know that bilge pumps suck.

And by now, we've found out—the hard way—that a lot of software seems to work the same way.

So I got pretty excited when I ran across **dBASE II**, an assembly-language relational Database Management System for CP/M. It works! And even a rank beginner like myself got it up and running the first time I sat down with it.

If you're looking for software to deal with your data, too, here are some tips that will help:





Tip #1: Database Management vs. File Handling:

Any list or collection of data is, loosely, a data base, but most of those "data base management" articles in the buzzbooks are really about file handling programs for specific applications. A real Database Management System gives you data and program independence (no reprogramming when data changes), eliminates data duplication and makes it easy to turn data into information.

Tip #2: Assembly Language vs. BASIC:

This one's easy: if you're setting up a DBMS, you're going to be doing a lot of sorting, and Basic sorts are s-l-o-w. Run a benchmark on a Basic system like S*-IV against a relational DBMS like **dBASE II** and you'll see what I mean. (But watch it: I've also seen one extremely slow assembly-language file management system.)

Tip #3: Relational vs. Hierarchal & Network DBMS.

CODASYL-like hierarchal and network systems, around since the 1960's, are being phased out on the big machines so why get stuck with an old-fashioned system for your micro? A relational DBMS like **dBASE II** eliminates the predefined sets, pointers and complex data structures of a CODASYL-type DBMS. And you don't need to be a programmer to use it.

dBASE II vs. everything else.

dBASE II really impressed me.

Written in assembly language (with no need for a host language), it handles up to 65,000 records (up to 32 fields and 1000 bytes each), stores numeric data as packed strings so there are no round-off errors, has a super-fast multiple-key sort, and supports ISAM based on B* trees.

You can use it interactively with English-like commands (DISPLAY 10 PRODUCTS), or program it (so when you've set up the formats, your secretary can do the work). Its report generator and user-definable full screen operations mean that you can even use your existing forms.

And if all this makes your mouth water, but you've already got all your data on a disk, that's okay: **dBASE II** reads your ASCII files and adds the data to its own database.

Right now, I'm using **dBASE II** with my word processor for budgeting, scheduling and preparing reports for my clients.

Next come job costing, time billing and accounting.

An Unheard-of Money-Back Guarantee.

dBASE II is the first software I've seen with a full money-back guarantee.

To check it out, just send $700 (plus tax in California) to Ashton-Tate, 3600 Wilshire Blvd., Suite 1510, Los Angeles, CA 90010. (213) 666-4409. Test **dBASE II** doing your jobs on your computer for 30 days. If, for some strange reason, you don't want to keep it, send it back and they'll refund your money.

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From Typewriter to Hard Copy Printer

Rochester Data's Dynatyper Mechanic

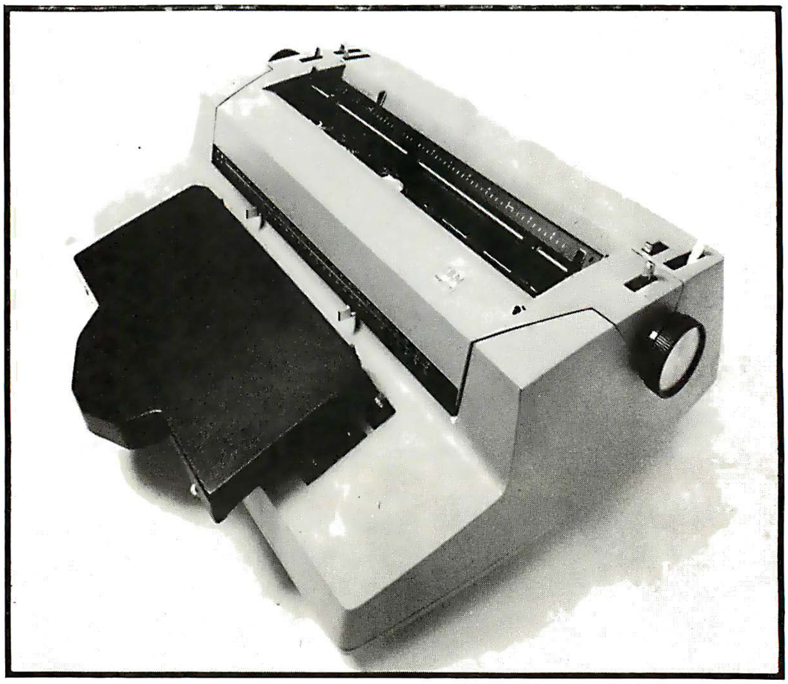


Photo 1. Dynatyper mounted on an IBM Selectric

by Roger H. Edelson

For those computer enthusiasts with champagne tastes but a beer budget, the Rochester Data Dynatyper may be just the ticket. If you have any conventional typewriter with a powered carriage return or an IBM Selectric machine, the Dynatyper will allow you to produce impact printer quality from your computer at the price of a dot-matrix unit.

The unit consists of unlikely assemblage of 52 solenoids driving plungers, which in turn depress the keys of your typewriter. All of this mechanical gadgetry is enclosed in a low profile case which is easily mounted (non-permanently) to the typewriter keyboard. Photo 1 provides an overall view of the unit mounted on an IBM Selectric, and photo 2 illustrates the bottom where the plungers exit.

The wonder of all this is that it really works, reliably, and can be purchased for around $500, including the power supply and microprocessor interface. Once installed and interfaced to the host computer, you can start producing output at any rate consistent with your typewriter—approximately 10 to 18 CPS.

With drastic reductions occurring in the prices of good quality dot-matrix printers, why should this mechanical add-on be selected? In cases where it is necessary to have variable type fonts available, or many copies must be made, or a legal type style is a must, the Dynatyper combined with the already present office typewriter is a cost-effective solution.

Two models are available, one for any IBM Selectric with a U.S. keyboard (model 1) and another for any powered carriage return portable or office typewriter if it had a U.S. keyboard (model 2). Both models are very nearly the same, the only difference being the length of the solenoid plungers. If there is a need to use the Dynatyper on both Selectric and non-selectric typewriters, a conversion kit is available (for less than $20), consisting of plungers of the other length.

It only takes about 2 minutes to convert from one model to the other. The mounting technique is simplicity itself; using the supplied template, two plastic buttons are cemented to the typwriter keyboard and the height of the Dynatyper is adjusted using the four adjusting screws. Once this is completed, the cover is replaced and the locknuts are tightened to finish the job. The mounting of the washers on the typewriter is seen in photo 3, while photo 4 shows the inside with the plunger installed.

The Dynatyper provides the means to actuate 44 alpha-numeric keys plus 6 function keys (carriage return, space, backspace, tab, case lock, and case shift), which must be powered. The energizing solenoids drive these keys through non-marring delryn plungers.

The solenoids will provide an operating force of about 3 oz., which closely matches the operating force of a normal typist. The timing must be adjusted through the software to match the acuation and delay times of the particular typewriter.

For those microcomputers for which Rochester Data provides driving software, this timing is easy to adjust through self-prompting software. Currently, software is provided for the TRS-80 and Apple computers. An RS 232/Centronics interface and an HPIB interface will be available later.

The company also makes a general purpose interface (GPIB) designed to plug into an 8-bit output port, or a 2708/2716 EPROM socket. The GPIB is designed to accept 3 bits for X-select and 3 bits for Y-select. Also required to enable this interface is a one-bit address latch signal that's used to trigger the Dynatyper one-shot beginning the solenoid timing cycle. Software drivers available enable the Dynatyper to work with either a 6502, 8080, or Z80 based system. When connected to the EPROM socket, the Dynatyper operates as a memory mapped device even with Z80 or 8080 microprocessors.

The RS 232C interface reportedly will employ a Z80 based slave microprocessor with a 2K RAM buffer. Top-of-form positioning will be implemented and auto carriage return (CR) after 80 characters. This interface will also provide switch selectable type rates for easier interfacing with different typewriters.

The circuitry is simplicity itself. There are 50 solenoids arranged to fill most of an 8 by 7 matrix. There are eight solenoid drivers in the X axis of this matrix and seven in the Y axis. Actually, eight Y-lines are implemented, but there are no solenoids on the Yo line. The solenoids are connected between the X and Y lines using selection diodes. The circuitry that interfaces with the X and Y drivers must be designed to select only one X and Y line at a time.

The interface circuit uses two 7445 binary to 1-of-8 decoders driven by a 6-bit data bus. Because the X-Y drivers operate from plus and minus 18 volt supplies, the interface decoders must be high-voltage open-collector types. The TRS-80 and Apple interface is quite imaginatively packaged on a single dual purpose card. Depending on the computer to be used, the appropriate end/side of this card is plugged into the computer bus.

Software "bang" prevented

To enhance the operating reliability of the Dynatyper, tested at over 10 millon strokes per plunger, the interface circuitry has been designed using a one-shot circuit that sets the solenoid actuation time. With this implementation, a software "hang" will not result in constant current through the solenoid and subsequent damage to the coil. If, per chance, a coil does fail it is a simple task to remove it and drop in a new one.

Rochester Data will repair or furnish replacement parts at no cost for the first year (its up to you, however, to pay the transportation costs). After that the replacement parts are available at a nominal cost.

The company has indicated that they have made a few modifications on the Dynatyper since they shipped the unit I tested, in order to eliminate some field problems. A slight change in the manufacturing and assembly was made to reduce the chance of the plungers sticking, though throughout my test, I never experienced this problem. They have also made a circuit change such that when there is a command to actuate the SHIFT LOCK key, the typewriter SHIFT key is actuated simultaneously. This improves the

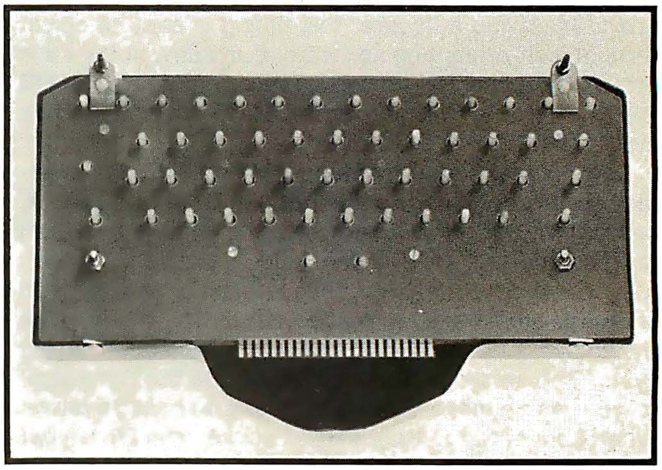


Photo 2. Bottom view of unit where plungers exit

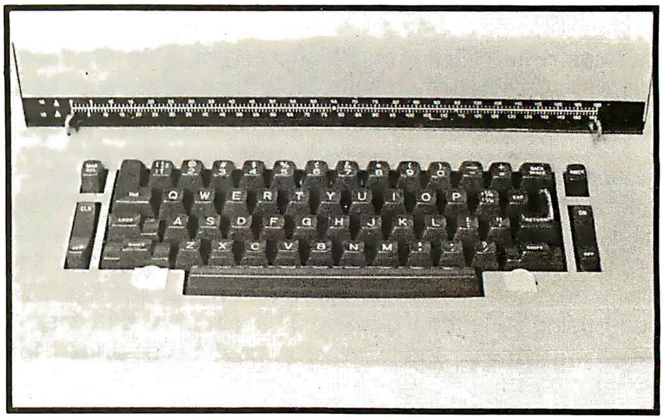


Photo 3. Mounting of washers

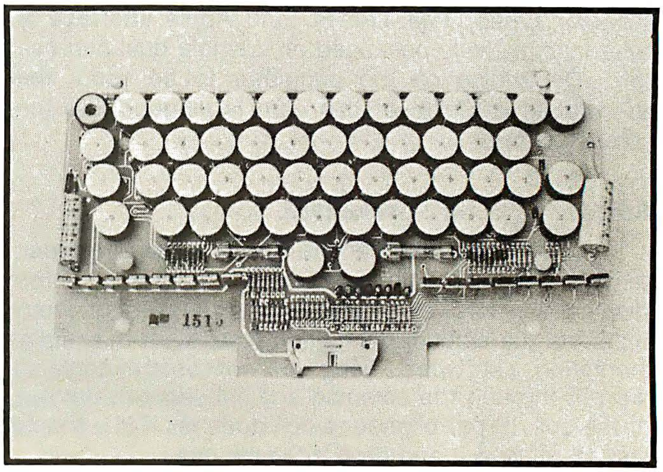
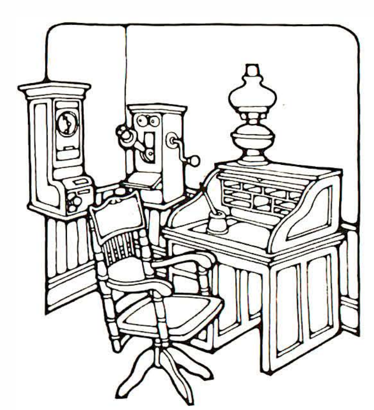


Photo 4. Interior view with plungers installed

response and operation on some typewriters where somewhat larger key forces are required.

I can readily recommend the unit. If you already have a powered standard or IBM Selectric typewriter, however, the unit does lose some of its cost-effective appeal. □

CIRCLE INQUIRY NO. 2



Articles Wanted...

Articles relating to mini systems in the business and industrial fields are being sought for the November issue. Peripherals and interfacing products are other topics to be covered in this hardware-oriented issue. Articles intended for the November issue should be received no later than July 15 for consideration.

Other article topics being sought include: business hardware, software, and unique applications, computer languages, educational and home applications, tutorials and word processors.

The payment rate ranges from $20 to $50 per published page. Pieces describing company projects or products will carry the company byline, but no payment is offered. Submittals should include an abstract, outline and stamped return envelope.

Manuscripts should be typed, double spaced with one-inch margins. Minimum length is four pages, unless programs are included. Photos should be numbered and have a brief description attached. Tables, listings, etc. should be on separate pages and each should have a caption. Computer listings should be printed using a new ribbon to assure good reproduction. Authors are requested to submit a statement of their background and expertise.

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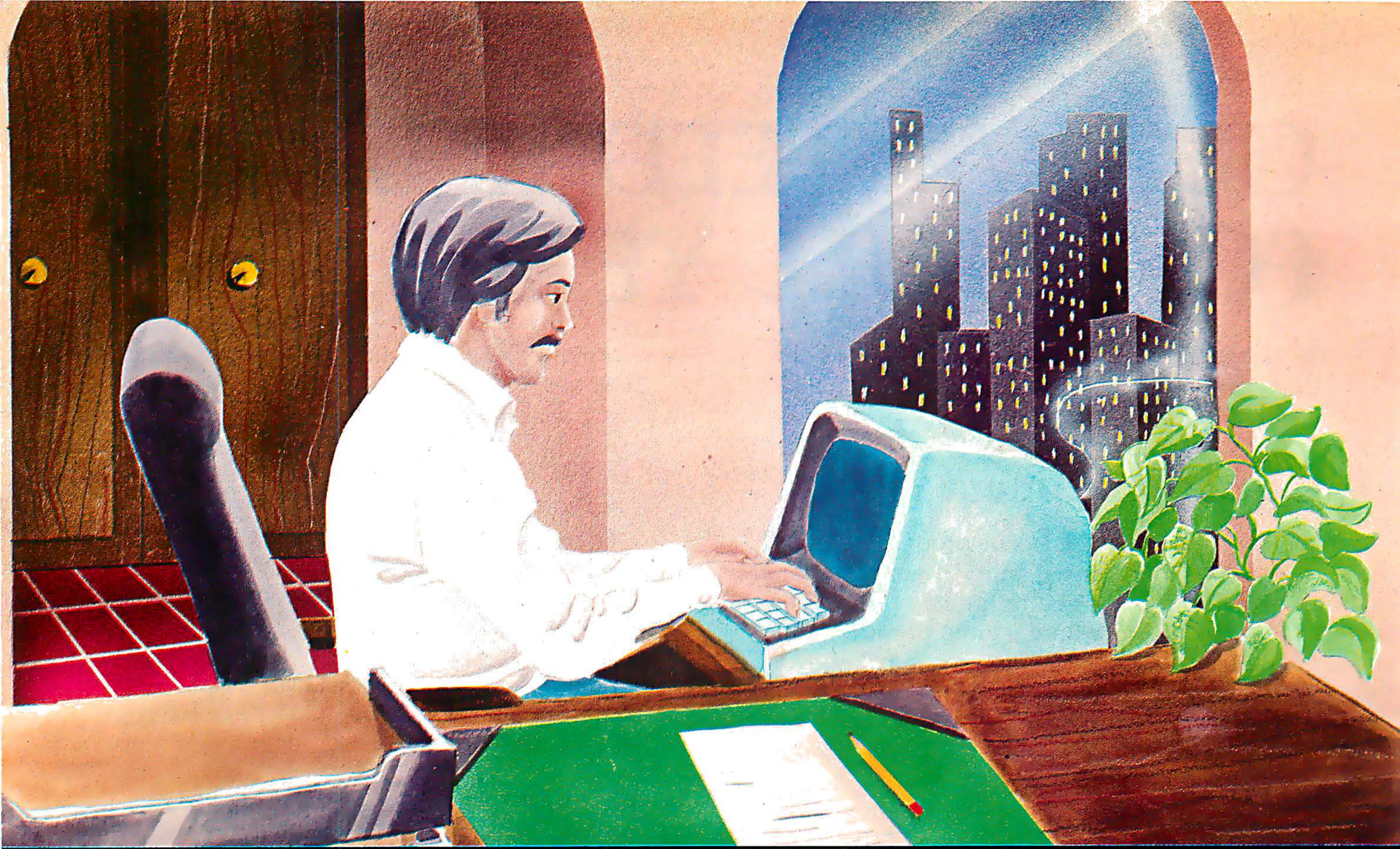

SPANISH-TO-ENGLISH

by David D. Busch

Most of the Basic language's limitations stem from its original purpose as a high level language that would be easy for beginners to learn and use. Its strongest point—the simple English keywords—provides an artificial barrier for those whose primary language is not English. Some of the largest Spanish-speaking communities in the world, for example, are in the U.S. The availability of a Basic in Spanish might make it easier for these citizens to use computers such as the TRS-80, Pet or Apple II at an earlier age.

A machine language Spanish-Basic interpreter for any of these would be ideal. Programs could be written in a Hispanic version of Basic, run, tested and debugged in that form. Unfortunately, that would be a major undertaking, best tackled by a software house with some hopes of recouping the time investment through sales. But, one-tenth a loaf is often better than none. I used my TRS-80's Disk Basic to write a very simple pseudo-compiler that converts programs written in Spanish Tiny Basic to standard Basic for running.

In other words, the program Spanish/Bas is used to write source code, using 20 level I-type Spanish keywords, instead of the English Basic equivalent (table 1). As each line is entered, the program checks it for various criteria (each must begin with a line number, and no more than one statement is allowed per line) and generates a new line of code, replacing each of the Spanish keywords with the English equivalent. Both versions may be saved to disk or listed at any time. Editing is accomplished (like level I) by re-entering the line. The English (compiled) version of the program is object code that may be loaded and run under your Basic interpreter, like any Basic program, as long as the code entered in Spanish conformed to the normal syntax rules of Basic.

Ideally, the program should be used by a person who already knows standard Basic to teach a Spanish-speaking person how to program. Any Basic programming course, translated into Spanish, could be used, with my Spanish statement and command equivalents substituted for those of standard Basic.

The Spanish words I have chosen are not necessarily the best possible equivalents for the Basic keywords replaced. I chose the Basic translations using two criteria. First, the Spanish words should be short and mean approximately what the Basic equivalents mean. Because the keywords are, in effect, commands, I used the imperative form of the verbs. Second, my programming job was made easier by selecting Spanish words that were either the same length or longer than the Basic keywords.

If this last criterion is kept in mind, users with more sophisticated Spanish backgrounds than mine may wish to substitute Spanish keywords that are more accurate.

In some cases, it was necessary to sacrifice a direct translation for ease of programming. For example, LEA would have been better than LLEVE (carry) for READ. But, since it was shorter than the word it would have replaced, it would have made writing the program more difficult.

COMPILER PROGRAM

To use the program, the student types RUN (in English) and is shown a summary of the commands and statements available. This is only a memory-refresher, as knowledge of Basic (or 'Spanish' Basic) will be necessary. An existing program can be loaded from disk, using the CARGE command. Prompts ask for the names under which the Spanish (source) program and the English (object) program were saved. Then, the program can be edited, like level I, by retyping in a line, or by adding new ones.

At any time, a specific line in Spanish can be seen by entering ALISTE XXX, where XXX is the line number. Or, by typing just ALISTE, the entire program will be presented a section at a time. Entering LIST will display the compiled English version. NUEVO or CORRA will erase the current program in memory, and allow starting over.

To conserve memory space, and speed up I/O time when saving and loading, line numbers between 0 and 100 must be used. Those with 48K machines can easily up the total allowable line numbers as high as possible.

Only single statements are allowed per line. Spaces must be used after line numbers and between words. It is permissible to forget to end a line with a space, as one is automatically added by the program. Spaces are essential, because in searching for keywords, the program looks not for, say, the letters SI, but <space>SI<space>. Otherwise, by the time the loop which searches for keywords got to SIGUIENTE, the word would have been changed to IFGUIENTE.

Disk Basic words may be used, or the original English keywords (PRINT, for example). The program looks for and changes only the Spanish words in table 1.

Table 1. Spanish-English keywords used

Commands (Los Mandados)

English	Spanish	English	Spanish
NEW	NUEVO	RUN	CORRA
LOAD	CARGE	SAVE	AHORRE
LIST	ALISTE		

Statements (Las Declaraciones)

English	Spanish	English	Spanish
PRINT	IMPRIMA	INPUT	CONTESTE
READ	LLEVE	DATA	DATOS
RESTORE	RESTAURE	GOTO	VAYA A
IF-THEN	SI-ENTONCES	FOR-NEXT	PARA-SIGUIENTE
STEP	PASO	STOP	CESE
END	FIN	GOSUB	VAYA SUB
RETURN	RETORNE	ON	EN
CLS	BORRE		

Statements that may be used in English:

POINT TAB SET,RESET @ (as in PRINT @)

All built-in functions (MEM, INT, ABS, RND), math operators, relational operators, and logical operators (AND,OR), as well as any Disk Basic features may be used, but they must conform to Disk Basic syntax, not that of level I. For example, PRINT @ is used instead of PRINT AT, and OR instead of +.

The actual translation from Spanish to English is a relatively simple process. The programmer inputs the desired line in line 580. That line is first checked to see if it begins with one of the seven recognized commands (lines 600-680). Then, the program line is stored in its unchanged version in the string variable UC$ (line 690).

The program next checks for the positions within the line for quotation marks and colons (lines 710-810). If neither is found, control passes line 850. Otherwise, the program compares the positions of the two quotes (B and B2) with that of the colon (C) to see if the colon occurs between the quotes. If it does not, the line has two statements, and is rejected (line 830). Colons inside the quotation marks (in a PRINT or INPUT statement, for example) are ignored.

Valid line number needed

At line 850, a subroutine begins that checks each character of the line until a space is encountered. The characters up to the first space must be a valid line number, or else the line is rejected. If the line number is OK, then the value is stored in LN (line 910), which points to the array element of EP$(n) (Spanish version) or CP$(n) (English version) in which the line will be placed.

A loop beginning at line 950 searches through the line for occurrences of the keywords. Keywords are read from DATA into an array SPAN$(n). If, using the INSTR function, a keyword is found, control branches to line 1040. There, the position of the word (Y) is compared with the positions of the quotation marks found previously, if any. Keywords contained in quotes are ignored and the program returns to the loop to search for the next one.

Spanish keywords not contained in quotes are replaced by the English equivalents, contained in yet another string array E$(n). The words in E$(n) differ from those in SPAN$(n) in that they have had spaces concatenated on to them to make them as equal in length to the Spanish words they replace. The extra spaces are ignored when the compiled program is RUN.

The spaces required are READ from DATA into AE(n), and E$(n) spun up when the program is first run, using STRING$ to append the proper number of spaces (line 340).

Once all the substitutions of Spanish words for English are made, the unchanged, Spanish version (UC$) is stored in EP$(LN), and the translated version in CP$(LN). Entering a new line with the same line number (LN) simply replaces the old line with the new in the array.

The other portions of the program just LIST the two versions, SAVE them, or LOAD them from disk. The subroutine at 1120-1180, for example, checks each ALISTE command for a line number, and then lists that line, if it exists. If no line number is appended to the ALISTE command, all the lines are listed, 10 at a time to keep the program from scrolling off the screen (lines 1200-1280). A similar subroutine at lines 1580-1640 LISTS the English version.

When the programs written are SAVED or LOADed, the user is asked for the filespec of both versions. Disk Basic saves these in ASCII form, and the English program can be loaded and run normally, assuming that the syntax is correct.

A word of warning

Herein lies the problem with all compilers. The programmer cannot run the program to test it until it has been compiled. Then, the compiled version, if bugs are found, cannot be changed (because the Spanish-speaking person can't understand the Basic object code). Because the program is actually being run under an interpreter, the English-speaking person can edit it. But for those for whom the Spanish/Bas was intended, the object code may mean about as much as a machine language dump.

Because Spanish/Bas was meant to be used as a learning tool by myself and others, I made it extremely simple to change. Keywords may be added by appending them to the proper locations in DATA lines, and adding numeric DATA that shows the difference in length between the longer Spanish keyword, and the shorter English equivalent. WR in line 140 must be changed to reflect the new number of keywords.

This program will compile from any language. The user should select keywords in, say, French and enter them with their English Basic counterparts in the DATA lines. All the prompts in Spanish will have to be changed as well, but these were purposely kept to a minimum in the program. □

Program on page 144

Table 2. Variables Used in Spanish/Bas

A$	Stores each Spanish program line as input by user
AE(n)	Spaces needed to make English word same length as Spanish equivalent
B	Position of first quotation mark in program line
C	Position of second quotation mark in program line
C$	Colon (CHR$(58))
CP$(n)	Stores original program lines, as they appeared before compiling
CU	Counter to keep track of lines displayed on screen
E$(n)	English keywords, with spaces to lengthen to Spanish equivalent
ENG$(n)	English keywords
EP$(n)	Stores Spanish program lines, after compiling
F$	Filespec to save original Spanish version of program to disk
F2$	Filespec to save English version of program
G	Loop Counter
L	Stores length of E$(G)
LN	Line number of line input by user
LS	Maximum number of lines to be input
N	Loop Counter
NE$	Filespec to load Spanish program from disk
NI$	Filespec to load English program from disk
Q$	Quotation mark (CHR$(34))
SP$	Space (CHR$(32))
SPAN$(n)	Spanish keywords
T	Loop Counter
TST$	Stores first set of characters in program line. UC$ Stores uncompiled line until it is inserted in EP$(n)
V	Position within program line of keyword, if any
V2$	Remainder of program line, beginning at position V
V3	Value of V2$
W$	Remainder of program line, beginning one position after first quote
WRDS	Number of keywords used in Spanish/Bas
Y	Position of start keyword in program line

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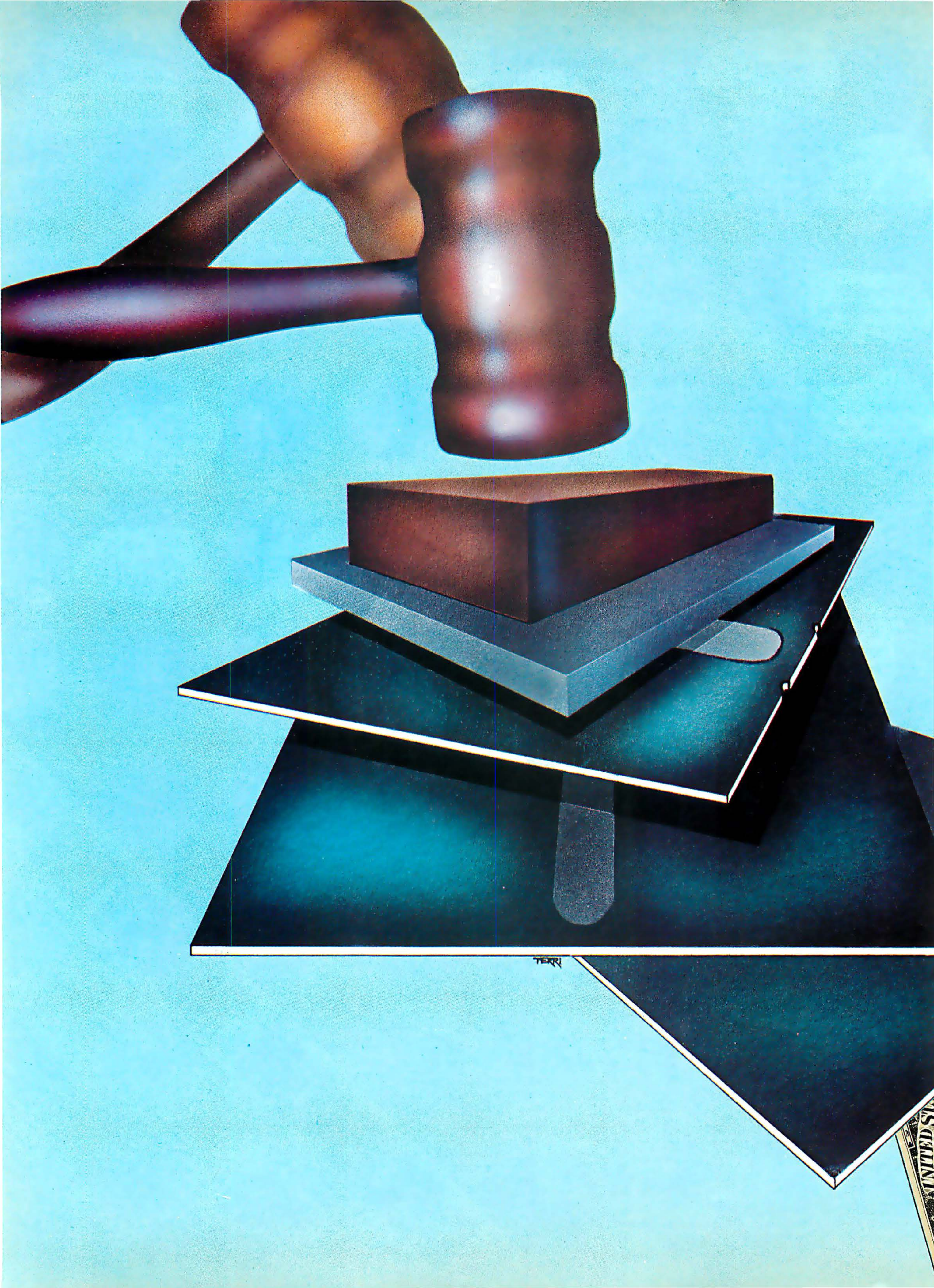

TERRI

COMPUTERIZED BILLING FOR LAW OFFICES

by Robert Sellers Smith and Joan McIntyre

The microcomputer is revolutionizing the traditional law office. Such computerized functions as accounting, word processing and legal research have increased the efficiency of law office operations enormously. But the true backbone of the automated law office is a good legal billing and timekeeping system.

Approximately 2½ years ago, the law firm of Smith, Huckaby and Graves, P.A. in Huntsville, AL agreed to assist with the development of a legal billing and timekeeping software program by Micro Craft, a Huntsville-based company specializing In software development. It didn't take long to discover the system's worth: it increased income approximately 25 to 35%.

A lawyer has two big problems: getting all the work done and billing for it promptly. He will not get paid for services if he forgets to bill or bills too late. Without an efficient billing program, there isn't enough time for the lawyer to do a thorough job of checking each file for his professional time. Consequently, a great deal of time may never get billed. Other time may not be picked up until months later.

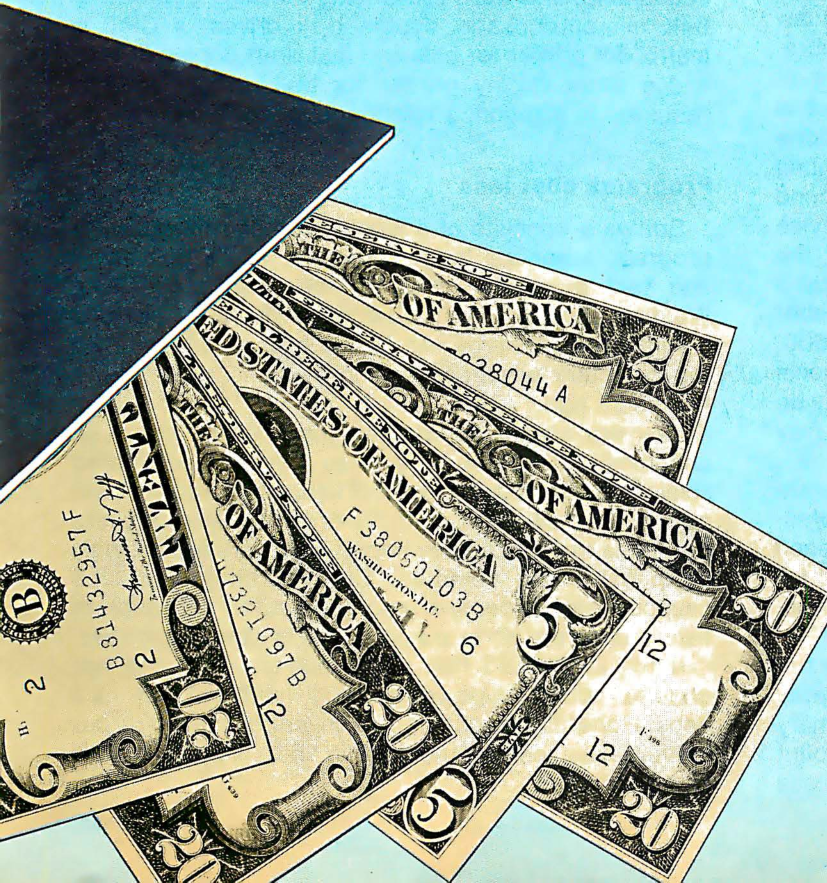
Clients also complain that the lawyer doesn't keep them informed about their cases (perhaps another reason there's trouble collecting) and that the bills are too high. Computerized billing and timekeeping systems eliminate much of this.

One reason computerized billing words is that many clients feel lawyers pull numbers out of hats without reference to any equitable system. They often feel the lawyer goes through a routine like this each month: "Let's see, let's bill Harvey Jones $1,200 on that. He's got a good paying job. He can afford it...Well, Mrs. Hackley, she has three young children and no job. We'd better cut her bill some...Now on Dr. Wilson, make his bill $4,500."

Lawyers know this is incorrect, but many times their clients don't. Clients know with computerized billing that the law firm employs a regular, systematic billing method. Everyone is treated equally and equitably. Clients more readily accept computer-printed bills.

With the Micro Craft billing system, there are seven charge codes. Each client's account is coded into one of these categories:

Code 1 Bills at straight time
Code 2 Discounted bills, discounted by any percent



Code 3 Flat fee bills (Time is kept track of, but the bill is for whatever fee has been agreed upon.)
Code 4 Monthly retainer bills for clients on regular monthly retainers
Code 5 Contingency fee bills
Code 6 No charge bills
Code 7 Administrative time "bills" for office information

Out-of-pocket expenses are billed to each client, regardless of the charge code.

Additional benefit occurs

One of the most interesting side benefits is that the lawyer has automatically kept every client informed of services rendered in connection with his matter. For example, those clients whose matters are handled on a contingency fee basis receive bills each month with detailed listings of every transaction. Even though no money is owed (except expenses), each client knows that the lawyer performed such services as preparing interrogatories, talking to the opposing attorney or attending a pretrial conference. Every account with time is billed every month, so a client gets a bill each month instead of a large bill after several months or when the matter is concluded. Clients prefer this type of billing. In addition, office income increases while the amount of unbilled service decreases.

Micro Craft's system uses the daily time sheet method of posting time. Separate slips are not necessary as the computer automatically posts each item to the proper client account. A code system, based on services rendered, allows the lawyer to enter his time on the time sheet much faster. Code 1A1, for example, is the code for "Telephone conference with client." The attorney writes the client's account number on the daily time sheet, along with 1A1 and the amount of time. The computer operator punches the time in as code 1A1. The computer automatically translates the code's message onto the bill.

The code was designed to cover every billable law office transaction and service. It contains an abbreviated method of accurately describing and billing over 1,500 different legal transactions and services. In actual use, it's a simplified shorthand system. This is done with the aid of a two-part code, the first representing approximately 17 types of services and the second representing parties with whom or for whom the service is rendered, or further describing the nature of the service or transaction. The second part contains approximately 94 entries. Therefore, the total number of services that can be described is in excess of 1,500.

Provision is also made for writing in additional services. The number and type of code entries may be varied to fit the practice of the law firm. The code may be fully mastered in a few minutes.

Computerized billing also facilitates a highly accurate office management summary. Each lawyer's professional time is automatically kept track of. Time for each legal assistant and secretary can also be entered for billing purposes or simply to analyze how all administrative time is spent.

At the end of the month, the billing disks are run through a summary program, and law office data never before available is easily collected. The summary shows the following data for each attorney: the amount billed out, the amount paid in out-of-pocket expenses for clients, the amounts collected in fees, total accounts receivable amount, and total hours put in on each account. Totals for the firm are also given.

The timekeeper list on the summary sheet breaks down the number of hours spent in each charge code category for each timekeeper, along with the total hours. If too much time is spent on contingency fee matters and not enough on bread-and-butter work, the attorney knows it immediately.

This unique management tool is extremely beneficial. Every month, it allows each lawyer to examine his production in depth. Each lawyer wants to look good on the summary sheet in comparison, so there is an incentive to maintain satisfactory production levels. The summary also lets a firm correct any deficiency situation before it gets totally out of hand. If accounts receivable are too high, the lawyer knows it right away and can try to correct the situation. He also immediately knows how much he billed out for the month. It is better for him to see right away that he only billed out a certain amount for the month when he should have billed out more. The computer also indicates how much of his time is spent on contingency fee, unbilled and administrative matters.

Such a system can work for every law office, large or small. A secretary can learn to use it in approximately 30 minutes. A computer operator can easily handle all billing for over 600 active accounts in 30 to 40 hours per month. Up to 250 accounts can be handled on each double-density floppy disk, making the system very efficient for a large number of accounts. Complete law office accounting takes 8 to 16 hours per month for the computer operator. That leaves approximately 120 hours per month for word processing. Smaller firms would have even more time for this when a reduced amount of active accounts is handled.

The amazing thing about computer systems is the price. Even a small firm can now afford one. The hardware required to handle legal billing and timekeeping, accounting, and word processing consists of a 48K to 64K microprocessor, double disk drives, a CRT, a matrix dot printer for bills and fast draft copies of text, and a letter quality printer for text. Legal research requires, in addition, a telephone modem.

Programs cost less

Software consists of a legal billing and timekeeping program, a general ledger program, and a text editor and text processor program for word processing. Westlaw and Lexis law research are also available for a monthly rental charge. All of this now costs less than the computer word processing systems alone cost a few years ago.

Lawyers should understand they can purchase an uncommitted system rather than a system committed solely to word processing. A full fledged microprocessor can handle it all—along with hundreds of other software programs that can be developed. Software is amazingly inexpensive and versatile. On the other hand, the capacity of inexpensive microcomputer hardware to handle different software programs is almost unlimited.

It has been said that many lawyers were the last ones to accept typewriters and held out for quill pens. Hopefully in our age of invention, most of our lawyers have learned that lesson and will push forward into computers. □

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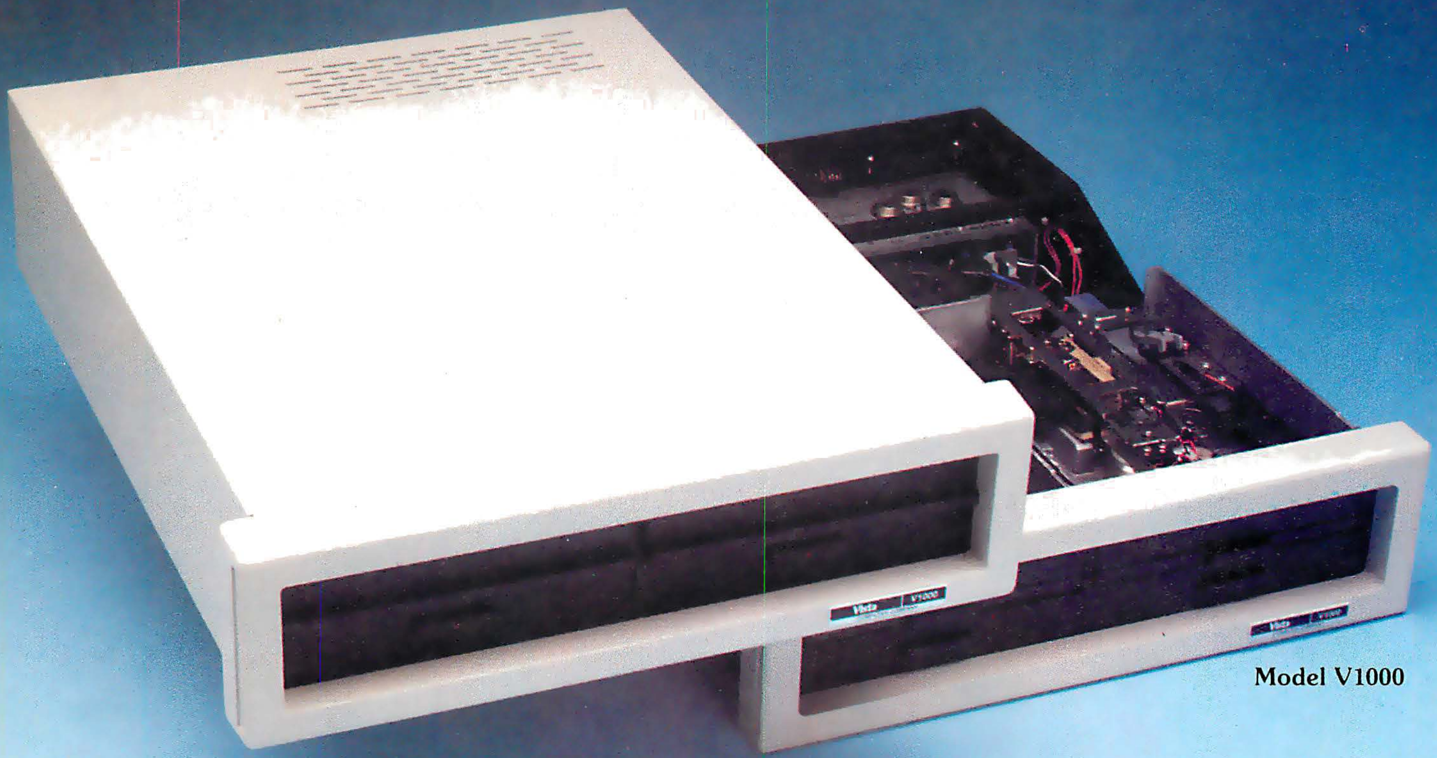
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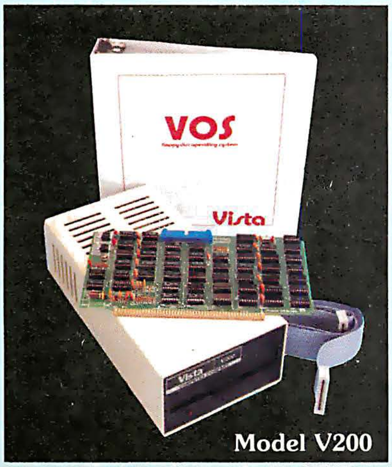

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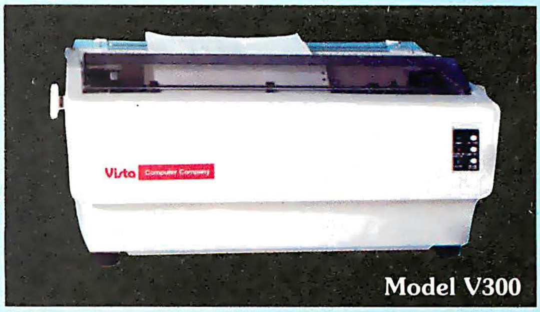

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FORTRAN
PILOT
BAS

COMPUTER LANGUAGE ROUNDUP

by Bernard Conrad Cole

There was a time when you could walk into your neighborhood computer store and buy software in any high level language you wanted —*as long as it was Basic.* There are at least 80 different dialects of Basic, not to mention the most recent and sophisticated versions, CBasic and SBasic.

Those were the good old days for the home and personal computer user, compared to what is available now—more than 200 high level languages. How do you make a choice?

One way is to listen to what the various experts and proponents of particular high level languages have to say. But if you are the average personal computer user—still a relative novice to the esoterica of hardware and software—the "advice" of the experts only makes the selection much more difficult.

What is necessary is to put these opinions into some sort of perspective. The only true measuring stick is whether a particular high level language is the best programming tool to suit your particular needs.

These needs may be both logical and emotional. After you have assessed a language and determined your needs, you may reject it for another simply because you feel comfortable "speaking" to the computer in the language to which you're accustomed.

How well a language fits your personality and thinking patterns is a personal choice. But in more measurable terms, there are several ways to analyze your requirements and the capabilities of the various languages.

A computer can execute instruction only in machine language form. Therefore, a program written in symbolic form must first be translated into machine language instructions prior to execution on the computer. These high level language translators can be either interpreters or compilers.

A compiler takes another program written in some high level language and translates the whole program into machine language. Then, in a separate step, the machine language version is executed by the computer. An interpreter operates on a program written in a high level language and performs the operations as it reads them, line by line. The high level language is executed directly, rather than translated into machine language first.

The chief advantage of a compiled language is execution speed. The chief advantage of an interpreter is smaller programs. On the average, an interpreter is 15 times slower than compiled code. Interpreters also offer the additional advantage of ease of use. Specifically, it is possible to interact with your program during execution and make changes that will be reflected in future executions.

Any high level language can be either compiled or interpreted. Depending on the intended application areas, various high level languages tend to be implemented more as one type rather than the other. For example, Cobol is almost never interpreted. On the other hand, APL is almost never compiled. Most Fortran translators, however, are compilers. About half the Basic translators are interpreters, and half compilers, the most powerful being CBasic.

High level languages can also be analyzed in terms of their functions. Following is a run-down of the four classifications. In many cases, these functions can overlap, but defining them in this way makes it easier to make a choice.

Procedure-oriented languages

These languages relate to the procedures being coded and are machine or computer independent. Therefore, a program coded in a procedure-oriented language can be executed on any computer that has a translator available for that particular language. This type also reduces the need to have a detailed knowledge of the computer itself, allowing you to focus more closely on the problem.

These languages are different from problem-oriented languages, where you state the problem and leave the system to choose a procedure to solve it. It is also

Breaking the Language Barrier

It has become increasingly apparent to manufacturers of large mainframe and minicomputers—and more recently to the personal computer industry—that one of the biggest barriers to the spread of computers is the difficulty and cost of producing programs to carry out complex tasks. It comes as no surprise that there is a feverish effort underway to find ways to simplify the various steps required to create a computer program.

A number of microcomputer system suppliers have extended the concept of problem-oriented languages and developed a number of special "do-it-yourself" languages designed especially for business users.

Similar languages do not yet exist for personal computer users. But, as the number of business users increases, this situation is sure to change. The following are examples of "do-it-yourself" languages.

Adam, developed by Logical Machine Corp., is the best known example. Names of quantities, entries, files, and so on, are called "nouns." Actions to be taken are called "verbs." The Adam meta-language comes with about 50 standard nouns and verbs. The user creates new verbs from the standard ones and creates nouns to describe the work that needs to be done. Nouns and verbs are stored in a master index file and can be listed on command.

Adam automatically assigns memory space for these items and for all the records created and used. It monitors inputs to keep users from abusing the system. In Adam, nouns and verbs can be defined by words in German, Italian, or any other alphabet-based language, allowing it to "speak" the appropriate language.

Create, developed by Complete Computer Systems, is an extension of RPG, providing a wide range of report generation capabilities. It also allows a user to set up his own computer files, by asking whether the data base is a new or existing one. It also asks what the key fields will be and whether these contain letters and numerals or numerals only. When the questions have been answered, Create automatically sets up a file format and displays it on the CRT screen. A file with up to 40 fields can be set up in less than 15 minutes.

Dataform, developed by Datapoint Corp., is designed to allow people who have no professional programming experience to design and produce forms and enter data into computer files. Forms are created on a CRT screen by typing in appropriate instructions into the keyboard. Text for each field is entered and each is defined as containing alphabetical or numeric characters. The location of each field is defined, restrictions on fields are imposed, and field items that are on every form are specified, so they can be entered automatically on every form. Preprogrammed routines check for correctness of field entries. If the operator makes mistakes, Dataform displays error messages.

English, developed by Microdata Corp., is a meta-language allowing business people to retrieve information

distinguished from list or string-processing languages, which express procedures, but in terms that are almost entirely symbolic.

These languages offer savings in programming time. Since the procedure is written in a form closer to human means of communication—more English-like in its structure—documentation and program understandability are improved.

Fortran, an acronym for FORmula TRANSlation, is the first procedure-oriented language to be widely used. It was designed initially for use on mathematical problems and is still used most commonly for mathematics, engineering and science problems.

Fortran is basically a programming system that includes the language and a compiler that permits programs to be written in a mathematical-type language. The grammar, rules and syntax used are, generally, common with easy-to-learn mathematical and English-language conventions. All Fortran-type languages treat arithmetic operations with commands that evaluate expressions and substitute the result for current values of variables. It also includes statements for transfer control, looping—designating a set of statements to be executed a certain number of times—and input/output.

Cobol, an acronym for COmmon Business Oriented Language, is a high level language intended for use with business data processing problems. It is the most widely used procedure-oriented language.

For many programmers, it offers several important advantages. First, Cobol programs are stated in precise, easily learned natural words and phrases, so they can be read and understood by non-technical people with little background in data processing. Second, program testing is simplified and can be completed by someone other than the original programmer. Cobol also contains many important file organizing features and can deal with variable data length. I/O procedures and report generation are its strong points.

ALGOL, standing for ALGOrithmic Language, was developed by an international committee for expressing algorithms, whether intended for later execution on a computer or not.

It is used mainly for the programming of scientific problems, but is also used by many professional programmers as a reference language. It is used as a model for the invention of new artificial languages, compiling techniques and mathematical structures.

ALGOL is similar in some respects to Fortran, but has several advantages. First, it is more comprehensive and has more powerful instructions. Second, it has fewer restrictions and is more flexible and readable. It also has fewer exceptions. Third, it has a more formal structure and is easier to model.

PL/1, an acronym for Programming Language One, is a multipurpose language designed for solving both business and scientific applications. It incorporates advantages of both Fortran and Cobol. It is similar to

and produce reports easily. It also has the capabilities of updating and processing the system files.

Every English "sentence" begins with a "verb", and can contain only one. Verbs are terms that command the system to take specific actions, such as LIST, SORT, COUNT and SELECT. Each sentence must also contain a "noun" or file-name. In addition, a sentence may or may not include attributes such as QUANTITY, VALUE and NAME; selection criteria such as AND, AFTER and WITH, as well as various connectives that modify the effect of the verb or alter the display format.

In English, frequently used procedures can be stored as fixed sequences of operations with a single command capable of generating a complete report.

The terms used are stored in dictionary files, and each can have as many synonyms as the user desires. And by using the appropriate dictionary words, English can speak any alphabet-based language.

Escort, developed by Sperry Univac for its BC/7 mainframe systems, is used as a tool to create new files, inquiry and report generation, file maintenance and transaction processing. Reports are formatted automatically by an operator not trained in programming, based on the names the operator assigns to various items. Using a tutorial mode of operation, the user is led step-by-step through the process, with video screen messages explaining how to proceed and define the various choices. As the user follows the procedures, Escort automatically creates the computer programs needed to carry out various functions.

This new generation of languages has made life for the non-programming professional user considerably easier —and cheaper. For one thing, the professional programmer is no longer necessary. Instead, the people in a company who understand its business do the software themselves, considerably lowering the cost of programming.

But even using do-it-yourself languages, the creation of a computer program is not a simple task. Programming and debugging functions have been simplified and even eliminated in some cases. What still remains to be resolved is the system analysis. At this stage, it is necessary to investigate and deliniate the data and logic of the application. The problem has been to get new users of computers to lay out their thought processes in a logical sequence, so the computer can follow the logic—not an easy task.

Artificial Intelligence (AI) researchers may have an answer with "expert systems". In this approach, a system containing information about the particular application area and programming asks a series of questions that prompt the user to provide the necessary details. It then creates a program in a few minutes, once it has been given the information in plain English from, for instance, an accountant, manager or other business user.

The concept may soon be more than just a laboratory curiosity, though it will be a while before it reaches personal computer users. A leading IBM scientist has revealed that the computer giant is using AI techniques to develop such expert systems. And recently, companies such as Xerox and Schlumberger have "raided" universities around the world for AI specialists to work on similar projects. Finally, a new company, DJ-AI, has developed just such a system called (prophetically it is hoped) The Last One. □ ***—BCC***

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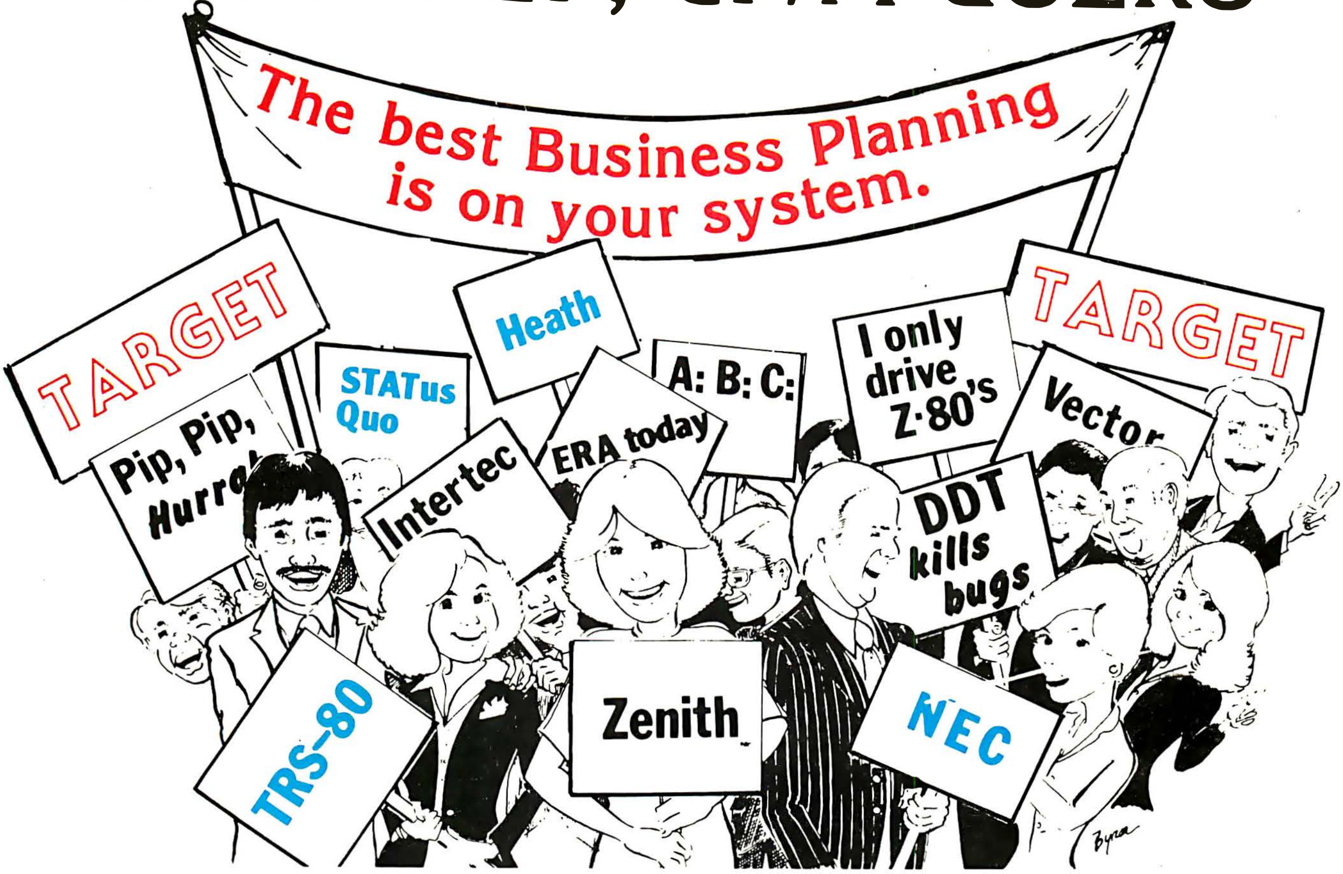

For the past few months you have patiently endured the indignity of watching your friends show off their flashy visible number cruncher on their game-playing computer and longed for something as slick.

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```
LINE 1 SALES = 100 200 300 400
LINE 2 EXP   = GROW 50 BY 15%
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```

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```
SALES 100 200 300 400
EXP 50  +B2*1.15 +C2*1 +D2*1.15
NET  +B1-B2 +C1-C2 +D1-D2 +E1-E2
```

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Fortran in its simple concise statements and to Cobol in its ability to manipulate and easily input and output grouped records or files.

It uses basic building blocks called procedures, a group of instructions that perform a stated function. Procedures used very seldom can be held in auxiliary storage and called to main storage only when required. One procedure can be contained in another, and any data declared in a procedure is automatically available to all others nested within.

PL/1 can handle string data, which consists of either strings of alphanumeric characters or strings of bits. This ability is important. Without it, programmers would have to use assembly languages for such problems. With PL/1, a programmer can also describe data in terms of arrays and structures. The former is a collection of data of the same time and with similar characteristics and the latter contains mixed characters with data fields of different sizes. It also incorporates the use of labels, allowing it to adapt to any level of detail and readability.

PL/M is an abbreviated version of PL/1, designed for use with microcomputer-based systems of limited power and memory capacity. It was developed initially for Intel Corp. as a proprietary language for its 8080 and succeeding devices. It was quickly followed by other variants, including MPL and PL/W for the Motorola 6800, SMPL for National Semiconductor's IMP series and 8900 families, PLuS for Signetic's 2650 and PL/Z for Zilog's Z-8, Z-80 and Z-8000 microcomputers.

Unlike Basic, Fortran and PL/1—in which a large operating system isolates the program in execution from the peripheral devices—a given program with one of these variants may exist just to control individual input and output ports in addition to providing for ease of structured programming.

To a lesser degree, Basic falls into this category, especially the more recent forms such as CBasic and SBasic. But, by structure and intent, Basic is a conversational language.

Conversational languages

Most languages under this classification are also procedure-oriented languages. But not all procedure-oriented languages have been specifically designed to facilitate human-machine interaction.

Conversational is not the same as English-like. The latter refers to the structure of the language, the former refers to the way the language is used. Most have their origins in time-sharing computer systems and were designed to allow the use of large computers via terminals on a personal and direct basis. Specifically, they are designed to be highly interactive languages; ones in which the programmer/user gets immediate response to what is typed into the computer.

Basic, an acronym for Beginners All-purpose Symbolic Instruction Code, is a Fortran-like language. It can be learned by the average non-computer oriented engineer or mathematician in a few hours and the dedicated layman in several days. The simple conditions and attributes allow it to be mastered in a few weeks. It is commonly used for business and commercial applications.

In its more traditional forms, each line begins with a number that identifies it and specifies the order in which the statements are to be performed. The computer sorts out the program before running it and, thus, statements need not be input in any specific order.

Though it is less powerful and versatile than ALGOL and Fortran, Basic is more than adequate for most commercial and business applications. It permits conversational statements, free style input, segmenting of complex statements, 6 significant bits of accuracy and easy and safe program modification. It also includes editing functions that permit combinations of two or more programs into one, and allow selection from a library of stored programs or functions, such as solving simultaneous equations, curve fitting, and statistical analysis.

Comprehensive and useful language

APL, an acronym for A Programming Language, is a powerful computation-oriented language with its feet in the procedure-oriented languages, the conversational approach and the problem solving languages equally.

It has operators that carry out actions that require dozens of statements in other languages. It has, thus, the attraction of being a language wherein a beginner can start doing meaningful work literally in minutes—and still have available language features of significant power and range.

APL's power is based on the use of arrays as the basic data elements and a set of operators of enviable scope for manipulating arrays. All operators that act on scalars, such as arithmetic and logical operations, exist in both the single and dual mode. For example, the operator that produces the maximum of two values—if applied to a single value—returns the smallest integer that is greater than or equal to the argument. There is an operator that produces the factorial of a single argument or the binomial coefficient of two. Another operator acts as a random number generator. All operators apply without change to arrays, as long as dimensions are compatible.

In some respects, APL is too efficient for its own good—at least the good of the programmer. It can be condensed to an extreme degree, which sometimes can make it difficult to explain and understand. This, in turn, is a handicap in producing correct programs. As a result, it is not always in a programmer's best interest to take full advantage of APL to produce the shortest possible programs.

Pascal, named in honor of the 18th century French mathematician Blaise Pascal, was proposed in 1968 to correct the faults of the early compilers such as Fortran, Cobol and Basic. The first implementation was completed in 1970 and it has been used increasingly since that time.

Pascal is a block structured language similar to ALGOL. Programs written using it consist of two blocks: a header, naming the program and specifying the variables to be used; and the body of the program, called a block, which is subdivided into six sections. The first four declare the labels, constants, data types and variables. The fifth names and precedes an actual procedure. The last section—the statement section—contains the executable code for the named function.

Labels identify statements so they can be referenced. Constants equate numbers with names throughout a program. Data types are numerous and structured types can be defined to include arrays, records, sets and files. Each named variable is followed by its type. And procedures can be placed within procedures. Operators are defined for multiply, divide, add, subtract, logical and relational; numerous control statements are allowed.

Pascal programs are first compiled into an intermediate code, called P-code, which in turn is interpreted on various computer systems. The only code that needs to be written in the native code of the target processor is a small interpreter. From that point, Pascal takes over.

Forth, developed originally for process control, has gained wide acceptance, even though it has a rather unusual structure.

Where most programming languages produce either machine code for direct execution by the CPU (Fortran and PL/M, for example) or interpreter code (Basic, Pascal and LISP), Forth does neither. Instead, it produces threaded code which is neither interpreter code nor directly executed by the CPU. It is interpreted, but is much faster (10 times) than Basic and smaller (less than 50 bytes).

String- and list-processing languages

These languages are oriented specifically for the convenience and manipulation of data, especially non-numerical data, whose length and structure change considerably during the calculation of a problem. Special cases are string-processing languages that deal only with strings of characters.

Candidates for string and list-processing include: Information retrieval, theorem proving, picture processing, pattern generation, algebraic manipulation, simulation of human problem solving, heuristic programming, linguistic analysis, machine translation of numerical languages and natural language translation—in fact, any application requiring the manipulation of alphabetical characters and words rather than numbers.

LISP, standing for LISt Processing, is radically different from traditional languages. Data and storage characters are represented either externally—as a sequence of characters formed according to specific rules—or internally, as a set of computer words interlinked in a specific way.

Externally, a list consists of a sequence of list elements separated by blanks and closed by parentheses. When a list is formed, the necessary storage cells are taken from a list of available cells called a free storage list. In LISP, a subroutine can be considered as a tool that defines a function in a mathematical sense; that is, it maps sets of input values onto sets of output values. In LISP, this function is expressed in a notation that displays its functional nature more explicitly than ordinarily done as a sequence of instructions. Various expressions in LISP include conditional expressions that test conditions and accounts according to the results of the test.

SNOBOL, an acronym for StriNg Oriented SymBOLic Language, has significant applications in program compilation and generation of symbolic equations. It is a unique language that provides complete facilities for the manipulation of strings of characters. It is particularly applicable to programs associated with text editing, linguistics, compiling, and symbolic manipulation of algebraic expressions.

Problem-oriented languages

In its most general meaning, a problem-oriented language would be one that helps solve problems. Thus, Fortran, ostensibly a procedure oriented language, is problem-oriented when used to solve scientific or numeric problems. The same is true for Cobol when applied to business problems. But among computer scientists, there is a more restricted meaning to this category, synonymous with applications-oriented or special purpose.

Certain types of problems, or calculations, occur so frequently in both the scientific and business areas that programmers have found it useful to develop languages specific to particular types of applications. The advantage of this type of non-procedural problem-oriented programming language is that the user need not be a trained programmer, only someone who is familiar with the problem area in question.

The major purpose of such languages is to permit programming activity to focus more strongly on the problem, rather than on the computer hardware and software.

There are a number of non-procedural problem-oriented languages available, but few of them for small or personal computers. They include: ***COGO*** (COordinate GeOmetry), ***GPSS*** (General Purpose Systems Simulator), ***APT*** (Automatically Programmed Tools), ***STRESS*** (STRuctural Engineering Systems Solver) and ***ICES*** (Integrated Civil Engineering System).

The chief advantage of such languages is the lower amount of programming work required to produce a program, compared to most procedural languages. The reason for this is that much of the internal logic of the object program is provided by a generator program that translates the source program into the object program.

The basic disadvantage to these languages is their lack of flexibility. For one thing, the programmer no longer has control over input and output functions. Second, he is unable to minimize the use of memory or execution time, as he would if he had more direct control of hardware operations. Third, such languages are more machine dependent than procedure-oriented languages.

Procedure-oriented languages such as Basic are not as machine independent as they are supposed to be. In some cases, the difference is hard for anyone except the most expert of programmers to use. Moreover, as many minicomputer manufacturers have learned, many business users of computers are not all that concerned with flexibility if, in exchange, they gain efficiency and ease of use.

At least one traditional problem-solving language is beginning to appear for use on personal computers mainly because of its business applications: ***RPG*** (Report Program Generator).

Developed first by IBM for use on its large computers, RPG is one of the most widely used problem-oriented languages available and has the capability of producing reports very easily. The user fills out a series of forms stating exactly what his data looks like and what the layout and content of his final report is to be. From there on, the computer and RPG take over.

Some rule-of-thumb benchmarks

Even when you've narrowed down your choice to a specific language type there is still a confusing range of choices. To form a framework wherein your decision is a little more solid, there are several criteria to specifically define your needs.

An important consideration is ease of learning. Problem oriented languages are the easiest to learn and use. Unfortunately, not many are available for use on personal computers. Procedure-oriented languages such as Fortran, Cobol and ALGOL are next, followed by interactive conversational languages such as Basic. For the average unsophisticated user, the string and list oriented languages are the hardest.

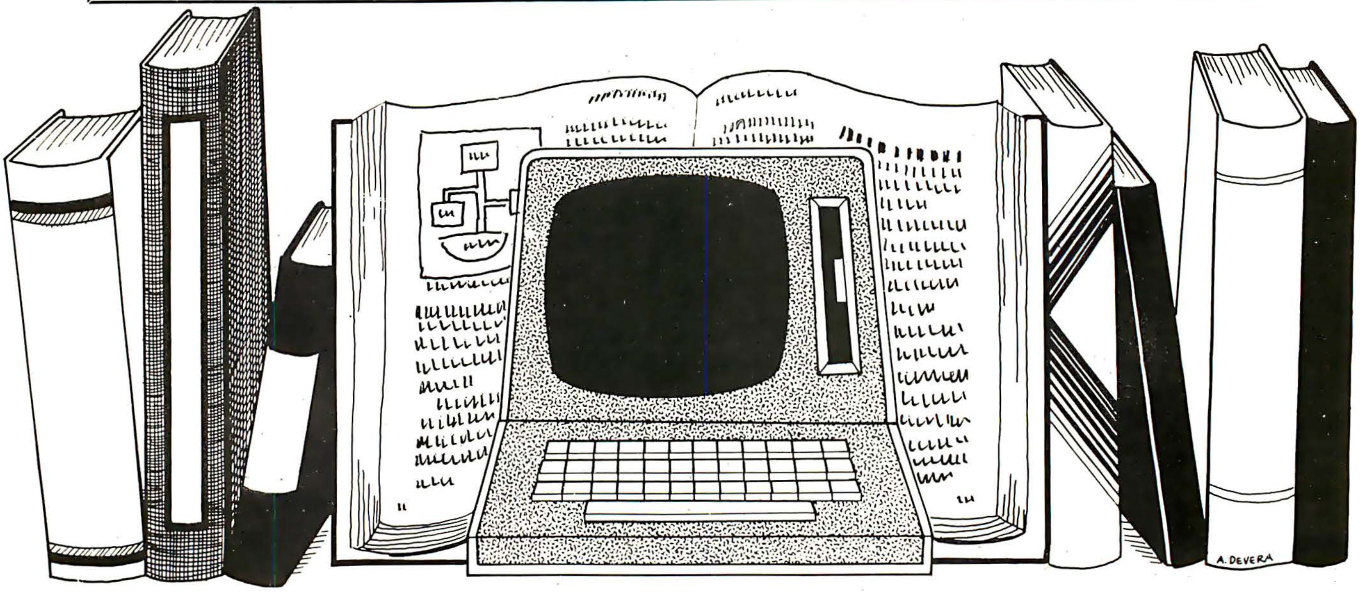
Another factor is ease of coding. It's easier to code programs in problem-oriented languages than in procedure-oriented languages. And both are easier than the list processing options.

It's also important that the language you choose contain all the elements needed to solve your particular class of problems. ALGOL and Fortran, although good for computation, may not provide the alphanumeric character manipulation ability required for a specific inventory control problem. On the other hand, a language containing too many facilities is not desirable, since you pay a higher price for those features you do not use.

Finally, language range should be considered. Some high level language don't allow you to do all the operations required for the solution of a given problem. Some have weak or inadequate input/output facilities, others no bit-handling capabilities.

The important thing is that the criteria should reflect *your* requirements. Before you consider the purchase of any computer language, decide what you want it to do. Then, show your list to an expert who wants you to use his particular brand of computer language. Only then can you really decide on your best personal option. □

OPERATING SYSTEMS: THE CHOICE IS YOURS



by Roland H. Alden

The primary function of an operating system (OS) is to provide an interface between users, application software and computer hardware. Without it, the use of computers would be a frustrating and fairly unproductive experience. For instance, few users would want to directly communicate with a disk drive to pick a track and sector to write data on, so the OS file management system becomes an extension of any software they write themselves. What an operating system, in effect, does is to define a "virtual computer" that is far easier to use than any "real" computer.

The first operating system was designed to automate the job of the system operator in batch-oriented computer centers. They minimized the amount of time the relatively expensive CPU spent "waiting" for the operator to load punch cards, and change lineprinter forms and tape reels for each job. Today, the primary goal of general-purpose operating systems is still to optimize the use of every part of the computer system, and arbitrate the many conflicting situations that arise.

The operating system also plays a major role in making applications software transportable, and insuring upward compatibility for the user who needs to move to a larger or newer system. Software written in high-level languages is normally designed to interface to an operating system, which then interfaces to the hardware. Such software can be easily run on different hardware configurations, and different computers altogether, as long as the operating system stays the same.

An increasingly important role of the operating system is to provide a number of utility programs and other systems software that make the development of end-user application programs a faster and less expensive process. These programs include high-level file management utilities like ISAM and data base management sub-systems, sorts, mathematical subroutine libraries, networking software systems, etc.

With the advent of the newer generation of 16-bit microprocessors, users are demanding more sophistication in operating systems, and vendors are responding. Today a rich variety of OS and systems-level software is available, and it is important for the user to have a basic understanding of OS concepts and how they affect the development and use of a computer system. The OS can be an extensive and complex software system, but all operating systems have a number of things in common.

The command processor. When a user first sits down at the terminal, the system is waiting for a command. This level is sometimes called the monitor level, and the program that the computer is executing is the command processor. This is a part of the operating system that manages the loading of programs into memory, the transition of control from the operating system to the user's program and back again.

After the user types a line of text at the terminal (followed by a "return"), the command processor goes to work. The first word is normally assumed to be the name of the command, which is the name of a program. Any text after the command is called the argument string and the command processor usually makes it available to the program when it begins execution.

The command is really only a program like any other, and it is up to the command processor to find it, load it into memory, and transfer control of the computer to it. Depending on how tight memory is, the operating system will have the most frequently used commands (programs) loaded into memory at all times, and will otherwise find the program on disk and load it into memory automatically.

Most command processors have a facility where the user can group a sequence of commands together in a file called a command file. The name of this file becomes the command the user types in. Instead of loading this file and then executing it, the command processor reads the file to see what commands are to be loaded and then executed. Complex, multiple-command job streams can then be invoked with one command.

The Unix system has a unique command processor facility. The command processor section is called the shell and is not a part of the operating system per se, but simply another program that is loaded and run. One of the chief features of the shell is its ability to re-direct I/O to and from running programs. This is accomplished with some simple directives as to where the input which drives the command is to come from, and where any output resulting from the command is to go. Output can be directed (via pipes), and passed through intermediate programs for processing (called filters).

For instance, suppose the user wants a directory of his files in sorted order printed on the lineprinter. Rather than junking up the directory program itself with all the logic needed to perform this task, Unix allows the user to specify a sequence of separate program events in a command as follows: DIR |SORT| > PRINTER.

The | symbol instructs the command processor to filter the results of the DIR program through SORT before outputting the result (>) to PRINTER. A user could, of course, filter this material through a statistics program to determine the average, mean, and total file length. Most Unix programs are stripped down to the bare essentials to make chaining of these separate modules efficient and workable.

The task manager is the work scheduler for the CPU. A task, sometimes called a process, is a single job-stream that the computer is able to execute. A single-processor computer system by definition can only be executing one task at any given moment. A single-user system usually only performs one task anyway, and the task manager is either very simple or omitted altogether from the operating system.

In multi-tasking systems, the computer appears to be executing many job-streams simultaneously. This is done by juggling the multiple tasks (the computer can still only execute one task at a time). It is up to the task-manager to determine what task the CPU will be devoted to, and what other tasks must wait.

A useful variation on multi-tasking is sub-tasking. In some systems, one task can create another sub-task and they will run together in parallel. Usually there is a highly structured relationship between the creating or parent task, and the sub-task or child task. Using signals (sometimes called semaphores), parent tasks and child tasks can communicate status information or data, and they can wait on one another to produce some data or change status before continuing themselves.

When more than one task is ready to receive CPU service, the task-manager must determine what task will be run first. Priority schemes vary from the very simple daisy-chains where the next task in line gets served first, to the very complex. A more sophisticated approach to task priority can be useful in applications like process control and measurement where real-time response must be guaranteed, yet other tasks need to be run too. Very low priority can also be useful when running background jobs that don't have a user waiting on a terminal for results.

The file manager is the librarian of the operating system, and is one of the most important sub-systems. It is the job of the file manager to keep directories of disk systems, and to provide easy to use functions for the basic file operations, such as read-to, write-from, create a new file, delete an old file.

An important aspect of many OS file managers is device independence. To a large extent it is possible to hide the distinction between a file on a floppy disk, hard disk, or tape; even if the physical formats of the devices are all different. Many operating systems even bury I/O distinctions between the keyboard and CRT screen—they too can be considered files.

The major function of the file management system is to coordinate access to the system disk drives and tape drives. Since the disk(s) almost always contain more than one file, the file manager must maintain directories giving the location of each separate file on the disk. The directory structure establishes the basic mechanics of the file management system.

Most directory structures are hierarchal in nature, and are closely linked with the actual hardware devices. For instance, the Alpha Micro computer maintains a master file directory for a given disk unit. Entries in this master directory point to one or more user file directories that logically collect the files of one user together. This scheme constitutes a sort of two-level tree structure. The Unix and Polymorphic systems expand on this theme somewhat. In these systems any directory can contain one or more sub-directories, which can again contain more directories, etc.

The most important function of the file management system is to separate the physical aspects of the library of files with the logical concept of their existence. Directories should pool a collection of files which are related in some way that is meaningful to the user. Unfortunately, most systems still force the user to think in terms of "DISK:XX", etc. Some systems provide a labeling function for disks, but few allow the user to specify a label like ARCHIVE-DISK in place of DISK:XX when performing file-oriented operations.

The memory manager. Most microprocessors allow the user to address memory with 16 bit integer values, that provide the standard addressing range of 64K. It is often desirable, especially in multi-tasking/multi-user systems, to allow more than 64K of physical memory to be in the computing system. Even when there is only 64K, if two tasks are to share it, memory management will be required.

The basic technique of memory management is to supply a context in which a particular memory address is to be evaluated. Imagine a system with two 64K memory boards and a task requesting access to memory location 10. A simple mechanism for determining which of the 64K memory boards is to be referred to effectively doubles the memory capacity of the system. A scheme popular in older 8-bit computers is bank-switching where chunks of memory are selected and de-selected. Several memories can respond to the same address as long as they both are not selected at the same time.

The Z-8000 and 8086 16-bit microprocessors have segment registers and various modes that establish

the context of the memory address. None of these systems allow a task to address a memory location outside the 64K range, but the simple establishment of multiple ranges can increase the amount of memory a system can take advantage of. (The M68000 microprocessor allows the use of 32-bit long registers to directly address any memory location within the range of 0-4,294,967,296.)

Because the computer can only be executing one task at a time, there is no real reason (other than speed) why any task other than the currently executing task should be in memory. Swapping is a memory management technique that allows a task to be temporarily written to disk in order to make room for another task.

While memory management techniques are intimately involved with the available hardware, much OS software is devoted to the efficient management of this relatively expensive resource. An efficient memory management system is crucial to the performance of a multi-user system.

Security systems protect an individual's personal information property from misuse in a multi-user system with large mass storage facilities. Security is concerned with preventing unauthorized persons from gaining access to the system, protecting programs and protecting private files.

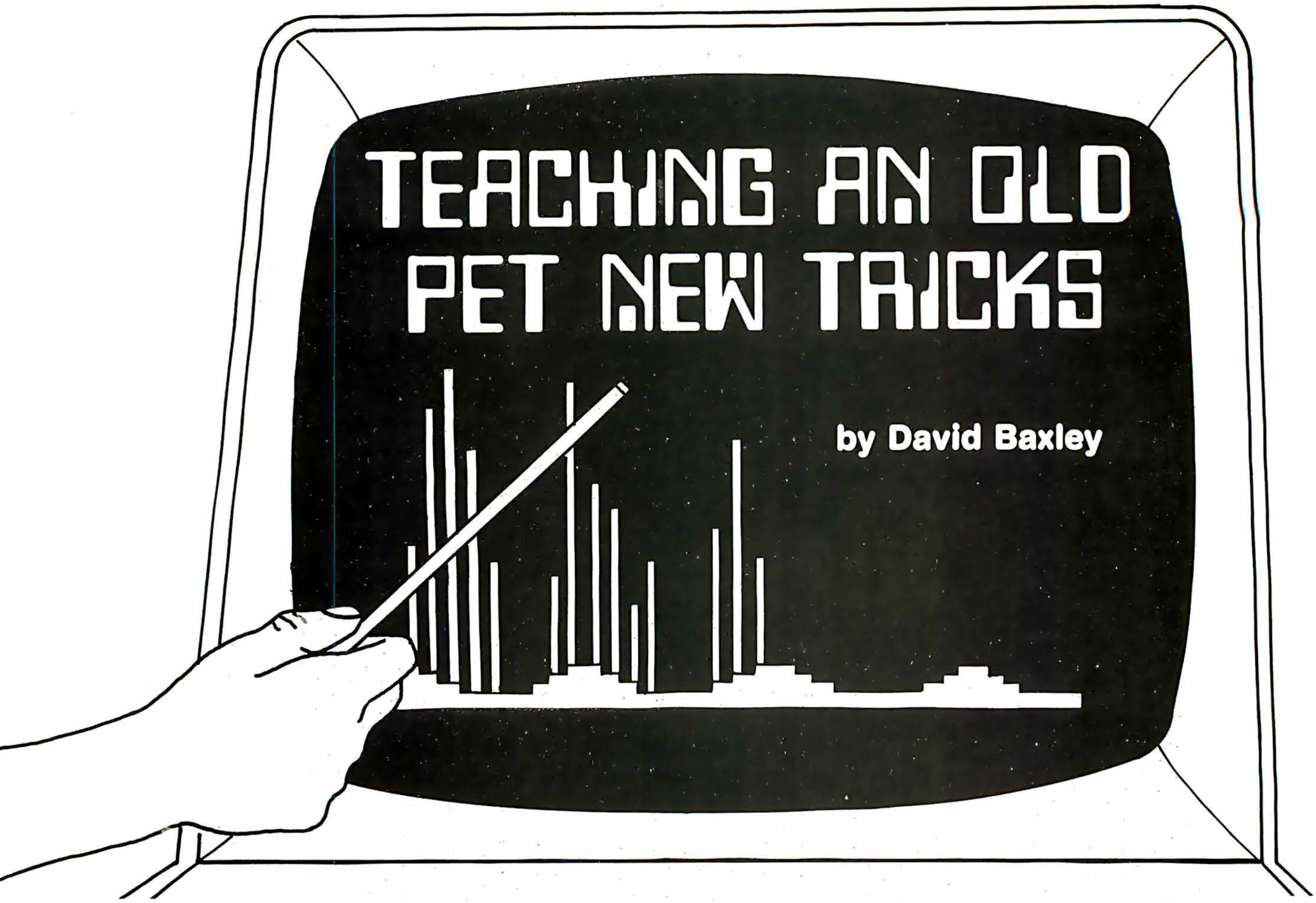
Increasingly, microprocessor operating systems are adopting the sophisticated approach used in mainframe systems of profiling each potential user. Profiling involves recording a set of data about the potential user under a logon name. When the user attempts to logon, the OS reads the profile to determine whether the user should be allowed to logon—and if he is allowed to, it determines what he can and cannot do.

For instance, the logon profile could contain a password, the hours the user is allowed to use the system, the number of pages the user is allowed to send to the lineprinter each month, etc. On many systems, the profile will contain the name of a program that is to be automatically run as soon as the user logs on. The user can effectively be prevented from doing anything else but run this program. This serves two functions: it makes the system seem simpler to a novice user and it enforces a type of security.

The profile will sometimes contain a security code that describes what privileges the user should have. Security systems should prevent most users from erasing whole disks, etc. The concept of the system operator is often used to protect system maintenance programs from unauthorized use.

The protection of private files is normally done in conjunction with the file management system's directory structure. Each user will have his or her own directory. More sophisticated systems allow a user to mark files that are totally private, can be read by others but not altered, can be executed by others (in the case of program files), etc. In some systems, the concept of a group is used to classify different types of users. Users in one group could have sets of privileges distinct from users in another group and a user could mark a file as being accessible to others in his or her group.

Because modern operating systems are designed for transportability, an investment in an OS and applications software is likely to outlive the computer hardware itself. Careful thought in the selection of an operating system can pay off significant dividends in the future. □



TEACHING AN OLD PET NEW TRICKS

by David Baxley

Have you ever plotted a linear function on your Commodore Pet screen and had it come out looking like a shotgun blast? Do your sine waves look like star fields? Do your biorhythms look like paint droppings? Now you can quadruple the resolution on the Pet screen with no hardware modifications.

The Pet screen presently has 1,000 data points available for plotting. The data points are arranged in a 25 by 40 character screen display. The following program will increase the number of data points to 4,000 in a 50 by 80 character screen display. Though this could not be considered high resolution graphics, it does improve the appearance of most plots.

Before describing the program, it is worthwhile to examine some of the design criteria. Quadrupling the screen resolution requires that each character position be split into four data points. Think of each character on the screen as a square. Now divide that square into four equal squares, all contained within the larger square. This effectively creates four data points from one character position (see figure 1).

Next, we have to display each point independent of the others within that character position. This can be accomplished by using the Pet's graphic characters. There is a graphic character for all 16 combinations of points within a character position (see figure 2). By writing one of these graphic characters, a point can be displayed, seemingly independent of the others.

Notice that each graphics character is assigned a binary code. Each of the four squares is assigned a bit position within the last 4 bits of a byte. The bits are numbered from left to right: 8, 4, 2 and 1. The upper left and right points are assigned bit positions 8 and 4 respectively. The lower left and right points are assigned positions 2 and 1 respectively. A 1 in any bit position shows that point to be displayed. If the 1 bit is set to 0, the lower right point is blanked.

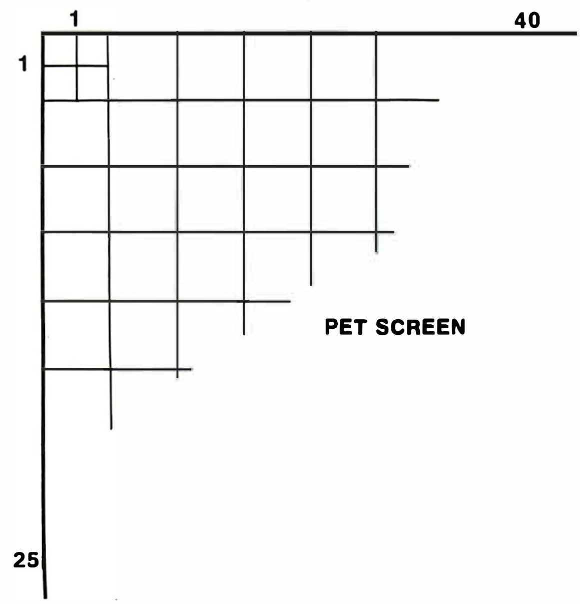


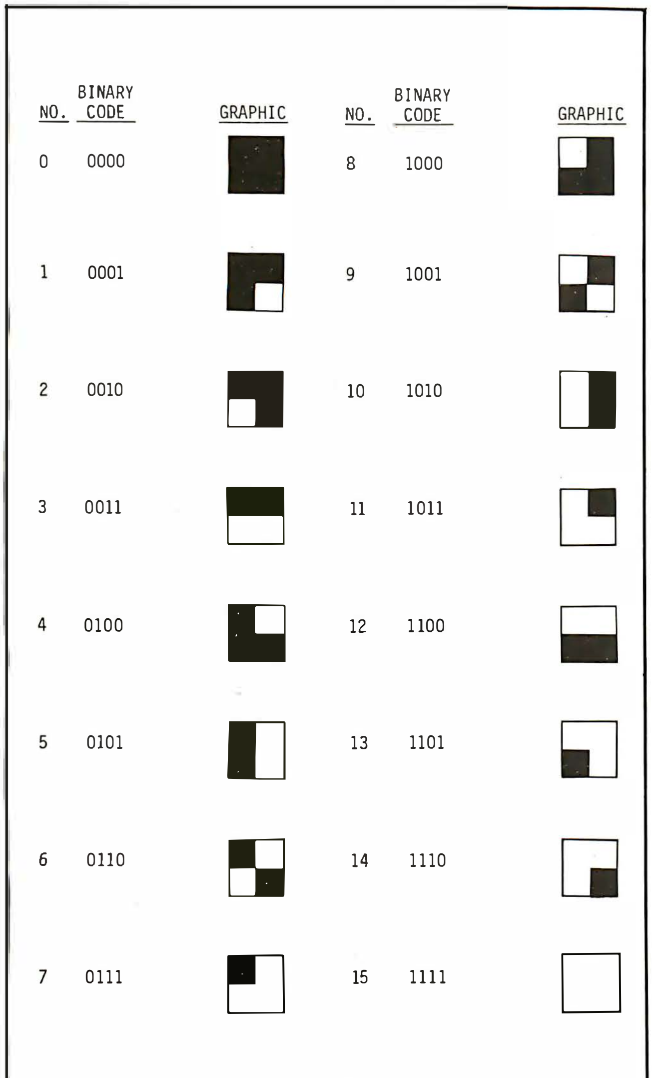
Figure 1. Splitting screen into four data points

With 4 bits, we can code all 16 combinations within one character position.

The program was manually assembled using 6502 Assembler Language and is divided into three sections: mainline, point subroutine and plot subroutine.

The mainline is the controlling section for the two subroutines. There are two entry points into the mainline. If the mainline is entered at the SET address, a point is displayed. The RESET entry point blanks a data point. A switch is set in memory location $05 to record which entry point is taken. The rest of the mainline will be easier to understand after describing the two subroutines.

The subroutine POINT determines which point in a character position is to be displayed by examining the

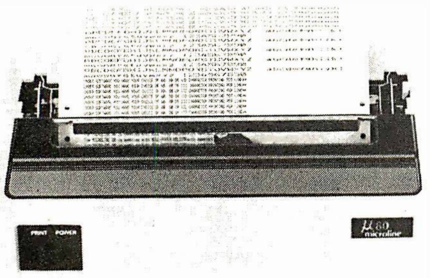


NO.	BINARY CODE	GRAPHIC	NO.	BINARY CODE	GRAPHIC
0	0000		8	1000	
1	0001		9	1001	
2	0010		10	1010	
3	0011		11	1011	
4	0100		12	1100	
5	0101		13	1101	
6	0110		14	1110	
7	0111		15	1111	

Figure 2. Sixteen graphic characters

X,Y coordinates. Notice in figure 3 that the odd Y coordinates use an upper left or upper right point. Conversely, the even Y coordinates use either a lower left or right point. Even and odd X coordinates use a left or right point. In this manner, we can determine which point in a character position is to be displayed. It is then a simple matter to select the correct binary code for that point.

The subroutine PLOT has two functions. The first is to compute the screen location addressed by the X,Y coordinates. The second is to retrieve the character at that screen location and convert it to a binary code. The Y coordinate is used to compute the screen line number. The screen line number is then used to access table B and retrieve the starting address of that line. The X coordinate is used to compute the position on the line. Using the address of the line and the position on that



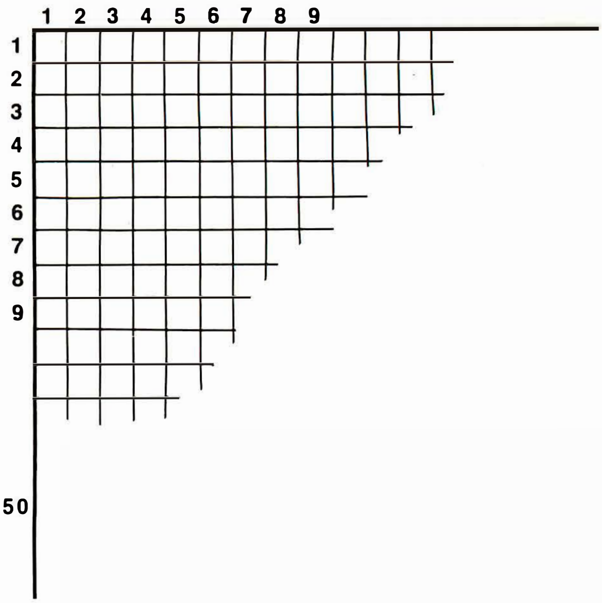


Figure 3. Use of coordinates

NARY CODE		GRAPHICS CHARACTER
1001	Old character	
0010	Data point	
1011	New character	

Figure 4. Combining two binary codes

LOCATION	MACHINE CODE	INSTRUCTION
0344	20 XX XX	JSR POINT
0349	20 XX XX	JSR PLOT
035A	4C XX XX	JMP LB3
0361	BD XX XX	LDA TABLEA,X
0399	BD XX XX	LDA TABLEB-2,X
039F	BD XX XX	LDA TABLEB-2,X
03B1	DD XX XX	CMP TABLEA,X

Figure 5. Changing absolute addresses

line, the address of the correct character is computed. The character on the screen is then retrieved, using the computed address and converted to a binary code according to the scheme described in figure 2.

Now we have the binary code that shows which data point within a character is to be plotted (from the subroutine POINT) and we have the binary code of the

POKE 178,Y	Stores the Y coordinate
POKE 179,X	Stores the X coordinate
SYS(826)	Displays a data point
SYS(832)	Blanks a data point

Figure 6. Commands for program access

```
10 PRINT"clr"
20 FOR Y = 1 TO 50
30 FOR X = 1 TO 80
40 POKE 179,X
50 POKE 178,Y
60 SYS 826
70 NEXT X,Y
```

Figure 7. Simple plot program

character presently on the screen (from subroutine PLOT). All that remains is to combine the binary codes. This creates a new binary code describing a new graphics character with a new point displayed. The new graphics character is then stored back in the correct screen location. An example of how the two binary codes are combined is shown in figure 4.

The program as presented resides in the second cassette buffer. If it is necessary to use the second cassette while plotting, the program must be relocated in another area of memory. This can be done after changing a few absolute addresses (figure 5).

The program can be implemented on your system in either of two ways. The first would be to run the Basic program shown in listing 1. The data statements contain the decimal codes of the machine language instructions. The second way is to type in the program shown in listing 2 using the monitor provided by Commodore.

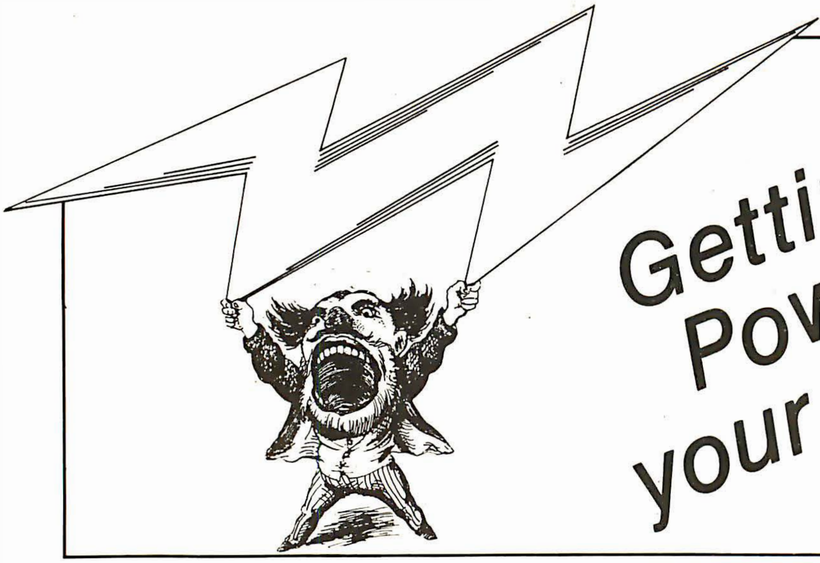
MEMORY LOCATIONS HEX	DECIMAL	
033A-03FF	826-1023	PLOT PROGRAM
B2	178	Y LOCATION
B3	179	X LOCATION
02	2	BINARY CODE OF DATA POINT TO PLOT
03-04	3-4	SCREEN LINE ADDRESS
05	5	DISPLAY/BLANK SWITCH

Figure 8. Memory locations

Either way, save the program on cassette so you won't have to type it in more than once.

The program is accessed using the commands shown in figure 6. Figure 7 shows a simple Basic program that plots every data point on the screen. Use it to make sure the plot program was typed in correctly. □

Program on page 148



Getting More Power from your Assembler

by Alan R. Miller

Sophisticated assemblers incorporate a macro processor. A macro is a set of instructions associated with the macro name. Whenever the macro name appears in the source program, the assembler substitutes the corresponding instructions. This is called a macro expansion.

Suppose that we want to interchange the contents of two memory locations with the following instructions.

```
LDA     FIRST   ;GET FIRST BYTE
PUSH    PSW     ;SAVE
LDA     SECOND  ;GET SECOND
STA     FIRST   ;PUT INTO FIRST
POP     PSW     ;GET FIRST
STA     SECOND  ;PUT INTO SECOND
```

This set of instructions can be defined in a macro called SWAP.

```
SWAP    MACRO           ;SWAP FIRST AND SECOND
        LDA     FIRST   ;GET FIRST BYTE
        PUSH    PSW     ;SAVE
        LDA     SECOND  ;GET SECOND
        STA     FIRST   ;PUT INTO FIRST
        POP     PSW     ;GET FIRST
        STA     SECOND  ;PUT INTO SECOND
        ENDM
```

The macro definition is placed near the top of the assembler source program. The first line defines the macro name; the last line terminates the definition. The name SWAP can now be used like an operation code. It is placed in the source program whenever the corresponding instructions are needed. When the assembler encounters the name SWAP, it substitutes the desired instructions. The final binary code generated by the assembler is the same as it would be if the instructions had originally been entered into the source program.

Each time the macro name SWAP appears in the source program, the same set of instructions will be generated and the same two memory locations will be interchanged. The SWAP macro becomes more versatile if the memory locations can be changed. If the names of the memory locations are placed on the first line of the macro definition, they become dummy variables.

```
SWAP    MACRO   FIRST,  SECOND
        LDA     FIRST     ;GET 1ST BYTE
        PUSH    PSW       ;SAVE
        LDA     SECOND    ;GET 2ND
        STA     FIRST     ;PUT INTO 1ST
        POP     PSW       ;GET 1ST
        STA     SECOND    ;PUT INTO 2ND
        ENDM
```

The actual parameters in the macro call are substituted for the dummy parameters at assembly time. The macro call: SWAP HIGH, LOW generates the following assembly language instructions.

```
LDA     HIGH    ;GET 1ST BYTE
PUSH    PSW     ;SAVE
LDA     LOW     ;GET 2ND
STA     HIGH    ;PUT INTO 1ST
POP     PSW     ;GET 1ST
STA     LOW     ;PUT INTO 2ND
```

The statement: SWAP LEFT, RIGHT will produce the following instructions.

```
LDA     LEFT    ;GET 1ST BYTE
PUSH    PSW     ;SAVE
LDA     RIGHT   ;GET 2ND
STA     LEFT    ;PUT INTO 1ST
POP     PSW     ;GET 1ST
STA     RIGHT   ;PUT INTO 2ND
```

The structure of macros can be much more complicated than these examples. One macro can be nested inside another.

```
OUTER   MACRO
        . . .
        IF      FAST
INNER   MACRO
        . . .
        . . .
        ENDM            ;;INNER
        . . .
        ENDIF           ;;FAST
        . . .
        ENDM            ;;OUTER
```

Conditional assembly directives can be used to create different versions. Comments in the macro definition that begin with a single semicolon are reproduced in the macro expansion along with the op codes. But if the comments are preceded by two consecutive semicolons, they will appear only in the macro definition, not in the macro expansion.

A subroutine can be used whenever a set of instructions is needed at several places of a program. There are times when a similar, but different, group of instructions is needed. A subroutine cannot be used in this case. Consider the three 8080 output routines that follow. The first sends a byte to the console, the second sends a byte to the list device and the third sends a byte to the phone modem.

```
COT:    IN      CSTAT
        ANI     COMSK
        JZ      COT
        MOV     A,C
        OUT     CDATA
        RET
;
LOT:    IN      LSTAT
        ANI     LOMSK
        JZ      LOT
        MOV     A,C
        OUT     LDATA
        RET
;
MOT:    IN      MSTAT
        ANI     MOMSK
        JNZ     MOT
        MOV     A,C
        OUT     MDATA
        RET
```

The structure of these routines is very similar. Each begins by reading the appropriate status register. Then a logical AND is performed to select the output-ready bit. Looping occurs until the peripheral is ready. The byte is moved from the C register into the accumulator and sent to the appropriate peripheral. Finally, a return instruction is executed.

These three routines are slightly different, hence they cannot be replaced by a single subroutine. However, since they have similar structure, they can be generated with a macro. The macro definition looks like this.

```
OUTPUT  MACRO   ?S,?Z       ;OUTPUT ROUTINES
?S&OT:  IN      ?S&STAT     ;CHECK STATUS
        ANI     ?S&OMSK     ;MASK FOR OUTPUT
        J&?Z    ?S&OT       ;NOT READY
        MOV     A,C         ;GET BYTE
        OUT     ?S&DATA     ;SEND IT
        RET
        ENDM
```

It would appear near the beginning of the source program. The macro name is chosen to be OUTPUT and the two dummy arguments are ?S and ?Z. Dummy arguments can have the same form as any other identifier. A question mark was chosen as the first character so the dummy arguments would be easier to find in the macro definition. You must be careful not to use register names such as A, B, H or L for dummy arguments if these register names also appear in the macro.

Each of the three output routines is generated by a one-line macro call.

```
    OUTPUT C,Z      ;CONSOLE OUTPUT
;
    OUTPUT L,Z      ;LIST OUTPUT
;
    OUTPUT M,NZ     ;MODEM OUTPUT
```

Each line includes the appropriate parameters. At assembly time, the real arguments replace the dummy arguments of the macro. The ampersand character (&) is a concatenation operator. It separates a dummy argument from additional text. The macro processor substitutes the real parameter for the dummy argument, then joins it to the rest of the text. By this means, the expression ?S&OT becomes LOT if the real argument is the letter L.

Macro assemblers may give the user three options for the assembly listing: 1) show the macro call, the generated source line, and the resultant hex code, 2) show the macro call and the hex code, 3) show only the macro call. If option 1 is chosen, the three macro calls to OUTPUT will produce the following.

```
                OUTPUT  MACRO   ?S,?Z       ;OUTPUT ROUTINES
                ?S&OT:  IN      ?S&STAT     ;CHECK STATUS
                        ANI     ?S&OMSK     ;MASK FOR OUTPUT
                        J&?Z    ?S&OT       ;NOT READY
                        MOV     A,C         ;GET BYTE
                        OUT     ?S&DATA     ;SEND IT
                        RET
                        ENDM
                ;
                        OUTPUT  C,Z         ;CONSOLE OUTPUT
4000+DB10       COT:    IN      CSTAT       ;CHECK STATUS
4002+E602               ANI     COMSK       ;MASK FOR OUTPUT
4004+CA0040             JZ      COT         ;NOT READY
4007+79                 MOV     A,C         ;GET BYTE
4008+D311               OUT     CDATA       ;SEND IT
400A+C9                 RET
                ;
                        OUTPUT  L,Z         ;LIST OUTPUT
400B+DB12       LOT:    IN      LSTAT       ;CHECK STATUS
400D+E602               ANI     LOMSK       ;MASK FOR OUTPUT
400F+CA0B40             JZ      LOT         ;NOT READY
4012+79                 MOV     A,C         ;GET BYTE
4013+D313               OUT     LDATA       ;SEND IT
4015+C9                 RET
                ;
                        OUTPUT  M,NZ        ;MODEM OUTPUT
4016+DB14       MOT:    IN      MSTAT       ;CHECK STATUS
4018+E680               ANI     MOMSK       ;MASK FOR OUTPUT
401A+C21640             JNZ     MOT         ;NOT READY
401D+79                 MOV     A,C         ;GET BYTE
401E+D315               OUT     MDATA       ;SEND IT
4020+C9                 RET
```

The first argument in the macro, ?S is replaced by the actual argument. This is the letter C in the first call, the letter L in the second call and the letter M in the third call. The second argument is used to select a JZ or JNZ instruction for the third line of the macro expansion.

Some assemblers automatically remove the ampersand symbol from the resultant assembly listing. Others leave the symbol in place. In this latter case, the first line of the first routine would look like this:

```
C&OT:   IN      C&STAT  ;CHECK STATUS
```

But this is a matter of style. The actual machine code generated is the same in either case.

If you have a Z80 CPU but an 8080 macro assembler such as the Digital Research MAC, you can run all 8080 programs just as they are given here. You can also do the Z80 programs by using macros to generate the Z80 instructions. For some of the instructions, the regular Zilog mnemonic can be used. For others, a slightly different format is necessary. Consider, for example, the Z80 instruction that performs a two's complement on the accumulator. The Zilog mnemonic for this operation is NEG. A Z80 assembler converts this mnemonic into the two hex bytes ED 44. With an 8080 macro assembler, you can use the same mnemonic. Define the following macro.


```
NEG   MACRO   ; TWO'S COMPLEMENT
      DB      OEDH, 44H
      ENDM
```

Then, the macro call: NEG is placed in the source program when the Z80 NEG instruction is needed. The 8080 macro assembler will insert the desired hex bytes ED 44 at this point.

As another example, consider the Z80 relative-jump instruction. This instruction can be implemented with a macro that uses the assembler's program counter, a dollar sign. The macro definition looks like this.

```
JR   ADDR   ;RELATIVE JUMP
     DB     18H, ADDR-$-1
     ENDM
```

The dummy parameter ADDR is the destination address of the jump. The macro call: JR ERROR will generate the correct Z80 code. The first byte will be 18 hex. The second will be required displacement for the jump.

The Z80 instruction DJNZ can be generated in a similar way. This instruction decrements the B register and jumps relative to the address of the argument if the zero flag is not set. The macro definition is as follows.

```
DJNZ   MACRO   ADDR
       DB      10H,ADDR-$-1
       ENDM
```

And the macro call looks like: DJNZ LOOP.

This approach will work with most macro assemblers. There may be a problem, however, with the interpretation of the dollar sign. This symbol usually refers to the address of the beginning of the current instruction. But for some assemblers, it is interpreted as the address of the following instruction. If your assembler uses the latter interpretation, you will have to change the macro accordingly. If in doubt, check the user manual.

Some Z80 mnemonics are not compatible with the macro format. For example, the Z80 instruction: PUSH IX cannot be generated with a macro called: PUSH MACRO REG, since PUSH is a regular 8080 mnemonic. One possibility is to name the macro PUSHIX instead.

```
PUSHIX   MACRO
         DB      ODDH,OE5H
         ENDM
```

Similar problems occur with the commands POP IX, ADD IX,BC, SUB (IX + dis), and SET. A format that is different from the Z80 mnemonic must be chosen in each case.

The Digital Research macro assembler has an added bonus. Frequently-used macros can be placed into a separate macro library and given the file extension of LIB. In fact, this assembler is supplied with a macro library called Z80.LIB that will generate all of the Z80 instructions. The statement MACLIB Z80 is placed near the beginning of the regular source program. The assembler will then look in the file Z80.LIB for the required macros.

Adapted, by permission, from Dr. Miller's book **The 8080/Z80 Assembly Language: Techniques for Improved Programming** *©1981 by John Wiley & Sons, New York.* □

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CIRCLE INQUIRY NO. 77

Puzzles for the Logic Minded

Puzzles to test your mettle from the pages of the publication *The Four-Star Puzzler*

Digititis

B. Upton-Rowley

We have removed most of the digits from the long-division problem below. The object is to replace the number, one digit per dash, so that the completed division is mathematically correct. The puzzle has a unique solution.

```
          _ _ _
       ________
_ _ ) _ _ 2 _ _
      _ _
      ---
        _ _
        _ _
        ---
        2 _ _
        _ _ 8
        -----
            0
```

Enigma

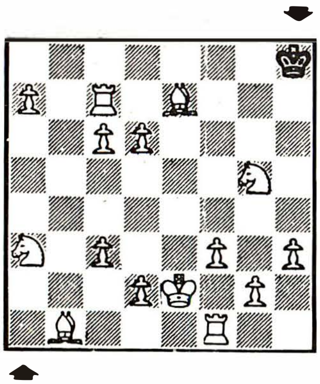
Guess the object or word that is described in the riddle.

I work with single eye for human good,
Yet often wound my friends, though old and true ones;
I mend bad habits as all people should,
But must admit I readily form new ones.

Chess Maze

Kenneth Feucht

START



FINISH

Can you negotiate the black King from the upper right to the lower left corner of the chessboard maze? Move the King one square at a time in any direction, as in chess. You may never move the King into check, of course, but you may capture white pieces (which remain stationary) to clear the King's path. Are you equal to the royal challenge?

An Open-and-Shut Case

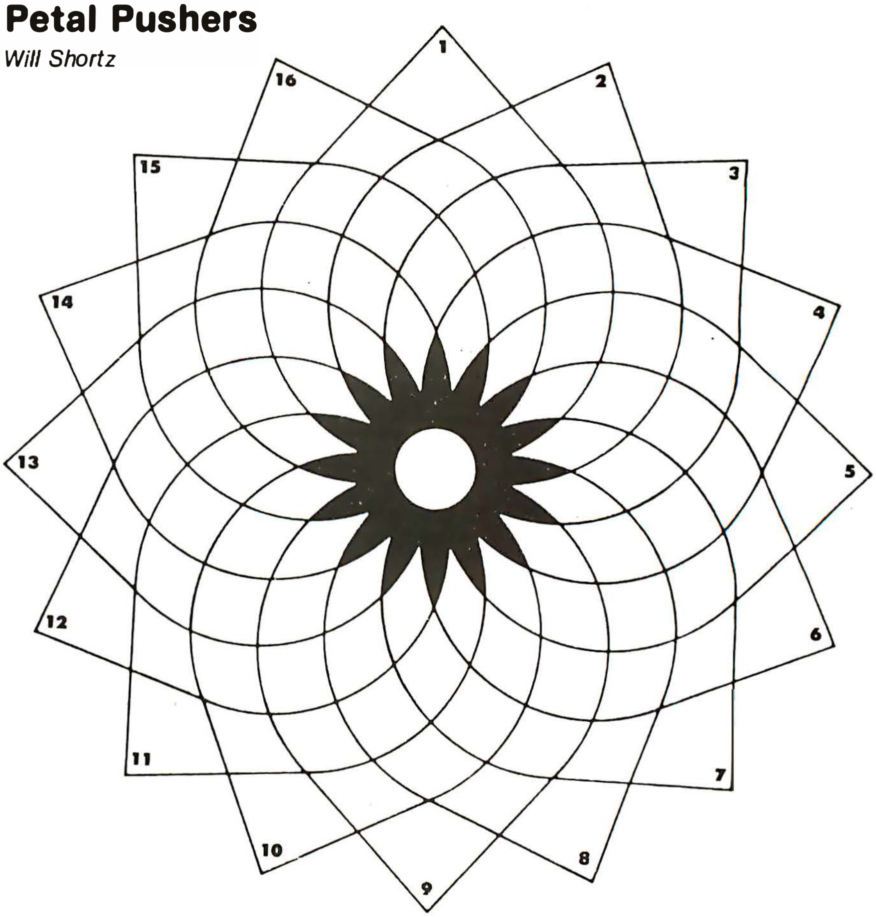
Fred Bernard

A giant gymnasium contains a row of 1,000 lockers, all closed, and a line of 1,000 men. The first man runs along and opens every locker. The second man then runs along and closes every second locker, starting with locker #2. The third man runs along and changes the status of every third locker (if it is open he shuts it, if it is shut he opens it), starting with locker #3. The fourth man runs along and changes the status of every fourth locker, starting with #4, and so on until all the men have passed by all the lockers.

Which lockers are open in the end?

Petal Pushers

Will Shortz



Answer the clues to find the 32 six-letter words that go in this flower blossom. All the words proceed from the outside of the blossom inward—half of them proceed clockwise from the numbered petals; the other half counterclockwise.

Work from both sets of clues to complete the puzzle.

Clockwise

1 Glamor
2 "Good boy" at Christmas
3 Idiot
4 Quiver contents
5 Stir up
6 Soft metallic element
7 "Think_____" (slogan of today)
8 Cereal fruit
9 Sonnet part
10 Sponsored
11 Fivesome
12 *Brave New World* author
13 Merchant
14 Moved right along
15 This activity keeps you on your toes
16 Team vs. captain, maybe

Counter Clockwise

1 Holster's aid
2 Villain of the 1940s
3 Got friendly, with "up"
4 Thorough
5 Hitchcock classic
6 Conqueror of Mexico City
7 Biography
8 Like old patches
9 Rich materials
10 Mediterranean port
11 Here and there
12 More than busy
13 Like some living rooms
14 Two trios together
15 Troubadour's offering
16 Posted

Answers on page 106

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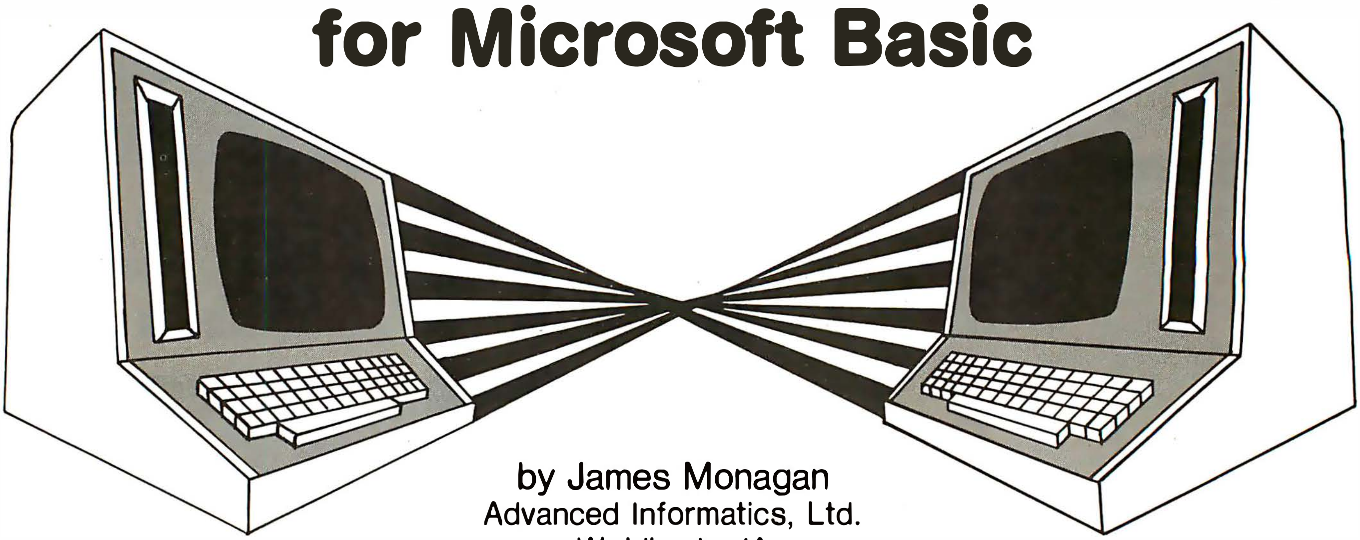
A Cross-Reference Program for Microsoft Basic



by James Monagan
Advanced Informatics, Ltd.
W. Liberty, IA

Have you ever modified a Basic program, only to find that the changes made in one line had unexpected ramifications elsewhere in the program? Or unintentionally used an existing variable when you added a new line to a program? Or just despaired of following all the GOTO and GOSUB connections in a complicated program?

If so, you can appreciate the advantages of having a cross-reference listing of a program before making any changes. It shows each variable used in a program, together with every line number in which the variable is used. Line numbers referred to in branch instructions (GOTO, GOSUB, IF...THEN...ELSE, RESUME) are also shown, together with a cross-reference listing, you can find at a glance every line containing the variable V$ or a call to line 1050.

The following cross-reference program was written on an Informer III computer by Advanced Informatics, Ltd. It is written in Microsoft Basic-80 revision 5.0. It can easily be modified to run in Altair Basic, TRS-80 Disk Basic, or any other version of Microsoft Basic in which programs can be saved in ASCII (non-compressed) format. In 5.0 Basic-80, the program requires 48K of memory. In 4.5 Basic-80, Altair Basic, and TRS-80 Basic, less memory is required. The symbol table can be adjusted in size to fit the available memory.

The first step is to save the program in ASCII format. The next step is to run the cross-reference program. When prompted, enter the name(s) of the program(s) to be cross-referenced. Just hit •RETURN□ or •ENTER□ when there are no more names to enter. The program then asks for the date. Whatever you enter in response to this request will appear in the header of the cross-reference listing. Finally, the program will ask if you want a cross-reference listing, a program listing or both. Enter the number 1, 2, or 3 to specify your choice.

The program will then begin processing the program to be cross-referenced or listed. This program, which must have been saved in ASCII format, is read in, a line at a time. Each line is parsed to separate imbedded commands and other reserved words from variable names and referenced line numbers. Variable names and line numbers are added to the symbol table when they are encountered for the first time. Every line in which a symbol is encountered is entered in a sublist associated with the symbol table entry.

As each line is parsed, its line number is displayed on the screen, allowing the operator to monitor the program's progress. When the last line has been parsed, the cross-referenced listing is printed. The execution time depends on the processor's speed and the average line length. It took about ten minutes to generate the accompanying cross-reference listing on an Informer III, corresponding to a processing rate of about 4 seconds per line.

The reserved words are defined in the data statements in lines 130 through 250. If additional words are added, they must be inserted in alphabetical order. The array RW$ is used to store these reserved words. This array is dimensioned in line 80 and must be redimensioned if additional words are added to the data statements. The last element in this array is set equal to the string "\", so as to simplify the search algorithm. (A search for a substring in the array RW$ is terminated upon encountering an array element greater than the substring.)

The integer array PT% is used as a sort of hash table for the list of reserved words. The elements PT%(0) through PT%(25) point to reserved words beginning with the letters A through Z. Thus, the element RW$(PT%(0)) is "ABS" and RW$(PT%(2)) is "CDBL". Where there is no corresponding reserved word, the hash table entry points to the end of the array. So, RW$(PT%(1)) is "\", as are RW$(PT%(24)), RW$(PT%(25)), etc. These tables are set up in lines 270 through 360.

The symbol table is more complicated and makes use of six different arrays. The symbols themselves are stored in the string array V$. The integer array VNXT% links the symbols together in chains. Thus, VNXT%(I) = J if V$(J) is the next symbol after V$(I). VNXT%(I) = −1 if V$(I) is the last symbol in a chain of symbols. To expedite searches, 92 symbol chains are threaded through the symbol table. The chains for symbols beginning with digits 00NNN to 65NNN start at the symbol elements V$(0) through V$(65). The chains for symbols beginning with the letters A through Z start at the symbol elements V$(66) through V$(91).

Reference line numbers are stored in the array RFL%. Those for the same symbol are linked together by the array NXT%. The elements of FRST% and LST% point to the first and last reference line numbers for the corresponding symbol. Thus, RFL%(FRST%(I)) is the first reference line for the symbol V$(I), RFL%(NXT%(FRST%(I))) is the second, and RFL%(LST%(I)) is the last.

The going gets easier

Compared to the complex organization of the symbol table, the rest of the program is relatively straightforward. Program lines are input into the string L$ in line 680. L$ is parsed a character at a time, with the variable LP pointing to the character being parsed.

Variable names begin with alpha characters and are terminated by reserved words, non-alphanumeric characters, or the end of the line. Numbers are treated as referenced line numbers only if they follow the appropriate reserved words. The variable BRNCH is used as a flag to indicate when a line number can be expected. Whenever an alpha character is encountered, the program tests if there is an embedded reserved word that begins with that character.

After the last line has been input and parsed, the symbol table is printed out. No sorting is necessary at this point, since all variables have been entered in the symbol table in alphanumeric sequence. The print routine merely retraces the linkage through each of the 92 possible symbol chains.

Following are modifications for Altair Basic, Basic-80 rev 4.5, and TRS-80 Basic: Insert a CLEAR statement at the beginning of line 60. (Try CLEAR 3000.) Increase or decrease value of variable I in line 90, so that symbol table is as large as possible without causing an OUT OF MEMORY error. Delete line 430. Insert any missing reserved words (such as CLS, CMD, MEM, POINT, RESET, and SET) in the DATA statements. Be sure to insert them in alphabetical order. Increase the size of the array RW$ in line 80, so that it can hold all of the reserved words.

In modifications for Basic-80 revision 5.0, the program will run as is. However, it does not allow for variable names with embedded reserved words. To allow for this, changes lines 780 and 890 to read:

```
780 IF C$=" " THEN GOSUB 1010:GOTO 750 ELSE...
890 IF V$>"" THEN 1160 ELSE C=ASC(C$):...
```

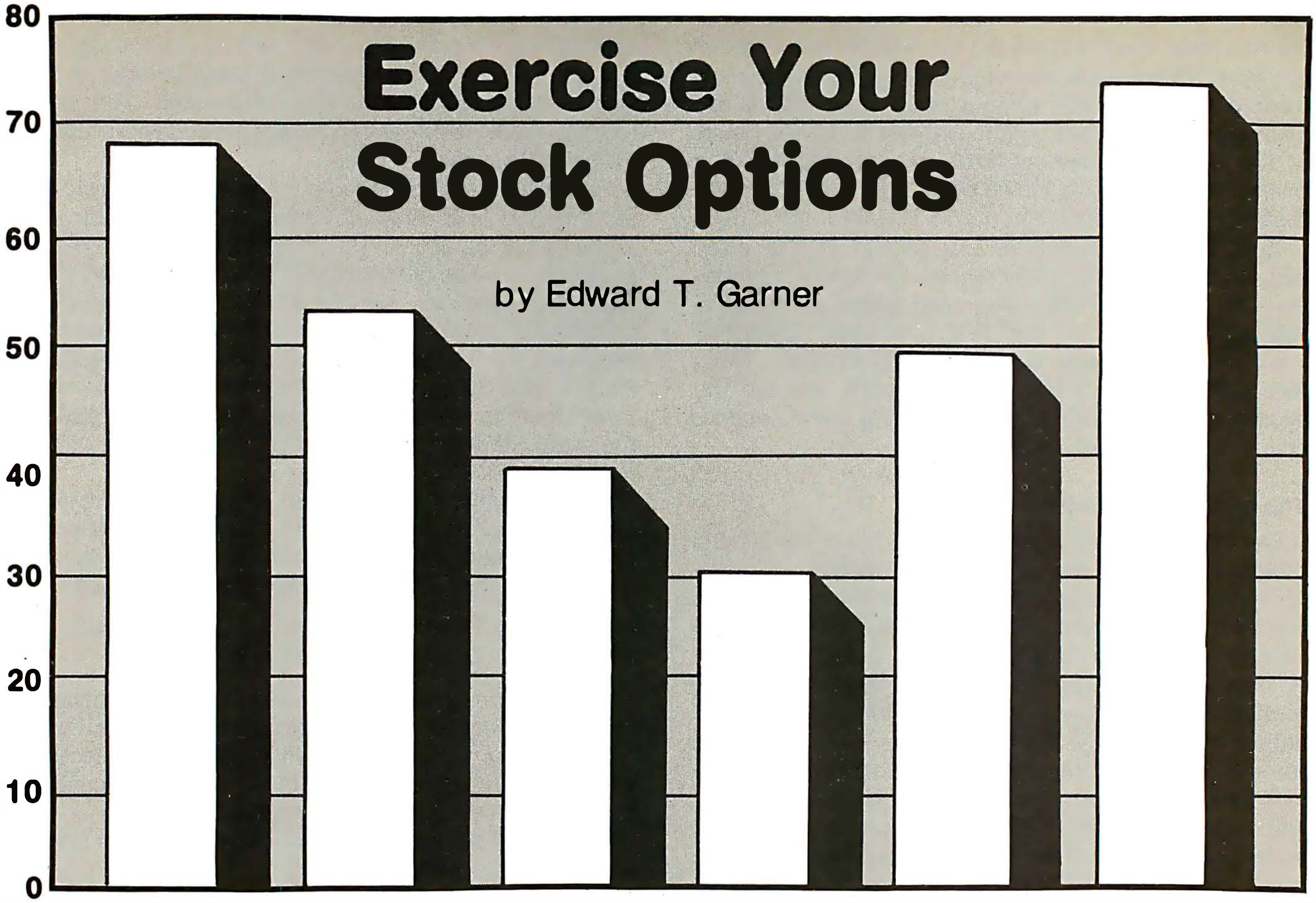
In modifying for Microsoft's Basic compiler, change line 90 so that the array dimensions are specified with constants; i.e., change DIM VNXT%(I+90),... to DIM VNXT%(490),... Compile with the /E switch because of the ON ERROR GO TO statement in line 70.

The compiled version runs at least four times faster than the interpreted version. □

Program on page 150

Exercise Your Stock Options

by Edward T. Garner



Writing options on your portfolio is a good conservative way to increase the return on your assets. One small part of the field is the writing of covered call options.

The financial sections of most newspapers list several option exchanges and two types of options (PUT and CALL) for several months at different prices. For our purposes, we are interested only in listed call options. Listed means they are created and reported on by an exchange, which also provides the financial guarantees and control that allow a marketplace to function. They are based on well-traded securities on the American and New York stock exchange. The market maker activities of the options exchange provide liquidity for your positions.

Some terminology is useful if you want to sound informed when you talk to your broker:

- The owner of one option has the right to buy 100 shares of company A at price X on or before date D.
- The price X is the striking price. The date D is the expiration date. The option exchanges set this date as the first Saturday following the third Friday of the option month. Don't rush to get your calendar; the program calculates this for you.
- To write an option is to sell it. This means you have transferred the above rights for money, known in the options game as a premium.
- When an option is covered, it means you, as the writer, own the stock the option is written against. This is why this is a conservative method. If you write a call on company A, the stock increases, and the option is exercised, you will have to produce the stock from your portfolio or go into the open market and purchase company A's shares.

The following program, written in Applesoft Basic on an Apple II Plus computer, is a calculator, not a predictor. It accepts your statement of reality and produces the return on investment for three possibilities. You have to do some advance work to gather the information the program needs. Use the input worksheet in figure 1 as a guide. Figure 2 illustrates sample commission rates for stock and option trades with a major firm. Use them or supply your own. You will need a Standard and Poor stock guide or equivalent to estimate the dividend

```
STOCK NAME OR SYMBOL: IBM
STRIKING PRICE: 65
OPTION DATE(MM/YY): 10/80
TODAYS DATE(MM/DD/YY): 7/7/80
NUMBER OF SHARES, AT : 300,62
PERIOD DIVIDEND: .86
UNDERLYING STOCK COMMISSION: 264
NUNBER OF CALLS, AT : 3,2.0625
OPTION COMMISSION: 41.6
```

Figure 1. Input worksheet

payments during the option life. The Wall Street Journal or the stock pages of your local paper can provide the current prices of the option and the underlying stock.

The program assumes you are going to purchase the stock now and write the options at the same time. This factors out any loss or gain you may have in an existing portfolio. The purpose is to quickly analyze the return on investment for these conditions: 1) The stock rises and the option is exercised. You received more than if you had sold it on day one, but you did not participate in its advance. 2) The stock trades in a narrow range and the option is not exercised. You pocket the premium as an added yield from your portfolio. 3) The stock declines and the option is unexercised. You have lowered your breakeven point, even though you may be a net loser in this stock. The output example shown in figure 3 is for IBM on 7/7/80 with the Oct 65 options.

LISTED STOCK COMMISSIONS
NUMBER OF SHARES

PRICE	100	200	300	400	500
20	51	93	128	164	199
24	58	104	144	185	222
26	61	109	153	195	233
28	64	115	161	204	245
30	66	120	169	214	256
32	68	125	177	223	268
34	71	131	185	232	279
36	73	136	191	241	291
38	76	142	198	250	302
40	78	147	205	260	314
42	80	152	212	269	322
44	83	158	219	278	330
46	85	163	226	287	338
48	88	169	233	296	346
50	88	174	240	306	354
55	88	176	257	322	374
60	88	176	264	338	394
65	88	176	264	352	409
70	88	176	264	352	424
80	88	176	264	352	440
90	88	176	264	352	440
100	88	176	264	352	440

LISTED OPTION COMMISSIONS
NUMBER OF CONTRACTS

PRICE	1	2	3	4	5
0.5000	8.00	13.00	17.50	22.00	26.50
0.5625	8.65	14.15	19.20	24.25	29.30
0.6250	9.25	16.25	20.90	26.50	32.15
0.6875	9.90	16.40	22.55	28.75	34.95
0.7500	10.50	17.50	24.25	31.00	37.75
0.8125	11.15	18.65	25.95	33.25	40.55
0.8750	11.75	19.75	27.65	35.50	43.38
0.9375	12.40	20.90	29.30	37.75	46.20
1.0000	25.00	29.25	37.30	45.30	53.35
1.5000	25.00	30.70	39.45	48.20	56.95
2.0000	25.00	32.10	41.60	51.05	60.50
2.5000	25.00	33.55	43.75	53.90	64.10
3.0000	25.00	35.00	45.85	56.75	67.65
3.5000	25.00	36.40	48.00	59.60	71.25
4.0000	25.00	37.85	50.15	62.50	74.80
4.5000	25.00	39.25	52.30	65.35	78.40
5.0000	25.00	40.70	54.45	68.20	81.95

Figure 2. Sample commission rates

```
         COVERED OPTION WRITER
====================================
NET PROCEEDS: $  577.15 FOR IBM
====================================
OPTIONS  EXERCISED     UNEXERCISED
************************************
NET        $ 1207.15      835.15
ROI            6.39%       4.42%
ANNUAL ROI    22.67%      15.68%
************************************
BREAK EVEN POINT:$   60.09 PER SHARE
NET CAPITAL EMPLOYED= $18286.85
************************************
BUY 300 SHARES AT 62
SELL 3 OPTIONS AT 2.0625
DAYS TO EXPIRATION = 103
LAST TRADING DAY: 10/17/80
COMMISSIONS: STOCK=264  OPTION=41.6
PERIOD DIVIDEND = .86
STRIKING PRICE= $65
```

Figure 3. Example of output on IBM Oct. 65 options

Because the program provides an easy way to calculate return on investments:

- You are encouraged to try 'what if' games. If I could sell option X for $Y, what would the return on investment be?
- You are more likely to re-evaluate your position during the life of the option. For instance, a sharp downward movement of the option price might offer an opportunity to reverse your position and pocket an early profit.
- You can easily investigate the return on the same option with different expiration dates.

My personal conviction is that simple programs should be designed for clarity and change rather than efficiency. It should flow top to bottom, if possible. This program was written in this style. There are some useful features of date calculation and formatting that may be used in your own programs. Some useful extensions for disk owners would be to insert your own filing and data editing routines. Also you might rework the calculation routines to give you the option premium needed to give you a desired return.

As a caveat, anything you buy or sell involves risk and even a conservative investment can lose. You have the responsibility to integrate and supplement the results of this program with your own knowledge in making your investment decisions. This program can help you become a more informed decision maker. □

Program on page 152

COLORFUL GRAPHICS AND TEXT PROGRAM

by Robert Moskowitz

Paddle-Graphics by On-Line Systems, Simi, CA is a solid and workable graphics program. In rough terms, the disk-based program allows you to: outline a figure, fill it with color, paint with a variable width brush, add text to the hi-res screen in any of five sizes, plot straight line from one point to another, and create shape tables for use in your own programs.

I found the documentation a little skimpy, and not entirely clear. But compared with some documentation I have tried to decipher, this 28-page booklet is good enough to get you started and answer most of your questions.

The program itself is a good one for many reasons. For example, it gives you a menu or prompt at every choice point. It is constructed with a consistent set of controls so you can learn and use the program very easily, without diverting your attention from your work to the details of operating the system.

When you boot the Paddle-Graphics disk, you have a choice of: 1) outlining a new figure; 2) filling hi-res spaces with colors; 3) retrieving or saving a picture; 4) creating or retrieving a shape table; 5) adding text, or 6) cataloging the disk.

Let's say you want to draw a new picture. The best procedure is to fill the blank screen with white or black as a background. Go back to the main menu and select "outlining a figure." This gives you four options: 1) two paddle drawing (a la Etch-a-Sketch); 2) one paddle drawing, where you first set the speed, then control the direction of the moving point; 3) automatic line drawing, and 4) variable width brush strokes.

The four modes are set up to work together, allowing you to position your "pencil" just where you want it, trace shapes or draw "freehand", draw light lines or use heavy brushstrokes, erase portions of the screen and add straight lines as needed.

One good technique for accurate drawing is to trace from an existing picture your tape to your monitor or TV screen. I had a lot of luck with my early tries to copy Bugs Bunny from a machine-made transparency. Later, I found I could also trace from pictures on tracing paper if I turned the brightness control way up.

The program makes it easy to add text in any of five sizes, in English or Greek, with more fonts claimed to be coming soon. You bring in the picture you want from disk, set up the text parameters and position the cursor for the first letter. Then you type normally, one line at a time. If this mode has a drawback, it is that you cannot control spacing of the letters on a line, nor can you position any line but the first without restarting the text mode from the main menu.

Shape tables are much easier to create with the program than without it. Once you have the shape you want on the hi-res screen, the fruits of a new drawing session or something you retrieved from disk, the computer does most of the rest of the work. Following detailed prompts, you locate the shape for the computer by setting pointers at the upper-left and lower-right corners of an imaginary box enclosing your shape.

The computer now shows you the box and slowly traces every point within it. When fully traced, the shape goes onto the disk in the shape table you name. You can "print" any of these shapes at any point on the screen, rotate it, and change to another shape with simple keystrokes. By loading a shape table into RAM and poking its address into specific pointer locations, any of your programs can utilize any of the shapes you make.

The program mixes the hi-res colors to make its own, too. You can write text in eight colors, and fill in shapes in about 20, including silver, aqua, and avocado. If you get the color wrong, or don't like what you see, it's very easy to re-color any portion of your work. My Sony TV did not show much difference between some of the colors. But company spokespeople say that different TVs yield differing color results.

One very interesting aspect of the program is its back up capability. You can make as many duplicates as you want of the original program disk. The copies simply won't function. But if you bomb the original disk sometime later, you can re-copy back onto the original and you're in business once again. If you destroy the disk itself, the company will replace it for a fee. The program requires a 48K Apple with single disk drive. □

Program follows

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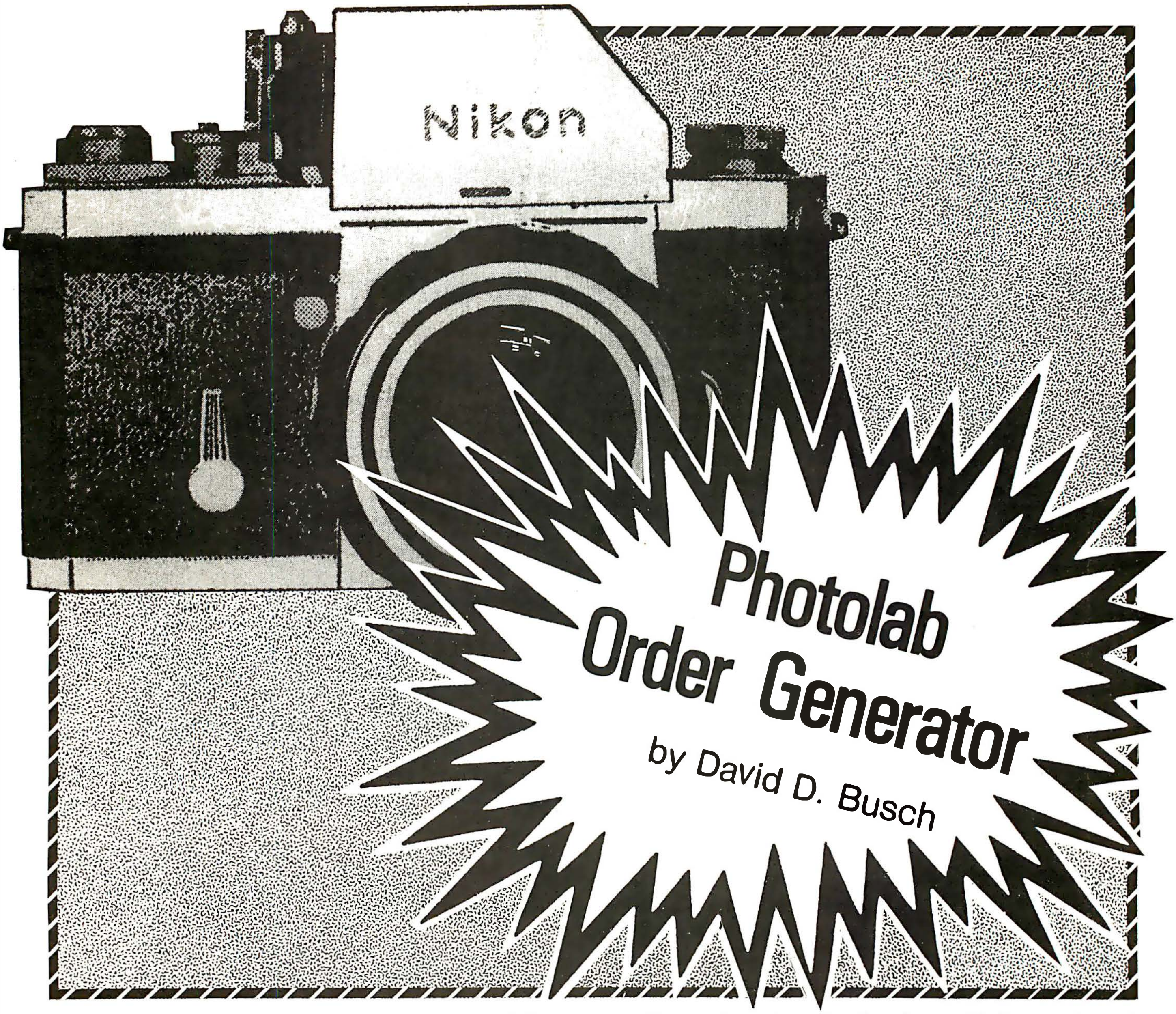


Photolab Order Generator

by David D. Busch

Because it can be carried on as a part-time activity, photography has become one of the most common small business operations, and is a prime candidate for efficiency-gains through imaginative use of microcomputers.

Following is a disk-based program for the TRS-80 model I and other computers that streamlines printing out processing and printing orders. Freelance and studio photographers, photojournalists, writers, and others who take a great many pictures frequently find that their time can be more productively spent outside the darkroom. Especially for color film processing and printing, a custom processing lab can pay for itself in time saved.

That's not the case if the photographer must spend 10 to 15 minutes making out photo lab order forms each time a batch of film is ready to be sent out. Large photo labs that serve photographers all around the nation try to ease this chore by providing their own preprinted forms. The more common local lab is just as likely to accept a form supplied by the customer.

The program's main features include:

1) Basic pricelists for various types of services from several different labs may be stored in disk files. The photographer need only enter the type of film, and number of rolls, along with the number of prints (if any) desired. The program accesses the lab's pricelist, itemizes the changes and provides a grand total automatically.
2) The photo lab order itself is stored on disk, and can be recalled and printed at any time. If extra copies are needed for recordkeeping or accounting, they can be produced at your convenience.
3) A list of orders that have been printed is available for cross-referencing outstanding orders.
4) Different types of film or prints may be mixed in a single order, and "forced" processing may be specified where necessary. Charges for extended or special developing are included in the totals.
5) Client, project name, and date are printed on the order.

Following is a summary of the functions of the basic modules of the program:

Enter photolab price list. This short subroutine at lines 1530-1630 allows entering pricing information for any number of labs. Each processor's prices are saved in a disk file, F$, named in line 1540. Error traps stop input if the lab name is more than eight characters, or contains a space; neither is allowed under Radio Shack's disk Basic file naming syntax. Then, prices for each of five products stored in a string array PR$(n) are input. The products are read into PR$(n) from a DATA statement (line 60). These data can be changed if the photographer uses other lab services.

I usually get my film developed and contact printed, so the negative film processing prices reflect these combined services. Virtually the only print size I order are 8 by 10s, so no size options are provided. The prices for these services are stored in an array, PL(n), while the costs of extended processing are in a second, PU(n). Both arrays are saved to disk at lines 1650-1720.

Enter new lab order. First, the existing lab order file is loaded, in lines 1060-1160. The number of orders currently in the file (NP) is input, and a FOR-NEXT loop from 1 to NP repeats a subroutine that loads the following information about each order in the file: TT(n)—grand total for that order, CLIENT$(n)—the name of client and project, JOB$(n)—the name of the project alone, PO$(n)—the actual photo order itself. Any of the pricelists stored can be recalled by entering the proper lab filename when prompted in line 1750.

As the new lab order is entered, NP is incremented by one, so that all data will be stored in the next available position in their appropriate arrays. The client name and project are input, and concatenated together, separated by a linefeed (CHR$(10)), so that the printer will list each on separate lines.

A module at lines 490-690 contains a menu that allows the user to choose from inputting the five different types of film or print processing orders stored in PR$(n), or of terminating the session. After each type of film or print is input, control returns to this menu, until a photo lab order is requested.

The number of rolls of film, type of film, and whether extended processing is required are input in lines 710-800. The price for normal or special processing is calculated using the price list selected, in lines 790 and 800. An appropriate descriptive string is generated from the input data, e.g. "10 rolls of Tri-X at an exposure index of 800," and temporarily stored in the string variable SEG$.

Photography...is a prime candidate for efficiency gains through imaginative use of microcomputers.

If prints are ordered, a similar routine at lines 970-1040 produces a corresponding string and PRICE. For both prints and film, the next step is a subroutine at lines 820-950, which produces a string representation of PRICE using the STR$ function. The value of PRICE is then added to the total cost of the order (TT).

Next, a subroutine that simulates PRINT USING looks at PRICE$ to see if a decimal point is contained (line

Answers to Games section on page 96.

Digititis

32 10208

Enigma

A needle

Chess Maze

Kh8-g7-h5-h4-g3-f4-e5-d5-c5-b6-a5-a4 x a3-b2-a1

An Open and Shut Case

There are 31 lockers open in the end: No.'s 1, 4, 9, 16, 25, 36, 49,...., 961; i.e. all the lockers with numbers that are perfect squares. Reason: Perfect squares have an odd number of divisors, so the lockers with these numbers would have their status changed an odd number of times (leaving them open in the end); all other numbers have an even number of divisors, so the lockers with these numbers would have their status changed an even number of times (leaving them shut in the end).

Petal Pushers

CLOCKWISE: 1. Pizazz 2. Horner 3. Cretin 4. Arrows 5. Foment 6. Cesium 7. Metric 8. Raisin 9. Sestet 10. Backed 11. Pentad 12. Huxley 13. Seller 14. Sailed 15. Ballet 16. Mutiny

COUNTERCLOCKWISE: 1. Pulley 2. Hitler 3. Cozied 4. Arrant 5. Frenzy 6. Cortez 7. Memoir 8. Resewn 9. Satins 10. Beirut 11. Passim 12. Hectic 13. Sunken 14. Sextet 15. Ballad 16. Mailed

840), and, if trailing zeros are needed, adds one or two.

In line 920, the length of SEG$ and PRICE$ are subtracted from 80 to determine the number of periods that must be added to fill out a line, and the STRING$ function used to produce the 80-character line:

10 rolls Tri-X at an exposure index of 800 . . . . $25.00

The resulting SEG$ is appended onto the end of PO$(NP), which stores the complete photo lab order information. PO$(NP) then has a pair of linefeeds tacked onto its end.

When control returns to the menu, additional choices may be entered, and these are also added onto PO$(NP). The linefeeds insure that each film or print component of the order will be printed on separate lines.

However, only 255 characters may be stored in a single string variable, or array element under Radio Shack's disk Basic. Every time 80 characters are added onto PO$(NP), a counter, C1, is incremented. When C1 = 4 (line 510), NP is boosted by 1, so that succeeding entries are deposited in the next element of the array PO$(n). Another counter, CU, is increased by 1 at this point, to keep track of the number of array elements taken up by a given lab order.

Listing the order data

Print out lab order. Because a lab order may be contained in several elements of an array, the client and project name, the date, and grand total appear only in the first of that particular series. The value of CU is used at the printout stage to tell the program to look at the first element of that particular series for the client and date data. If CU is greater than 1, a FOR-NEXT loop is used to LPRINT each of the elements of PO$(n) required in reverse order.

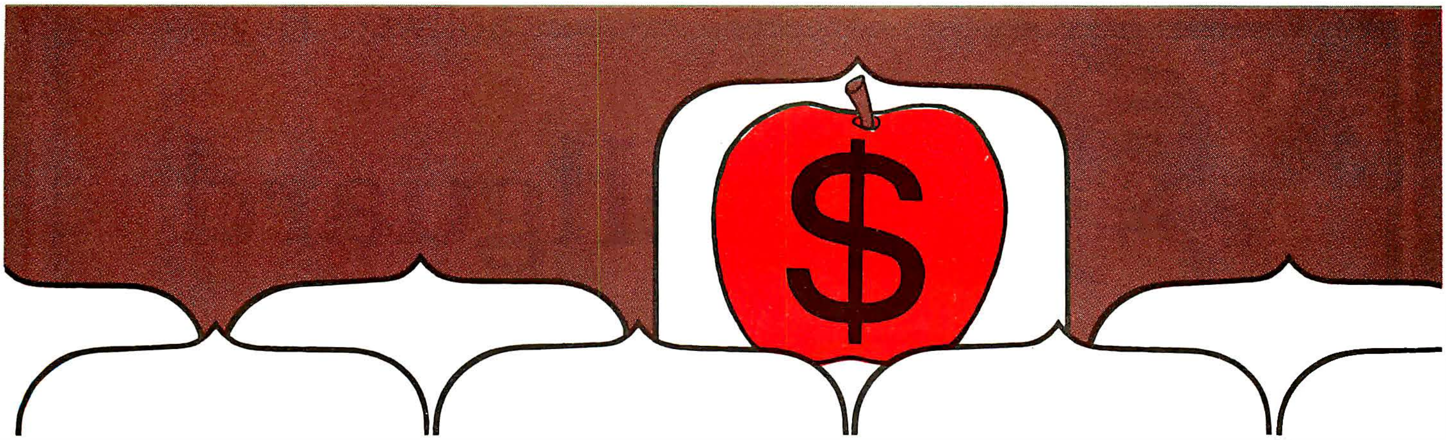
If negatives are being sent for printing, the additional message that cropping instructions are included on the negative sleeves is also LPRINTed. When AFLAG does not equal 1, indicating that the lab order data has not already been saved to disk, control goes to the disk output routine at lines 1180-1280.

Accessing existing lab orders. Sometimes, it will be necessary to order a printout of an existing lab order for recordkeeping and tracing purposes. This is provided for in a module at lines 230-360. All existing projects and the dates they were sent for processing are listed, 12 at a time, and the one for which a hardcopy is desired is input. A FOR-NEXT loop at lines 330-350 compares the name input with each project name in the file and, when a match is found, sends control to the printout routine.

In line 30, NME$ is defined as "YOUR COMPANY NAME GOES HERE", but is not implemented in the program. You should substitute the name of your choice, and insert an LPRINT NME$ statement at the appropriate location in the photo lab order.

Because I order 8 by 10 prints exclusively in my work, these are the only sized included in the processing menu. Similarly, the other items used encompass the bulk of my photo lab order choices. By adding DATA items, and expanding the lab pricelist routine, it should be easy to adapt the program to your own list of processing requirements. □

Program on page 154



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CPA3 ACCOUNTS PAYABLE

Prints checks to vendors and non-vendors on available pre-printed checks or on plain paper. Each check stub shows invoice(s) paid, discounts taken, net paid, Prints Purchases and Cash Disbursement Journals. Customized journals. Allows simulation of manual special journal entries. Prints Aging Report to 150 days, vendor list and labels and even a Cash Requirements Report. Posts to General Ledger.

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Spellguard

Proofreader for CP/M Documents

by Alan R. Miller

Microcomputers are becoming more useful as available software continues to improve. Microsoft unquestionably set the standard with its Basic and Fortran compilers. MicroPro broadened the horizon by providing an editor called Word-Master and a text formatter named WordStar. With these packages, a microcomputer can approach the speed and performance of large mainframe computers.

One of the features commonly found on large computers is a proofreading program. Until recently, such programs were not available to micro users. Now, Innovative Software Applications, Menlo Park, CA, has developed a program called Spellguard for just this purpose. It is not an editor or a text formatter program; it is used to proofread documents prepared by other means.

The program is provided on common, floppy-disk formats. A version 1.4 or 2 CP/M system, with a minimum memory size of 32K bytes, is necessary. Several files are provided on the diskette. One of these is the main program, which can perform various tasks. There will also be one or two dictionaries containing 10,000 to 20,000 words.

A document is first prepared with a CP/M editor such as: WordStar, Word-Master, Magic Wand, ED or Electric Pencil. After it's written, it's analyzed by the program prior to the generation of the final, formatted copy. Each word in the document is looked up in a selected dictionary. This proofreading phase is relatively rapid. A 10,000-word file can be examined in less than a minute.

Several numbers are displayed on the console during the proofreading step. These include the total number of words encountered so far and how many of these are unique, that is, distinctly different. The number of different words that could not be found in the dictionary is also shown. A word is considered to be terminated by a space or other nonalphabetic character. Thus, the appearance of fit3 in a computer program will be interpreted as the word fit.

The second phase begins. Words not found in the dictionary are presented individually and alphabetically to the user. There must be an exact match. Thus, the singular word program is different from the plural word programs. As each word is displayed, the user selects one of three options: (1) the correctly spelled word is to be added to the dictionary; (2) the misspelled word is to be marked; or (3) the word is ignored.

Option 1 must be used with care. A word entered into the dictionary can only be removed with difficulty. Furthermore, if you have regularly been misspelling a particular word, you are likely to enter this misspelled version into the dictionary. Option 3 can be used for special words that are not likely to be encountered again. This helps keep the dictionary from growing too large.

As the disposition of each mismatched word is selected, it is shifted to the left side of the video screen. The next word appears on the right side of the screen. If an incorrect option was inadvertently chosen for the prior word, the process can be reversed. Pressing the letter R retrieves the previous word. The correct disposition can be selected. This phase continues until all mismatched words have been displayed.

New words, if any, are added to the dictionary during the next phase. If there are only a few such words, they are added to the end of the file. If there are many new words, the dictionary is automatically reorganized. This reorganization step takes several minutes. During this time, the user is cautioned not to reset the computer. The new total number of words in the dictionary is reported on the video screen. The number of new words that can be added is limited only by the available size on the disk.

Dictionary reorganization is very cleverly implemented. A straightforward method would be to create an entirely new dictionary in a separate disk file. Entries, found by scanning the old dictionary, would be moved to the new one. Unfortunately, while this method can be easily programmmed, it requires an unreasonable amount of disk space. In fact, the two directories will require about twice the space of the original dictionary. But a 20,000-word dictionary requires about 100K bytes of disk space. Consequently, this technique cannot be implemented on single-density 8-in floppies or on double-density 5-in floppies, because there is not that much room. The actual method used to reorganize the dictionary requires no additional disk space beyond the amount needed by the dictionary itself. It is done on a sector-by-sector basis.

The format of the dictionary is unusual. It begins with the 1A hex end-of-file mark and, thus, cannot be displayed on the console with the CP/M Type command. There is a Spellguard command, however, that can be used to display any part of the dictionary on the console or on the list device. If the dictionary is inspected with the CP/M program Dump, it will be seen that the entries following the end-of-file mark are present in ASCII. Adjacent entries are separated by binary zeros.

The incorrect words in the original document are especially marked during the final phase of operation. A copy of the original text file is generated, but the final letter of each misspelled word is flagged with a special character. This character is initially chosen to be an open bracket [, but it can be changed to something else. The chosen character must be compatible with your text formatter. The square bracket is suitable for ail of the common text formatters. Unfortunately, the left bracket is used to indicate an array subscript in Pascal and Algol source programs.

During this phase, the filetype of the original file is changed to BAK and the new file, containing the flagged words, is given the original filename. This concludes the operation.

The misspelled words are corrected with the regular text editor during the next step. The global-search routine is used to locate the flagged words. With WordStar, the command: <QF[will find the first misspelled word. After it is corrected, a command of Control-L will locate the next word.

When all flagged words have been corrected, it would be wise to analyze the document again. This will insure that the corrections were properly made. Perhaps a corrected form of an initially misspelled word should also be added to the dictionary.

This reviewer has just completed the manuscript for a book with text written by WordStar. The Pascal programs were generated with Word-Master, then incorporated directly into the manuscript using WordStar's <KR command.

Computer jargon added

Each chapter was analyzed by Spellguard. The result was rather interesting. The Spellguard dictionary is quite general and so it contains such words as ashtray, kindergarten and icebox, that are unlikely to appear in a Pascal programming book. On the other hand, a number of commonly used words such as compiler, components, introduction, optional, prior and transistor were conspicuously absent.

About 100 words were added to the dictionary as each of the first few chapters were analyzed. The number of new words dropped to about 10 for subsequent chapters.

The keyboard on my video terminal apparently needs attention since letters are frequently omitted from the middle of words. I find it very difficult to locate such errors, but Spellguard readily found them.

I also discovered a second problem. Apparently, I have been regularly misspelling the words matrices, indices and accommodate. Also I have four ways to spell the word asymptotic. I was totally unaware of this idiosyncrasy. Spellguard easily pointed out the problem.

Humbled by the success of the program, I then gave it the manuscripts from my previous *Interface Age* articles. Again, the result was similar. Several dozen new words were added to the dictionary and several misspelled words were located.

As a final test, Spellguard was given the manuscript from my first book. This version had been corrected after several (human) proofreaders thoroughly reviewed it. I therefore expected it to be relatively error free. Not so. Spellguard was able to discover numerous typographical errors mostly caused by missing letters.

The user interaction is superb. It is on a level with the best of Lifeboat Associates' software. The user is presented with a series of options including a help section. The user responses are single letters without a carriage return. Each letter has been chosen to suggest the desired course of action:

A	ADD to dictionary . . .
M	Mark incorrect word . . .
I	IGNORE word . . .
H	HELP . . .

There are two minor problems with the version of Spellguard that was available to review. Incorrectly spelled words can very easily be incorporated into the dictionary. Once incorrect words are entered, they cannot be readily removed.

Spellguard is useless to someone who cannot spell. Each time Spellguard finds a word that is not in its dictionary, the user must decide whether it is a new word or whether it is a misspelled word. Nevertheless, professional writers who are not expert typists (but can spell), will find the program to be invaluable. It is especially useful for finding missing and transposed letters. □

COMPUTER SYSTEMS INC.

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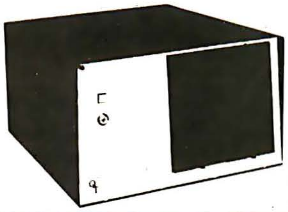
Lawndale, California 90260
(213) 970-0952



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QT SYSTEM +

The QT System+ is designed for both businessmen and engineers in accordance with the latest IEEE standards. Among other functions, it can be used for accounting and word processing, as well as a variety of scientific applications. The system will soon be available with MP/M® to allow multiuser, multi-tasking operations. This means, for example, that an engineer could be working on scientific applications in the lab while an accountant is writing payroll checks in the office. QT also offers a full line of business and applications software, ranging from a business package to word processing.

Technical specifications: 4MHz Z-80A CPU • Dbl-sided, dbl-den. 5¼" & 8" floppy disk controller (handles both drives simultaneously) • Two 8" dbl-den., sgl. or dual sided disk drives, expandable to 4 floppy drives • CP/M® 2.2 included • 64K RAM • Comes complete in single mainframe • EPROM/ROM in any combination to 8K • Two RS232C serial I/O ports • Two parallel I/O parts • Hard disk compatible • Real time clock • Std. 2K monitor program & disk routines included on ROM • Power-on/Reset jump to monitor program • 2716 (5V) EPROM programmer (software incl. on monitor ROM)(ext. 25.5V @ 50ma req.) • Uses Z-80A CPU vectored interrupts • Assembled, tested & burned • Documentation included.

With Terminal 920C Add $900.00

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SYS+SS Computer System with 8" Single Sided Drives (801R) without Terminal

A&T (6 slot)	$3595.00
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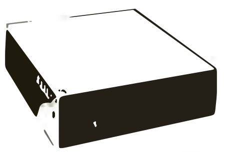
DISK DRIVE PRODUCTS

QT DISK PACKAGES



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5¼" or 8" disk controller with free CP/M 2.2

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4 MHz RAM board expandable from 16K to 256K

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SDS-RAM264K 64K kit	$409.95
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Bare Board ..... $35.00 each
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SEALS ELECTRONICS 32K STATIC BD

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4116 200 ns	8 for $32.00
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2732 (5V)	$40.00
2114L 300 ns	8 for $36.00
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TMS 9900 JL	$29.95

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Features: 1K RAM (which can be located at any 1K boundary) plus one each Parallel and Serial I/O parts on board • Power on jump to on-board EPROM (2708 or 2716) • EPROM addressable on any 1K or 2K boundary • Full 64K use of RAM allowed in shadow mode • Programmable Baud rate selection, 110-9600 • 2 or 4MHz switch selectable • DMA capability allows MWRT signal generation on CPU board or elsewhere in system under DMA logic or front panel control • Two programmable timers available for use by programs run with the SBC+2/4 (timer output and controls available at parallel I/O connector; parallel input and output ports available for use on CPU board).

Bare Board	$ 60.00
Kit	$190.00
A&T	$295.00

Z+80 CPU

Features: Power on jump to on-board EPROM (2708, 2716 or 2732) • EPROM addressed on any 1K or 2K boundary; also shadow mode allows full 64K use of RAM • On-board USART for Synchronous or Asynchronous RS-232 Operation (Serial I/O port) • Programmable Baud rate selection, 110-9600 • Switch selectable 2 or 4 MHz • MWRITE signal generated if used without front panel • Front panel compatible.

Bare Board	$ 50.00
Kit	$150.00
A&T	$210.00

RAM+16

Features: S-100, 16K x 8 bit static RAM • 2 or 4 MHz • Uses 2114 1K x 4 static RAM chip • 4K step addressable • 1K increment memory protection, from bottom board address up or top down • Deactivates up to six 1K board segments to create "holes" for other devices • DIP switch selectable wait states • Phantom line DIP switch • Eight bank select lines expandable to ½ million byte system • Data, address and control lines all input buffered • Ignores I/O commands at board address.

Bare Board	$ 35.00
4Mhz Kit	$190.00
4Mhz A&T	$225.00

RAM+ 65

•S-100, 16K x 8 bit static RAM •2 or 4MHz •Uses 2114L (300NS) CHIP •Addressable in 4K steps •Memory protection in 1K increments, from bottom board address up or top down • May deactivate up to six 1K segments of board to create "holes" for other devices • DIP switch selectable wait states • Phantom line DIP switch •Features bank selection by I/O instruction using any one of 256 DIP switch-selectable codes—allows up to 256 software-controlled memory banks.

Bare Board	$ 35.00
4MHz Kit	$210.00
4MHz A&T	$250.00

EXPANDABLE+ REV II DYNAMIC MEMORY BOARD

NEW

Features: Runs at 4MHz • 3242 refresh controller with delay line • Four layer PC board insures quiet operation • Supports 16K, 32K, 48K or 64K of memory • 24 IEEE-specified address lines • Optional M1 wait state allows error free operation with faster processors • Optional Phantom disable • Uses Z-80 or on-board refresh signal • Bank on/off signal selected by industry standard I/O port 40 (Hex) • Convenient DIP switch selection of data bus bits determines bank in use • 3 watts low power consumption • Convenient LED indication of bank in use.

Definitely works with Cromemco and North Star

Bare Board . . . $ 75.00

KIT		A&T	
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16K	$280.00	32K	$450.00
32K	$360.00	48K	$575.00
48K	$480.00	64K	$675.00
64K	$525.00		

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Features: Date/Month/Year • Day of week • 24 hour time or 12 hour (a.m./p.m.) selectable • Leap year (perpetual calendar) • 4 interval interrupt timer; 1024Hz (approx. 1 millisec), 1 sec., 1 min., 1 hr. • On-board battery backup • Simple time and date setting • Simple software interface • Time advance protection while reading.

Battery Included

S-100 or Apple		TRS-80	
A&T	$150.00	A&T Only	$150.00
Kit	$100.00		
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- **4 Port Serial Bd (APR)**
- **E-PROM Programmer (MAY)**
- **Floppy Disk Controller (JUN)**
- **Hard Disk Controller (JUN)**
- **Color Video Bd (AUG)**

I/O+ INDUSTRIAL GRADE I/O BD

Has two serial Sync/Async ports (RS-232, current loop or TTL) with individual Xtal controlled programmable baudrate generators • Four 8-bit Parallel ports; one latched input port and other three can be programmed in combinations of input, output or bidirectional • Also, has three 16-bit Programmable Timers and an 8-level Programmable Interrupt Controller w/Auto restart (8080 / Z80) • Other features include; on-board clock divisor for timers, completely socketed, wire wrap posts for easy port configuration plus more.

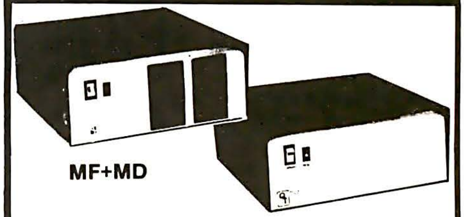
Bare Board	$ 70.00
Kit	$200.00
A&T	$375.00

SILENCE+ MOTHERBOARDS

These motherboards are among the quietest on the market. A unique grounding matrix — with each line completely surrounded by ground shielding — eliminates need for termination and gives high crosstalk rejection • They're customer-proven, without crosstalk sometimes operating at 14MHz • A LED power indicator helps eliminate zapped circuits • IEEE S-100 std. compatible, available with 6, 8, 12, 18 or 22 slots • (The 22 slot board fits Imsai chassis and has slot for front panel.)

6 Slot		12 Slot	
Bare Board	$ 25.00	Bare Board	$ 30.00
Kit	$ 40.00	Kit	$ 70.00
A&T	$ 50.00	A&T	$ 90.00
8 Slot		**18 Slot**	
Bare Board	$ 27.00	Bare Board	$ 50.00
Kit	$ 55.00	Kit	$100.00
A&T	$ 70.00	A&T	$140.00

QT MAINFRAMES



MF+MD

MF+

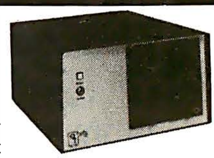
5¼" Disk Mainframe with 25A Pwr Sup

MF+MD12	(12 slot M/B)	$500.00
MF+MD8	(8 slot M/B)	$475.00
MF+MD6	(6 slot M/B)	$450.00
MF+MD	w/o M/B	$400.00

Q.T. Mainframe

MF+12	(12 slot M/B)	$450.00
MF+18	(18 slot M/B)	$500.00
MF+22	(22 slot M/B)	$600.00

MAINFRAME+ DISK DRIVE



Includes cabinet, 25 amp power supply, IEEE S-100 compatible 6, 8 or 12 slot motherboard and dual 8" disk drive with disk drive power supply.

MF+DD6	$625.00
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Accepts one 8" disk drive (Shugart, Remex, PerSci, Siemens, etc.) • Fan cooled, with data cable and AC line filter to eliminate EMI • Operates from 100-125VAC/200-250VAC at 50-60Hz • Disk drive NOT included.

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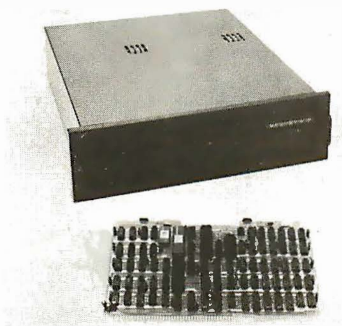
CIRCLE INQUIRY NO. 115

NEW PRODUCTS

Floppy disk controller for Multibus systems is capable of reading from and writing to 8-in. diskettes in both single and double density. The MM-SBC-80F controller is compatible with Intel's iSBC-201 and iSBC-202 controllers. Available with or without drives, the unit satisfies Intel controller conventions for reading and writing to diskettes, but performs the operation in a more flexible manner. The I/O parameter block (IOPB) from the system master is accepted and processed by a resident 8085 microprocessor and data for

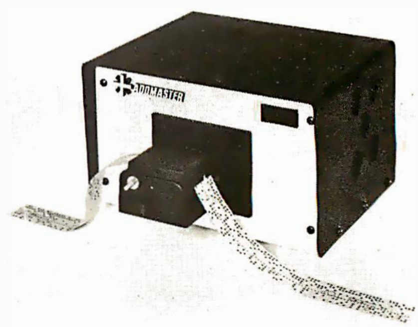


transfer is buffered in resident RAM. An 8257 DMA controller performs the data transfer to/from system memory. Since this device can be interrupted, the MM-SBC-80F need not have the highest priority in the systems as do the iSBC-201/202. If the data transfer needs to be interrupted by another device, the controller remembers where it left off and later completes the transfer when it gets control of the bus again. Micromation, 1620 Montgomery St., San Francisco, CA 94111.
CIRCLE INQUIRY NO. 250

Minicomputer system, model 400, is designed to operate during electrical power shortages and outages. When line power is interrupted, the system will operate for 20 minutes at full capacity to complete tasks. Special optional power conservation measures can extend limited operation for up to two hours. Brown-out conditions do not affect its operation since the system will

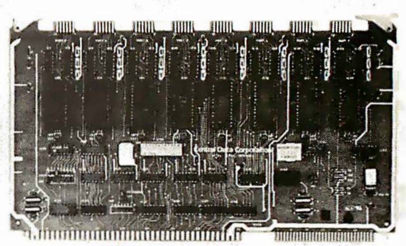
run efficiently from 73 to 300 volts without any setting changes. Frequency may vary from 40 to 400 cycles. The system will automatically power down when the battery level reaches a pre-established level. Both memory and disk capacity have been expanded to over eight times the capacity of the original 400 system. Price: $28,700. The basic system includes 16K, 16 bit word RAM, 30M-byte disk, plus a keyboard, CRT display, status panel, I/O computer, arithmetic generator, realtime clock, direct phone modem, and standard operating software. Computer Talk, Inc., P.O. Box 148, Morrison, CO 80465, (303) 697-5485.
CIRCLE INQUIRY NO. 251

Stand-alone paper tape reader, model 605, reads at 150 cps, has a parallel TTL output and is bi-directional. It stops on character, is self-contained and has automatic taut-tape sensing. The reader has



5 volt AC and 24 volt DC output power available and an optional internal clock. The desk-top model is priced at $495 for one unit. Addmaster Corp., 416 Junipero Serra Dr., San Gabriel, CA 91776, (213) 285-1121.
CIRCLE INQUIRY NO. 252

Multibus octal serial board allows up to eight EIA RS-232 interfaces to be hooked to any Multibus system. Each interface is controlled by a Signetics 2651 USART which has an on-chip baud rate generator, enabling the user to set each USART at a different



speed. The board allows full 16-bit dip-switch addressing and straps select a full range of interrupt capabilities. Available baud rates range from 50 to 19,200. Central Data Corp., 713 Edgebrook Dr., Champaign, IL 61820, (217) 359-8010.
CIRCLE INQUIRY NO. 253

Inventory management system for small business carries over 1,000 items, 17 fields of information for each item. On-line item add, delete, change, and display. Direct on-line sales/returns and orders/receipts entry provide automatic on-hand and sales history adjustment. Reports include: status, sales history, reorder, physical reconciliation and user-selectable summarization. Functions are are menu driven with full-page entry, on-

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FILE BOX

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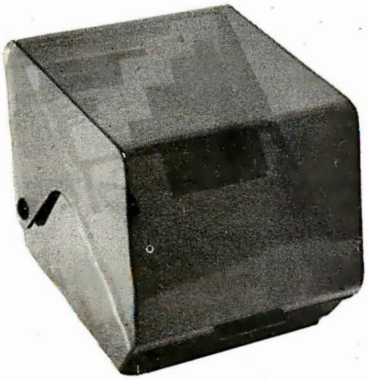

$24.95 for 5¼" disks

$29.95 . . . for 8" disks

MTC brings you the ULTIMATE diskette storage system, at an affordable price. Storing 50 to 60 diskettes, this durable, smoke-colored acrylic unit provides easy access through the use of index dividers and adjustable tabs. Unique lid design provides dust-free protection and doubles as a carrying handle.

'RINGS' & THINGS

Help prevent data loss and media damage due to improper diskette centering and rotation with the FLOPPY SAVER™ reinforcing hub ring kit. 7-mil mylar rings install in seconds. Kit is complete with centering tool, pressure ring, 25 adhesive backed hub rings and instructions.

HUB RING KIT for 5¼" disks $10.95
HUB RING KIT for 8" disks $12.95
REFILLS (50 Hub Rings) . . . . $ 5.95

Protect your expensive disk drives and your valuable diskettes with our diskette drive head cleaning kit. The kit, consisting of a pair of special "diskettes", cleaning solution and instructions, can be used for 52 cleanings. Removes contamination from recording surfaces in seconds without harming drives.

CLEANING KIT for 5¼" drives . . . $24.95

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An economical form of storage for 10 to 15 diskettes, and is suitable for your bookshelf! Case opens into a vertical holder for easy access.

5¼-inch diskette case $3.50
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These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

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DISKETTES

The Beautiful Floppy with the Magnetic Personality™

Thousands of people have switched to this low-cost alternative. These quality diskettes are packaged in a plain white box . . . no fancy printing, fancy names or fancy labels, not even our own (labels cost money). Trust us.

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10 boxes of 10 . . . . (each box) $21.50

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Introducing MTC's premium generic diskette. Single-Sided, Soft-Sectored, DOUBLE-DENSITY, 5¼-inch diskettes with reinforcing HUB-RINGS. Individually 100% ERROR-FREE certified. Invest in GOLD!

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Seven data-shielding improvements mean greater durability and longer data life. These individually, 100% error-free certified diskettes feature thicker oxide coating, longer-lasting lubricant, improved liner, superior polishing and more! Meets or exceeds IBM, Shugart, ANSI, ECMA and ISO standards. Reinforcing HUB RINGS help prevent data loss and media damage, reducing errors.

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NEWDOS/80 by Apparat $149.95
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BOOKS

TRS-80™ DISK AND OTHER MYSTERIES . . $19.95
MICROSOFT™ BASIC DECODED $29.95
1001 THINGS TO DO WITH YOUR PERSONAL COMPUTER . . . . $ 7.95

Let Your TRS-80™ Test Itself With

THE FLOPPY DOCTOR & MEMORY DIAGNOSTIC

by THE MICRO CLINIC

A complete checkup for your Model I. THE FLOPPY DOCTOR completely checks every sector of 35- or 40-track disk drives. Tests motor speed, head positioning, controller functions, status bits and provides complete error logging. THE MEMORY DIAGNOSTIC checks for proper write/read, refresh, executability and exclusivity of all address locations. Includes both diagnostics and complete instruction manual.

SYSTEM DIAGNOSTICS $19.95

An improved version of the SYSTEM DIAGNOSTICS above. Designed for single or double density, 35-, 40-, 77-, or 80-track disk drives. Includes new and modified tests. Features THE FLOPPY DOCTOR, Version 3.0.

SYSTEM DIAGNOSTICS-V3 . . $24.95

CALL FOR INFORMATION ON OTHER PRODUCTS

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PRICES IN EFFECT June 1, 1981 THRU June 30, 1981.
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8106

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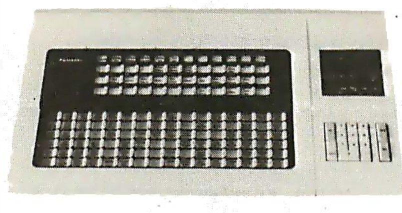
- $3.00 EXTRA for C.O.D.
- Ohio residents add 6½% sales tax.

screen instructions, full error detection and recovery, and a 200-page document. Requires Heath/Zenith H8/H19 or H89 with HDOS operating system, Microsoft Basic, 48K RAM, two 5¼-in. disk drives, and

a 132-column line printer. Total system: $200. Documentation: $20. XtraSoft, Inc., P.O. Box 91063, Louisville, KY 40291, (502) 499-1533.
CIRCLE INQUIRY NO. 254

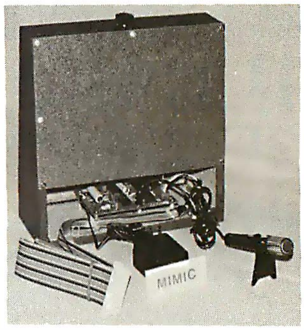
Disk drive assembly with TRS-80 model III compatibility enables users to add 40 or 80 track 5¼-in. disk drives either internally or externally. The internal drive assembly includes one mini-disk drive, power supply, controller, and mounting hardware, and sells for $599. An additional internal drive is $265. Eighty track drives are available, as is the extra 16K memory required to add drives to a 16K model III. VR Data Corp., 777 Henderson Blvd., Folcroft, PA 19032, (800) 345-8102.
CIRCLE INQUIRY NO. 255

One-touch key-mat simplifies the operation of various digital and analogue devices. The man-machine interface is approximately the size of a standard keyboard. The key-mat may be utilized to improve data processing control applications, such as data entry and automated equipment control. It consists of one switch panel and one removable cartridge mechanism. The switch panel features 96 variable keys, 24 page select keys, 12 function keys and 48 fixed indicators with status



lights. With 96 customized legends per page and 24 pages per cartridge, the interface has 2,304 legends for each cartridge. When employing the maximum 15 interchangeable cartridges, the unit makes 34,560 legends available to any application. Any page is accessible to the operator in less than one second. Easy entry of numeric data is assured by the 10 key numeric pad. System function keys are also provided. Eli Spater, Panasonic Industrial Sales Div., One Panasonic Way, Secaucus, NJ 07094, (201) 348-5336.
CIRCLE INQUIRY NO. 256

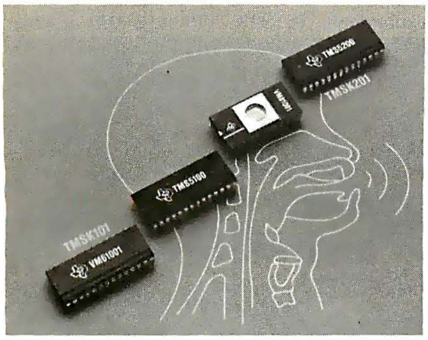
Speech processor converts speech signals to a digital bit stream for computer storage or automatic speech recognition purposes. The Mimic also reconstructs the digital speech representations to analog form for reproduction through an available speaker. Since both the speech encoder (input) and decoder (output) functions are located in a single unit, the system can also be used for



speech communications applications without a computer. The speech data rate is user selectable, with highly intelligible speech reproduced at rates from 9600 to 20,000 bits per second. Extremely low data rate speech can also be achieved by subsequent processing of the bit stream. Several versions are available. Mimic Electronics, P.O. Box 921, Acton, MA 01720.
CIRCLE INQUIRY NO. 257

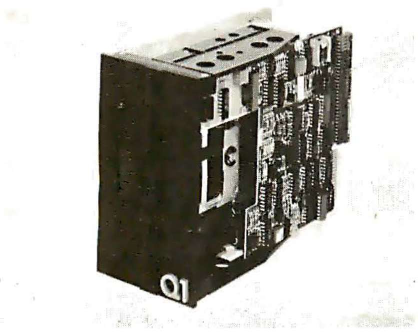
Winchester disk systems fill the gap between 1M-byte and 10M-byte end-user disk add-ons. The 5M-byte drives interface to a wide variety of microcomputers—TRS-80 models I and II, Apple II and III, Altos, Alpha Micro, Intertec Superbrain, NEC PC-8001, and Ontel, as well as all S-100 bus-based computers running under CP/M or Oasis. A system package consists of the drive itself, which is highly compact—exactly the same size as a 5¼-in. floppy; an intelligent, Z80-based controller card; an intelligent interface card with firmware and software appropriate to the given model of microcomputer; and a complete power supply adaptable to line standards worldwide. Performance specifications include an unformatted data capacity of 6.9M bytes (5.8M bytes formatted); a minimum seek time of 10 mS; and average seek and latency times of 50 and 8.3 mS, respectively. Power consumption is 120 W. Corvus Systems, 2029 O'Toole Ave., San Jose, CA 95131, (408) 946-7700.
CIRCLE INQUIRY NO. 258

Synthesis evaluation kits provide an inexpensive means of evaluating the TMS5100 speech-synthesis chip for low-cost speech applications and the TMS5200 chip for higher-performance speech application. Both kits use TI's linear predictive coding (LPC) technique, which produces high-quality, natural-sounding synthetic speech. The TMS5100-based TMSK101 kit and the TMS5200-based TMSK201 kit permit the designer to evaluate speech components in the initial design of new products or to upgrade existing products by incorporating speech capability. The TMSK101 provides speech-synthesis evaluation capability for low-cost applications based on 4-bit microprocessors or single-chip microcomputers. The kit includes a TMS5100 voice-synthesis processor chip and a TMS6100 ROM, programmed with a sample set of 204 LPC analysis-synthesis words. The TMSK201 kit permits the designer to evaluate TI's voice-synthesis capability on microprocessor-based systems (8 or 16-bit) and mini-computers. The kit Includes the TMS5200 voice-synthesis processor and a TMS2532 EPROM, programmed with a set of 35 Items (32 words, 2 phrases, and one tone), each



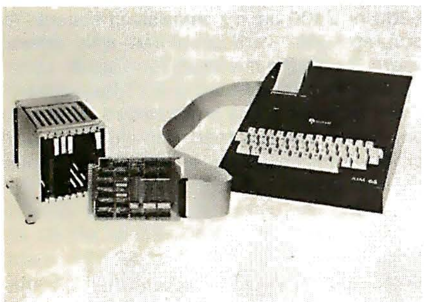
individually encoded using LPC. Texas Instruments, Inquiry Answering Service, (Attn: TMSK101/201), Box 225012, M/S 308, Dallas, TX 75265.
CIRCLE INQUIRY NO. 259

Minifloppy quad-density disk drive, model 301, has a 1M-byte capacity on a double-sided double-density 5¼-In. diskette. It Is a compact disk memory device designed for random access data storage, data entry, and data output applications. A virtually frictionless band positioner provides 5 mS access time and extremely accurate and reliable positioning. All electronics are packaged on



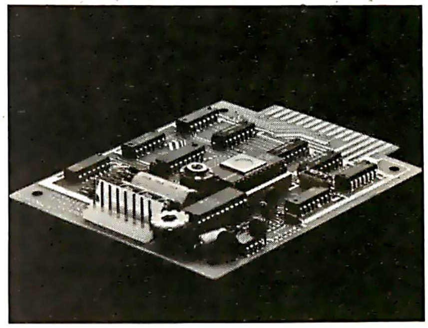
a single printed-circuit board, and Interface signals plug directly Into this board. Other features Include a head that Is centered between two parallel rods to eliminate radial positioning errors and a clutch mechanism that provices very accurate diskette positioning and diskette life. Q1 Corp., 125 Ricefield Ln., Hauppauge, NY 11787, (516) 543-7800.
CIRCLE INQUIRY NO. 260

STD bus expansion for the Aim 65 computer Is supplied by an Interface device. By directly substituting for the STD bus



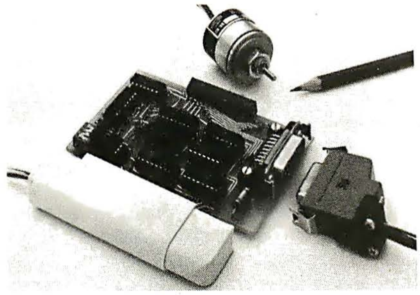
processor car, STD-Mate allows full speed use of cards by the Aim 65 both for expansion of existing Aim 65 systems and development/debugging of stand-alone STD bus systems. Price: $140. Forethought Products, 87070 Dukhobar Rd., Eugene, OR 97402, (503) 485-8575.
CIRCLE INQUIRY NO. 261

Phonetic voice synthesizer In the form of a sample evaluation kit Is for system designers who wish to Incorporate unlimited speech capability Into their products or services. The Votrax Speech PAC (Phoneme Access Controller) Is a small self-contained circuit board consisting of a CMOS silicon speech chip, external controller, memory and on-board audio amplifier. The unit comes pre-programmed with 250 stored words and phrases that can be Intermixed with phoneme sequences to provide unlimited vocabulary.



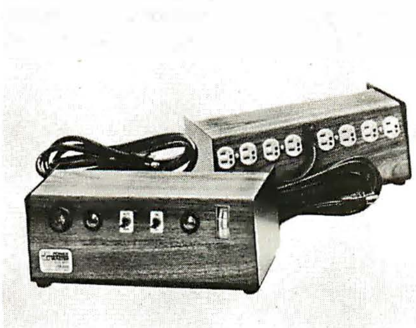
Price: $275. Votrax, 500 Stephenson Hwy., Troy, MI 48081, (800) 521-1350.
CIRCLE INQUIRY NO. 262

Shaft position encoder with Pet interface, the CO30C, communicates with mechanical systems in the outside world. It will give an accurate digital shaft position signal by



resolving 360° of mechanical rotation into 256 8-bit words. To avoid the possibility of untrue readings being made, a special control system code, Gray, is used. The sequence of binary numbers in the Gray code are arranged in such a way, that for each increment of rotation, only one of the 8 bits changes state. An interface/decoder board is supplied, which latches the Gray code output, converts it to binary and enables the code to be fed into a Pet computer via the user port. A wide variety of applications are possible in the field of position control and mechanical data logging. Cetronic Limited, Hoddesdon Rd., Stanstead Abbotts, Ware, Herts SG12 8EJ, England.
CIRCLE INQUIRY NO. 263

Line monitor power conditioners, Power Master, reduce electrical pollution coming through electrical power lines and branch circuits to solid state electronic equipment that is sensitive to voltage spikes and electrical noise. Equipment that can be protected includes minicomputers, word processors,

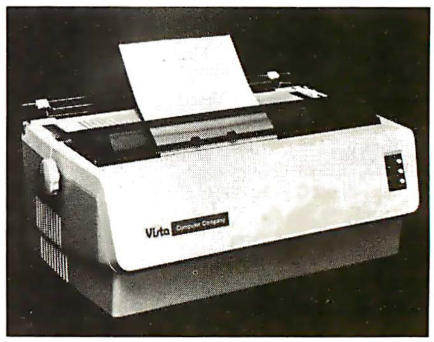


electronic instruments, photocopiers, cash registers, personal computers, automatic bank tellers—any electronic equipment with semiconductors that are sensitive to voltage spikes and electrical noise. SGL Waber Electric, 300 Harvard Ave., Westville, NJ 08093, (609) 456-5400.
CIRCLE INQUIRY NO. 264

Disk based system expander, model EXP-100 for the PMC-80, provides 32K memory expansion, mini-floppy disk interface for four drives, Centronics parallel printer interface, RS-232C interface and an S-100 bus to provide additional interface capabilities. Now the computer is capable of a number of configurations ranging from a simple low cost level II tape based system to a fully implemented word processing or business system utilizing the same software as was developed for the TRS-80 model I computers. It will run TRSDOS software as well as other operating systems designed for TRS-80 compatibility such as NEWDOS and VTOS. Software and operating systems are available from Radio Shack and many independent software companies. The S-100 bus permits the addition of 16K or 32K memory boards. The 16K memory board is expandable to 32K. Other S-100 boards

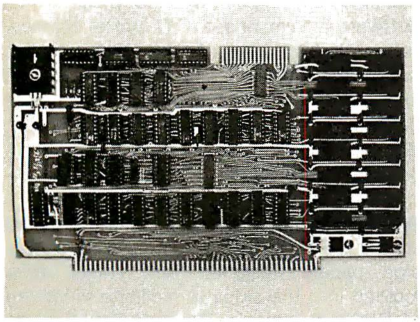
available from independent hardware vendors may be plugged into the expander to provide special features not readily available to TRS-80 users. Price of the expander is $410 without memory and an additional $245 for 16K or $295 for 32K memory board. Personal Micro Computers, 475 Ellis St., Mountain View, CA 94043, (415) 962-0220.
CIRCLE INQUIRY NO. 265

Daisy wheel printers, V300 series, include a 25 cps and 45 cps model. Both models are impact printers that produce letter quality printing using standard Diablo or Qume-type 96-character print wheels. Also, both printers can accommodate paper widths up to 15 inches and can print up to 136 columns. Character spacing is 1/120 in. minimum, and line space is 1/48 in. minimum. It is furnished complete and ready to use, and offers a wide variety of interface matching capabilities. It is available with either an industry standard Centronics parallel interface or RS232-C. Internal DIP switches can be used to select system operating parameters such as 7 or



8-bit character lengths, single or double stop bits, odd or even parity, and 300, 600, 1200 or 2400 baud transmission speeds. A programmable vertical format unit allows users to select a maximum form length up to 66 lines with top-of-form and VT justification. Front panel switches are provided for power on, select, and line feed, and indicators are provided for power on, on-line status, paper out and ribbon out. Either multistrike fabric or carbon film Diablo-type cartridge ribbons may be used. The V300-25 is priced at $1,895, and the V300-45 at $2,195. Vista Computer Co., 1317 Edinger Ave., Santa Ana, CA 92705, (714) 953-0523.
CIRCLE INQUIRY NO. 266

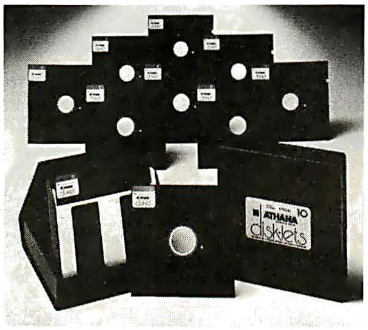
Dual-port dynamic RAM for general purpose and direct memory access applications, Top-Of-Board DMA port, allows memory access without disabling or interrupting the CPU, yielding higher effective operating



speeds. It can be software enabled or disabled and I/O bank selected. This allows the port to be dedicated to video I/O or disk systems while the CPU continues functioning with other memory. The versatility of the port makes it ideal for applications in high resolution graphics. The 32K memory features two independent 16K banks addressable on 16K boundaries. Software control versatility allows 16K, 32K, 48K, or 64K bank selection. Other features include: transparent refresh, S-100 and IEEE S-100 compatibility, and low power consumption (7 watts maximum). The dual-port RAM allows computer speeds otherwise unattainable in applications involving video I/O, disk through DMA port and multi-user time sharing systems. It also can be used as a standard 32K RAM. It is compatible with 8080, 8085, and 4MHz Z80 CPUs without wait states. Price: $579. B&G Computer Applications, 206 Brookside, Bryan, TX 77801.

CIRCLE INQUIRY NO. 267

Mini-magnetic disks at 5-in. diameter feature Center-Foil, a special reinforcement of the center hub of each disk that increases disk life plus a new jacket lubrication for long wear, reliable and repeatable performance. The Center-Foil insures stable and positive support of the disk and track alignment in the many drives used in word processing, personal computers, mini and micro computers and large business and industrial data



processing systems. Also incorporated is the Athana jacket lubrication. Custom design in the processing of the diskettes and lubricated jacket provides the end user maximum performance, reliability and long life. Models are available for all commonly used drives and applications. The diskettes come in a variety of packages including plastic cassettes, library cases and all with Athanacode, a color coordinated labeling system with color keyed index and reference identification. Athana, 2730 Monterey Ave., Torrance, CA 90503, (213) 775-3741.

CIRCLE INQUIRY NO. 266

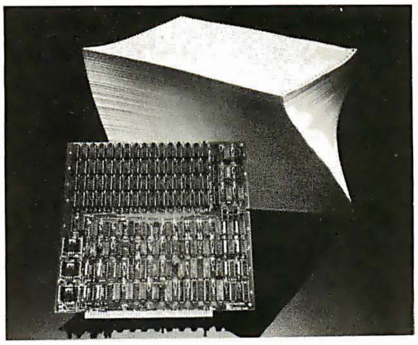
Analog I/O cards, DT2742 series, are compatible with any 8-bit STD-bus microcomputer, including STD-8085, STD-6800,

STD-6809 and STD-Z80. The product family is ideally suited for industrial process control systems, automated test equipment and machinery automation. Consisting of over 50 models of data acquisition function cards (including analog input A/D, analog output D/A, input channel expansion and DC-DC conversion cards), the series is the most comprehensive analog I/O product offering available from a single manufacturer for STD-bus users. The series offers three different analog input cards that implement the latest STD standard interrupt technique. They are the DT2742 for high level input applications, the DT2744 for low level input applications and the DT2745 for isolated low level input applications. Data Translation, 100 Locke Dr., Marlboro, MA 01752, (617) 481-3700.

CIRCLE INQUIRY NO. 269

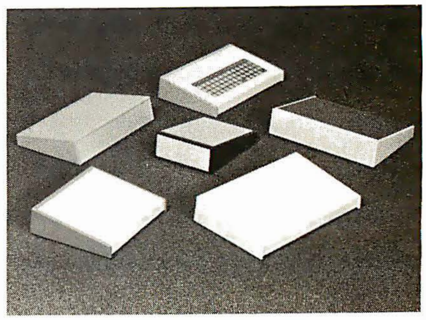
Improved firmware for the Malibu 160 printer uses the MPIO communications board. Contained within a 2708 EPROM, this enhanced printer driver not only provides a fully formed character set, but it also provides the ability to print continuous graphics (no blank columns between plotted points) and proportional characters. Includes sample graphics program. Price: $50. AArdvark Computer Solutions, San Diego, CA (714) 292-8338.
CIRCLE INQUIRY NO. 270

Dynamic RAM board featuring 128K bytes of RAM is now available from Pliceon Inc. Designated Superstore, the board has been optimized for Alpha Micro System computers and can be configured for either 8- or 16-bit processors. The boards are organized as 8 blocks of 16K bytes, divided into two 64K memory blocks controlled by individual I/O ports. When used with 8-bit processors,



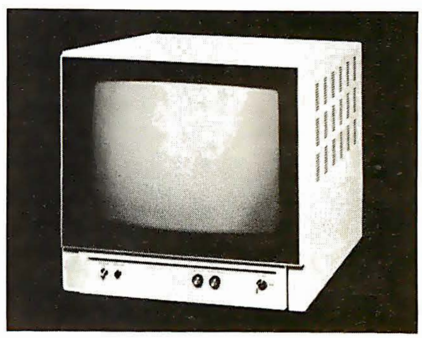
memory is organized as 128K by 8; with 16-bit processors, 64K by 16. Memory can be addressed in either of two ways. First, it can accept an extended 24-bit address, providing 16-megabyte address field. Or, it can be operated in bank select mode. Bank selection is made on 16K-byte boundaries. Each block can be individually enabled or disabled via simple switch settings or via software commands to I/O ports. Memory refresh is transparent to the CPU, reducing processor overhead. The memory is 3 MHz in either 8- or 16-bit systems. Access time is 330 ns. with a cycle time of 550 ns. Pliceon, 2350 Bering Dr., San Jose, CA 95112.
CIRCLE INQUIRY NO. 271

Wedge-shaped enclosure in three standard widths are composed of structural foam ABS side panels designed with unique tabs molded into the sides to facilitate mounting of PCBs or chassis. Control panels are of .080 aluminum. These units in widths of 8.5-in., 11.33-in or 16-in. are styled for keyboard consoles and instrument enclosures in flat, vertical or hanging modes with two or more surfaces for control mountings. Present plans call for the units to be shipped unassembled and painted either light precision tan, dark instrument tan or a combination



of the two colors. In 1-4 quantities the 16-in. wide unit costs approximately $40. Buckeye Stamping, 555 Marion Rd., Columbus, OH 43207, (614) 445-8433.
CIRCLE INQUIRY NO. 272

Medium resolution color monitor, Hitachi HM-1719, features a 19-in. convergence free screen actuated by a proprietary in-line gun. It provides a dot shadow mask of 0.47 pitch for increased clarity. The unit is designed for optimum performance at 512 by 512 pixels with a capability of 720(H) by 540(V) pixel resolution, which is best suited for computer graphics and process monitoring systems. It incorporates all the standard advancements pioneered by Hitachi including single PCB reliability, self convergent in-line gun, built-in high voltage regulator, video bandwidth of 25 MHz and long persistence phosphor. It is



available with NTSC/RGB input as one of the options. in addition to a 720 by 540 pixel resolution, no point on raster deviates from its proper position by more than 2% of raster

CIRCLE INQUIRY NO. 49

CIRCLE INQUIRY NO. 99

FUTRA COMPANY
P. O. BOX 4380
DEPARTMENT I
TORRANCE, CA 90510
(213) 370-2933

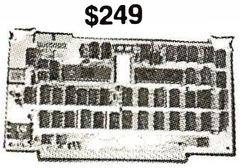
APPLE II PLUS COMPUTER
$929.00

- 48 K Apple II $1169.95
- Disk II W/Int 525.00
- Disk II 455.00
- Graphics Tablet 650.00
- Language System .. 395.00
- Parallel I/O 149.00
- H.S. Serial 159.00
- Centronics I/O 179.00
- Integer Firmwar 152.00
- Applesoft Firmw ... 152.00
- Communications ... 179.00
- Silentype 519.00
- Sup R Mod 29.00

VIDEX VIDEOTERM
80X24
Display
$279

9X12 Dot Matrix with upper and lower case and graphics capability. Use with Z80 business software on your Apple with the Z80 softcard

CCS S100 Z80 CPU
MODEL # 2810A
$249



On board serial I/O, on board 2K Rom monitor, power on jumps, full buffering of data and address lines. Assembled and tested.

MICROSOFT 16K RAMCARD
$159

Add 16K of Ram to your 48K apple. Use it to load Intger, Applesoft or MBASIC. Perfect for use with the Z80 softcard and MBASIC.

Research Science Inc Peachtree/40 Software

- General Ledger ... $219.00
- Accts Receivable ... 219.00
- Accts Payable 219.00
- Payroll 219.00
- Inventory 219.00
- Mailing List 219.00

NORTHSTAR HORIZON II

- 32 K Dual Density $2295.00
- 32K Quad Density . 2695.00
- 32 K Ram 450.00

ATARI 800 Personal Computer
16K Color

$785

Includes: Computer, basic cartridge, programming manual, operators manual, RF Mod/Switch.

CCS GPIB IEEE (488) Interface Card
MODEL # 7490
$249

Up to 15 interconnected controllers, talkers, and/or listeners can be interfaced. Controls counters, signal generators, digital Multimeters, color graphics ETC. Includes 3 FT cable.

CCS Apple Boards

- 7114A 12K Prom . $ 69.00
- 7424A Cal/Clock 99.00
- 7440A Prog Timer .. 89.00
- 7470A A/D Conv 95.00
- 7710A Serial Asyn . 129.00
- 7712A Serial Sync . 149.00
- 7720A Parallel 99.00
- 7728A Centronics ... 99.00
- 7811B Arith Proc .. 325.00

Mountain Computers Inc

- Romplus $169.00
- Romwriter 149.00
- Music System 495.00
- Apple Clock 249.00
- 100K Day Clock ... 309.00
- Introl System 244.00
- X/10 Control 179.00

ABT 10 Key Pad $115.00
ABT Bar Wand $175.00
DC Hayes Mod II $335.00

Personal Software for Apple II

- Visicalc $115.00
- CCA Data MGT 84.00
- Desk Top Plan 84.00

Hewlit Packard
HP85 Desk Top Computer
$2650

Self contained unit includes: Console. CRT. Printer. Tape Recorder. Comes with BASIC and is compatible with a variety of HP peripherals. Call or write for more information.

APPLE II Software

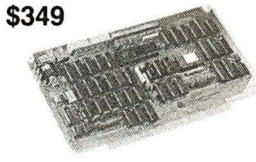
- Apple Adventure ... $22.00
- Apple Bowl 15.00
- Shell Games 27.00
- Dos 3.3 .... 55.00
- Dos Tool Kit 70.00
- Apple Fortran 175.00
- Apple Pilot 135.00
- Apple Plot 70.00
- The Cashier 199.00
- the Controller 550.00
- Apple Writer 59.00
- Tax Planner 109.00

MICROSOFT Z80 SOFTCARD
with MBasic and CP/M
$259

Now you can run Z80 or 8080 software on your apple. Includes card, Diskette, and manuals for the CP/M and MBASIC.

CCS S-100 FLOPPY DISK CONTROLLER
MODEL 2422A

$349



Supports up to four drives in any combination of 5" and 8" single- or double-sided drives, reads and writes soft-sectored diskettes formatted to the IBM• standards for single- and double-density diskettes, and come fully supported with Rom-Resident firmware and a copy of CP/M• 2.2 on disk.

MICROMATION S100 Z80 CPU With 64K Memory
$1895.00

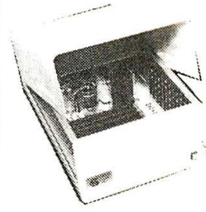
Use multiple CPU'S in a single S100 mainframe to provide each user with a dedicated CPU with 64K of memory.

TELEVIDEO CRT
MODEL # 920C
$895.00

Scotch Diskettes
Box of 10
Soft, 10 or 16 Sector

5 ¼" o, 10 or 16 .... $27.00
8" SS/SD o Sec. 31.00
SS/DD 0 Sec. 37.00
DS/DD No Sec. 44.00
5 ¼" Sleeves (10) $6.95

CCS S100 MAINFRAME
MODEL # 2200



$374

12 Slot Mother Board, Active Ternination, card guides, Power Supply with +&-16V & 4 AMPS and 8V & 20 AMPS, assembled and tested.

TARBELL S100 Z80 CPU
WITH MEMORY MANAGEMENT
$399.00

Dynamic mapping of logical to 1 megabyte of physical memory in 4K blocks. Designed to implement multiuser operating system such as the MP/M. Includes two serial I/O ports.

CCS Intergrated Computer
MODEL # 2210A
$1799

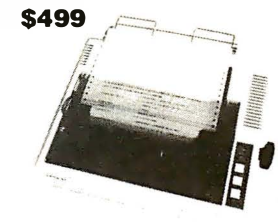
Mainframe, Z80 CPU, 64K memory, Disk Controller, RS232 cable, flopy disk cables, CP/M2.2. Integrated, tested and shipped with cables installed.

TARBELL S100 BOARDS

32K Static Ram
Floppy Disk Interface $649.00
Double Density $445.00

EPSON MX80 PRINTER
DOT MATRIX

$499



9X9 Dot Matrix printhead offers 40, 60, 80, 132 column with multiple Font capabilities. 50 million character life printhead can be replaced for less then $30. Requires parallel interface.

Epson/Apple MX80
Interface $99

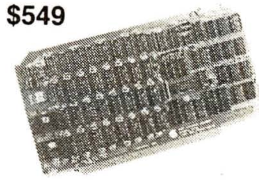
TEXAS Instrument Printer
MODEL # 820 R/O
$1795.00

CORVUS HARD DISK
10 MEGABYTE
$4350

Winchester drive for Apple or S100 computer. Please specify.

CCS S-100 64K Dynamic Ram
MODEL 2065A

$549



The 2065 provides your S-100 system with 64K of fast, reliable memory. Compatible with the IEEE proposed STD. Features 4116-Type dynamic rams, use with A 4 MHZ CPU.

CCS S-100 Boards

- 2032A 32K Static Memory $544.00
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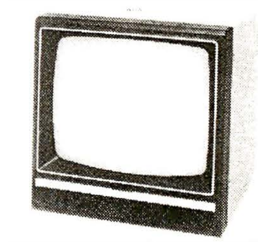

800 Line Resolution monitor with green phosphoric screen for pleasant viewing. Perfect for new 80 by 24 video boards.

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INCLUDES: Power Supply, Case, Cable, and Documentation.

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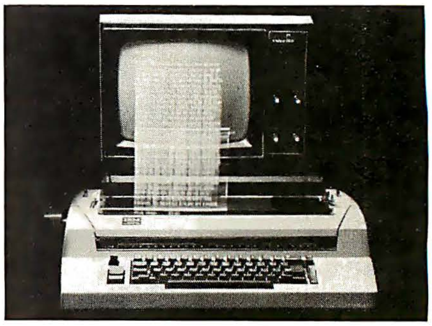
light. The raster light regulation is less than a 1% to 0% change at peak 6fL (Long persistence phosphor), 15fL (Normal phospor) luminance. Convergence does not deviate more than 0.028 in. (0.7mm) from picture height in a centrally located area bounded by a circle whose diameter is equal to the picture height. Elsewhere, the deviation does not exceed 0.060 in. (1.5mm). Hitachi America, 100 California St., San Francisco, CA 94111, (415) 981-7871.

CIRCLE INQUIRY NO. 273

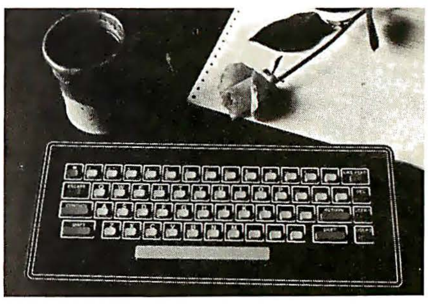
Typewriter interface for the IBM Electronic, ETI², makes it possible to connect a model 50, 60 or 75 to any computer having a standard parallel printer port. Beyond its almost universal compatibility, the unit features a Z80 microprocessor, 2000 bytes of RAM (text buffer), and total access to all of the typewriter's automatic functions (word and phrase underlining, tabbing, centering, etc.). Another important breakthrough is that the user can easily redefine the ASCII to IBM character and control codes translation. This feature will allow most word processing pro-



grams to access the typewriter's automatic functions, without modifying the word processing program. Medlamix, Box 67B57, Los Angeles, CA 90067, (213) 475-9949.

CIRCLE INQUIRY NO. 274

Keyboard panel, model MK 058-001, meets the new ergonometric standards (safety regulations) required by the European countries. The overall keyboard profile is approximately 0.400 in. allowing improved packaging capabilities for portable and desk top applications. It provides a crisp tactile feedback to the operator, which, coupled with the shorter 0.060 in. travel allows faster throughput. The patented 2.8-oz. force keyswitch construction provides hysteresis that eliminates troublesome keyswitch teasing. And all



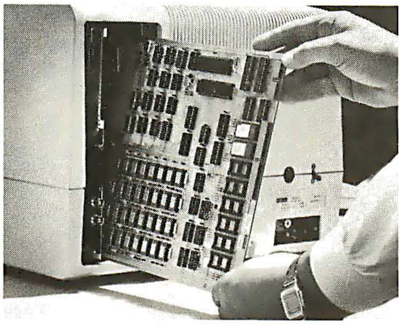
metal dome keyswitches are sealed from the environment which extends the useful life of the keyboard. Legends are placed on the bexel to provide a more advanced styling or can be added to the buttons to allow more than one operating mode for the keyboard. Because the legends are graphically applied

to the bexel, the cost of changing graphics is very low. Logotypes and model numbers can be easily added to the keyboard. Advanced Input Devices, Box 1818, Coeur d'Alene, ID 83814, (208) 773-3586.
CIRCLE INQUIRY NO. 275

Standby power supply unit provides a self contained reliable power source for use in brownout or blackout. It can protect minicomputers, microprocessors, security systems, electronic scales and cash registers,

portable instruments, communications equipment and remote test equipment. Upon loss of commercial AC power, unit generates a regulated quasi sine AC wave from a sealed gelled electrolyte battery in less than 25 mS. Maintenance free battery is kept fully charged under normal power line conditions. Low voltage indicator and shutdown circuit insures long life by preventing deep discharge. Plug in unit is attached to regular power source and connected to device requiring protection. Input voltage is 117 VAC ±5%, independent of battery voltage. Output power is 400 watts maximum for 40 minutes. Self contained battery charge recharges battery in maximum of 24 hours. When line voltage is restored, load is automatically switched back to AC line. Welco Industries, 9027 Shell Rd., Cincinnati, OH 45236, (513) 891-6600.
CIRCLE INQUIRY NO. 276

Conversion kit, VT100, allows any user of the Digital Equipment Corp. VT100 video terminal to convert their terminal into a full microcomputer system with the installation of a INT/200 microcomputer board. Actual installation of the board is accomplished by the user following instructions included in the kit's manual. The converted unit is called a Micro Node and is the industry's first commercial grade microcomputer featuring built-in networking capability. The kit includes a 64 kilobyte Z80A microcomputer board with

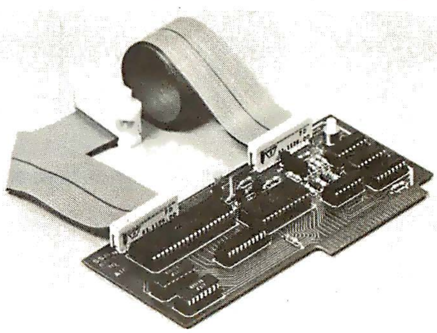


32K bytes of ROM/PROM space, a detailed installation manual, a Node Basic license, and either CP/M or MP/M licenses depending on the user's choice. An optional diskette/printer controller board allows the user to attach local single or dual-density 8-in. diskette drives, and a Centronics/Data Products/serial interfaced printer. Price: $1,850 including Node Basic, while CP/M and MP/M are individually priced at $120 and $300 respectively. Data Node, 432 Toyama Dr., Sunnyvale, CA 94086, (408) 744-0561.
CIRCLE INQUIRY NO. 277

Data terminal is microprocessor controlled and interactive, with color graphics, reverse video, programmable and resident character sets, selectable baud rates and data formats. Also included is a light touch, flexible-membrane keyboard with finger positioning overlay and aural feedback. It is suitable for a wide variety of industrial, educational, business and individual applications requiring interactive communication between computer and user. Microprocessor intelligence and LSI video control circuits bring performance, features and flexibility at low cost. The terminal can be interconnected with standard RS-232 modems for communication across telephone lines. The VP-3301 is compatible with most time sharing and data base computer networks. The character display format,

40 characters by 24 lines of 20 characters by 12 lines, is software selectable. Each character of all characters may be displayed in one of eight colors (or gray scales on B/W display). Price: $369. RCA Microcomputer Products, New Holland Ave., Lancaster, PA 17604, (717) 397-7661.
CIRCLE INQUIRY NO. 278

Serial and parallel Apple interface, AIO, provides expanded flexibility and capability to interface the computer with a broad range of peripherals including printers, plotters, terminals, modems and other computers. Users actually get two boards in one; AIO can interface with both serial and parallel devices at the same time under Pascal. The RS-232 serial interface has three handshaking lines (RTS, CTS, DED), and eight



standard baud rates from 110 to 9600 (including 134.5 baud for selectrics). Additional baud rates are possible through external input and baud rates are rotary switch selectable.

 CIRCLE INQUIRY NO. 47

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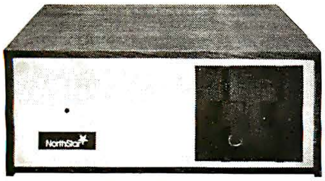

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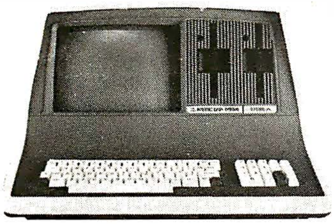

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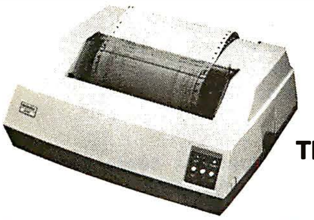

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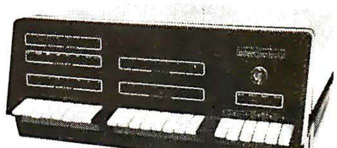

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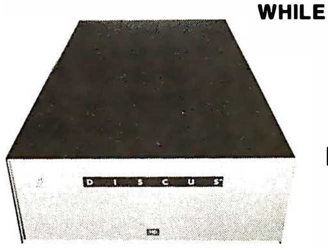

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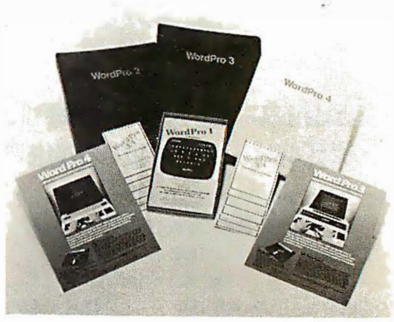
The two bi-directional 8-bit parallel ports are provided with four additional interrupt and handshaking lines, as well as interface configurations that are totally programmable and software controlled. Price: $225 or in kit form at $175. SSM Microcomputer Products, 2190 Paragon Dr., San Jose, CA 95131, (408) 946-7400.
CIRCLE INQUIRY NO. 279

Word processing software for use on Commodore computers, Word Pro 3 Plus and Word Pro 4 Plus, includes such features as: math functions (adding and subtracting columns of numbers within text), superscripts and subscripts, bold overstrike, exit to Basic,



variable lines per inch, additional pitch settings, audible feedback, pause command, and simultaneous input/output. A major benefit is the turn key design and ease of use. Professional Software, 166 Crescent Rd., Needham, MA 02194, (617) 444-5224.
CIRCLE INQUIRY NO. 282

Operating system, the Oasis, is now available for the S-100 based North Star Horizon microcomputer. The Oasis/North Star combination allows unique flexibility in maintaining public, private or shared files with versatile user security and accounting controls. File locking and automatic record locking insure data integrity for up to 16 users. Supporting the new North Star 18-Mbyte Winchester-type hard disk, Oasis compliments the mass storage media with sophisticated archive and restore back-up capabilities. Multi-user spooler, convenient inter-user communication capabilities, and general purpose text editor are additional software features of the new system. Comprehensive program development support offered includes re-entrant high level Basic, EXEC interactive job control language, text editors, compiler, interpreter, relocating macro assembler, debugger, linkage editor, and diagnostic/conversion programs. File sort and RM Cobol (ANSI '74) are optionally available. Price: $500. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.
CIRCLE INQUIRY NO. 283

Software development tools allow the OEM to interactively define and generate end-user business software such as general ledger, accounts receivable, accounts payable, inventory control and order entry. Metasoftware produces business packages in highly structured Basic source code, which can easily be modified to add other specialized tasks. The heart of the system is Edgen, a software development tool that allows the OEM to interactively define a customer's database, then produces one or more structured Basic source code programs to manage various aspects of that database.

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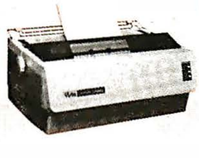

• 25 CPS (Optional 45 CPS) • Typewriter quality • Centronics parallel • RS 232 Serial (Optional) • Proportional spacing • Bidirectional • Programmable VFU • Self test • Diablo compatible • Friction feed (Optional tractors) • 136 printable columns. • Manufactured by C. ITOH.

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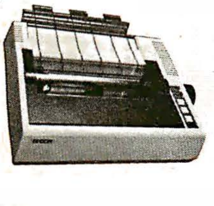

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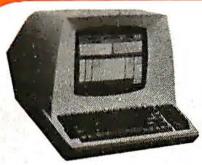

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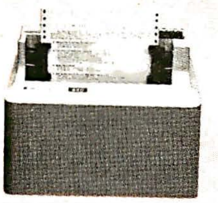

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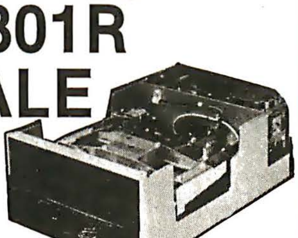

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- **Carrier Detect Delay:** 1.2 seconds ON; 120 msec OFF
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- **Teletype Interface:** 20 milliampere current loop
- **Optional Interfaces:** IEEE 488; TTL; TTY 43
- **International (CCITT) frequencies available**
- **Switches:** Originate/Off/Answer; Full Duplex/Test/Half Duplex
- **Indicators:** Transmit Data, Receive Data, Carrier Ready, Test
- **Power:** Supplied by 24 VAC/150 MA UL/CSA listed wall-mount transformer. Input 115 VAC, 2.5 watts. (A 220 VAC, 50 Hz adaptor is available upon request.)
- **Dimensions:** 10" x 4" x 2"
- **Weight:** 1.74 lbs. (3 lbs. shipping weight including AC adaptor.)
- **Warranty:** Two years on parts and labor, excluding the AC adaptor which carries the manufacturer's warranty

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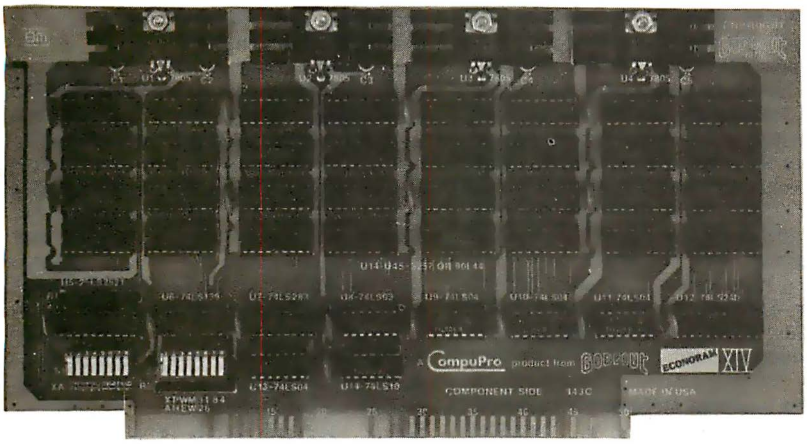

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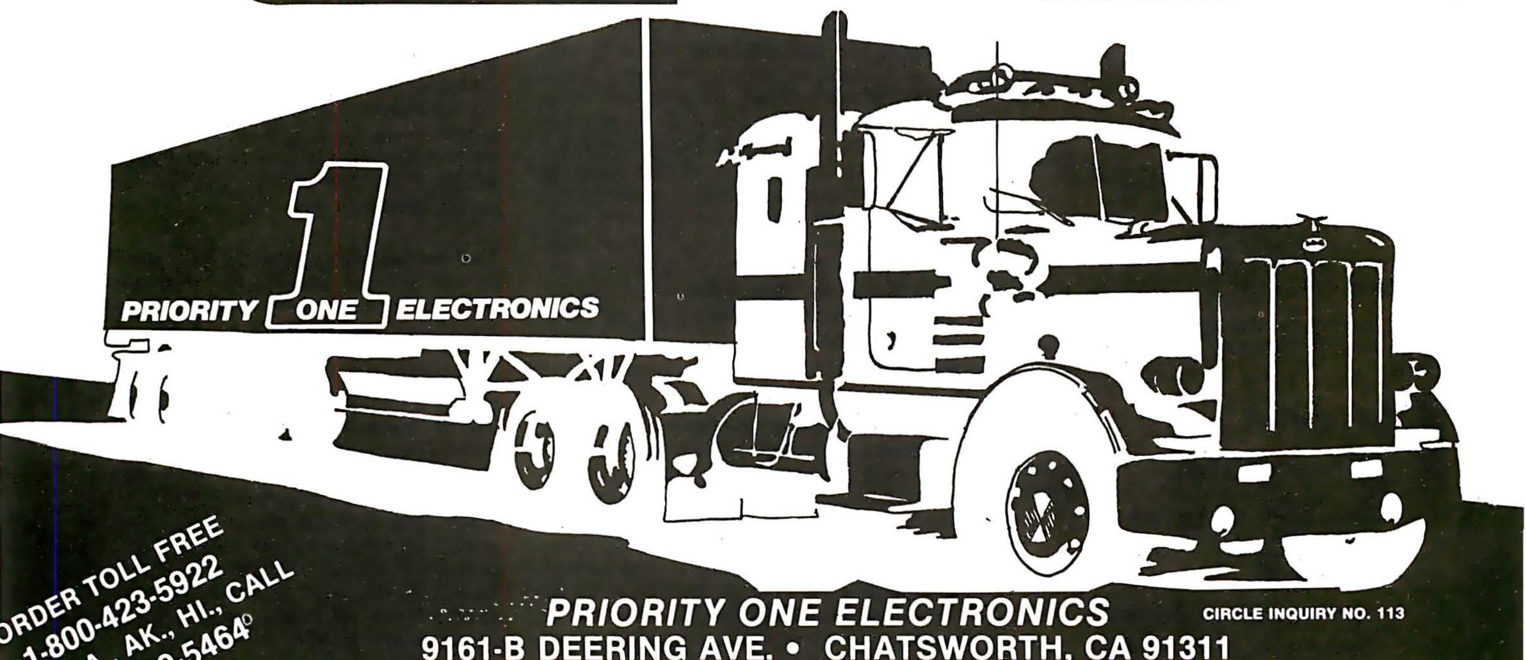

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Sales Prices are for prepaid orders only. Credit Card orders will be charged appropriate freight.

Repgen is a module that interactively produces software to generate reports based on the previously defined database. Tutor allows the interactive generation of training software modules. Commercial Computer, 7884 12th Ave. S., Minneapolis, MN 55420, (612) 854-2309.
CIRCLE INQUIRY NO. 284

Graphic driver software allows for a variety of software print fonts on graphic printers. Graphic Writer allows Apple users to get hard copy of the character sets available to them in Apple's Applesoft Tool Kit. This software may be used in conjunction with Applewriter for transparency to the user—all the familiar menus and options for editing and printing are still at his command. It is available for the Silentype, Paper Tiger 440G/445G, or Paper Tiger 460G. Software package requires 48K Apple II or Apple III Plus; DOS 3.3; Applesoft tool kit; Apple parallel or Centronics interface card; a graphic printer. Computer Stations, 12 Crossroads Plaza, Granite City, IL 62040, (618) 452-1860.
CIRCLE INQUIRY NO. 285

Interactive business management system, IBMS, is backed by readable, "beginner proof" documentation. There are nine modules, so an entry made in one area automatically updates all related areas. Included are accounts receivable, perpetual inventory, accounts payable, payroll, general ledger, mailing labels and more. Price: $1,495. Programma Int'l., 2908 N. Naomi St., Burbank, CA 91504, (800) 423-2978.
CIRCLE INQUIRY NO. 286

Software utility package, Reader, interfaces the Radio Shack TRS-80 series microcomputers to the Scan-tron model 2012 Optical Mark forms reader. This enables the user to input data directly into the TRS-80 using pencil marked forms instead of manual keyboard entry. Ideal for applications such as test scoring and analysis, order entry, inventory and labor accounting. Reader is a machine code driver module that may be loaded into upper memory of the TRS-80 and then called by the users Basic program to transfer data from the forms reader to the TRS-80. The data input from the Scan-tron forms reader is stored in memory as a single string variable that may be accessed using normal Basic string functions. Time consuming card image translation by the Basic program is avoided as all decoding is performed by the machine code utility. It is available on diskette for TRS-80 models I, II and III, complete with instructions for setting up the system. A Basic test program is also included. Price: $175. Desert Sound, 16268 Main St., Hesperia, CA 92345, (714) 244-2555.
CIRCLE INQUIRY NO. 287

Electronic typing software has been released in an enhanced version. The software adds automatic page numbering, restart (jump-to-beginning), block move, block copy and block indent. The document index has also been modified to add automatic character count and creation date. This version also permits the user to utilize as many as three disk drives. The updated version 5.0, replaces 4.5. The software runs on Zenith Data Systems Z-89 or Heathkit H-89 microcomputers which have at least 48K bytes of RAM plus a printer. Price: $395. Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025, (312) 391-8181.
CIRCLE INQUIRY NO. 288

Plotting software package, Plot-80 for both dot matrix and daisy wheel printers, is available for use on the TRS-80 model I equipped with 48K RAM, one disk drive, and one of several graphics printers. The system is geared towards the plotting of graphs and histograms of various types, with numbered and labeled axes. There are five modes, one of which will permit plotting of any type of image utilizing lines and points. Any number of plot modes may be superimposed on the same image. The plots are produced using a 210 high by 430 wide dot matrix (a resolution of up to 60 dots/in.). Data to be plotted may be entered using a data entry and editing utility (supplied as a Disk Basic program) or directly from a disk file generated by a user program. It is available on a formatted diskette (specify 35/40 track or 77 track Micropolis format). Single disk drive owners must supply a diskette with an operating system or add $15 to the cost of the package for a TRSDOS diskette. Printers that are currently supported include: Base-2, Paper Tiger (w/graphics option), Gencom, Qume, Xerox, Diablo and NEC Spinwriter. The printer and interface (serial or parallel) must be specified when ordering. Price: $99.95. Microcomputer Specialists, Box, 11295, Elkins Park, PA 19117, (215) 849-2766.
CIRCLE INQUIRY NO. 289

Business programs for Apple computer include Bookkeeper I, utilizing Microsoft's SoftCard and RAMCard. This permits the implementation of the Bookkeeper I for business users of Apple. Apples with dual diskettes, 80 by 24 video card, 56K of memory (with RAMCard), CP/M and Microsoft Basic (through the SoftCard) may now run DTI's quality bookkeeping program products, including general ledger, accounts receivable, accounts payable, payroll, and fixed asset/depreciation. Scheduled phone training services for users of the Bookkeeper I program products is also provided. Training fees start at $30. A non-technical operator's reference manual is provided with each product. User self-maintenance of the program products is a feature. Maintenance of tax tables, W-2s, quarterly tax reports, financial statement headings, etc. requires no programming. Price: $95 per module. Data Train, 840 NW 6th St., Grants Pass, OR 97526, (503) 476-1467.
CIRCLE INQUIRY NO. 290

Text formatting program, Tex version 2.0, permits an input file with text interspersed with Tex commands. From this, Tex outputs a printable, paginated document file whose format is determined by the user's commands. It can generate an index and table of contents, produce super and subscripts, accept insertions from the user console or a second source file, and chain source files. It also offers special features for owners of Diablo 1640/1650 printers with XMEM2 PCB assemblies: proportional spacing, shadow print, bold overprint and auto-underline. It is compatible with all versions of CP/M. Digital Research, Box 579, 801 Lighthouse Ave., Pacific Grove, CA 93950, (408) 649-3896.
CIRCLE INQUIRY NO. 291

Mailing system with built-in sort allows sorting on any field and allows the names

The book you've been waiting for...

Ever since Radio Shack sold the first TRS-80 Model I users have been searching for detailed information about its inner workings that Tandy would not, or could not, make available. In particular the Level II BASIC from Microsoft contains dozens of subroutines that can be tremendously useful to any programmer, but Tandy Corporation is probably under contractual obligation to Microsoft not to supply information (if they even have it!).

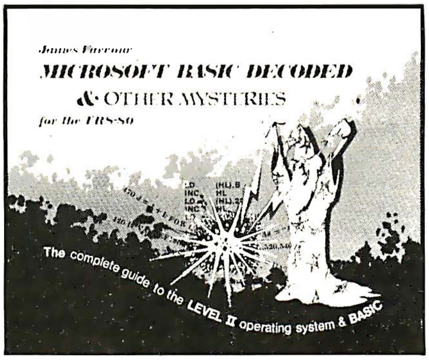
Dedicated users, proficient in assembly language, have disassembled the Level II ROMs and made their own comments. But the majority of users are left in with virtually no information, apart from occasional articles and whatever they can decipher on their own.

ENTERPRISING USERS - Several of the more enterprising programmers realized that if they published their own comments a lot of TRS-80 users would buy them. The BOOK, Disassembled Handbook and Supermap are some of the available books giving comments on the ROM set - but they all suffer from serious drawbacks, being either incomplete, unintelligible or even worse - inaccurate!

Incomplete books are usually published when the author has not finished understanding what he's writing about. Hence the "continued next book" lines in some publications, translated into english read "buy another book when I've done some more work". Unintelligible books are due to poor editing, or no editing at all! Inaccurate information is a result of not checking with anyone else.

Microsoft BASIC Decoded & Other Mysteries is both complete and understandable. Nearly 7,000 lines of comments for the Level II ROMs, with an additional 6 chapters of useful information, make this the biggest and best book available on the subject.

Written by James Farvour, the comment section took more than a year to finish - it even includes the changes for the latest ROM set in an appendix. Edited by Jim Perry, until recently managing editor of 80 Microcomputing, the text and comments are understandable.



Complete & Understandable - IJG, publishers of TRS-80 Disk & Other Mysteries, could have published an incomplete or unintelligible book on the ROMs - but chose to wait and do it properly.

Tested examples are given for virtually every ROM subroutine, showing you how to CALL them from BASIC or use them in an assembly language program. With more than 300 pages Microsoft BASIC Decoded & Other Mysteries is by far the largest book about Level II available.

Copyright - In order to respect Microsoft copyright the actual disassembled code is not printed, but the book is designed to come apart and fit into a standard 3 ring binder with your own disassembly (all pages are pre-drilled).

In short, Microsoft BASIC Decoded & Other Mysteries, is the most complete, understandable and accurate guide to your Level II ROMs that is available - bar none!

Pick one up at your nearest IJG dealer, phone your order in or use the coupon - satisfaction guaranteed.

FOR TRS-80 USERS

Please rush me _____ copy/copies of **Microsoft Basic Decoded & Other Mysteries** @ $29.95 each. Add $2.00 shipping & handling per book.

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* T.M. Microsoft † T.M. Tandy Corp.

and addresses entered to appear on letters automatically. The system is user-oriented with instructions every step of the way. Features completely interactive entry of: attention of (may be a constant field or a variable field); company name; street address; room no.; city; state; postal code; area code and telephone no. and selection category code. It is available on North Star mini-floppy diskette or on large 8-in. disk. It requires a two disk drive system, printer, CP/M and CBasic2. Price: $150 including diskette and user manual. HSC Computer Services, Box 43, Brooklyn, NY 11236, (212) 780-0022.
CIRCLE INQUIRY NO. 292

Educational course, Individual Study Center, is now available in Apple disk. The software makes it possible for a person to teach himself any subject he wants in a fun and challenging manner. There are over 50 different prepared subject data files available for grades 1-9, high school through adult. The user can run an activity and choose any subject data file. Some activities are for children, others for teens and adults. Exciting activities include Puzzler, House on Fire, Around the Ball Park, Beat the Clock, Matching, completion drills and tests. The package contains 7 programs in a sturdy vinyl binder. Also included is a Demonstration Subject data file and a manual with instructions and descriptions of every activity. Price: $54.95. T Y C Software, 40 Stuyvesant Manor, Geneseo, NY 14454.
CIRCLE INQUIRY NO. 293

Project management package, Milestone, is designed to operate on most computer systems using either the CP/M or UCSD Pascal operating systems. Milestone is based on critical path network analysis techniques that have previously been available only on large minicomputer systems. These same techniques are now available for smaller projects commonly encountered in business, government, engineering and construction projects. Unlike earlier PERT/CPM programs for large main-frame computers, Milestone is interactive—it immediately displays the results of a scheduling change on the terminal screen. It is available for microcomputers such as Apple, TRS-80, and many S-100 systems using CP/M or UCSD Pascal operating systems. It requires an 80 by 24 screen and 48K of RAM. Price: $395. Organic Software, 1492 Windsor Way, Livermore, CA 94550, (415) 455-4034.
CIRCLE INQUIRY NO. 294

Checking account package, Microcheck-80 for the TRS-80 model I, features extensive editing of keyboard entries, storage of outstanding checks and deposits on disk, automatic bank statement reconciliation, and maintains a complete history file of cleared checks. Each check is assigned a category, permitting cleared check retrieval by category, month, any combination of the two, or in detail. A summary of expense categories is also included. Machine language programs, designed so sorting is unnecessary, assure extremely fast execution. 32K plus one disk drive are required. 48K and a printer provide additional capabilities. The package is perfect for personal or small business use. Price: $39.95. Suma Microware, 1110 W. 41st St., La Grange, IL 60525.
CIRCLE INQUIRY NO. 295

UCSD Pascal is now available for Cromemco, Dynabyte, Onyx and Vector Graphic systems. The BIOS for the Z-80 adaptable system has been written so the UCSD Pascal programs now run on these microcomputers. It is complete with documentation, certified by SofTech Microsystems. Price with Pascal compiler is $450 in single quantities. A run-time-only system is available for $350. Professional Business Software, 119 Fremont St., San Francisco, CA 94105.
CIRCLE INQUIRY NO. 298

Software language for the 6800 microprocessor adapts Forth for the SWTPC computer and the Percom disk, based on the fig-Forth model. The software contains all of the high level commands published by the 1978 Forth standards project, along with variable length names and virtual memory. The Forth language compiles English words into machine code that runs at speeds close to assembly language. It uses single or double precision numbers using a LIFO stack to pass numbers between commands. Forth comes on a single density 5¼-in. diskette, suitable for single drive use. The requirements are 16K bytes of memory, a Percom disk with mini-dos in ROM, and an input-output device (CRT, printer). The disk contains the complete object code (6.5K), a full text editor and some special utilities. The manual contains a description of all Forth words, a short tutorial of Forth, an explanation of operating the screen editor, and some modifications for different input-output routines (SWTPC serial or parallel board, break key, etc.). Price: $24.95. Greene Software, 6169 Fawn Meadow, Victor, NY 14564.
CIRCLE INQUIRY NO. 297

Version of Forth for the Alpha Microsystem AM-100 computers, makes it more powerful and versatile operating under the Alpha Micro operating system. The most significant feature of AM-Forth, version B, is that the program is re-entrant. As such, the basic Forth dictionary may be loaded as a part of AMOS system memory and shared by any number of users in the multi-user Alpha Micro system. Other added features include an assembler, screen oriented editor, floating point math operations, and utilities for string handling and building data structures. Improvements have been made to provide more versatile I/O to AMOS sequential and random files and allow use of lower case characters. Special CRT handling features are supported, and utilities are included to access system TIME and DATE functions. It is available on an AMS or STD disk containing complete source code, executable object code, Forth utilities for the editor, assembler, and data structures, and some sample Forth programs. Sierra Computer Co., 617 Mark NE, Albuquerque, NM 87123.
CIRCLE INQUIRY NO. 298

Data base software system, Integration, is a complete, fully integrated system of business software ideal for general accounting, invoicing, manufacturing and retail inventory control, order entry and cost accounting. It is a business-oriented data base in which every single transaction feeds your master records. The result of this vast and easy to use data base is unique. It helps you to better understand the operation and cash flow of your business. And better understanding means better planning and higher

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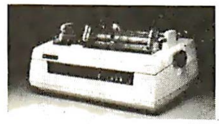

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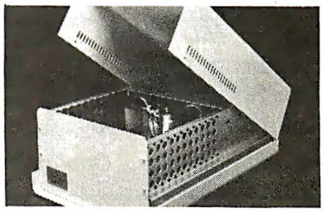

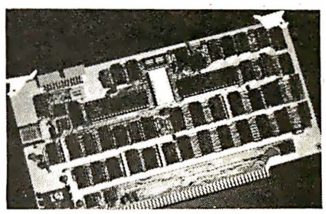

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CP/M operating system is available for Xycom's 3805 table top and 3905 rack mounted host/development systems. Sold as an unbundled software product, it was developed to allow system users to utilize their equipment beyond that of industrial software development. With the CP/M option, users will be able to utilize hundreds of software packages from scores of independently vendors and be able to run general ledger, order entry inventory control, payroll and other business programs. Features include a complete set of tools for basic software development: Assembler; degugger; text editor; file management routines; device drivers and more. The system provides a full 64K byte implementation and supports up to four 8-in. floppy disk drives. It also provides a private interface and a general purpose serial interface. Xycom, Inc., 750 N. Maple Rd., Saline, MI 48176.
CIRCLE INQUIRY NO. 301

Statistical software for Hewlett-Packard's Series 9800 system 45 desktop computers are available as a Statistics Library. Enhancements to selected data-entry and analysis routines have been added. The library, which runs on both the monochromatic HP 9800 system 45B and the color-graphics system 45C, includes the following routines: basic statistics and data manipulation, regression analysis methodds, statistical graphics, general statistics, nonlinear regression, analysis of variance, Monte Carlo simulation utilities and principal components and factor analysis. Enhancements include improved data entry, pre-analysis manipulation routines, improved regression analysis routines and improved statistical graphics plotting routines. Price: $1,500. Hewlett-Packard, 1501 Page Mill Rd., Palo Alto, CA 94304, (415) 857-1501.
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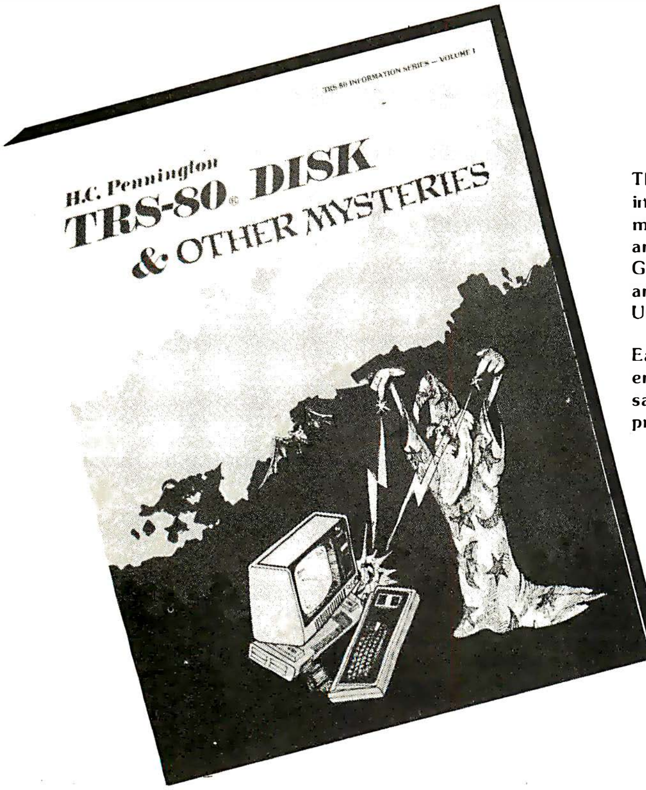

This valuable textbook, the first in a series by H. C. Pennington, has been reviewed in 3 major magazines and has been the topic of extensive conversation on two major computer communications networks. Presently, the book is being distributed and sold throughout the United States, Canada, the Union of South Africa, England, Germany, Australia, the Netherlands & others. William Barden, Jr., a well known and widely published computer author comments, ". . . my advice is to get it and USE it!"

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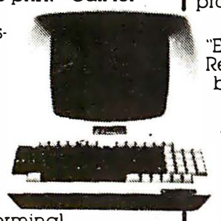

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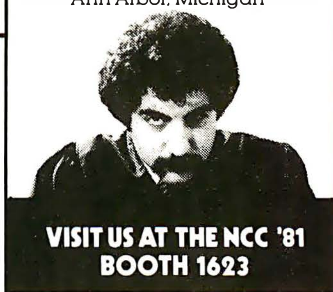

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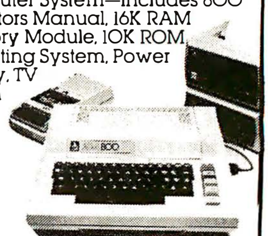

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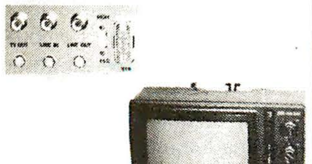

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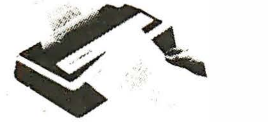

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BOOK REVIEWS

The Small Computer in Small Business: A Guide to Selection and Use
by Brian Smith
Stephen Greene Press, Brattleboro, VT

Reviewed by Bernard Conrad Cole

Many owners of small businesses sense intuitively that the computer is an excellent way to increase their productivity—and profit margins. But threatened by the possibility of failure, fearful of the cost, and confused by computer technology and jargon, many are reluctant to take advantage of these benefits.

In this book, the author, a management consultant and former professor of business management, attempts to change all that. It has been designed as a primer for business operators or entrepreneurs who want to gain a basic knowledge of computers in order to deal with vendors.

Written from the point of view of someone who neither builds nor programs computers, but does use them, Smith assumes that his reader knows very little about data processing. He does a very good job of keeping technical gobbledygoop to a minimum.

With the novice user in mind, he makes no distinction between minicomputers and microcomputers, classifying them all under the broad umbrella of "small computers." Instead, he defines them in terms the businessman understands: price, capability and function. All new terminology is set in boldface type and explained in the glossary.

Smith begins with a clear explanation of what a computer is, its various component parts, how it works, and the various broad applications in small businesses. But it is the chapters on justifying a computer, evaluating and selecting a system and planning for its installation that make the book worthwhile.

143 pages $12.50

Owning Your Home Computer: The Complete Illustrated Guide
by Robert L. Perry
Everest House, New York, NY

Reviewed by Rocky Smolin

Those of us who own home computers have no trouble finding things to do with them—functional or trivial. But when someone remarks, "I'd like to get a home computer, but if I owned one, what would I do with it?" We are suddenly at a loss to explain exactly what keeps us glued to the CRT, isolated from the rest of society, for hours at a crack. At last, our embarrassment can be relieved by referring our curious friends to this informative and edifying book.

The first part, assuming no knowledge of computers on the part of the reader, starts with a discussion of the home information explosion. It describes how the reader can tap into this coming revolution in our lifestyles. Following this is the first history of home computers I have ever read—all about old machines now obsolete (over three or four years old), a little about how the hardware works, and most importantly, where and how to buy a home computer.

The second section deals with the newest home computers and the information services—networks such as Micronet, The Source, and EIES. Next, the author takes a look into the future—integrated video terminals, talking (and listening) computers, and more about networks.

Overall, it's an excellently written and informative volume that will answer the questions not only of those who are thinking of 'going micro', but also current users looking to expand their horizons.

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BOOK REVIEWS

Microshopper: The New Computers
by Julie A.K. Ross
PGI Publishing, Tempe, AZ

This book, with its 8½ by 11-in. format, large type and copious illustrations provides the neophyte with a much needed entree, if not into the personal computer world, at least into the world of the computer store. The introduction is a futurist's view of the new technology—apparently for perspective, but not very enlightening. This is followed by a history of computers, some introduction to basic hardware functions, a comparison of popular languages, and a section on toys and robots. Finally, there is a chapter on selecting a system.

The heart of the book, the presentation of the products, makes up for any lack of substance. This section is divided logically into CPUs, mass storage, video terminals and monitors, printers, communications and software. Each section is prefaced with a description of the important characteristics by which that category can be evaluated. These explanatory notes are followed by product descriptions, with a picture and the manufacturer's address. The section on printers includes a handy chart comparing the important features of 25 printers from ten manufacturers.

There are two things missing. One is prices. Computer prices fluctuate wildly and are subject to change without notice. Perhaps the publishers could include this information in their next edition. Price is one of the primary factors in the decision to buy any computer equipment. The other missing item is a more comprehensive display of software. Nevertheless, the book is one of the best hardware catalogs to be found.

174 pages $9.95 —*RS*

RECENT BOOKSHELF ADDITIONS

1981 Software Writer's Market
Kern Publications, Duxbury, MA 119 pages $45

Educational Software Directory—Apple II Edition
Swift Publishing Co., Manchaca, TX 103 pages $11.95

Programmer's Guide to LISP
by Ken Tractor 210 pages
Tab Books, Blue Ridge Summit, PA $10.95

The MC6809 Cookbook
by Carl D. Warren 176 pages
Tab Books, Blue Ridge Summit, PA $11.95

Introduction to Computer Design and Implementation
by S.I. Ahmad and K.T. Fung 271 pages
Computer Science Press, Rockville, MD $19.95

APL/STAT:The Do-It Yourself Statistician's Guide to Computation with APL
by James Ramsey and Gerald Musgrave 356 pages
Lifetime Learning Publications, Belmont, CA $14.95

Correction: *Physicians' Primer on Computers—Private Practice*, Lexington Books, Lexington, MA is priced at $18.50, not $12.95 as reported in the April issue.

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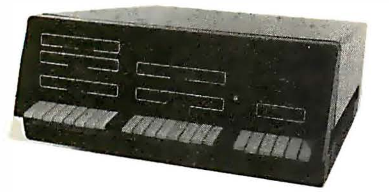

COMPLETE SYSTEM with InterSystem 64K RAM, I/O Board and double density disk controller board. Full 1-year warranty,
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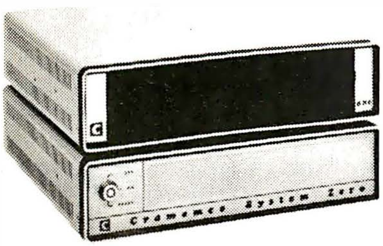

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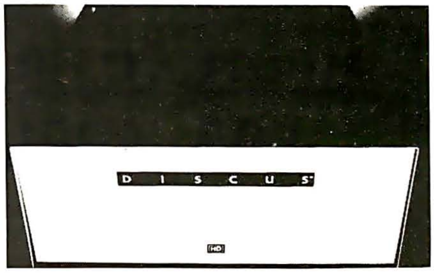

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A New UNIX Like Disk Operating System,
With true multi-user, multi-tasking capabilities
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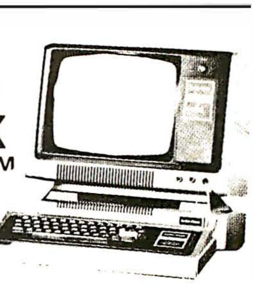

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CIRCLE INQUIRY NO. 105

CALENDAR

Jun 2-4 Europe Software Fair, Magriethall of the Royal Netherlands Industries Fair, Utrecht, The Netherlands, exhibitions and seminars on all types of computer software, system design, service bureaus, suppliers. Royal Netherlands Industries Fair, Box 8500, 3503 RM Utrecht, The Netherlands.

Jun 6-7 Applefest '81, Plaza Castle, Boston, MA, full scale computer show devoted exclusively to Apple computer equipment, including systems, support equipment, software, publications and services. Sponsored by Apple/Boston, the Boston Computer Society's Apple user group. Gail Konchagulian, Boston Computer Society, Three Center Plaza, Boston, MA 02108, (617) 367-8080.

Jun 6-9 Atlanta Small Computer Show, Hilton Hotel, Atlanta, GA, exhibitions of small computers, peripheral equipment, supplies and services. Atlanta Small Computer Show, 4060 Jancie Dr., Suite C-1, East Point, GA 30344.

Jun 8-10 Int'l Conference on Decision Support Systems, Colony Square Hotel, Atlanta, GA, examining the technology, applications and implications of decision support systems in the office of the 80s. Pat Van Cleve, Execucom Systems Corp., Box 9758, Austin, TX 78766, (512) 345-6560.

Jun 10-13 International Motorcon '81, Conrad Hilton Hotel, Chicago, IL, practical sessions, tutorials and panel discussions on components and electronic motion control. Motorcon '81, P.O. Box 2889, Oxnard, CA 93030, (805) 985-1595.

Jun 15-18 National Computer Graphics Conference, Convention Center, Baltimore, MD, tutorials, meetings, and exhibits on business graphics, computer mapping, financial, educational, and medical graphics, design, software and database, telecommunications, and marketing graphics. NCGA, 2033 M Street, N.W., Suite 330, Washington, D.C. 20036, (202) 466-5895.

Jun 15-19 Fundamentals of Computer Systems Analysis and Design, AMA Management Center, Atlanta, GA, seminar covering practical applications of design techniques in developing an effective DP system. Also held Jun 22-26 at AMA Headquarters in New York. American Management Assoc., 135 W. 50th St., New York, NY 10020.

Jun 16-18 Nepcon East '81, New York Coliseum, NY, spotlighting the East coast electronics manufacturing industry with 375 displays on manufacturing techniques, new methods and cost-saving developments. Industrial & Scientific Conference Management, 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

Jun 22-24 Fundamentals of Data Processing, Sheraton Inn, Silver Spring, MD, seminar on basic DP principles for administrative assistants and office support staff. American Management Assoc., 135 W. 50th St., New York, NY 10020.

Jun 22-26 Operational Availability and Maintainability Engineering, UCLA campus, Los Angeles, CA, short course for those involved in the conception, design, operation and maintenance of mechanical equipment. Short Course Program Office, Continuing Education in Engineering and Mathematics, 6266 Boelter Hall, UCLA Extension, Los Angeles, CA 90024, (213) 825-1047.

Jun 22-26 Structural Dynamics Seminar, Sheraton Plaza, Los Angeles, CA emphasizing discrete methods, numerical methods and structural modeling for computer-oriented solutions to various structural dynamic problems. Continuing Education Institute, 10889 Wilshire Blvd., Suite 1030, Los Angeles, CA 90024, (213) 477-8379.

Jun 22-27 Engineering Management Seminar, Sheraton Hotel, Washington, D.C., eight self-contained sub-courses of interest to engineers who are assuming broader managerial responsibilities. Continuing Education Institute, 10889 Wilshire Blvd., Suite 1030, Los Angeles, CA 90024, (213) 477-8379.

Jun 23-26 Software Design, Reliability and Testing, Sheraton Motor Inn, Lexington, MA, seminar/workshop for engineers, programmers and technical managers. Also held Aug 24-27. Institute for Advanced Professional Studies, One Gateway Center, Newton, MA 02158.

Jun 24-26 Computer Industry Trade Expo, Convention Center, Atlantic City, NJ, all aspects of computer hardware represented including micro and mainframes, peripherals, software and services. CITE, 110 Charlotte Place, Englewood Cliffs, NJ 07632.

Jul 2-4 Science and Technology Exhibit, Adam's Mark Hotel, Houston, TX, exhibits by industrial, educational and research organizations concerned with energy advancements through technology. Tony Hill, CET, Houston Engineering and Scientific Society, 2615 Fannin St., Houston, TX 77002.

Jul 19-24 National Computer Camp, Grand View Lodge, Moodus, CT, recreational and educational weekend for youngsters with emphasis on computer technology. Additional session held July 26-31. Computer Camp, Grand View Lodge, Box 22, Moodus, CT 06469.

Jul 26-31 Harvard Computer Graphics Week '81, Harvard University, Cambridge, MA, seminars spanning all aspects of management graphics and developments in computer mapping. Laboratory for Computer Graphics, Harvard U., 48 Quincy St., Cambridge, MA 02138.

Jul 29-31 1981 Microcomputer Show, Wembley Conference Centre, London, England, seminars and exhibitions covering various aspects of the use of microprocessors in business and manufacturing. Technology Marketing and Analysis Corp., 680 Beach St., San Francisco, CA 94109.

Aug 10-14 Reliability and Life Testing, UCLA campus, Los Angeles, CA, short course for engineers and scientists involved with the reliability, design, product assurance, quality and safety aspects of components, equipment and systems. Short Course Program Office, 6266 Boelter Hall, UCLA Extension, Los Angeles, CA 90024, (213) 825-1047.

Aug 10-14 Seminars for the Systems Analyst, Grand Portage Lodge and Convention Center, Grand Portage, MN, comprehensive courses covering technology and interpersonal management skills. Pam Jensen, Executive Development Center, 324 Business Administration, 271 19th Ave. S., University of Minnesota, Minneapolis, MN 55455.

Aug 26-29 National Small Computer Show, New York Coliseum, New York, NY, lectures, seminars, and exhibitions of microcomputer equipment. NSCS, 110 Charlotte Pl., Englewood Cliffs, NJ 07632, (201) 569-8542.

Free Literature

Logic development system for HP model 64000 is presented in recent edition of Hewlett-Packard Journal. Included are: acceleration of system design, resource sharing, emulators, Pascal, program debugging, 64000 linker, assembler, and a discussion of key problems and likely solutions. Inquiries Manager, Hewlett-Packard, 1507 Page Mill Rd., Palo Alto, CA 94304.

CIRCLE INQUIRY NO. 201

Elastometric connector system, Cambiflex, is described in 7-page data file. Seven different applications are illustrated and complete characteristics are listed. Cambion, 445 Concord Ave., Cambridge, MA 02238.

CIRCLE INQUIRY NO. 202

Logical operating system for the IBM series is described in a color brochure. The PXS (Program Executive System), a supplement to the EDX operating system, provides extensive user facilities for program development and distributed processing operations. The system is described to perform a broad range of functions that normally must be coded during application development. Alan Hochschild, Inc., 601 Montgomery St., Suite 1411, San Francisco, CA 94111.

CIRCLE INQUIRY NO. 203

Customer support and service programs are described in a 12-page brochure, *No Problem Service.* Programs described include extended warranty repairs, on-site maintenance plan, out of warranty repairs and the express depot service. Lear Siegler, Inc., Data Products Div., 714 Brookhurst, Anaheim, CA 92803.

CIRCLE INQUIRY NO. 204

Electromechanical relays are featured in a 48-page catalog. Included are 30 black and white photographs of sub-miniature PC board, miniature telephone PC board, instrumentation and communication, and industrial relays. ITT Components, 1551 Osgood St., N. Andover, MA 01845.

CIRCLE INQUIRY NO. 205

Instructional programs for grades K-12 include games, packages and books for use with the Apple, Atari, Pet and TRS-80 microcomputers. Organized by subject and grade level, each entry includes program name, type (drill, simulation, etc.), functional description, indication of program availability for one or more of the four micros, and memory requirements. MicroMedia, 686 Sierra Vista Ln., Valley Cottage, NY 10989.

CIRCLE INQUIRY NO. 206

Computer cable & interface catalog H10 describes specifications for EIA RS 232, 499 assemblies and bulk cable. Accessories include ribbon, telco, coaxial kits, switching boxes, plenum and molded assemblies, adapters and isolated power supplies. CCP, 147 Gazza Blvd., Farmingdale, NY 11735.

CIRCLE INQUIRY NO. 207

The finest Data Base Manager Available

Maxi Manager

JUST CHECK SOME OF THESE FEATURES

- Supports six different relational search techniques.
- Comes with programmer's interface.
- Over 93 pages of documentation.
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- Record length up to 800 characters.
- Files can be up to four disks in length.
- Compatable 35, 40, 77 & 80 track drives.
- Has calculated equation fields.
- Complete report generator.
- Data can be merged into letters.

✱WE ARE HOLDING THE PRICE AT $79.95 until the next version (MAXI MANAGER 2) is ready. The MAXI MANAGER 2 will support large fields, screen editing, ability to add extra disk drives and much more! All previous owners may then trade in their original disks for the $20 difference in price. A conversion program will also be included to update previous data files.

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MAXI MANAGER for TRS-80 Models 1 & 3
Requires 48K of RAM and 1 Disk Drive Minimum.

COMPATABLE WITH NEWDOS 2.1.
NEWDOS 80 VERSION AVAILABLE FOR $10 AFTER INITIAL PURCHASE

MAXI MANAGER
TRS-80 DISK MODEL 1 012-0096 $79.95

MODEL 2 & 3 VERSIONS COMING SOON

NOTE 1: File size is dependant on memory size.
NOTE 2: Sequential files only.
NOTE 3: User must apply own driver routine.
NOTE 4: Hard copy print out only
NOTE 5: Four functions (+ – * /) only
NOTE 6: Same as note #5 with a maximum of two calculated fields.
NOTE 7: Available as a separate program for $99.95.
NOTE 8: 120 character maximum.
NOTE 9: Data structures defined in manual.
NOTE 10: 132 characters maximum.
NOTE 11: User option (files can be read from ascending or descending order).

DATA MANAGEMENT PROGRAM COMPARISON CHART

	CCA DATA MANAGER	AIDS III with CALS	MAXI MANAGER	RADEX 10	PROFILE
FILE CAPACITY & FORMAT					
Maximum # of disks per file	1	1	4	31	4
Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No
FIELD TYPES					
Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD/YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No
SORTING					
Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No
FILE MAINTENANCE					
Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No
RECORD SELECTION TECHNIQUES					
Record number	Yes	Yes	Yes	Yes	No
Binary search (high speed)	No	No	Yes	No	No
Maximum # of simultaneous keys	1	4	10	31	1
RELATIONAL COMPARISONS					
Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No
PRINTING					
User specified page title	Note 8	Yes	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
Built in screen print	No	No	Yes	No	No
MISCELLANEOUS					
Cost	$75.00	$94.90	$99.95	$99.00	$79.95
Punctuation allowed within data fields	Yes	?	Yes	Yes	Yes
Upper / Lower case	Note 3	Note 3	Yes	Note 3	Note 3
Built in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	93	38	29

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TOLL FREE HOT LINE (800) 327-7172

SAY YOU SAW IT IN INTERFACE AGE

Spanish/English
Continued from page 68

Sample run

```
10 IMPRIMA "HOLA"
>IMPRIMA "COMO SE LLAMA"
COMENCE LA LINEA CON UN NUMERO
>101 IMPRIMA "COMO SE LLAMA"
COMENCE LA LINEA CON UN NUMERO MENOS QUE  100
>20 IMPRIMA "COMO SE LLAMA":CONTESTE" NOMBRE :";A$
SOLAMENTE UNA DECLARACION CADA LINEA
>20 IMPRIMA "COMO SE LLAMA"
>30 CONTESTE "NOMBRE :";A$
>←


ALISTE


10 IMPRIMA "HOLA"
20 IMPRIMA "COMO SE LLAMA"
30 CONTESTE " NOMBRE :";A$
>←


LIST


10 PRINT   "HOLA"
20 PRINT   "COMO SE LLAMA"
30 INPUT    " NOMBRE :";A$

>

>40 SI A$="DAVID" ENTONCES VAYA A 30
>50 CESE
>

LIST

10 PRINT   "HOLA"
20 PRINT   "COMO SE LLAMA"
30 INPUT    " NOMBRE :";A$
40 IF A$="DAVID" THEN     GOTO   30
50 STOP

>
```

```
240 NEXT N
250 '***** READ ENGLISH AND SPANISH KEYWORDS INTO ARRAY *****

260 FOR N=1 TO WRDS
270 READ ENG$(N)
280 ENG$(N)=SP$+ENG$(N)+SP$
290 READ SPAN$(N)
300 SPAN$(N)=SP$+SPAN$(N)+SP$
310 NEXT N
320 '****** BUILD ARRAY OF ENGLISH KEYWORDS SAME LENGTH AS
            SPANISH WORDS THEY REPLACE IN PROGRAM, ADDING
            SPACES AS NEEDED ******

330 FOR N=1 TO WRDS
340 E$(N)=ENG$(N)+STRING$(AE(N), 32)
350 NEXT N
360 DATA 0, 2, 3, 2, 0, 2, 1, 1, 4, 1, 0, 5, 2, 2, 1,0,0, 3, 1
370 DATA IF, SI, RUN, CORRA, INPUT, CONTESTE, LIST, ALISTE, END, FIN, PRINT,
IMPRIMA, READ, LLEVE, DATA, DATOS, THEN, ENTONCES, FOR, PARA, STOP, CESE,
NEXT, SIGUIENTE
380 DATA CLS, BORRE, GOTO, VAYA A, RESTORE, RESTAURE
390 DATA STEP,PASO,ON,EN
400 DATA GOSUB, VAYA SUB, RETURN, RETORNE
410 GOSUB 430
420 GOTO 570
430 CLS
440 PRINT"          ####   ESPANOL-INGLES BASIC ('LEVEL I')  ####"
450 PRINT "LOS MANDADOS :  AYUDA, CORRA, NUEVO"
460 PRINT "  CARGE/AHORRE  (CARGAR O AHORRAR UNA PROGRAMA)"
470 PRINT "  LIST/ALISTE   (ALISTAR EN INGLES/ESPANOL)"
480 PRINT
490 PRINT "LAS DECLARACIONES ESPANOLAS:
500 FOR N=1 TO WRDS  STEP 3
510 PRINT ENG$(N);"=";SPAN$(N),
520 PRINT ENG$(N+1);"=";SPAN$(N+1),
530 PRINT ENG$(N+2);"=";SPAN$(N+2)
540 NEXT N
550 RETURN
560 '****** INPUT PROGRAM LINE ********

570 PRINT ">";
580 LINE INPUT A$
590 B2=0

600 '****** CHECK FOR 'COMMAND' ******

610 IF LEFT$(A$, 4)="LIST" GOTO 1570
620 IF LEFT$(A$, 6)="ALISTE" GOTO 1110
630 IF LEFT$(A$, 6)="AHORRE" GOTO 1290
640 IF LEFT$(A$, 5)="CARGE" GOTO 1440
650 IF LEFT$(A$, 5)="AYUDA" GOSUB 430
660 IF LEFT$(A$, 5)="AYUDA" GOTO 570
670 IF LEFT$(A$,5)="CORRA" THEN RUN
680 IF LEFT$(A$,5)="NUEVO" THEN RUN
690 UC$=A$
```

Program listing

```
10 '    #### SPANISH-ENGLISH TINY BASIC PROGRAM TRANSLATOR #####

30 '    --- ONLY LEVEL 1 KEYWORDS SHOWN IN PROGRAM WILL BE
           TRANSLATED.  ANY OTHER DISK BASIC STATEMENTS,
           (I.E ELSE,INSTR,RIGHT$),FUNCTIONS (INT,RND),OR
           OPERATORS (AND,OR) MAY BE USED, BUT THEY MUST
40 '       BE IN ENGLISH AND CONFORM TO DISK BASIC SYNTAX.
           THIS IS AN INSTRUCTIONAL PROGRAM ONLY.
50 '
           ONLY ONE STATEMENT PER LINE ALLOWED WITH THIS PRO-
           GRAM, AND USER * MUST * SPACE AFTER LINE NUMBERS
           AND WORDS.

60 '      PROGRAMS WRITTEN IN SPANISH CANNOT BE RUN (THIS
          IS NOT AN 'INTERPRETER' ) UNTIL THEY HAVE BEEN
           'COMPILED' INTO STANDARD BASIC.  THE SPANISH
          VERSION CAN BE SAVED TO DISK AND EDITED AT ANY

70 '       LATER TIME.  AS EACH NEW SPANISH LINE IS ENTERED
           THE APPROPRIATE ENGLISH LINE IS 'RECOMPILED'.
           TO SAVE MEMORY AND I/O TIME, ONLY LINE NUMBERS
           FROM 0 TO 100 MAY BE USED.
80 '       USER MAY CHANGE THIS FEATURE BY ALTERING THE VAL-
           UE OF LS TO THE DESIRED LINE NUMBER SIZE.
90 '       NEW KEYWORDS MAY BE ADDED.  THIS PROGRAM ASSUMES
           THAT THE SPANISH WORD IS LONGER THAN THE ENGLISH
           EQUIVALENT.  TO ADD KEYWORDS, CHANGE THE VALUE OF
           WR TO EQUAL THE NEW TOTAL OF KEYWORDS.
100 '      ADD THE NEW WORD(S) TO THE END OF THE DATA LINES,
           AND ADD A NUMBER EQUAL TO THE DIFFERENCE BETWEEN
           THE LENGTH OF THE ENGLISH AND SPANISH WORDS TO
           THE NUMERIC DATA LINE.
110 '      (I.E. FOR READ AND LLEVE THE DIFFERENCE IS 1).
           NOTE : THE SPANISH WORD MUST BE THE SAME LENGTH
           OR LONGER (ADD 0 TO DATA LINES IF SAME LENGTH).

120 '     YOU'RE ON YOUR OWN IN ADDING STATEMENTS AND COMMANDS
           TO THE SUMMARY DISPLAY.
130 CLEAR 8000
140 WR=19
150 LS=100
160 DIM ENG$(WR+2), SP$(WR+2), AE(WR), E$(WR), S$(WR), EP$(LS), CP$(LS)
170 Q$=CHR$(34)
180 C$=CHR$(58)
190 SP$=CHR$(32)
200 CLS
210 '***** READ NUMBER OF SPACES REQUIRED TO MAKE ENGLISH KEYWORDS
            EQUAL IN LENGTH TO SPANISH WORDS THEY REPLACE *****

220 FOR N=1 TO WRDS
230 READ AE(N)
```

```
700 '***** CHECK FOR QUOTES OR COLONS ******

710 A$=A$+CHR$(32)
720 B=INSTR(A$, Q$)
730 C=INSTR(A$, C$)
740 IF C=0 AND B=0 GOTO 850
750 IF B=0 GOTO 830
760 '***** FIND POSITION OF SECOND QUOTATION MARK *****

770 W$=MID$(A$, B+1)
780 B2=INSTR(W$, Q$)+B
790 IF C<B GOTO 830
800 IF C>B2 GOTO 830
810 GOTO 850
820 ' ***** IF COLON NOT WITHIN QUOTES, THEN LINE HAS TWO STATEMENTS *****

830 IF C<>0 THEN PRINT"SOLAMENTE UNA DECLARACION CADA LINEA": GOTO 570
840 '***** CHECK FOR BEGINNING LINE NUMBER *****

850 TST$=""
860 FOR T=1 TO LEN(A$)
870 IF MID$(A$, T, 1)=CHR$(32) GOTO 910
880 TST$=TST$+MID$(A$, T, 1)
890 NEXT T
900 ' ****** IF LINE NUMBER VALID, ASSIGN NUMBER TO ARRAY POINTER LN *****

910 LN=VAL(TST$)
920 IF LN>LS PRINT"COMENCE LA LINEA CON UN NUMERO MENOS QUE ";LS:GOTO 570
930 IF LN<1 PRINT"COMENCE LA LINEA CON UN NUMERO": GOTO 570
940 '***** LOOP TO SEARCH FOR ALL KEYWORDS *****

950 FOR G=1 TO WR
960 Y=INSTR(A$, SPAN$(G))
970 IF Y>0 GOTO 1040
980 NEXT G
990 '***** ASSIGN LINE TO FINISHED PROGRAM ARRAYS *****

1000 EP$(LN)=UC$
1010 CP$(LN)=A$
1020 GOTO 570
1030 '***** CHECK TO SEE IF KEYWORD IN QUOTES *****

1040 IF Y<B GOTO 1070
1050 IF Y>B2 GOTO 1070
1060 GOTO 980
1070 L=LEN(E$(G))
1080 ' ***** SUBSTITUTE ENGLISH KEYWORD FOR SPANISH *****

1090 MID$(A$, Y, L)=E$(G)
1100 GOTO 980

1110 ' **** LIST SPECIFIC LINE OF SPANISH PROGRAM *****

1120 V=INSTR(A$, SP$)
1130 IF V=0 GOTO 1200
1140 V2$=MID$(A$, V)
```

```
1150 V3=VAL(V2$)
1160 IF V3>0 THEN  PRINT EP$(V3) ELSE GOTO 1200
1170 PRINT
1180 GOTO 570
1190 ' ***** LIST ALL SPANISH PROGRAM LINES *****

1200 CU=1
1210 CLS
1220 FOR N=1 TO 100
1230 IF EP$(N)="" OR EP$(N)="," GOTO 1270
1240 PRINT EP$(N)
1250 CU=CU+1
1260 IF CU/10=INT(CU/10) THEN PRINT "EMPUJE < ENTER >";: INPUT E$
1270 NEXT N
1280 GOTO 570
1290 '***** SAVE PROGRAMS TO DISK *****

1300 INPUT"NOMBRE DE LA PROGRAMA EN ESPANOL :";NE$
1310 INPUT "NOMBRE DE LA PROGRAMA EN INGLES :";NI$
1320 OPEN "O",1, NE$
1330 FOR N=1 TO 100
1340 PRINT #1, EP$(N); CHR$(13);
1350 NEXT N
1360 CLOSE 1
1370 OPEN "O",1, NI$
1380 FOR N=1 TO 100
1390 PRINT #1, CP$(N); CHR$(13);
1400 NEXT N
1410 CLOSE 1
1420 GOTO 570
1430 '***** LOAD PROGRAMS FROM DISK *****

1440 INPUT"NOMBRE DE LA PROGRAMA ESPANOL ;";F$
1450 INPUT "NOMBRE DE LA  PROGRAMA  EN INGLES :";F2$
1460 OPEN "I",1, F$
1470 FOR N=1 TO 99
1480 LINE INPUT #1, EP$(N)
1490 NEXT N
1500 CLOSE 1
1510 OPEN "I",1, F2$
1520 FOR N=1 TO 100
1530 LINE INPUT #1, CP$(N)
1540 NEXT N
1550 CLOSE 1
1560 GOTO 570
1570 ' ***** LIST ALL LINES OF ENGLISH PROGRAM *****

1580 CU=1
1590 FOR N=1 TO 100
1600 IF CP$(N)<>"" PRINT CP$(N): CU=CU+1
1610 IF CU/10=INT(CU/10) THEN PRINT "EMPUJE < ENTER >";: INPUT E$
1620 NEXT N
1630 PRINT
1640 GOTO 570
```

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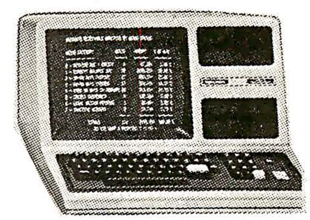

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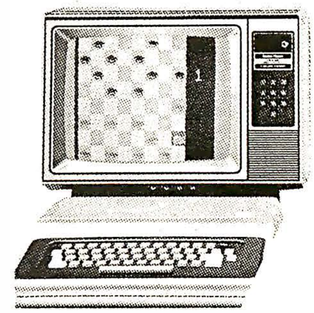

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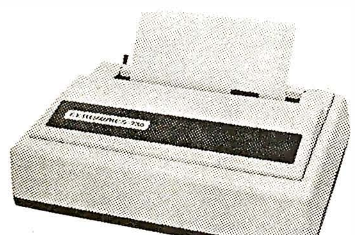

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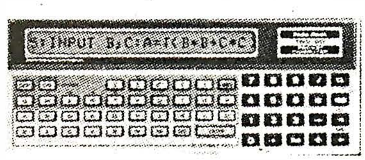

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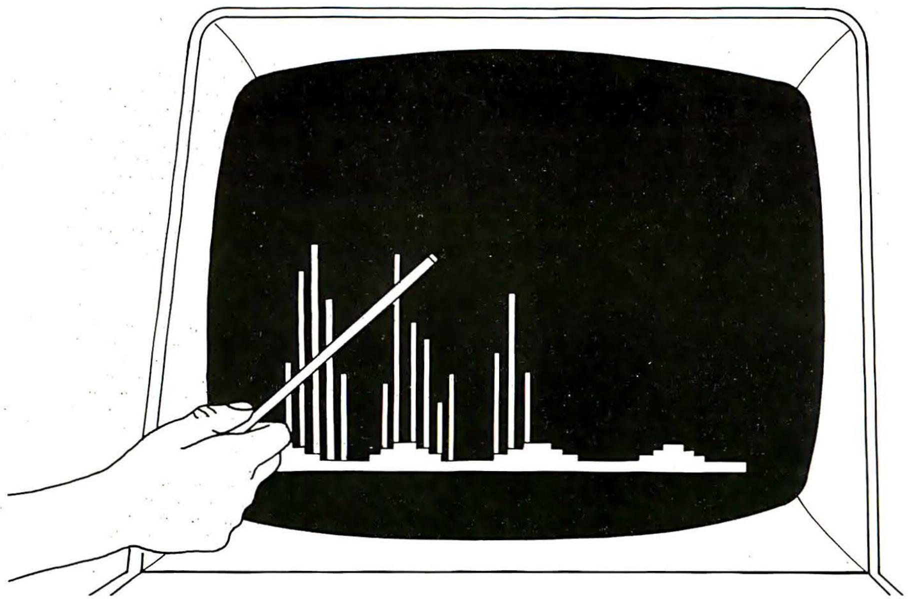


Listing 1. Basic program

```
9900  FOR I = 826 to 1023:  READ A : POKE I,A : NEXT I
9901  DATA 169,0,133,5,240,169,4,255,133,5
9902  DATA 32,112,3,133,2,32,144,3,72,165
9903  DATA 5,240,12,165,2,69,5,133,2,104
9904  DATA 37,2,76,96,3,104,5,2,170,189
9905  DATA 190,3,145,3,96,234,234,234,234,234
9906  DATA 234,234,234,234,165,178,106,144,8,165
9907  DATA 179,106,144,14,169,8,96,165,179,106
9908  DATA 176,3,169,1,96,169,2,96,169,4
9909  DATA 96,234,234,234,234,234,165,178,74,144
9910  DATA 2,105,0,10,170,189,204,3,133,3
9911  DATA 232,189,204,3,133,4,165,179,74,144
9912  DATA 2,105,0,168;136,177,3,162,15,221
9913  DATA 190,3,240,3,202,208,248,138,96,234
9914  DATA 234,234,32,108,123,98,124,225,255,254
9915  DATA 126,127,97,252,226,251,236,160,0,128
9916  DATA 40,128,80,128,120,128,160,128,200,128
9917  DATA 240,128,24,129,64,129,104,129,144,129
9918  DATA 184,129,224,129,8,130,48,130,88,130
9919  DATA 128,130,168,130,208,130,248,130,32,131
9920  DATA 72,131,112,131,152,131,192,131
```

Listing 2. Main program

```
033A  A9 00     SET    LDA #00       ENTRY POINT FOR SET FUNCTION
033C  85 05            STA $05       SAVE SET/RESET SWITCH
033E  F0 04            BEQ LB1
0340  A9 FF     RESET  LDA #FF       ENTRY POINT FOR RESET FUNCTION
0342  85 05            STA $05       SAVE SET/RESET SWITCH
0344  20 70 03  LB1    JSR POINT     DETERMINE WHICH SQUARE IS SELECTED
0347  85 02            STA $02       SAVE THE ADDRESSED SQUARE
0349  20 90 03         JSR PLOT      DETERMINE WHICH SCREEN LOCATION
034C  48               PHA           SAVE REGISTER A
034D  A5 05            LDA $05       LOAD SET/RESET SWITCH
034F  F0 0C            BEQ LB2       BRANCH IF SET
0351  A5 02            LDA #02       RETRIEVE ADDRESSED SQUARE
0353  45 05            EOR $05       COMPLIMENT
0355  85 02            STA $02       SAVE ADDRESSED SQUARE
0357  68               PLA           RETRIEVE REGISTER A
0358  25 02            AND $02       TURN OFF CORRECT BIT
035A  4C 60 03         JMP LB3
035D  68        LB2    PLA           RETRIEVE REGISTER A
035E  05 02            ORA $02       TURN ON CORRECT BIT
0360  AA        LB3    TAX           TRANSFER REGISTER A TO X
0361  BD BE 03         LDA TABLEA,X  LOAD CORRECT GRAPHIC CHAR
0364  91 03            STA ($03),Y   STORE GRAPHIC CHAR IN SCREEN
0366  60               RTS           RETURN TO BASIC
0367  EA               NOP
0368  EA               NOP
0369  EA               NOP
036A  EA               NOP
036B  EA               NOP
036C  EA               NOP
036D  EA               NOP
036E  EA               NOP
036F  EA               NOP
0370  A5 B2     POINT  LDA $B2       LOAD Y LOCATION
0372  6A               ROR A         CHECK LAST BIT
0373  90 08            BCC LBC1      BRANCH IF EVEN
0375  A5 B3            LDA $B3       LOAD X LOCATION
0377  6A               ROR A         CHECK LAST BIT
0378  90 0E            BCC LBC3      BRANCH IF EVEN
037A  A9 08            LDA #08       UPPER LEFT SQUARE
037C  60               RTS           EXIT SUBROUTINE
037D  A5 B3     LBC1   LDA $B3       LOAD X LOCATION
```

```
037F  6A        ROR A            CHECK LAST BIT
0380  B0 03     BCS LBC2         BRANCH IF ODD
0382  A9 01     LDA #01          LOWER RIGHT SQUARE
0384  60        RTS              EXIT SUBROUTINE
0385  A9 02     LBC2 LDA #02     LOWER LEFT SQUARE
0387  60        RTS              EXIT SUBROUTINE
0388  A9 04     LBC3 LDA #04     UPPER RIGHT SQUARE
038A  60        RTS              EXIT SUBROUTINE
038B  EA        NOP
038C  EA        NOP
038D  EA        NOP
038E  EA        NOP
038F  EA        NOP
0390  A5 B2     PLOT LDA $B2     LOAD Y LOCATION
0392  4A        LSR A            COMPUTE LINE NUMBER

0393  90 02     BCC LBF6
0395  69 00     ADC #00
0397  0A        LBF6 ASL
0398  AA        TAX              TRANSFER REGISTER A TO X
0399  BD CC 03  LDA TABLEB-2,X   GET SCREEN LOCATION
039C  85 03     STA $03          STORE ADDRESS LOW
039E  E8        INX              INCREMENT X
039F  BD CC 03  LDA TABLEB-2,X   LOAD SCREEN LOCATION
03A2  85 04     STA $04          STORE ADDRESS HIGH
03A4  A5 B3     LDA $B3          LOAD X LOCATION
03A6  4A        LSR A            COMPUTE POSITION WITHIN LINE
03A7  90 02     BCC LBF7
03A9  69 00     ADC #00
03AB  A8        LBF7 TAY
03AC  88        DEY
03AD  B1 03     LDA ($03),Y      LOAD CHAR FROM SCREEN
03AF  A2 0F     LDX $0F          CONVERT TO BINARY CODE
03B1  DD BE 03  LBF8 CMP TABLEA,X
03B4  F0 03     BEQ LBF9
03B6  CA        DEX
03B7  D0 F8     BNE LBF8
03B9  8A        LBF9 TXA         TRANSFER BINARY CODE TO REGISTER A
03BA  60        RTS              EXIT SUBROUTINE
03BB  EA        NOP
03BC  EA        NOP
03BD  EA        NOP
03BE  20        TABLEA
03BF  6C
03C0  7B
03C1  62
03C2  7C
03C3  E1
03C4  FF
03C5  FE
03C6  7E
037C  7F
03C8  61
03C9  FC
03CA  E2
03CB  FB
03CC  EC
03CD  A0
03CE  00 80     TABLEB
03D0  28 80
03D2  50 80
03D4  78 80
03D6  A0 80
03D8  C8 80
03DA  F0 80
03DC  18 81
03DE  40 81
03E0  68 81
03E2  90 81
03E4  B8 81
03E6  E0 81
03E8  08 82
03EA  30 82
03EC  58 82
03EE  80 82
03F0  A8 82

03F2  D0 82
03F4  F8 82
03F6  20 83
03F8  48 83
03FA  70 83
03FC  98 83
03FE  C0 83
```

Cross Reference
Continued from page 99

Sample Cross Reference program

```
   0            1500
 300             330
----------------------------------------------------------------
 350             310
 410             460    1480
 450            1490
----------------------------------------------------------------
 480             420
 570             420
 610             540
----------------------------------------------------------------
 670             680     750     790     800     930     940
 750             780     790     810     820     850     930     970
                1150    1160
 890             770
----------------------------------------------------------------
 900             910
1010             750     790     800     810     840     920
1040            1040
----------------------------------------------------------------
1060            1040
1080            1050
1090            1020    1050
----------------------------------------------------------------
1130             820     830
1150             770
1160             900
----------------------------------------------------------------
1200             670
1230            1330
1260            1310
----------------------------------------------------------------
1340            1230
1400            1240    1300
1410            1240
----------------------------------------------------------------
1430             680
1450            1450
1460            1460
----------------------------------------------------------------
1480              70
1520             630    1210    1400    1440
BC               610     690    1370
----------------------------------------------------------------
BRNCH            690     780     890     950    1150
C                890     900    1020    1030
C$               610     760     770     780     790     800     810
                 820     830     840     890    1130    1160
----------------------------------------------------------------
D$               480     540
ER$              690     840     960    1020
F                530     540
----------------------------------------------------------------
F$(               80     450     540

SYMBOL          REFERENCE LINE
----------------------------------------------------------------
FRST%(            90    1070    1250
```

```
180 DATA IF, IMP, INPUT, INP, INSTR, INT, KILL, LEFT$, LEN, LET, LINE
190 DATA LIST, LLIST, LOAD, LOC, LOF, LOG, LPRINT, LSET, MERGE, MID$, MKD$, MKI$
200 DATA MKS$, MOD, MOUNT, NAME, NEW, NEXT, NOT, NULL, OCT$, ON, OPEN, OR, OUT
210 DATA PEEK, POKE, POS, PRINT, PUT
220 DATA READ, REM, RENUM, RESET, RESTORE, RESUME, RETURN, RIGHT$, RND, RSET, RUN
230 DATA SAVE, SGN, SIN, SPACE$, SPC(, SQR, STEP, STOP, STR$, STRING$, SWAP
240 DATA TAB(, TAN, THEN, TO, TROFF, TRON, UNLOAD
250 DATA USING, USR, VAL, VARPTR, WAIT, WIDTH, XOR, "\"
260 '
270 'FILL ARRAY WITH RESERVED WORDS
280 '
290 RW=0
300 READ RW$
310 RW=RW+1: RW$(RW)=RW$: IF RW$="\" THEN 350
320 I=ASC(RW$)-ASC("A"): IF PT%(I)=0 THEN PT%(I)=RW
330 GOTO 300
340 '
350 FOR I=0 TO 25: IF PT%(I)=0 THEN PT%(I)=RW
360 NEXT
370 '
380 'GET LIST OF FILE NAMES
390 '
400 FX=0
410 PRINT: PRINT " ASCII SAVED PROGRAM #" FX+1 " = ";: LINE INPUT L$
420 IF L$="" THEN IF FX<1 THEN 570 ELSE 480
430 IF INSTR(L$, ".")=0 THEN L$=L$+".BAS"
440 NAME L$ AS L$
450 FX=FX+1: F$(FX)=L$
460 GOTO 410
470 '
480 PRINT: INPUT"DATE = ";D$
490 PRINT: INPUT"1) CROSS REFERENCE    2) LIST    3) BOTH ";M
500 '
510 'PROCESS LIST OF FILE NAMES
520 '
530 FOR F=1 TO FX
540 CLOSE: OPEN"I", 1, F$(F): PRG$="'"+F$(F)+"'     -     "+D$: GOSUB 610
550 NEXT
560 LPRINT STRING$(65-LZ, CHR$(10))
570 END
580 '
590 'INITIALIZE FOR CROSS REFERENCE
600 '
610 LC=0: BC=0: PZ=0: V$="": C$="": VC=91: RC=-1
620 FOR I=0 TO 91: VNXT%(I)=-1: NEXT
630 IF M>1 THEN GOSUB 1520
640 '
650 '   INPUT LINE & EXTRACT LINE#
660 '
670 IF EOF(1)THEN 1200
680 LINE INPUT#1, L$: IF M>1 THEN GOSUB 1430: IF M=2 THEN 670
690 LG=LEN(L$): BRNCH=0: ER$="": LC=LC+1: BC=BC+LG
700 LP=INSTR(L$, " "): LN=VAL(LEFT$(L$, LP)): PRINT LN,
710 IF LN>32767 THEN LN=LN-65536!
720 '
730 '   PARSE REST OF LINE
740 '
750 LP=LP+1: IF LP>LG THEN GOSUB 1010: GOTO 670
760 C$=MID$(L$, LP, 1)
770 IF C$>="A"AND C$<="Z"THEN 890 ELSE IF C$>="0"AND C$<="9"THEN 1150
780 IF C$=" "THEN 750 ELSE IF C$<>","THEN BRNCH=0
790 IF C$=CHR$(34)THEN GOSUB 1010: LP=INSTR(LP+1, L$, C$): IF LP>0 THEN 750 ELSE 670
800 IF C$="'"THEN GOSUB 1010: GOTO 670
810 IF C$="&"THEN GOSUB 1010: V$=C$: GOTO 750
820 IF C$="$"OR C$="!"OR C$="%"OR C$="#"THEN GOSUB 1130: GOTO 750
830 IF C$="("THEN GOSUB 1130
840 GOSUB 1010: IF C$<>","THEN ER$=""
850 GOTO 750
860 '
870 '   TEST FOR COMMAND
880 '
```

```
FX            400     410     420     450     530
I              60      90     320     350     620    1030    1040
             1050    1070    1080    1250    1270    1310
-------------------------------------------------------------------------------
IL           1030    1040    1060
J              60    1050    1220    1340
L$            410     420     430     440     450     680     690
              700     760     790     910     930    1440    1450
             1460
-------------------------------------------------------------------------------
LC            610     690    1370
LG            690     750
LN            700     710    1050    1080    1270    1280
-------------------------------------------------------------------------------
LP            700     750     760     790     910     930     970
LST%(          90    1050    1080
LW             60    1460
-------------------------------------------------------------------------------
LZ            560    1240    1300    1320    1380    1400    1410
             1440    1450    1460    1520    1550
M             490     630     680    1200
NXT%(          90    1050    1080    1310
-------------------------------------------------------------------------------
P             890     900     910     920
PRG$          540    1540
PT%(           80     320     350     890
-------------------------------------------------------------------------------
PZ            610    1210    1530
RC            610    1050    1070    1080    1370
RFL%(          90    1050    1080    1270
-------------------------------------------------------------------------------
RW            290     310     320     350
RW$           300     310     320     920     930     940     950
              960     970
RW$(           80     310     900     910     920
-------------------------------------------------------------------------------
RZ           1250    1260    1290    1300    1320
SZ           1240    1410
V            1220    1230    1250
-------------------------------------------------------------------------------
V$            610     810    1010    1020    1040    1050    1070
             1090    1130    1150    1160
V$(            90    1040    1050    1070    1250
VC            610    1060    1070    1370
-------------------------------------------------------------------------------
VNXT%(         90     620    1040    1060    1070    1230
X            1430    1450    1460
Y            1450
===============================================================================
LINES:  155      BYTES:  5018      SYMBOLS:  72      REFERENCES:  258
```

Program listing

```
10 PRINT:PRINT"CROSSREF    -    BASIC-80 VERSION OF 05/19/80"
20 PRINT:PRINT"COPYRIGHT (C) 1980 BY ADVANCED INFORMATICS"
30 PRINT:PRINT"LISTS ALL VARIABLES & REFERENCED LINE #'S"
40 PRINT"----------------------------------------"
50 '
60 DEFINT I-J:LW=80
70 ON ERROR GOTO 1480
80 DIM RW$(126),PT%(25),F$(10)
90 I=400:DIM VNXT%(I+90),V$(I+90),FRST%(I),LST%(I),RFL%(5*I),NXT%(5*I)
100 '
110 ' RESERVED WORDS
120 '
130 DATA ABS,AND,ASC,AS,ATN,AUTO,CDBL,CHR$,CINT,CLEAR,CLOSE,CONSOLE,CONT
140 DATA COS,CSNG,CVD,CVI,CVS,DATA
150 DATA DEFDBL,DEFINT,DEFSNG,DEFSTR,DEFUSR,DEF,DELETE,DIM,DSKI$,DSKO$,DSKF
160 DATA EDIT,ELSE,END,EOF,EQV,ERASE,ERL,ERR,EXP,FIELD,FILES,FIX,FOR
170 DATA FRE,GET,GOSUB,GOTO,HEX$
```

```
890 C=ASC(C$):P=PT%(C-ASC("A")):BRNCH=0
900 IF C<ASC(RW$(P))THEN 1160
910 IF INSTR(LP,L$,RW$(P))<>LP THEN P=P+1:GOTO 900
920 GOSUB 1010:RW$=RW$(P)
930 IF RW$="DATA" THEN LP=INSTR(LP,L$,":"):IF LP>0 THEN 750 ELSE 670
940 IF RW$="REM"THEN 670
950 IF RW$="GOTO"OR RW$="GOSUB"OR RW$="THEN"OR RW$="ELSE"OR RW$="RESUME"THEN BRN
CH=1
960 IF RW$="ERASE"THEN ER$="("ELSE ER$=""
970 LP=LP+LEN(RW$)-1:GOTO 750
980 '
990 '  END VARIABLE
1000 '
1010 IF V$=""THEN RETURN
1020 IF V$>="A"THEN V$=V$+ER$:C=ASC(V$)+1ELSE IF V$>="0"THEN V$=RIGHT$("     "+V$
,5):C=VAL(LEFT$(V$,2)) ELSE 1090
1030 IL=-1:I=C
1040 IF V$>V$(I)THEN IL=I:I=VNXT%(I):IF I>0 THEN 1040 ELSE 1060
1050 IF V$=V$(I)THEN J=LST%(I-91):IF RFL%(J)=LN THEN 1090 ELSE RC=RC+1:NXT%(J)=R
C:GOTO 1080
1060 VC=VC+1:IF IL>=0 THEN VNXT%(IL)=VC
1070 V$(VC)=V$:VNXT%(VC)=I:RC=RC+1:FRST%(VC-91)=RC:I=VC
1080 RFL%(RC)=LN:NXT%(RC)=-1:LST%(I-91)=RC
1090 V$="":RETURN
1100 '
1110 '  EXPAND VARIABLE
1120 '
1130 IF V$<>""THEN V$=V$+C$
1140 RETURN
1150 IF V$="" AND BRNCH=0 THEN 750
1160 V$=V$+C$:GOTO 750
1170 '
1180 '  LIST VARIABLES
1190 '
1200 IF M=2 THEN RETURN
1210 PZ=0:GOSUB 1520
1220 FOR J=0 TO 91:V=J
1230 V=VNXT%(V):IF V<0 THEN 1340
1240 IF LZ>56 THEN GOSUB 1400ELSE SZ=SZ+1:IF SZ=3 THEN GOSUB 1410
1250 RZ=0:I=FRST%(V-91):LPRINT V$(V);
1260 IF RZ=0 THEN LPRINT TAB(16);
1270 LN=RFL%(I):IF LN<0 THEN LN=LN+65536!
1280 LPRINT USING"    #####";LN,
1290 RZ=RZ+1
1300 IF RZ>6 THEN RZ=0:LPRINT:LZ=LZ+1:IF LZ>56 THEN GOSUB 1400
1310 I=NXT%(I):IF I>0 THEN 1260
1320 IF RZ>0 THEN LPRINT:LZ=LZ+1
1330 GOTO 1230
1340 NEXT J
1350 '
1360 LPRINT STRING$(80,"=")
1370 LPRINT"LINES: "LC"     BYTES: "BC"     SYMBOLS: "VC-91"     REFERENCES: "RC+1
1380 LZ=LZ+2:RETURN
1390 '
1400 GOSUB 1520:LPRINT"SYMBOL"TAB(20)"REFERENCE LINE":LZ=LZ+1
1410 LPRINT STRING$(80,"-"):LZ=LZ+1:SZ=0:RETURN
1420 '
1430 X=1
1440 IF LZ>60 OR RIGHT$(L$,3)="'PG"THEN GOSUB 1520
1450 Y=INSTR(X,L$,CHR$(10)):IF Y>0 THEN LPRINT MID$(L$,X,Y-X):LZ=LZ+1:X=Y+1:GOTO
 1450
1460 LPRINT MID$(L$,X,LW):LZ=LZ+1:X=X+LW:IF X<LEN(L$) THEN 1460 ELSE RETURN
1470 '
1480 IF ERR=53 THEN PRINT:PRINT"FILE NOT FOUND":RESUME 410
1490 IF ERR=58 THEN RESUME 450
1500 ON ERROR GOTO 0
1510 '
1520 LPRINT STRING$(65-LZ,CHR$(10))
1530 PZ=PZ+1:LPRINT TAB(72)"PG#"PZ
1540 LPRINT PRG$:LPRINT
1550 LZ=3:RETURN
```

Exercise Your Stock Options
Continued from page 101

Program listing

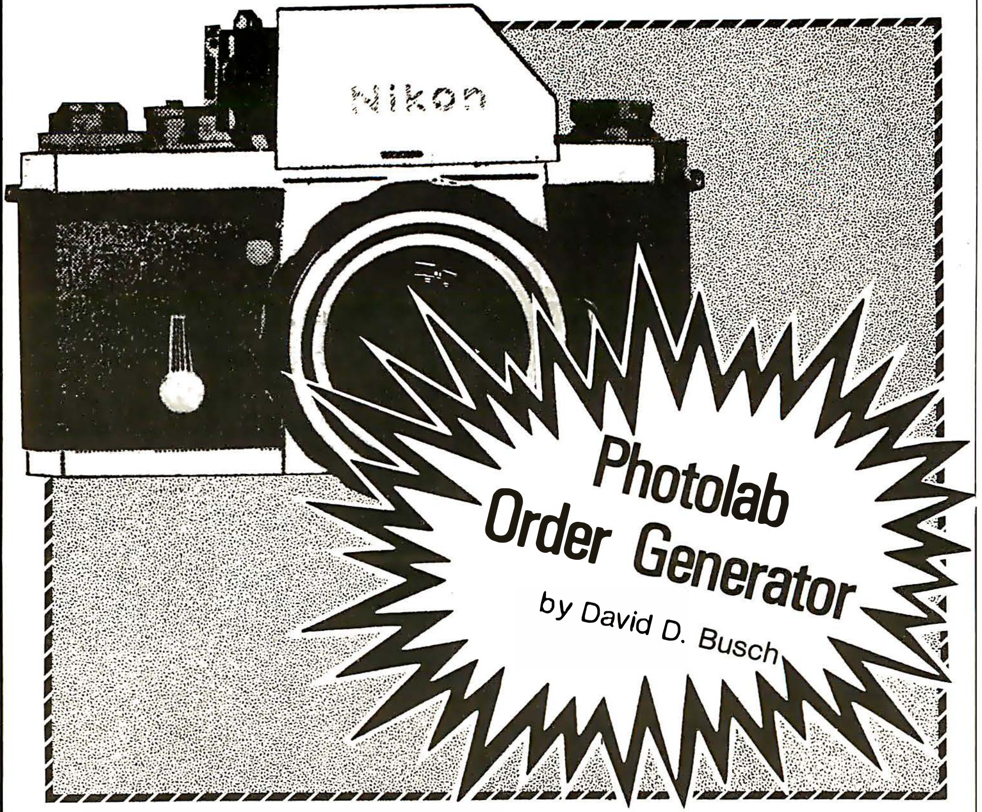
```
10  REM COVERED OPTION WRITER
20  REM APPLESOFT
30  REM BY EDWARD GARNER
40  REM CHEVY CHASE,MD
50 K = 12: DIM QV(K)
60  FOR I = 1 TO K
70  READ QV(I): NEXT I
80  HOME : VTAB 5
90  INPUT "STOCK NAME OR SYMBOL: ";ST$
100 ST$ =  LEFT$ (ST$,10)
110  INPUT "STRIKING PRICE: ";EP
120  INPUT "OPTION DATE(MM/YY): ";Z$
130 E2$ = Z$
140  FOR I = 1 TO 5
150  IF  MID$ (E2$,I,1) = "/" THEN 180
160  NEXT I
170  GOSUB 1100: GOTO 120
180 Z$ =  LEFT$ (E2$,I - 1)
190 Z$ = Z$ + "/1/" +  MID$ (E2$,I + 1,5 - I)
200  GOSUB 2000
210  IF NZ = 0 THEN  GOSUB 1100: GOTO 170
220  REM  1/1/48 WAS THURSDAY
230 C% = NZ - 7 *  INT (NZ / 7): REM  0=WED
240 C% = 9 - C%:C% = C% - 7 *  INT (C% / 7)
250 DE = NZ + 15 + C%: REM  EXPIRATION DATE
260  INPUT "TODAYS DATE(MM/DD/YY): ";Z$
270  GOSUB 2000
280  IF NZ = 0 THEN  GOSUB 1100: GOTO 260
290 D1 = DE - NZ: REM DAYS IN OPTION
300  INPUT "NUMBER OF SHARES, AT : ";N,P
700  PRINT "COMMISSIONS: STOCK=";M2;"  OPTION=";M1
710  PRINT "PERIOD DIVIDEND = ";D2
720  PRINT "STRIKING PRICE= $";EP
730  END
740  DATA    31,28,31,30,31,30,31,31,30,31,30,31
1000  REM FORMAT ROUTINE
1001 ER$ = "***************"
1002 SP$ = "               "
1003 ZE$ = "000000000000000"
1004 X$ =  STR$ (XX)
1005  FOR J = 1 TO  LEN (X$)
1006  IF  MID$ (X$,J,1) (   ) "." THEN  NEXT J
1007  IF J )  LEN (X$) THEN X$ = X$ + ".0"
1008 K = W% - D%
1009  IF K - J ( 0 THEN 1015
1010 Y$ =  LEFT$ (X$,J)
1011 Y$ =  RIGHT$ (SP$ + Y$,K)
1012 X$ =  RIGHT$ (X$, LEN (X$) - J)
1013 Y$ =  LEFT$ (Y$ + X$ + ZE$,W%)
1014  RETURN
1015  REM  WIDTH ERROR
1016 Y$ =  LEFT$ (ER$,WT): RETURN
1017  REM ****************
1018  REM  D%=DECIMAL PLACES
1019  REM W%=FIELD WIDTH
1020  REM XX=INPUT  Y$=OUTPUT
1021  REM ****************
1100  REM ANNOUNCE BAD DATE
1101  PRINT "WRONG DATE FORMAT"
1102  PRINT Z$: PRINT "TRY AGAIN"
1103  RETURN
2000  REM  UNPACK DATE Z$=MM/DD/YY
2001  REM   PRODUCE NZ=RELATIVE DATE1/1/48=1
2002  REM  ROUTINE IS REENTRANT
2003  IF QJ = 1 THEN 2009
2004  DIM Q1(3): DIM Q4(12)
2005 Q4(1) = 0:Q4(2) = 31:Q4(3) = 59
2006 Q4(4) = 90:Q4(5) = 120:Q4(6) = 151
2007 Q4(7) = 181:Q4(8) = 212:Q4(9) = 243
2008 Q4(10) = 273:Q4(11) = 304:Q4(12) = 334
2009 QJ = 1:J = 1
2010 Q1(1) = 0:Q1(2) = 0:Q1(3) = 0
```

```
310  INPUT "PERIOD DIVIDEND: ";D2
320  INPUT "UNDERLYING STOCK COMMISSION: ";M2
330  INPUT "NUMBER OF CALLS, AT : ";C,PR
340  INPUT "OPTION COMMISSION: ";M1
350 PR = PR * 100
360 L1 = N * P:L2 = L1 + M2:L3 = C * PR:L4 = L3 - M1
370 D3 = D2 * N:P1 = N * EP
380 L5 = P1 - (L2 + M2):L6 = L5 + D3 + L4
390 R1 = L6 / L2:R2 = R1 * (365 / D1)
400 R1 = R1 * 100:R2 = R2 * 100
410 L7 = D3 + L4:R3 = 100 * (L7 / L2):R4 = R3 * (365 /
    D1)
420 L8 = (L2 - L7) / N
430  HOME : HTAB 10: PRINT "COVERED OPTION WRITER"
440  PRINT "===================================="
450 D% = 2:W% = 8:XX = L4: GOSUB 1001
460  PRINT "NET PROCEEDS: $";Y$;" FOR ";ST$
470  PRINT "===================================="
480  PRINT "OPTIONS  EXERCISED     UNEXERCISED"
490  PRINT "...................................."
500  PRINT :XX = L6: GOSUB 1001
510 V$ = Y$:XX = L7: GOSUB 1001
520  PRINT "NET       $";V$;"   ";Y$
530 W% = 6:XX = R1: GOSUB 1001
540 V$ = Y$:XX = R3: GOSUB 1001
550  PRINT "ROI            ";V$;"%";"    ";Y$;"%"
560 XX = R2: GOSUB 1001
570 V$ = Y$:XX = R4: GOSUB 1001
580  PRINT "ANNUAL ROI  ";V$;"%";"    ";Y$;"%"
590  PRINT "....................................": PRINT

600 W% = 8:XX = L8: GOSUB 1001
610  PRINT "BREAK EVEN POINT:$";Y$;" PER SHARE"
620 XX = L2 - L4: GOSUB 1001
630  PRINT "NET CAPITAL EMPLOYED= $";Y$
640  PRINT ".....................................": PRINT

650  PRINT "BUY ";N;" SHARES AT ";P
660  PRINT "SELL ";C;" OPTIONS AT ";PR / 100
670  PRINT "DAYS TO EXPIRATION = ";D1
680 N = DE - 1: GOSUB 3000
690  PRINT "LAST TRADING DAY: ";Z$
2011  FOR I = 1 TO  LEN (Z$)
2012  IF  MID$ (Z$,I,1) = "/" THEN 2023
2013  NEXT I:NZ = 0: RETURN
2014  IF Q1(3) < 48 THEN Q1(3) = Q1(3) + 100
2015 Q1(3) = Q1(3) - 48
2016 Q2 =  INT (1 + (Q1(3) / 4)): IF Q2 < 0 THEN Q2 =
     0
2017  IF Q1(1) > 12 THEN NZ = 0: RETURN
2018  IF Q1(2) > 31 THEN NZ = 0: RETURN
2019  IF Q1(1) < 3 AND ( INT (Q1(3) / 4) = (Q1(3) / 4)
     ) THEN Q2 = Q2 - 1
2020 Q1(1) = Q4(Q1(1))
2021 NZ = Q1(1) + Q1(2) + (Q1(3) * 365) + Q2
2022  RETURN
2023  IF J = 1 THEN 2026
2024  IF J = 2 THEN 2028
2025  GOTO 2013
2026 Q1(1) =  VAL ( LEFT$ (Z$,I - 1))
2027 QE = I + 1:J = J + 1: GOTO 2013
2028 Q1(2) =  VAL ( MID$ (Z$,QE,I - QE))
2029 Q1(3) =  VAL ( MID$ (Z$,I + 1, LEN (Z$) - I)): GOTO
     2014
3000  REM  REVERSE CALENDAR
3001  FOR Q = 0 TO 99
3002 QK = ((Q / 4) =  INT (Q / 4))
3003  IF 0 >  = N - (365 + QK) THEN 3006
3004 N = N - (365 + QK): NEXT Q
3005  STOP
3006 QY = 48 + Q:QV(2) = 28 + QK
3007  FOR Q = 1 TO 12
3008  IF 0 >  = N - QV(Q) THEN 3011
3009 N = N - QV(Q): NEXT Q
3010  STOP
3011 QM = Q:QD = N
3012  REM  BUILD Z$ FROM QM,QD,QY
3013 Z$ =  STR$ (QM) + "/" +  STR$ (QD) + "/" +  STR$
     (QY)
3014  RETURN
3015  REM ****************
3016  REM   N=DATE INPUT
3017  REM   Z$=MM/DD/YY OUTPUT
3018  REM ****************
```

Photolab Order
Continued from page 106



Program listing

```
10 CLEAR 4000
20 DIM PO$(50),CLIENT$(50),DATE$(50),JOB$(50),TT(50),CU(50)
30 NME$="YOUR COMPANY NAME GOES HERE"
40 G$="$$$$$$.##"
50 L$=STRING$(80,"-")
60 DATA BLACK-AND-WHITE FILM,COLOR NEGATIVE FILM,COLOR TRANSPARENCY FILM,
      8 X 10 COLOR PRINT,8 X 10 BLACK-AND-WHITE PRINT
70 FOR N=1 TO 5:READ PR$(N):NEXT N

80 ' ****** MENU ******
90 CLS:PRINT
100 PRINT "DO YOU WANT TO :"
110 PRINT "                    1.) ACCESS LAB ORDER FILE "
120 PRINT "                    2.) GENERATE NEW PHOTO LAB ORDER"
130 PRINT "                    3.) ENTER NEW PRICELIST"
140 PRINT
150 PRINT "   ENTER CHOICE :";
```

```
650 B=VAL(A$)
660 IF B<1 OR B>6 GOTO 640
670 IF B=6 GOTO 1300
680 CLS:PRINT:PRINT
690 IF B>3 GOTO 970

700 ' ****** ENTER FILM INFORMATION ******

710 PRINT " ENTER EACH TYPE OF ";PR$(B);" SEPARATELY."
720 PRINT "ENTER TYPE OF ";PR$(B);
730 INPUT ROLL$
740 INPUT "ENTER NUMBER OF ROLLS :";NO$
750 IF VAL(NO$)<1 PRINT "USE NUMBERS ONLY":GOTO 740
760 INPUT "PROCESS AT NORMAL EXPOSURE INDEX (Y/N) ";AN$
770 IF LEFT$(AN$,1)="N" INPUT " ENTER EXPOSURE INDEX DESIRED :";EI$
780 SEG$=NO$+" ROLLS OF "+ROLL$
790 PRICE=PL(B)*VAL(NO$)
800 IF EI$<>"" THEN SEG$=SEG$+ " AT AN EXPOSURE INDEX OF
"+EI$:PRICE=PRICE+PUSH(B)*VAL(NO$)

810 '****** FORMAT PRICE ******

820 PRICE$=STR$(PRICE)
830 TT=TT+VAL(PRICE$)
840 H=INSTR(PRICE$,".")
850 IF H=0 GOTO 880
860 IF LEN(MID$(PRICE$,H+1))<2 THEN PRICE$=PRICE$+"0"
870 GOTO 890
880 PRICE$=PRICE$+".00"
890 FB=LEN(PRICE$)
900 FA=LEN(SEG$)
910 FC=FA+FB
920 SEG$=SEG$+STRING$(80-FC,".")+"$"+PRICE$
930 ROLL$="":AN$="":EI$=""
940 PO$(NP)=PO$(NP)+SEG$+CHR$(10)+CHR$(10)
950 GOTO 490

960 ' ****** ENTER PRINT INFORMATION ******

970 CLS:PRINT:PRINT
980 NFLAG=1
990 PRINT PR$(B);"S "
1000 INPUT "ENTER TOTAL NUMBER OF PRINTS";TP$
1010 IF VAL(TP$)<1 PRINT "ENTER NUMERALS ONLY":GOTO 1000
1020 PRICE=PL(B)*VAL(TP$)
1030 SEG$=TP$+"  "+PR$(B)
1040 GOSUB 820

1050 '****** LOAD ORDER INFORMATION FROM DISK ******

1060 OPEN "I",1,"PROCESS"
1070 INPUT #1,NP
1080 :  FOR N=1 TO NP
1090 :    INPUT #1,TT(N)
1095 :    INPUT #1,CU(N)
```

```
160 A$=INKEY$:IF A$="" GOTO 160
170 A=VAL(A$)
180 IF A<1 OR A>3 GOTO 160
190 IF A=3 GOTO 1530
200 GOSUB 1060
210 ON A GOTO 230,380

220 ' ****** ACCESS LAB ORDER FILE ******

230 CLS
240 AFLAG=1
250 PRINT "PROJECT NAME";:PRINT TAB(30)"DATE SENT"
260 PRINT
270 :  FOR N=1 TO NP
280 :    IF JOB$(N)<>"" PRINT JOB$(N);TAB(30)DATE$(N):C3=C3+1
290 :    IF C3/12=INT(C3/12) INPUT "PRESS ENTER FOR REST OF LIST";A$:CLS
300 :  NEXT N
310 PRINT
320 INPUT "ENTER NAME OF PROJECT FOR HARDCOPY ";NA$
330 :  FOR N2=1 TO NP
340 :    IF NA$=JOB$(N2) THEN NP=N2:GOTO 1320
350 :  NEXT N2
360 CLS:PRINT:PRINT "WRONG PROJECT NAME": GOTO 250

370 ' ****** ENTER NEW LAB ORDER ******

380 CLS:PRINT:PRINT
390 GOSUB 1740
400 CLS:PRINT:PRINT
410 NP=NP+1
420 CU=1
430 INPUT "ENTER CLIENT :";CLIENT$
440 INPUT "ENTER PROJECT NAME :";JOB$(NP)
450 INPUT "ENTER DATE (MM/DD/YY) :";DATE$(NP)
460 TT=0
470 CLIENT$(NP)="CLIENT :"+CLIENT$+CHR$(10)+"PROJECT : "+JOB$(NP)

480 ' ****** BEGIN ENTERING FILM/PRINT DATA ******

490 CLS:PRINT:PRINT
500 C1=C1+1
510 IF C1<4 GOTO 550
520 PO$(NP)=PO$(NP)+CHR$(26)
530 CU=CU+1:NP=NP+1
540 C1=1
550 PRINT "ENTER EACH TYPE OF FILM OR PRINT ORDERED SEPARATELY"
560 PRINT
570 PRINT " ADD TO PHOTO LAB ORDER :"
580 :  FOR N=1 TO 5
590 :    PRINT "                   ";N;".) ";PR$(N)
600 :  NEXT N
610 PRINT"                  6. ) PRINT OUT FINISHED LAB ORDER "
620 PRINT
630 PRINT"       ENTER CHOICE :";
640 A$=INKEY$:IF A$="" GOTO 640

1100 :    INPUT #1,CLIENT$(N)
1110 :    INPUT #1,JOB$(N)
1120 :    INPUT #1,PO$(N)
1130 :    INPUT #1,DATE$(N)
1140 :  NEXT N
1150 CLOSE 1
1160 RETURN

1170 ' ****** SAVE PROCESS ORDER DATA TO DISK ******

1180 OPEN "O",1,"PROCESS"
1185 CU(NP-F2)=CU
1190 PRINT #1,NP
1200 :  FOR N=1 TO NP
1210 :    PRINT #1,TT(N)
1215 :    PRINT #1,CU(N)
1220 :    PRINT #1,CHR$(34);CLIENT$(N);CHR$(34)
1230 :    PRINT #1,CHR$(34);JOB$(N);CHR$(34)
1240 :    PRINT #1,CHR$(34);PO$(N);CHR$(34)
1250 :    PRINT #1,CHR$(34);DATE$(N);CHR$(34)
1260 :  NEXT N
1270 CLOSE 1
1280 RUN

1290 ' ****** PRINT OUT PHOTO LAB ORDER ******

1300 IF CU>0 THEN F2=CU-1 ELSE F2=0
1310 TT(NP-F2)=TT
1320 LPRINT "                    P H O T O   L A B   O R D E R";
1330 LPRINT "                    ";
1340 LPRINT DATE$(NP-F2)
1350 LPRINT L$
1360 LPRINT
1370 LPRINT
1380 LPRINT CLIENT$(NP-F2)
1390 LPRINT
1400 LPRINT
1410 IF CU=1 LPRINT PO$(NP):GOTO 1450
1420 :  FOR N=0 TO CU
1430 :    LPRINT PO$(NP-N)
1440 :  NEXT N
1450 LPRINT
1460 LPRINT " TOTAL ORDERED :";:LPRINT USING G$;TT(NP-F2)
1470 LPRINT
1480 IF NFLAG=1 THEN LPRINT " INSTRUCTIONS FOR PRINTING NEGATIVES ON
NEGATIVE SLEEVES":LPRINT EL SE LPRINT
1490 LPRINT L$
1500 IF AFLAG=1 RUN
1510 GOTO 1180

1520 ' ****** ENTER PRICE LIST *****

1530 CLS:PRINT:PRINT
1540 INPUT "ENTER NAME OF LAB ";F$
1550 IF LEN(F$)>8 PRINT "ONLY EIGHT LETTERS ALLOWED":GOTO 1540
```

```
1560 IF INSTR(F$," ")<>0 PRINT"SPACES NOT ALLOWED IN FILENAME":GOTO 1540
1570 :  FOR N=1 TO 5
1580 :    PRINT " ENTER PRICE FOR ONE ";
1590 :    PRINT PR$(N);" : ";
1600 :    INPUT PL(N)
1610 :  NEXT N
1620 INPUT " ENTER COST TO PUSH ONE ROLL B & W FILM :";PU(1)
1630 INPUT " ENTER COST TO PUSH ONE ROLL COLOR FILM :";PU(2)

1640 ' ****** SAVE PRICE LIST TO DISK ******

1650 OPEN "O",1,F$
1660 :  FOR N=1 TO 5
1670 :    PRINT #1,PL(N)
1680 :  NEXT N
1690 PRINT #1,PU(1)
1700 PRINT #1,PU(2)
1710 CLOSE 1
1720 RUN

1730 ' ***** LOAD PRICE LIST FROM DISK ******

1740 CLS:PRINT:PRINT
1750 INPUT "ENTER NAME OF LAB TO BE USED :";F$
1760 IF LEN(F$)>8 PRINT"YOU'VE MADE A MISTAKE SOMEWHERE":GOTO 1750
1770 OPEN "I",1,F$
1780 :  FOR N=1 TO 5
1790 :    INPUT #1,PL(N)
1800 :  NEXT N
1810 INPUT #1,PUSH(1)
1820 INPUT #1,PUSH(2)
1830 CLOSE 1
1840 RETURN
```

Sample run

```
>RUN


DO YOU WANT TO :
                    1.) ACCESS LAB ORDER FILE
                    2.) GENERATE NEW PHOTO LAB ORDER
                    3.) ENTER NEW PRICELIST

    ENTER CHOICE :? 3



ENTER NAME OF LAB ? SUPERIOR
 ENTER PRICE FOR ONE BLACK-AND-WHITE FILM : ? 3.50
 ENTER PRICE FOR ONE COLOR NEGATIVE FILM : ? 5.00
 ENTER PRICE FOR ONE COLOR TRANSPARENCY FILM : ? 5.00
 ENTER PRICE FOR ONE 8 X 10 COLOR PRINT : ? 10.00
 ENTER PRICE FOR ONE 8 X 10 BLACK-AND-WHITE PRINT : ? 4.00
 ENTER COST TO PUSH ONE ROLL B & W FILM :? 2.00
 ENTER COST TO PUSH ONE ROLL COLOR FILM :? 4.00
DO YOU WANT TO :
                    1.) ACCESS LAB ORDER FILE
                    2.) GENERATE NEW PHOTO LAB ORDER
                    3.) ENTER NEW PRICELIST

    ENTER CHOICE :? 2



ENTER NAME OF LAB TO BE USED :? SUPERIOR
ENTER CLIENT :? BURNSIDE ADVERTISING
ENTER PROJECT NAME :? PORTLAND NEWS
ENTER DATE (MM/DD/YY) :? 04/04/81
ENTER EACH TYPE OF FILM OR PRINT ORDERED SEPARATELY

 ADD TO PHOTO LAB ORDER :
                 1 .) BLACK-AND-WHITE FILM
                 2 .) COLOR NEGATIVE FILM
                 3 .) COLOR TRANSPARENCY FILM
                 4 .) 8 X 10 COLOR PRINT
                 5 .) 8 X 10 BLACK-AND-WHITE PRINT
                 6.  ) PRINT OUT FINISHED LAB ORDER

      ENTER CHOICE :? 1
←

 ENTER EACH TYPE OF BLACK-AND-WHITE FILM SEPARATELY.
ENTER TYPE OF BLACK-AND-WHITE FILM? TRI-X
ENTER NUMBER OF ROLLS :? 10
PROCESS AT NORMAL EXPOSURE INDEX (Y/N) ? N
 ENTER EXPOSURE INDEX DESIRED :? 800
ENTER EACH TYPE OF FILM OR PRINT ORDERED SEPARATELY

 ADD TO PHOTO LAB ORDER :
                 1 .) BLACK-AND-WHITE FILM
                 2 .) COLOR NEGATIVE FILM
                 3 .) COLOR TRANSPARENCY FILM
                 4 .) 8 X 10 COLOR PRINT
```

```
5 .) 8 X 10 BLACK-AND-WHITE PRINT
6. ) PRINT OUT FINISHED LAB ORDER

ENTER CHOICE :? 3   ←

ENTER EACH TYPE OF COLOR TRANSPARENCY FILM SEPARATELY.
ENTER TYPE OF COLOR TRANSPARENCY FILM? EKTACHROME 400
ENTER NUMBER OF ROLLS :? 5
PROCESS AT NORMAL EXPOSURE INDEX (Y/N) ? Y
ENTER EACH TYPE OF FILM OR PRINT ORDERED SEPARATELY

ADD TO PHOTO LAB ORDER :
    1 .) BLACK-AND-WHITE FILM
    2 .) COLOR NEGATIVE FILM
    3 .) COLOR TRANSPARENCY FILM
    4 .) 8 X 10 COLOR PRINT
    5 .) 8 X 10 BLACK-AND-WHITE PRINT
    6. ) PRINT OUT FINISHED LAB ORDER

ENTER CHOICE :? 6

←

          P H O T O   L A B   O R D E R        04/04/81
-----------------------------------------------------------------

CLIENT :BURNSIDE ADVERTISING
PROJECT : PORTLAND NEWS

10 ROLLS OF TRI-X AT AN EXPOSURE INDEX OF 800..........$ 55.00

5 ROLLS OF EKTACHROME 400..............................$ 25.00

TOTAL ORDERED :    $80.00
-----------------------------------------------------------------
```

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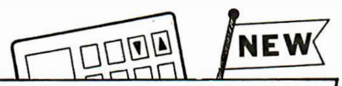

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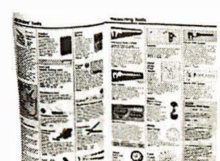

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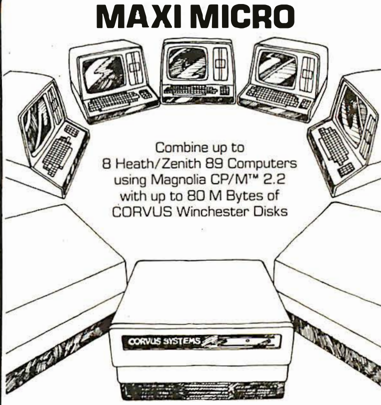

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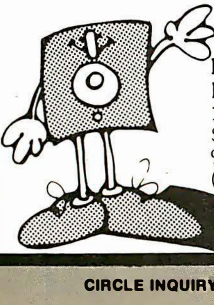

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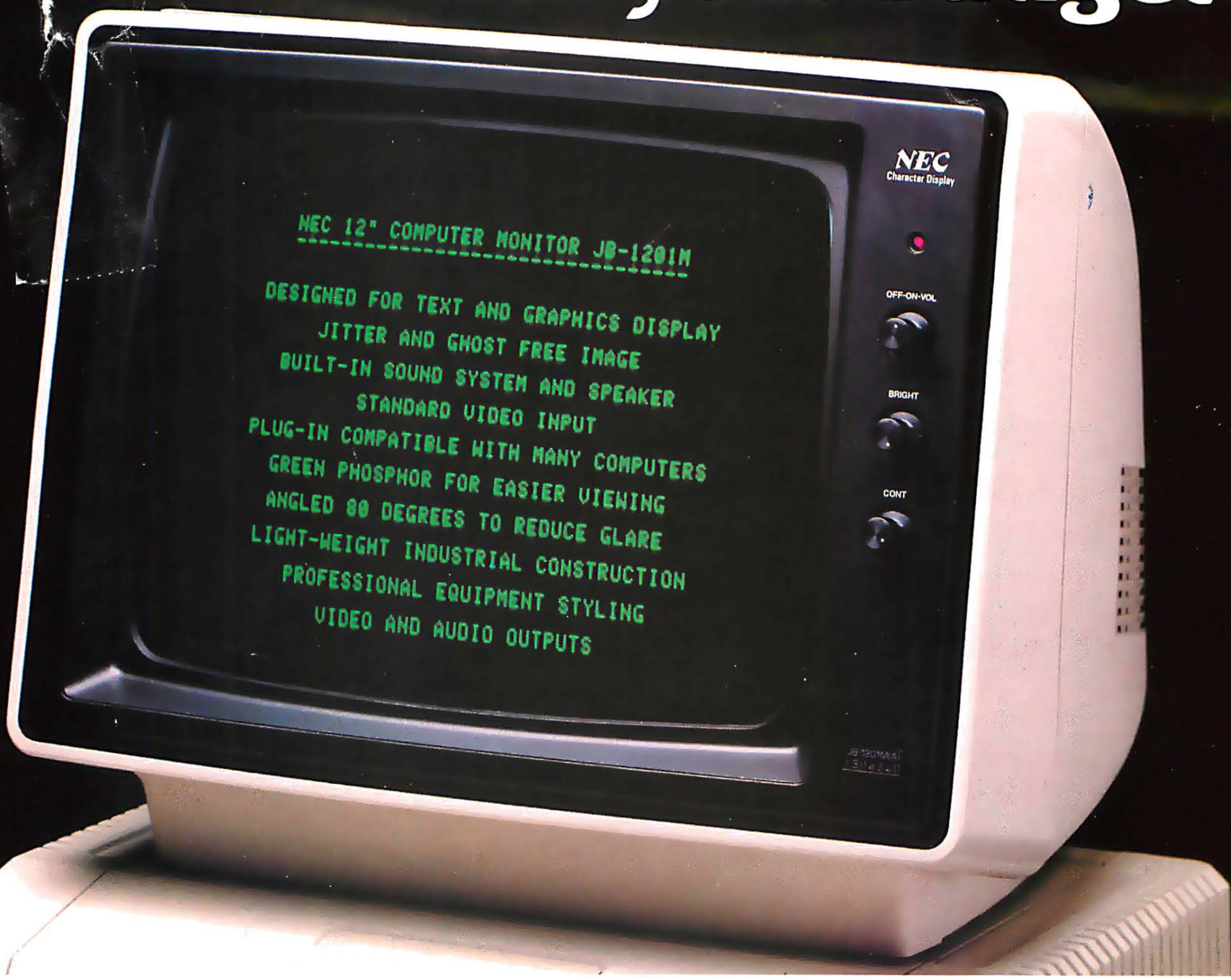

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