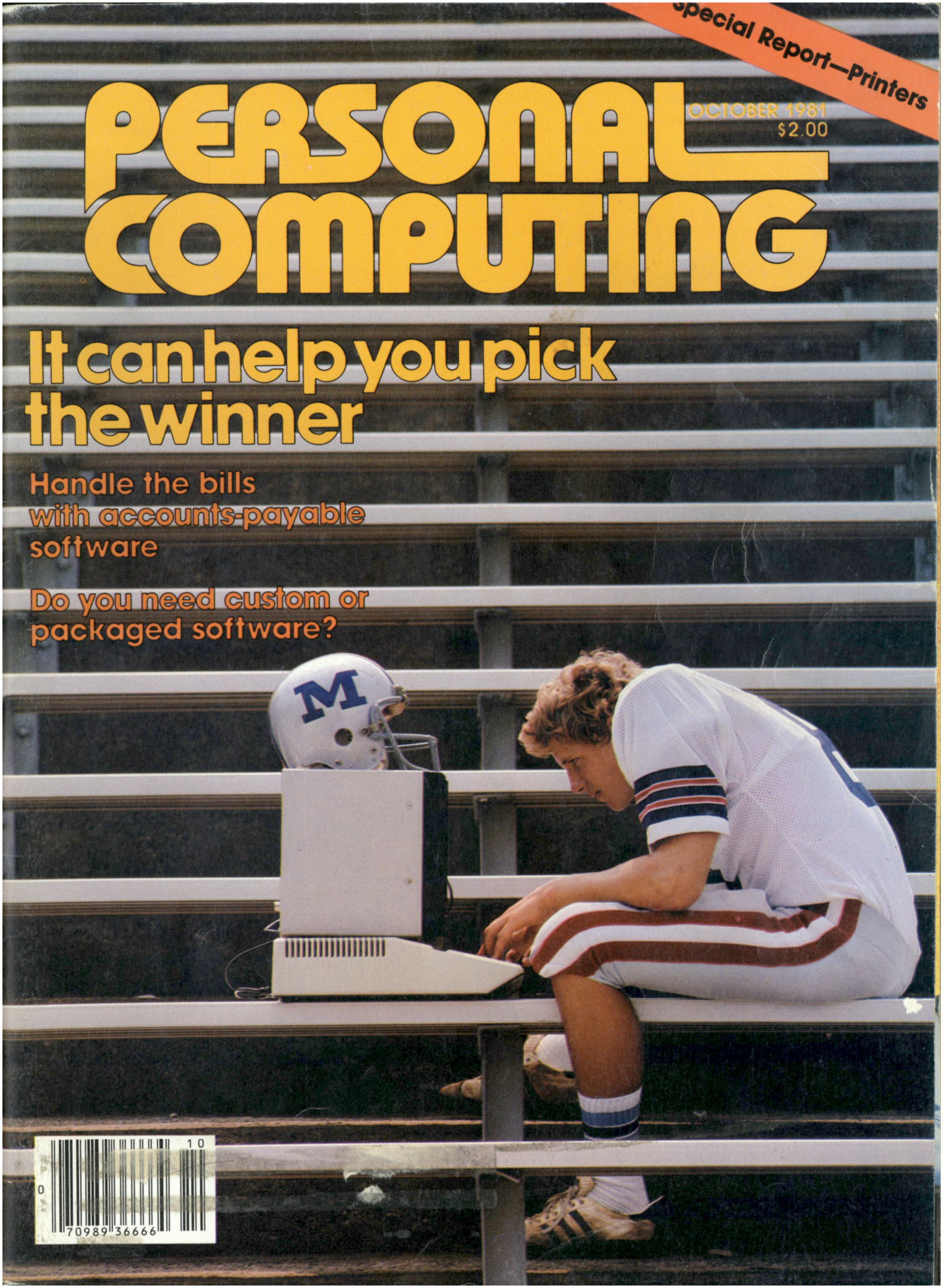
Special Report—Printers
PERSONAL COMPUTING
OCTOBER 1981
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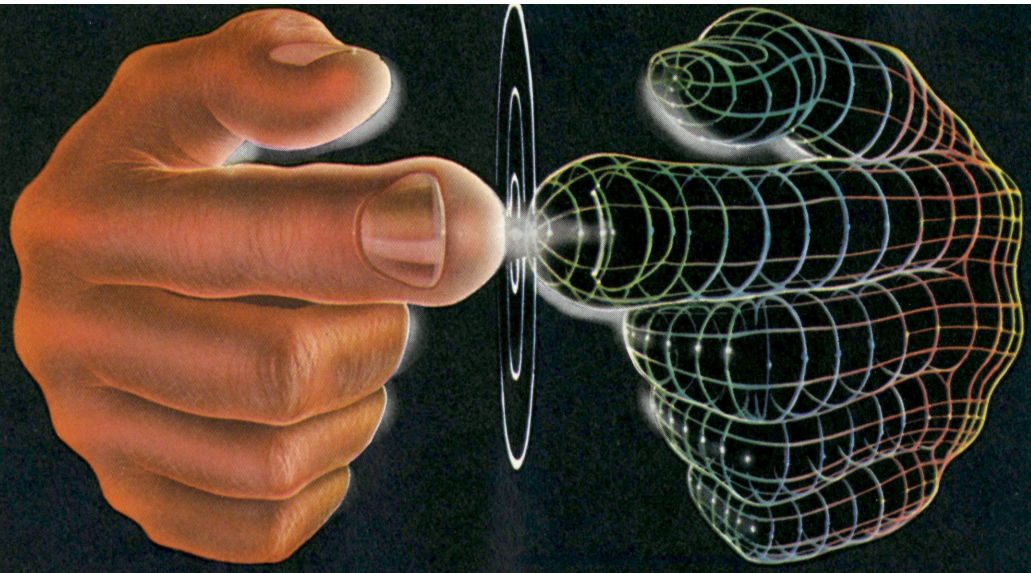

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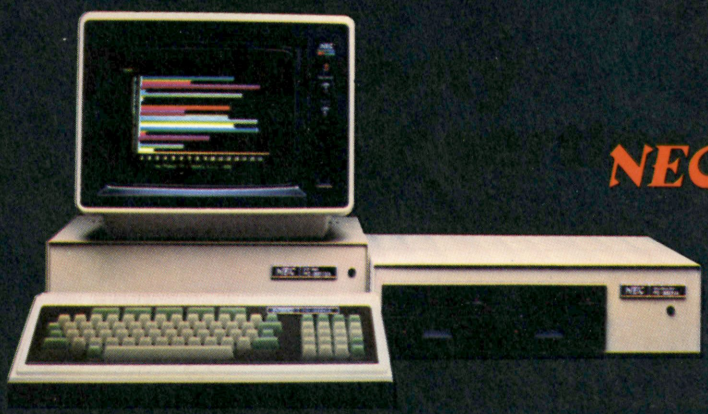

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CIRCLE 1

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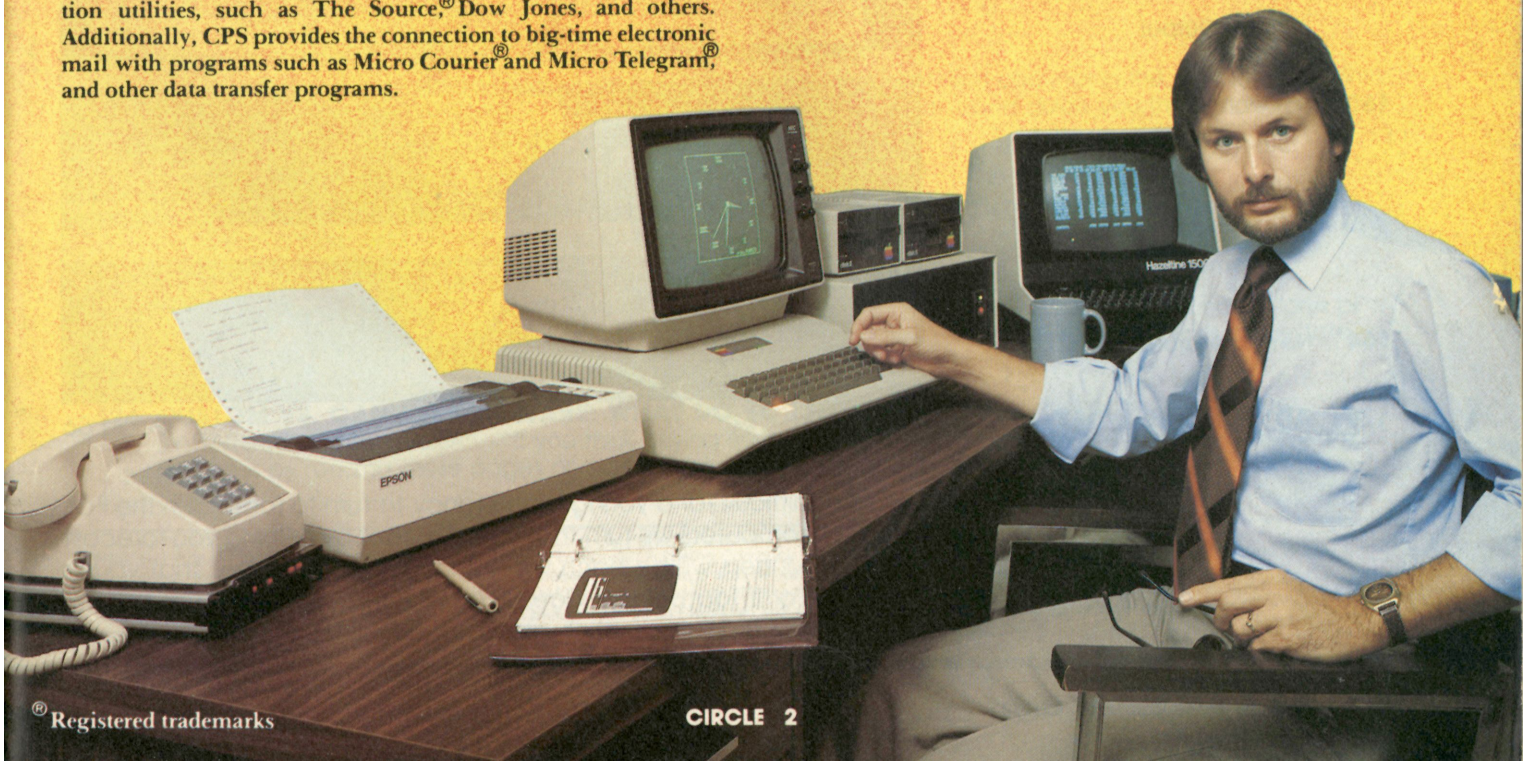

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CIRCLE 2

PERSONAL COMPUTING

October 1981
Vol. V, No. 8

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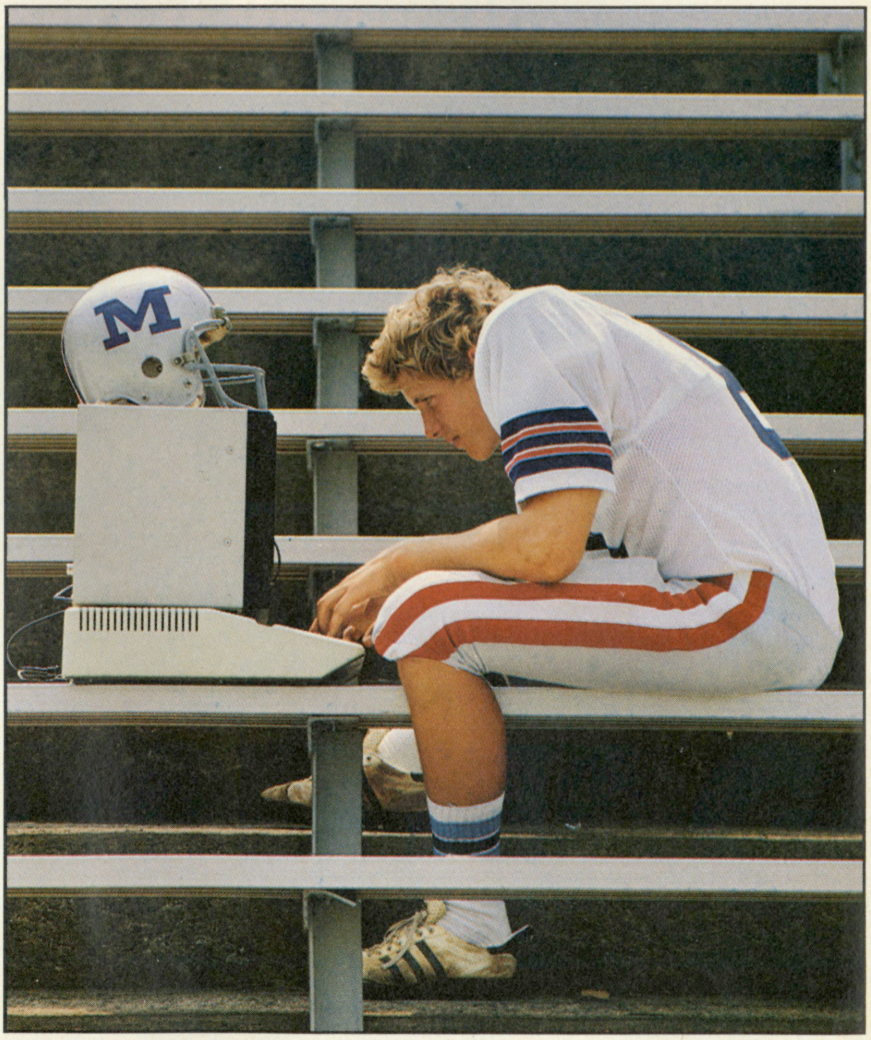

COVER PHOTO BY STEVE SAGALA

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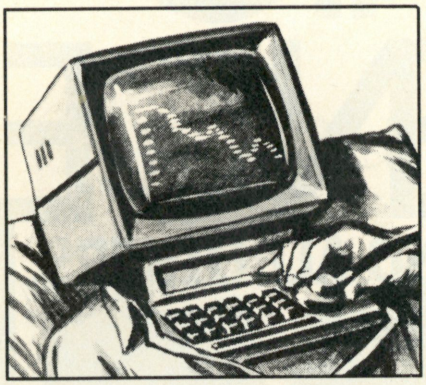
BEHIND THE COVER

It's not difficult for a young man's fancy to turn to football in the Fall. Personal computers will turn that fancy to fact by helping you forecast who the winners will be each weekend. And if you're not that young anymore, or if football just doesn't do it for you, your computer can help you in other sports, such as golf or bowling.



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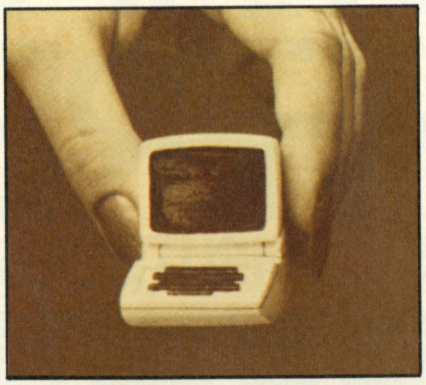

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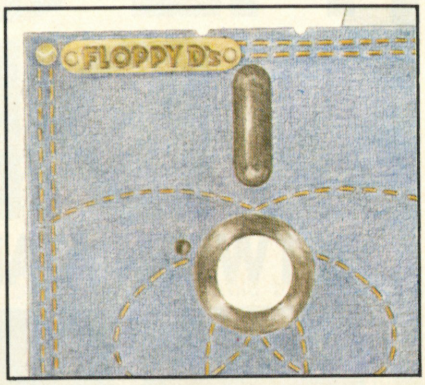

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24 ENGINEERS GET PERSONAL WITH COMPUTERS
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35 DRAWING THE WORLD TOGETHER: DATA BANKS
BY ELLI HOLMAN This Paul Revere of the information world is providing us with news that's only 90 seconds old. . .and much, much more.

38 22 WAYS TO PROCESS YOUR PAYABLES
BY ROBERT PERRY If Peter Piper had to pick a package to pay his payables, he'd have more than 22 to choose from. Find out how to get *your* payable pipeline flowing.

47 DIAGNOSTIC AND UTILITY SOFTWARE
BY ROBERT HARWOOD Utility routines perform system functions like printing, loading programs or disk operations. The utilities that test hardware are diagnostic routines. Find out more on these pages.

56 SPORTING WAYS TO COMPUTE THOSE GAMES
BY ROBER W. HART, J.D. PATTEN AND RICHARD SPILLMAN Whether golf, football or bowling is the name of your game, this special sports section will lead you to your goal of winning.

67 PRINTERS: A PERSONAL COMPUTING SPECIAL REPORT
Lots of hands are dipping into pockets to purchase printers. But confusion abounds in the marketplace. What to choose? How much to spend? From whom to buy? Let this special report guide you through the personal-computer printer jungle

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BY KEN MCLAMB The home computer is challenging the shoebox for storage of those most important items in one's life. And we don t mean love letters. We're talking IRS.

101 AN EASEMENT FOR FRUSTRATION—AUTOMATING THE REAL ESTATE OFFICE
BY SANDI FENSTERMACHER AND SUSAN FOSTER Astute realtors are escaping suffocation under reams of pulp by automating their business procedures. How else to survive—sans insomnia—in today's real estate market?

124 CUSTOM VS. CANNED SOFTWARE: WHAT DO YOU NEED?
BY DARSHAN SINGH KHALSA If you think buying hardware is a tough choice, just wait. Prevent software psychosis by reading these pages and determining what you need.

PERSONAL COMPUTING (ISSN 0192-5490) is published monthly by Hayden Publishing Company, Inc., 50 Essex St., Rochelle Park, NJ 07662. James S. Mulholland, Jr., President. Printed at World Color Press, Inc., Mt. Vernon, IL. Second class postage paid at Saddle Brook, NJ and at additional mailing offices. Copyright® 1981, Hayden Publishing Company, Inc. All rights reserved. POSTMASTER: Please send form 3579 to PERSONAL COMPUTING, P.O. Box 13916, Philadelphia, PA 19101. Subscription rates: U.S. 1 year (12 issues) $18; 2 years (24 issues) $33; 3 years (36 issues) $46. Canada & Mexico: add $4/year for surface mail, $8/year for airmail. Other countries: add $8/year for surface mail, $36/year for airmail. Back issues: U.S.: $4. All other countries: $5.

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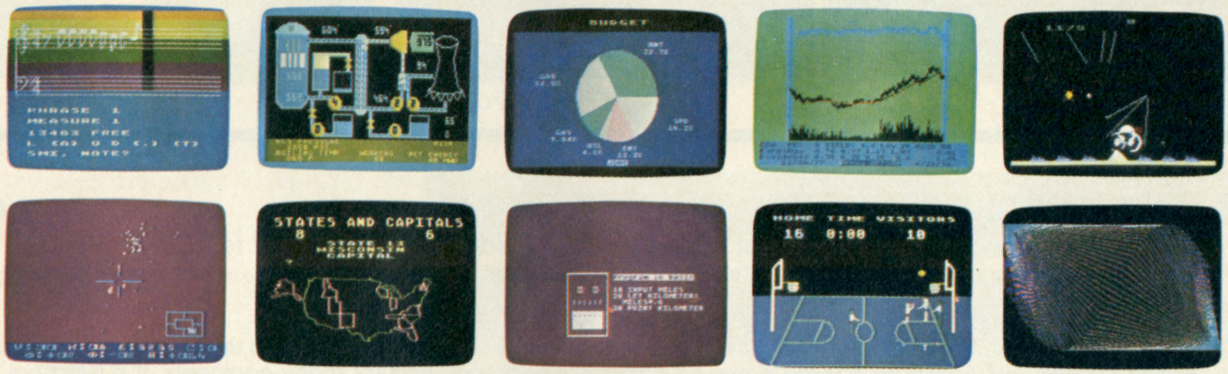

3.7 million reasons why the ATARI Personal Computer is something to see.
The display screen used with our computers is composed of 192 horizontal lines, each containing 320 dots. Delivering color and luminosity instructions to each dot for a second requires 3.7 million cycles...a lot of work for the normal 6502 processor.

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Sharing. To learn more about the amazing capabilities of ATARI computers, visit your local computer store for a demonstration. Or send for our Technical User's Notes, intended for the serious programmer. They are only $27 and contain a lot more information about our computers' special capabilities than most companies could tell. See your ATARI dealer, or send $30 ($27 plus $3 postage and handling), payable to ATARI, to Technical User's Notes, c/o ATARI Customer Service, 1340 Bordeaux Avenue, Sunnyvale, CA. 94086.

*ATARI 800™ computer only.

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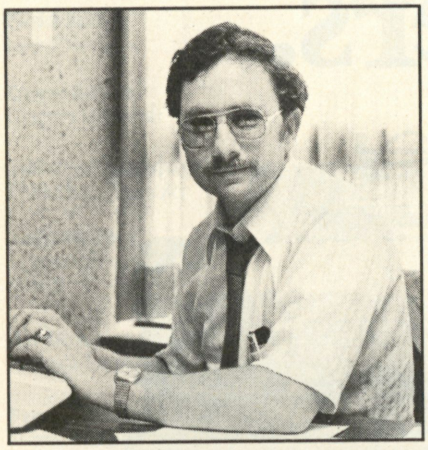
CIRCLE 3

You got to be good



When I was but a callow youth, I took some instruction from Uncle Sam's Army in knife fighting. One of the students in the class, noting an apparent weakness in the program of instruction, raised his hand. Upon being recognized, he asked, "Sergeant Parker, I notice all the moves you've shown us assume the opponent to be relatively unsophisticated in the use of the knife. What should one do if he comes upon an opponent who is well schooled in knife fighting?"

The instructor, no fool he, simply looked at us all and replied, "Men, you got to be good."

I never forgot that. You got to be good in everything you do. And, believe it or not, that's particularly true if you're buying a personal computer.

The plethora of products pervading the marketplace is astounding. It's not enough that one can make the proper decision about the basic system to buy. One then needs to know what peripherals are necessary. And what peripherals work with what software. And what software won't work with what peripherals.

There aren't many of us who have the expertise to make the right decision the first time. And if we make the wrong decision, we can wind up spending a lot of bucks for a product that won't do what we need done.

Even that's not too bad, as long as our job is selecting personal-computer systems and peripherals. But what happens if that's just a sidelight? What if we bought the system in the first place so we could improve our productivity, and then find that it won't do what is needed the way it's configured?

It can get downright discouraging. It might make us think we had finally met that knife fighter who knows what he's doing.

We got to be good.

The problem is a concern for the whole personal-computing community. Some manufacturers make products that they assure the prospective buyer will do everything they need. Then when the prospective buyer becomes the owner and calls back, the manufacturer may say something like, "Oh, I didn't understand what you were doing. What you need is..."

And there are software houses that tout their programs as "The one that will do just what you have in mind." Then comes the problem, and the inevitable response: "Oh, you didn't say you have the left-handed framistan installed. For that, what you need is this other program that..."

Some dealers, of course, try to sell products they have on the shelves. "Oh yeah," they say, "I've had a problem with that thing. We're working on that right now. In the meantime, though, why don't you try this thing I have. It can..."

We got to be good.

But it shouldn't be that way. The buyer should be able to specify, in simple terms, what he wants to do. The seller should be able to sell just the equipment needed. And explain its use in simple terms.

And, probably most important, the manufacturers need to get together, agree upon some standards, and make the hardware and software meet those standards.

This can and will happen. It happened in the institutional-computer world. But there, it happened the wrong way. In that world, one company is so big that it sets the standards all by itself. After it announces a new product, for example, everyone else comes out with a similar one. But the products are complicated, and so a whole group of people has evolved to work with institutional computers. They speak to the computers for us.

We could go that way in the personal-computer community too. We could let one firm define de-facto standards. But that would be bad for the community. That firm could define whatever standards it wished. True, the user would have some of his problem solved. But then he'd probably need experts to make his no-longer-personal computer work.

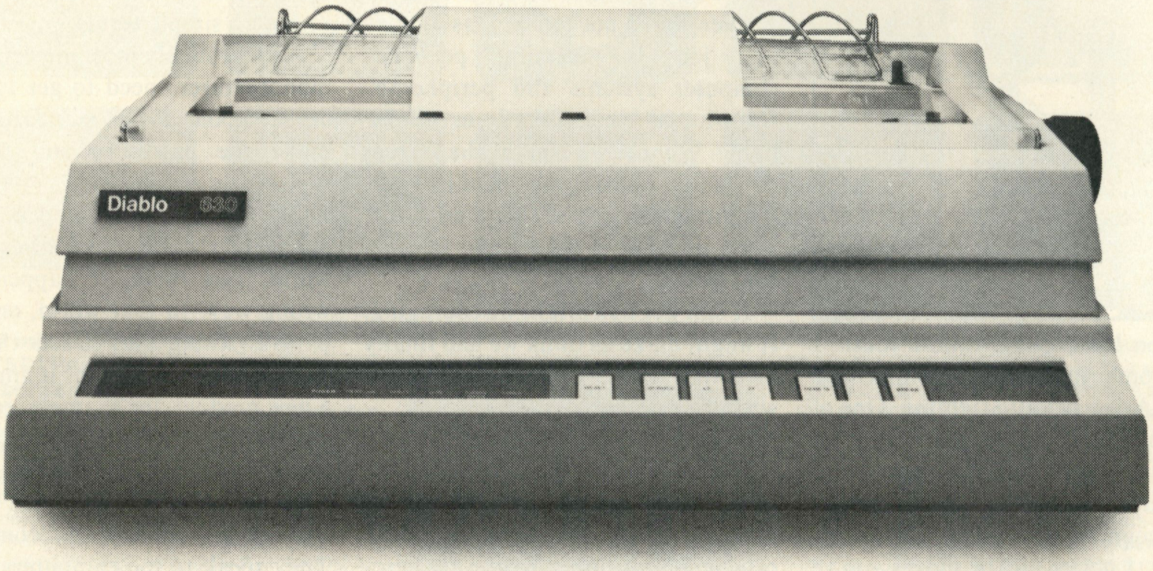
Someone has to help the personal computer user. Someone has to make sure that people can use computers.

That's the real challenge to the people in the industry. The manufacturers, the software houses, the dealers—even the publications, like this one.

They got to be good.

David Gabel

If you want a choice in print wheels, here's the first choice in printers.



The Diablo 630.

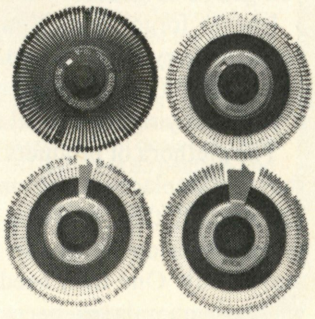
It's the first printer that lets you use either metal or plastic print wheels. So you can choose the print wheel that's just right for the job.

The 630 works as well with a 96-character plastic daisy print wheel as it does with an 88-, 92-, or 96-character metal daisy print wheel. In over 100 different type styles.

Every 630 has fewer moving parts than competitive printers, which makes it more reliable. And it offers unsurpassed print quality. Compatibility with Diablo supplies. And bi-directional printing capability.

So if you want to change your print wheels, you'll just have to change your printer.

To a Diablo 630 printer.



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CIRCLE 4

PERSONAL COMPUTING

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FEEDBACK

Larceny looms large

Dear Editor:

I do not feel that articles like "Software Protection Schemes: How They Work," which appeared in your August issue, are an appropriate response to the copying problem. This is a futile and unhealthy "us against them" strategy that ignores fundamental economic and technical realities.

The technical problem with software protection is that although you can make a tape that I can't read, you can't make a tape that I can't copy. Some tapes I can copy over the phone!

People will buy rather than copy when the price of software and its documentation is perceived as fair. The desirable approach is to educate both buyers and vendors to reasonable expectations.

Fred Bones
Kenosha, WI

Editor's reply: While it may be true that there is a little larceny in all of us, we chose not to print your tape-copying scheme for several reasons. First, far be it from us to aid or abet a copyright infringement. Second, as writers we suffer from acute palpitations at the thought of anything even remotely resembling plagiarism; and third, as a voice of the personal-computing movement, Personal Computing *magazine is dedicated to helping keep this industry stay as bug-free as possible.*

In other words, we don't promote rip-offs.

Oh, to make a buck

Dear Editor:

This letter is in reference to the program "Lease or Buy" which appeared in your July issue. The program does not work and has never worked on a Model I TRS-80 computer simply because the program is not finished.

In Line 600, eight input routines are missing.

I will provide a (TRSDOS) formatted diskette with the corrected program for $15.

Printing a program which will not execute is just plain stupid.

Ronald C. Wagener
Computer Generated Data
Virginia Beach, VA

Editor's reply: We wholeheartedly agree and apologize to any reader who may have suffered from the missing line numbers in line 600. But save yourself $15. Here are the missing numbers: 3320, 3420, 3440, 3460, 3480, 3530, 3570, 3590, 3610, 3760.

Lease/Buy limits

Dear Editor:

I would like to make a few comments on the article entitled "Lease or Buy" by Duane Hope, published in July. There seem to be several conceptual errors in the author's set up that need to be recognized.

First, the program discounts the salvage value at the same rate as the other certain flows. The salvage value is the *only* item that is unknown and needs to be treated with a different degree of risk than the depreciation tax shields.

The interested reader is invited to read my article in *Financial Management* in 1973 entitled "Analysis of Financial Leases." In this article I argue for charging the discount to account for the risk differences in the various cash-flows.

Another significant error in the article is that the author fails to ac-

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SpellStar vs. the competition

SpellStar is not the first proofreading software on the market. We just made sure it would be the best.

Other programs show you a list of apparently misspelled words on your screen, separate from the document. You must decide what to do about each word without seeing its context—and that can be confusing. But SpellStar actually operates within the WordStar program. So it lets you see each word *in context* before taking action. It's so much easier. And you're always only one keystroke from full word-processing capability.

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Once we've handled your word processing, let MicroPro start solving all your computing problems—with our software solutions. MailMerge™, another WordStar option, makes it easy to combine files to produce personalized form letters. SuperSort™ takes on the biggest sorting, merging, and selecting jobs. And DataStar™ handles data entry, retrieval, and update with tremendous power and precision.

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CIRCLE 5

CALENDAR

OCTOBER

Oct. 15-18—THIRD ANNUAL NORTHEAST COMPUTER SHOW; Hynes Auditorium, Prudential Center, Boston, MA; Northeast Expositions, Inc., 824 Boyleston St., 202 Chestnut Hill, MA 02167; (617) 739-2000.

Oct. 17-18—EDUCATIONAL SOFTWARE SHOW; Stouffer's Inn, White Plains, NY; Queue, Inc., 5 Chapel Hill Dr., Fairfield, CT 06432; (203) 372-6761.

Oct. 20-22—COMPUTERIZED OFFICE EQUIPMENT EXPO SOUTHWEST; Astro Hall, Houston, TX; Cahners Exposition Group, 222 W. Adams St., Chicago, IL 60606; (312) 263-4866.

Oct. 20-22—TEXAS COMPUTER CONFERENCE; Market Hall, Dallas, TX; Southern Methodist University, Box 2700, Dallas, TX 75275; (214) 692-3080.

Oct. 21-23 — COMPUTER SHOWCASE EXPO; Brooks Hall, San Francisco, CA; Interface Group, 160 Speen St., Framingham, MA 01701; (800) 225-4620, in MA call (617) 879-4502.

Oct. 30-Nov. 1—COMPUTER SHOWCASE EXPO; Miami Expo/Center, Miami, FL; Interface Group, 160 Speen St., Framingham, MA 01701; (617) 879-4502.

FEEDBACK

count for ADR (Asset Depreciation Range) depreciation. Most firms now use this technique for depreciation since it produces much faster depreciation charges (salvage is not subtracted from original cost).

A program, to be useful, must have the current and best method of depreciation available; otherwise, the program is not of much value.

A final limitation of the program is that it is set up on a yearly rather than monthly basis. Most leases are denominated and paid in months. Consequently, a program must also be structured to use monthly data because of interest compounding.

In summary, the user should be careful when using this program on a carte blanche basis without understanding the key assumptions behind the model.

Jerome S. Osteryoung
Tallahassee, FL

Simple music

Dear Editor:

I was intrigued by the article in the July issue of *Personal Computing* on computer-generated music. As the owner of an Apple II Plus, I am constantly on the outlook for new applications for my machine. I am also an active amateur musician who has always dreamed (along with just about every other musician) of owning a synthesizer but has never had the funds to purchase one (my computer was a gift).

When I saw your article on computer music I was pleased, to say the least. But alas, my high hopes soon turned to disappointment as the article provided little in the way of practical information. I realize that the article was meant only as a primer, but I was so intrigued that I felt compelled to write and ask that you print a more in-depth follow-up article on personal computer-generated music. I would greatly appreciate it, as I am sure many of your other readers would—both musician and non-musician alike.

James Bradley Pope
Missoula, MT

Editor's reply: Watch future issues of Personal Computing *for more on music-by-computer. . .*

Ducking apples

Dear Editor:

When are hardware and software developers going to realize that there are other computers out there besides the apple, TRS-80 and Atari?

I know a lot of frustrated TI 99/4 owners who would love to purchase hardware or software. Why don't they translate some of their programs and make hardware compatible with the TI 99/4?

This letter is being written by a TI 99/4 owner who is tired of being pelted with Apples.

Louis Semler
North Versailles, PA

Editor's reply: Texas Instruments has a toll-free number for anyone who wants information on available software: (800) 858-4565. If that doesn't help, try contacting the 99/4 Home Computer Users Group, P.O. Box 95148, Oklahoma City, OK, 73143. And right under your own apple tree is the Pittsburgh 99/4 Users Group, 111 Teeple Ave., Donora, PA 15033.

Buyer, beware

We have been informed by the advertising agency for Mark Gordon computers that that firm is apparently out of business. Principals of the firm fail to respond to postal or telephonic inquiries.

The editors of Personal Computing regret any inconvenience this may cause our readers.

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CIRCLE 6

OUTLOOK

Apples on Sesame Street

Apple Computer Inc. and the Children's Television Workshop, creators of "Sesame Street," have combined efforts to design, develop and distribute 20 software programs for use on Apple computers. The programs are an outgrowth of 50 educational games developed by the Children's Television Workshop (CTW), and were tested over the past year at the Sesame Place Computer Gallery in Langhorne, Pa. Apple will publish the programs and distribute them under the Special Delivery Software label.

The games, entertaining in their use of sound, color and animation, are primarily aimed at the three-to-thirteen-year age group. Program concepts include tests of motor skills, reading, vocabulary, math, logic and problem solving, along with creative and artistic challenges.

Free Operating Systems from Heath

Heath Company is offering a free operating system to purchasers of the assembled Zenith Data Systems Z-89-FA commercial all-in-one-computer. Purchasers will have their choice of the Heath Disk Operating System or the Heath CP/M Operating System, in either 5¼-inch or 8-inch floppy disk versions.

The offer will be good on purchases made at list price from the Heath mail order catalog, any of the 62 Heathkit Electronics Centers in the U.S. and Canada, or at an authorized Heathkit/Zenith Educational Systems distributor. More information can be obtained from Heath Company, Dept. 350-235, Benton Harbor, MI 49022.

TV Services to Multiply by 1985

In its recently concluded study of AT&T vs. Cable TV, International Resource Development has concluded that new consumer information, transaction and security services will be available to more than half the U.S. population by 1985.

Some of the possible new two-way TV services will include: Checking Bureau—keywords of permanent user interest searched continuously against an on-line newspaper data base; Grocery optimization—makes sure you pay the lowest prices in your area, order delivery, and a viewing of last week's order; Get-Me-A-Job—openings matched to your skills; StudyWall—moving viewdata access to TV news and documentary film footage; Home Psychotherapy—the computer is programmed to simulate questions, answers and observations of a psychotherapist. Further information on this $985 report (#177) can be obtained from IRD, 30 High St., Norwalk, CT 06851.

American/French Clubs to Exchange Information

A nonprofit personal computer club in France requests contacts with similar organizations in the U.S., particularly regarding professional and nonprofit radio stations and organizations software. Interested parties should contact AMIF, 6, rue des Ormes, 94120 FONTENAY-SOUS-BOIS, France.

IBM really gets personal

IBM has recently unveiled its first offering in the personal computer market—the IBM Personal Computer. The unit, perhaps surprisingly, plays music and includes game software–to say nothing of the standard features available.

The machine is impressive. It's starting price is a mere $1565. For that price the buyer gets the 83-key keyboard, the computer itself, based on an 8088 microprocessor, and 16k of main memory. This minimal configuration can use a tape cassette for mass storage and a television set (with an rf modulator) for a display. (The machine is fully FCC certified for home operation as a class B computing device.)

IBM is cognizant of the fact that this minimally configured machine probably won't last a serious computerist long before he wants to expand. The company offers upgraded versions of the machine, and will sell them in different configurations. For example, the firm lists a more typical configuration for home or school as 64k of main memory, one disk

continued on page 17

Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

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CIRCLE 7

Step up to 'Fortune 500' business

Today the hallmark of a successful company is the ability to develop sophisticated business plans which lessen the risk of being caught unprepared.

In the past, the capability to generate such plans was restricted to companies in The Fortune 500 league. Smaller companies were forced to rely on desktop calculators and sharpened pencils as their business planning tools. After all, how many companies could afford to buy a computerized planning system?

Yesterday, not many. Today, every company, large, medium or small, can have the capability to create sophisticated, effective and cost-saving plans on a computer.

Introducing TARGET™

The TARGET™ Business Planning System is the management tool you have been waiting to use. With TARGET™ and an affordable microcomputer, you now have the capability of analyzing past business operations and projecting likely future performances within seconds and at a startling low cost. Even if your business does not own a microcomputer, purchasing a unit just to use with TARGET™ is easily a wise, cost effective decision.

To illustrate. What if you had $6,000 to spend on planning for the year starting January 1? With that amount of money you could purchase a good microcomputer system and The TARGET ™ Business Planning System. You now have a powerful and versatile tool that will assist you in developing business plans which can save you much more than your initial investment year after year. In addition, when your microcomputer is not using TARGET™ to plan, it is available to handle your word processing, accounting and inventory control chores.

Let us see how far that same amount of money would stretch using alternative approaches. For $6,000 you could purchase up to 240 hours of time on a commercial time sharing service. That would last you only through February 15. Or, you could use the same money to make a small downpayment on a planning package to run on a large computer system, assuming, of course, that you already have that very expensive computer, you know how to use that system, and the system is not already over-burdened. And remember, when next January 1 comes around you will owe that company an additional $1,000 to $3,000 in maintenance.

It should be quite obvious to you by now why the TARGET™ Business Planning System is getting attention among financial planners, accountants and members of the board of directors.

TARGET™ Saves Money

"Mainframe" planning	up to $50,000 plus yearly charges
"Time Sharing" planning	$25 - $50 per hour plus monthly minimum and use charges
TARGET™ Planner	**$195.00***

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TARGET™ runs under CP/M

TARGE

planning without spending a fortune

TARGET™ is so much easier to use

Take a look at the two or three more expensive products that want you to believe that they can provide you with time sharing capabilities on micros. These products are not only more costly, they are also far more complicated to use. With these products you must create a computer file for the reports specifications, another file for the data, and, in some cases, one or two additional files just to calculate and create the same report that you produced with TARGET™ so easily and quickly. TARGET™ allows you to enter data, calculation rules and report specifications all at the same time and in the order you choose.

For example, these lines . . .

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HEADING 1 = SAMPLE INCOME STATEMENT
LINE 1 SALES = 100 150 175 210
LINE 2 EXPENSES = GROW 70 BY 15%
UNDERLINE EXPENSES
LINE 3 PRETAX = SALES - EXPENSES
SKIP 1 AFTER PRETAX
LINE 4 TAXES = .48 * PRETAX
UNDERLINE TAXES
LINE 5 NET = PRETAX - TAX
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will produce this report . . .

SAMPLE INCOME STATEMENT

	1	2	3	4
1.0 SALES	100	150	175	210
2.0 EXPENSES	70	81	93	106
3.0 PRETAX	30	69	82	104
4.0 TAX	14	33	39	50
5.0 NET	16	36	43	54

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CIRCLE 8

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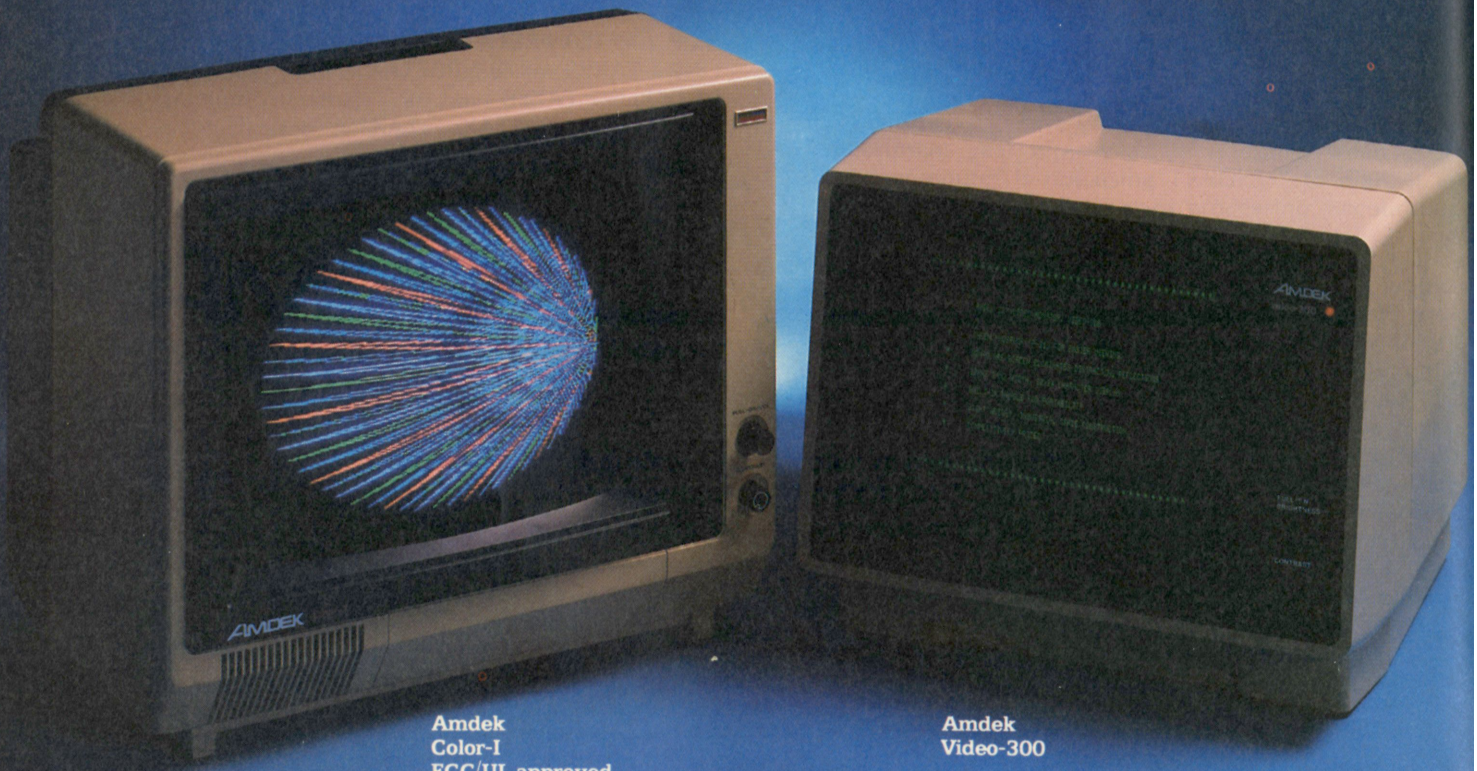

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NEW THIS FALL: our advanced high resolution **Color-II** monitor with interface board for Apple II compatibility. **Color-II** features RGB, TTL input and 560(H) x 260(V) resolution for crisp 80 x 24 character display and exceptionally sharp color graphics. Ask your dealer about an Amdek **Color-II**, **Color-I**, or **Video-300** monitor today.

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OUTLOOK

continued from page 12

drive and a monitor at $3005. An expanded system for business with color graphics, two drives and a printer would cost about $4500.

Of course, the other element in the personal-computer equation is software. IBM has its own DOS to run on the personal computer. In addition, when the machine is available for delivery this month, the company expects that it will have a version of CP/M available—the result of a contract with Digital Research.

In addition to those operating systems, business software (general ledger, accounts payable and accounts receivable) will be available, as will VisiCalc, EasyWriter, and Microsoft Adventure.

But IBM doesn't stop there. It has set set up a Personal Computer Software Publishing Department that will publish software from independent authors. In this way, says the company, IBM employees and external authors can submit programs for publication consideration. (An IBM spokesman said that one of the criteria for selection for publication will be the author's ability to support the software).

Service can be a big problem for personal-computer owners. IBM has one of the largest service organizations in the country for its big computers, and plans to use this expertise in the personal-computer arena. It will sell service contracts for about 10 percent of the purchase price of the computer. Then, says a company spokesman, if the machine goes down, the user can get a replacement dropped off within 24 hours. Or, service can be performed at IBM retail outlets, which will include Sears Roebuck business-machine outlets and participating Computerland stores.

1984 in 1990

Two hundred Columbus, Ohio families recently hosted a library, a bank, and a math and reading teacher in their homes—using only a telephone and a television set. Results of that 90-day viewdata test are encouraging. They also raise serious questions about the future of our communications systems and habits.

The experimental system, CHANNEL 2000, developed by OCLC (Online Computer Library Center), proved to be very successful. CHANNEL 2000 turned a TV set and telephone into a computer terminal that people could use in their homes to check

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CIRCLE 67

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CIRCLE 66

SOFTWARE for the apple II* from QUALITY SOFTWARE

METEOROIDS IN SPACE™
By Bruce Wallace

We have taken our popular space game, formerly called Asteroids in Space, made some important improvements, and given it a new name — METEOROIDS IN SPACE. Your space ship travels through a shower of deadly meteoroids. Use your laser gun to blast the meteoroids. Big meteoroids shatter into smaller meteoroids when hit, and the smaller ones are usually faster and just as deadly. From time to time you will encounter an alien space ship whose mission is to destroy you, so you'd better destroy it first. All the action is displayed in fast, smooth, high resolution graphics, accompanied by sound effects. You now can control your ship using one of two options — the Apple game paddles or the keyboard. In METEOROIDS IN SPACE, the spaceship's velocity gradually decreases unless more thrust is applied, adding an element of control. Also new to this version is a hyperspace feature — translate instantly to another spot in the galaxy. The game is over when five of your ships have been destroyed. An additional ship is added for every 10,000 points you score. Runs on any Apple II with at least 32K of RAM and one disk drive.

On Diskette — $19.95

BENEATH APPLE DOS
A Technical Manual
By Don Worth and Pieter Lechner

Become an expert on the intricacies of Apple's DOS (Disk Operating System). BENEATH APPLE DOS is the perfect companion to Apple's DOS 3.3 Manual. Containing eight chapters, three appendices, a glossary, an index, and over 160 pages, this manual will serve to completely fill in the many gaps left by Apple's DOS 3.3 Manual. Written for Apple users with DOS 3.3, 3.2 or earlier versions, any Apple disk user would welcome having this carefully written manual at his fingertips.

LEARN . . .
- How DOS 3.3 differs from other DOS versions.
- How disks are protected.
- How to use the disk directly, *without* DOS.
- How *every* routine in DOS works.
- How to customize DOS to your needs.

BENEATH APPLE DOS includes large quantities of excellent diagrams and tables and many programming examples.

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CROSS-REF by Jim Aalto
Applesoft programmers will be delighted to have this cross reference utility program in their 'tool kit' of software aids. What can CROSS-REF do to speed and facilitate your Applesoft program development? Consider these functions:

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*Apple II and Apple II Plus are trademarks of Apple Computer, Inc.

CIRCLE 11

OUTLOOK

out books from the library, look up articles in an encyclopedia, pay bills, or consult a calendar of community events. There were also math and reading games for the kids.

"The findings are encouraging," says Tom Harnish, the OCLC Research Scientist who directed the CHANNEL 2000 project. "CHANNEL 2000 has shown us that we're on the right track. There's an in-home information service in the future for libraries."

One of the most important questions asked by viewdata system operators as a result of the project is: What mix of services will stimulate purchase of such systems? Users said that of the services offered, they would be most likely to pay for a video encyclopedia first, a video catalog of library listings second, and home banking third. Choices four through seven were public information (about city, state and private organizations), Columbus Calendar, Math That Counts and Early Reader.

The researchers also asked the viewers what they would want in a hypothetical CHANNEL 2000. In order of desirability, they chose: home security, in-home computer, video games, library services, catalog shopping, a system that contacts doctors, adult self-education, encyclopedias, household energy control, and bill-paying. Eighty percent of the users indicated they would probably be willing to pay $15 a month for their six most desired services. Although entertainment and home security are not within the scope of viewdata services, they will ultimately be offered by the viewdata service.

Since communications and computers are the primary ingredients of viewdata, system-operator competition will be among telephone companies, cable operators and commercial time-sharing companies.

From an environmental standpoint, regulatory and legal issues will affect diffusion of such systems. Interoperability of systems is crucial and must be reckoned with. Copyright, royalty and privacy issues will also be important. These problems, if handled correctly, should not slow system development.

By 1990, people will still communicate mainly by telephone, and receive entertainment by television, but electronic information will become a common consumer service. Forecasters estimate that more than $2 billion in service revenues will be generated by over 8 million households in 1985, and up to $10 billion will be generated by 1990.

OCLC is continuing to explore this new medium through Viewtel—a new in-home and in-office project that is under way at their headquarters in Dublin, Ohio.

Will E. Kopp and Lee The'

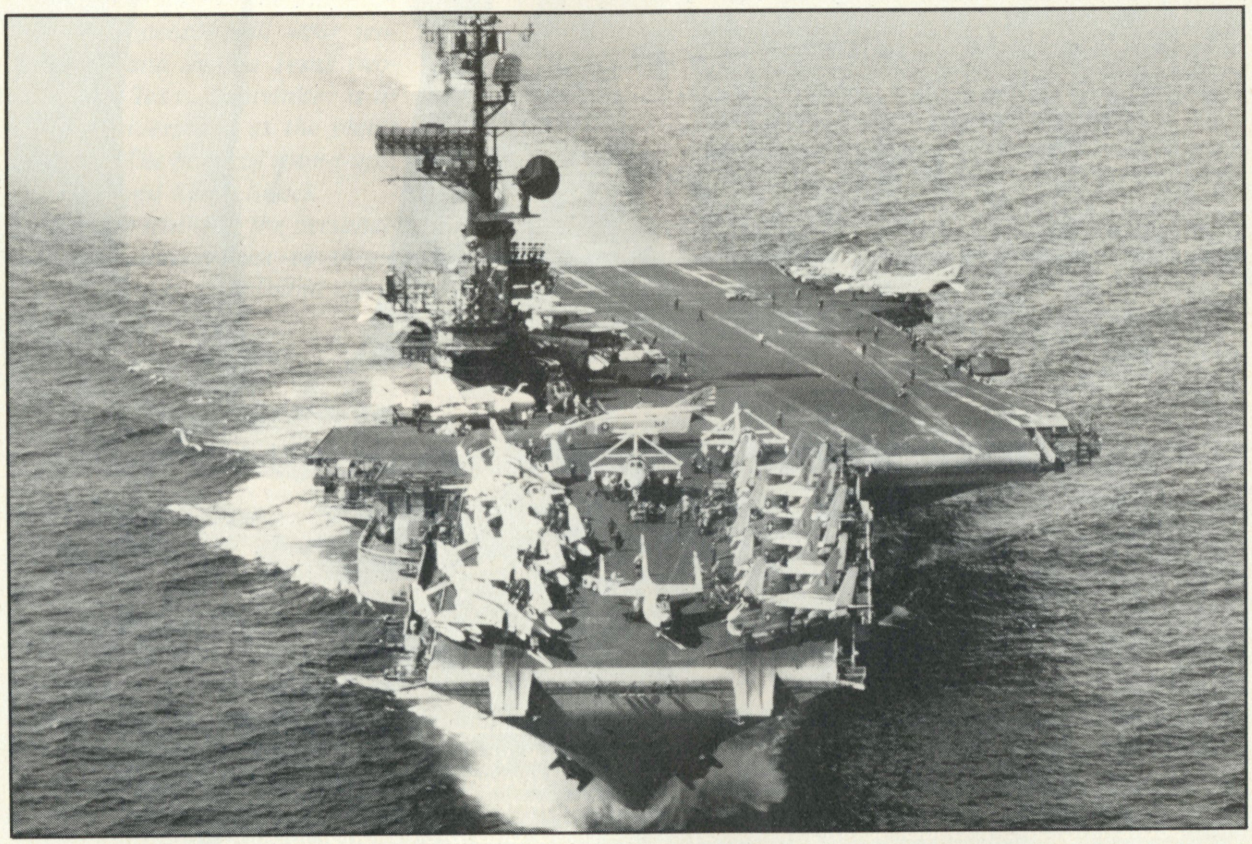
One if by land, two if by sea

Even though they can't dock a ship, spot enemy subs, swab the deck, or even swim, the two TRS-80 Model IIs aboard the *USS Coral Sea* have become very important members of the crew.

Commander David Oliver, formerly with the U.S. Navy aircraft carrier, bought a TRS-80 off the shelf and brought it on board a year and a half ago to manage personnel information. The ship's company is close to 3000, and when the airwing squadrons come aboard, the number comes close to 4500. A simple file system was too large and too time-consuming to maintain information on such a large number of people. The computer worked so well that the ship later added another Model II.

"When you talk about that many people in a small area, you are talking about problems," says retired Chief Petty Officer Carl Woodruff. "Before we had this system, we had to go through big manila folders for everyone on the ship three or four times a week, just to find a single piece of information. If we wanted to send out a list of letters to wives, we had to address each envelope by hand. There was no effective means of finding out across-board information." Now they are even inputting information on new personnel before they report to the ship.

Everyone on board has an input form with 50 basic items including: identification, current work detail, qualifications and assignments, residence off the ship, next of kin, security information, height and weight, date of rank change and pay rate.



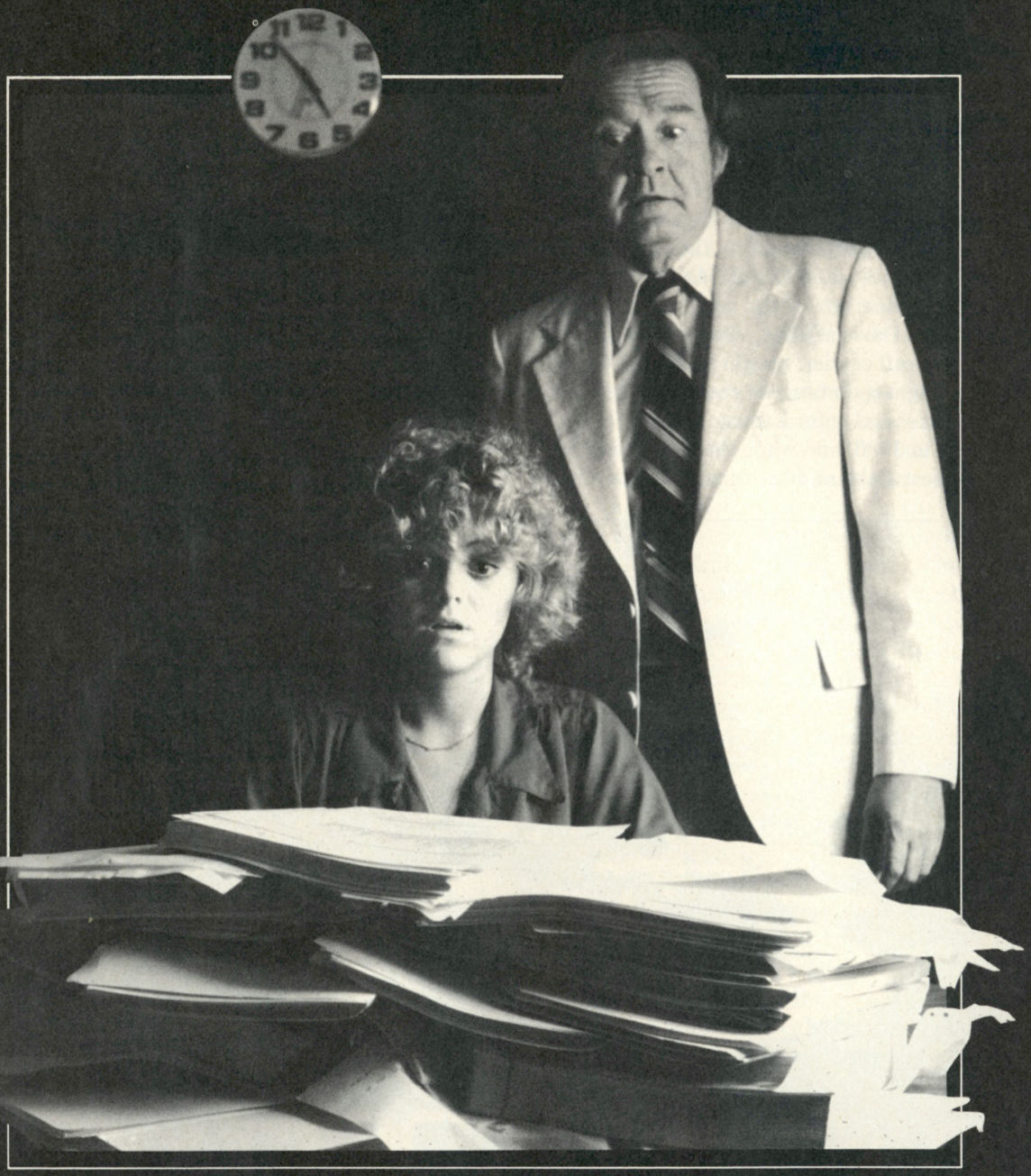
The *USS Coral Sea* has been using a personal computer system to manage information for the past year and a half.

Woodruff explains that "before we had this system, everyone kept track of his own file. Many times we were not able to keep track of everyone. We had embarrassing situations of not realizing for a month or two that a person had failed to report for duty. When that person showed up someplace else, they would figure out that he'd be declared a deserter."

The computer solves such problems by doing a daily muster report. It scans the data base and

continued on page 141

The Evan's Report Is In There – Somewhere!



The old-fashioned mess of paper filing systems can drive you over the edge. You waste time and money in inefficient searching and manual sorting. In today's business environment, this is both outdated and unnecessary.

DATADEX, the information organization system from IUS, hands you your valuable information immediately – when you need it from your APPLE II desktop computer.

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CIRCLE 21

A Personal Computing interview with
John Roach

Texas, the Lone Star State. The home of Pecos Bill, who shot out all the stars in the sky except one to prove how good a shot he was. A land of 262,314 square miles—the second-largest state in the union. A place where people still wear ten-gallon hats and do the Texas two-step, where Texas chauvinism is as great and widespread as the plains themselves. The home of round-ups, rodeos . . . and Radio Shack.

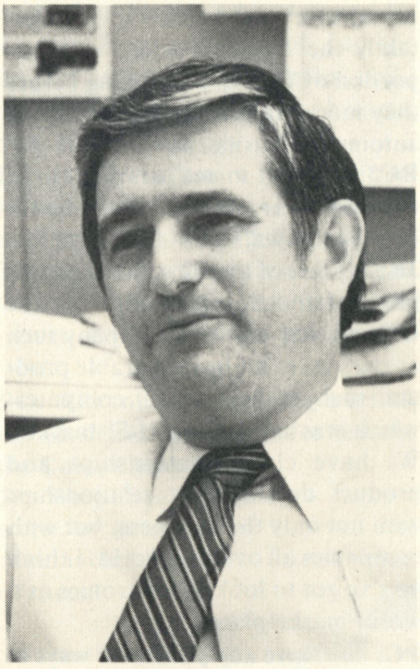
One of the truths in the personal-computer business must be this—Radio Shack has a profound effect on everything that has to do with personal computers. To paraphrase a phrase, "When Radio Shack moves, people watch."

Personal Computing *went to Fort Worth to interview Radio Shack's top dog, John Roach. The interview that follows provides us with some insight into the thinking of the corporation that almost overnight became a giant in the personal-computer industry.*

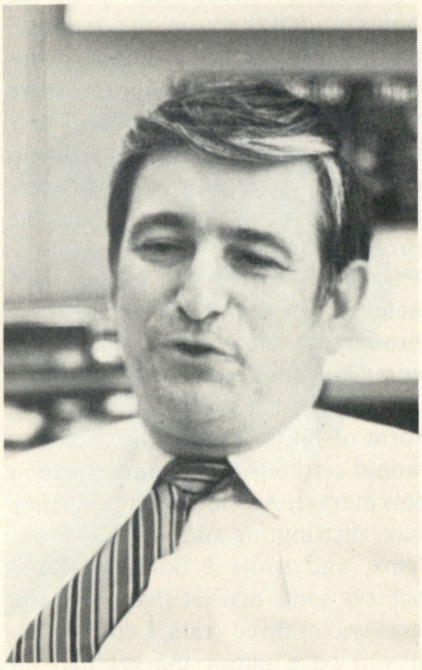
PC: Mr.Roach, can you give us a brief history of Tandy Corporation and its rise to the position it holds today?

JR: Tandy began in the leather business in the 30s and became a retail store chain in leather goods after World War II. The company was merged with American Hide and Leather in the mid-50s and in 1960 Charles Tandy became Chairman. The name of the company was changed to Tandy Corporation and that's when it got its listing on the New York Exchange. In 1963 Tandy Corporation bought Radio Shack.

"There is no question but that some kids become obsessed with games. But there is good news in that. . . It keeps them off the streets."



"Personal computers will be a major contributor to our standard of living, because they are low in energy consumption and high in results."



"We are glad to see Joe's software house bring out new software. The bad news is that we have no easy way of knowing how good Joe's software is."

PC: When did you join the company?
JR: I came to the company in 1967 as Manager of Data Processing.
PC: When Tandy bought Radio Shack, what was Radio Shack selling?
JR: It was selling a very broad range of consumer electronic products of the day . . . stereos, CBs, radios, etc.
PC: How many stores were there?
JR: Nine.
PC: What was Radio Shack's approximate sales volume at that time?
JR: About $15 million.
PC: And what is it today?
JR: One billion seven hundred million. There are now approximately 8,100 stores and dealers worldwide. Sometime in the next 12 to 18 months we'll probably pass 9,000 stores.
PC: What do you foresee happening in the personal-computer market in the U.S. within the next year or two?
JR: I think it will continue to grow as it has in the past. The awareness of personal computers and the use of personal computers—whether in business, or education, or in the home is definitely on the increase, and as a result will continue to increase the market. Of course, there will be new competitors. Their advertising and promotion will help those who are already in the business to build public awareness about the products.
PC: And what do you foresee happening with the influx of Japanese products in the American personal-computer marketplace?
JR: So far that influx is only in the form of NEC. I think the Japanese would certainly like to participate in this market. At the present time they have distribution and software problems, and while I think they will achieve some market share over the next two or three years, I don't think it will be a major market here in computers. I think they will do much better in peripherals.
PC: The trouble that has arisen in Detroit over the past few years has bred a certain sentiment, particularly in the Midwest, on "buying American." Would you care to comment on that?
JR: The computer and semiconductor industries in the U.S. are two of the most viable, competitive, energetic industries we have, and I certainly think we are going to retain a significant market share all over the world. However, this does not mean that the Japanese won't be aggressively trying to pick up as much of that share as they can.

But the true question—the sentiment of "Buy American"—is certainly a noble and good concept. We have learned by looking at oil prices that economics is a very important factor. If in fact American industry cannot truly remain competitive and provide better performance and service, it will be difficult for American business to maintain its market dominance. Quite frankly, I think that in the area of electronics we *will* maintain our market position.
PC: Whereas in other areas of consumer electronics the Japanese did make great inroads over the last ten years?
JR: As far as hi fi, radio and tape recorders go, much of that product is manufactured in the Orient. Certainly the Japanese wiped out that portion of U.S. industry long before they made significant inroads in the automotive business.
PC: Sharp, a major Japanese manufacturer, makes your handheld computer?
JR: It's one of the ways the Japanese have obtained distribution in the U.S. market—when a company such as ours takes an incomparable product, such as their pocket computer, which was not on the U.S. market. We have close relationships and product development relationships with not only the Japanese, but with companies all over the world. I think you've got to look at electronics as a world marketplace.
PC: Are there any particular ways in which you see personal computers significantly changing peoples lives over the next ten years?
JR: They will improve productivity at work—particularly in the office—which has been sorely lacking of productivity improvements. Microprocessors and our computers will appear in many of our household-appliances' functions. Certainly, personal computers will help us maintain our standard of living. They will be a major contributor in this regard because they are low in energy consumption and high in results.
PC: What is your definition of personal computers?
JR: That's about the hardest question you've asked. I generally view it as a computer system that sells for under $10,000, over which the user has a lot of control. It is not just a dumb terminal. It's a machine the user can program if he wants to. It's a machine he uses to help himself out—individually.
PC: What about the cost advantages of a personal computer?
JR: The more and more things that personal computers can do, with more software and hardware feature improvements relative to price, the more pervasive they will become in our society. The example I like to use is that people get a lot of entertainment value and a lot of utility out of the TV set. Most people pay less than $500 for it. People get a lot of utility out of a refrigerator, for which they pay perhaps between $500-$1000. And in the personal-computer home market, the user is going to expect a tremendous amount of utility for $500 or less. I think that utility is increasing on an evolutionary basis, not a revolutionary basis.

In the business market, certainly the user expects a great deal of utility and gets it. So the question you're asking is really a function of price. Price helps make the economic justification; therefore, people use the product.
PC: When do you expect personal computers to be purchased more frequently for the home?
JR: The home market will evolve as more functions, uses, and services are available. The home market is growing every day. You have business, educational, and recreational uses in the home. You are beginning to have Videotex-type services. If you look at Videotex services, you have to look at which particular one

is the one that makes you buy a home computer. Is it Dow Jones information? Is it something with *Better Homes and Gardens?* Sports news? *The Washington Post* availability in Fort Worth?

Each one of these new information providers and services has the potential of making people feel that they need a personal computer. In this year's catalogue we are introducing a device that you can add to your computer that enables you to control the lighting in your home. Is this important? Is this not important? I don't know. It's one more thing you can do with your computer.

PC: What other applications do you find noteworthy?

JR: Personal computers are desirable and affordable for those people who are worried about the education of their children. And there's banking by computer. I have one of the brochures from United America Bank in Tennessee, where they have a really great service. Maybe great enough to make somebody buy a computer. You can sit there and look at your statement any time to see what checks have cleared, what checks haven't, and what the balance is. This type of service appeals to me very much. Because I want to worry about all my personal business between 10:00 and 11:00 p.m. and I want to go ahead and write all these bills . . . pay them when I get them so that I don't have to worry about them two weeks from now when they are due. It's very convenient.

PC: The skeptic would say "I can do the same thing with a pencil and paper and checkbook. And it won't cost me over $1."

JR: There is no question that you can do everything that you can do with a computer with a piece of paper and a few phone calls, or in some like manner. But the computer is making it easy and making it fast. And you can sit down and drill and practice the kids on math, as well. I wrote my own program, using a color computer, to give to my eight-year-old daughter, Lori. Put the spelling words into the machine and give the audio off the tape recorder and it will pronounce the word to her and she can type it in—right or wrong. If we are not home at night she can drill and practice on her spelling and it doesn't require anybody to help. And of course you have the natural affinity of your kids relating to the TV screen, because most of them have spent so much time in front of it.

PC: The first impulse of many people is to educate their children via the personal computer.

JR: Absolutely. It is a major objective of people. Many parents sacrifice to be sure that their kids have the best in education, and this is just one more way in which they need to be educated—whether the school educates them or not. Of course, a lot is being done in the area of trying to get people up to a certain competence. . . to try and be sure that children come out of school with some measure of capability.

PC: Is there software being written to insure that people can obtain a minimum sixth-grade level?

JR: We have a lot of development with the Model III and Color Computers. Both are in the educational field.

PC: Will you be translating a lot of the Model III programs for use on the Color Computer?

JR: We will be translating some, or at least a reasonable subset of them. And we really have two educational developments underway. One is specifically for the home and one is specifically for the classroom.

PC: A number of parents will bring a computer into the home for their kids' education but will be frustrated by the kids' sole desire to play games on it.

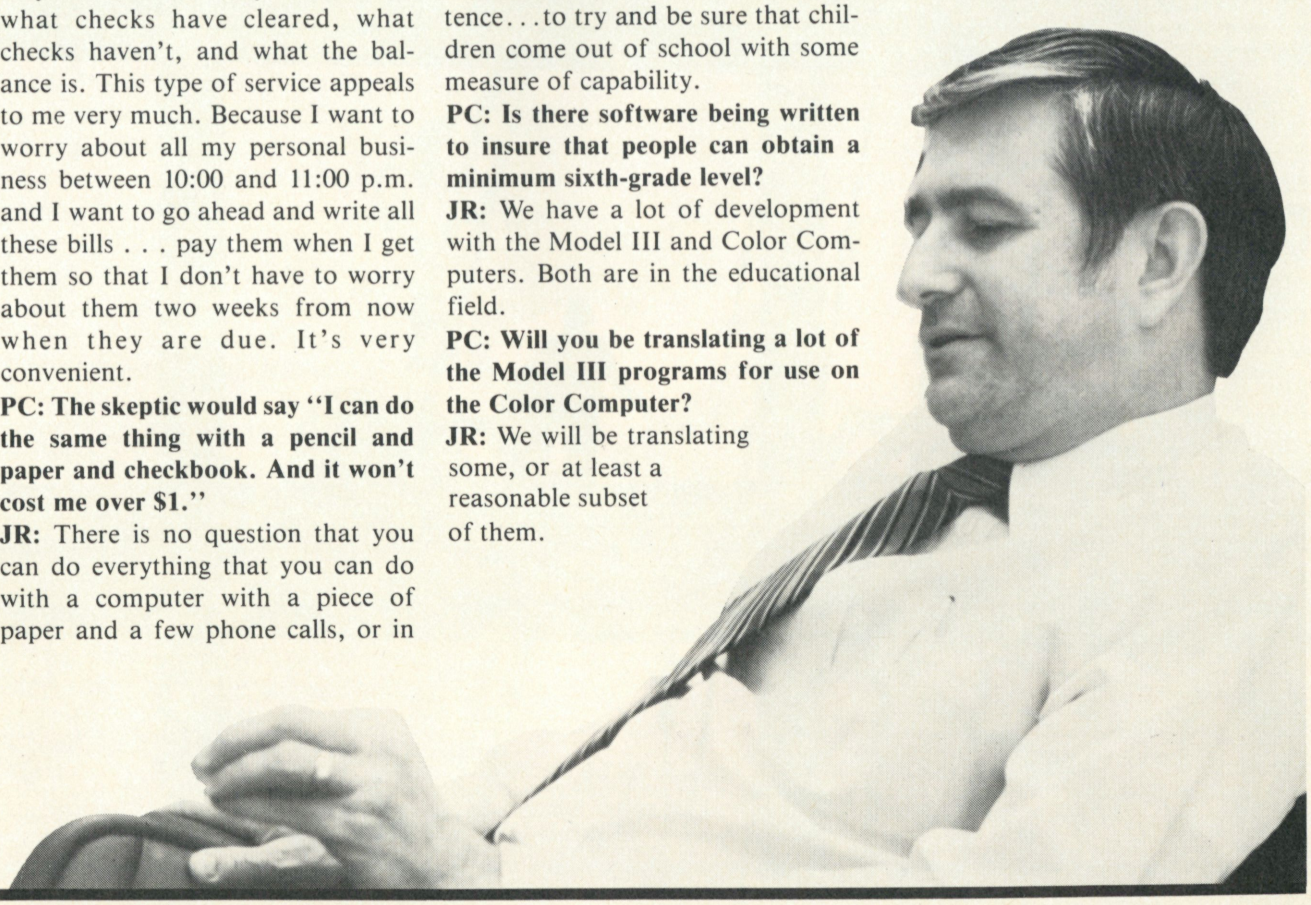
JR: Well, there is no question that some kids become obsessed with games. But there is good news in that. It keeps them off the streets.

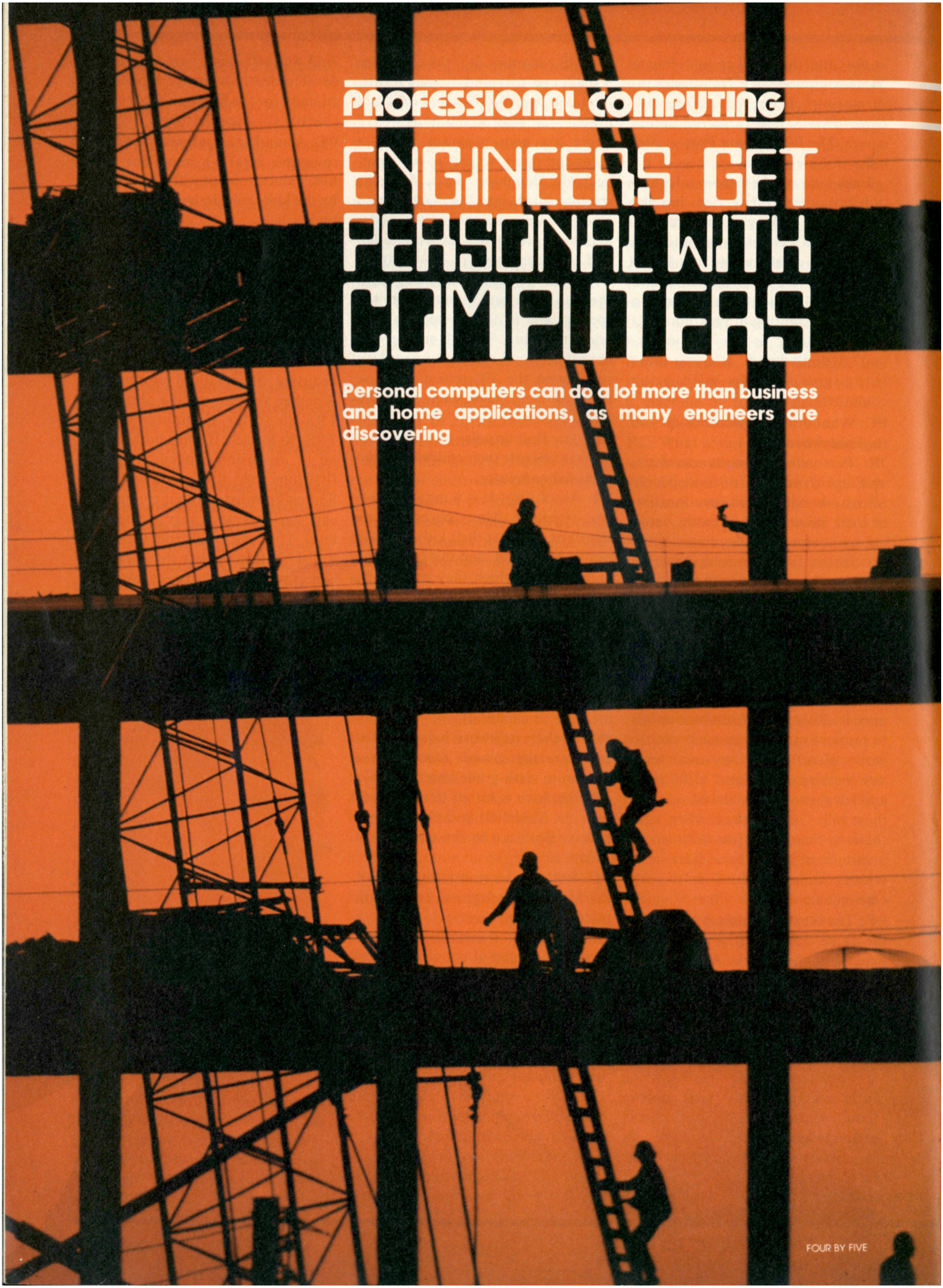
PC: Would you care to comment on the benefits of expansion capability?

JR: Well, it's certainly one of the beauties of personal computers. Whether you are talking about our TRS-80 Color Computer or our TRS-80 Model III, they both have a lot of expansion capability. So the first-time user, the person with very limited knowledge about computers, can start off at a very elementary level. They can build from there into a disk system so that the computer can grow as the business grows.

There is no question that we are in a computer generation. Those peo-

continued on page 152





PROFESSIONAL COMPUTING

ENGINEERS GET PERSONAL WITH COMPUTERS

Personal computers can do a lot more than business and home applications, as many engineers are discovering

Louise Kehoe

Engineers are a neglected minority when it comes to personal computing. The enormous potential for the use of personal computers by engineers and other technical professionals has, until recently, gone largely unrecognized by machine manufacturers. Yet this "neglected" group of present and potential users—there are about three to four million of them in the U.S.—is finding out for itself that the personal computer can become an important work tool.

Engineers and scientists are increasingly turning to personal computers for use as problem-solving tools and software development systems, as well as for use in the laboratory for controlling electronic instrumentation and collecting data. Already, systems valued at $300-400 million are being used in the scientific and technical field according to Tom Burns, a market analyst at SRI International, Menlo Park, California.

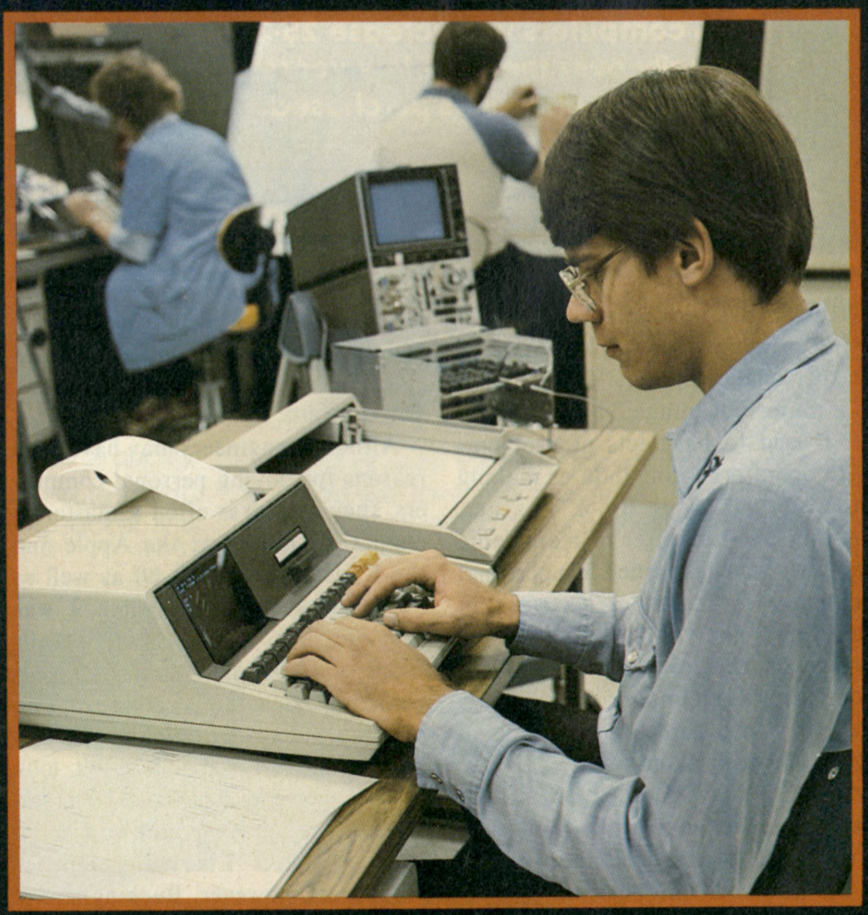
"The technical use of personal computers is very small compared to their use in business applications," says Burns, "but it is growing." He sees engineering applications of personal computers increasing by 25-30 percent annually over the next few years, in terms of the number of units purchased. And this increase will occur despite the fact that most personal-computer makers, with the notable exception of Hewlett-Packard, have aimed most of their sales efforts towards the businessman or teacher, rather than the technical professional.

The reasons for this sales effort are clear. First, the distribution channels of personal computers have been largely through dealers experienced in selling office equipment. Secondly, the nature of engineering applications is such that each application is slightly different, unlike office applications in which standard jobs like accounting and word processing make up the majority of uses.

Computer appeal

For the engineer, the personal computer can represent a step up from the programmable calculator to a more powerful computational tool. For many, it is seen as an alternative to time-sharing on a mainframe computer. "The engineer gives up some capability in exchange for convenience and low price," says SRI's Burns.

Convenience is the biggest appeal of the personal computer for the engineer, according to the users interviewed by *Personal Computing*. Generally, engineers are already experienced in the use of computers. They often have access to mainframe computer facilities and may even be accomplished programmers. They like owning personal computers because they are instantly accessible, under their own control and are never tied up



Engineers are now finding that personal computers are a pain-saving alternative to time-sharing.

with somebody else's job.

"I can sit at my desk, turn around and solve a problem on the computer and then turn back to what I was doing," says Grant W. Ireson, professor of industrial engineering at Stanford University. "I used to use LOTS (Stanford's Low Overhead Terminal System—the main student computer facility), but you have to get an assigned time, usually a 30 minute slot, and there is often a queue, even at 10 o'clock at night," Ireson explains. The loss of time in getting to use the computer was Ireson's primary reason for obtaining the personal computer. "Convenience is a major advantage," he notes.

"I used to have lots of problems with operators losing data or making other errors," says Brook Kraeger, another one-time user of mainframe facilities who has turned to a personal computer for much of his work in rain-flow analysis. Kraeger also brings up the low cost of personal computers as an important reason for buying. "In a three year period we spent $30 to 40 thousand on computer time," he says. Compared to these expenses even the relatively high-cost Cromemco system looks inexpensive.

At Rockwell International, personal computers were first purchased as a lower cost replacement for minicomputers and interface units used to control laboratory equipment, according to Ed Eversole, technical advisor on engineering computers in Rockwell's electronics operations. "We had been trying more expensive small computers through Hewlett-Packard IEEE 488 interface boxes. The interface boxes alone cost almost as much as the personal computers which incorporated the interface," he recalls. "When we heard about the Commodore PET (which has an IEEE 488 interface) we said 'This has got to be a winner' and sure enough it worked."

Engineering applications for personal computers will increase 25-30 percent annually over the next few years, in terms of the number of units purchased.

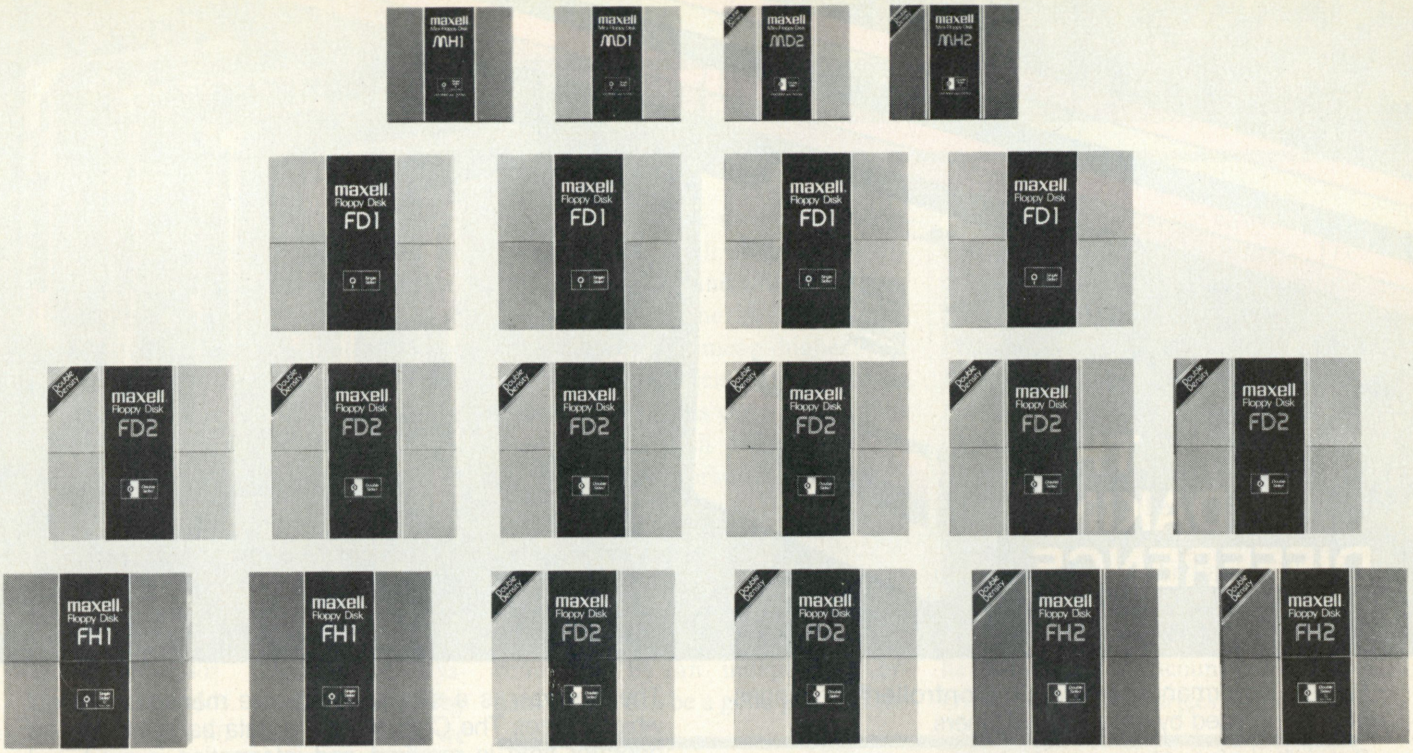
On a whim

Although engineers may have solid reasons for buying personal computers, their choice is often a matter of chance. "I looked at the Apple and the Radio Shack TRS-80 as well as the Commodore PET when I was shopping for a computer," recalls Leslie M. Buckingham, an engineering consultant specializing in producing cost-estimate reports for engineering projects. "I didn't look beyond these three because I was not thinking of getting into anything more expensive." Like many engineer purchasers, however, Buckingham is hard-pressed to come up with any good reasons for his selection of the Commodore system. "The best I can come up with is that I liked the compact unit and the green, non-reflective display."

Rockwell purchased the PET because it has the IEEE 488 interface, explains Eversole. He adds however, that the company is biased towards the PET because it is based on the 6502 microprocessor. Rockwell is a second source for the 6502. "We have a lot of engineers who are very familiar with the 6502, so it makes sense to use a machine based on it," he explains. Rockwell engineers are offered an automatic payroll-deduction scheme enabling them to purchase PETs on favorable terms, and already hundreds of them have done so. Others have chosen another company offer to buy a Rockwell AIM computer, also based on the 6502. Rockwell is now planning to purchase more PETs from Commodore for use in engineering departments.

Win Stuckey, who has his own engineering firm in Newberg, Oregon, works in the areas of structural and civil engineering and does a lot of surveying work. He bought an HP-85A a year ago with an HP software package for surveying. It was the availability of the software that he needed which dictated his choice of the HP machine. Like many engineers, Stuckey had previous experience with HP instrumentation, and was also influenced because he felt that HP is a reputable supplier and supported its products well.

"Different machines are good for different jobs," suggests Dr. Scott Cuttler, manager of the microcomputer development group at General Electric's Research and Development Center in Schenectady, New York. His research group uses 25 personal computers including machines from Commodore, Radio Shack and Apple. "We bought the Commodore PET first because it was the first personal computer that



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CIRCLE 13

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"...committed to solving the right problems."

made any sense," he recalls. Cuttler also said that the TRS-80 Model IIs were attractive because they are based on the Z80 microprocessor. "We are working on Intel 8080 and 8085 microprocessors and the group is very familiar with the 8080 assembly language, which is also used for the Z80," Cuttler explains. "A lot of our applications require the speed of assembly language. The high-level languages are too slow. We use the Radio Shack machines as off-line terminals to develop software for the microprocessor development systems," he adds. Cuttler started by buying TRS-80 Model I's, "but we found that we were expanding the Model I's to the point where the price difference between the Model I and Model II was very small, so we switched to buying Model IIs." Cuttler also bought some Radio Shack Color Computers, "for an application in which we needed the color display."

"We wanted to see how good the Apple was," says Cuttler. "We bought the first one because at that time it was the only machine for which VisiCalc was available. The greatest value of the Apple is the availability of ready written software for it. It is not as well suited to our particular engineering applications, being 6502 based," he explains, "but we use them primarily for financial planning."

Cuttler's latest purchase, a Sinclair ZX80, was bought chiefly out of curiosity. "It's a nice toy," says Cuttler, "but the fact that the screen goes blank during certain operations makes it impractical for engineering applications."

Buying factors

While Cuttler's opportunity to try out several different personal computers on the job is unusual, it is also enviable. Most engineers face a difficult purchasing decision having to choose between the several machines available. Price will often be one determining factor, and will usually cut down the list. Higher price, however, does not always mean higher performance, as a recently published set of benchmark tests conducted by the Business Research Division of the University of Colorado in Boulder, illustrates. According to the researchers' findings, some systems outperformed rival machines costing twice as much.

Benchmark tests, especially those conducted by an independent organization, can be a good guide to the performance of a computer. But different machines are better at different kinds of jobs and the benchmarks must cover the type of computation that an individual is planning to do in order to give a true indication of the machine's worth.

Availability of good applications software is essential for the nonprogrammer, and a major convenience for any user. Most manufacturers of personal computers have published lists of available software packages. Computers that first entered the market will have a more extensive software base, and this can be a drawback in buying a newer machine for which little software has been written.

Some computers are easier to use and to program than others. The operating system, which determines how the machine works, is one of the factors affecting this ease of use. Depending upon the sophistication of the user, this is something to be considered.

Finally, having determined which computer to buy, there is the question of where to buy it. Some dealers offer a lot of support in the form of classes designed to aid the user in the functions of the machine. On the other hand, mail-order discount sellers generally offer better prices without the trimmings. The service offered by different dealers if the computer malfunctions is also worth inquiring about at the time of purchase.

The enormous potential for the use of personal computers by engineers and other technical professionals has, until recently, gone largly unrecognized by machine manufacturers.

"Anybody interested in buying a small computer should have some schooling, or school themselves, in programming," advises Leslie Buckingham. "The user must understand the system to get the most benefit out of it," he suggests. "A lot of people buying a personal computer buy canned software. That's fine for a while, but they don't get into the depths of the system. I have learned enough about programming to be able to make program changes to fit my applications, and that's important to the engineering user."

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CIRCLE 15

The competition

The well known personal computers such as Apple, Commodore and Radio Shack currently rank high on the list of computers used by engineers, but they may soon be in for some stiff competition from new computers expected to appear in this country from Japan.

"The Japanese already have a lot of experience in the engineering and scientific fields of personal computing," suggests Tom Burns of SRI. He also believes that they will be much more active in selling to this market than American manufacturers have been. Burns soon expects to see several Japanese machines on the market in the U.S., such as the ultra-portable NEC briefcase computer.

Already available in the U.S., although not widely, is the NEC color computer. Retailing for $3700 at one Northern California computer store, the NEC machine comes with dual disk drives, 64k of main memory and a monitor. It uses the CP/M operating system, which means that a sizable base of software will be compatible with the new computer.

Also entering the U.S. personal computer market is IBM. Although Burns predicts that IBM will offer a lot of software for technical applications, Hewlett-Packard is the only manufacturer to date to have designed a personal computer with the technical professional in mind.

The HP-85A and its little brother the HP-83 are unique in this regard. The 85A comes with an integral printer and tape drive. The 83 is stripped of these peripherals. The 85A sells for $3250 and the 83 for $2250. Software offered by HP includes its own version of VisiCalc, surveying, math, linear programming, statistics, regression analysis, waveform analysis, AC-circuit analysis and information-management applications packs. However, the major limitation of the HP machines is a very small display screen. HP has overcome the problem to some degree by offering graphics software, but the small display still limits the usefulness of the HP machines in an application such as word processing, which can be extremely useful for the engineer, according to Burns.

One of the latest personal computer offerings which has potential engineering applications is the Xerox Star 8010. According to Xerox, the system is for people who spend most of their working hours acquiring and developing information—analyzing existing material, changing its form, adding their own ideas and creating new information—a description that fits engineers quite well.

The basic hardware of the Star consists of a desktop keyboard unit and a large (10.6- x 13.6-inch) display that features black on white "page" images. On one side of the display is a series of symbols which moves, a pointer on the display can be selected to control functions such as store, retreive or print. A rigid-disk, floppy-disk combination provides storage of up to 5400 pages of text.

The Star has an unusual control device called a mouse, designed to make the system easy and convenient to use. The mouse has two control buttons on top and can be moved freely around the desktop. And it's screen also moves, enabling the user to select a function from the symbols on the screen.

One feature that has particular appeal for the engineer is a facility for creating and editing equations. Two font sizes are included, as are Greek letters and mathematical symbols. As each element is entered, it is placed in the proper position to follow typesetting rules, with subscripts and superscripts already in place.

Another important feature of the Star is that it is compatible with the Ethernet local area network. Ethernets can be used to link equipment within an office and between offices. The system is currently under joint development by Xerox, DEC and Intel and opens up a wide range of possibilities in personal computing. In the engineering field, the local area network will clearly find applications in design groups where a number of engineers are working on a large project.

Engineers and scientists are increasingly turning to personal computers for use as problem-solving tools and software development systems. . .

The major strength of the Star system is clearly, however, in the word-processing field, which is of great importance to some engineers. Priced at $16,595 including the basic software, the Star is more expensive than most personal computers.

Also worth consideration for engineering applications is Vector Graphic's System B. The system is based on the Z80 microprocessor and

the popular S-100 bus. According to the company, about 15 percent of its systems currently sell to engineers and scientists.

Vector Graphic offers great versatility on its system with numerous expansion boards. Others compatible with the S-100 bus can be obtained from many vendors. Bob Whickham, marketing vice president, points out some of the features of the system which appeal to engineers—high resolution graphics, an IEEE 488 interface, software for microprocessor program development, and assemblers for most of the popular microprocessors. Up to 18 card slots are available for functions such as real time clocks and analog-to-digital converters. The basic system costs about $4000, with the additional board offered by Vector Graphic selling in the $200-500 range. Peripherals are not included in this price.

Cromemco's system Z2D is another machine that can be built up to suit a variety of engineering uses, and is also based on the Z80/S-100 combination. It is a very rugged system, according to users, which makes it particularly useful in severe environments or if the system is often moved.

The users

A man who can speak from experience with a large number of different personal computers is General Electric's Dr. Cuttler. "We use [the personal computers] for everything—controlling experiments, programming for test equipment, as very smart calculators, as design tools, and for controlling device parameters. Then we also do our financial planning and word processing on some of them."

Cuttler's list of machines covers the gamut. He has a Commodore PET, 12 Radio Shack TRS-80 Model IIs, two TRS-80 Model Is, two Radio Shack Color Computers, three Apple IIs, three Apple ///s and even a Sinclair ZX80. What's next on the shopping list? "I want to see the new IBM machine, and I would like to have a [Xerox] Star."

As Chief Engineer at a new TV station, WCGV TV channel 24, Ed Rosenthal purchased an Apple II to keep track of an enormous inventory of electronic parts. He also uses it to graphically illustrate energy usage for his company and is planning to purchase word-processing software to enable him to speed up the report-writing tasks that keep him away from the "true" engineering parts of his job.

Leslie M. Buckingham has his own engineering practice in Boston, specializing in producing cost-estimate reports. He bought his Commodore PET 18 months ago to do number-crunching tasks like statistical analysis. "I started off with a very simple program for statistical analysis that I purchased from a local computer store. Since then I have broadened the program to make it more useful." Like many personal computer users, Buckingham uses his machine both in his office and at home.

Stanford's Grant Ireson was among more than forty members of the engineering faculty to receive his personal computer as a gift from the dean, William M. Kays. About two years ago, Kays hit upon the idea of buying personal computers for interested members of the faculty to get them involved in computing.

Describing the success of the scheme, Kays says of the faculty members, "I've been impressed by some of the innovative uses they've developed. They have different interests so they generate very differnt kinds of programs. Some of them like graphics, and so will program graphical solutions. Some are strictly mathematical. It's mind-expanding, I think, to see what they come up with.

"Some of the faculty who are the most enthusiastic are those who haven't done much with a computer before, or people who had been working mainly through their students," Kays says.

Ireson first used his TRS-80 Model II to prove the solutions to problems in a text book he was writing. Since then he has expanded into word processing for preparation of articles, reports and letters. "I'm also using it for economic analysis," he adds.

Brook Kreager, a civil engineer working independently in Santa Cruz, California, specializes in hydrology and hydraulics. He handles a lot of data on rainfall, evaporation and run-off to build up watershed models. "I got the Cromemco computer to run a rain gauge about two years ago," he says. Since then he has expanded the memory capacity of his system, and added a new printer which allows him to do all his report writing using the computer. His partner also uses the system for word processing in the preparation of a textbook he is writing. As his business expands, Kreager hopes to add more people and with them, more computer terminals to his system.

Win Stuckey describes himself as the last of the old time general civil engineers. His business in Newberg, Oregon, involves structural engineering, surveying and hydrology. He bought an HP-85A 15 months ago for engineering applications along with an HP software package that runs surveying calculations. Since then he has purchased more software for structural work and is also using the machine to do his job costing, general ledger and accounting. "In my spare time I am now evaluating software offerings, particularly in the word-processing field. This is a neglected field for the HP-85," says Stuckey. Pleased with his system, Stuckey says that the computer is running an average of 10 hours per day. "We have five people using it, and then we rent out time to one of our competitors who does not have his own machine."

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Life expectancy	Printhead — 100 million char. Drive Mech. — 10 million char. Ribbon — 5 million char.	50 — 100 million char. 5 million char. 3 million char.
Dimensions	3.8″ × 15″ × 9″	5.2″ × 14.7″ × 12″
Character set	96 ASCII	96 ASCII
Interface	Parallel	Parallel
Warranty	90 days	90 days
Printhead replacement	$29.95	$30
Cost	**$299**	**$650**

*Data source: Epson MX-80 Operation Manual

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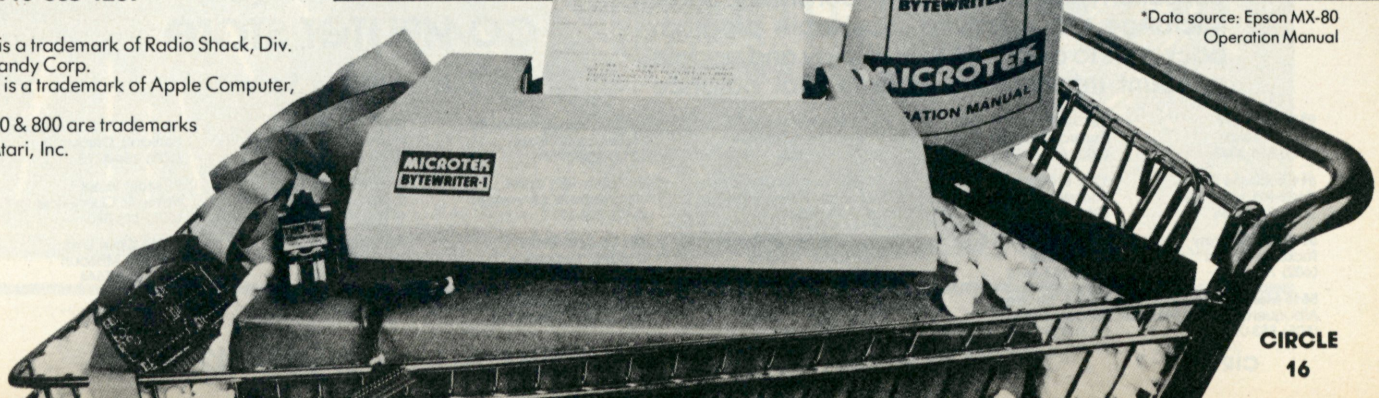
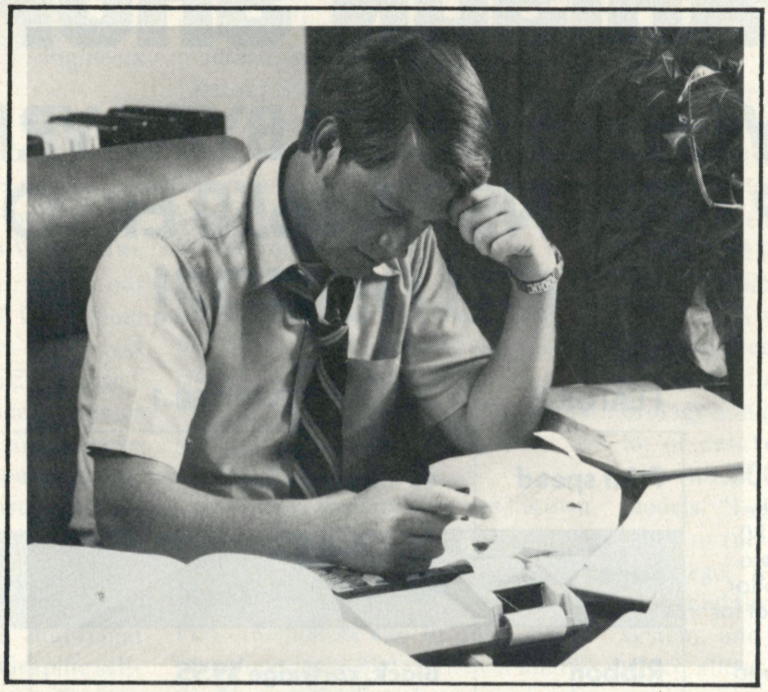


CIRCLE 16

CASH FLOW PROBLEMS?



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CIRCLE 17

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Elli Holman

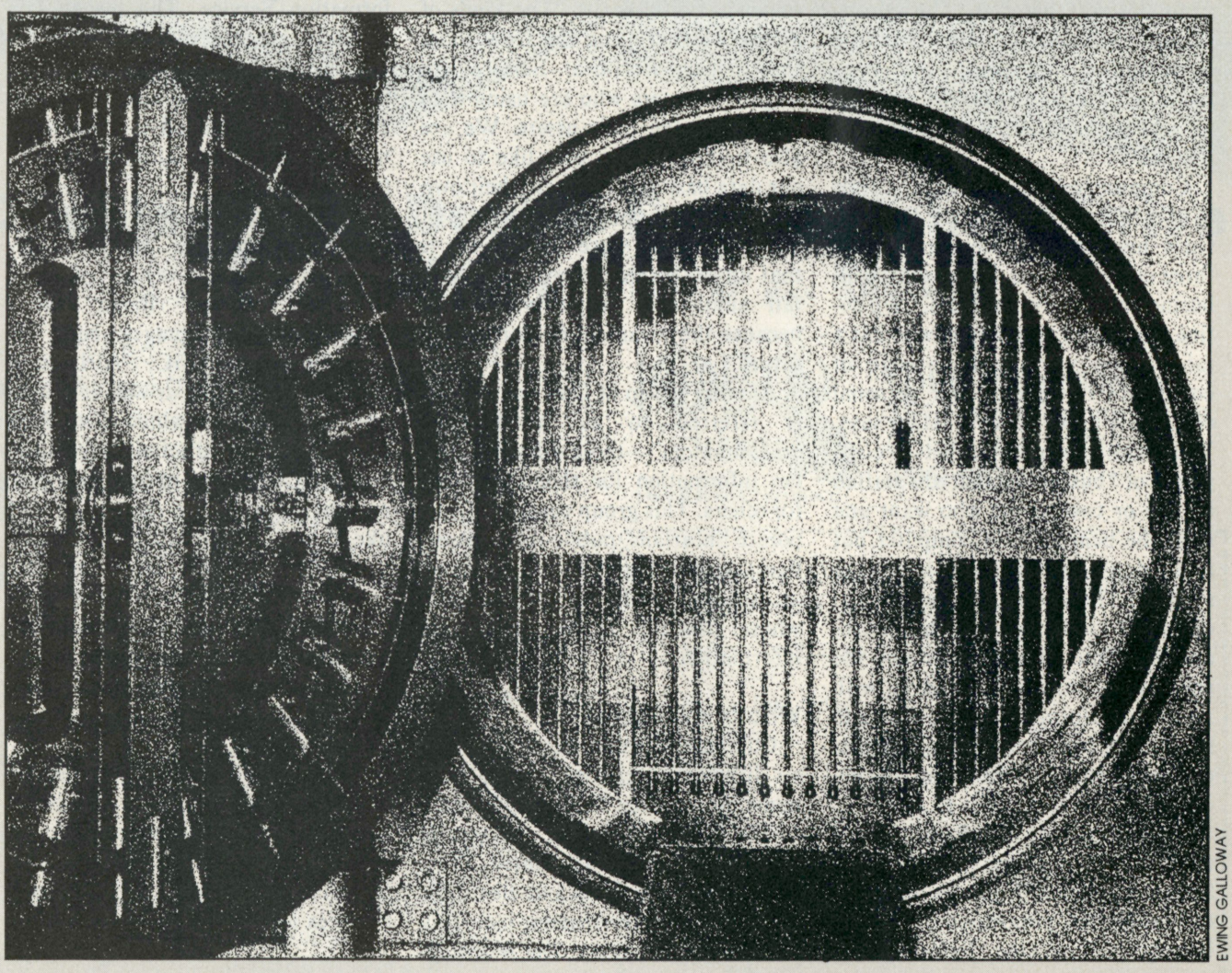
The global link: data banks

Connecting the world via a common network was once the dream of the visionary. Now science fiction has turned to fact—and data banks are providing us with a global union.

Writers routinely predict the impossible. Critics routinely scoff. And then the impossible becomes a reality. Marshall McLuhan predicted the impossible with his communications concept of the "global village" in the 60's. The critics scoffed, but the impossible is now a reality in the form of information networks.

McLuhan envisioned that someday the entire world would be connected by a common network. This network would be a data bank that could provide information pertinent to everyday life—world news, educational material, sports, travel, finances or games.

With the advent of data banks, a new realm of everyday life has opened up and McLuhan's global village has materialized. The businessman no longer need rely upon his stockbroker to give him up to the minute information concerning his fi-



EWING GALLOWAY

nancial holdings. The consumer no longer need wait for the evening news broadcast to find out what has happened in the world. The student no longer need wade through hundreds of library books for research purposes. All of these people can simply access the data bank, call up the topic of their choice and find what they are looking for.

Who uses data banks?

When data banks first came into existence, the only users were those people who were already familiar with computer equipment. This group consisted of data-processing professionals and computer programmers. These people became the core of the enthusiast market until the data-bank phenomenon was introduced into the office—and suddenly interest boomed. The educational, engineering and scientific communities welcomed the data banks with open arms. And now the technology has entered the consumer market.

Compuserve's Rich Baker, editor of the Information Service Div., divides his service's user group into three classifications: hobbyists, small businessmen and consumers. "We define a hobbyist as a person who has a fairly good working knowledge of computers in general and personal computers in particular," Baker says. The small business market is comprised of "businesses that are staffed by one or two people who want and need the benefits of a computer but really don't want to invest in a large system." These people buy a personal computer to manage their businesses and hook into data bases around the country to provide themselves with pertinent information. The last and smallest group, consumers, consists of the curiousity seekers who buy everything the market has to offer.

According to Mike Rawl, advertising/public relations manager, The Source started with games and hobbies and then progressed to stocks, bonds, sophisticated business and financial-forecasting services. "We found out that people are looking for hard news—news that they can use. They want it for information, they want it for research and they want it for decision making. They want it to play with and they want it to use. So our trend is taking us more and more into the business/professional market because that is where this information is."

Rawl also thinks that in the very near future, users of data banks will fall into the general-public category: "We will begin selling hardware and software together. The programs will get easier to use and the economies of using them will become greater and greater. People are being forced toward this type of communication."

Don Fleck, Dow Jones' manager of marketing services, views the market somewhat differently. "The kinds of people we find using the Dow Jones Information Retrieval Service are largely investors who are using it to better manage their assets. We are also finding people who like to use our data base just to create their own private newspaper to keep on top of breaking news, since the service is that up to the minute. And we get a fair number of people who use it because they want to be part of the future."

Another group of Dow Jones users is referred to as "information disseminators"—those who not only get information for themselves but for others. This group consists of corporate librarians, public relations officers, marketing research personnel or anyone inside an organization whose function is to disseminate information.

What's available?

Compuserve's data base consists of six different categories ranging from home information to electronic mail. In the first group, news, the service provides the live Associated Press news and sports wires and electronic editions of 11 newspapers including *The New York Times, The Washington Post* and *The Los Angeles Times*.

Finance, the second category, offers current and historical securities information, including stocks, bonds, options and commodities news.

Electronic mail is Compuserve's third category. "We provide a way for our customers to send electronic messages to each other and receive responses—all across the country," Baker says.

Entertainment, the fourth category, contains a variety of electronic games including everything from football and blackjack to multiplayer science-fiction oriented games, "where you can actually play the games with somebody in another part of the country," states Baker.

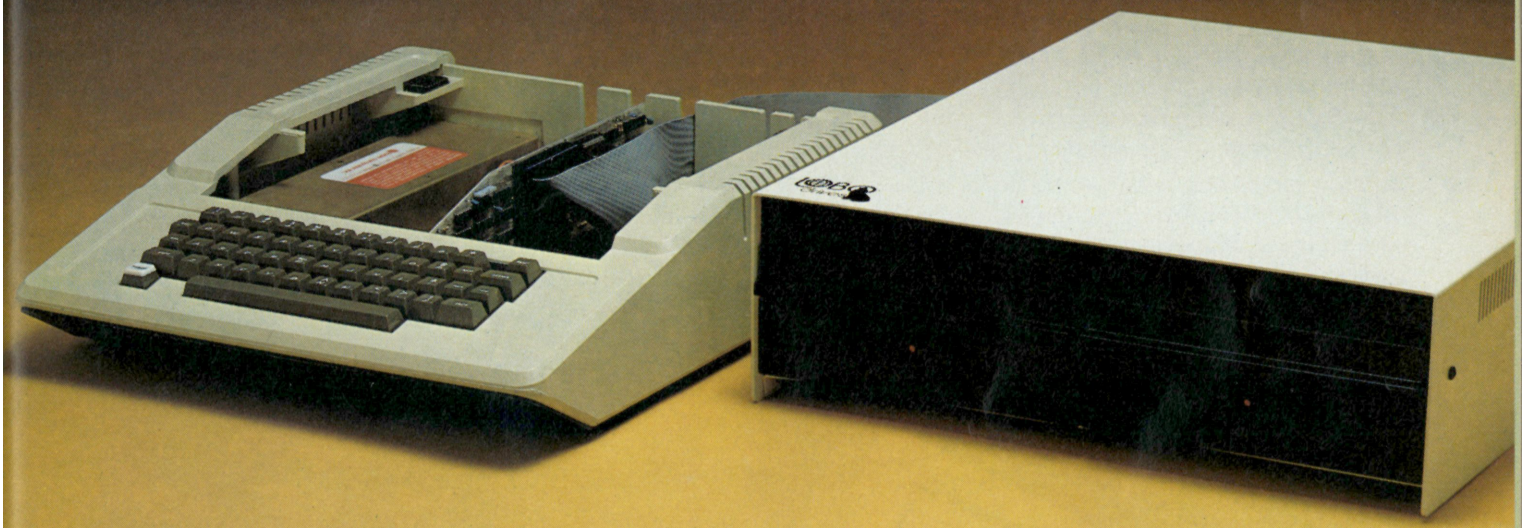
Home information makes up the next category on the Compuserve Information Service. The material it contains ranges from food recipes and meal-planning information to home decorating and energy conservation. Also included is nutritional material and information on how to tune up your car.

The last Compuserve category is personal computing. "In that category we provide a variety of more technical services," Baker states. Programming languages such as FORTRAN, BASIC, APL and COBOL are offered as well as a software exchange in which customers can buy designated software from the service. Using this option, the user notifies Compuserve that he would like to buy a particular piece of software. The company sends the software over the phone lines to the user's computer and the user is automatically billed for the cost.

The Source contains over 1000 information and communication services including an advanced electronic message system and instant news from the UPI news service. It can serve as an electronic travel agent, perform business calculations, buy discount merchandise, research complex topics, give investment mar-

continued on page 136

4.4 MEGABYTES FOR YOUR APPLE



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CIRCLE 18

Jack Edlow runs two businesses in Washington, D.C., that are about as different as businesses can be—a radioactive waste consulting and traffic-management firm and a travel agency. But he runs them both smoothly on one computer with the same accounting software packages.

Both businesses have benefitted from the combined power of these integrated packages, he says. "The accounts payable package has improved my ability to negotiate with trucking and shipping companies. Before I started using the Prodigy PROTEGE system, I had no real idea of how much business I did with each carrier. I knew who the big carriers were, but I did not have the numbers to lay out before a carrier's salesman and show him I deserved better rates and discounts. Now I can."

On the other hand, his travel agency—which he began because his company could not find one that provided good service—has dramatically improved its receivables with the PROTEGE A/R package.

The prodigal son

The experience of Edlow International, Inc., and hundreds of other small businesses, prove the value of the Prodigal Son of accounting software—accounts payable. Inventory, payroll, general ledger and accounts receivables—the brothers who stayed dutifully home—are praised often–accounting software for curing an inventory problem, boosting the collection rate of receivables, cutting through a general ledger paperwork

Robert L. Perry

mess, or solving a terrible payroll crisis. Few businessmen even recognize their need for accounts payable, until it comes forcefully through the door, begging their notice. But it is, like the Prodigal Son, a most valuable addition to your computer software family.

Why A/P is ignored

A/P software is most often ignored because it is not effective unless you operate it in conjunction with an integrated general ledger package. Frankly, most small businesses which have installed computers recently are either not integrating their accounting packages or are solving their most pressing problems first.

And most small business owners, with a comparatively few vendors—40 to 75—cannot see the benefits they could receive from improved cash-flow management. They have not yet realized, as have medium-sized and big businesses, how they could invest loose cash in short-term deposits to earn bundles of interest, especially in today's money markets with their extraordinarily high interest rates. They have also not seen that they could buy into other businesses, help them grow, and increase their long-term profits.

The name of the game

In A/P, as in every other computerized accounting function, the name of the game is *control*. Most small businesses have no idea where their money goes each month, and certainly not where the money *must* go during the next month or two months. Thus, they do not, and cannot, plan their payments, and they often fail to take advantage of substantial discounts which could save them hundreds of dollars per year. Often, they end up taking out short-term loans, and paying very high interest rates, when they could have done away with the need for a loan with a tighter collection of receivables and smarter planning of payables.

Traditionally, small businesses are poorly managed, and to improve their accounting practices would often involve too much paperwork and hiring more employees that they cannot afford. The only practical solution,

22 ways to process your payables

A study of the plethora of available accounts-payable software

PHOTO BY KENNETH W. SCHROERS

ACCOUNTS PAYABLE CHART OF REPORTS

Report Name / Company	AMERICAN BUSINESS SYSTEMS	BUSINESS ENHANCEMENT COMPUSERVICE	COMPUTER PRODUCTS INTERNATIONAL	COMPUTER SYSTEMS DESIGN	CROMEMCO	CYBERNETICS/MBS	DESIGN SOFTWARE	GRAHAM DORAN SOFTWARE	INTERNATIONAL MICRO SYSTEMS	MICRO ARCHITECT	MICROCOMPUTER CONSULTANTS	MICRODATA	MICROSOURCE	NORTH AMERICAN SOFTWARE	NORTH STAR COMPUTERS	PEACHTREE SOFTWARE	PRODIGY SYSTEMS	RADIO SHACK	SMALL BUSINESS SYSTEMS GROUP	STRUCTURED SYSTEMS GROUP	SYSTEMS PLUS	VANDATA
Cash Requirements	●		●		●	●	●		●	●	●	●	●	●	●	●	●	●		●	●	
Aged Trial Balance	●	●	●		●		●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Vendor List	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
GL Distribution	●	●	●		●	●	●	●	●		●	●	●	●	●	●	●	●		●		●
Transaction Register	●	●		●	●	●	●		●	●		●	●	●	●	●	●	●		●		●
Invoice Register	●	●	●		●							●	●				●					
Pre-Check Writing	●		●	●	●	●	●				●	●	●		●	●	●	●				
Check Register	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Vendor Analysis	●		●		●	●	●	●				●		●			●	●		●		
Check and stub	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Open Item / Unpaid	●			●	●	●	●		●	●	●	●	●	●		●	●	●	●	●	●	●
Manual Check Register	●				●		●					●		●			●					
Debit / Credit Memo List	●				●		●					●					●		●			
Journal / Batch Proof	●				●		●	●					●	●						●	●	●
Bank Reconciliation	●											●		●								
Monthly Voucher Register	●										●	●										
History File							●						●					●				
Mailing Labels											●											
Monthly Cash Summaries												●										

especially today, is a computerized accounting system.

Accounting methods

There are two kinds of accounting systems: accrual basis and cash basis. Most accounts payable software uses only the accrual basis, a method in which income or expenses are charged against the tax period in which they are incurred, regardless of whether the income is actually received or the expense actually paid during that period. For example, in accounts payable, if you use the calendar year as your fiscal year, and buy a machine in December, but do not pay for it until February, the expense would still have occurred in December and be considered as the previous year's expense for tax purposes. This method is most often used by businesses which carry comparatively large inventories.

The cash basis method, on the other hand, defines income and expenses as occurring when the money actually changes hands. If you buy and receive a machine in December, but pay for it in February, then the expense is considered paid in February. This is the most common method of accounting for small businesses, but

ACCOUNTS PAYABLE CHART OF FEATURES

Feature/Company	AMERICAN BUSINESS SYSTEMS	BUSINESS ENHANCEMENT COMPUSERVICE	COMPUTER PRODUCTS INTERNATIONAL	CYBERNETICS/MBS	COMPUTER SYSTEMS DESIGN	CROMEMCO	DESIGN SOFTWARE	GRAHAM DORIAN SOFTWARE	INTERNATIONAL MICRO SYSTEMS	MICRO ARCHITECT	MICROCOMPUTER CONSULTANTS	MICRODATA	MICROSOURCE	NORTH AMERICAN SOFTWARE	NORTH STAR COMPUTERS	PEACHTREE SOFTWARE	PRODIGY SYSTEMS	RADIO SHACK	SMALL BUSINESS SYSTEMS GROUP	STRUCTURED SYSTEMS GROUP	SYSTEMS PLUS	VANDATA
Accrual basis	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cash basis															●				●			
On-line processing			●			●					●	●	●			●						
Batch processing	●	●		●	●		●	●	●	●				●		●	●	●	●	●	●	●
Aging by due date	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Aging by invoice date	●					●	●				●							●			●		
Audit trails	●				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Automatic checks	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Auto GL integration	●	●	●		●	●	●	●	●		●	●	●		●	●	●	●	●	●	●	●
All vendor payments	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●	●	●
Partial payments	●	●	●		●	●	●	●	●		●	●	●	●	●		●	●		●	●	●
Selected vendors		●	●		●	●	●	●			●	●					●		●	●	●	●
Payments by due date	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Automatic discounts	●				●	●	●	●		●	●	●	●	●	●	●	●	●			●	
Manual payments	●		●		●	●	●	●			●	●	●	●	●		●	●		●	●	●
One-time vendors		●		●	●		●					●		●				●			●	
Credit/debit memos	●				●		●											●	●			●
Finance charges added					●							●										
Multiple bank accts.	●											●		●				●				
No. of Aging Periods	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Double-entry acctg.	●				●														●			●
Trial payment run									●													

only a few packages allow for it.

Two other terms are important in accounts payable: open item and closed item. The former means that you have not paid an outstanding invoice, thus it remains "open," while the latter means you have paid an invoice, so it is "closed."

Minimum features

A/P software, like any other, ranges from excellent to poor. It may have a few useful features, functions and reports, or dozens. But a minimally useful A/P package will offer the following features:

- Integration with general ledger with automatic updating either during batch processing or after each transaction, and allocation of each invoice against a number of GL accounts.
- Menu-driven operation with error traps and prompts.
- Full audit trails.
- Automatic check printing, with a provision for recording hand-written (manual) checks.
- Various payment methods, including an ability to pay all invoices before a set due date, all invoices outstanding, specific invoices selected by the user, and partial

payments against total outstanding invoices.
- At least three aging periods, 30-, 60- and 90-days, with current status of invoices.
- Automatic flagging or payment of invoices with available discounts.
- Year-to-date and/or annual summaries.

Minimum reports

A minimal set of A/P reports would include:
- Vendor master list (by vendor number and/or alphabetically).
- Cash requirements report (also called cash projections report or similar name).
- Transactions list.
- Pre-check writing register or list.
- Aged payables report or trial balance.
- Check register with actual printed checks shown.
- General Ledger distribution report.

Although a few A/P packages have fewer features and reports, they may still be valuable for a small business which needs a simplified, integrated accounting system to replace a hand-written, home-grown system. It depends on whether the user can define the advantages he can receive from using such a package.

Worth the cost?

As you look at the chart of features and see how much capacity—in terms of vendors and monthly transactions—many of these packages will store, you may be put off. Some will hold hundreds of vendors and 1000 transactions per month. But what if you only have 50 vendors and 100 transactions per month? Can you find a cheaper, more limited package that will be just as useful as a package with maximum vendor and transaction limits you are sure you will never need?

A better way to look at it is: Look first at the capabilities of the software and not at the capacity. Look at its features and reports, study its ease of operation, and ignore capacity. If you buy a package with a capacity of 1000 vendors, but you only have 50, that does not automatically mean you wasted your money. If you find that the program produces the kinds of reports and includes the features you want, you will still get value for your money.

For example, Nickey Smith, who owns La Mesa Music Company in La Mesa, Texas, uses Microsource's LedgerPlus A/P package. He has about 40 vendors a month and writes about 35 to 40 checks a month for expenses incurred by his retail store—a "hodge-podge" of music, stereos, records and tapes, instruments and electronics. But Microsource's package has a capacity of hundreds of vendors on an Apple II disk. (A new CP/M version has just been released.)

Yet, Smith says his purchase was worth it because of the time he saves and the new information about his business that he generates with the computer. "The A/P package has meant a lot of time saved. We no longer write checks manually, and the trial balance gives us all of the invoices in balance. Checking that against statements is very easy.

"Before we got the computer and the package, we weren't doing the GL trial balance with the monthly accounts payable. We were doing the monthly P&L (profit and loss statement) and the balance sheet by hand, but we could not do the payables trial balance."

And it has enabled him to take an increasing burden off his wife's shoulders. She used to do all of the check-writing and invoice-checking. But, more than that, Smith adds, "We are more disciplined in our bookkeeping, and it fulfills our need to know more about our business more quickly."

A/P software ranges in price from $129 to $995. Generally, price is related to the capacity, capabilities,

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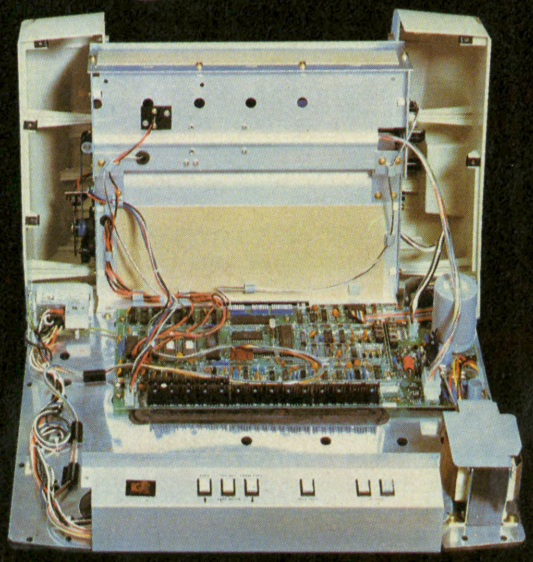

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CIRCLE 20

features and functionality of each package. For example, an $800 package is far better than a $129 package. Yet, in the upper price ranges, price does not necessarily reflect a program's adequacy. In short, a package priced at $650 may be better for a specific purpose than one priced at $800, which is not a small difference.

After deciding to purchase an A/P program, take some time—months, if necessary—to read about, study and test various packages before you make up your mind. Then, take at least a month to implement and learn how to use your new package.

Nobody's perfect

Even the best accounts payable package on the market suffers from problems. Like any other software, no package is perfect, nor will it have absolutely everything you want.

Even the best accounts payable package suffers from problems. Like any other software, no package is perfect.

One problem is endemic, however. Says Frank Kaphan, owner of Lumerand, Inc., a $2.5 million ladies handbag manufacturer in New Jersey, "With a computer, we lose a lot of the detail we used to have with general ledger cards. On the cards, we

could tell at a glance how much business we did with each vendor for the past five years, or how much business a customer did with us. We also knew how long it took us to pay, how long it took a customer to pay, and how many handbags we shipped to a customer. With a computer you can see the totals, but you can't see all the details."

None of the A/P packages available will carry that much detail in its A/P files. However, users may want to consider using a data-base manager to establish electronic ledger cards to store that information. The problem, then, would be integrating a DBMS with the accounting packages—a very rare type of software.

Yet, Kaphan says he is a satisfied user of the Prodigy PROTEGE payroll and accounts receivable packages. Of the 100 checks he writes each month, almost 90 are payroll checks, and he issues about 1000 invoices. He deals with so few vendors each month that the accounts payable is valuable only for integrating into the general ledger.

Kaphan believes accounts payable would be valuable primarily to a wholesaler or distributor, or to a business such as a hardware store, with hundreds of vendors each month, and not to a small business with a few vendors.

To each his own

Smith notes that although he has not used all of the power of the Ledger Plus A/P, he has a friend who has used an A/P package more extensively. "My friend runs a cowboy goods shop, and he runs a payables package on a TRS-80 Model II. It's valuable to him because he pays bills

continued on page 112

Structured Systems Group aged trial balance listed by vendor number

Sunbelt Distributing
ACCOUNTS PAYABLE
AGED TRIAL BALANCE

PAGE 2
DATE 05/25/79

VENDOR NUMBER	VOUCHER NUMBER	PAY DATE	INVOICE NUMBER	INVOICE DATE	GROSS AMOUNT	DISCOUNT AMOUNT	CURRENT DUE	PAST DUE 30 - 59	60 - 89	90 AND OVER	BALANCE DUE	HOLD
00165	Herts Truck Leasing											
	00238	06/04/79	00000	05/25/79	495.00		495.00				495.00	
00179	Department of Motor Vehicles											
	01573	05/25/79	01225	04/19/79	4,702.00			4,702.00			4,702.00	
00196	Connecticut Insurance											
	00233	06/15/79	02555	05/25/79	1,000.00		1,000.00				1,000.00	H
00206	Putnam Office Furniture											
	01563	04/10/79	12551	03/16/79	564.21	<11.29>			552.92			H
	01578	05/08/79	12669	04/25/79	1,256.25	<25.13>		1,231.12				H
	00231	06/19/79	05566	05/19/79	145.22		145.22					
							145.22	1,231.12	552.92	0.00	1,929.26	
00210	Structured Systems Group											
	01582	06/15/79	01325	04/18/79	15,000.00			15,000.00				
	00230	06/18/79	00225	05/18/79	855.00		855.00					
							855.00	15,000.00	0.00	0.00	15,855.00	
00223	Digital Diskettes											
	01559	05/30/79	00256	03/15/79	14,256.29				14,256.29			
	01574	06/10/79	00358	03/15/79	8,450.25				8,450.25			
	01587	05/25/79	01556	04/30/79	2,656.85		2,656.85					
	00228	05/25/79	01556	05/25/79	2,558.25		2,558.25					
							5,215.10	0.00	22,706.54	0.00	27,921.64	
00254	Western Union											
	00239	06/15/79	05655	05/25/79	2,664.56		2,664.56				2,664.56	
00268	Berklawn Golf Clup											
	00236	05/25/79	00125	05/25/79	1,500.00		1,500.00				1,500.00	
00271	Timesetter Publications											
	00234	06/15/79	05556	05/15/79	850.00		850.00					
	00243	06/25/79	05566	05/25/79	4,500.00		4,500.00					
							5,350.00	0.00	0.00	0.00	5,350.00	

REPORT TOTALS

90 AND OVER	0.00
60 - 89	26,184.56
30 - 59	28,277.87
CURRENT	60,920.72
TOTAL PAYABLES	115,383.15
NUMBER OF ACTIVE VENDORS	20

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Robert Harwood

ADVANCED COMPUTING

Diagnostic and utility software

Utility routines make life easy, even though you may not realize they're there. And diagnostics can spot the trouble you've just become aware of

A user of a menu-driven, turnkey personal computer system, like one for small-business accounting or word processing, isn't usually aware of the need for utility routines. But they may be in use on the system without the user's knowledge. These "transparent" utility routines, like those for copying a disk or preparing a new disk for recording (formatting), are called directly by the applications program. The user never, knowingly, makes direct use of the disk-operating system (DOS) or its utility routines.

Utility routines are a general class of computer program, usually written in assembly language, that combines with a disk-based personal computer system DOS to perform system functions like printing, loading programs or disk operations. Included in these utility routines are the programs that exercise and test the system hardware (diagnostics).

What's in a DOS?

A personal computer DOS is usually broken down into three parts. The "kernel" is the part of the DOS that transfers data between the disk files and the system random-access memory (RAM), and supplies the basic framework for all system opera-

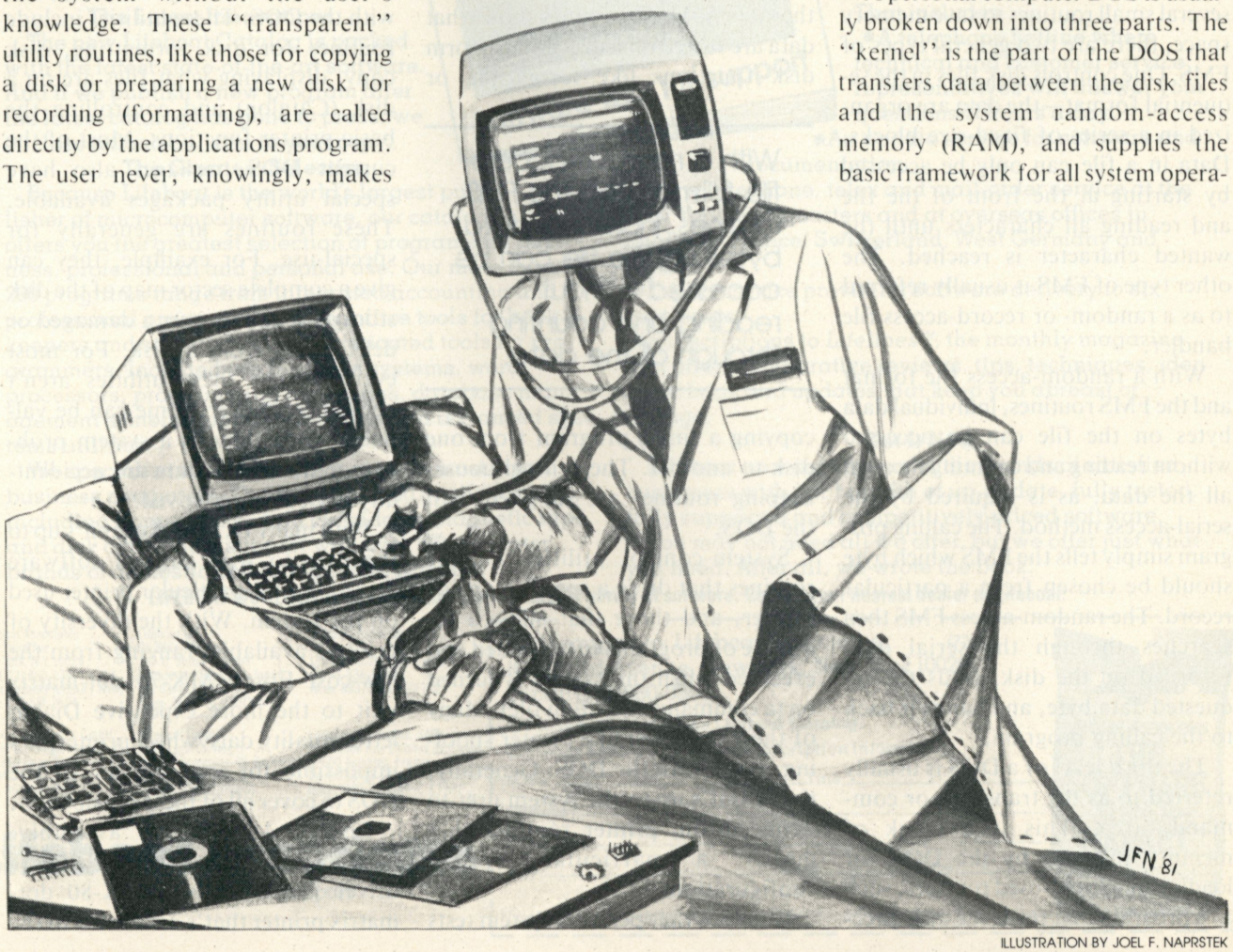

ILLUSTRATION BY JOEL F. NAPRSTEK

tions. Included in this part of the DOS are the disk drivers—the routines that translate data into a form that the disk hardware can use.

The second part of a DOS is the file-management system (FMS). These routines control how data are stored on the disks and are used by other programs to gain access to these data. A file-control block is used to access the FMS. This is a fixed-format data block that other programs use to communicate with the FMS. It contains file data, such as the file name and what function is to be performed (reading or writing data), as well as a fixed-length data buffer that contains the disk data passed between the FMS and the calling program. Data access with the FMS is a series of machine-language commands.

While they may be divided into several small routines to save memory space, there are two general types of FMS. One controls disk files in the sequential format—the data are organized in a series of fixed-size blocks. Data in a file can only be accessed by starting at the front of the file and reading all characters until the wanted character is reached. The other type of FMS is usually referred to as a random- or record-access file handler.

With a random-access file format and the FMS routines, individual data bytes on the file can be accessed without reading and counting through all the data, as is required by the serial-access method. The calling program simply tells the FMS which byte should be chosen from a particular record. The random-access FMS then searches through the serial data recorded on the disk, finds the requested data byte, and hands it back to the calling program.

The third level of a DOS is usually referred to as the transient, or command, area. This is a block of memory reserved by the DOS for loading in seldom-used routines, such as a program that reads the disk directory and lists the name of all of the files on a disk on the terminal. This transient area is where the programs commonly known as utility routines are loaded and used by the system. Overlaying multiple routines in the same memory area decreases the amount of RAM needed for a system.

Utility routines

There are three general types of utility programs—those for system housekeeping and diagnostics, those used for system control, and those for programming, such as text editors, assemblers that convert mnemonic names into machine language and high-level languages like BASIC or FORTRAN.

For a personal computer system, the housekeeping utility routines maintain the working environment of the system. These routines show what data are stored on a disk and perform disk functions like formatting or copying a single program from one disk to another. The general housekeeping routines are supplied with the DOS.

With a random-access file format and the FMS routines, individual data bytes on the file can be accessed without reading and counting through all the data.

System-control utilities include routines that drive a specific type of printer, and those that allow a sequence of programs to be loaded and executed when the system is turned on (a command-execution file). Many of these routines, like printer spooling, come with the DOS. Generally, though, it's up to the system user to write custom printer routines that match a particular system configuration.

Routines that perform system tests are considered by many to be part of the housekeeping utility routines. There are two general types of system-test routines. Some, like the error-test routines that are part of the DOS disk read/write operations, are used during normal system operation. Others, like the error-tests made during a disk-formatting operation, are only used on command. There is also a complete family of diagnostic utility routines that are used to check the system hardware for proper operation and to indicate if an error has occurred, and if so, where the error is located. Some of these routines are supplied by the system hardware manufacturer in the form of a program listing.

Other routines

The basic utility routines needed for system use are normally supplied with the DOS. These utilities include routines for disk formatting, disk copy, displaying what files are on a disk (Catalog) and controlling the basic printer functions. Most of the current DOS packages also have special utility packages available. These routines are generally for special-use. For example, they can give a complete sector map of the disk storage or can recover a damaged or deleted file from a disk. For most everyday use these utilities aren't needed. However, some can be valuable when there is a system problem or when disk data are accidentally erased or destroyed.

With many DOS packages it's up to the user to write special software drivers for the particular printer used on the system. With the diversity of printers available, ranging from the low-cost Epson MX-70 dot-matrix unit to the more expensive Diablo letter-quality daisywheel printer, it's impossible for the supplier of the DOS to cover all of these possibilities.

Listing 4 gives the assembly-language source code for a software driver for the Epson MX-80 dot-matrix printer that's connected to the

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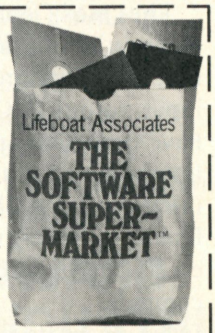

CIRCLE 22

RS-232-C serial port of a Smoke Signal Broadcasting 6800-based personal computer. It's written for use with the Technical Systems Consultants' FLEX operating system. Although most serial-input printers can be driven with a continuous stream of ASCII characters, the Epson unit must be continually monitored for a data-ready state. The printer's data buffer size and its stop-print action during its logic-seeking printing is responsible for this situation. The MX-80 also has a slow page-eject time. And if the printhead overheats, the printer will shut down; when cool the unit resumes printing.

The RS-232-C connections between the computer-output port and the MX-80 are conventional—pins 1, 2 and 3 for serial data in/out and signal ground—with the exception of an additional line to monitor the unit's print-ready state. To monitor the print-ready condition of the MX-80, a connection between pin 11 of its RS-232-C interface and pin 5 of the serial output of the computer must be made. This ties the MX-80 data-terminal ready (DTR) signal to the clear-to-send (CTS) connection of the computer's ACIA serial port. When the MX-80 cannot receive data, this signal connection inhibits the transmit-data-register-empty (TDRE) status bit in the ACIA. The software driver monitors this status bit and waits until the printer is ready to receive data before loading the data-output register of the ACIA.

Diagnostics

The most common hardware-diagnostic routines are those that check the system memory and the input-output (I/O) channels. There have been some routines written to test the actual system microprocessor (μP) chip, but these are generally limited to finding minor μP operating errors. On a conventional personal computer, it's not possible to use a failed μP chip to fully test itself. Most diagnostic routines simply assume that the basic μP card is in working order.

This test approach is used for the majority of personal computers, but there are exceptions. Some systems—Commodore's PET and CBM personal computers and many commercial minicomputers—combine software and special hardware for system tests. Software routines exercise the system hardware. If there is a minor fault, it's displayed on the display screen. If the fault is major and prevents basic system operation, a trouble lamp lights up on the circuit board. These trouble lamps indicate the type of trouble and which computer function is out to lunch.

Computer peripheral devices, like video terminals and printers, sometimes include self-test features. This self test is possible because most of the newer peripheral gear uses a μP for control. The self-test feature allows the user to determine if the problem is in the computer or in the peripheral.

Self-testing of an I/O device, like a printer or terminal, usually causes the device to display its complete character set. This repetitive display "walks" across the width of the screen and scrolls vertically on the screen. This walk/scrolling action displays each of the characters at all positions on the display, creating slanted lines of the same character. It's easy to see if a character changes—usually an indication of a bad memory location for the display memory of a terminal or the input-line buffer memory of a printer.

As an example, Perkin-Elmer's Bantam 550 terminal will continuously display its character set when the Escape (ESC) and Control (CTRL) keys are pressed at the same time. These tests are done off line—the terminal can be completely disconnected from the computer. To stop the test, the Delete (DEL) and Control keys are simultaneously pressed.

Many of the more-recently designed low-cost printers also have a self-test feature. The Epson MX-80 dot-matrix printer, as an example, is placed in the self-test mode by holding down its Line Feed (LF) key when the power to the printer is turned on. The printer then continuously prints all of the members of its internal character set, testing the unit's printhead and operation of the unit's printing functions like the printhead, motor and ribbon advance.

Memory testing

Many memory tests assume that the system's μP card is working properly. Most personal computers do not have the front-panel switches and display lamps usually associated with a minicomputer. Although these switches and lamps do permit testing and monitoring of the system data bus and give the user some control of the computer, they do cost money. For economy and easier operation they have been replaced with a single reset switch and a monitor program in ROM.

The monitor routines provide for basic control of the system with functions such as input and output, memory examine/change and initiation of the operation (bootstrapping) of a system disk. Associated with the monitor is a small amount of RAM used as a scratchpad by the μP. Usually a scratchpad contains 64 or 128 bytes of memory. With some microprocessors the scratchpad is a separate memory chip. Newer μP designs, like Motorola's 6502, contain the scratchpad memory within the μP chip.

The small amount of scratchpad memory, when used with the monitor routines, can be manually programmed to perform memory and I/O testing. This type of testing is a bit slow and inconvenient, but it is useful when a new system is first tested or when there has been a massive failure of an existing system, for example,

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from a power-line surge.

Memory testing is used to find out if a particular data pattern is correctly loaded into one and only one memory location. If a data bit within a memory location sets falsely, or not at all, a memory-storage error occurs. If the same test data are loaded into more than one memory location, a memory-addressing error occurs. Usually several different routines are used for memory testing. Each routine tests for a specific type of memory error, but some types of combinational errors may be missed. The combination of these routines insures that the system memory is working properly.

Listing 1 gives the assembly-language source code of a simple memory test for a 6800 μP system. Routines similar to this were supplied by Motorola and Southwest Technical Products to users of 6800 personal computers. The memory diagnostic routine fits within the scratchpad memory used by a 6800 monitor such as SWTbug, Mikbug or Smartbug.

The routine tests a memory card for memory-addressing and memory-content errors. It starts by loading a continuous stream of 256 (all of the binary states for an 8-bit memory location) sequential binary numbers from the lowest memory address to the highest memory address specified. It then returns to the beginning address, reads the data in each memory location and makes sure that the data that should be there, is, in fact, present.

If the data are not correct, an X is printed on the I/O device and the cycle restarts. If the entire cycle passes the test, the routine prints a # symbol on the I/O device and again restarts the test. The routine is repeated until the system reset button is pressed, returning system control to the monitor.

(Editor's note: the original source-code listing for this memory test was published by SWTP in an uncopyrighted test included with its system kits some years ago. Numerous routines similar to this have been published by others.)

A test of this type isn't perfect. It's possible that an addressing error in the hardware might set the same data in two or more memory locations that would be there anyway. However, each repeat cycle of the test routine puts different data in different locations and the chance of missing a problem is reduced.

> Memory testing is used to find out if a particular data pattern is correctly loaded into one and only one location.

A more sophisticated memory test is called the rotating-bit test. It tests each memory location to see if a single binary bit placed in any one of the 8-bits of a memory location falsely sets another bit in that same location. This type of test sequence starts from the lowest memory address and loads that address with the binary-pattern 0000 0001. The data in this memory location are then read back and verified. If these data are correct, the pattern is shifted left one bit to 0000 0010 and the test repeated. After the memory address is tested with all eight of the binary combinations—by shifting the test bit left one binary position at the end of each test cycle—the test is repeated on the next memory location. All memory locations are tested in this way.

Once the memory locations have been tested to make sure that only specified bits are set, a more thorough check of memory addressing is needed. Typical of this type of test is the dual-address memory check. This test starts with the lowest memory address and writes zeros into all locations. It then loads all ones into the first memory address, and then checks all other memory locations to make sure that no other location was falsely loaded. If all memory locations are correct (still loaded with all zeros), the test location is changed to all zeros and the test repeats using the next higher memory address until the end of memory is reached.

Listing 2 is a variation on the dual-address memory test. It was written by Jim Butterfield for use with Commodore/MOS Technology's Kim single-board 6502-μP system, and is easily adapted to any 6502-based personal computer. This version puts all ones in every memory location to be tested. All zeros are placed in every third location, and then the routine tests all locations for the correct data pattern. The test is repeated twice, with the position of the all-zero bytes changed. When the first, second and third memory-location sequences have been tested, the whole cycle repeats with the all-ones and all-zero patterns reversed.

To run Butterfield's memory test, load the addresses of the first and last memory pages to be tested into the RAM-addresses (hexidecimal numbers are indicated by the $ sign) $0000 and $0001, respectively. Start the program at address $0002. If a memory error is found, the program halts with the address of the error shown on the Kim display. If the test finishes without finding an error, the display shows a number that is one greater than the top address tested.

(Editor's note: this program is in the public domain. It was also published by Hayden Publishing Company on p. 122-123 of "The First Book of Kim," by Butterfield, Ockers and Rehnke.)

Although it is simple in nature, the dual-address test can be quite time-consuming. At a 1MHz clock rate, with a 6800 μP, it takes a bit under 30 seconds to test 1kbyte of RAM. Test

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CIRCLE 24

time increases to over 30 minutes if 8 kbytes of RAM are tested in one pass. When using memory tests that load a memory location and then test all other locations for error, it's better to repeat the test on small blocks of memory rather than doing the entire memory in one pass; the time saving can be enormous.

An even more sophisticated memory test is known as a sum test. This type of test generates a unique data content for each memory location checked. This generated data lets the routine test for adding or dropping a data bit within a memory location and allows for ensuring that data are only stored in the addressed memory location. These data stored in a memory location are the sum of the most-significant byte (MSB) and the least-significant byte (LSB) of the memory address. Data in adjacent memory locations as well as in different blocks (pages) of memory are unique.

Listing 3 gives the assembly-language source code for a memory sum-test diagnostic. The source code was written for a 6800-μP system by Chris Courtney of Respco, Inc., and was originally published by Southwest Technical Products for use with its 6800-based computer kits. Note the "hole" in the assembled code between addresses $A034 and $A048. This hole is required because the SWTbug and MIKbug monitors use this area of the scratchpad memory to store the subroutine-call return stack.

To run the sum test, load the two-byte hexidecimal starting address in LOMEM and the ending address in HIMEM. The START address in location $A048 sets up the monitor to run this routine when the 'G' key is pressed on the computer terminal. The number used for the start address should be the upper limit desired plus one. As an example, to test the first 4-kbyte block of memory ($0000 to $0FFF), LOMEM would be set to $0000 and HIMEM set to $1000.

If no memory errors are found by the test routine, a '+' sign will be printed on the terminal. When an error is found, a string of hexidecimal numbers will show the error and its location. The format for the error message is: [Test Pattern No.] [Errant Bit(s)] [Address].

The test pattern shows which test pattern was in use at the time of the failure. The Errant Bit hexidecimal number shows which bit, or bits, of the memory located at the indicated address was in error. A total of 256 passes are needed to completely cycle the memory through all of the 256 possible test-data patterns. When repeating the test, reload the program to insure that all variables are set to their start values.

For regular system use, these routines can be merged into a common memory-test utility program. If two versions of each routine are written—one starting at a low memory address and the other starting at a high-memory address—it's normally possible to run a system test without resorting to hand-loading the routines from the keyboard. The only time hand-loading should be necessary is when there is a severe system memory failure. It's usually possible to get a system up and running with enough memory by swapping memory boards or memory chips so that at least the block of memory used for the DOS is good. This permits the routines to be loaded and used to check out the system memory.

I/O Testing

When the primary input-output channel (port) of a computer isn't functioning—for example, the one used by a monitor to connect to the system terminal—about the only thing that can be done is to fix it the hard way or substitute another I/O card for the damaged one. However, once a system is up and running on at least the primary I/O port, tests of the other ports, both parallel and serial, can be run. These tests may prove valuable for secondary I/O devices like printers and modems.

For special communications devices, like modems (modulator-demodulator), about the only local tests that are practical to run are those on the I/O-port hardware. However, some modem manufacturers do offer a dial-up service for modem tests. The user dials up and connects to a central computer system. This system then runs a diagnostic routine on the modem. Obviously if the modem is completely out, no connection to the central computer can be made. If the modem is working the remote diagnostics give it a complete check and detect any degradation in performance.

The concept behind I/O-port testing is simple. The test routine puts out a series of binary numbers to the output side of the port and then uses the input side of the port to check for a data match. Like most tests, the diagnostic routine uses all of the 8-bit binary combinations (0-256 decimal).

When testing a parallel port, like that of a PIA (Peripheral Interface Adapter), the external device must be unplugged. A jumper cable is inserted in the external-device socket that connects the port's output lines to the input lines. The diagnostic routine then compares the output test pattern, via the jumpers, to the test pattern returned as an input.

Tests for a serial port, like an ACIA (Asynchronous Communications Interface Adapter), are similar to those for a parallel port. However, a jumper cable is not needed between the input and output pins since the same wiring is used for input and output signals. The diagnostic routine conditions the serial I/O device, like an ACIA, so that it echoes the output test pattern. The returned test pattern is then compared to the output data-bit pattern.

continued on page 166

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CIRCLE 20

Richard Spillman

LEISURE COMPUTING

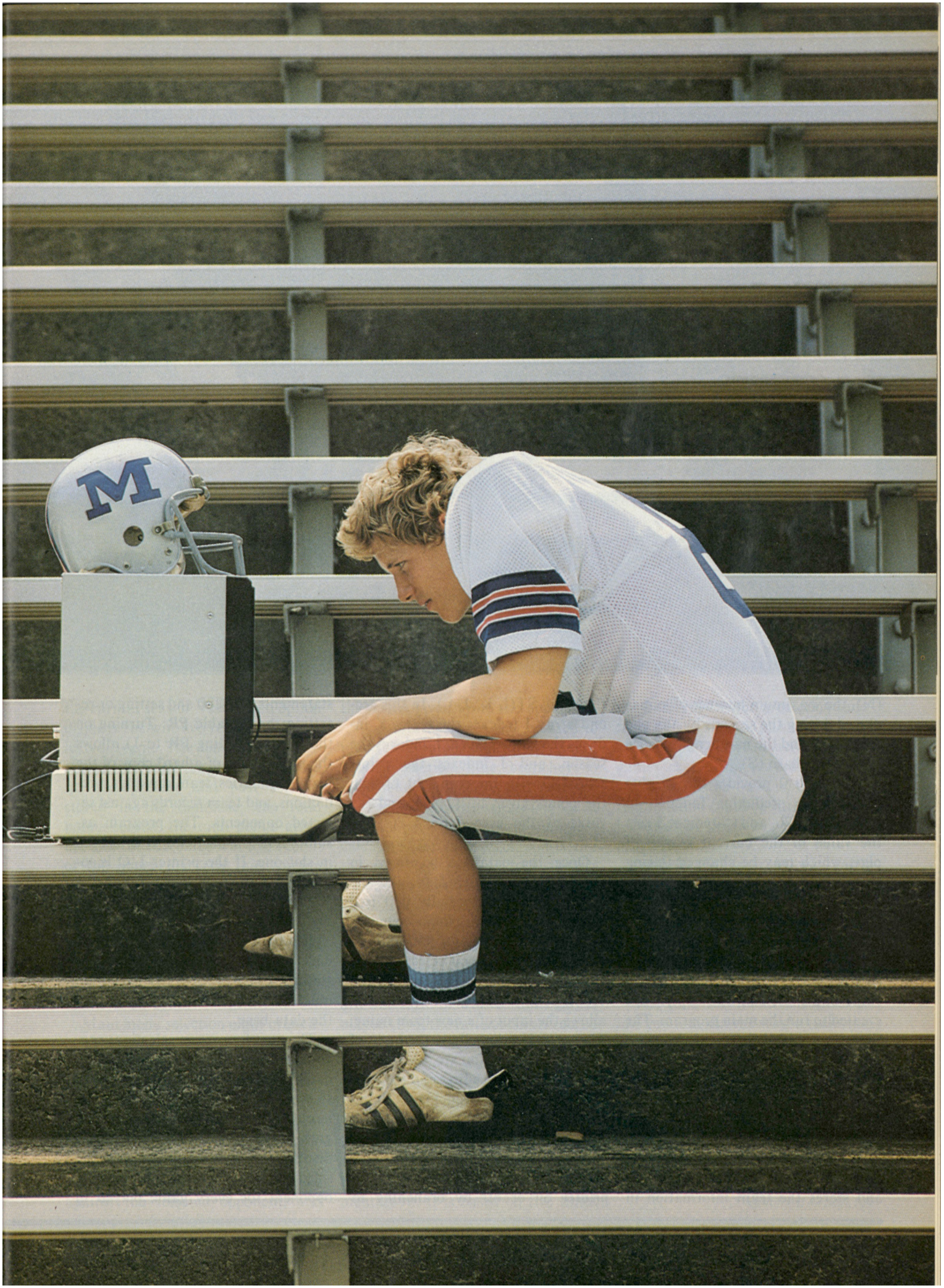
Make some sense out of all the stats

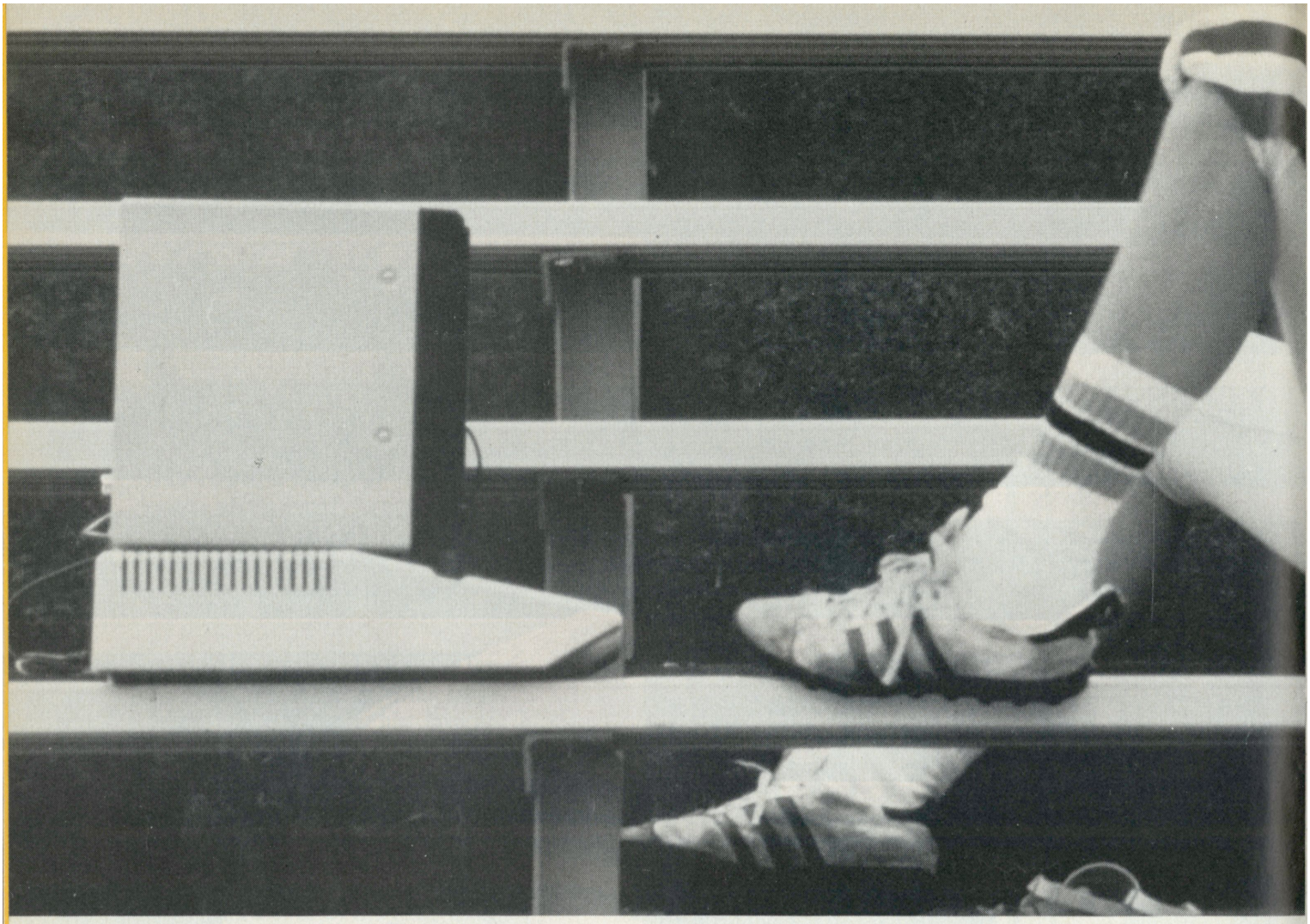
This record keeper will help keep stats and prognosticate on next weekend

Even the most avid sports fan can have a hard time keeping up with his favorite team and sport. Statistics and schedules can become a blur considering all the information today's fan digests. But the sports enthusiast doesn't have to work so hard at his pastime anymore. He can sit back, relax and enjoy the game using his personal computer.

The *SPORTS* program is written in Applesoft BASIC for an Apple II Plus with 48k of memory. It generates a sports data base and provides the win-loss record for every team in the data base. It predicts the outcome of future games, and allows the user to define his own statistic for use in predicting the winner (such as the percentage of third-down conversions in football). Since the program uses standard BASIC functions, it should run with minor changes on any system with a BASIC-type language.

The first three statements of the *SPORTS* program must be adjusted to meet the requirements of the sport. Statement 1 sets the number of teams





(N), the maximum number of games played during the seasons by any one team (M), and the number of seasons in the data base (S).

Statement 2 provides the weights used in the prediction function in statement 2570, and statement 3 sets the value of the current season of play, which may be changed during the program to allow an examination of the results of other seasons.

The first operation of the program is to load the data base from the disk. Then, by running the short program SPORTS INIT which asks for the value of N, M, and S, two files are created to run the main program. The first file, NAMES, stores the team names, and the second file, DB, stores the team records. In addition, SPORTS INIT asks for the user defined statistic and also stores it in the file NAMES.

The main program then stores the team names in the array TEAM$(I) and stores the team information in the array ST(I, K, J, L). In this second array I indexes the team, K indexes the game played, L indexes the season, and J indexes the points scored (J=0); the opponent (J=1); the points given up (J=2); and the value of the user defined statistic (J=3).

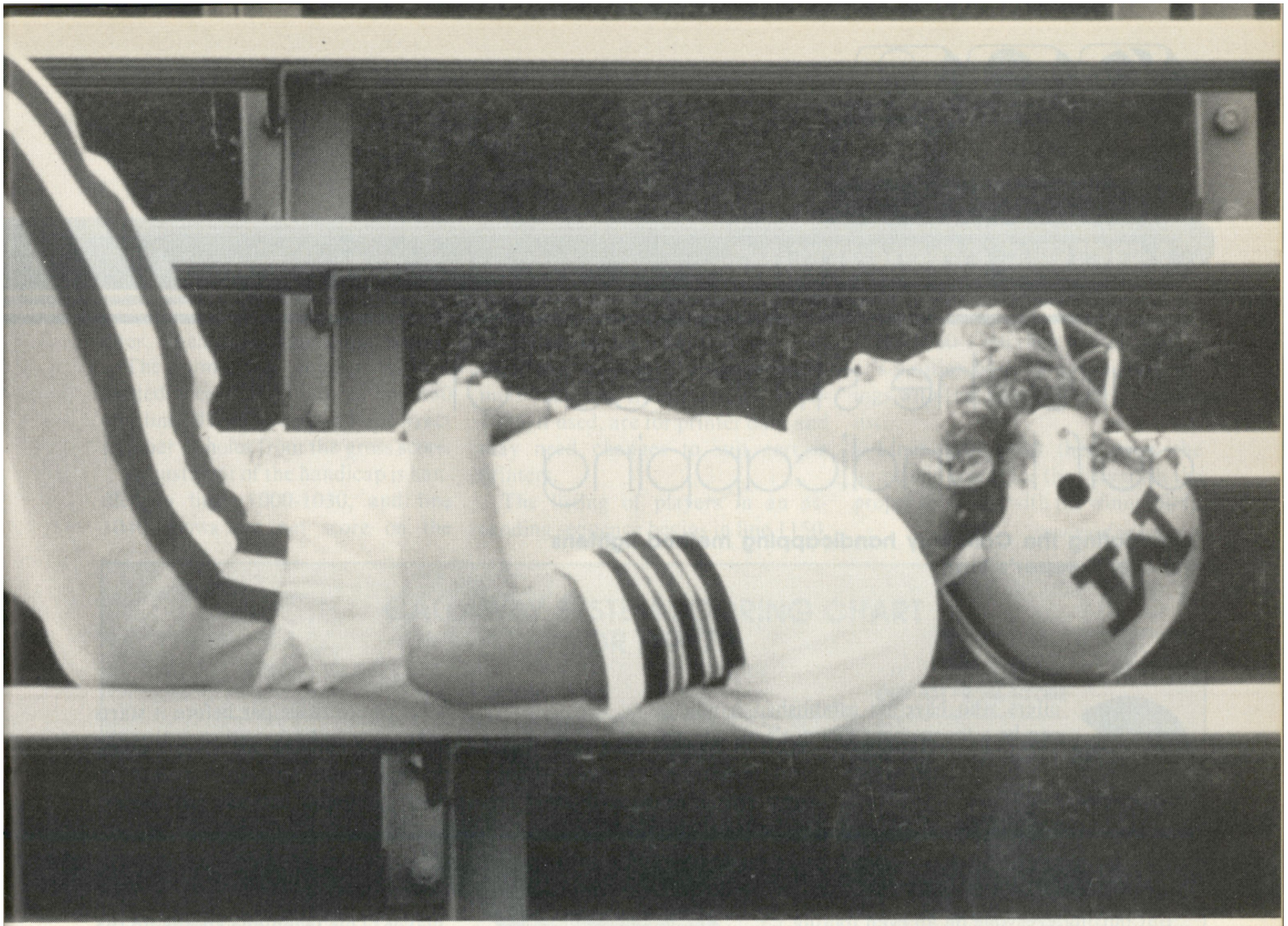
Once the database is stored in main memory (which may take one or two minutes, especially if it is a large database) the main menu is generated in statements 350-480.

The first two menu selections are used to enter data. The first option branches to statements 510-550 and allows the input of a new team name. The second option allows the input of the game result. You are asked to enter the team names first and then the points scored by each team. Statements 685-795 then update the data base.

The next two menu selections, numbers 3 and 4, simply turn the printer on or off by branching to statements 850-880 and setting or resetting the variable PR. Turning on the printer (setting PR to 1) allows the preparation of a hard copy of the team summaries, team rankings, predictions, and team records against selected opponents. The program assumes that the printer I/O is located in slot one. If the printer I/O is located in a different slot, statements 1182, 1365, 1802, 1900, 2260, and 2605 must all be changed.

The fifth menu selection saves the data base on disk by branching to statements 900-1060. This option must be used after every update of the data base.

The next four menu selections provide summary information using the data base. Selection six branches to statements 1110-1520, requests the name of the team to summarize, and gives three options. The first option displays the schedule of games for the selected team giving the score and the opponent for every game played in



the current season. The second option displays the win-loss record of the selected team. The information displayed includes the win-loss record for the present and past seasons stored in the database; the total points scored; the total points given up; and the combined win-loss record of the opponents. The third option simply returns the program to the main menu.

The win-loss record of all the teams in the data base for the current season is output by main menu selection seven, which branches to statements 1800-1930.

Main menu selection eight branches to statements 2000-2370 and generates a summary of the record of any team against any specified opponent across all the seasons stored in the data base. The information it supplies includes the number of times the teams played, the win-loss record of the target team, the points scored against the selected opponent, and the points given up to the opponent.

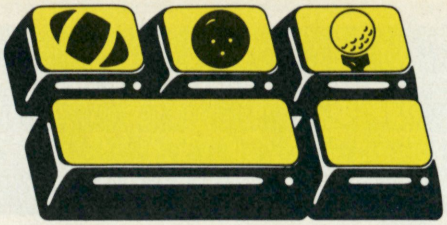
The data base can also be used to predict the outcome of future games. Menu selection nine branches to statements 2400-2730 and asks for the names of both teams. The value of the special prediction function, calculated for each team, consists of the weighted sum of four factors which are evaluated in statement 2570. This prediction function may be adjusted by changing the weights which are given in statement two. The four weighted factors which are summed in the prediction function are: the ratio of wins to total games played (P1); the ratio of points scored to total points scored in each game (P2); the ratio of wins to total games played for all the opponents (P3); and the value of the user defined statistic. The team with the highest value for this weighted sum is the predicted winner. The point spread is determined by the function given in statement 2690. It is based on five times the difference in the prediction functions for each team, plus .8 times the average point spread across all the games each team played. Both the weights and the form of the prediction function could be varied to try to improve the predictive power of the program.

Overall the program was fairly successful in predicting the results of the 1980-1981 pro football season. Each week it was always better than 50 percent correct, and occasionally it had 11 correct and only three wrong.

The final two menu selections allow you to select the season (selection 10) and exit the program (selection 11).

Using this program, the avid follower can now keep up-to-date information on his favorite teams, and maybe even know the outcome of some of the games before he reads the sports page.

continued on page 169



LEISURE COMPUTING

Take the strain out of golf handicapping

Automating the Callaway handicapping method lightens the scorekeeper's load

Golfers who have no established handicap can be a tournament director's nightmare. That's especially true if the tournament director happens to be the one who was selected to run the impromptu tournament that follows the company (or department) sales meeting.

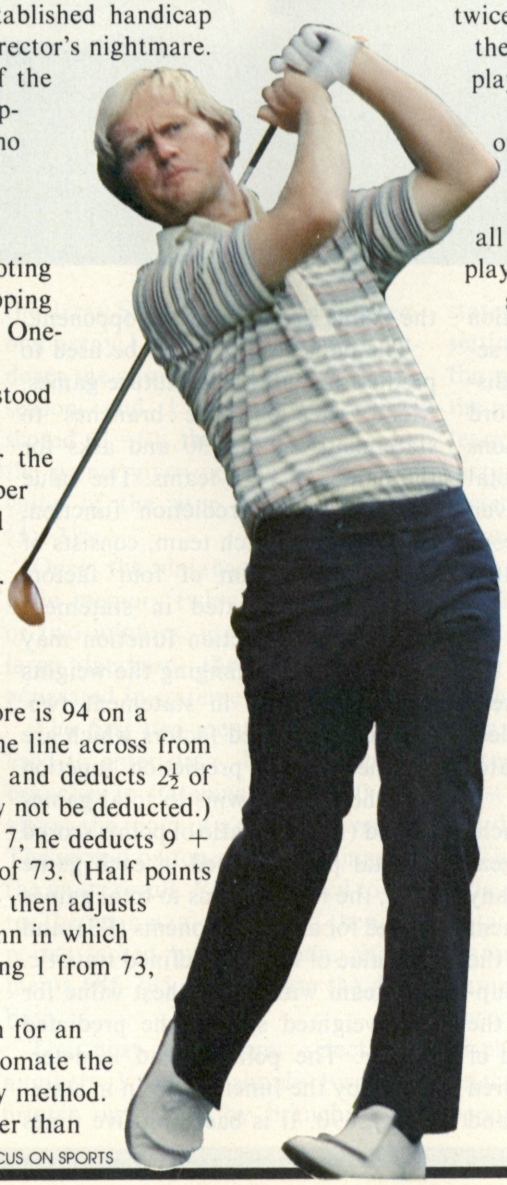
But putting everyone on an even footing is simple with an automated handicapping program that uses the Callaway One-Round-Handicapping system.

The Callaway system is best understood by referring to the chart.

The scoring chart is made up for the course based on normal par. The number of "worst" holes that may be deducted is shown on the right of a player's gross score. After deducting the proper "worst" holes, the net score is then adjusted according to a list at the bottom of the chart.

For example, if a player's gross score is 94 on a course with a par of 72, he follows the line across from 94 to the 'deduct from score' column and deducts 2½ of his worst holes. (Holes 17 and 18 may not be deducted.) If his worst hole scores were 9, 8 and 7, he deducts 9 + 8 + 7/2, or 21, from 94, for a score of 73. (Half points are counted as one point.) The player then adjusts his score by following down the column in which his gross score appears, and subtracting 1 from 73, for a net score of 72.

The handicapping program, written for an Apple II, does nothing more than automate the table lookups implicit in the Callaway method. It adjusts any hole score that is greater than twice par to twice par before it starts the table lookups, and then lists the players in ascending order by score.



FOCUS ON SPORTS

The program uses a technique of finding the rank of each player as it sorts the list, rather than doing a complete string swap of all of the data associated with each player. This technique speeds up the sorting and avoids the possibility of garbage collection that can occur with the Apple computer.

The simple bubble sort in lines 1160-1280 can be changed to a faster routine if the number of players exceeds 50. Dimension statements limit the number of players to 100 in lines 20-40.

Program Notes

Lines 80-280 are for tournament- and course-data input. Data on each player are input in lines 290-400.

Lines 410-600 check for any holes input over twice par, adjusts them to twice par, advises the operator and requests verification of the data by the operator.

Hole scores are arranged into a list in lines 690-780, highest score first, to use

later when deducting worst holes.

The number of holes to be deducted is calculated in lines 860-880 and lines 910-980 deduct the correct number of holes from the gross score.

Adjustment of the handicap is handled in lines 1000-1030, and line 1040 shows the net score on the screen to the operator.

Line 1050 loops for the input of more players, if any. Lines 1060-1085, if used, are for printer data and may need changes to suit certain printers.

The listing of players in an ascending sequence begins in line 1150. Lines 1160-1280 then sort each player's position by rank in the final ratings with the winner at the top of the list.

Lines 1330-1410 then print the name and scores for the players in the proper sequence with the winner first.

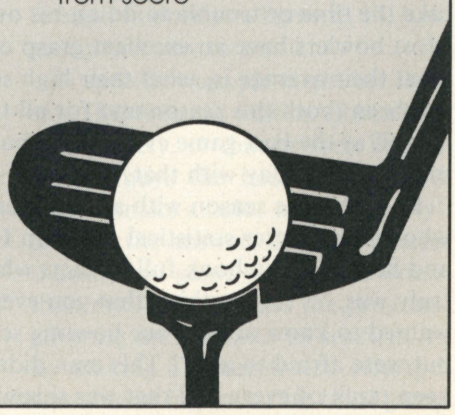
continued on page 171

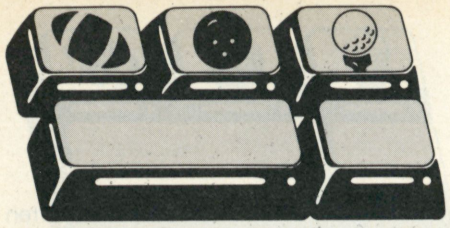
CALLAWAY SYSTEM SCORING CHART FOR PAR 72

SCORE					DEDUCT FROM SCORE
—	—	70	71	72	Scratch
73	74	75	—	—	½ worst hole
76	77	78	79	80	1 worst hole
81	82	83	84	85	1½ worst hole
86	87	88	89	90	2 worst hole
91	92	93	94	95	2½ worst hole
96	97	98	99	100	3 worst hole
101	102	103	104	105	3½ worst hole
106	107	108	109	110	4 worst hole
111	112	113	114	115	4½ worst hole
116	117	118	119	120	5 worst hole
121	122	123	124	125	5½ worst hole
126	127	128	129	130	6 worst hole
ADJUSTMENT					
+2	+1	0	−1	−2	Add to or deduct from score

NOTES:

1. No hole may be scored at more than twice its par.
2. Half strokes count as one stroke.
3. The 17th and 18th holes are never deducted.
4. In case of ties use the lower handicap followed by the lower hole score beginning at number 1.
5. The chart is for a par of 72. Adjustments must be made for other pars.





Let the computer count the pins

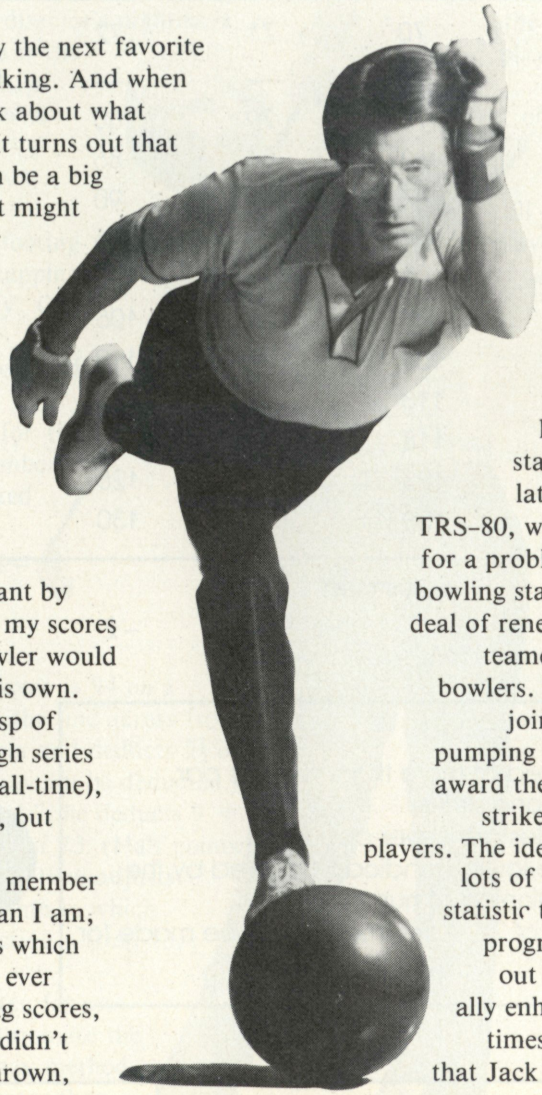
A personal computer with the proper software can take much of the pain out of keeping all the information bowlers just have to have

Besides bowling, probably the next favorite pastime of bowlers is talking. And when they talk, they often talk about what good bowlers they are. It turns out that a personal computer can be a big help in resolving disagreements that might arise about just how good a bowler each one is.

The disagreements are easily solved if the proper amount and type of statistics are on hand. And the personal computer is just the tool for keeping those stats.

I have been bowling for many years (more than I care to admit to), and being an accountant by training, have always kept track of my scores in more detail than the average bowler would take the time or trouble to do on his own. Most bowlers have an excellent grasp of what their average is, what their high series has been (both this season and for all-time), as well as the best game ever rolled, but many call it a day with that.

I bowled one season with a team member who was a greater statistical nut than I am, and he had a notebook full of facts which truly was, "...everything that you ever wanted to know about your bowling scores, but were afraid to ask." This man didn't keep track of every ball that was thrown,



but almost. He had every team member's average on every lane; how many strikes per lane; how many splits; how many times you lost the beer frame and all sorts of other valuable (trivial?) information. He moved on to other adventures, and I remained with the team until it finally disbanded, keeping the barest minimum of statistical data. A couple of years later, I acquired my Radio Shack TRS-80, which was my "solution looking for a problem," and suddenly the idea of bowling statistics for the team had a great deal of renewed appeal. By this time I had teamed up with a different group of bowlers. This particular team that I had joined had, an unusual method of pumping up team spirit, and that was to award the person who scored every fifth strike a dime from each of the other players. The idea, of course, was to encourage lots of strikes. Thus was born another statistic to keep track of. As with many programs I develop, this one started out with a central idea, and gradually enhancements were added. Sometimes this translates into "the house that Jack built." I'm now going into my

third season, and still tinkering with the program. I have some ideas about discarding parts of it that aren't used (but sounded good at the time), and adding some other 'features' which will make it more appealing.

In the beginning, before I had access to a printer, my "reports" to my teammates were perhaps every four to six weeks, and consisted of highlights that were copied from the screen. Later, having access to a DECWRITER in the office, I could give more complete run-downs.

I learned something from this—something which I knew from my work, but failed to apply until I learned the lesson all over again—that there is such a thing as information overload. Who wants to read through a 25-page printout every week? I could see my fellow team members losing interest, so I tried different report packages, varying the content from week to week and maybe even skipping some weeks. I would only inundate them with reams of facts every so often, like at the annual bowling banquet. This seemed to work out much better.

I offer here the current version of BOWLER, but first let's have a description of what all these 'statistics' are, and I'll assume that bowlers will accept these rather general bowling definitions:

PINFALL—The score for each game accumulated.

STRIKES—The number of times that all ten pins were knocked down on the first ball.

SPLITS—Times that pins are left on the lane with the headpin down and at least one pin missing between the remaining pins.

BEER FRAMES LOST—The number of times that a given player had to buy the beer (put $1 in the kitty). Limited to once per session per player. Based on getting the lowest pinfall on the first ball of the fifth frame.

DIMES COLLECTED—The number of dimes collected per game by virtue of getting the fifth consecutive strike.

DIMES PAID—The number of times per game that a player was on the paying end of 'Dimes Collected' by another player.

OPPORTUNITIES MISSED—Like 'runners left on base' in baseball—times that you had the chance to collect the dime payoff, but didn't.

Those are the individual statistics collected for each player for each game. In addition, note would be taken of the lanes (that's the polite term for alleys) used. They are numbered in pairs, like '17 & 18' or '29 & 30'. Also, we would keep track of our current opposing team, what their handicap was, their score for each game, and our own handicap. By recording individual team member's scores, it isn't necessary to record team scores as well, although it might be useful as a check that everything had been written down and added up correctly. These statistics are written in a little notebook and then transcribed later to an 'input sheet.'

From the input sheet, the data are entered into a program which creates the file that program BOWLER uses. The program creating the file is called BOWLDATA/A79, and the file which it creates is called BOWL7980.

I realize that program BOWLER could very well deal with the data if they were embedded in the program itself, but at that time I had a smaller memory at my disposal, and broke up the activity into three parts—a program to create a data file (BOWLDATA/A79), the data file (BOWL7980), and a program to read and operate on the data file (BOWLER).

Let's look at what the end result program is all about, and then cover the mechanics of getting to that stage.

My goal was to have a program that would allow almost total flexibility in selecting the information one might want. (The "everything you've always wanted to know . . ." idea.) I most definitely didn't want a "fixed report" which would always give the same combination of items in a given format. I wanted the ability to make off-the-wall "inquiries" of my "data base," and glean whatever information might be of some "value" at the time.

For example, suppose that we are going to be bowling on lanes 23 & 24 against "The Terrible Five." Some things you might want to know are, how has your team done against them in the past, how have you individually and collectively done on lanes 23 & 24, and how have you individually been doing for, say, just the last five weeks. Don't ask me what you're going to do with the information once you know it. I'll just give you a way to get it.

A specific example might be: Don says that it seems that he's been in a slump lately, or that he feels like he always buys the beer frames. It's easy to make a tailor-made 'inquiry' and get the answer. Or, I suspected that my last game was always worse than my first two, and the program gave me the statistics to confirm it. By making a concentrated effort, I was able to improve that third game

BUILDING THE BOWLING DATA BASE

Allowing for that rarity–a perfect game (12 strikes), or even a darned good game (10 strikes)–I can't handle a double-digit number for strikes. The same idea holds for splits. (I'd give up bowling if I got 10 splits in one game.) Beer frames lost can only be a 0 or a 1, so that's no problem. However, dimes collected, dimes paid, or dime opportunities missed can all be greater than 9, so what to do when it hits 10 or more? Since the data is represented as a string, I suppose that I could allow letters to substitute for values of 10 and above, and translate those values back to their equivalent numerical counterparts later. I didn't do this, however, and that is one of the future modifications which I might make if it gets to be a recurring problem. So far it hasn't, except for someone winning over 9 dimes in one game, and I take care of that by making adjustments between games (borrowing from Peter to give to Paul, as it were). Thus, if someone wins 12 dimes in the second game, but only 4 in the third, I might move a few numbers around and make it 8 and 8, or more likely, 9 and 7. (Not being divisible by 4, the 9 and 7 is a tip-off that an adjustment has been made, so an adjustment being present is flagged, if one wants to make it.)

Using long strings as data, as I have, one has to be careful, for it's easy to slip in an extra character or to leave one out. Therefore, I have built in an "edit" function to test the length of the string. If it is not 27, an error message identifying the offending data will be given and the program will stop.

When setting up a new season's version of BOWLDATA/A79, I will not erase all the data statements and start over. Instead, I will duplicate BOWLDATA/A79 by saving it as BOWLDATA/A80, and then just substitute the new values by overwriting the old ones. This gives me a format of sorts to follow, and lets me know ahead of time if I haven't entered the correct number of characters, for I am supposed to be writing on top of 27 characters with 27 new ones. If the quotation marks ending the string don't come out where they're supposed to, I know that something is wrong. Of course I have to move the end of data flag (0,0) (the second '0' is redundant) to the right position.

This method allows one unexpected by-product. I discovered once, when I left the flagging "0,0" out, that the computer (obviously) doesn't recognize the difference between 1978 and 1979 data, so it just kept on chugging. The result was a mixture of 1979 actuals (weeks 1 to 10, let's say), plus 1978 actuals (weeks 11 and after). This combined result showed me what would happen to our averages if history repeated itself for the last part of the season.

Program BOWLDATA/A79 is set up to create the data file to be read by the main program, BOWLER. The purpose of this program is to write data into a file which is accessed by BOWLER. Therefore, as you might expect, the bulk of the program consists of DATA statements, with a few READ and WRITE statements. The composition and interpretation of the DATA statements are given in the order in which they are read by this program.

GS$(1) is a 225-character string with the names of the 15 teams, each taking 15 positions. The team names are accessed by a moving pointer, according to the number of the opposing team. For example, if the letter O represents the number of the opposing team, the name of the team can be extracted by the expression MID$(GS$(1),(Ox15-14),15). In this way, team #10 would be evaluated as 10x15 (= 150), minus 14 (= 136, the starting position) ,15 (the length of the substring containing the name of the team).

A 24-character string, GW$(X) (X = 1 to 33), contains information about each week or bowling session. The data is accessed by giving the initial value of a pointer and the number of characters represented by that particular data element. You're correct if you recognize this as the MID$ function. (ch means characters.)
WEEK–Denoted by the value of "X" in GW$(X) (33 weeks is the total season).
DATE–Position 1, 5 ch (example–SEP07).
LANES–Position 6, 2 ch (left or odd lane only).
OPPONENT–Pos 8, 2 ch (01 to 15).
OPPONENT'S HANDICAP (per game)–Pos 10, 3 ch (if handicap is less than 100, use a leading zero).
OUR HANDICAP–Pos 13, 3 ch.
OPPONENT'S SCORES (with handicap)–for games 1, 2, 3 (Pos 16, 3 ch, Pos 19, 3 ch, Pos 22, 3 ch).

If score is over 1000, subtract 1000 in the data. The computer will recognize this condition and add it back. For example, 1009 would be entered as 009.

GN$(X) (X = 8 to 0) are the team member names where 0 = 'TOTAL.'

The player number and week number are P,W. The READ cycle will continue until a value of P = 0 is encountered, at which time the cycle is terminated, the file closed, and the program effectively ends.

The 27-character string, G$, provides information for the player and week numbers just read. Starting with the first game, the first three characters represent the score (use a leading zero if the poor devil bowled less than 100), the next six characters represent, respectively (one for each), the strikes, splits, beer frames lost, dimes collected, dimes paid, and dimes missed. Then repeat the 9 character cycle for the second and third games.

There is a potential problem in the above, and my solution represents a compromise. With 33 weeks of data, five players for each week, and 27 characters of information for each, that represents 4455 bytes of storage. Each additional character of information represents 33x5 (165) additional bytes required. When internal memory might be at a premium this could be important.

average (not by letting up in my first two games, although I've been accused of that).

When you run the program, the first prompt is for the name of a file to be read. Having the data files separate from the main program turns out to be an advantage—you have the flexibility of looking at this year's data, last year's, or whatever. If you had the data embedded in the main program, you would be somewhat cramped in which data file you could easily access.

Next, there will be a series of four prompts, which I'll refer to as 'section one,' and they begin with "FIRST WEEK, LAST WEEK." This section allows you to set up boundaries that you are interested in. If you are in the 15th week of the season, for example, and you don't want to look at all fifteen of the weeks, you don't have to. You could, by this method, initially ask for the first five weeks (1,5), then on a separate run the second five weeks (6,10), and finally the last third of the season (11,15). This gives you the opportunity to examine trends, or to isolate and review parts of the total data base.

The next prompt will be PLAYER NO. A report will be printed for any one player by entering his number (up to eight), or a more comprehensive team report will be given by entering a number like 99, which will signify the whole team.

You will then be prompted to enter the ALLEY NO. (You can call them lanes if you prefer.) Here you enter just the first half (odd number) of a pair of alleys, or enter 99 if you are interested in all the alleys.

The final prompt in this first section will be for OPPONENT. There are 15 other teams in this league, so enter one of their numbers, or 99 for all opponents. One purpose for limiting this selection to one team might be to see how your team has been doing against a particular opponent. Maybe you want to psych them out by casually laying a computer printout on the bench showing how you fared against them the last time out.

The computer will now busy itself for a bit (should I say 'for a while'?) reading the data file, 'remembering' those variables which match the criteria you have selected, and discarding those that don't match.

Having finished this chore, you now reach 'section two' and will be presented with a new menu to choose from:

HI/LO VALUES, EACH GAME AND AVG (1)
OVERVIEW FOR ONE PLAYER (2)
COMPREHENSIVE—ALL PLAYERS AND TEAM (3)
TEAM RECORD VS SELECTED OPPONENTS (4)

If number (1) is chosen, you will be asked to select which ONE player you want to have represented. Following that choice, you will be prompted to select from a list of attributes (PINFALL, STRIKES, SPLITS, etc.).

When you have made these two choices, you will be provided with a value listing of the selected attribute for each of the games played, starting with the first week that you selected, and ending with the last one (which you also chose). The format will label the attribute selected, provide the name of the player, show the highest value of that attribute, when it occurred, on what lanes and against which opponents. It will do the same for the lowest value of that attribute. Then it will display, in consecutive order, the values of that attribute for every session of bowling. It will do this for your first game, then your second, your third, and so on, and finally the total for the series will be given.

If choice (2) is selected, you must again choose one player, but this time the aggregate results for all attributes for that player, and not a listing of individual games, will be displayed. The display will first consist of totals, then go on (after you have answered the prompt to continue) with averages.

A selection of number (3) will be followed by a series of prompts (one for each attribute) which you must answer one by one with Y or N. 'Y' means that you want to see statistics for that attribute, and 'N' signifies that you want it skipped.

Finally, choice number (4) will immediately send you to a subroutine which displays your team record against that of the team selected.

Some cautions

Think in advance of what your inquiry is going to be. 'Section one' of prompts acts as a 'filter' and includes or excludes data accordingly. You can't ask for 'player 7' in the first section and then choose 'player 4' in the second section. (You can, but you won't get anything.) And even worse, if you chose 'all teams' (99) in the first section, you can't opt for choice number 4 in the second section. I say 'worse' because the program will crash with that combination— it doesn't recognize a result for 'team 99.' (This is something I should fix, whenever I get around to it . . . it's stupid to let a program abort when you can anticipate it and get around it by directing the result of a wrong answer to a real zinger from the computer, or to a patient restating of the question, perhaps with a mild admonishment.)

Some combinations don't make sense. For example, if you choose '99' for PLAYER NO. in section one in conjunction with a choice of numbers 1,3, or 4 in section two, you are 'accumulating' data in part one that you aren't going to use in part two. As mentioned above, '99' with '4' will bring the program to its knees. Also, anything other than '99' in

continued on page 149

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CIRCLE 26

SPECIAL REPORT

Putting printers in perspective—a Personal Computing guide through the printer jungle

Why buy a printer? What kind to buy? What will it do? From whom should it be bought? How much should be spent?

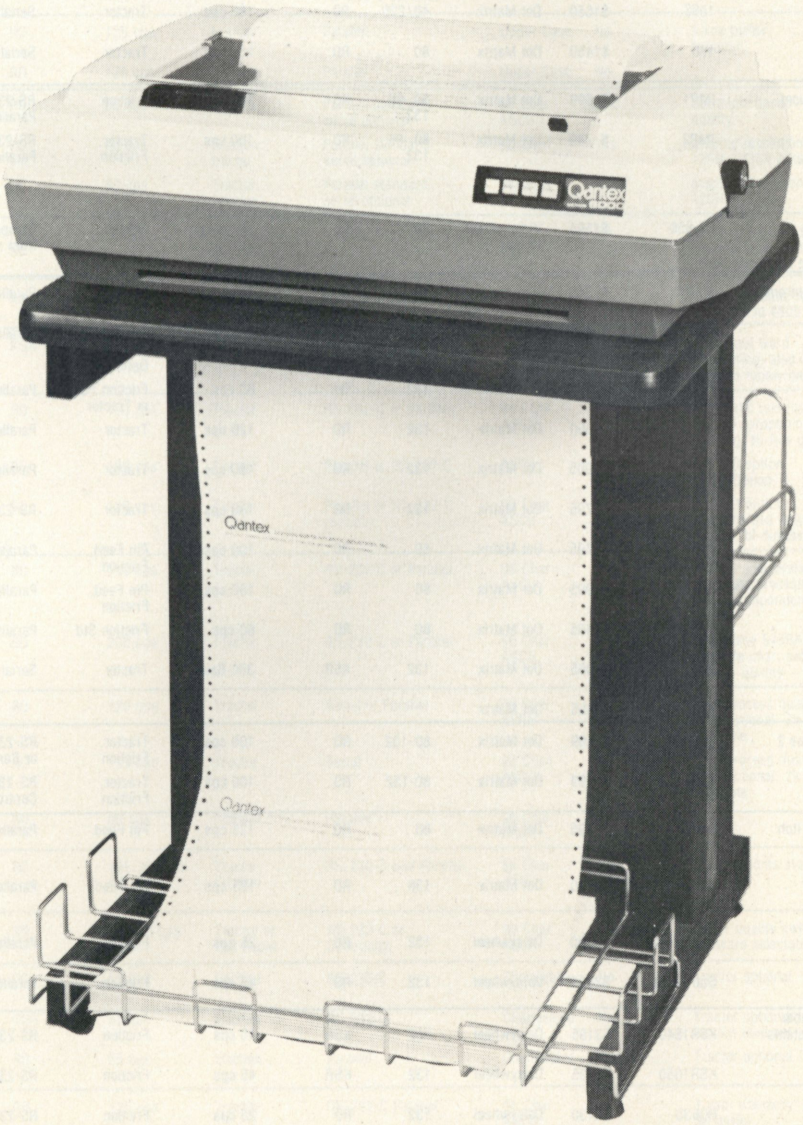
Editor's note: Nearly everyone who owns a personal computer will one day entertain the notion of buying a printer. After all, why settle for less than you could be getting if productivity improvement is your goal?

But buying a printer is no easy chore. There are myriads of products from which to choose. To say nothing of interface problems. With this in mind, we present the following history, explanation and buyer's guide to printers in answer to the many reader requests we've had.

Personal-computer companies have long been saying that with the introduction of their products, low-cost computing power has finally come to the consumer. That's true, of course. But the consumer expects that he will get proper value for his dollar. And of course he wants to spend just the amount of money he needs to spend to get the job done.

In this regard, the home computerist is no different than the small businessman who wants the same thing—maximum value for his minimal dollar.

But when it comes to buying a printer for that personal computer, there's one thing both the home computer user and the businessman will quickly discover: Printers will consume lots of dollars. And it's very easy to spend more dollars than



Quantex's 6010 dot-matrix impact printer operates at 150 cps with a 9 x 9 matrix and is microprocessor controlled.

CHART OF PRINTER FEATURES

COMPANY	MODEL	PRICE	CHAR FORM	COLUMNS	KSR/RO	PRINT SPEED	PAPER TRANSPORT	INTERFACE	CHAR SET	GRAPHICS	OPTIONS OR FEATURES
Anadex	DP8000	$1125	Dot Matrix	80	RO	112 cps	Tractor STD	RS-232-C Parallel 20MA	96 Char ASCII	No	Bidirectional, easily replaced head, 2k buffer
	DP8000 AP	$1125	Dot Matrix	96	RO	134 cps	Tractor	Parallel for Apple II	96 Char ASCII	No	Same
	DP9500	$1650	Dot Matrix	80/132	RO	150 cps	Tractor	RS-232-C, 20MA or Centronics	96 Char ASCII	Yes 72x60 Dots	2k buffer compressed print up to 176 columns at 200 cps
	DP9501	$1650	Dot Matrix	80/132	RO	120 cps	Tractor	RS-232-C, 20MA or Centronics 220 columns at 200 cps	96 Char ASCII		
	DP9000	$1550	Dot Matrix	80	RO	150 cps	Tractor	RS-232-C, 20MA or Centronics	96 Char ASCII	Yes 72x60 Dots	Compressed print 106 columns at 200 cps
	DP9001	$1550	Dot Matrix	80	RO	120 cps	Tractor	RS-232-C, 20MA or Centronics 220 columns at 200 cps	96 Char ASCII		Compressed print 132 columns at 200 cps
Apple	Silent type	$ 635	Thermal Non-impact	40	RO		Friction	Apple			Needs special paper
Anacom	150	$1495	Dot Matrix	136	RO	150 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	No	Lower case descenders
	150Z	$1650	Dot Matrix	40/220	RO	180 cps	Tractor	Serial & Parallel	4 sets standard	Yes	Easy operator use for small business
	160	$1450	Dot Matrix	80	RO	150 cps	Tractor	Serial or Parallel	96 ASCII	No	Demand document printer
Axiom	IMP1	$ 699	Dot Matrix	80, 96, 132	RO	100 cps	Friction	RS-232-C, 20MA or Parallel	96 Char ASCII	Yes 70x70 Dots	
	IMP2	$ 749	Dot Matrix	80, 96, 132	RO	100 cps	Tractor, Friction	RS-232-C, 20MA or Parallel	96 Char ASCII	Yes	Apple, TRS-80 Commodore PET, IEEE-488 interfaces available bi-directional quick cancel
	EX-850	$1595	Video screen printer	96	RO	13 sec/pg	Friction	Composite video, direct from monitor/computer	Unlimited	Unlimited	Reproduction, CRT screen image without special interface
Centronics	MICRO P1	$ 349	Non-Impact Electro Chem	40	RO	150 lpm	Friction	Parallel	90 Char ASCII	No	Uses special paper
	700	$1460	Dot Matrix	132	RO	69 cps	Friction-Std. Tractor-Optional	Parallel	64 Char ASCII	No	96 Char ASCII optional
	701	$1700	Dot Matrix	132	RO	60 cps	Friction Feed or Tractor	Parallel	64 Char ASCII	No	96 Char ASCII optional; bi-directional-std.
	702	$2660	Dot Matrix	132	RO	120 cps	Tractor	Parallel	96 Char ASCII	No	Bi-directional 9x7 matrix
	703	$2965	Dot Matrix	132	RO	180 cps	Tractor	Parallel	96 Char ASCII	No	
	704	$1795	Dot Matrix	132	RO	180 cps	Tractor	RS-232-C	96 Char ASCII	No	
	730	$ 795	Dot Matrix	80	RO	100 cps	Pin Feed, Friction	Parallel	96 Char ASCII	No	
	737	$ 995	Dot Matrix	80	RO	100 cps	Pin Feed, Friction	Parallel	96 Char ASCII	No	Letter quality serial int. opt.
	779	$1485	Dot Matrix	80	RO	60 cps	Friction Std.	Parallel	64 Char ASCII	No	Tractor optional
	761	$1865	Dot Matrix	132	KSR	300 Baud	Tractor	Serial	64 Char Std.	No	96 Char ASCII Optional
	753	$2965	Dot Matrix								
Base 2	800MST	$ 699	Dot Matrix	80-132	RO	100 cps	Tractor, Friction	RS-232-C, 20MA or Centronics Parallel	96 Char ASCII	Yes	11,920 Buffer
	850	$ 799	Dot Matrix	80-132	RO	100 cps	Tractor, Friction	RS-232-C, 20MA or Centronics Parallel	96 Char ASCII	Yes	2k FIFO buffer, short seeking
C. Itoh	Comet I	$ 995	Dot Matrix	80	RO	125 cps	Pin Feed	Parallel or RS-232-C	96 Char ASCII	No	Bi-directional, universal power supply, 2k buffer
	Comet II	$1290	Dot Matrix	136	RO	125 cps	Pin Feed	Parallel or RS-232-C	96 Char ASCII	No	Bi-directional, universal power supply, 2k buffer
	Star Writer I	$2380	Daisywheel	132	RO	25 cps	Friction	Parallel or RS-232-C	Changeable wheel	No	Tractor optional, uses Diablo print wheels
	Star Writer II	$2898	Daisywheel	132	RO	45 cps	Friction	Parallel or RS-232-C	Changeable wheel	No	Tractor optional, uses Diablo print wheels
Diablo Systems	KSR1640	$3195	Daisywheel	132	KSR	45 cps	Friction	RS-232-C	Changeable wheel	No	Uses plastic wheels, tractor optional
	KSR1650	$3295	Daisywheel	132	KSR	45 cps	Friction	RS-232-C	Changeable wheel	No	Uses metalized wheel, tractor optional
	R0630	$2430	Daisywheel	132	RO	25 cps	Friction	RS-232-C	Changeable wheel	No	Uses either metal or plastic wheel, tractor optional

CHART OF PRINTER FEATURES (cont.)

COMPANY	MODEL	PRICE	CHAR FORM	COLUMNS	KSR/RO	PRINT SPEED	PAPER TRANSPORT	INTERFACE	CHAR SET	GRAPHICS	OPTIONS OR FEATURES
Data Royal	1PS5000	$1110	Dot Matrix	80	RO	125 cps	Tractor	Serial and Parallel	96 Char ASCII	No	Quiet cover
	1PS7000	$2295-2860	Dot Matrix	132	RO	150 cps	Tractor	Serial and Parallel	96 Char ASCII	No	Expandable buffer
Datasouth	DS180	$1595	Dot Matrix	132	RO	200 lpm	Tractor Feed	RS-232-C or 20MA or 8-bit Parallel	96 Char ASCII	No	Non-volatile memory for settings
DIP Inc.	MOD81	$ 499	Dot Matrix	40-80	RO	100 cps	Friction	RS-232-C or Parallel	96 Char ASCII	No	
	MOD84	$ 795	Dot Matrix	40-80	RO	100 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	No	3k buffer available
	MOD85	$ 895	Dot Matrix	80-132	RO	100 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	Yes	x-on x-off for RS-232-C
Digital Equipment (DEC)	LA34	$1450	Dot Matrix	132	KSR or RO	30 cps	Friction, Tractor opt.	RS-232-C			
	LA36	$2695	Dot Matrix	132	KSR or RO	30 cps	Tractor	Parallel or 20MA or RS-232-C opt.	96 Char		
	LA120	$2750 $2700	Dot Matrix	132	KSR or RO	120 cps	Tractor	20MA or Parallel RS-232-C optional			
Eaton LRC	7000t40	$ 425	Dot Matrix	40	RO	125 cps	Friction	Parallel	Upper Case	No	3 line buffer, optional
	7000t64	$ 443	Dot Matrix	64	RO	125 cps	Friction	Parallel	Upper Case	No	
Epson American	MX80	$ 645	Dot Matrix	40-132	RO	80 cps	Tractor	Parallel standard, serial optional	96 Char ASCII	Yes	Correspondence quality
	MX80F/T	$ 745	Dot Matrix	40-132	RO	80 cps	Friction, tractor	Parallel standard, serial optional	96ASCII	Yes	graphic resolution up to 120Hx1216V dots
	MX100	$ 995	Dot Matrix	90-233	RO	80 cps	Tractor, Friction	Parallel standard, serial optional	96ASCII	Yes	graphic resolution up to 120Hx72V dots
General Electric	Terminet 2030	$1495 $1420-	Dot Matrix	80-132	KSR RO	30 cps	Friction, Pin, Tractor	RS-232-C	96 Char ASCII	No	Numeric cluster, tractors, integral modern, text editor, extended buffer
Heath	H14	$ 595	Dot Matrix	80-96-132	RO	30 cps	Tractor	RS-232-C 20MA	96 Char ASCII	No	Selectable baud rates from 110 to 4800
Howard Industries	Ty-printer 221	$2850	Daisywheel	132	KSR	30 cps	Friction	RS-232-C	Changeable	No	Intelligent word processing; also can be used as typewriter
Integral Data	Paper Tiger 460	$1394	Dot Matrix	80/132	RO	150 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	Yes 84x84 dots	Automatic text justification, proportional spacing, Hi-Res graphics
	Paper Tiger 445	$ 894	Dot Matrix	80/132	RO	198 cps	Tractor	Parallel or RS-232-C	ASCII	Option	Dot plot option, Serial Option
	Paper Tiger 560	$1695	Dot Matrix	132-220	RO	198 cps	Tractor	Parallel or RS-232-C (option)	96 Char ASCII	Yes: High Resolution	Dot plot high res. graphics Std.-letter quality, bi-directional
Infoscribe	500	$1595	Dot Matrix	136	RO	150 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	No	2 char. sets available, both data processing and correspondence quality
	1000	$1825	Dot Matrix	136	RO	200 cps	Tractor	RS-232-C or Parallel	96 Char ASCII	Yes	10w noise 54dBA, down loadable char. set dp & corres. quality
Lear Siegler	310 Ballistic	$2045	Dot Matrix	136	RO	180 cps	Tractor	Serial or Parallel	96 Char ASCII	No	Data process quality, bi-directional, 2k buffer available
	Microtek MT-80S	$ 895	Dot Matrix	40-132	RO	125 cps	Tractor	Serial	96 Char ASCII	No	Data process quality, bi-directional, 2k buffer available
	Bytewriter-1	$ 299	Dot Matrix	40-80	RO	80 cps	Friction	Parallel	96 Char ASCII	No	
Malibu Electronics	200	$2995	Dot Matrix	132	RO	165-200 cps 42-70 cps	Tractor, Friction	RS-232-C and Parallel	96 Char ASCII	Yes 120Hx144V Dots	Multiple fonts available
MPI	88G	$ 749	Dot Matrix	80/132	RO	60-180 cps	Tractor or Roll Paper	RS-232-C or Centronics	96 Char ASCII	Option	Letter quality switch or software selectable
NEC	5510	$3055-4255	Print element thimble	132	RO	55 cps	Friction	RS-232-C	Changeable	No	Tractor optional
	5520	$3415-3615	Print element thimble	132	KSR	55 cps	Friction	RS-232-C	Changeable	No	Tractor optional bottom feed opt
	5530	$3055-4255	Print element thimble	132	RO	55 cps	Friction	Parallel	Changeable	No	Tractor optional
Microtek	MT80	$ 795	Dot Matrix	40-132	RO	125 cps	Tractor	RS-232-C Parallel	96 Char ASCII	No	1 year warranty 3k buffer

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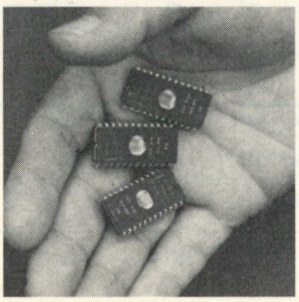
Up to now, you couldn't get some of these features at *any* price. With GRAFTRAX 80, you get 'em all. And more. Lots more.

Best of all, we haven't forgotten all those people who already own an MX-80 or MX-80 F/T. You own the printer that set the standards all the others are following. And you can install GRAFTRAX 80 PROMs yourself, for less than $100. And make the best even better.



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CIRCLE 27

CHART OF PRINTER FEATURES (cont.)

COMPANY	MODEL	PRICE	CHAR FORM	COLUMNS	KSR/RO	PRINT SPEED	PAPER TRANSPORT	INTERFACE	CHAR SET	GRAPHICS	OPTIONS OR FEATURES
Okidata	Micro line 80	$ 475	Dot Matrix	80/132	RO	80 cps	Friction and Pin Feed	Parallel	96 Char		Tractor Feed opt.
	Micro line 82	$ 595	Dot Matrix	80/132	RO	180 cps	Friction and Pin Feed	RS-232-C Parallel	96 Char ASCII		Tractor optional, bi-directional
	Micro line 83	$ 895	Dot Matrix	132	RO	120 cps	Tractor	RS-232-C Parallel	96 Char ASCII		Bi-directional-uses up to 15 in. paper
	SL300	$3995	Dot Matrix line printer	132	RO	300 lpm	Tractor	Parallel	96 Char ASCII	Plot	Software selectable fonts, oversize char, prints bar codes
Qume	Sprint 5/45	$3137	Daisywheel	132	RO	45 cps	Friction	RS-232-C and Parallel	Changeable	No	Tractor Cut sheet feeder
	Sprint 5/45	$3537	Daisywheel	132	KSR	45 cps	Friction	RS-232-C or Parallel	Changeable	No	Tractor Cut sheet feeder
	Sprint 5/55	$3364	Daisywheel	132	RO	55 cps	Friction	RS-232-C or Parallel	Changeable	No	
	Sprint 5/55	$3764	Daisywheel	132	KSR	55 cps	Friction	RS-232-C or Parallel	Changeable	No	
	Sprint Wide-Track	$4315	Daisywheel	240	RO and KSR	55 cps	Friction	RS-232-C or Parallel			
Radio Shack	Quick Printer II	$ 219	Non-Impact Electro-Thermal	16-32	RO	120 lpm	Friction	RS-232-C or Parallel Radio Shack TRS-80	Upper Case	No	Uses aluminum coated paper 2-3/8" wide
	Line Printer V	$1860	Dot Matrix	132	RO	120 cps 160	Tractor	TRS-80 Mod. I, II, III	96 Char ASCII	No	Print stand optional
	Line Printer VI	$1160	Dot Matrix	132	RO	100 cps	Tractor	TRS-80 Mod. I, II, III	96 Char ASCII	Special Graphic Char	Prints Nx9 bi-directional, self-test, stand opt.
	Line Printer IV	$ 999	Dot Matrix Letter Qual.	80-132	RO	50 cps	Friction or Pin	TRS-80 Mod. I, II, III	96 Char ASCII	No	Same as Centronics 737 for TRS-80
	Daisy Wheel II	$1860	Daisywheel	136	RO	43 cps	Friction	TRS-80 Mod. I, II, III	Changeable	No	Tractor optional, proportional spacing wheel
Sanders Media	Media 12/7	$4395	Dot Matrix infinite	13.2 in. print line	RO	1 pass, 120-260 cps; 4 pass, 10-50 cps	Friction	RS-232-C or Parallel (Centronics)	Multi-type faces	No	Infinite matrix, either fast Dot Matrix or letter quality
Texas Instruments	743	$1195	Electro thermal non-impact	80	KSR	30 cps	Friction	RS-232-C or 20MA TTY	96 Char ASCII	No	Apl. option, R.O. option, answerback memory
	765	$2995	Electrothermal non-impact	80	KSR	30 cps	Friction	RS-232-C or built-in acoustic coupler	96 Char ASCII	No	Bubble memory storage up to 80k, dual communication ports
	763	$2695	Electrothermal non-impact	80	KSR	30 cps	Friction	RS-232-C or 20MA	96 Char ASCII	No	Bubble memory, 20k up to 80k, internal modern
	810	$1895	Dot Matrix	132	RO	150 cps	Tractor	RS-232-C	64 Char ASCII	No	96 Char ASCII optional, expanded characters opt. compressed print optional
	820	$2165	Dot Matrix	132	KSR	150 cps	Tractor	RS-232-C Baud Rates 110-9600	96 ASCII Char	No	Terminal stand option, 20MA opt., APL opt.
Teletype	43	$1388-2982	Dot Matrix	80-132	KSR	30 cps	Pin Feed or Friction	RS-232-C	96 Char ASCII	No	Tractor optional, friction feed 80 col. optional, 220 volt optional
Trendcom	100	$ 375	Thermal non-impact	40	RO	40 cps	Friction	TRS-80, PET, Sorcerer	96 Char ASCII	No	220 volt optional
Xerox	1740	$3375	Daisywheel	132	KSR	45 cps	Friction	RS-232-C	Changeable		Same as Diablo except for Xerox service
	1750	$3555	Daisywheel	132	KSR	45 cps	Friction	RS-232-C	Changeable		Same
	1730	$2710	Daisywheel	132	RO	40 cps	Friction	RS-232-C	Changeable		Same
Xymec	HQ1000	$2650	Daisywheel	198	RO	25 cps	Friction	Parallel or RS-232-C, IEEE	Changeable	No	RO only, keyboard only for typewriter use

continued on page 75

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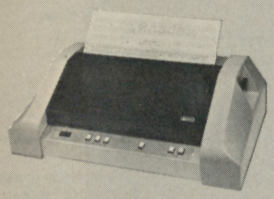

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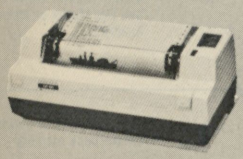

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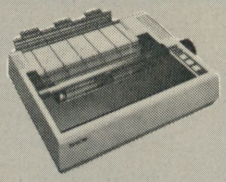

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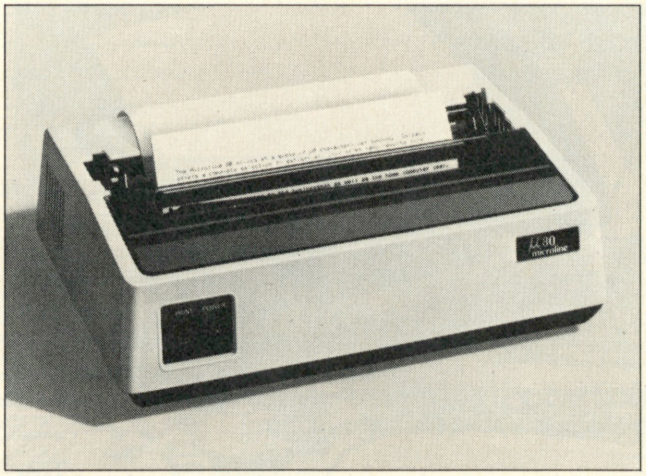
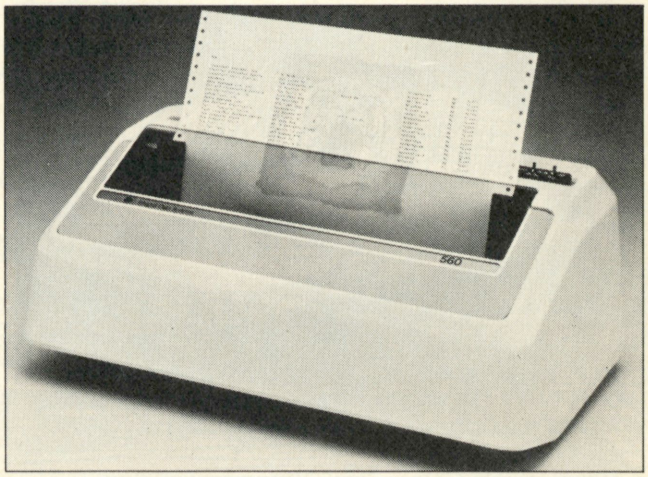


Okidata's Microline 80, 9 x 7 dot-matrix impact printer operates at 80 cps.



Integral Data Systems' 560, 24 x 9 dot-matrix printer is bidirectional, operates at up to 150 cps, and uses tractor feed.

necessary to get the desired function.

How to find the way out of the dilemma? How can the buyer insure getting the printer he needs, and no more? Is there a simple way to make a choice? No. The user must do his homework. But first, he needs some signposts in the personal-computer printer jungle.

In a universe populated by thousands of different printer models, all offering numerous and complex features, it pays to get down to basics. By understanding something about the actual printing methods, of which there are fewer than 10 major types, you can tell a lot about any printer, regardless of the "extras" it may incorporate.

Making matters a bit easier for personal-computer users is that few users will ever need line-printing (as opposed to serial-printing) capability. Since they use mechanisms that print an entire line at a time, even a slow line printer produces about 300 lines per minute. If you need output like that, you probably need more than a personal computer system.

Still, it pays to have a limited knowledge of line-printer technologies, if only to know what products to avoid.

The high end

Currently the most popular line mechanism is the band or belt. A rotating metal belt carries an embossed character set and a row of hammers forces appropriate characters against a ribbon and paper. This method produces relatively high-quality print and can provide output speeds from 150 lines-per-minute (lpm) to almost 4000 lpm.

Chain or train printers operate in a similar fashion but individual characters are linked as a rotating chain. The print quality does not equal that of the band models, and chain printers operate over a more narrow speed range.

Also coming into hard times are drum printers. Incorporating a cylindrical drum rotating on a horizontal axis, the printer "fires" hammers from behind the paper into the embossed drum. This technique sometimes causes unaligned characters. And the output speed range is even more limited than that of the chain type. Also, replacing an entire drum because one character is worn can be an expensive proposition.

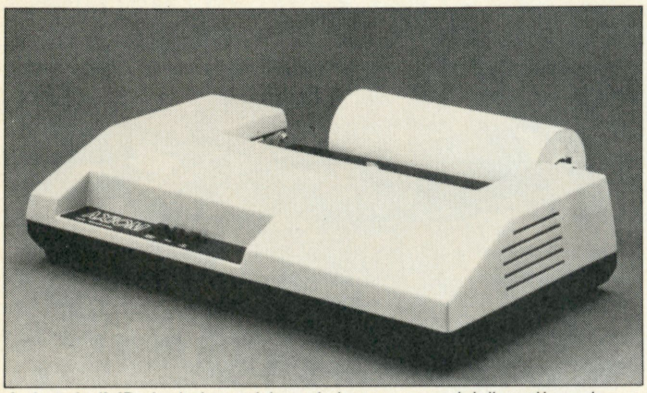
The last type of line printer that relies upon striking action by hammers is the impact dot-matrix. This method is discussed later under serial techniques, the only difference being that impact matrix-line printers use multiple instead of single printheads.

Three major line (or page) printing mechanisms that don't actually strike characters on the paper are nonimpact xerographic (electrophotographic) electrographic and ion-deposition methods. These printers are very complex, very fast and very expensive. The xerographic printer uses lasers, toner and a photoconductor in its operation; the electrographic uses electric styli, dielectric paper and toner; and the ion-deposition printer uses charged particles and toner. When you need about 40 pages-per-minute or 500,000 pages-per-month, be sure to consider these printers.

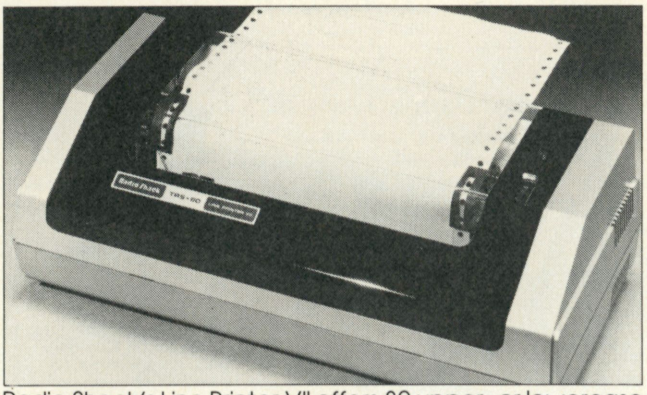
Slowing things down

Getting back to reality, printers do exist for users happy with 15- to 300-character-per-second speeds and affordable prices. In fact, manufacturers of serial printers, which produce one character at a time, are tumbling head-over-heels in an effort to join the growing group that offers printers priced under $1000. And, if you're willing to pay $2000 or $3000, you can get a good printer with extra features such as forms handling, communications ports and graphics capability.

Like line printers, serial printers use both impact and nonimpact printing methods. Unlike line printers, the serial nonimpact models are not priced out of sight. On the impact side we have two general types: fully-formed character printers and impact matrix printers. Representing the nonimpacts are thermal, elec-



Axiom's IMP-1 dot-matrix printer uses a bidirectional printhead and offers full graphic capabilities.



Radio Shack's Line Printer VII offers 80 upper- or lowercase characters with a 5 x 7 dot-matrix.

trosensitive and ink-jet methods.

Character printers

In many ways, fully formed character printers seem to be the mechanical dinosaurs of an increasingly electronic printer world. Printers that strike some form of embossed print element against ribbon and paper to form solid characters are slow (10 to 55 cps), noisy, inflexible for font variations, impractical for graphics and expensive.

With these limitations dragging them down, some weaker species of fully formed character printers are being driven toward extinction. But as a class these printers have a relatively secure and sometimes bright future for they have one shining trait—unmatched print quality.

One of the earliest printer types in production was the cylinder printer. Offered by Teletype, these printers survived for years as the reigning telecommunications printers, despite their slow, 10-cps speed and problems with print quality and printer reliability. In operation, a cylinder printhead containing a complete character set embossed in several rings is driven by a hammer into ribbon and paper. Teletype also produced a type-box mechanism in which individual character slugs reside in a box that moves into position for the appropriate slug to be driven by a hammer.

IBM provided the next evolutionary step in complete-character printers with its spherical "golfball" printhead. The embossed sphere rotates into proper position and strikes the paper itself, without a driving hammer. Attaining speeds of 15 cps, the golfball, or Selectric, mechanism produced a print quality that remains the standard.

Introduced by Diablo Systems in 1972, daisywheel printers quickly became the dominant fully formed character printer type. Qume is another major vendor of this type of printer. Offered in metal and plastic versions, daisywheel elements have spokes or arms that radiate from a hub. Each arm carries one embossed character, which is rotated into position when needed and driven into the paper by a hammer.

Metal wheels produce higher quality print than plastic wheels, but the added weight of the metal limits the high-quality elements to the lower speeds of the daisywheels' 30-to-55-cps range. The metal wheels, which have exhibited lives of over 30 million character impressions, are best suited for word-processing applications.

In the small-business-system market, there is a vying for a low-cost printer regardless of what the technology, whether it be matrix, ink-jet, daisywheel or another. Very inexpensive impact matrix printers have eroded part of this market on the extreme low-end, but the need for high-quality output coupled with almost a throw-away type element leads users to a fully formed character printer.

As opposed to technological breakthroughs in printhead design, future improvements for daisywheel printers will be in the price/performance area, the type of supplies that one uses, the maintainability aspect and the reliability aspect. These improvements are possible without a degradation in print quality.

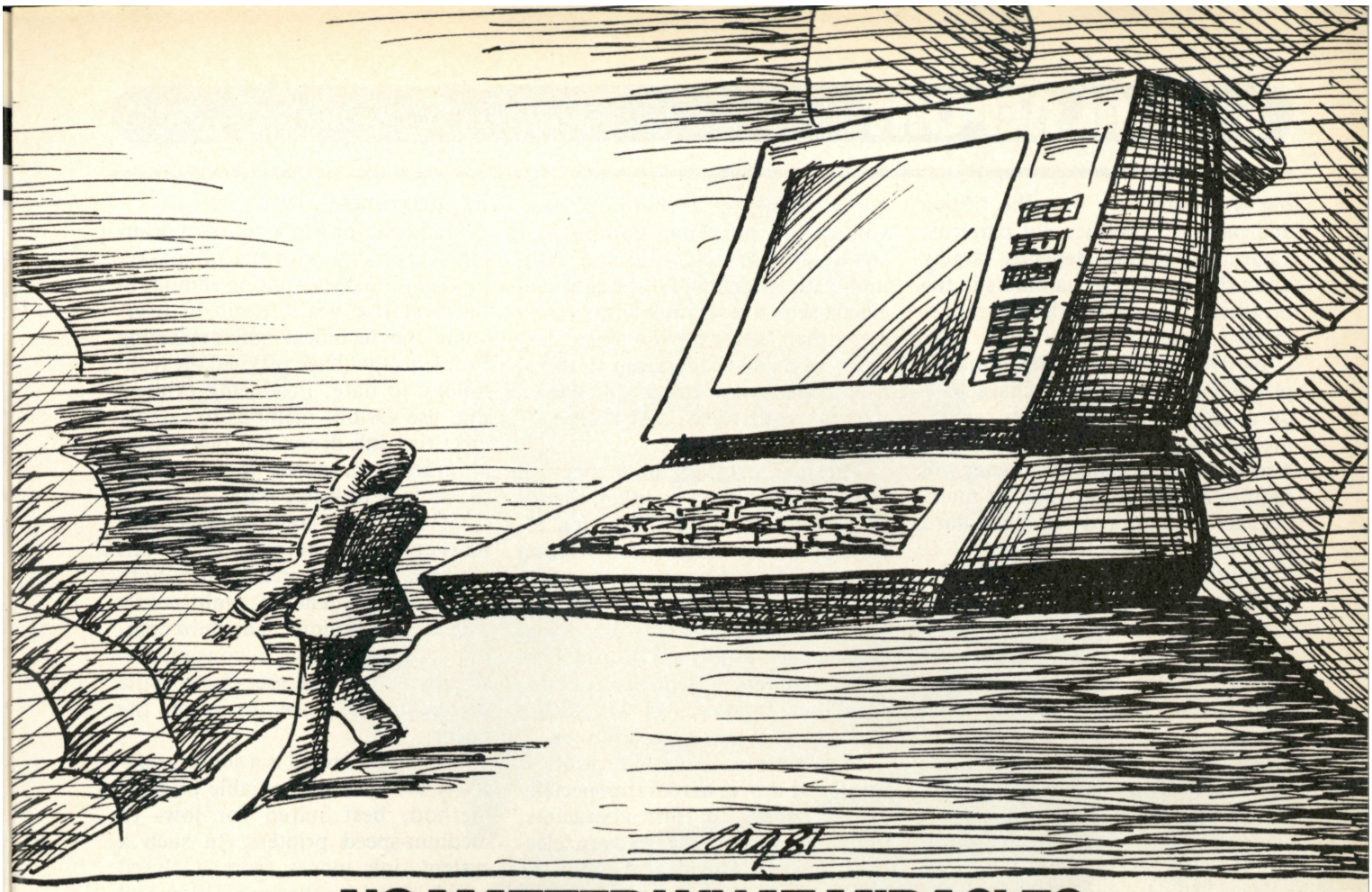
Also in the fully formed character field, NEC Information Systems' "thimble" print element is as fast as the fastest daisywheel mechanism (55 cps). Spokes on the thimble radiate up from the hub in the same direction, forming the thimble shape for which the element is named. Each spoke has two rows of characters, providing a bigger character set than the daisywheels do. Rotating on a vertical axis, the thimble head can be positioned up and down to access either row of characters.

Impact matrix

If one word best characterizes impact matrix printers, it's flexibility. No other serial-printer technology offers as broad a range of capabilities or suits as many diverse applications as impact matrix techniques.

Priced from under $1000 up to about $7000, these printers can offer print quality approaching fully formed character printers at speeds reaching 150 cps; on the high end, a 600-cps model competes with low- to medium-speed line printers.

Various methods exist for "firing" impact matrix printheads, permitting a range of speeds, precision, reliability and head life. But all impact matrix printers produce characters or graphics by selectively driv-



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CIRCLE 29

ing wire hammers into the ribbon and paper to produce dot patterns. Character quality depends largely upon the number of hammers in the printhead and upon their arrangement.

By overlapping the dots, a matrix printer can print "solid" characters. Of course, overlapping dots require more dots-per-character. In general, a solid or high-quality character will require at least four times as many dots as are required for a standard 5 x 7 matrix character.

Printheads on Centronics Data Computer's impact matrix printers range from 5 x 7 dot matrix up to 18 x 9 dot matrix. One printer, the model 753, uses the 18 by 9 head to permit either mono or proportional spacing.

Although it was once suspect, the reliability of impact matrix printheads has improved markedly. Early matrix printers were achieving printhead character lives of 50 to 60 million. The development of "ballistic" and "freeflight" matrix printheads extended the printhead life to about 300 million characters.

Because characters are formed by dots, the matrix printers can change character fonts without changing a print element. These printers have the ability to vary character size and print graphics, which is not available, or at least very cumbersome, with solid print elements.

Impact matrix printers have entered new markets on both the low and the high end of the technology's range. Several firms, including Centronics and Dataroyal, have printers costing under $1000 designed for either small-business use, personal-computer use, OEM use or a combination of these applications.

In the home, multiple copies probably aren't required. If only one original is needed, thermal printing or electrostatic discharge can be used.

Thermal printers

Of the three nonimpact serial-printer technologies—ink jet, thermal and electrosensitive—thermal and electrosensitive methods share many more characteristics than the complex ink-jet techniques. Best suited for personal computing, small-business, scientific and communications demands, thermal and electrosensitive printers must rely upon their relatively low cost, flexibility and silent operation to offset user uncertainty about the special papers required by each type of machine.

Thermal printers have become fairly well-accepted by users, thanks in part to extensive marketing efforts by several large firms offering these printers. Electrosensitive machines have not been so widely promoted, although Centronics does market such a printer. But the high speed and very low prices available with these nonimpacts will assure their growing market acceptance.

In operation, a thermal printer's printhead moves across the specially coated paper. To form characters, individual wires in the head are selectively heated. This heat darkens the paper, producing dot patterns that form the necessary characters or graphics.

Typical of most thermal printer prices, TI's models cost from about $1200 to $3000. TI models use a 5 x 7 dot matrix head and produce speeds ranging from 30 cps to (in four dual-head printers) 120 cps.

Thermal printers are in general, reliable. Impact printers are getting a lot more reliable now than they have been, but thermal printing allows very light-weight mechanical designs and silent operation.

Electrosensitive printers

These printers are of the nonimpact type. They work with a special paper that has a shiny, metallic coating. Electric discharge removes parts of the shiny coating in a dot-matrix pattern.

Because these printers don't have moving elements in their printhead (the printhead itself moves, but has no internal moving parts) they are very fast. They can zip along at 225 cps. And there's another bonus of the simple construction—reliability. The printhead should last for 50 million characters.

Ink-jet printers

Heralded for some time as a printing technology with major market potential, ink-jet printing should, in the next five years, begin to overcome the technical and marketing problems that have plagued the technology to date. Producing printers that use various methods to rapidly eject tiny ink drops and place them accurately on paper is a difficult technology to break into.

Of the three companies actively marketing ink-jet printers in this country, Siemens and Silonics both use a drop-on demand, multi-nozzle printhead technique. The third company, IBM, chose a continuous-stream method that uses electrostatic deflection to place drops on the paper.

Drop-on-demand is a simple, relatively low-cost and reliable printing method, best suited for low- to medium-speed printers. In such a system, ink moves from a closed supply cartridge through a filter and into (in the case of Silonics and Siemens) a multi-nozzle printhead. Ink only comes into contact with the air when it is ejected toward the paper by an electrical pulse.

Silonics' Quietype printer incorporates a printhead with seven vertically arranged nozzles to produce a 7 x 9 dot matrix at 180 cps. The Siemens PT-80 and PT-80i use a 12-nozzle head; two interleaved rows of six, side by side. Forming a 9 x 12 character matrix, the PT-80 operates at 30 or 90 cps and the PT-80i attains 270 cps.

Because of their relatively simple design, drop-on-demand ink-jet printers cost much less than IBM's continuous-stream model. End user price for the Silonics Quietype runs under $3000; both Siemens models cost in the $2000 to $3500 range.

IBM chose the more complex continuous-stream technology for its 6640 ink-jet printer because the firm believes continuous stream allows higher performance and greater quality capability. With the 6640 mechanism, ink is ejected in a stream from a single-nozzle printhead. Rapid horizontal printhead move-

continued on page 110

High resolution, dot addressable graphics with vertical resolution of 72 dots per inch and up to 82 dots per inch horizontal resolution.

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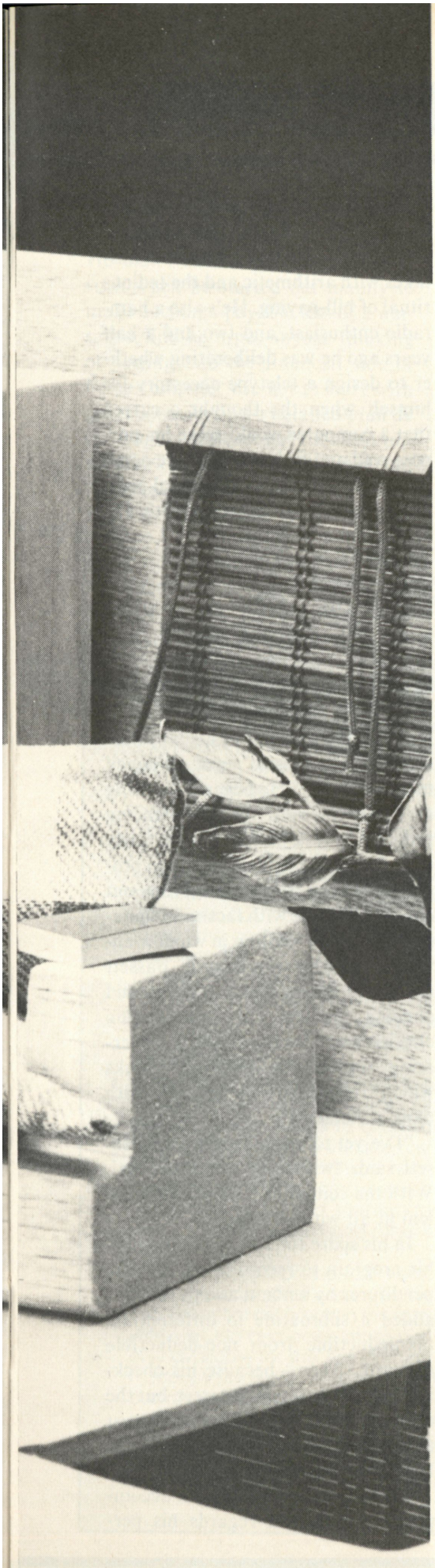

PHOTO BY STEVE SAGALA

Ken McLamb

LEISURE COMPUTING

Time, money earned in home-computed finances

Personal computers alleviate the pain of shoebox technology, wherein love letters compete with receipts for space and attention

Another tug-of-war is getting underway between alternative technologies. The brash challenger in an improbable match-up is the personal computer, and the defending champ is the shoebox.

Yes, the shoebox. That perfectly-sized, perfectly-shaped marvel of engineering with an interminable afterlife. In countless millions of closets, it keeps the dust off old collections of love letters, and organizes threads, bobbins and power-tool attachments, and keeps records of utility bills and tax-deductible expenses in one place.

Shoebox technology naturally has it all over computers for storing threads and tools, and although a computer could do a dandy job of preserving love eternally on tape cassette or disk, most people will keep letters bashfully in the closet.

But the personal computer is the clear choice—thousands of people have already made the choice—between the old and new ways to manage finances at home.

Personal and household financial management and planning have emerged as probably the most valuable of practical applications for home computers. This has been difficult to discern until quite recently, because the advent of small, affordable, easy-to-use computers was welcomed mainly by players of games, and by hobbyists who were attracted more to the equipment itself than to its possible applications. Besides, in those horse-and-buggy days of personal computing, meaning 1975 or so, the performance ability of the hardware was woefully unmatched by software programs to put the computers through practical paces.

The hardware/software disparity is now on the verge of disappearing. Personal computer manufacturers and third-party producers have greatly expanded the scope and quality of programs over the past couple of years. Legions of erstwhile gamesmen and hobbyists have not only put their computers to work at useful tasks, but have discovered to their delight that you don't have to be a genius to change a program to suit your purpose exactly, or even to design your own applications at the keyboard.

Yesterday's sophisticated toy is industriously turning lights and appliances on and off at the right time and screening out burglars; getting the kids to sit in rapt attention for homework assignments; printing out updated resumes as well as letters to Grandma; and generally performing

an ever-widening variety of jobs to heighten the efficiency and enjoyability of life at home.

But so many of today's possible uses have the effect of making financial work easier, more complete and more accurate, that the dollars-and-cents benefit occurred more often than any other in an informal survey of how people are using their personal computers in this second half of 1981.

Good-bye, fiasco

Of the two dozen or so personal computer owners *Personal Computing* talked with throughout the U.S., having in common a desire for constructive use as well as recreation, nearly everyone includes two, three or more financial functions in his own bundle of practical applications. Many have automated their incoming bills and checking records, either as a streamlining for timeliness and accuracy or as the basis for more complex analysis and projection of where money is going. Similarly, household budgets can be checked continually against reality, item by item, permitting changes in budget or spending habits long before the old pencil-and-paper method would sound an alarm.

Tax is a subject unto itself, as usual, and can be made less painful in preparation, and very possibly even in payment, by the use of tax programs or extraction of the relevant figures from a broader electronic file of data—and the computer might even be able to fill out the actual 1040 and several of the common supplementary schedules as well.

Computers will be the canny repository, digestor, analyst and advisor on anything to do with personal investments—if you feed them right. Real or hypothetical holdings in stocks, bonds or duck-feather futures can be tracked according to your parameters for price movement over a given time period. The indicators you establish for probable upward or downward movement, can also be used to track holdings, even with daily updated signals, to buy, sell or hold. Impatient for up-to-the-hour price changes? There is no need to wait for tomorrow's newspaper listings, because instant access to current prices for investors is one of the rapidly growing number of information services that can be tapped simply by coupling your home telephone with your computer and keying in your query.

But what if . . . ?

Decision-making for any type of investment is aided by the computer's ability to do much of your thinking on "what-if" scenarios. If you want to buy a piece of land, for example, with your own or borrowed money, you can assess which possible levels of appreciation and interest rate will produce a gain or loss at any point in the future. That's an easy one. Far more complex calculations and analyses, which just a few years ago were performed only by data-processing professionals with expensive machines owned by big companies, can be done today by a non-expert sitting at home with equipment of a cozy size and price.

The ease of getting into home financial applications is expanding with each passing day, as personal computer manufacturers announce the availability of new finance-related programs dedicated to their machines, and independent software producers introduce new financial packages or the adaptation of old ones to be compatible with more personal computer systems.

Tom Bassett, owner of a graphic arts and audio-visual supply shop in Frankenmuth, Mich., has never purchased a financially-oriented program. But he is building up, step-by-step, an elaborate personal-accounting system that is tailored precisely to his needs.

Does that make Bassett a mathematical whiz? Exactly the opposite. Bassett was annoyed by his own mistakes with arithmetic and the tedious ritual of bill-paying. He's also a ham-radio enthusiast, and two and a half years ago he was deliberating whether to design a teletype accessory for himself when the thought occurred that a computer would serve his purpose well and be less costly. He opted for a Sorcerer Model I personal computer from Exidy Systems, with 32k of random access memory, a Leedex 12-inch black-and-white monitor and a Microtek printer. He has since expanded with another 16k of RAM and a Micropolis disk drive.

Lead is dead

With the new computer in front of him and the manual on his lap, Bassett swore he "would never set pencil to paper again." He began by writing a straightforward check-balancing program, a task he found to be fairly easy even as a beginner. He then programmed the system to print out checks complete with facsimile signature, ready for mailing in window envelopes. For his own records, Bassett developed a new-check register and ongoing review of outstanding checks, and also developed an operating routine for returned checks which reconciled his records with bank statements.

"I've yet to make a mistake," Bassett said, "which for me is unusual. With the computer I've had no problem at all with accuracy."

In his spare time Bassett expanded his program to record non-check expenditures by amount and payee, and added a subroutine to differentiate tax-deductible from non-deductible expenses. Then—because his checking account now pays interest, but the original program records the interest as a deposit— he'll add a subroutine to record the interest properly.

At its present stage of accomplishment, Bassett regards his per-

sonal computer system as "an essential part of the household operation." He didn't necessarily conceive it as such when he started out mainly to make accounts-payable less of a nuisance, and he urges anyone thinking of getting into the financial side of home-computer use not to start with great capacity and a detailed *plan de campagne*. Instead, get the most important function in good order and then expand in steps dictated by logic and experience. The one-brick-at-a-time approach helps the average person to overcome any trepidation felt in taking on a computer as a financial-management partner. Bassett says he never felt awed working with a machine a lot smarter with numbers than he is, until one day when he reviewed the cumulative integrated functions of his financial program and said to himself, "Good grief, did I do that?"

Not everyone has Tom Bassett's creative drive, but it isn't necessary. Software designed to help with record-keeping and financial planning is becoming more prevalent. Several of the more versatile and sophisticated packages were developed for small-business use but are just as applicable to household business, and are within the budgets of most individuals who intend to use them seriously. (None of the programs mentioned cost more than about $200, and some are almost as inexpensive as game cassettes.) Well

A financial software sampler

In addition to the proprietary programs made available by manufacturers of personal-computer hardware, a variety of independent software publishers offer packages that help non-experts with their personal financial management and planning. The following is a modest sampler indicating how versatile this field of software is becoming. To find financial programs that are compatible with your computer, or if you need guidance in selecting a personal computer system that will make the best use of the software applications you'll need, check with retail stores and get in touch with the publishers of the programs that seem most promising.

- *VisiCalc* has been the best-selling program for some time and has recently been enhanced by its publisher, Personal Software. Developed primarily for small-business use, its versatility and affordability for financial modelling have made it just as popular with serious individual users needing a time-saving electronic worksheet that does automatic recalculations.

  Personal Software also recently upgraded Desktop/PLAN for printouts of models, and has VisiPlot to convert input into charts and graphs. Other upgraded packages include VisiTrend/VisiPlot for trend forecasting, statistical analysis, charting and graphing, VisiDex for cross-referenced storage and retrieval of data, and VisiTerm for communication with large data bases and other personal computers by modem.

  VisiCalc itself is provided in versions that will run on most of the personal computer systems on the market. The other programs in the family interface easily with VisiCalc and each other but thus far they are only available for the Apple II and the Apple II Plus.
- *Money Maestro* is a sign of the growing importance publishers are attaching to personal business applications. The producer, InnoSys, specializes in software for the banking industry, but has presented this home-banking system organized around the user's checkbook. Record-keeping, tax reporting and budgeting, as well as non-check transactions of all types are accommodated. The program is compatible with computers having a CP/M operating system.
- Howard Soft has a trio of programs for individuals who are experienced with finances but not necessarily experienced with handling them on a computer. *Creative Financing* is for "anyone who invests with borrowed money," says the publisher, because it compares dissimilar loans, answers "what-if questions," and otherwise helps the investor deal with inflation, taxes and other risks and certitudes. *Real Estate Analyzer* does the same, and more specifically for real estate. *Tax Preparer* helps build itemized files throughout the year, and on T-day will automatically print forms and schedules in IRS format, along with supporting statements based on the itemized files. These programs are available only for Apples at this time.
- *Financial Partner* by Denver Software bundles essential accounting functions into a home system. The package includes the program, UCSD Pascal language and operating system in a user-friendly format for a general financial ledger which includes charting. It is now compatible with Apples, and compatibility with Commodore models and others is anticipated.
- Dow-Jones has more than its famous quotations coming into investors' homes these days. Compatible with several modem-equipped personal computer models is the *Dow Jones Investment Evaluator,* which accesses current quotations of securities and other listings, and will print out the value and percentage change of a particular stock or an entire portfolio. Financial news and special reports are also available to those buying the software program and paying for access time as used. It's an at-home stock ticker and a researcher that can retrieve specified editorial information published within the past three months by Dow-Jones publications.

established, reputable software houses are bringing increasing numbers of financial programs on the market specifically for personal applications. The personal computer manufacturers themselves are expanding their catalogs with software for personal business.

Where to find?

Atari, synonymous in millions of minds with video fantasies of outer space, offers a collection of programs for personal finance and record-keeping, including the recently introduced Personal Financial Management System. The program keeps track of transactions—cash, checks, savings, credit card charges—and permits screened displays according to category, date or payee, which helps plan and analyze budgets and project future trends. Atari also offers an Investment Analysis Series for the 800 model, comprised of Bond Analysis (price, interest, tax impact), Mortgage & Loan Analysis, Stock Analysis (separate programs for portfolio analysis, stock rate of return and dividend analysis), and Stock Charting to retrieve, list and graph daily performance data.

Personal computer systems from Apple Computer, in addition to being compatible with a wide range of software designed by third-party producers, offer the benefit of Apple's own Personal Finance Manager package. This family budget organizer and analyst permits up to 200 monthly entries in as many as 24 budget categories, allowing a year's worth of financial data to be stored on a single diskette.

Texas Instruments supports its TI 99/4 personal computer with programs such as Household Budget Management and Home Financial Decisions, which manipulates variables to guide the user's planning in home purchase, saving for higher-level education, and leasing vs. buying a car. Personal Record Keeping for systematic filing, sorting and retrieval is also offered, as are Personal Real Estate to evaluate prospective investments, Securities Analysis, and Tax/Investment Record Keeping. Further, 99/4 owners can greatly broaden their software horizons by joining the unique, independent club of 4000 fellow users that specializes in encouraging members to develop programs and makes them available at very low cost. The latest club catalog includes more than 30 programs for home and personal finance.

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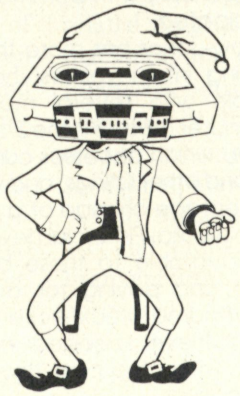

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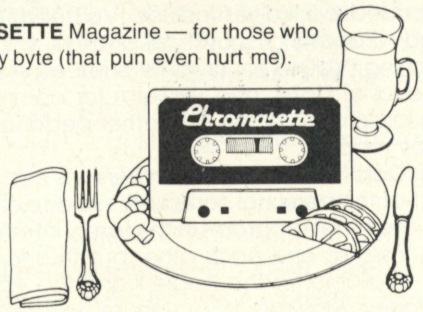

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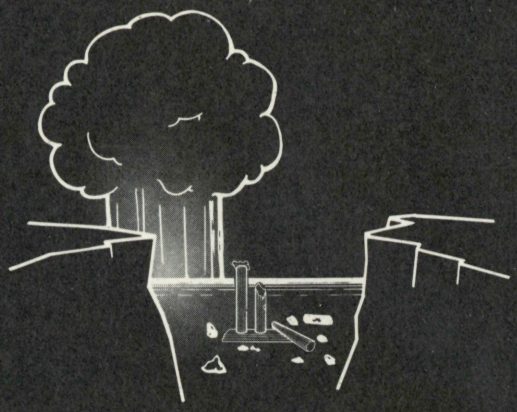

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CIRCLE 31

tape and disk for its PET series, is in the process bringing these programs within the reach of more people with support for the new low-cost VIC-20 model. The company introduced a tax-preparation cartridge, which will be revised annually as federal rules change, and home budgeting is due to follow. Commodore says the emphasis of subsequent software will be on tools to help home users deal with inflation, save on energy, and otherwise improve daily life.

At-home users of Radio Shack's TRS-80 Model I and Model III can obtain the Personal Finance Level I program which balances a checkbook and monitors a monthly budget. Budget Management, which makes it possible to distribute data more elaborately through 60 accounts and to print reports; Cassette Portfolio, for records and evaluation of stocks, bonds, funds and options; and Standard & Poor's sophisticated STOCKPAK system for portfolio analysis and management are also available.

STOCKPAK and two more investment-analysis programs, the Investment Portfolio System published by Personal Financial Systems and Stock Tracker from H&H Trading Co., are applied by Lewis Garrison of Montgomery, Ala., to make buy and sell decisions. Stock Tracker is Garrison's personal favorite, although he doesn't always act on its advice. The program tracks the performance of stocks, and flashes buy/sell recommendations according to chartable cycles and correlations of recorded data.

In Garrison's view, anyone with the time and interest to maintain such programs on home computers will get investment counsel from the computer that's about as likely as any to be right. Although Garrison isn't an active enough trader for brokers' commissions to be a major expense, he believes an investor with the habit of churning portfolio could save a lot of money by getting discount brokers to execute a personal computer's analysis.

Garrison, a few weeks away from the end of his Air Force career as a medical equipment repairman, was using his word-processing program on resumes for a civilian career in accounting. He has Radio Shack's TRS-80 Model I computer and Line Printer IV and three disk drives, an outfit he acquired two years ago primarily to help with budgeting as well as for games and educational programs for the children.

Like Tom Bassett, Garrison did his financial programming from scratch at first. But when Radio Shack brought out the Budget Management program, Garrison liked its versatility so much that he switched over with the aid of a few personalized modifications.

He commends the budgeting function to other home computer users "to save time and show where the money is going." He says the experience will be enlightening to those budgeters who have assumed their estimates are correct but haven't done detailed paperwork. But "to-the-penny" entry and processing of every expense takes more time than it's worth—even on the computer. There is one exception, however: Set up your electronic tax file properly at the beginning of the year, update with the kind of precision the IRS likes, and you'll sleep well the night of April 14.

Walk away from taxes

Bill Boyarsky of Raleigh, N.C., says his annual "day of misery" has disappeared from the calendar in the three years he's assigned his tax calculations to an Apple II system. "I

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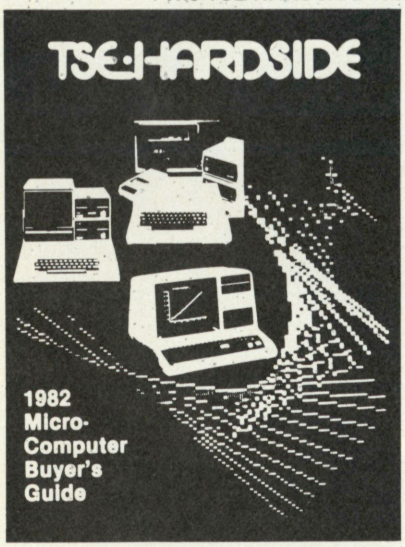

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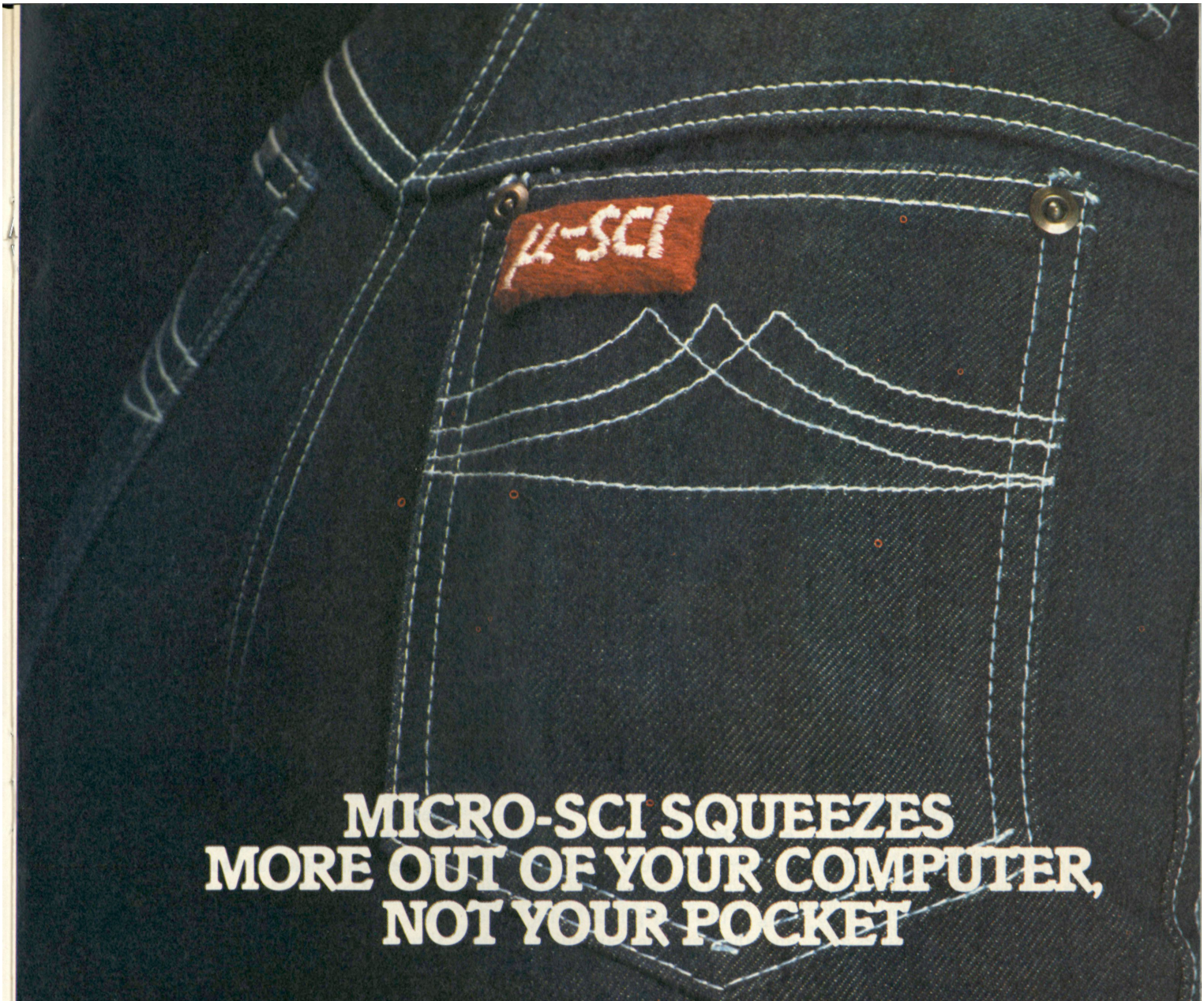

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just tell the computer to do it and I walk away," he said. "In 15 minutes it generates 20 sheets of paper with all the figures I need for the tax forms."

Boyarsky, a photographer, is among the many professionals and entrepreneurs who have found an irresistible combination of home and work reasons to computerize. His only early acquaintance with computers, in a college course 10 years ago, left Boyarsky with the impression he had indeed seen the future. Three years ago, he realized the future was here when he observed a group of undergraduates using large computers as easily as seventh-graders use chalk and a blackboard. "It was an integrated part of their lives," Boyarsky said. "I watched a student programming a computer to solve one-shot problems. It was just like my taking a piece of paper to figure out the answer to 32 times 23. It was amazing."

Thus inspired, Boyarsky soon had an Apple at home doing optical calculations and generating charts to guide him in adjusting exposures and bellows extensions for intricate copy photography under fixed lighting—a chore that routinely took three or four hours manually.

With the aid of the Super Checkbook program from Power Soft, Boyarsky has established household and business accounts side by side in the computer. He uses its plotting capability for what he calls "reverse budgeting": If the chart indicates unusually high expenditures in March, for example, he'll investigate whether it's an unusual occurrence caused by a substantial car-repair bill or lump payment of insurance, or something more fundamental that needs watching in the future.

From Boyarsky's experience with computerized finances, there has been a marginal benefit in time-saving—entering data in the computer vs. organizing on paper—but a "phenomenal" improvement in getting usable information from raw data, and manipulating it in ways that weren't possible before. "I personally feel a computer is a very, very useful thing to have in the house," he said. "It makes dreary tasks enjoyable, too."

There's also a dovetailing of business and personal applications for electrical contractor John Peters, who operates a three-employee house-rewiring service from his home in San Francisco. Peters had formerly taken the route of assigning the more complex home-finance chores to the outside accountancy that keeps his business books. But in view of the recurring cost, he's eagerly following developments at Atari for a general ledger accounting package that would be suitable for in-house financial work on his Atari 800 personal computer.

Computer gravy

Peters got the system, including disk drive and printer, at the beginning of this year primarily for games and the versatile capability of the VisiCalc financial-modeling package. He now has five data files installed with VisiCalc—contract, invoice, statistical, price and archive. As an afterthought, Peters acquired Text Wizard word-processing software from DataSoft and has been amazed to discover how well the word and number functions blend and complement each other. "I hadn't been expecting it," he said. "The value of letter processing is pure gravy."

The home of Edward Moss in Bountiful, Utah, is often filled with grandchildren and other school-age relatives, so a year ago he bought a Texas Instruments 99/4 personal computer primarily for its educational value. The dealer included the TI Household Budget package, and for Moss that was the end of the shoebox era.

"I always had my records stacked and piled in boxes, and I'd go hunting for pieces of paper one at a time," Moss said. "When I need something now I just print it out."

Moss, a radar technician, also acquired the Personal Record-Keeping program available independently from the national TI users organization. He entered his financial data daily at first, but soon found weekly or bi-weekly entries to be sufficient. He values his early computer experience for the discipline it taught in completeness and accuracy. As for financial discipline, Moss projected the effect of his spending patterns at mid-year, checked it against budget, and discovered that he would be $2000 short by Christmas if he didn't change his spending habits.

The computer didn't just flash the warning; it helped Moss make the decisions to get the budget back on track. He has 15 categories of expenses recorded, with constant access to updated totals for each projection of the results. Thus if Moss wants to reduce this month's costs by X dollars, he doesn't have to search through the loose receipts and forms that used to be the only way he could determine which costs were unavoidable and which gave the best prospects for trimming.

Getting a personal computer system with one purpose in mind, then being attracted to entirely unrelated applications as a bonus, has been shared by nearly all the users interviewed by *Personal Computing*. Moss got a speech synthesizer with his original equipment because he wanted to make learning enjoyable for children. And he has succeeded handsomely: "They treat a talking computer as a living being," Moss said. "It holds their attention much better than homework ever could."

In other cases, users have reversed that course by acquiring a system for the record-keeping benefit and then discovering the vistas of education or word processing at home.

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CIRCLE 35

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His cat, perhaps miffed at being left alone, knocked over a lamp which started

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CIRCLE 36

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CIRCLE 37

Thorwald Esbensen

Elevated education made easy: computers in schools

Artful ways to prevent America's education from slip-sliding away

Editor's note: The importance of getting computers into the schools cannot be underestimated—not by educators nor legislators. The future strength of education in the U.S. may be at stake—when one stops to consider that the dominant countries in the global economy are moving toward graduating computer-literate students.

The importance of this movement is recognized by Representative Thomas Downey (D-NY), who sponsored H.R.2112. This bill is presently pending before Congress and calls for the establishment of a National Center for Personal Computers in Education (CPCE). It is Downey's belief that the U.S. may be in danger of losing its international leadership position if computers are not assimilated into our schools. And the majority of U.S. schools are presently untouched by personal computer technology.

What can aware, concerned citizens do to prevent the untimely obsolescence of our next generation's education?

By their very nature, schools tend to be satisfied with the status quo, whatever that may mean for a given district. Why? It's easier that way. Change takes effort and can lead to unpredictable consequences. Risk taking is never a popular exercise for any institution, and schools are no exception. It is a common occurrence for board members to lose their seats, and superintendents their jobs, because of changes perceived by the public as undesirable. The old tried and untrue state of affairs may be ineffective from an instructional point of view. Yet as Hamlet observed, we'd "rather bear those ills we have, than fly to others that we know not of. . ."

Preferably, those interested in advocating the use of personal computers for school purposes should be well regarded within the community. An idea for a course of action can be ever so fine, but unless it is espoused by individuals or factions generally thought to be responsible and prudent, it may never receive a fair hearing. Or, if implemented, it may be carried out reluctantly—at best. For personal computers to be installed in a manner and setting conducive to success, the cause needs to be promoted by one or more effective champions. The event will not happen magically.

Start small

Once an administration has decided to move ahead with the acquisition of personal computers, the temptation may exist to go forward on all fronts at the same time. While such a strategy blunts the accusation of playing favorites, it increases the likelihood of trouble cropping up

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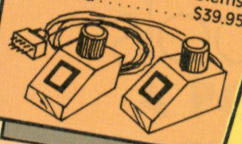

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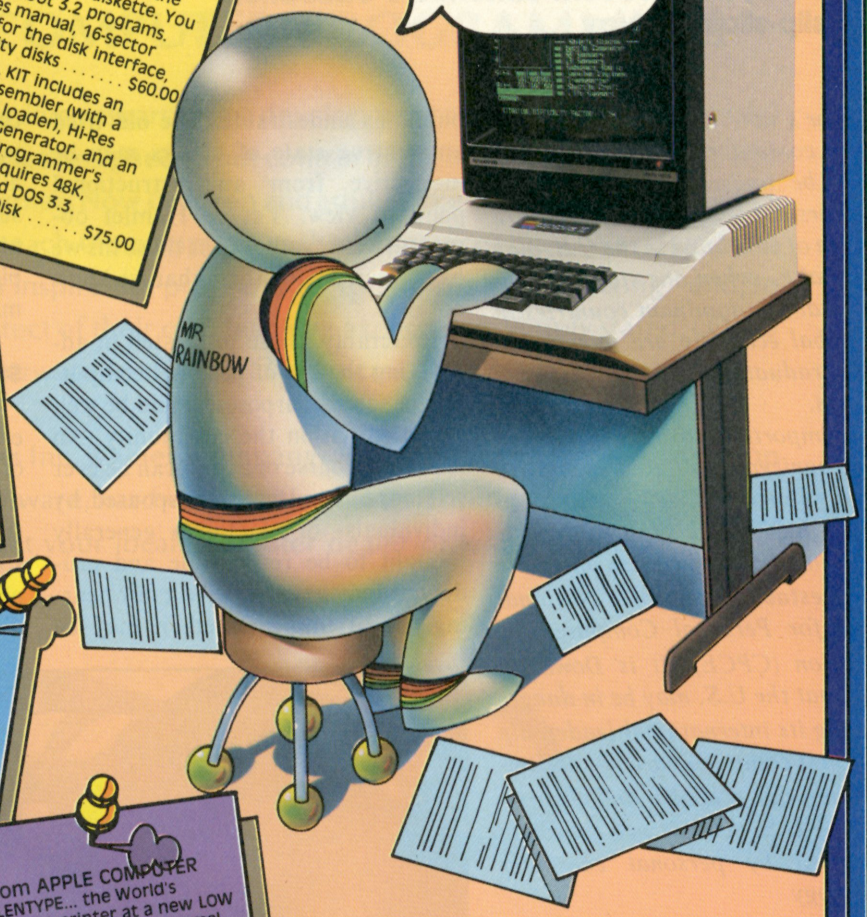

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CIRCLE 38

somewhere along the line. Broad-scale enterprises have a habit of looking better on paper than they do in the flesh—especially if they have only recently emerged from the drawing board. In this respect, conducting a pilot project of some sort would seem to be a sensible way for school people to enter the age of the personal computer.

The great myth

There is a mistaken belief that computers are for secondary math types. This common and unfortunate misconception serves only to reinforce the uneasiness that the general public feels about the awesome power of computers. The average person is willing to admit that it would be a good idea to know more about these wonderous machines, but the prospect is intimidating. At the very outset, therefore, the introduction of personal computers into an educational system should be done in a way that encourages the view that computers are easy to use.

An uninvited guest

The introduction of a strange object into an educational system can initially arouse a certain amount of skepticism and concern. In earlier times, radio and television triggered their share of fear and anxiety. Now computer buffs who overstate their case must share part of the blame for an adverse reaction. Well-meaning promoters of computers for education have occasionally predicted a future in which children will be interacting mostly with machines to acquire a basic education. This sort of crystal gazing will not, as the saying goes, play well in Peoria. A better strategy is to follow the line of least resistance. Instead of cranking up a grand but inflexible placement scheme (e.g., all of this grade the first year; all of that grade the next), seek out those individual teachers here and there within the system who are already motivated to use a personal computer. Have no doubt. These teachers are there. Look for them and you will find them. Begin with those individuals, and your chances for initial success will increase mightily.

Spice of life

Variety is a good thing. This point is closely related to the previous one and will tend to happen naturally if you let it. The idea is to have personal computers used in more than one setting. Mr. Jones may have one kind of use in mind at the fifth grade level. Mrs. Smith may want to try something else with a few kindergarten students. The school librarian may be interested in helping to put together a

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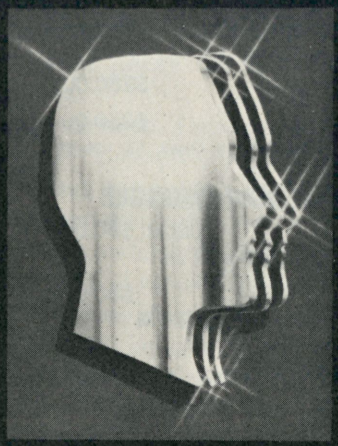

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CIRCLE 39

student support center. The exact shape of things doesn't really matter all that much—at least not for openers. The more important consideration is to get willing hands aboard as soon as possible, and go from there.

Aid the inquisitive

To help and encourage interested students, in-service work for interested teachers could be provided. This might take different forms. For example, a one- or two-day workshop having as its theme, *Shake Hands with a Personal Computer,* could show how versatile and friendly personal computers really are. During the course of such a workshop, the opportunities for hands-on work with the computer should be made available to everyone in attendance. This implies that enough machines be presented to permit this to happen. Ideally, each participant should have an individually assigned computer to use. The next best thing—and still an acceptable ratio—is to have one computer for every two participants. If a school system cannot come up with arrangements on its own, local dealers could be approached.

It is important to have good instructional materials available to use on the personal computer. There is more than one way to accomplish this. School systems may have access to cooperative software centers where non-copyrighted materials can be readily obtained. Commercially produced enabling programs can also be purchased. These permit non-programmers to create their own classroom materials for use with personal computers. However, a word of caution is in order here. School systems that expect teachers to write their own educational software should be reminded of what happened during the 1960's when teaching machines first appeared on the horizon. At that time, hardware vendors rushed their metal contrivances to market in the cheerful belief that educators would supply their own personalized programs to fill these empty boxes. Alas, it was not to be.

Information showing the benefits of personal computer-assisted instruction should be located and disseminated. For example, a recent survey, *The Effects of Computer-Assisted Instruction on Elementary Student Achievement,* by Lois Avaunne Hed, reviewed 15 studies relative to the use of computers and personal computers in elementary subjects for regular classroom students, special education students, and disadvantaged students. The areas studied were mathematics, reading, and language arts. Twelve of the

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CIRCLE 40

studies revealed that students using computer-assisted instruction made significantly greater gains than students with little or no computer instruction. Learning time was compressed, and the individualized attention that was provided resulted in more hours of concentrated instruction for the learner.

Helping hands

Reach out to the wider community for assistance. A particularly potent force these days is the citizens' advisory committee. Local school boards are usually willing to form and listen to such a group regarding a given topic. Recommendations from an advisory committee organized with the approval of the educational authorities themselves will generally receive the kind of serious consideration that individuals acting on their own cannot begin to match. The following recommendations presented this past June to an interested district board of education by a citizens' computer advisory committee illustrate this point:

•Negotiations: It would appear that the use of a computerized information-processing system such as VisiCalc (or a similar program) could be of assistance in projecting implications throughout the negotiating process. Although the initial amount of time spent would be considerable in preparing for computerized operations in this area, the result would soon justify this in terms of efficiency.

•Media services: There is a crying need for computerized assistance throughout this instructional support area. Inventory control, media-scheduling tasks, catalog preparation, and library work of various kinds all illustrate functions that could be greatly simplified by an appropriate use of computer capabilities.

•Word processing: In view of recent developments in the field of computerized word processing, it would seem prudent to move swiftly in order to update current clerical services in the area. Present practices that require repetitious typing chores on the part of the secretarial staff are clearly outmoded.

•Instructional continuity: The use of computers in the school district in question has been heavier at the elementary level. However, this has given rise to an interesting situation. At the present time, almost every student in the district coming out of sixth grade has had an opportunity to work with computers in one way or another. But upon entering seventh grade, this opportunity suddenly ceases. Not until eighth grade (where a two-week course on computers is offered by the math department) does the student again have significant access to the computer for instructional purposes. This break in continuity should be remedied, and further efforts be made to increase the availability of computers to students wherever this is appropriate.

•Curriculum: Closely related to the above point is the matter of computers within the curriculum. As things now stand, computerized instructional materials exist only in bits and pieces and most of these are at the drill-and-practice level. Although drill and practice have a legitimate place in instruction, there is a great need for conceptual materials to be programmed as well. Until this is done, the powerful capabilities of the computer as a learning tool will remain largely untapped. Appropriate curriculum committees should be formed to develop specific plans for including computer-assisted instruction in the various subject matter disciplines on a K-12 basis.

•Instructional equipment: During the past three years, the district has been vigorously acquiring personal computers for instruction, and this effort should be continued. In particular, modern equipment should be obtained for the programming classes taught at the senior high school level. The current setup is deplorable. Old teletype terminals are still being used. These are obsolete, and should be replaced as soon as possible.

•New Horizons: Modern business offices everywhere are swiftly acquiring computerized word-processing systems of one kind or another. Business education departments should be encouraged to establish a model office so that students can be instructed in the use of the latest equipment and procedures pertaining to the operation of the modern American office.

Serious consideration should also be given to the possibility of teaching typing to students in the elementary grades. Nearly all of the newest computers use a standard typewriter keyboard configuration. Students at all grade levels in the district are now using these keyboards. Why not teach them the fingering that will enable them to use these machines in an efficient manner?

Finally, exciting developments are almost a daily occurence in the world of computers. One of the most interesting (with far-reaching educational implications) is the placing of video disks under the control of personal computers. What this means is that the millions of pieces of information that are capable of being stored on a video disk (including motion pictures and sound) can be called upon in any sequence for teaching purposes, using a color television screen as an electronic blackboard for either group or individual instruction. The possibilities inherent in this capability are staggering to contemplate. The school district should devote significant time and energy to staying on top of such new developments so that it may remain on the cutting edge of modern education in the best sense of the word.

Mr. Esbensen is an educator, author and software marketer. He is responsible for the development of the use of personal computers for instruction in the public schools of Edina, Minnesota.

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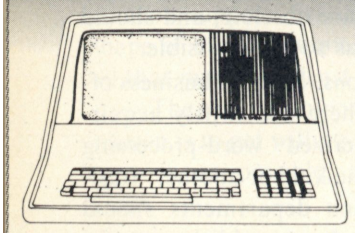

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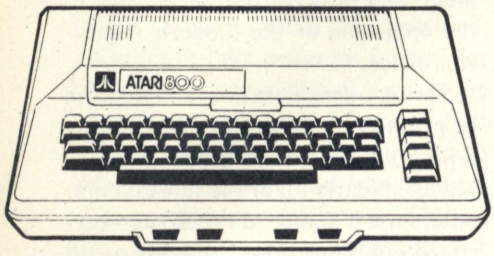

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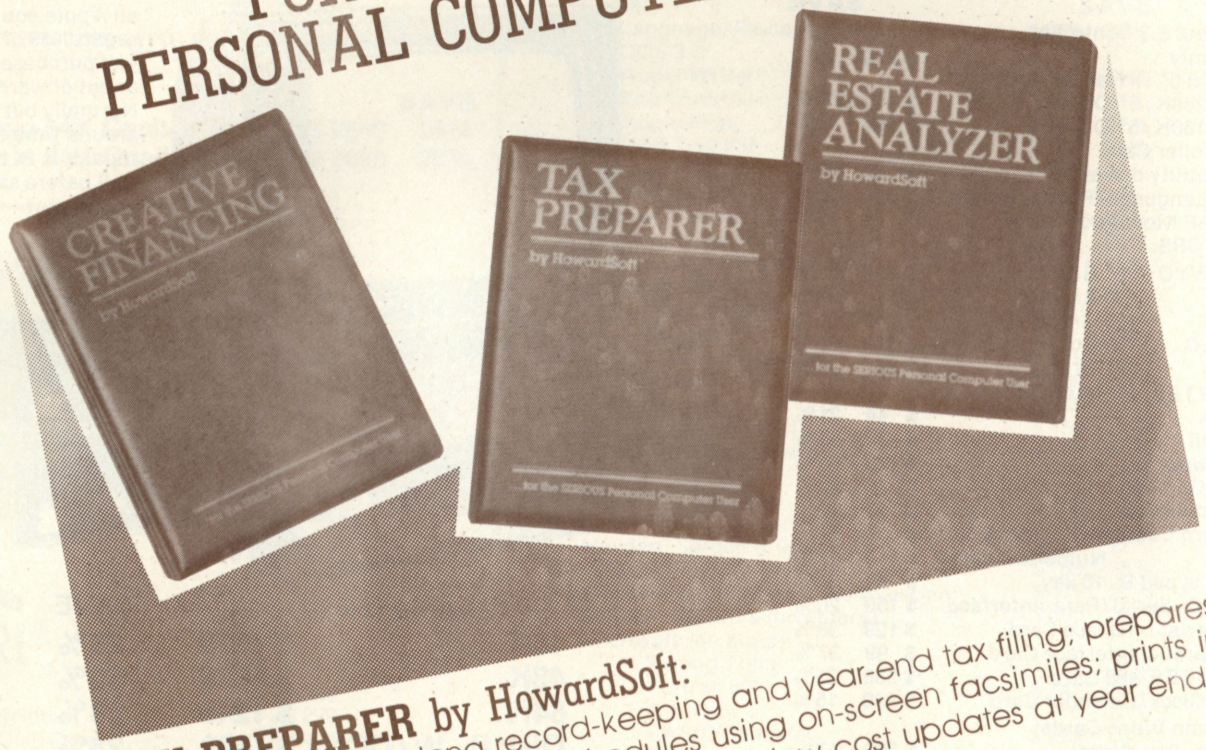

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CIRCLE 42

Sandi Fenstermacher and Susan Foster

BUSINESS COMPUTING

An easement for frustration—automating the real estate office

For fast relief, the move is on to computerize those listings

Selling real estate in today's economy bears absolutely no resemblance to Peter Stuyvesant's purchase—sans mortgage—of Manhattan. With the record-high interest rates of today, it is virtually impossible for the first-time home buyer to qualify for FHA (Federal Housing Administration) loans, VA (Veterans Administration) loans, or conventional home-loan financing. Only *two out of 10* people can presently qualify—a figure based on interest rates and the sky-rocketing price of homes. And that's providing that the lenders have available monies to lend.

Realtors have many other variables to quantify as well. Should the seller carry a portion of the loan?

EWING GALLOWAY

Can the buyer qualify for a conventional loan? What are the lending requirements in the variable-rate mortgage programs? What are the requirements for adjustable rate programs, FLIP, PAM and ANIMAL loans? What is required for the other 30-or-so "creative" mortgage programs that are now being offered in the home-mortgage market?

Being a realtor ain't easy today, as there are normal business responsibilities that exist regardless of economic fluctuations—training new sales assistants, obtaining new listings, showing properties to prospective buyers, closing sales. And beneath all of the real estate functions of the office are the fundamentals of operating a business, including accounts payable, accounts receivable, general ledger, payroll, inventory, and sales forecasting.

Additional related real estate business procedures must also be attended to: salesmen's performance, evaluation reports and internal and external reports, including true rate of return on investment, before and after taxes, buy-sell reports based on internal rate of return and return on equity, rent control, component depreciation, market analysis reports, and listing and sold information.

Oxygen, please

Astute realtors are escaping suffocation under reams of pulp—by automating. Bob Blumberg of Red Oak Realty in Berkeley, Calif., began his "automation for alleviation of pain" quest with a PRC Model 300 Data Terminal and realtors' program. "Basically, the PRC dumb terminal system is for listing and sold information, since approximately 95 percent of all this activity is done on-line. A pitfall of the PRC system is that if one incorrect entry is made, the entire program crashes and there is no way to recover valid, previously entered data . . . all of which we paid $250 a month to put up with."

In his quest for an alternative, appropriate, cost-effective solution, Blumberg became acquainted with the world of personal computers by combing all the computer retail stores in the San Francisco Bay area. His search for the right equipment for his applications was hindered by the salespeople he encountered who "lacked knowledge of the appropriate real estate software applications needed by our profession."

But Blumberg persisted: "Two years ago when I began my pursuit for a personal computer, I even considered time-sharing. But respect-

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ability of the manufacturer, control of input and output, flexibility and cost made my final decision for me—an Apple II, two disk drives, a monitor, an NEC Spinwriter, plus an armload of software, including a general-ledger program, a word-processing program, and VisiCalc."

Like Blumberg, Dennis Stanford of Denver, Colo., is extremely concerned with budgets, projections, statistical analysis and research. Manager of a trade association with commercial properties, Stanford is also concerned with maintaining current mailing lists and using a word processor to enhance both internal and external communications. He estimates that by using his personal-computer system he is saving himself 40 hours a week and $400 for the additional secretarial person he would need.

Stanford's introduction to personal computing netted him a life-long interest: "After purchasing my first system for the business, I became a real software and programming buff—with no previous data-processing background. More recently, I purchased a second system for my home to handle household budgeting, management, checkbook balancing and menu planning. The only change I made from my initial purchase was choosing an Apple printer."

Turned on

And Stanford is continuing his commitment to personal computing. "I have secured the services of a programmer who is helping me develop a commercial real estate analysis program. Our program will include performance of such functions as cash-flow analysis, rate of return on investments projections, amortization schedules including wrap-arounds and balloon payment loans, the effects of annual taxes, on-sale taxes, and so on. I feel that realtors are going to have to give up the security of the service bureau or suffer with a dumb terminal . . . the hardware and software are there now."

Software solutions

As the automation needs of the real estate profession are becoming more apparent, software solutions are becoming more accessible. For example, appraisal is a critical element of financial transaction in the fast-moving real estate business. Data on similar properties, known as "comparables," are used by appraisers to develop current values, and the use of computers to manage these data bases is well established with firms

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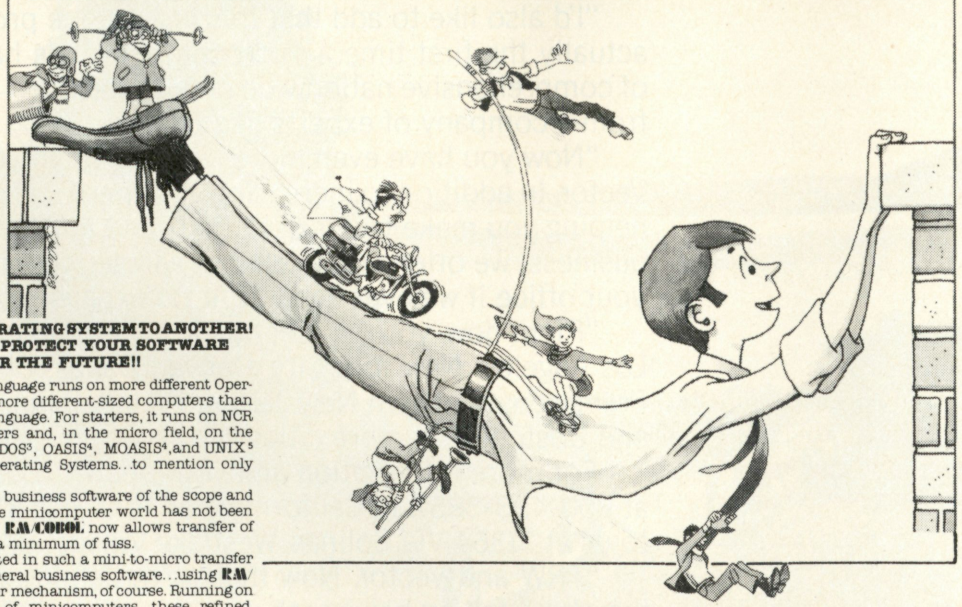

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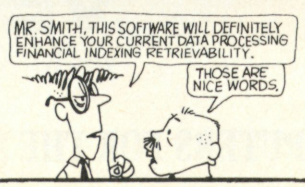

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CIRCLE 44

serving major urban areas. Typically employing a large time-sharing computer system, such a service is affordable when shared by many users.

However, thousands of real estate appraisers serving smaller, localized markets have not been able to make use of this tool because of the high cost. Tony DiNicola, a Vector Graphic computer dealer in Alexandria, La., has attempted to solve this problem by developing software for the Vector computer that enables a real-estate office to rapidly and accurately compare and appraise properties at a relatively low cost.

The package was initially developed to meet the needs of the Mike Haynes Real Estate Company in Alexandria. Haynes specializes in appraising properties in this central Louisiana community of 100,000. According to Haynes, a thorough review of comparables is an important element of a professional appraisal, and a complete file on properties and comparables is a major resource of an appraisal firm.

Haynes initially built a data base of about 1500 entries on file cards. Access to this data entailed reading and pulling cards manually from the file for review. This was extremely time-consuming, and most important, the probability of overlooking an entry was high. Haynes knew that computers held the key to more efficient data-base manipulation, and asked DiNicola to suggest solutions.

The resulting system contains some 2400 entries on a single diskette with 47 data elements per entry. These are accessed under computer control by reference to any data element as a search key—for example, all three-bedroom houses sold since 1978, or all homes sold in a specified subdivision for more than $75,000.

Among the other software packages on the market, the Real Estate Analyzer by Howardsoft is designed to help the realtor, or anyone investing in real estate, make intelligent buy-sell decisions by performing detailed cash flow and return-on-investment analyses on properties.

Using the full power of the Apple, the program includes a number of factors that are often overlooked. The impact of current ordinary income taxes as well as on-sale capital-gains taxes and depreciation recaptures are included, as are the effects of separately specified annual inflation in rents, property values, operating expenses, property taxes and the dollar. Complex loan terms and depreciation schedules are also handled. The user is provided with an accurate prediction of future pre-tax and after-tax cash flow as well as profit upon sale, based on the pre-specified economic conditions.

This software package makes it possible to directly compare dissimilar properties. It is possible to forecast the net ROI upon a sale in any future year, so that the optimum holding period and consequences of a forced early sale are revealed. It is also possible to determine how changes in the various inflation factors, loan arrangements and depreciation schedules affect after-tax cash flows and profits. As a consequence, both the probable returns and the risk of investment are evaluated by the computer.

Service bureau syndrome

The need for realtors to automate is also being filled through the use of service bureaus, which are designed to provide data-processing services to users on a time-sharing basis. The user may opt to use the "batch process," wherein an employee completes input forms which are sent to the bureau for keypunching. This procedure usually generates reports the following morning.

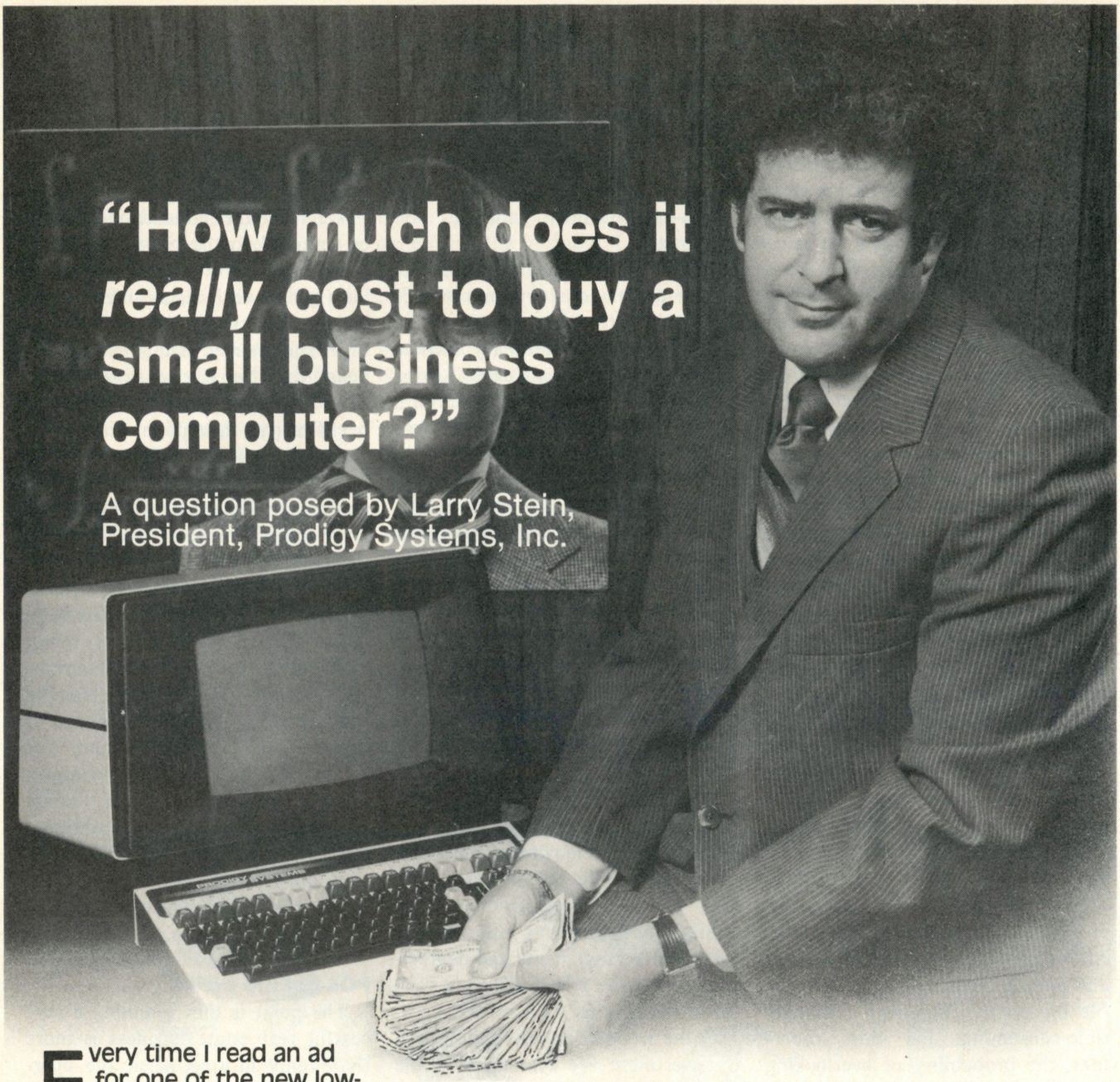
But a potential consequence of this form of automating is excessively slow turn-around time. For example, if a keypunch operator has a question regarding the information on a batch ticket, it is either punched incorrectly or returned to the ticket originator for correction. A few of these problems can severely delay internal and external reports, resulting in a loss of time and money. The monthly expense for this service ranges from $150 to $300 depending on the number of entries, the amount of time and the number of personnel needed.

Another alternative is to install an on-line terminal system linked to a large mainframe computer. In this form of automation the real estate office staff will essentially be performing the work of a service bureau by an on-line system of entry.

The price paid for this system involves extensive employee training that requires significant pools of people—and perhaps hours of frustration—because of the complex interaction between the real estate office and the bureau. In addition, the user must contend with down time and service fees ranging from $250 to $400 per month.

PCs get the ballot

The point is this: Running a successful real estate business is more thoroughly insured when the operation is automated. There are alternatives to the form the automation will take. But with the current comet-like rise in interest and usage of personal computers in small businesses, along with the personal computer's cost effectiveness, this solution appears to be heading for dominance in the realm of how-to-automate. As Louisiana's Haynes states: "I'm 100 percent sold on the use of personal computers in the real estate business. Because of my new computer capability, I'm in a good position to participate in the boom we forecast for our area as light industry moves in to take advantage of our sun-belt environment."



"How much does it *really* cost to buy a small business computer?"

A question posed by Larry Stein, President, Prodigy Systems, Inc.

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Printers in perspective

continued from page 78

ment breaks the stream into separate drops. These drops are charged by an electrode and then deflected vertically onto the paper by two charged plates. Ink not needed for character formation (approximately 99 percent of the ink ejected) enters a gutter and is recirculated through the system.

Because of the need to recycle unused ink, continuous-stream printers must incorporate reconstituting and filtering systems and a circulation pump. These requirements raise the price of the printer to about $27,000, beyond the range of most personal-computer users.

As ink-jet printing evolves, it is unlikely that serial drop-on-demand printers will attain much greater speeds than are already available.

With an understanding of the various serial printing methods, even newcomers to the field can lump certain printer models into categories that best suit their application needs. After that, it's just a question of adding enough features to keep up with the Jones.

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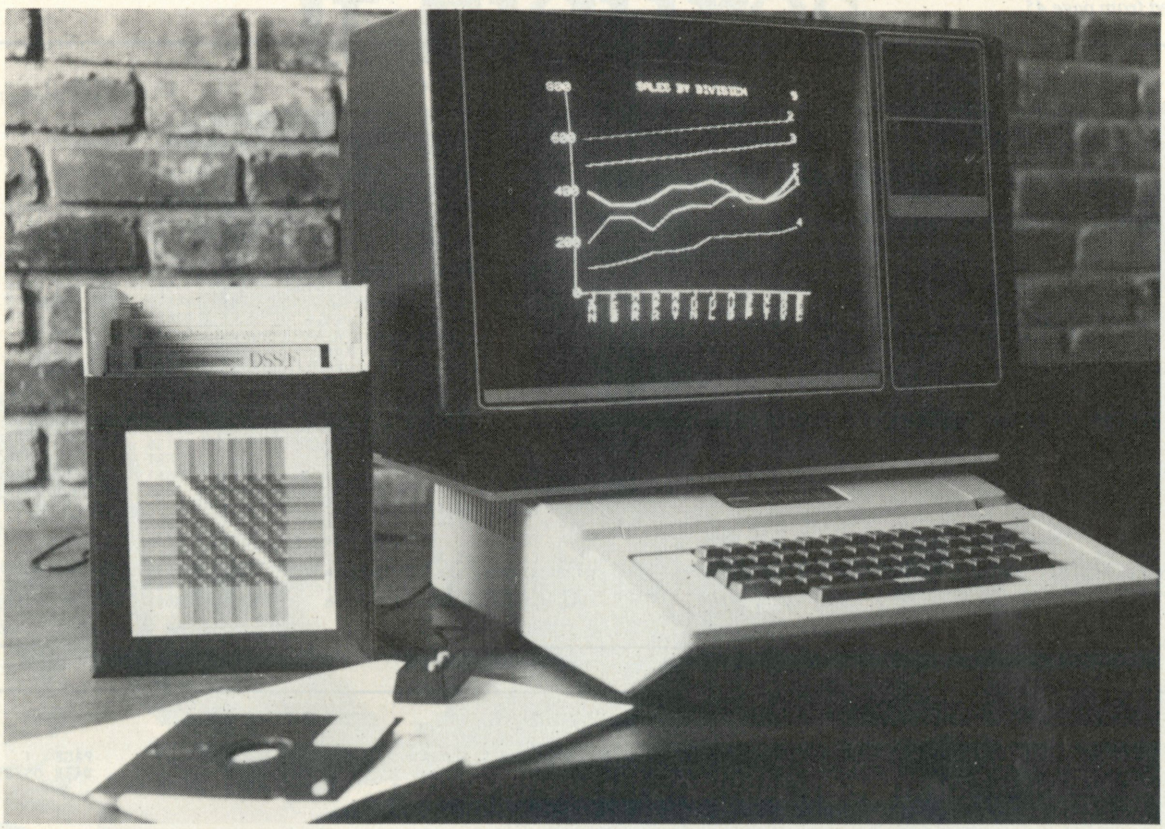

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CIRCLE 46

Process your payables

continued from page 45

Sunbelt Distributing
ACCOUNTS PAYABLE
VENDOR LIST

PAGE 1
DATE 05/05/79

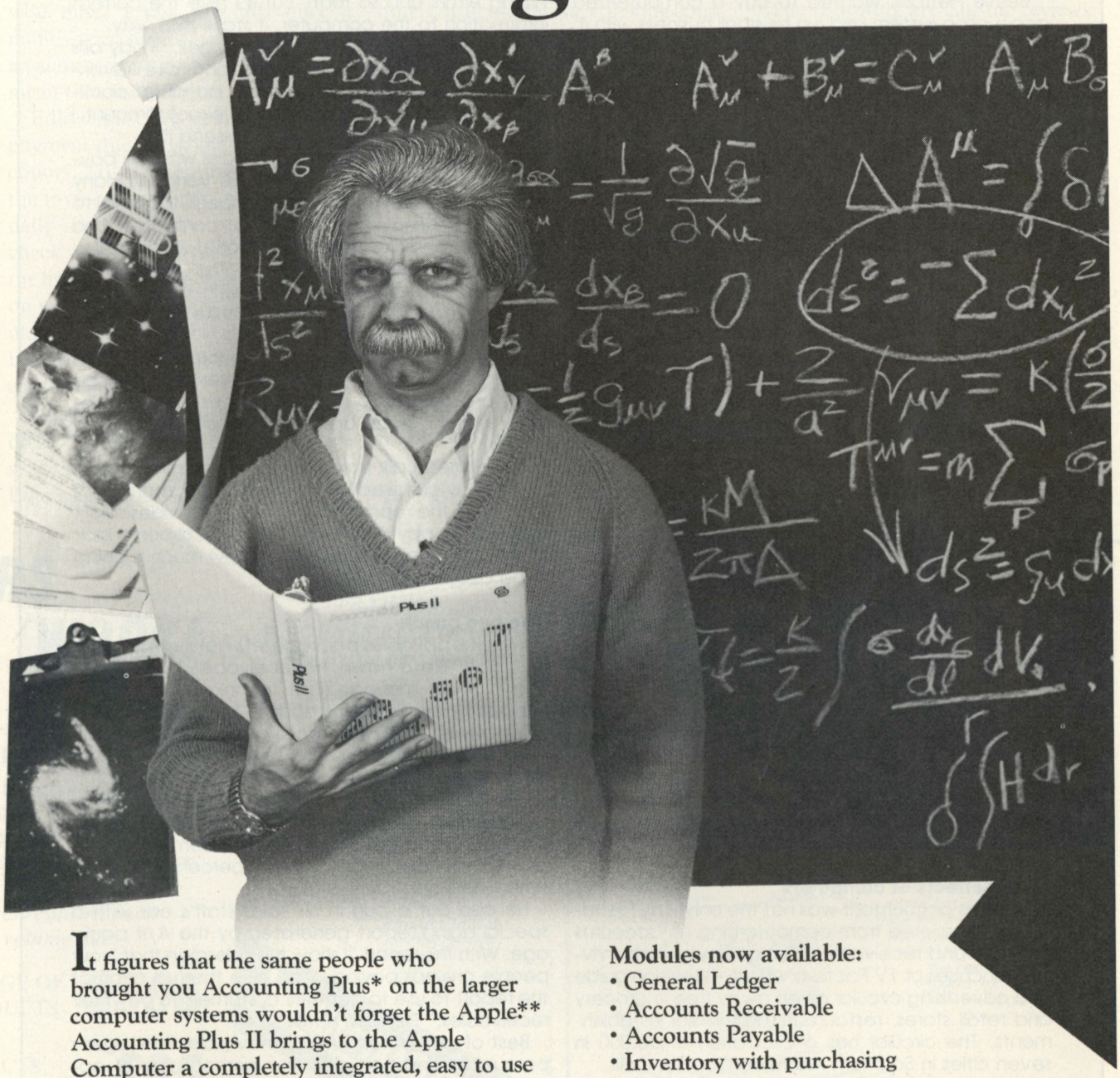
NUMBER	VENDOR NAME	ADDRESS LINE 1	LINE 2	CITY	STATE	ZIP	PHONE
00134	Acme Booth Builders	Harry Acme	1425 El Cerritos	Los Robles	TX	79552	561 459 8852
00182	Acme Industrial Insurance	Walter Acme	2256 Newport Blvd.	Costa Mesa	CA	94662	714 465 7982
00268	Berklawn Golf Clup	Rogers Hornsby	21 Sky Terrace	Berkeley	CA	94562	415 321 2222
00031	Bright & Shiny Advertising	Alex Bright	2441 Sepulveda Blvd.	Venice	CA	96335	213 325 8878
00196	Connecticut Insurance	Frank Weston	2256 Rhodes Collar	Manhasset	NY	10056	212 355 7895
00179	Department of Motor Vehicles	Registration Dept.	22 Albion Way	Hemet	CA	98866	816 662 2498
00223	Digital Diskettes	Melba Toeced	5566 Walsh Avenue	Santa Clara	CA	94456	408 665 2131
00120	Distin Pension Management	Chuck Webster	1425 Post Street	San Francisco	CA	96552	415 665 0708
00062	Electronics Distr. Magazine	Bob Alvarez	2557 Madison Ave.	Madison	WI	64512	312 366 5978
00080	Electronics Merchandising	Bill Gates	12445 Silicon Hwy.	Sunnyvale	CA	93612	415 322 2158
00028	Frieden Mailing Service	Tom Roskow	1847 Commerce Lane	Palo Alto	CA	94301	412 322 4567
00151	Grandview Exotic Autolease	Chuck Lesskin	4556 Market Bl.	San Anselmo	CA	94566	415 668 4513
00093	Great Southern Paper Co.	Beauregard Le Montmarat	1452 Pinetree Turnpike	Okaloka Falls	OR	85992	222 345 4698
00165	Herts Truck Leasing	Al Herts	455 Embarcadero	Oakland	CA	94668	415 548 6658
00285	Hines Auto/Truck Service	Bill Hines	142 Alpine Hwy.	San Carlos	CA	95441	415 366 2558
00237	Internal Revenue Service		P.O. Box 4556	Provo	UT	56615	
00045	La Coultre Print Drivers	Tom Shane	14271 A Street	Washington	DC	20001	115 322 1588
00059	Lesse Paper Products	Miriam Davis	2255 Transamerica Lane	Oakdale	IL	55135	216 355 8521
00148	Natnl. Billboard Placemnt	Harry Foster	3157 Kleiser Avenue	Oaklawn	IL	26687	211 366 9999
00206	Putnam Office Furniture	Accts. Receivable	256 Fremeion Rd.	Fremeion	CA	94561	415 666 7894
00103	Radio Media Service	Maria Spelling	2256 Battery Street	San Francisco	CA	98665	415 326 2588
00117	Seashell Oil Vendors	Lance Batton	2001 Petroleum Ave.	Dallas	TX	76512	916 457 8966
00076	Sproule Parts Mfg.	Terry McGhee	459 Campus Drive	Berkeley	CA	94567	415 548 8846
00240	State Employment Board		P.O. Box 456	Sacramento	CA	93312	
00210	Structured Systems Group	Bill Systems	5204 Claremont Ave.	Oakland	CA	94567	415 547 1567
00014	Technical Printing Inc.	Alicia Harvey	4221 Alsace Lane	San Leandro	CA	95446	415 357 8829
00271	Timesetter Publications	Chet David	456 Milline Ave.	San Francisco	CA	94566	415 322 2589
00254	Western Union	John Lewis	Two Telegraph Way	Oakland	CA	94662	415 663 2177

Sunbelt Distributing
ACCOUNTS PAYABLE
AGED CASH REQUIREMENTS
GROSS AMOUNTS REQUIRED AS OF 06/15/79

PAGE 1
DATE 05/25/79

PAY DATE	VENDOR NAME	VENDOR NUMBER	VOUCHER NUMBER	INVOICE NUMBER	INVOICE DATE	PAY AMOUNT	DISCOUNT AMOUNT	GROSS AMOUNT
03/03/79	Technical Printing Inc.	00014	00001	00023	03/03/79	400.50	0.00	400.50
			TOTAL DUE AS OF 03/03/79			400.50		400.50
04/10/79	Putnam Office Furniture	00206	01563	12551	03/16/79	552.92	11.29	564.21 HELD
			TOTAL DUE AS OF 04/10/79			953.42		964.71
04/20/79	Electronics Merchandising	00080	01224	01556	04/20/79	1,000.00	0.00	1,000.00 HELD
			TOTAL DUE AS OF 04/20/79			1,953.42		1,964.71
04/27/79	La Coultre Print Drivers	00045	01581	66752	04/27/79	1,823.39	0.00	1,823.39
			TOTAL DUE AS OF 04/27/79			3,776.81		3,788.10
05/08/79	Putnam Office Furniture	00206	01578	12669	04/25/79	1,231.12	25.13	1,256.25 HELD
			TOTAL DUE AS OF 05/08/79			5,007.93		5,044.35
05/12/79	Electronics Merchandising	00080	01588	00255	04/22/79	2,558.00	0.00	2,558.00 HELD
			TOTAL DUE AS OF 05/12/79			7,565.93		7,602.35
05/15/79	Sproule Parts Mfg.	00076	01564	22466	03/22/79	2,524.60	0.00	2,524.60 HELD
	Acme Booth Builders	00134	00002	00022	05/15/79	1,000.00	0.00	1,000.00
	Acme Booth Builders	00134	00003	00000	05/15/79	100.00	0.00	100.00
			TOTAL DUE AS OF 05/15/79			11,190.53		11,226.95
05/23/79	Sproule Parts Mfg.	00076	00229	02255	05/13/79	546.40	11.16	557.56
			TOTAL DUE AS OF 05/23/79			11,736.93		11,784.51

Accounting Plus II
It Figures



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**TM of Apple Computers, Cupertino, CA

CIRCLE 47

His accountant said it couldn't be done— so he fired his accountant.

Bernie Pietrosilli wanted to buy a computerized accounting system and run his small business with it, but his accountant said it couldn't be done. "He looked at the systems and said we could not do it. It would be too much work and we would never finish it," recalls Pietrosilli.

A few months later, Pietrosilli had not only leased a computer and studied and tested four accounting packages, but he had chosen a package, and had the entire system in place and operating. With one less accountant.

A voluble and enthusiastic businessman, Pietrosilli says, "I did not believe my accountant, so I went out and did what he said I couldn't do. Getting the system up and running took a little longer than it should have, as I went back to the previous year and updated my books so I could audit the new computerized books and not be surprised.

"With last year's books on-line, I could immediately see if the numbers were correct. If they weren't, they stood out right away. And I found a lot of manual errors—little things that my accountant had done or overlooked. Those errors plus his attitude toward computers led me to get rid of him."

What are these software packages that Pietrosilli found so easy to install and operate? They're the relatively new Systems Plus *Accounting Plus* packages, which Pietrosilli says he found to be bug-free. However, he says he found the first versions of the company's documentation and user manual to be difficult. "The old manual was for computer-oriented people. The new one is written for the layman, and gives specific examples of how to use each function and report. It discusses potential problems and how to resolve them."

Systems Plus' new manual is an attractive and comprehensible volume which gives simple explanations and examples of all the steps that must be followed to use the software.

Ripple effects of computers

Firing his accountant was not the only way Pietrosilli has prospered from computerizing his accounts payable and receivables. Pietrosilli owns two thriving franchises of *TV Facts,* a weekly television guide and advertising circular given away free in grocery and retail stores, restaurants and similar establishments. The circular has a circulation of 30,000 in seven cities in Southern Alameda County, Calif.

In addition, Pietrosilli gives the Systems Plus accounts payable and receivables packages credit for enabling him to buy into two other businesses with his substantial dollar savings. He states that "it would be impossible to do all of this manually without two extra employees. That would be expensive. Even a low-paid clerk earns $900 a month—not including all of the benefits. And clerks send statements and checks to the wrong addresses, make typing errors and so forth. But if I give the correct information to the computer, it stays that way."

Pietrosilli says that with the packages, "I pay bills wisely, collect receivables quickly, and take advantage of more discounts. With the payables package, the computer tells me the exact amount I owe, when it is due and where to send it."

Yet he doesn't do anything special with the payables software and he only has 50 vendors. Many small businessmen believe this number is too small to be worth an investment in a computer and software. And for payables alone, it may be. But Pietrosilli uses all of Systems Plus' accounting packages: Payables combined with general ledger and accounts receivable make a powerful combination.

He can close his franchises' payables on the system as often as he wishes, usually every two or three days, and he prints out and examines the payables reports about twice a week. He posts only once a month.

"I use the audit trails the software provides because they are great for my new accountant. And I use all of the reports the software provides. Most important in payables is the cash-flow report. I look at the age of my payables and how much is going to be due," he explains.

One-two punch

While his payables package lets Pietrosilli guard his cash flow like a hawk, his receivables package—and a smart management technique—helps him keep the cash flowing steadily. "I had been hurt in the past. I had let my receivables slide when we opened a second business. I expected people to send in the money they owed me, but they didn't.

"Then, when I got the computer, I started sending out statements—something we couldn't do manually—and the money started coming in. I improved my receivables by 300 percent in a short time," he says.

He also put a bug in his sales staff's ear with a special aging report generated by the A/R package. With this report "I show the salesmen that 'your people are not paying,' and give them a copy of the report to use to get their customers to pay their receivables," Pietrosilli notes.

Best of all, he has linked a new sales manager's perquisites and bonus to the percentage of accounts receivables which his salesmen collect. "When a man's 'perk' is tied to that, he takes an entirely different look at receivables," he notes.

What has his computer meant to Pietrosilli? "If we had not gone to a computer and these packages, there is no doubt we would have gone under. Receivables would have killed us, and if not that, we would have had to hire a couple of more people we could not have afforded to pay."

four or five times a month. His bills come due at strange times during the month, so the computer allows him to catch some discounts he would otherwise miss. I pay my bills once a month, regardless of the discounts, so an automatic payment feature doesn't mean that much to me."

Edlow must also deal with various payment due dates and variable discounts. His accounting staff enters the invoices each day, and he gets a daily report. "I review a daily precheck writing report, and I check off the list and tell them what I want paid on which days. This is much like our old manual system. I keep track of the bills each day because each may have a different due date.

Of course, running two distinctly different businesses on the same system creates its own problems. Edlow has about 100 vendors for each business, but a large miscellaneous category for "one-off" deals—that is, one-time purchases. And the types of vendors are remarkably different—hotels, tour operators, trucking companies and steamship lines.

As noted, Edlow's A/P package helps him negotiate with carriers, but he says that he chose the A/P to be compatible with the other PROTEGE software for GL, and for his own desire to eventually write or commission his own software for the Prodigy.

From these experiences, it is clear that business owners are finding diverse uses for A/P packages, uses that are not usually given as good reasons to add an A/P package to an accounting system. So, before ignoring A/P for your system, or sticking to its traditional uses, consider how you can use A/P in unusual ways that will strengthen your business and increase your control over your business affairs.

22 packages

The following are capsule reviews of 22 accounts payable packages. These 22 are neither the only, nor necessarily the best, A/P packages on the market. Many more are available for the most popular personal computers and practically every manufacturer has its own A/P program to go with a general accounting series. These 22 represent a broad choice of A/P packages that give a good idea of the types of programs available and their features and functions.

American Business Systems, Inc. offers an advanced A/P package which generates 13 reports and has a sizeable capacity—500 vendors and 1500 open invoices—for a standard dual floppy drive system. It is written

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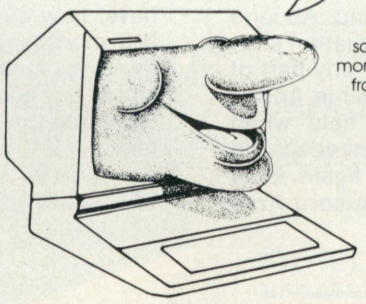
CIRCLE 48

The Voice



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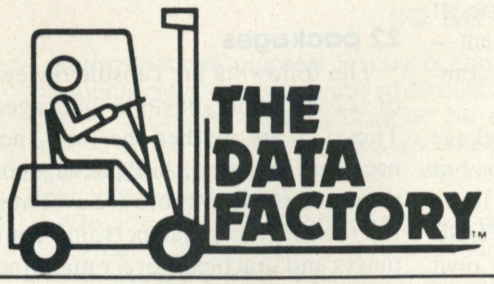
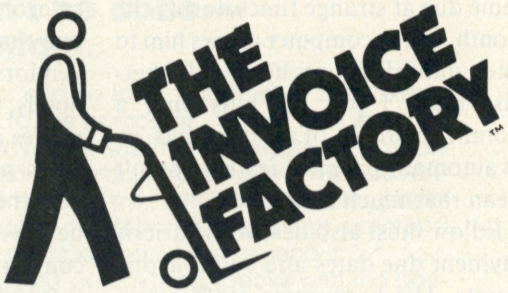
CIRCLE 49





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NEW RECEIVABLE SYSTEM

Use the account data from The Data Factory and transfer it to The Invoice Factory to print invoices, statements, receivable reports, or sales analyses of products quickly, accurately, and effortlessly. With only an account number entry, all pertinent information on an account is automatically before you — shipping address, terms, contact, etc. Choose the product code and enter the amount ordered. Automatically the numbers are extended, tax and handling charges computed and UPS freight rates totaled. An audit trail and product sales analysis is available from the original order entry. You always know how much outstanding money you don't have, how current sales compare to last months, and the total of everything a customer has purchased within any given time period with this complete accounts receivable system.

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CIRCLE 50

in ANSI COBOL and runs on any 64k personal computer with a CRT, printer and floppy or hard disk that runs ANSI COBOL.

The ABS package allocates invoices for up to 10 general ledger accounts, makes sure available discounts can be taken, and provides for operator prompting and data-editing checks to reduce errors. The company has an excellent one-year warranty, but charges $100 for any new version or update.

Business Enhancement Compuservice (BEC) offers a limited A/P function within the Accounting III system for the 32k Commodore business machines. It does have a large capacity—1130 accounts and 1380 invoices per floppy disk—but it maintains a limited amount of information about each account or invoice. It integrates to the BEC General Ledger, prints checks one at a time or by a choice of account numbers, ages and updates the A/P trial balance once a month, and produces statements with service charges added.

Computer Products International will pay open items in two methods—by deferral (all items with specific exceptions are paid) and by selection (each selected item only will be paid). With general ledger, it distributes data against up to nine accounts, and verifies all GL account numbers. It will automatically verify and display a vendor's name after the vendor number is entered, but limits one invoice to a voucher.

The A/P package produces a variety of reports—an aged trial balance, a cash requirements report by a specific due date including any valid or missed discounts, a pre-check writing report which allows adjustments, a check register (also called a cash disbursement journal), a GL distribution report, and a short vendor analysis report. The latter, produced on request, shows the total amount billed, the number of outstanding vouchers per vendor, and the average voucher amount for each vendor.

Computer Systems Design, Inc. has a batch-processed A/P system aimed at contractors because it interacts with GL and a job costing package. It produces eight reports, including an aged A/P list, a transaction edit report (pre-check writing), and a suspended, unpaid A/P report. All of its reports and transactions are done by vendor number, and it has a 74-transaction maximum per batch.

It is a limited package, but is comparatively easy to use. Almost all of the work is done through three files—record transactions, balance transactions and masterfile maintenance. It prints checks with a stub like most other packages.

Cromemco, Inc., offers an A/P package with 15 reports, a capacity of 800 invoices per month with several hundred vendors in each file. It is designed, the company states, for accountants, controllers and those with some accounting knowledge. It calculates cash discounts and finance charges, and handles partial payments and handwritten checks. Users can pay invoices and credit memos by date, or pay all invoices outstanding from a specific vendor. One check will pay and list an unlimited number of invoices and credit memos—an unusual feature.

Cybernetics/Micro Business Systems, Inc. publishes an A/P package originally designed for minicomputers. It runs in Ryan-Mcfarland COBOL and a variety of popular operating systems, including CP/M, OASIS and UNIX. It is an accrual A/P system that produces a variety of reports, incuding a vendor number-file printout as well as an alphabetical listing. It accepts adjustments, credit

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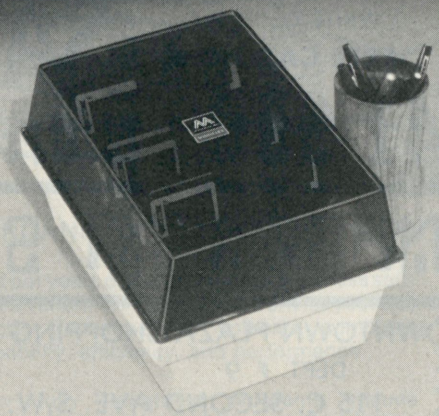
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memos and pre-paid invoices, and will calculate due date, discounts and discount dates, and will use them as default values, but they may be changed as needed.

It automatically interfaces to the MBS General Ledger, but if the automatic feature is not used, each invoice must be distributed through the keyboard. A user can distribute an invoice to an infinite number of GL accounts and the system will verify each account number. Open items are aged either by invoice date or due date, and the user can define the aging periods through a control file. As a whole, this is a sophisticated and capable package.

Designer Software's PALANTIR A/P has an interesting "what if" feature. A "trial payments" report can be run with various invoices to see how much is owed each vendor, and how many weeks are left before payment is due. The package has full-screen data entry with the ability to put both debits and credits into any GL account. It automatically calculates discounts and applies credits to specific items or to an open credit file.

It distributes invoices for up to 20 GL accounts and maintains a full double-entry balance. The company says that with the program, there is no limit to the number of vendors that may be entered, but an eight-inch single-sided, single-density disk is limited to 800 vendors and 500 open items, or some combination of the two.

The A/P package also has a uniquely flexible "inter-company transfer" billing feature in which credits charged within company departments or divisions are charged to the inter-company transfer account rather than to accounts payable. Thus, the transfers become a "wash" in the company's GL. The Palantir A/P is batch-processed with no limit to the number of transactions per batch, and the system is reasonably fast. It takes about half an hour for an experienced operator to enter 50 invoices, verify the transactions, update the open vouchers and carry the batch to the GL.

Only one batch at a time is processed, but everything is always updated all the way to the GL accounts, so the user immediately gets an updated financial statement after each batch is processed.

Graham-Dorian, recently acquired by FMG Corporation, has an "on-line" A/P system that will automatically update the GL whenever a transaction is entered. It has two choices of

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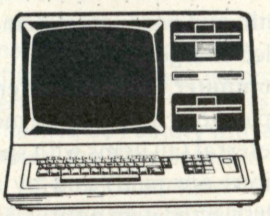

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CIRCLE 52

check writing—by specific vendor for specific invoices or partial payment of a specified amount for each vendor. It will also pay all vendors between two due dates, and will make exceptions for vendors who will not be paid. It has a capacity of 300 vendors and 1000 open items on one eight-inch floppy. But, G-D has not updated its manual which emphasizes computer operations—since 1979. Compared to other menu-driven programs, the G-D manual requires the user to become involved in running the operating system.

International Micro Systems has a full open voucher A/P package which produces seven reports, including an open voucher report and a GL posting report. It runs on CP/M or MP/M with a minimum of 48k. It is designed to keep a year's worth of payables online for small to medium-sized businesses with a capacity of 600 vendors and 5500 vouchers. It will integrate summaries of A/P transactions to a GL.

The IMS A/P places all of its functions on one 16-choice main menu, and also requires extensive user interaction with the package's programs. Its cash requirements report lists weekly requirements for the next five weeks, and another report summarizes year-to-date purchases by vendor.

Micro Architect's A/P is the least expensive package discussed here, and runs on the TRS-80 Model II. It produces a cash requirements report based on discount or due dates, and ages past due payables. It runs with 64k, two disk drives and an 80-column screen. It prints checks, an automatic check register, and a GL transaction register. It does not integrate to GL, however. This is a simple package which provides many of the basic reports that small businesses will want.

Microcomputer Consultants' A/P produces 10 reports, including a daily adjustments report, and lists purchases by category and not by vendor. It also provides a "closed voucher" list and vendor mailing labels—a unique feature for this software house. It automatically calculates discounts, has up to 100 account codes which a user can define, and lets the operator define all of the criteria by which payments are made and checks written.

Microdata Corp.'s RESULTS A/P produces the greatest number of reports—15—because it is based on a more advanced personal computer system. It handles bank reconciliation procedures, which no other package does automatically. It will process a number of divisions or companies at once, and allows the user a choice of several bank accounts to write checks against—a feature sure to appeal to medium-sized businesses with more than one checking account. It allows "keyword" searches of vendor accounts as well. Among its reports are two for bank reconciliation, and one monthly handwritten and voided check summary. It not only integrates to GL, but also to a job cost program.

Microsource's LedgerPlus A/P uses two separate data files, a vendor account and a historical transaction file. It allows for deferred, partial, manual and selected payments. It produces seven reports, and will store up to 550 transactions with 50 vendors before a file purge is required. One of the reports is a history listing of all vouchers on file, and it is the only report that gives information on fully paid vouchers.

North American Software publishes one of the few A/P packages that can handle cash-basis accounting. It handles manual checks and one-time vendors, and allows checks

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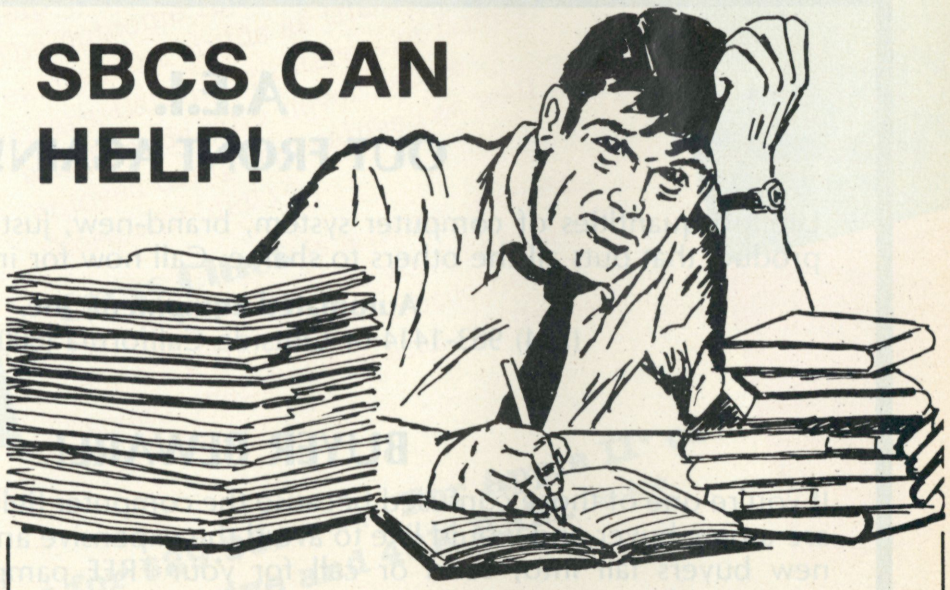

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- numerous report options
- user oriented documentation
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to be written from different bank accounts. It also prevents "negative" checks from being written, using a fail-safe voiding routine. The system will include up to 14 invoices per check and check stub, but voids out any check on the check stub for which more than 14 invoices are printed. A maximum check limit can also be established and posting errors which cause large checks to be printed can be prevented.

North Star ACCPAC payables integrate directly to ACCPAC GL and work with up to three disks and a maximum of 1500 vendors. The user can defer payment or make partial payments by invoice, and can use alphabetic or numeric account codes to produce half a dozen reports.

Its reports include a pre-payment register, an aged cash requirements report, a detailed aged trial balance, and a list of overdue invoices. Vendor lists can be printed alphabetically or by number code.

Peachtree Software (Vector Graphic version) A/P follows the same format as other Peachtree accounting packages, and allows payments by due date, by discount date or within certain cash requirements. It sends monthly journal summaries to Peachtree GL, and produces a variety of standard reports. In this version, it runs on the Vector Graphic MZ, System B or 3030 personal computers with 56k RAM, in Microsoft BASIC with CP/M, and two disk drives with at least 500k of on-line storage.

Prodigy Systems, Inc.'s PROTEGE includes a sophisticated and flexible report generator. The system also automatically generates standard checks, such as rent or insurance. It keeps a complete history file for each vendor and purchase, and allows for several payment methods. It handles handwritten checks and allows instant access to a company's current cash balance. It interfaces, of course, directly to PROTEGE GL.

Radio Shack has recently released an enhanced and more expensive version of its A/P package for a Model II three-drive system that increases the number of vendors and open items the system will process. Its new reports include job distribution (for the beginnings of a job cost system) and bank check reconciliation procedures. It also allows for accrual or cash-basis accounting. Specific vendors may be selected for viewing, or lists may be printed by vendor name or number with a full or abbreviated listing. The user can select specific invoices, and exclude, hold or release invoices that

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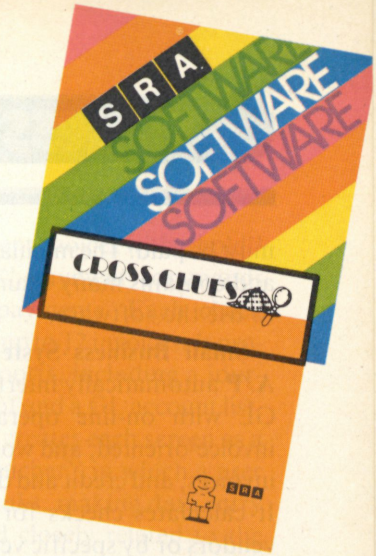

The computer umpires. Two players or teams compete. Uncover the hidden words. The best combination of skill, intellect, timing and luck wins. Appeals to young teens through adults.

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Cross Clues is not a conversion of an existing game. Clues coaxed from the computer help both you and your opponent. The outcome remains in doubt and excitement builds as the finish nears. Catch the interest of family and friends who never before enjoyed computer games (as well as those who did!)

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must be paid. The manual is very clear and contains many examples of how to use the software.

Small Business Systems Group's A/P automatically interfaces with its GL with on-line operations. It is invoice-oriented, and works with new invoices, and credit and debit memos. It calculates checks for a group of vendors or by specific vendors which the user selects. Its five reports include detail and summary open and closed item listing, a debit and credit memo listing, and a vendor list with year-to-date vendor activity. Invoices can be distributed to as many as five GL accounts.

Structured Systems Group publishes an A/P which gives a complete or partial vendor list including each one's payables, and projects cash requirements through a given date—by vendor or invoice date order. It has

ACCOUNTS PAYABLE VENDORS GUIDE

COMPANY	NAME/COST	CONFIGURATION/CAPACITY
American Business Systems 459 Littleton Rd. Westford, MA 01886	Accts. Payable $700–900	Any 64K Z-80 or Z-8000 micro with Ryan McFarland Cobol and RIO, CP/M, OASIS, UNIX or TI DX5 or 10 operating system, and two 8-inch floppies or hard disk. Minimum capacity: 500 vendors; 1500 open invoices; 50 transactions/day with two single-sided, single-density drives. **CIRCLE 190**
Business Enhancement Compuservice 1711 E. Valley Pkwy. Suite 109 Escondido, CA 92027	Accounting III or IV—Accts. Payable/Cost set by dealers	32k PET or CBM 2001-8032, or 2040-4040. 1130 accounts and 1380 invoices per diskette. **CIRCLE 191**
Computer Products International, Inc. 3225 Danny Park Computer Plaza Building Metairie, LA 70002	Accts. Payable Cost N/A	Any 48k CP/M system with CBASIC, and two disk drives. Capacity limited to disk space. **CIRCLE 192**
Computer Systems Design P.O. Box 735 Yakima, WA 98902	Accts. Payable $240 for TRS-80, $410 for Altos, and $520 for IBM versions.	Radio Shack TRS-80 32k, any 48k ALTOS system, and IBM 16k 5110, all with two disk drives. Capacity set by system size. Also new TRS-80 Model III system. **CIRCLE 193**
Cromemco, Inc. 280 Bernardo Ave. Mountain View, CA 94302	Accts. Payable $995	Runs on any Cromemco system with double-sided, double-density mini- or regular floppies. Capacity: hundreds of vendors and thousands of invoices per disk. **CIRCLE 194**

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HARD DISK DRIVE & CONTROLLER $5995. Second User $595.
HSDS Software $400. (Note: HSDS now also available for CORVUS drives!!)

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Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) **Mod I & III $30.00**
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, −, *, /. Binary search of sorted and unsorted arrays. Hash codes.

BASIC CROSS REFERENCE UTILITY (Mod II 64K) **$50.00**
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

DSM **Mod I $75.00, Mod II $150.00, Mod III $90.00**
Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort specification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — improved disk I/O times make this the fastest Disk Sort/Merge available on your TRS.
(Mod I Min 32K 2-drive system. Mod II 64K 1-drive. Mod III 32K 1-drive)

GSF (Mod I & III Tape or Disk - Specify Memory Size)
Mod I $25; Mod II $50; Mod III $30
Generalized Subroutine Facilities. The STANDARD against which all other sorts are compared! And then compare prices! Machine language — fast and powerful! Multi-key multi-variable and multi-key character string. Zero and move arrays. Mod II includes USR PEEKS and POKES. Includes sample programs.

DISCAT (32K 1-drive Min) **Mod I, III $50.00**
This comprehensive Diskette Cataloguing/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space.

KFS-80 (1-drive 32K Min — Mod II 64K) **Mod I, III $100.00; Mod II $175.00**
The keyed file system provides keyed and sequential access to multiple files. Provides the programmer with a powerful disk handling facility for development of data base applications. Binary tree index system provides rapid access to file records.

MAILLIST (1-drive 32K Min - Mod II 64K) **Mod I, III $75.00; Mod II $150.00**
This ISAM-based maillist minimizes disk access times. Four keys — no separate sorting. Supports 9-digit zip code and 3-digit state code. Up to 30 attributes. Mask and query selection. Record access times under 4 seconds!!

COMPROC (Mod I & Mod III — Disk only) **Mod I $20; Mod III $30**
Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, No. of FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver software, debounce and screenprint!

UTILITY PACKAGE (Mod II 64K) **$150.00**
Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and SUPERZAP are used to reconstruct or recover date from bad diskettes! XCOPY provides multi-file copies, 'Wild-card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette include track-0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

DEVELOPMENT PACKAGE (Mod II 64K) **$125.00**
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ACCOUNTS PAYABLE VENDORS GUIDE

COMPANY	NAME/COST	CONFIGURATION/CAPACITY
Cybernetics, Inc. 8041 Newman Ave. Suite 208 Huntington Beach, CA 92647	Accts. Payable/ $1000 for one license by dealer.	Any 64k system with RM/COBOL and OASIS, CP/M, MP/M and UNIX with 132-col. printer and 3 floppies with 500k each, or 2 floppies with 1 Mb each. **CIRCLE 195**
Design Software 3400 Montrose Blvd. Suite 718 Houston, TX 77006	Palantir A/P $850	Any 48k CP/M system with two disk drives or hard disk and Microsoft COBOL-80. Capacity depends on disk size. **CIRCLE 196**
Graham-Dorian Software P.O. Box 16355 Fort Worth, TX 76133	Accts. Payable $805	48k CP/M with two floppy disk drives. Up to 300 vendors and 1000 open invoices on one 8-inch floppy. **CIRCLE 197**
International Micro Systems, Inc. 8425 Quivira Rd. Lenexa, KS 66215	Accts. Payable $795	48k CP/M or MP/M systems with dual floppies or hard disk and CBASIC 2. 500k recommended. Maximum capacity of 600 vendors and 5500 vouchers. **CIRCLE 198**
Micro Architect 96 Dothan St. Arlington, MA 02174	AP (Accts. Payable) $129	TRS-80 Model II, 64k, two disk drives and TRSDOS version 2.0. **CIRCLE 233**
Microcomputer Consultants P.O. Box T Davis, CA 95617	Accts. Payable/ $600	Any 56k 808/8085/Z80 micro with CP/M version 2.2, two 8-inch floppies with 132-column printer and CRT with addressable cursor. **CIRCLE 234**
Microdata Corp. P.O. Box 19501 Irvine, CA 92713	RESULTS Accts. Payable Price N/A	Runs only on Microdata REALITY computers. **CIRCLE 235**
Microsource 1425 West 12th Pl. Tempe, AZ 85281	LedgerPlus Accts. Payable/ Price dealer set	48k Apple, Vector Graphic or TRS-80 with Micropolis disk drive, VDT, dot matrix printer. Capacity: Set by disk size and density, such as 50 vendors and 550 transactions, or 300 vendors and 300 transactions. **CIRCLE 236**
North American Software 677 Craig Rd. Suite 202 St. Louis, MO 63141	Accts. Payable/ $850	TRS-80 Model II, 64k, four disk drives with TRSDOS. 2900 vendors; 900 open vouchers; 2000 open checks. **CIRCLE 237**
North Star Computers 14440 Catalina St. San Leandro, CA 94577	ACCPAC Accts. Payable Cost N/A	North Star Horizon, 48k, dual floppies or hard disk. Up to 1500 vendors depending on configuration. **CIRCLE 238**
Peachtree Software Vector Graphic, Inc. 31364 Via Colinas Westlake Village, CA 91362	Peachtree Software Accts. Payable (Vector Graphic version) $995.	CP/M 2.2 version, 56k RAM, Vectro Graphic MZ, 3030, System 2600, System 3005, System 5005, System B microcomputer, and Microsoft Disk BASIC. 600 vendors per diskette. **CIRCLE 239**
Prodigy Systems, Inc. 497 Lincoln Hwy. Iselin, NJ 08830	PROTEGE AP Cost part of system config- uration.	PRODIGY computers only. 64k Z80A based with two floppies and PROTEGE OS. **CIRCLE 240**
Radio Shack One Tandy Center Fort Worth, TX 77062 (or any Computer Center)	Accts. Payable $499	64k TRS-80 Model II with three floppy disks and Line Printer III. Capacity: 1000 vendors; 2000 open items; 2000 GL distributions; and 1000 open checks. **CIRCLE 241**
Small Business Systems Group Six Carlisle Rd. Westford, MA 01886	Accts. Payable/ Price N/A	For TRS-80 Models I, II and III, and Altos micros with two floppies. **CIRCLE 242**
Structured Systems Group 5204 Claremont Oakland, CA 94618	Accts. Payable $820	Any 8080- or Z-80-based, with 56k RAM, with CP/M, dual floppies; 132-column printer. Capacity: 1000 vendors; 200 ledger accounts; and up to 1000 transactions on a two-drive, single density system. **CIRCLE 243**
Systems Plus 3975 East Bayshore Palo Alto, CA 94303	AccountingPlus II Accts. Payable $425	Apple II Plus or II with firmware card, 48k, dual drives, and 80- or 132-column printer. Also Corvus hard disk. Up to 10,000 vendors. Compatible with CP/M, MP/M and CDOS as well. **CIRCLE 244**
VANDATA 17541 Stone Ave. North Seattle, WA 98133	Accts. Payable $295	Any 8080, 8085, or Z-80 system with 48k; one double-density floppy or three mini-floppies for the best results; 132-column printer; and CP/M and CBASIC 2 Version 2.5 or later. Osborne-based with significant changes. Capacity governed by disk size and density. **CIRCLE 245**

flexible payment choices with "hold" and "release" payment commands and partial payments. Each check stub will hold up to 12 invoices. It produces nine reports, including a journal batch proof and a GL account list. The program creates each screen as a "facsimile voucher" in which a user fills in the blanks, making data entry very easy and closely related to the resulting printout. It also includes a set of defaults so a user can skip through the unneeded questions.

Systems Plus' Accounting Plus II software is an on-line A/P package that automatically posts to GL accounts and maintains up to 10,000 vendors—far more than most people will ever need. It allows for partial payment and payment to the oldest invoice, which few others provide. It will automatically pay regular invoices, such as rent, and post them to GL. It produces seven reports, including an open voucher list.

VANDATA A/P is an Osborne-based system that handles invoices, credit and debit memos, prepaid invoices and manual checks. The company has recently rewritten the Osborne manuals and made them much easier to work with. The user can set up as many as four aging periods, or use standard defaults, which automatically post to GL. It produces eight reports, including six variations of a detail or summary transactions list that includes—new invoices only, modified or deleted transactions only, or new credit or debit memos. An update report includes errors, a summary and GL postings.

As a whole, these 22 packages provide something for every business which can benefit from a personal computer. Not everyone makes a living hauling radioactive waste as Jack Edlow does, but with a good accounts payable package, every business can stop wasting money. After all, what business can afford to ignore their "hot" bills?

Custom vs. canned software: what do you need?

Will off-the-shelf software suit your purpose or are your needs unique enough to warrant a major investment in custom-made software?

You've decided to computerize your business. You know you're going to get a versatile personal computer, but what software should you get—canned software, modular software or custom software?

"Canned" software is prewritten, mass-market software usually available nationwide from computer stores and other sources. It's been developed by numerous software vendors for the usual business-acounting functions (general ledger, accounts receivable, accounts payable, payroll) and for specific applications such as CPA client write-up, legal time and billing, medical/dental billing, real estate management and job costing.

"Modular" software is a programming tool that enables persons with

limited programming skills to develop useful computer programs with a minimum of effort. It includes financial planning and budgeting tools such as VisiCalc and Desktop Plan, information management and database management tools such as DB Master and Condor DBMS Series 20, file management and data-manipulation tools such as Prism and FMS-80, and language extensions and program generators such as Magsam and Pearl. Modular software represents a new generation of programming tools now available on personal computers.

"Custom" software is software programmed to your specifications by an experienced data processing person. The custom programmer is usually contracted to automate some or all of the highly-specialized business functions that must be performed. Custom programming is usually undertaken only when it has been determined that the necessary software does not exist.

Analyze for complexity

The most important step in the software purchase decision-making process is to analyze in detail the functions you wish to computerize. The complete set of functions, once determined, is called "the application." The complexity and uniqueness of the application will probably be the single most important factor in determining whether canned, modular or custom software should be purchased.

The experience of Tom Madine illustrates this point. Madine owns TSC Graphics, a small but thriving mail-order photography business in Columbus, Ohio.

His employees go around the country and photograph runners in long distance marathons. They then mail the runner a proof of the photo, in hopes that the runner will order from the proof. "We get a fair number of orders. They are complex because they differ in nature, amount and place of origin. The orders are small—$10 or $12. I wanted to get a computer to mechanize the order tracking when we had a substantial increase in order quantity."

Madine's original business procedure included a great deal of mechanical alphabetizing, numbering, sorting and re-sorting. He would then have to pay a typist to handle address labels.

Madine found himself needing a lot of aspirin—and a personal computer. "I did a lot of shopping. I talked to

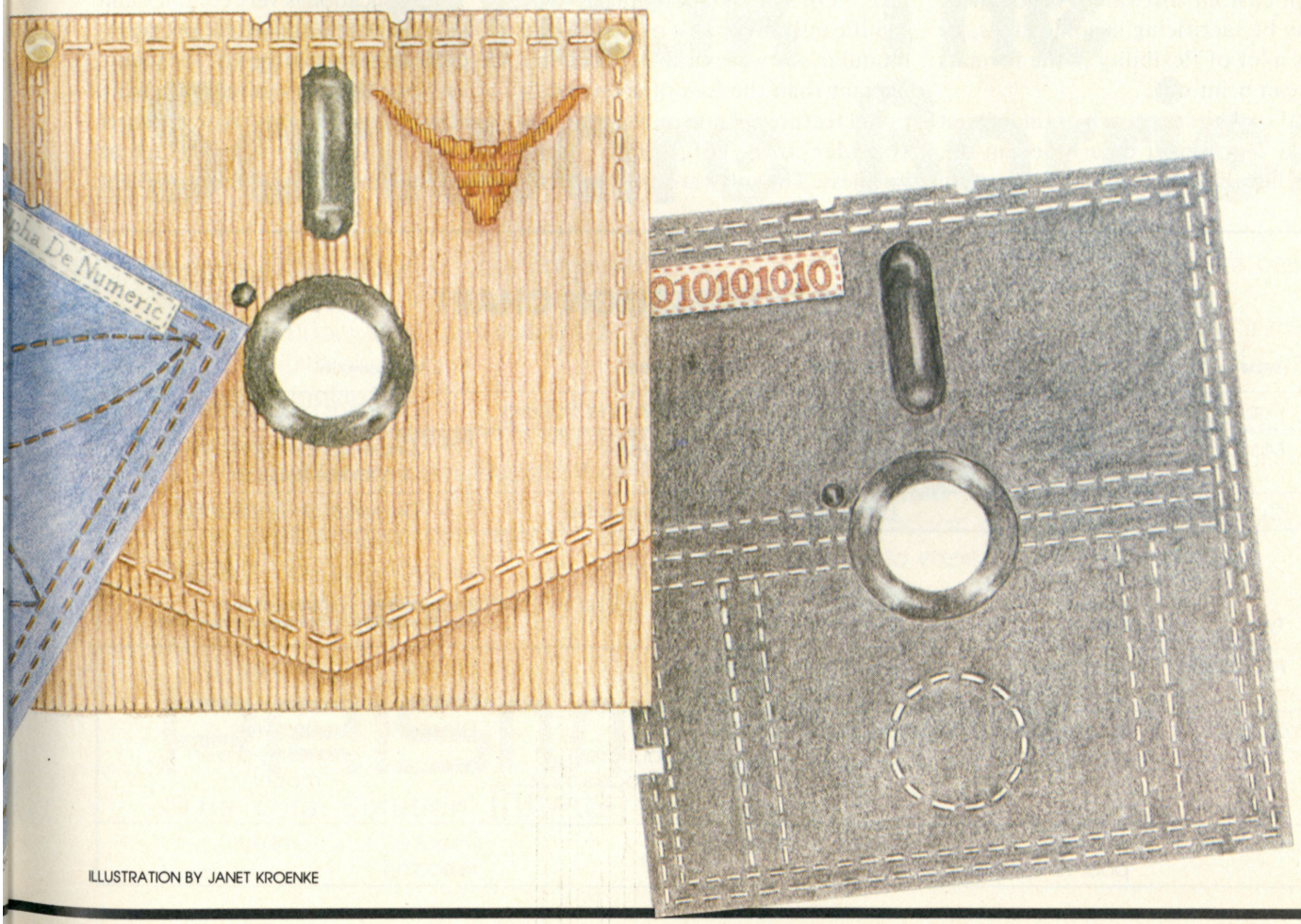


ILLUSTRATION BY JANET KROENKE

a number of independent computer dealers and I decided on MicroAge. My goal was to have the system on line and keeping track of orders as soon as possible. The MicroAge people sat down with me and discussed the application. They asked a lot of probing questions and then they recommended a database which worked very well—except I wasn't able to handle large numbers of orders. It was very slow in the sort and I had some printout formatting problems. I explained the problem to MicroAge and they had me try Stoneware's DB Master. It's a lot more powerful in handling multi-disk applications. The computer was paying for itself in two weeks.

Madine's computer solution—canned software—worked for his applications since he was not prepared to go through a debugging process with custom software. Although he may be sacrificing in some areas, he has a lot of flexibility in the formats he can print out.

"I took the approach of finding out what a powerful data base can do, and how I could adapt my application to it. The payoff for me was that I was operational very quickly. I specified what I wanted done, and then I researched what existed. There's a tradeoff. It doesn't do everything for me. For instance, if I got a credit card order, it would be nice if the machine automatically printed up the credit card slip. I'm sure a custom programmer would do it."

Points to ponder

Second only in importance to the complexity of your application are the factors of cost and development time. The total system cost must fit your budget. It must also be operational within a specific time period, determined by your business expectations.

There will be some trade-offs. Unless the software is custom programmed for you, it may not have all the features and functions you would like. On the other hand, the significantly lower cost of canned and modular software may be more important than the loss of a few additional features. And you must always consider the evolution of your business. The software must be flexible enough so it can adapt to your projected growth.

Four applications

Analysis of your business is the most important step toward computerizing it. *How complex is your application? How unique is it?* If you can answer these two questions, you will be well on your way toward a solution.

There are four situations that arise which require different kinds of software solutions:

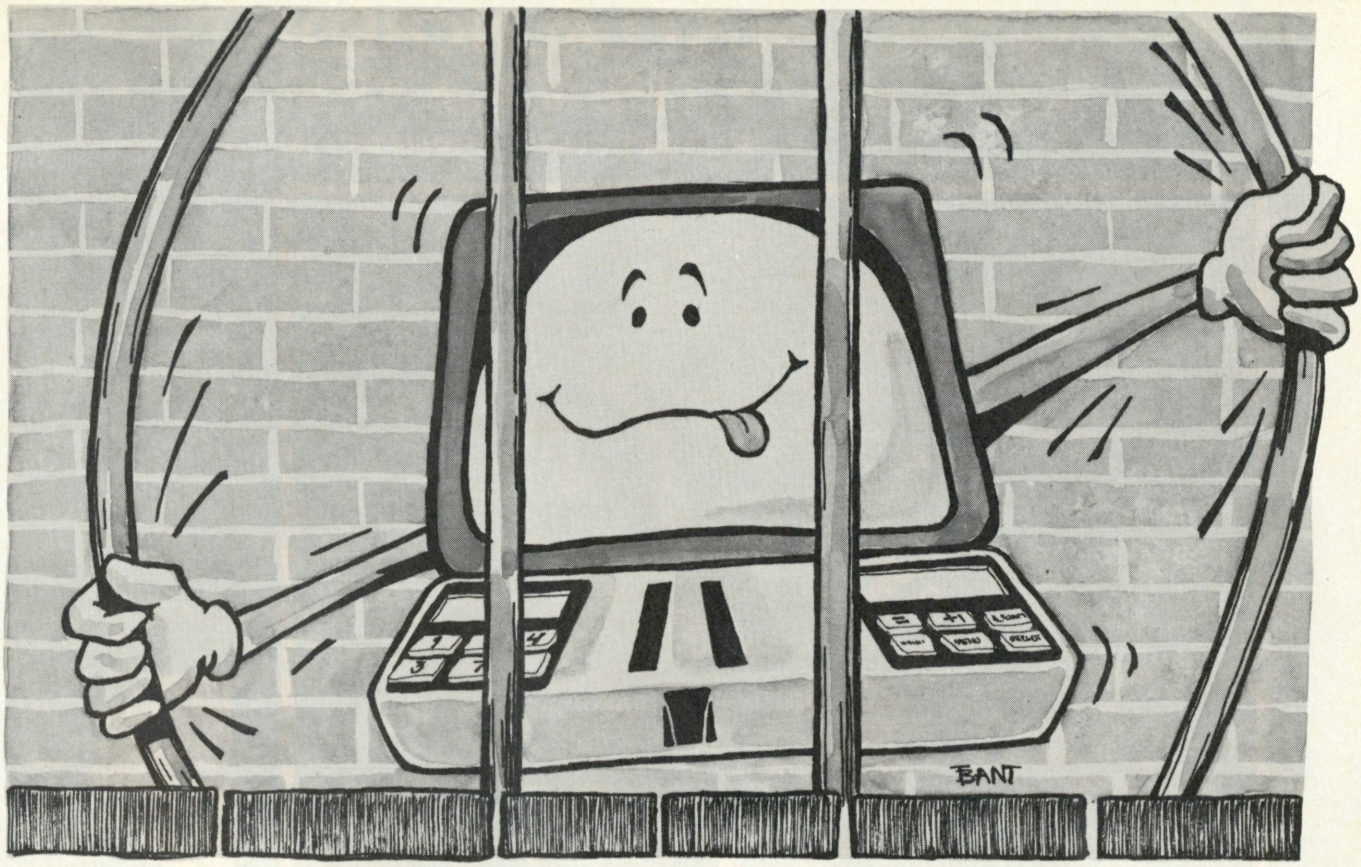
- The application is simple and common. Use canned software.
- The application is simple and unique. Use modular software and do it yourself.
- The application is fairly complex and unique. Use modular software and hire a competent programmer to use it.
- The application is very complex and unique. Hire a competent programmer to custom program for you.

Is your industry already heavily computerized? Is it a favorite target market of software houses (such as medical care or accountant-client

SOFTWARE COMPARISON CHART

Type	Cost	Suitability	Develop time	Complexity
Packaged	Low	Moderate	Installation and training	Depends on application
Modular	Intermediate	Good	Days or weeks	Depends on ingenuity of model designer
Custom	High	Excellent	Weeks or months	Depends on application

Type	Vendor Support	Vendor Stability	Product Bugs	Adaptability and Flexibility	Ease of use for novice operator
Packaged	By phone usually good	Good	Usually well debugged	Limited	Turnkey
Modular	By phone usually good	Good	Usually well debugged but user developed models may contain flaws	Excellent	Requires menu-driven model
Custom	In person poor to excellent	Varies	Unknown	Requires recoding	Turnkey



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Micro Applications Group, 7300 Caldus Avenue, Van Nuys, California 91406, (213) 881-8076.

PRISM requires CP/M and CBASIC. (CP/M is a registered trademark of Digital Research. CBASIC is a trademark of Complier Systems.)

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VOYAGE OF THE VALKYRIE
BY LEO CHRISTOPHERSON

The ancient Norse lords bravely sailed their ships across new waters in search of adventure. No obstacle was too great to overcome nor any force powerful enough to prevent their mighty advance. ■ Now you're in command. You are the pilot of the attack ship Valkyrie. Your mission: to wrestle the island Fugloy from the grasp of an army of laser-wielding war birds and secure the golden treasures hidden within the walls of the island castles. Success of the mission depends solely upon you. The castle Drage appears on the horizon when suddenly the air is alive with the flutter of giant wings. Your prize is in sight . . . do you dare accept the challenge and go on? ■ You can put yourself at the controls of the Valkyrie thanks to the genius of Leo Christopherson and the versatility of the *TRS-80 microcomputer. As absolutely flickerless birds sail smoothly across the screen, strains of Wagner's "Ride of the Valkyries" are heard. The game offers 10 levels of difficulty which provide a challenge for players of all ages and skills. The game also provides one of the finest examples of computer cartoon-graphics presently available. Accept the challenge of the Voyage of the Valkyrie . . . available now at leading software retailers.

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bookkeeping)? If it is you can probably find what you want in a canned off-the-shelf software package for low cost at your local computer store.

The key is knowing *exactly* what the computer needs to accomplish. If the application is simple and common, look for a reputable canned software package. Such a product may not exactly fit what you need, but it may be sufficiently close that you can adapt your business to it.

But canned software is generally not "customizable," and this can be a drawback if you need to make changes. The software vendor invariably refuses to support a product if it is modified by unauthorized persons. The warranty will be voided. In some instances the software vendor supplies the original programming source code to authorized dealers, who are allowed to modify the package to suit individual customer needs. But such authorized dealers also must assume all product support and cannot rely on help from the vendor in case they make programming errors.

Most (but not all) mass-market software vendors will not rewrite their software to suit you because they are too busy developing enhancements to existing products to broaden their market. But your feedback will frequently result in the features you desire being implemented in future releases of the canned software. Yet the timeframe for those changes generally is not soon enough to be convenient for you.

On the other hand

Custom software, if done by a competent programmer, can wind up being exactly what you want. However, it is usually very expensive and takes a long time to debug. You may be able to benefit by finding someone who already paid for development of the same application if he puts you in contact with the programmer. Numerous software companies started this way—some customer paid for custom software, and the company then generalized it and began selling the package to others in the same industry.

And modular software is an emerging force in the personal-computer software market. These tools, in the hands of someone who has analyzed his business and knows exactly what he wants the computer to do for him, can shorten development time and minimize debugging efforts. The end result is apt to be so close to the desired result that the savings in time and effort is enormous.

Advice from a pro

Fred Keller, sales manager at Computerland in Dallas, Texas, matches people and the software they need: "Our approach is that we don't handle any custom software sales. We only sell hardware and off-the-shelf software. Most of our programs are the 'Big Five' (general ledger, accounts receivable, accounts payable, payroll, inventory), in conjunction with word processing and financial planners like VisiCalc or data base managers.

"This forms a good nucleus for small systems such as Apple or Commodore—under $12,000 systems. FMS-80 typically goes into hard-disk systems from $15,000 up. For specialized applications, we have a group of custom programmers that we refer people to. We pass them resumes and they contact the programmer they want.

"We are now seeing people (larger corporations with in-house programming staff) in the $15,000 to $40,000 system range creating their own programs (using modular software). But the average user has to go outside his company to get the programming expertise. People can understand the custom approach, but they cannot fathom spending $5000 on software customizing. On mainframes, the software is usually a larger percentage than the hardware cost, but in the personal computer field people still don't understand that.

Buyer beware

"There are hidden costs in custom programming that people often are not aware of " says Keller. "First, there is the price to the consultant—often $25 to $50 per hour. Second, which is not seen, is the time it takes the programmer to learn exactly what you want. Third, is your time to educate him. This is the real kicker: *it takes somebody to teach the programmer what to do.*"

Keller sees similar difficulties with modular software. "With semi-custom (modular) software, it is almost the same problem. It still involves the programmer's learning curve and the time to teach him. But it does save on programming time. Only with off-the-shelf software do you get economy of scale. In terms of price ratios, off-the-shelf software is about half or less than semi-custom software, and one-tenth the cost of a full custom job. Custom software worth $10,000 on a $5000 personal computer doesn't make sense, although the business does get a tax write-off for the expense."

You, a programmer?

William T. Rice owns Yachting Tableware in Wilmington, Delaware. He is the world's only manufacturer of non-skid dishes for boats. The company has dealers on both coasts, an inventory of 300 to 400 parts, and 60 product offerings. Although it is not a large company by international standards, it processes approximately 800 orders a month from around the world. Needless to say, they have some unique computer needs.

"I became very interested in doing my program, so for two years my hobby occupied Saturdays, Sundays and nights. I started out with the payroll program, and I did that one

without Magsam. In the fall of 1979, I came onto this Magsam program (a modular set of subprograms to automate sophisticated indexed access and manipulation of data files), and of course it's been an absolute godsend.

You manipulator, you

"So with CBASIC2 and Magsam, I did all of it. I've got my mailing lists, price lists, invoice printing and inventory posting. Everything is in Magsam files, which reduce the programming way, way down. All I have to do is manipulate a little bit of data, and put it into these Magsam files. They've been extremely reliable. Both my secretary and I use the system—we've had it up in the plant here since last winter."

Rice believes that programs ought to be written for an individual business. "Don't go with this canned stuff. But don't pay a programmer to do custom programming from scratch, either. Give him a package like Magsam and have him do exactly what you want. I think that's the way to go. My screen says 'What kind of dishes do you want?' and the whole thing is tailored for us. I didn't have to change the way I do business. I made those screens look pretty much like our invoices.

"If I had to have a custom programmer do the whole thing, it would have cost $15,000 to $20,000 for me to get exactly what I wanted. But, Yachting Tableware can't afford that."

A general recommendation from Rice is for most people to buy the software first. "Forget the hardware. Hardware is the last thing to worry about. The first thing is to find the software person, and then let him guide you into the hardware that adapts to his software. All of the customized external interfacing and screens should be adapted to the individual company and individual owner's concept of how the data should be printed out. Therein lies the future of the small-business computer."

What do you want?

Paul McGuckin of Sacramento, California had virtually no exposure to personal computers when he began to set up a relational data base to provide budgeting information for the Central California Newspaper Guild. He developed his applications with the Condor Series 20 Level 1 Data Base Management System, and found it to be powerful and easy for the novice programmer to use. He found

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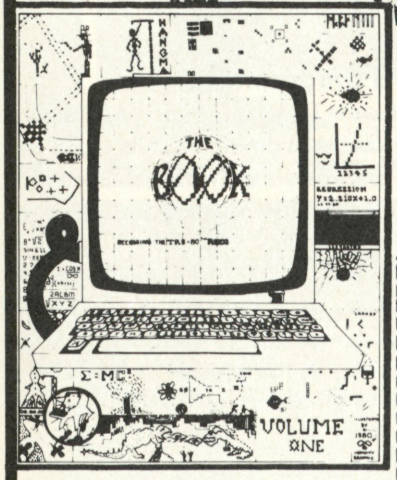

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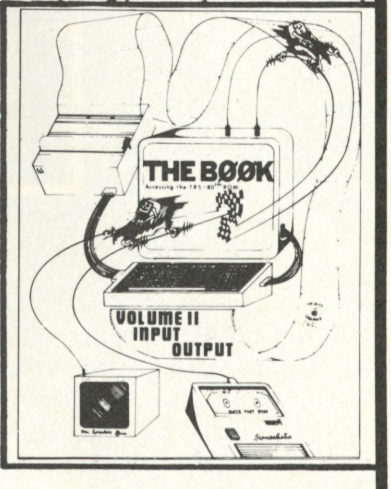

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that the hard part was not getting the software to do the job. The hard part was asking everybody what they wanted it to do.

"I think someone with a rudimentary knowledge of what they want, along with some familiarity with computer language, could come up with some good applications in about a week. If they sat down with it and went through the instruction manual, read about the commands, thought about what they wanted it to do, they could sit down and write the code. The Condor syntax is relatively straightforward.

"Using the Condor commands in sequence, the system performs computations without further intervention. There are menus to choose and processes to set up. Each month's activity is entered into the accounts and the system then compares the budget to the actual expenses for the month. . . . The union governing board now knows where they stand in relation to where they stood. The system is also used for tracking dues of the members of the labor union. They used to keep a file card on each member, showing how his dues had been split.

"We didn't have the budget for a custom programmer. We had $9200 for hardware, software, everything. Custom programming would have been impossible given the budget and the time-consuming debugging that would have been necessary. The development time using modular software is short, if you know what you want."

Program generators

Wayne Lichti of Long Beach, California, already had some computer programming experience when someone told him about Pearl. He had just been requested to put together a membership and tithing system for North Long Beach Brethren Church, so he decided to try out Pearl (Level 3) in this application. Pearl is used to generate error-free program source code in the CBASIC2 language for the application, which is designed in detail using Pearl program-generation functions.

Lichti states that "the system does integrated membership of branches of the church, statements of what money has been contributed and by whom. The church wanted to organize 3000 members. I had a choice of doing the system from scratch or finding a canned package. I could not find anything that I wanted. To develop the application from scratch would have required hiring an outside programmer. It would have taken two to

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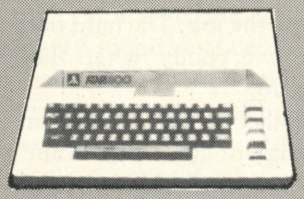

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three months and probably would have cost $2000 to $3000.

"Pearl did not give me exactly what I wanted, but it was close enough. The system is still evolving. If changes are needed, I make the changes and just regenerate the programs."

Lichti is currently putting the finishing touches on a specialized inventory system for Harbor Truck Services diesel-repair company in Long Beach. The inventory consists of 2000 items, but the part-numbering sequence is unusual in that different suppliers refer to standard parts with the same numeric part number and different alphabetic prefixes. Nothing was available in canned software with such unique requirements, so Lichti used Pearl to set up the entire system.

Costing solution

Don Kaye, owner of the Kaye Corporation of San Jose, California, had no previous experience with computers when he purchased an Altos computer with the FMS-80 File Maintenance System and Accounting Plus accounting software. He needed the system to solve the complexity of the construction job-costing system he developed for his real estate development business. He had surveyed the canned software available for his personal computer (which now includes a 20 Mbyte Corvus hard-disk drive), and could not find a job-costing system with the capability of tracking and comparing both his bank's budget and his own committed cost budget.

So over a six month period, and with considerable effort on the part of custom programmers, he created a system that now makes him mega-bucks.

A construction contractor relies on his bank for a construction loan on a given project. In return he must adhere to a set budget and timetable agreed upon with the bank. If there are cost overruns, he is in trouble with the bank. However, the contractor usually subcontracts parts of the job after he has the budget. This is called his "committed cost." By subcontracting under his budget and watching costs and completion times carefully, he comes in under the bank's budget, and on time. He also has a greater margin for error, and a greater margin for potential profitability. The shrewd contractor can increase his profitability by measuring his productivity against his committed cost to his subcontractors instead of measuring against his bank's budget.

Kaye ended up having experience with all three kinds of software, and has a unique perspective to share: "I was not familiar with computers before, although I did have a degree in electrical engineering. I wanted a job-costing system. I was told FMS-80 and Accounting Plus could be interfaced to provide exactly what I needed in a matter of a few hours.

"I spent a month coming up to speed on the FMS-80, and I think it is a terrific system. A professional programmer did the FMS-80 part of it, and it does the job costing completely now. It's now seven months later, and I now write my own reports with it. The interface with FMS-80 and accounts payable is extremely complicated. However, I was fortunate in being able to get some top-notch people who really know their stuff.

"In retrospect, the entire system should have been done in FMS-80. But what would have needed to be done in that case was to generate the total general ledger and accounts payable package, which probably would have cost more than $2000. The people who bid the programming job didn't know how complicated it was going to be. They gave me a fixed price bid of $1500, but they should have bid it at $3000 if they had known how much work it was going to be.

"The computer has been unbelievable. Yes, I've spent a lot of time with it, but the knowledge I've gained as a result will make me tons more money.

"I've got a $3 million project going right now, which only requires about two to three hours a week of my time, whereas before, on other projects that I've developed, they've taken three to four days and a couple of other people to do the amount of paperwork.

Kaye generates five reports. "The first one gives me my cost breakdowns, either pending or paid, the amount previously reported, the amount of the budget and all percentages. I can send this report to the bank as a report on where I'm at all the time. The second report shows what the total budget was that the bank and I agreed to and what was on the first report. I haven't necessarily gotten (sub-) contracts yet, so hopefully I might be able to save some money . . . What I'll have then is a variance of committed cost and a variance to the budget I agreed to with the bank. The third report is a breakdown of vendor costs. The other two reports are complete detail summary reports of all vouchers, month-by-month and vendor-by-vendor. I can clearly see where I am at any instant in time. There's no way a job can get out of hand.

"I can sleep nights because I know exactly where I am, and if we start to go over budget on any particular project, I can nail it down immediately. If I didn't have FMS-80 it would have been a mess. Frankly, that particular canned system really does have general-purpose versatility, especially since you can program in it. That's a key factor.

"Without having a technical background, I had a lot of difficulty explaining to my programmer exactly what I needed, and what I got wasn't exactly what I wanted so I had to make a modification. But it has allowed me to make a lot of money with very little time. I could run about three to four projects right now."

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BUSINESS COMPUTING

Data banks

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The base forecasts key economic indicators such as federal fund rates, consumer price index, money supply, unemployment rate and retail sales. This forecast is based on a weekly survey of economists and money-market dealers.

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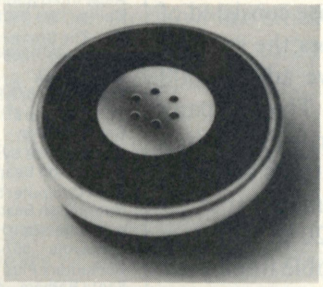

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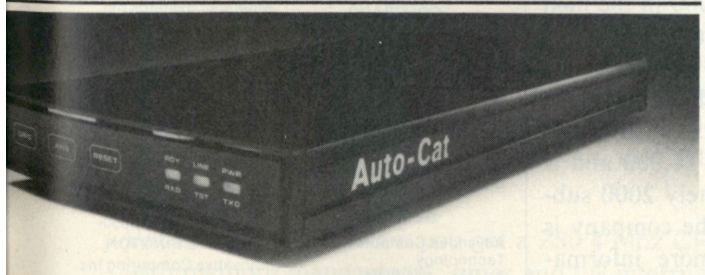

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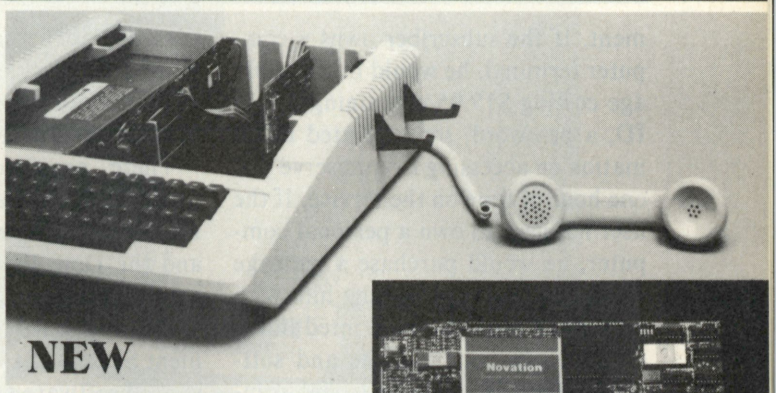

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CIRCLE 64

ment. If the subscriber owns a computer terminal, he would buy a package costing $19.95 containing a user ID, a password, some printed information on accessing Compuserve and one hour of time on the service. If the user happens to own a personal computer, he would purchase a package that costs $29.95 providing him with a user ID, a password, printed information, one hour of time and software that allows the personal computer to "talk" to the Compuserve network of information.

After purchasing the appropriate package, the subscriber uses his one hour of time and from then on is charged $5 per hour in non-prime-time service (6 p.m. to 5 a.m. weekdays, all day Saturday, Sunday and holidays). Prime time ($22.50 per hour) is from 5 a.m. to 6 p.m. during the week.

To subscribe to The Source, the user must pay a one-time hook-up fee of $100 which entitles him to a user manual, a directory of available information, private identification numbers, a subscription to *Source World* magazine and other newsletters which will keep him updated on what is happening with The Source. This data bank also has a $10 minimum monthly fee.

Rates for using The Source are $15 per hour from 7 a.m. to 6 p.m. weekdays, $4.25 per hour from 6 p.m. to midnight and $2.75 per hour from midnight to 7 a.m. Weekends and holidays cost $4.25 per hour all day.

"Almost all personal computers can access our service by putting the computer into straight terminal mode. So, all they would need to do is call up, get a $50 password from us and they are off and running," says Fleck of Dow Jones. The service can also be accessed through software which includes the one-time $50 fee.

Dow Jones has compatible software for the Radio Shack line of personal computers, Apple II, Commodore and Atari computers. Along with the fee, the software also entitles the subscriber to a free hour of time on the service as well as easy-to-understand user materials describing how to use the data bank.

There are two Apple software products available—The Dow Jones News and Quotes Reporter ($95) and the Dow Jones Portfolio Evaluator ($50). The Commodore system, the Dow Jones Portfolio Management System ($149.95), is a very advanced software system that accesses all Dow Jones data bases including new ones that are added after the software is purchased. The Dow Jones Investment Evaluator ($99), is a product for the Atari personal computer and will be available this fall. The Atari Telelink cartridge, a fairly basic package that puts the Atari terminal into straight terminal mode, retails for $29.95. The Radio Shack product line consists of a package that offers the subscriber a password alone ($19.95) and one that includes a tape cassette ($429.95).

As of this past August, Compuserve's subscriber base consisted of 12,000 customers across the country and by fall it will have added 2000 more names to its list. The company is also placing a priority on adding information providers to its service.

The Source has estimated that its market is growing at 20 percent per year and it hopes to double its current subscriber base of 10,000 in the next year. The company would also like its growth to continue at that pace and match the growth of the industry.

The Dow Jones service currently has a customer list of 21,000 and is growing at approximately 2000 subscribers per month. The company is increasingly adding more information bases aimed at the consumer market and in the near future hopes to add a general wire service, a purchasing service and video games to its bank.

Predicting the impossible is easy. So is criticizing. But now that the impossibility is a reality, the scoffing has stopped.

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OUTLOOK

continued from page 19

prints out all personnel who are supposed to report to the ship, who is overdue to report, whether the ship knows where they are, and whether or not a message has been sent to find them. The computer keeps track of on-board personnel by keeping track of where they sleep. In this manner it is easy to see if and where a space is open for a new man.

The basic elements of the system consist of two 64k TRS-80 Model IIs with two disk expansion units, a Racet hard-soft disk system, an M200 dot matrix printer, and an ESCON interface for an IBM selectric typewriter. And they have been expanding the system during the past year and a half that it has been on the ship. The system uses hard disks to store large quantities of information, and uses floppies as back-up.

The system faces many environmental conditions that most personal computers do not have to deal with, but it has withstood all the problems. Not many personal computers spend a month or two in the middle of the Indian Ocean with rough seas, 90 degree temperatures and high humidity. "In heavy seas, the computer table itself has moved," says Woodruff. "When it gets rocky you get a little bouncing up and down, and when you have catapult-shots of aircraft across the holding, the table will suddenly move a half-inch. It gets rough, but the system has stood up to it."

Another environmental hazard that the computer must bear is the dirt that settles from the heavy traffic on the flight deck above the computer. "We get enough dirt in the computer room to fill up a dust pan every day," says Woodruff. Excessive dirt will destroy disks, so a piece of scotchfoam and a prefilter were installed, and the filters are keeping the amount of dirt in check.

Woodruff says that the system is in use 18 to 24 hours every day, and it has only broken down once—and then only a day's work was lost when the power source was interrupted. "The most we would ever lose would be one day's work, because the operator cannot start a new day without backing-up the data base. The worst we were ever put back was 24 hours, and we only lost one address and one phone number. Out of 4500 records, that's not bad. We recovered that information by simply referring to the previous day."

One piece of advice that Woodruff gives to businesses is to develop their own programs if possible. He looked at some commercially available database management software programs, but they did not meet his needs. So he developed his own pro-

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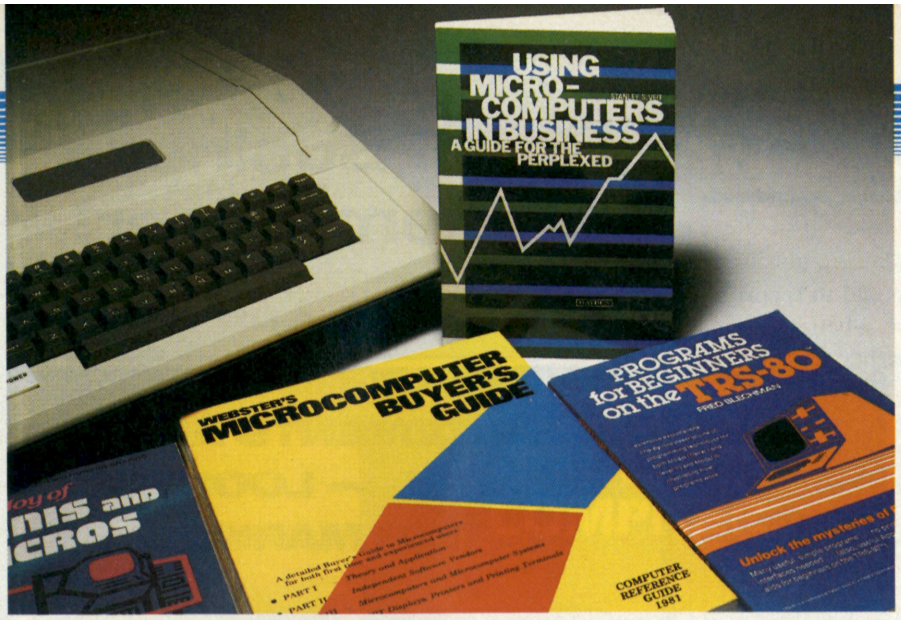

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gram. "There are a lot of programs that will do the general things, but it is nicer when you have one that is custom-tailored to your needs. I have duplicated some of the features of the commercial programs."

Woodruff states: "All ships are supposed to have some sort of personnel accounting, but ours is one of the most effective."

The robots are coming

Computerized, mobile machines—like C3PO and R2D2—are about to take a giant leap off the science-fiction movie screen and into the home and workplace, according to Ken Davis, inventor of Reggie the Robot.

On Sept. 19-21, visitors to the Sunbelt Computer Expo at the Phoenix Civic Plaza met and talked with Reggie, a first generation machine that Davis says is "designed to be an entertainer." The marketing plan of Davis' General Development Company calls for a mid-1982 sales date for his second generation robots, which will take on a variety of industrial and household tasks for less than $10,000 per "droid."

"I wanted to build a 'true' robot, one that would operate under its own power and respond to verbal questions," Davis says. "But I did not want people to be afraid of it."

A marketing research study of approximately 3000 people led Davis to discover some unusual fears people had that he would have to consider in designing his robot. "We found that science fiction, especially in movies, has left a subconscious impression of robots going berserk and killing people. Because of this, an astounding 85 percent of our interviewees wanted a machine that did not have arms and legs. If the robot did have arms and legs, people said they would not get close to it." Davis also found that people wanted a robot under five feet tall so that they wouldn't have to look up to it. They also wanted it to have a personality so they could relate to it as a friend and workhorse, rather than a machine.

Reggie 1 incorporates these and other features. "He is just under five feet tall, moves independently via wheels and, through voice synthesis, is capable of selecting key words from 40 to 50 common questions and then formulating his own reply." Davis spent a year and a half perfecting him and enough

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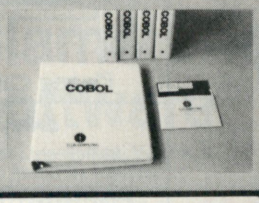

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CIRCLE 69

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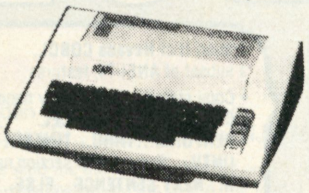

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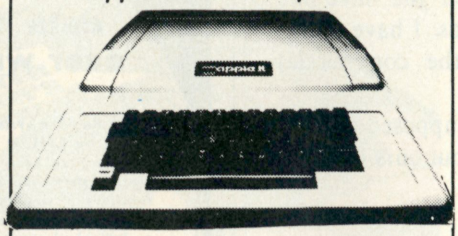

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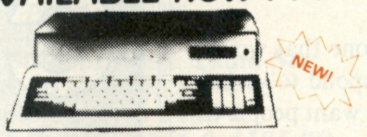

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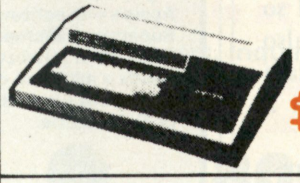

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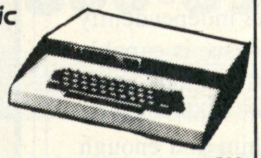

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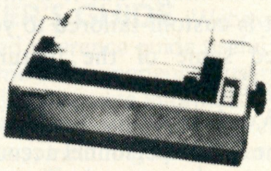

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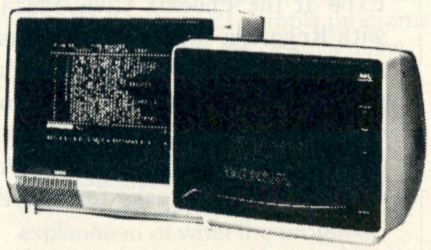

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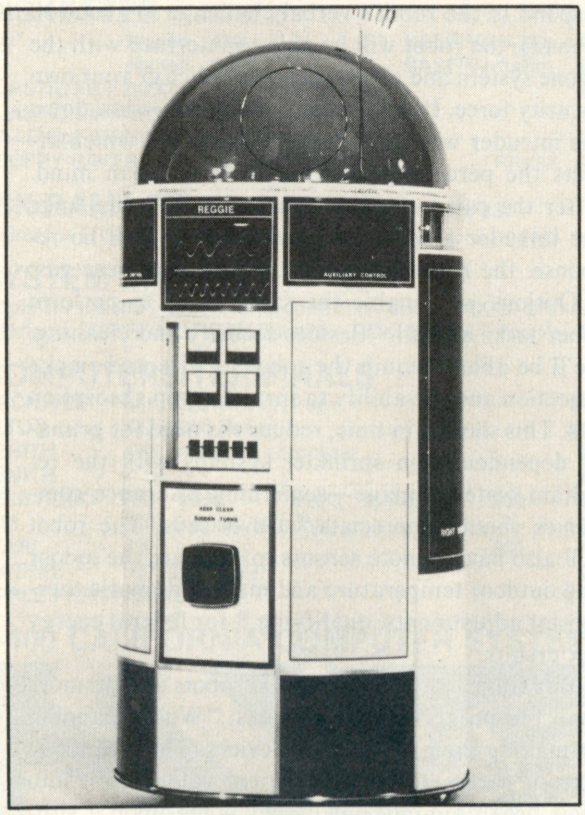
CIRCLE 70

money in components to purchase an average house.

On those rare occasions when Reggie doesn't know what to do, Davis can assist him via remote control. "But we're not talking about remote control as if Reggie were a slave device like a radio-controlled airplane. I can tell Reggie to do something, but it's like an electronic version of telling a child to do something. You can tell a child 'Come here, now,' and the child has to figure out how to



Reggie the Robot, a prototype for "intelligent" mobile computer/workhorses, will be offered for sale in 1982 for under $10,000 per "droid."

stand up, which legs to move in order to get him facing the right direction, and just how fast 'now' means. It's the same with Reggie. I can tell him where I want him to go and how fast, but his on-board computer has to figure out how to do it."

Reggie's next generation brothers will be working at more serious occupations. Davis' company is already working on a version for security intrusion, but it will also be designed for multiple duties through plug-in modules.

"The first model of this new robot will be unveiled during the first quarter of 1982," says Davis, "with off-the-shelf sales available by the second quarter. Though we're saying it will have a $10,000 price tag, we're really hoping to target it between $6000

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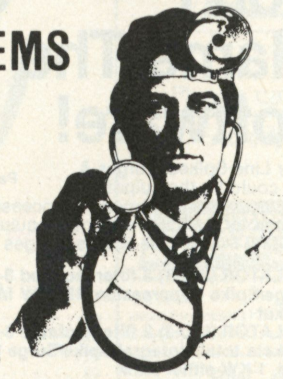

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CIRCLE 83

OUTLOOK

and $9000. In its initial mode, it will be capable of vacuuming or polishing the floor, but items like a security module will be available within 60 to 90 days in the third quarter."

As protection against intruders, Davis will give his robot some unusual capabilities. It will move about the premises looking for intruders, and with its onboard computer, it will be able to make logical decisions on what action to take if intruders are discovered. For example, if an intruder does not respond to the robot's verbal challenge in about 20 seconds, the robot will be able to interface with the phone system and alert either the police or your own security force. It will—at the very least—slow down the intruder with a powerful strobe light which affects the perception abilities of the human mind. After the call to security, the robot will challenge the intruder a second time. If there is still no response, the robot will flood the area with tear gas.

Options will enable the same robot to perform other tasks as well. "Besides security and cleaning, we'll be able to equip the robot for fire and smoke detection and the ability to spray oxygen absorption gas. This should, in time, reduce the need for primary dependency on sprinkler systems with the resultant water damage—something insurance companies should appreciate," Davis says. The robot will also have remote sensors to compare the indoor and outdoor temperature and make automatic thermostat adjustments, qualifying it for federal energy tax credits.

But Davis' new generation of robots will be more than pre-programmed machines. "We're planning on making them self-taught devices. They will have certain parameters or judgement values built into their programming, but if they come upon a situation for which they've not been specifically programmed, they will be able to make logical decisions based on what they do know, act accordingly or modify the act, and then put both the situation and the new decision into memory. In effect, they will learn by their own actions, just like people do."

Technology and business aside, does Davis ever find himself responding to his creation on a human level? "Oh, sure. I like talking with Reggie because he almost appears to have a real identity. Most of the time I know what he's going to say, but there is a certain randomness built into him and he does have the capacity to put different phrases together. One time when I was repairing him, he sensed that something was going on inside him and he started talking. Unconsciously, I started to talk back to him until I realized what I was doing and shut off his voice track."

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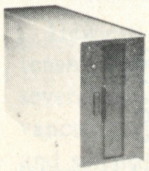

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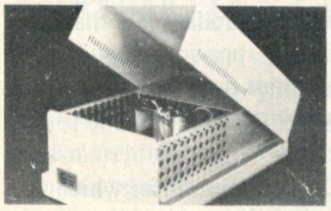

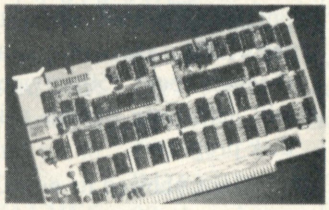

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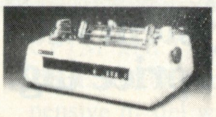

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CIRCLE 86

OUTLOOK

Lee The'

Major companies show new wares

Office Machine dealers and personal-computer manufacturers have been discovering each other in a big way, as the recent NOMDA (National Office Machine Dealers Association) show in Las Vegas indicates. The show featured over 28 manufacturers' small computer systems, and some 40 displays of computer equipment and supplies. Companies such as Atari and Xerox had elaborate displays in an effort to gain larger dealer bases, while Sanyo, Olympia and others showed intriguing new computers to test the American market.

Atari demonstrated its word-processing and financial software for small businesses. The Atari 800, still aimed primarily at the home market, now appears to offer a low-cost alternative to the computers that are frequently used in the business environment.

BMC, a Japanese company known for its green-screen monitors, showed the BMC computer which is manufactured by Okidata. The computer features an integral printer and monitor with high-resolution color or green-screen CRT's available. The system costs several thousand dollars less than the new IBM personal computer. But the BMC is not yet available in the U.S.

Data General displayed its Enterprise 1000 computer, also priced several thousand dollars less than the IBM. Data General will provide support through about 150 service stations nationwide, and will help train dealers using comprehensive video-disk programs.

Canon showed its new CX-1 computer, for which a seven-part accounting program is available.

Durango had its 800XR and 700 all-in-one units on display. Each computer resembles both a large typewriter and a letter-quality, multipurpose, dot-matrix printer with a medium-size monitor. A wide range of software and an additional two-disk unit are available, and both units can be purchased with CP/M.

Exidy announced a leasing agreement with Hertz Corporation, making it easier for people to go the lease route—at least with Exidy. It also announced Compuserve access via a $99 ROM cartridge, and a combined S-100 interface and monitor for $699. A networking system using a version of CP/M, a $295 dictionary add-on to its word-processing software, and a $450 legal accounting package were also announced.

Hewlett-Packard's Corvallis Division had an extensive display featuring its HP-85 computer and several new printers and printer/plotters with advanced graphics capabilities. A variety of business and scientific graphics can be generated with this equipment.

Intelligent Systems featured its full-color computers with word processing, quality resolution.

Leading Edge showed its word processing version of the Zenith/Heath computer, with the claim that what they provide is so complete that the average secretary can come on-line with its turnkey system with virtually no training.

Lexor, previously known for its very low-priced word processors, announced CP/M compatibility for the Lexowriter, making thousands of third party programs accessible for us by this system.

NEC displayed two machines, an 8-bit and a 16-bit model. The latter, the Astra, is slated as having an extensive word-processing package available for it this fall. Hardware prices start at $11,800 plus printer. The PC-8000 personal computer series featured a combination of full color and monochrome capabilities integrated into one monitor.

NNC displayed a sturdy-looking S-100 computer with a Winchester floppy disk-drive combination, CP/M and OASIS available. Also available are IEEE S-100 standard compatibility, and a less expensive model with two 8-inch floppies.

Sanyo had three computers in both 8- and 16-bit versions.

Sharp announced national distribution of its YX-200 personal computer, selling for under $6000 and available with CP/M and an accounting package from Structured Systems Group. Eight-inch floppies are available in addition to the standard memory system.

Also on display were computers from DEC, Televideo, Archives, Exo, Panasonic, Vista, Osborne, Olympia, Morrow Designs, Logical Machine Corporation and Xerox. The latter, featuring the 820/SAM, did not have much software available beyond word processing. But, Xerox's size and commitment to this product alone will make it one of the computers to watch in the coming year. And it's CP/M operating system will allow for rapid software development.

Many companies such as Howard, Malibu, Mannesman Tally and Qume showed their printers. Malibu's 200 is another example of a trend toward making letter-quality printers with dot-matrix technology.

LEISURE COMPUTING

Counting pins by computer *continued from page 65*

part one, if you want to see the whole team when you get to part two, confuses the computer, as does mismatching the player numbers in parts one and two.

Finally, the HI/LO VALUES choice will give the date for the latest occurrence of a high or low value. It doesn't list ties.

Let's run the program a few times and see what we can come up with. Your responses are underlined.

FILE TO BE READ
<BOWL7879> or
<BOWL7980—EN>?
Note: rather than keying in the name of the current year's file each time, I made it a default value which you would obtain by pushing the ENTER key.

ENTER

FIRST WEEK, LAST WEEK?
1,15 (This means that I want weeks 1 to 15, inclusive.)

PLAYER NO.? (This signifies 99 that I want to see the whole team.)

ALLEY NO.?
99 (This indicates all alleys are of interest.)

OPPONENT?
99 (All opponents, not just one in particular.)

By the way the above inquiry is structured, it indicates an interest in overall statistics for the entire team's performance for the first 15 weeks... not limited to a given pair of alleys or against a certain opponent, and not focusing on any one player.

This completes 'section one,' and as soon as the computer has read the data file, it will reach 'section two' and begin prompting you again, as follows:

CHOICES:
HI/LO VALUES, EACH GAME & AVG (1)
OVERVIEW FOR ONE PLAYER (2)
COMPREHENSIVE—ALL PLAYERS & TEAM (3)
TEAM RECORD VS. SELECTED OPPONENTS (4)

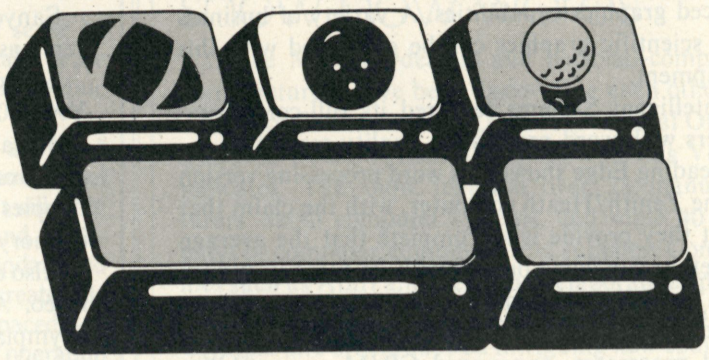
We wouldn't ordinarily select choice (1) here (although you could), since (1) is player-oriented, and in section one, we chose '99' when prompted for the player number. For the same reason, choice (2) would not be appropriate (although

possible). Choice (4) will not work, as explained in the part on 'cautions,' and that leaves choice (3). So you type in '3' and push the ENTER key.

This will be the prompting screen you'll now be confronted with:

PRINT YES OR NO (Y OR N) FOR EACH: (Note: These will appear one by one.)
PINFALL?
STRIKES?
SPLITS?
BEER FRAMES LOST?
DIMES COLLECTED?
DIMES PAID?
DIME OPPORTUNITIES MISSED?

If you answer 'Y' to all of the above, you'll get 14 screens (or pages, with a printer) of results. There will be two for each attribute chosen—one for the absolute numbers, and one for the averages. It will obviously take longer for the computer to chug through the calculation subroutine for each attribute selected, so don't choose them all each time if you don't need to, especially if you're just "browsing" through the data.



Running the program again, let's alter the response in section one which concerns PLAYER NO. Let's dissect Roger's scores. He is player number 4, so instead of '99,' this time we will enter '4' in response to that prompt. The other prompts will be answered as before.

When we arrive at section two,

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	1552 CRT Terminal	1,295	125	70	48
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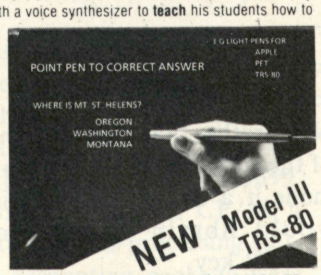

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CIRCLE 88

there are two likely choices, considering how we have approached section one (asking for a certain player). These would be choices (1) or (2).

Choice (1), selecting the HI/LO option, is followed by a (somewhat redundant) prompt from the computer for "WHICH PLAYER?" and furnishing this information with another prompt for which one of the attributes you are interested in. Exhibit 2 displays the results of selecting PINFALL. I mentioned that this was "somewhat redundant" in that we selected PLAYER NO. 4 in section one, so why have to tell the computer about it again? There is no excuse for not programming this time-saver in. My only rationalization is that if in section one you chose '99' (entire team) for player number, and then changed your mind by the time you got to section two, you must then inform the computer.

Choice (2), selecting the OVERVIEW FOR ONE PLAYER option, is followed by a lot of foolishness on the screen, with numbers appearing at random spots. I decided to give the computer some work to do while I was waiting for it to calculate all the statistics for the player chosen in section one. Actually, I did it because I can't stand looking at an unchanging screen and wondering if the computer has frozen up on me or is otherwise malingering. There will be two screens or pages of output resulting from this choice—one for the absolute numbers, and the next for the averages.

If we run the program again, let's put the PLAYER NO. back to '99' but this time show the OPPONENT as '4,' which is the team number for "THE TERRIBLE FIVE." Finishing up section one and coming into section two, we could theoretically select either one of the latter two choices for this section. Choice (3) would give comprehensive statistics for the team, but only as they related to those times when "The Terrible Five" was our opponent. Let me make up an off-the-wall inquiry for this situation. (I've got the means of giving you an answer, so let me make up a question.) Let's say that your team is meeting "The Terrible Five" in a mid-season "position night" playoff round, and you are trying to recall how your team has performed when you last played them. It seems that your team was plagued by splits. By combining OPPONENT number 4 in section one with COMPREHENSIVE— ALL PLAYERS AND TEAM in section two, you can "slice" out of the data base all that concerns opponent number 4, and can study strike and split performance—two good indicators of how your luck (?) was running.

Ordinarily, when deciding to specify an opponent in section one, you follow it up in section two by taking choice (4) TEAM RECORD VS SELECTED OPPONENTS. Since it's really pinfall that counts in winning or losing games, the computer doesn't ask you what attribute you might like to see—it proceeds with its task of selecting and comparing your total pins, by game, to those of your designated opponent, adding in the all-important handicap, and figuring the won/lost record. Our league awards two points to the victor, so that in the case of a tie we don't end up with half points.

continued on page 172

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CIRCLE 90

continued from page 23

ple who learn how to improve their personal productivity and their convenience of living by using computers are going to have a real advantage over those who cannot. You see this particularly in business where there are worksheet-type programs. Managers readily become more productive. And the reports that you are able to generate are much better—people can relate to them a lot easier. I would much prefer to look at a computer printout than a green sheet.

PC: It is our understanding that there is some resistance to personal computers by people in management.

JR: Well, there certainly is some resistance, but the personal computer is really going to be the backbone of the work station of the future. And certainly the work station of the future may do more things than the personal computers of today normally do. The personal computer will be part of the electronic mail system and it may be involved in a lot of other functions.

A person can resist. He can put his hands over his eyes and say 'I don't want to be more productive,' but I think the necessity and the economics of the office business are going to make computers earn their way—and not too slowly.

PC: Perhaps some of the resistance comes from not wanting to look foolish—a fear that springs from initially not knowing how to use a computer?

JR: Computers have that strange attribute that make you think that they are fragile and delicate. Something will break or go wrong. But with a very minimal amount of education and experience you find that nothing strange ever really happens.

PC: If our hypothetical businessman wants to get some introductory training, can he get it at Radio Shack Computer Centers?

JR: What Radio Shack has to offer that is not readily available on other computers is a variety of services, one of them being the training and educational classrooms that are in each and every one of our stores—about 160 in the U.S. There is a single place where a businessman, teacher or professional can get his questions answered, get the right equipment selected and purchased, have training available, get accessories, supplies, repairs. We feel that the training departments in the computer centers really set us apart from our competitors.

PC: You mentioned repairs. What kind of feelings do people get when their computers break?

JR: The feelings vary. Often it's one of frustration because the user is not quite sure of what has gone wrong. I think the good news is that with a machine like the Color Computer, the likelihood of something going wrong is greatly diminished because it is virtually an all-semiconductor product.

Obviously, the customer in the home is not going to want to be concerned with a lot of repair. I don't care if it is your dishwasher or lawnmower. The thought of having something repaired is always a little unsettling. And certainly we would not expect that computers in the home require any more repair than a stereo system.

PC: Radio Shack products are repaired on computer center premises?

JR: Radio Shack systems are repaired on the premises at most computer centers. Where we have several computer centers within a city, you might have a computer center that does not have a repair department, but normally, 80 percent do. Of course, if you take any Radio Shack product that you might have into any Radio Shack outlet they will be glad to send it off to have it repaired for you. This is really one of our strengths.

PC: How assured can a prospective Radio Shack customer be of the expertise of the Computer Center people?

JR: Certainly as you deal with first-time users, you don't know for sure if the sales or training people are totally communicating with the user. But the reason the computer centers have been opened is to give the customer a place to go where he can find training and salespeople who are really experts in computers. They are continually being trained on the applications and the hardware.

PC: Are the managers of your stores trained professionals so that if a problem comes up, the customer can go to his local dealer to help him work through the glitch?

JR: I would never claim that anyone could answer every question that comes up. The thing we do know is that we have a continual and rather exhaustive training program for our computer-center personnel. We would hope that you would be able to get all the assistance you would need. Certainly many of our other store managers are able to sell the friendlier, less sophisticated systems with ease. But if you want to deal with an expert, go to the computer center.

PC: Do you see a difference in what could be called an "institutional computer" and what could be called a personal computer?

JR: A majority of our machines are certainly used for organizational, institutional purposes. And, a majority of our machines at the present time are used for home purposes. I don't know that there is necessarily a clear distinction between where machines should be used. We don't want to severely restrict the multipurpose nature of the machines.

PC: How do you people like Joe's Software House, which sells off-brand software for the TRS-80?

JR: Everybody who sells software that works for the TRS-80 is doing us a big favor. We are the first to know that we can never develop every application known to man. And the availability of solutions of software makes the equipment more salable. So we are glad to see Joe's Software House bring out new software. That's the good news.

The bad news is that we have no easy way of knowing how good Joe's software is.

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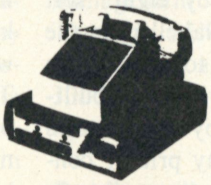

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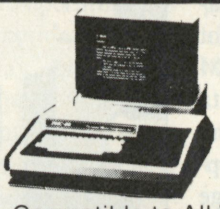

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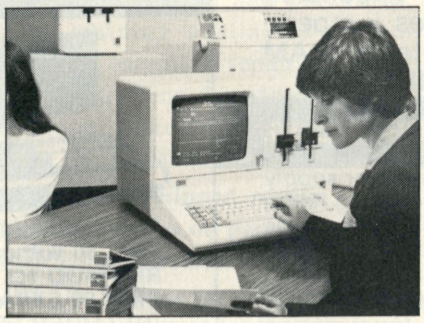
CIRCLE 91

IBM combines data and word processing

IBM's new System/23 Datamaster small business machine—not to be confused with the new IBM Personal Computer—combines data processing and word processing, and addresses a variety of commercial applications for both small and large businesses.

Datamaster can include two computer workstations with a shared file capacity, permitting two people to use the system simultaneously.

A full-function data-processing installation, with a single computer workstation and an 80 character-per-second (cps) printer, will cost $9830. A typical installation would include one computer workstation with dual-integrated disk drives and a printer. As a user's business expands, he can add an additional workstation, another disk unit and up to four printers.



Datamaster features dual computer workstations which can each access up to 4.4 million characters of information.

Datamaster components include the IBM 5322 computer workstation, integrated disk capability, 1920-character CRT display (24 x 80), additional printer attachment and interpretive language (BASIC).

Two bidirectional matrix printers, the 5241 which prints at 80 cps, and the 5242 which prints at 160 cps, were also announced. Model 2 of the 5242 prints at 160 cps and at 40 cps for high-quality business letters and documents.

The 5246 Diskette unit can contain one or two disk drives of 1.1 Mbytes of storage each, for a total capacity of 2.2 Mbytes. Models 021 and 022 can be attached to two 5322 computer workstations for file-sharing. With the addition of the unit, each 5322 can access up to 4.4 Mbytes of on-line storage. With two computer workstations and the additional 5246, total disk memory can be increased to 6.6 megabytes. With proper coding by the user, disks prepared on Datamaster can also be run on IBM's System/34.

New kind of business tool

Hewlett-Packard's newest business computer, the HP-125, is designed for use by business managers and professionals for financial decision-making, planning, analysis, word processing and management communications. A desktop system that combines the features of a personal computer, a word processor, a computer terminal, a financial calculator and a graphics workstation, the computer is priced below $7500.

The HP-125 runs a fully HP-supported CP/M operating system. In addition to its local processing abilities, the HP-125, at the press of a button, can become a remote terminal through dual RS-232-C ports, at speeds up to 9600 baud.

The HP-125 is powered by twin Z80-A microprocessors. A system processor with a 64k memory is dedicated to program execution, while a separate terminal processor gives the user many of the advantages of an "intelligent" terminal. Most functions are performed by eight "soft keys," with functions labelled on the screen. They are used to set margins and tabs, to call up the system's built-in self-test, or to copy information from the screen to any printer connected to the system.

The HP-125 from Hewlett-Packard is a business system that manipulates words, numbers and pictures.

For inserting and deleting information, a full complement of editing keys produces a "what-you-see-is-what-you-get" image on the screen. The HP-125 stores up to five full pages (120 lines) of displayed information, with key-controlled scrolling to review long reports or earlier work. None of these features draws upon the resources of the program-executing processor or its memory, leaving them free for user-program execution.

Four software packages

VISICALC/125, a financial planning and analysis tool, aids decision-making by turning the HP-125 screen into an electronic "spread sheet." It provides rapid answers to questions about the consequences of various options as solutions to problems in planning, forecasting, bud-

The Datamaster processing unit provides up to 128 kbytes of main memory in 32 kbyte increments, has 112 kbytes of read-only storage (ROS), and a main storage cycle time of 975 nanoseconds. Storage parity checking is also standard, so that data moved to and from storage is checked to make sure nothing is lost through electronic error.

Datamaster uses BASIC, which is also used on the System/34. Program products available provide the user with word-processing communications capability, and an additional licensed program aids in converting IBM 5110 and 5120 BASIC to Datamaster BASIC.

The keyboard of the 5322 computer uses the familiar alphanumeric typewriter layout with a separate numeric key pad, and two operator keys provide arithmetic functions.

Datamaster's display screen contains characters in upper- and lowercase, and there is automatic cursor positioning. The display frequency, at 18.432 MHz, provides for high visual resolution and minimizes audible high-frequency noise. The display features dual intensity, reverse image, blinking, underlining and nondisplay for security purposes.

To add word processing, a user will need the 5322 computer workstation with a minimum of 64 kbytes of memory and 0.6 megabytes of disk storage.

IBM licensed application programs offered with Datamaster are billing, inventory accounting, accounts receivable, accounts payable, payroll and general ledger, and are all part of the Business Management Accounting System.

Datamaster allows users to automatically update information between application programs. For instance, if billing and accounts receivable are installed together, information entered for billing purposes is automatically passed to the accounts receivable program without additional keying by the operator.

The cost of the word-processing option, with associated hardware and software, ranges from $1100 to $2200.

For more information contact: IBM, General Systems Division, P.O. Box C-1645, Atlanta, GA 30301; (404) 238-3643.

CIRCLE 150

---

geting and other business operations, without hours of calculating.

GRAPHICS/125 can create paper charts or professional-quality overhead transparencies. It transforms tabulated data, including data from VISICALC/125, into bar, pie, and line charts, and produces text in a variety of type sizes and styles.

WORD/125, a word-processing package, provides text composition and output and supports the tailored generation of bulk mailings through a mail-merge capability. In conjunction with a letter-quality printer, WORD/125 offers proportional spacing and a facility to tailor document contents. The package includes complete formatting control, global search and replace editing, block text movement, and keystroke-interactive processing.

LINK/125, a software data-communications link, can transfer files to and from an HP 3000 and execute IMAGE/3000 data-base management inquiry procedures. Through LINK/125, the HP-125 can become a component of an HP 3000 Distributed Data-Processing System.

Configurations

The HP-125 Business Computer is available in two models. Model 10 uses dual 5¼-inch mini-disks, with 500 kbytes of mass storage. Model 20, based on dual 8-inch flexible disks, offers 2.4 Mbytes of capacity. Both models can be expanded with additional disk drives.

Each model can be used with a choice of three printers—an integral thermal printer for personal utility copies, a letter-quality printer for word processing, and a 180-characters-per-second serial dot-matrix printer for higher speed or multicopy purposes. Color graphics are available in a choice of one- or eight-pen plotters that can be attached to the system.

Both models of the HP-125 include dual data-communications ports for connection to other systems, or attachment to serial-interface devices. Speeds up to 9600 baud, and a variety of protocols are available.

Prices of HP-125 systems start at $7460 for an entry-level system including an HP-125 Processor, dual 5¼-inch disk drives, two RS-232-C data communications ports, and an integrated 80-cps thermal printer.

Software prices are: VISICALC/125, $200; WORD/125, $500; GRAPHICS/125, $200; and $125 for LINK/125.

For more information: Inquiries Manager, Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304. **CIRCLE 151**

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CIRCLE 92

HARDWARE UPDATE

INTERFACES

Interface Card

The Universal Interface Card is designed to be used in one I/O slot of SS-50C systems. The card allows users to design custom I/O interfaces.

The board costs $14. For more information: Quality Research Company, P.O. Box 7202, Spokane, WA 99207. **CIRCLE 152**

Videodisc Link

Two new products designed to link industrial videodisc players and computers, PR-7820-2 Videodisc Player and the universal External Interface, a communications adapter, have been announced by DiscoVision Associates.

The industrial optical videodisc player, either the PR-7820 or the PR-7820-2 provides two-way communication with most computers. It uses a low-powered laser beam to relay any combination of motion picture sequences, sound and still frames from a videodisc to any standard television receiver or monitor. The system's capabilities include slow motion, freeze frame, frame-by-frame viewing, forward and reverse scanning and direct automatic random access.

With a remote keypad, the user can quickly locate a particular picture by reference to the appropriate frame number. Two audio channels can be used for either stereophonic sound or bilingual programming.

The PR-7820-2 can be connected to a host processor using the player's two-way bus through a standard connector. An 8-bit parallel communications protocol provides controls for send, receive, acknowledge commands and status information between the player and the processor.

The Universal External Interface (UEI) converts data from the PR-7820-2's internal microprocessor into most computer communications formats. It provides either a standard RS-232-C serial interface or an IEEE 488 parallel interface for the PR-7820-2. The UEI contains all hardware and software necessary for communications with a host computer, modems or terminals.

The price of a PR-7820-2 player is $2475 and the UEI costs $225.

For more information: DiscoVision Associates, 3300 Hyland Ave., P.O. Box 6600, Costa Mesa, CA 92626; (714) 957-3000. **CIRCLE 153**

Plug-In Board

A plug-in board for Apple II computers allows the user to connect serial-driven peripherals to the computer. Called the ASIO, the board has two 26-pin header connectors; one is for the connection of a terminal or printer, while the other is for a modem.

Besides the connectors, the board also provides an RS-232-C serial interface. Signals are brought to and from the board through a 12-inch cable having a DB25S connector that extends out the back of the Apple II.

On-board firmware is designed to accommodate a wide variety of serial-driven peripheral devices, via user-set flags that control the peripherals' operations.

The ASIO board costs $139, assembled and tested, or $109 in kit form. For more information: SSM Microcomputer Products, Inc., 2190 Paragon Dr., San Jose, CA 95131; (408) 946-7400. **CIRCLE 154**

I/O Module

Percom Data Company announced a dual serial I/O module for system-50 computers, designed for the 30-pin I/O bus, the SS-30 bus of System-50 computers, and works with both older and newer versions of the SS-30 bus.

The module also provides for an optional on-card bit rate generator (BRG) for applications where a system baud clock generator is not available. Other features include control

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Las Vegas, NV

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Richard Ruth
Shippensburg, PA

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David Hendel
Lititz, PA

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Mechanicsburg, PA

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Hoffman Estates, IL

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Richard Cannova
Los Angeles, CA

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Bob Mills
Mission, KS

"Anything that prolongs the life of a diskette is a plus. Thank you Verbatim for an excellent improvement."
Steve Toth
Piscataway, NJ

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Gerald Janas
Warren, MI

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Playa Del Rey, CA

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CIRCLE 120

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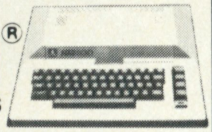

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CIRCLE 94

HARDWARE UPDATE

of serial-to-parallel and parallel-to-serial data conversion, transmit and receive rates for each channel, eight selectable bit rates and compatibility with RS-232-C standard levels.

The dual I/O card, assembled and tested, sells for $59.95 without the bit rate generator and $74.95 with the bit rate generator installed. The generator may be purchased as a kit for $19.95.

For more information: Percom Data Co., Inc., 211 N. Kirby, Garland, TX 75042; (800) 527-1592.
CIRCLE 155

PERIPHERALS

Protection System

RAMLOK, a computer equipment protection system, guarantees that equipment will receive 115V AC +/− 10 percent.

Response time to complete voltage failure is within 20 ms, when RAMLOK will switch to a standby power source, such as a battery/inverter combination. The length of standby power operation is typically from 2 to 20 minutes.

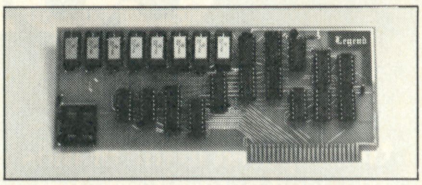
RAMLOK will also filter line voltage with a dual T-section RFI filter to control pulse, continuous, or intermittent interference.

The protection system costs $495.

For more information: Ladco Development Co., P.O. Box 464, Olean, NY 14760; (716) 372-0168.
CIRCLE 156

RAM Card

A 64k RAM card for the Apple II is available from Legend Industries. The board gives the Apple the ability to access double its own RAM space by bank switching 16k banks of RAM.

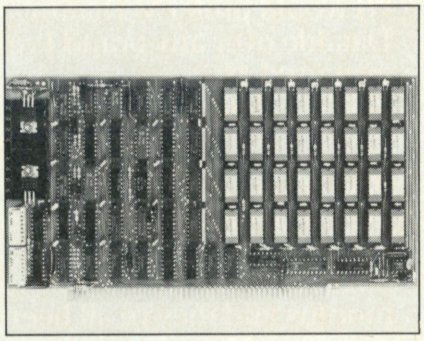


The board costs $349.

For more information: Legend Industries, P.O. Box 112, Pontiac, MI 48056. **CIRCLE 157**

Memory Module

Designed specifically for the Sol, Cromemco, North Star and other S-100 bus personal computers, the



new CI-S100 64k memory module features expandability to a half Mbyte.

On board hidden refresh requires no outside intervention, making the CI-S100 look like a static RAM.

For more information: Chrislin Industries, Computer Products Divison, 31352 Via Colinas #102, Westlake Village, CA 91361. **CIRCLE 158**

INPUT/OUTPUT

New Terminal

The ERGO-2000 computer terminal is designed to increase operator efficiency with such features as a detached, low-profile keyboard with integrated palm rest. A green, non-glare screen tilts 25 degrees to accommodate any viewing angle.

The ERGO-2000 contains such

video features as smooth or jump scroll, blinking fields, reduced intensity, reverse video and underline.

The terminal is code-compatible with the DEC VT52, Hazeltine 1500, or Lear Siegler ADM3A.

For more information: Micro-Term, Inc., 1314 Hanley Industrial Court, St. Louis, MO 63144; (314) 968-8151. **CIRCLE 159**

Graphics Terminal

With Retro-Graphics, users can now convert their present Texas Instruments terminals from alphanumerics to full graphics capability, including point plots, pie and bar charts, and complex mappings and curves.

Other features include area fill, selective erase, an enhanced text mode, and an interactive cross-hair cursor. An optional light pen allows the TI terminal to emulate the Tektronix 4010 Graphic Input Mode.

The Model 940 Retro-Graphic package costs about $1400.

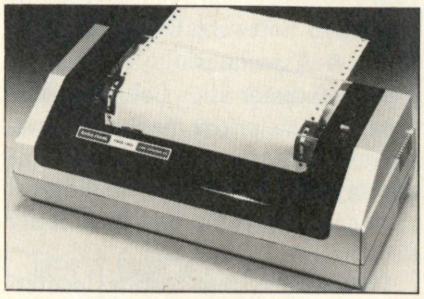
For more information: Digital Engineering; 630 Bercut Dr., Sacramento, CA 95814; (916) 447-7600. **CIRCLE 160**

New Printer

New from Radio Shack is Line Printer VII, offering high-quality impact printing and dot-addressable high-density graphics.

The printer accomodates 80 or 40 5 x 7 dot-matrix characters per eight-inch line at 30 cps. In addition, its dot-addressable high-density (3780 dots-per-square-inch) graphics capability makes the Line Printer VII suitable for hard copy printout.

Line Printer VII uses standard fanfold paper and features an adjustable tractor feed.

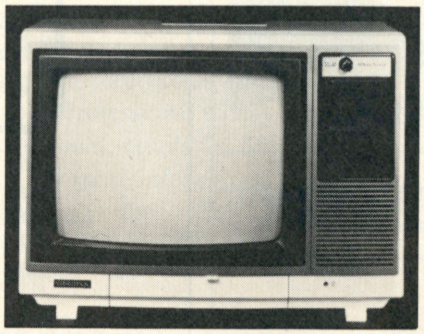


The printer costs $399.

For more information: Radio Shack, 1800 One Tandy Center, Ft. Worth, TX 76102; (817) 390--3272. **CIRCLE 161**

Analog Monitor

Videotek's RGB-13 is a 13-inch RGB monitor designed for color display of text, graphs, plots, diagrams, and medical applications. The monitor features a slot mask in-line gun CRT capable of 350 lines of horizontal resolution.



The RGB-13 has full range analog input and a video channel bandwidth of 46 MHz. Selectable internal and external sync and audio input are standard features.

The price of the monitor is $899.

For more information: Videotek, Inc., 123 York St., Pottstown, PA 19464; (215) 327-2292. **CIRCLE 162**

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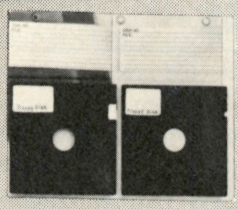

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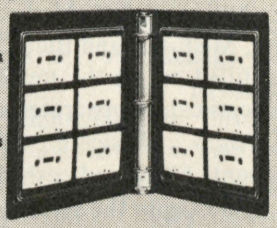

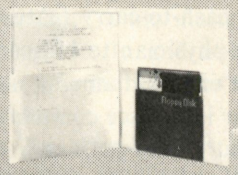

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CIRCLE 95

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BUSINESS

Billing System

Med-Apple is a billing system for one to 10 physicians. It can handle 7000 accounts and 2000 transactions per billing period. Medicare, Medicaid, Medi-Cal and Blue Cross forms are filled out at the touch of a key. Reports can be generated at any time to show physician activity for amounts billed and cash receipts.

Exclusive to the system, the developer says, is a cash-to-carry feature that allows the physician to bill certain patients for only that amount not covered by their insurance company. The system also makes patient lists and prints mailing labels.

The minimum requirements are an Apple II Plus (48k) with three disk drives. The system also operates on the Apple /// with a Corvus hard disk. For more information: Professional Medical Software, 3604 Foothill Blvd., La Crescenta, CA 91214; (213) 248-2884. **CIRCLE 163**

Text Processor

A text processor for the Apple /// computer, called the Docuwriter /// Text Processor, has been released by the Micro Software Div. of Charles Mann & Associates.

The processor allows either 96k or 128k versions of the machine to create text file systems up to 126k. The system includes its own mailing-list management system and form letter element.

The entry system features centering, special form text creation, scientific notation, footnoting, superscripting, subscripting, embedded custom strings and underlining. Edit features include block text movements, string replacement, insertion, deletion, text reformatting and text merger.

The system requires an Apple /// with at least 96k of RAM, the SOS operating system pacakage, an Apple Modem Eliminator and a compatible serial printer.

Docuwriter /// is available for $349.95. For more information: Charles Mann & Associates, Micro Software Div., 7594 San Remo Trail, Yucca Valley, CA 92284; (714) 365-9718. **CIRCLE 164**

Project Management

Organic Software, specialists in small computer software, have introduced Milestone, a low-cost project management software package designed to operate on the CP/M 86.

Milestone is useful in smaller

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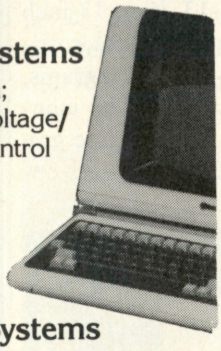

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CIRCLE 117

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projects commonly encountered in business, government, engineering and construction, where the project can be broken into a series of distinct tasks. It automatically lays out each job against a time scale showing which tasks are critical and which can be delayed. It also displays the manpower and expenses versus time, as well as the totals and project completion date. The original plan can be altered during a project to reveal the impact of any scheduling changes.

Milestone is available for microcomputers, such as the Apple, TRS-80 and many S-100 systems using CP/M 86, CP/M or UCSD Pascal operating systems. It requires an 80-by-24 screen and 56k bytes of RAM. Milestone's price is $295.

For more information: Organic Software, 1942 Windsor Way, Livermore, CA 94550; (415) 455-4034.
CIRCLE 165

Management System

Two extras for the Super PIMX database management system—Version 1.1 and Version 2—are being offered by the Computer Information Exchange.

Version 1.1 adds optional pagination and titling of printout, easy accommodation of machine-language drivers, flexible file management and menu-driven memory management.

Version 2 features such conveniences as direct transition from search mode to change or kill mode, high-speed sorting and the elimination of "freezes."

Super PIMX for the Radio Shack TRS-80 costs $19.95 on cassette. Add $5.95 for the disk version. California residents add tax.

For more information: Computer Information Exchange, Box 159, San Luis Rey, CA 92068; (714) 757-4849. **CIRCLE 166**

Budgeting System

Taranto & Associates has announced the addition of a budgeting facility to its general ledger system.

Under the new system, budgeted amounts may be entered monthly. Budget reports include monthly, quarterly and annual actual-to-budget comparisons, as well as actual-to-prior year comparisons. Featured in these comparisons are calculations of variances in both dollars and percentages.

For more information: Taranto & Associates Inc., 121 Paul Dr., P.O. Box 6216, San Rafael, CA 94903; (800) 227-2868; in CA (415) 472-2670. **CIRCLE 167**

Client Billing

A timekeeping, billing and management package, Professional Client Billing, Series III, is designed for professional offices. The package calculates receivables based on retainer fees, standard rates and services, time units, and disbursements.

PCB also generates mangement reports gauging productivity and profitability of services performed. It is compatible with all microcomputers operating under CP/M or an equivalent operating system, as well as with word processors supporting similar implementations.

Customizing features to tailor PCB's capabilities to a company's present receivables system are available. Professional Client Billing, with a manual, retails for $995.

For more information: Serendipity Systems Inc., 225 Elmira Rd., Ithaca, NY 14850; (607) 277-4889.
CIRCLE 168

Business System

A complete business software system for $199 is available from Rocky Mountain Software Systems. Written in Microsoft's MBASIC, the programs run on any CP/M computer with at least 48k of RAM.

The system is comprised of four packages: General Ledger, Accounts Receivable, Accounts Payable, and Payroll. The general ledger package produces detailed financial statements with month, YTD and previous year data.

The accounts receivable package provides instant consumer account information with complete invoicing. The accounts payable package features current and aged payables, complete vendor/voucher history, check writing and cash flow management reports. The payroll package calculates payroll for every type of employee while maintaining monthly, quarterly and annual totals for multiple states (user modifiable tax tables).

The complete system costs $199, with individual packages at $59 each. For more information: Rocky Mountain Software Systems, P.O. Box 3282, Walnut Creek, CA 94598.
CIRCLE 169

Investment Software

From Pear Systems comes the Portfolio Evaluation and Reporting System (Pear) for investors. Designed for the Apple II computer, Pear is said to be the first such system for the Apple designed with multiple portfolio record-keeping.

A unique feature is that securities information is entered only once and can be changed on all portfolios with a single entry. Pear also features automatic pricing from Dow Jones, matching of proceeds and cost basis by tax lot, automatic adjustment of positions for stock splits and fully formatted portfolio appraisal.

The complete system sells for $500, and documentation that fully explains each prompt is available separately. The system requires an Apple II computer with 48k of memory, dual 5 1/4-inch floppy disk drives, a 132-column printer and a D.C. Hayes micromodem.

For more information: Pear Systems, 27 Briar Brae Rd., Stamford, CT, 06903. **CIRCLE 170**

UTILITY

Conferencing Utility

First Edition, by the Communi-Tree Group, is a computer conferencing software package with general data base and "electronic mail" features. Designed to run on an Apple II or II Plus with 48k of memory, one or more disk drives, and a Hayes Microcomputer Products MicroModel II (modem not required for local data-base use), the system allows users to enter and retrieve messages via regular phone lines using a computer or terminal and a standard 30 cps or 10 cps modem.

Each new message is attached to another already in the data base, allowing users to organize a "conference tree" of messages—any one of which can "grow" into a new conference or subconference. This tree structure makes it easier to find specific information and to enter information in the most appropriate part of the data base. Maximum message length is 50 lines of 80 characters, with up to 320 different messages, depending on available disk space.

The price for the complete conference tree system is $95; the program (on 5¼-inch floppy disk) alone is $80; the manual alone is $20.

For more information: Communi-Tree Group, 470 Castro St., Suite 207-3002, San Francisco, CA 94114; (415) 474-0933. **CIRCLE 171**

Data Base Manager

IDM-M3 is a new interactive data base manager from Micro-Architect.

The basic components of IDM are a data-base initialization program, a data-base manipulation program, a report writer and a report generator.

IDM requires a dual-disk system with 48k of memory and TRSDOS. It is priced at $149. A simplified 32k version of IDM is $69.

For more information: Micro-Architect, 96 Dothan St., Arlington, MA 02174. **CIRCLE 172**

BASIC Interface

A Comstar-CP/M interface allows BASIC programs compiled with the Comstar compiler to run under the CP/M operating system.

The interface includes modifications to the Comstar library routines, a North Star-CP/M transfer routine and a module which maps the North Star DOS into the CP/M environment.

The interface package costs $75. For more information: Comstar, 395 Sierra Madre Villa, Pasadena, CA 91107; (213) 793-5748. **CIRCLE 173**

Terminal Programs

A series of smart-terminal programs, called Smart, are available on cassette or disk for the Radio Shack Model I or Model III. The program permits the transfer of data between computers.

Smart features the provision for formatting line length. The line will feed on a space and not hyphenate the word. The program for Model I costs $79.95, and that for Model III costs $99.50. For more information: MicroPeripheral Corporation, 2643 151st Pl. N.E., Redmond, WA 98052; (206) 881-7544. **CIRCLE 174**

Word Processing

Type-Righter word-processing software for the Apple /// features automatic justification, adjustable tabs, global search and replace and the ability to add individual files together in any order.

Type-Righter costs $195. For more information: Imagineering Inc., c/o Adcast Advertising, 405 S. Farwell, Suite #10, Eau Claire, WI 54701; (715) 835-8611. **CIRCLE 175**

GAMES

Scrabble Crossword

"Monty Plays the Scrabble Brand Crossword Game" is a strategy game for up to three players. A Scrabble game set is required.

The game includes graphic presentations of the Monty characters, board positions and scores, and sound effects.

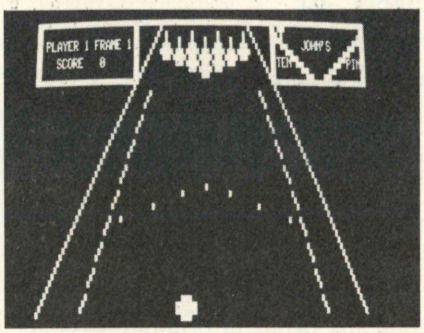
Monty is available for the 48k Apple II and II Plus with Applesoft BASIC and one disk drive.

The Monty game costs $34.95.

For more information: Personal Software Inc., 1330 Bordeaux Dr., Sunnyvale, CA 94086; (408) 745-7841. **CIRCLE 176**

TRS-80 Bowling

Tenpins, a machine language bowling game for one to four players, features realistic action and sounds and both beginner and advanced levels. Scoring, pinsetting and ball return are all automatic.



The game is available for the TRS-80 Model I/III on cassette for $14.95, and on disk for the Model I for $20.95.

Contact: Acorn Software Products, Inc., 634 No. Carolina Ave. S.E., Washington, DC 20003; (202) 544-4259. **CIRCLE 177**

Space Game

Invasion Orion, a tactical space battle game, can now be played by one or two players.

In Invasion Orion, each player controls up to nine spaceships armed with destructor beams, missiles and torpedos. Ships spend energy on movement, shields and firing weapons, and each player must decide how

to allocate that energy to defeat his opponent.

The game includes 10 scenarios and three skill levels. Also included is a game program and 48-page battle manual.

It is available on cassette for the 32k Apple with Applesoft in ROM, 16k TRS-80 Level II, 16k Pet and 32k Atari 400/800, or on disk for the 48k Apple and Applesoft in ROM, 32k TRS-80 and 32k Atari 400/800.

The price is $24.95.

For more information: Automated Simulations, Inc., P.O. Box 4247, Mountain View, CA 94040.

CIRCLE 178

Shooting Game

Country Carnival is a fast-moving shooting gallery game with multi-color Hires animation and real-time carnival sound effects. As you try to shoot down the targets with a limited number of bullets, a vicious duck eats your ammunition if you do not shoot it. The target rabbits multiply at a faster and faster rate as the game progresses.

Country Carnival is available on disk for the Apple II and the Apple II Plus. A disk drive, color monitor and paddles or a joystick are required for the game. The price is $24.95.

For more information: Programma International, Inc., 2908 N. Naomi St., Burbank, CA 91504; (213) 954-0240. **CIRCLE 179**

SYSTEMS

Operating System

TurboDOS, a new operating system compatible with Digital Research's CP/M, handles program loading six times faster than CP/M and is up to 10 times faster than CP/M in file management operations.

A sophisticated buffer manager performs multi-level buffering of disk I/O along with a program load optimizer. The program optimizer scans the allocation map of a program file and loads at the maximum transfer rate of the disk controller. Both features account for the increased speed of TurboDOS.

The system is compatible with standard CP/M format diskettes, and an alternate "Turbo" format increases the storage capacity of each floppy disk from 25 to 30 percent.

TurboDOS is available for the IMS line of S-100 computer systems, the Radio Shack Model II, and the INFO 2000 Performer series of computers. The price ranges from $195 to $700 depending upon system configuration.

For more information: Data-Rx, 686 Lighthouse Ave., Monterey, CA 93940; (408) 375-2775. **CIRCLE 180**

New Language

Commodore PET/CBM users can now have the power of Pascal and the ease of BASIC with COMAL, a new programming language.

For more information and a free disk copy of Commodore COMAL, send a large self-addressed stamped envelope to the COMAL Users Group, 5501 Groveland Terrace, Madison, WI 53716. **CIRCLE 181**

Assembler Packages

The InfoSoft I/SAL structured assembler package, and its sister package, Sal Tools, provide the system programmer with a full power assembler with Macro's, relocation, overlays, and structured code.

The package has full Z80 capabilities and a run-time support library.

Optional packages include a differential file comparison utility that compares different program revisions and report changes, a program library catalog system, and a source library manager.

For more information: InfoSoft Systems, 25 Sylvan Rd. So., Westport, CT 06880; (203) 226-8937.

CIRCLE 182

NEW!!! THE ELECTRIC MOUTH*

for S100, Elf II, Apple, TRS-80 Level II*

From $99.95 kit

Now — teach your computer to talk, dramatically increasing the interaction between you and your machine.

That's right: the ELECTRIC MOUTH actually lets your computer talk! Installed and on-line in just minutes, it's ready for spoken-language use in office, business, industrial and commercial applications, in games, special projects, R&D, education, security devices — there's no end to the ELECTRIC MOUTH's usefulness. Look at these features:

- ★ Supplied with 143 words/letters/ phonemes/ numbers, capable of producing hundreds of words and phrases.
- ★ Expandable on-board up to thousands of words and phrases (just add additional speech ROMs as they become available).
- ★ Four models, which plug directly into S100, Apple, Elf II and TRS-80 Level II computers.
- ★ Get it to talk by using either Basic or machine language (very easy to use, complete instructions with examples included).
- ★ Uses National Semiconductor's "Digitalker" system.
- ★ Includes on-board audio amplifier and speaker, with provisions for external speakers and amplifier.
- ★ Adds a new dimension and excitement to programming; lets you modify existing programs and games to add spoken announcements of results, warnings, etc.
- ★ Installs in just minutes.

Principle of Operation: The ELECTRIC MOUTH stores words in their digital equivalents in ROMs. When words, phrases, and phonemes are desired, they are simply called for by your program and then synthesized into speech. The ELECTRIC MOUTH system requires none of your valuable memory space except for a few addresses if used in memory mapped mode. In most cases, output ports (user selectable) are used.

Spoken Material Included

one	eighteen	at	dollar	inches	number	ss	c t
two	nineteen	cancel	down	is	of	second	d u
three	twenty	case	equal	it	off	set	e v
four	thirty	cent	error	kilo	on	space	f w
five	forty	400hertz tone	feet	left	out	speed	g x
six	fifty	80hertz tone	flow	less	over	star	h y
seven	sixty	20ms silence	fuel	lesser	parenthesis	start	i z
eight	seventy	40ms silence	gallon	limit	percent	stop	j
nine	eighty	80ms silence	go	low	please	than	k
ten	ninety	160ms silence	gram	lower	plus	the	l
eleven	hundred	320ms silence	great	mark	point	time	m
twelve	thousand	centi	greater	meter	pound	try	n
thirteen	million	check	have	mile	pulses	up	o
fourteen	zero	comma	high	milli	rate	volt	p
fifteen	again	control	higher	minus	re	weight	q
sixteen	ampere	danger	hour	minute	ready	a	r
seventeen	and	degree	in	near	right	b	s

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CIRCLE 93

NEW LITERATURE

Decision Pamphlet

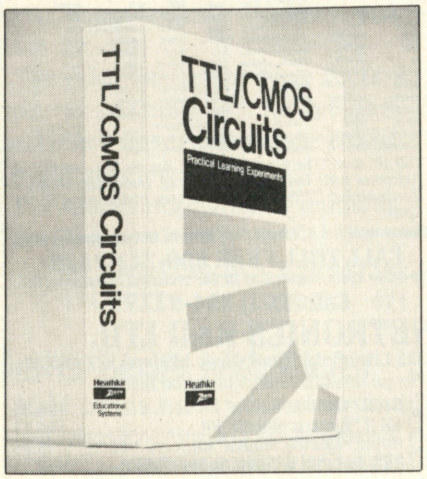
Micro Data Base Systems now provides a free software decision pamphlet. This pamphlet identifies and describes the important features to consider when deciding upon a software tool to use for application system development.

The features discussed include logical data structuring, control over data redundancy and data inconsistency, availability of a high-level query language, availability of programming-language interfaces, mechanisms for data-base recovery and restructuring, and portability of the software tool across machines and operating systems.

For more information: Micro Data Base Systems, P.O. Box 248, Lafayette, IN 47902; (317) 488-1616. **CIRCLE 183**

Circuits Course

A hardware-oriented course in TTL and CMOS Circuits from Heathkit/Zenith Educational Systems is designed for the electronics student, experimenter, radio amateur or computer enthusiast.



The course is comprised of a series of circuit "files" arranged in a logical progression. Each file provides the student with a description of the particular circuit and its operation, a circuit schematic, and modifications that can be performed on the basic circuit.

Examples of the circuits that the student can build include seven-segment digital displays, flip-flops, clock generators, data selector distributors and comparators.

Sixty-five electronic components for use in constructing more than 50 circuits are included in the course.

The EH-702 TTL and CMOS Circuits Course is mail order priced at $59.95.

For more information: Heath Company, Dept. 350-165, Benton Harbor, MI 49022; (616) 982-3210, in Canada Write, Heath Company, 1480 Dundas St. East, Mississauga, ONT L4X 2R7. **CIRCLE 184**

Supplies Catalog

The World's Largest Selection of Computer Supplies is a free 64-page catalog from Edward Ochman systems.

The catalog includes most items associated with the operation of a computer.

For a free catalog, write Edward Ochman Systems, P.O. Box 141, Fairfield, CT 06430; (203) 259-1927. **CIRCLE 185**

Robot Book

Robot Intelligence, a new book from Tab Books, shows how robot intelligence works, from the basics of EAMI behavior to complex data-gathering programs.

Beginning with an updated look at the theory of artificial machine intelligence and the basics of robotics, there are explanations of the three classes of responses—Alpha, Beta and Gamma. Each one represents a progressively higher level of program behavior, and each is presented in an easy-to-understand program format. Modifications, loading instructions, learning curves and data compiling are also covered.

The book includes composite listings of program ingredients, appendices giving complete listings of standard ASCII codes and characters, and TRS-80 graphics codes and characters.

The price is $16.95 hardbound and $9.95 paperback.

For more information: Tab Books, Inc., Blue Ridge Summit, PA 17214; (717) 794-2191. **CIRCLE 186**

Program The 6809

A 272-page paperback by Andrew C. Staugaard, Jr., *6809 Microcomputer Programming and Interfacing,* describes chip structure and basic concepts of the 6809. It explains addressing modes, registers and data-movement instructions, arithmetic, logic and test instructions for the 6809. Branching, input and output signals, interfacing and applications of the 6809 are also explored.

The book includes example programs, and appendices cover the 6809 instructions, 6802/6821 peripheral interface adapter and specification sheets for the 6809 and related series equipment.

The price is $13.95; Canadian price is slightly higher.

For more information: Howard W. Sams & Co., Inc., 4300 W. 62nd Street, Indianapolis, IN 46268;(317) 298-5400. **CIRCLE 187**

Programming Ideas

Tab Books has announced *67 Ready-to-Run Programs in BASIC,* covering topics of interest to the home computerist.

Written in BASIC and featuring detailed program explanations, this volume provides everything needed to play a variety of computer games, experiment with graphic forms, take care of household and business record-keeping, and offer children a new educational challenge. Anyone whose computer has BASIC and 4k memory can use this software library.

For more information: Tab Books Inc., Blue Ridge Summit, PA 17214; (717) 794-2191. **CIRCLE 188**

Step Right Up To...

ARCADE EXCITEMENT!

THRILLS!

New! **COUNTY CARNIVAL** (Dan Illowsky) It's all here—the swerving and moving targets in the shooting gallery, the bright colors, and the carnival music! A kaleidoscope of fun, motion, and skill that brings the excitement of the COUNTY CARNIVAL to your home.
Catalog #13301, Apple II, Apple II Plus; $24.95

CHILLS!

MICRO INVADERS (ESP Laboratory, Dan Illowsky, Programma Int'l) There is no place to hide—there is no escape from the MICRO INVADERS. You command the final battle between the last of the human race and the invading aliens. Brilliant color graphics, battle sounds, and 10 levels of play make this an exciting game!
Catalog #13300, Apple II, Apple II Plus; $19.95

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SUPER DUNGEON (Ron Nelson) You have learned of huge gold deposits hidden in a maze of caves beneath the earth's surface. As you set forth on this unbelievable expedition you'll also discover that SUPER DUNGEON is filled with weapons, potions, jewels, and more. Will you return with the treasure or will the demons of the dark conquer you?
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CIRCLE 87

Diagnostic and utility routines

continued from page 55

Listing 1

```
                        * SHORT MEMORY-ADDRESS CONVERGENCE TEST
                        * FOR 6800 MICROPROCESSOR COMPUTERS
                        * WITH SWTbug OR MIKbug MONITORS

A002                    LOMEM   EQU     $A002       TEST START ADDRESS
A004                    HIMEM   EQU     $A004       ENDING ADDRESS
E1D1                    OUTEEE  EQU     $E1D1       MONITOR OUTPUT ROUTINE

A014                            ORG     $A014       SCRATCHPAD RAM ON uC BOARD

                        * THE TEST CAN BE STARTED WITH RANDOM
                        * DATA IN THE B REGISTER OR WITH FIXED
                        * DATA AS SHOWN HERE.  TO USE RANDOM
                        * DATA ELIMINATE THE FIRST LINE OF
                        * CODE LABELED 'RUN.'

A014 C6 01              RUN     LDA B   #$01        START TEST WITH SINGLE ONE

                        * LOAD THE MEMORY WITH A TEST BYTE

A016 F7 A0 48           START   STA B   BSTORE      SAVE CONTENTS OF B REGISTER
A019 FE A0 02                   LDX     LOMEM       GET START ADDRESS IN INDEX REG.
A01C E7 00              LOOP1   STA B   0,X         PUT CONTENTS OF B REG IN RAM
A01E BC A0 04                   CPX     HIMEM       SEE IF LAST ADDRESS LOADED
A021 27 03                      BEQ     CHECK       CHECK ALL IF FINISHED
A023 08                         INX                 BUMP INDEX REG TO NEXT ADDRESS
A024 20 F6                      BRA     LOOP1       LOAD THE NEXT POSITION

                        * CHECK ALL LOADED MEMORY LOCATIONS
                        * AGAINST CURRENT TEST BYTE

A026 F6 A0 48           CHECK   LDA B   BSTORE      GET THE ORIGINAL DATA BYTE
A029 FE A0 02                   LDX     LOMEM       POINT TO FIRST MEMORY LOCATION
A02C E1 00              LOOP2   CMP B   0,X         SEE IF MATCH
A02E 26 09                      BNE     ERROR       NO MATCH -- DO ERROR ROUTINE
A030 BC A0 04                   CPX     HIMEM       SEE IF ALL THRU
A033 27 0B                      BEQ     CYCLE       ACCB IS ALL ZERO -- ALL DONE
A035 08                         INX                 BUMP INDEX REG TO NEXT ADDRESS
A036 5C                         INC B               ADD ONE TO TEST BYTE
A037 20 F3                      BRA     LOOP2       DO IT AGAIN

                        * ERROR PRINTOUT ROUTINE

A039 86 58              ERROR   LDA A   #'X         ASCII LETTER X
A03B BD E1 D1                   JSR     OUTEEE      PRINT THE ERROR MESSAGE
A03E 20 D6                      BRA     START       RESTART THE TEST

                        * PRINT END OF GOOD TEST AND RESTART

A040 86 23              CYCLE   LDA A   #'#         ASCII # CHARACTER
A042 BD E1 D1                   JSR     OUTEEE      PRINT THE O.K.
A045 5A                         DEC B               SUBTRACT ONE FROM TEST BYTE
                        *                           MAKING IT ALL ONES
A046 20 CE                      BRA     START       START UP TEST AGAIN

                        * TEMP STORAGE FOR TEST BYTE

A048                    BSTORE  RMB     1           TEMP STORE FOR TEST BYTE

                                END

NO ERROR(S) DETECTED
```

Listing 2

```
0000 xx       BEGIN  xx       starting page for test
0001 xx       END    xx       ending page for test
0002 A9 00    START  LDA #0       zero pointers
0004 A8              TAY          for low-order
0005 85 FA           STA POINTL   addresses;
0007 85 70    BIGLP  STA FLAG      =00 first pass,
                                   =FF second pass
0009 A2 02           LDX #2
000B 86 72           STX MOD      set 3 tests each pass
000D A5 00    PASS   LDA BEGIN    set pointer to..
000F 85 FB           STA POINTH   ..start of test area
0011 A6 01           LDX END
0013 A5 70           LDA FLAG
0031 91 FA           STA (POINTL),Y   change 1 out of 3
0033 C8       SKIP   INY
0034 D0 F6           BNE TOP
0036 E6 FB           INC POINTH   new page
0038 A5 01           LDA END      have we passed..
003A C5 FB           CMP POINTH   ..end of test area?
003C B0 EC           BCS FILL     nope, keep going
; memory set up - now test it
003E A5 00           LDA BEGIN    set pointer..
0040 85 FB           STA POINTH   ..back to start
0042 A6 72           LDX MOD      set up 3-counter
0044 A5 71    POP    LDA FLIP     test for FLIP value..
0046 CA              DEX           ..2 out of 3 times..
```

```
0015 49 FF          EOR #$FF    reverse FLAG
0017 85 71          STA FLIP    ..=FF first pass.
                                  =00 second pass
0019 91 FA    CLEAR STA (POINTL),Y    write above
                                      FLIP value..
001B C8             INY               ..into all
                                      locations
001C D0 FB          BNE CLEAR
001E E6 FB          INC POINTH
0020 E4 FB          CPX POINTH
0022 B0 F5          BCS CLEAR
          ; FLIP value in all locations -
            now change 1 in 3
0024 A6 72          LDX MOD
0026 A5 00          LDA BEGIN   set pointer..
0028 85 FB          STA POINTH   ..back to start
002A A5 70    FILL  LDA FLAG    change value
002C CA       TOP   DEX
002D 10 04          BPL SKIP    skip 2 out of 3
002F A2 02          LDX #2      restore 3-counter
0047 10 04          BPL SLIP          - or -
0049 A2 02          LDX #2          1 out of 3..
004B A5 70          LDA FLAG    test for FLAG value;
004D D1 FA    SLIP  CMP (POINTL),Y   here's the test...
004F D0 15          BNE OUT         branch if failed
0051 C8             INY
0052 D0 F0          BNE POP
0054 E6 FB          INC POINTH
0056 A5 01          LDA END
0058 C5 FB          CMP POINTH
005A B0 E8          BCS POP
                ; above test OK - change & repeat
005C C6 72          DEC MOD     change 1/3 position
005E 10 AD          BPL PASS      ..& do next third
0060 A5 70          LDA FLAG    invert..
0062 49 FF          EOR #$FF      ..flag for pass two
0064 30 A1          BMI BIGLP
0066 84 FA    OUT   STY POINTL  put low order adds
                                  to display
0068 4C 4F 1C       JMP START       ...and exit to KIM
```

Listing 3

```
                OPT    PAG

        * ADDRESS SUM TEST FOR 6800 uC SYSTEMS>

        * DERIVED FROM ORIGINAL SUMTEST2 written
        * by Chris Courtney of Respco, Inc. and
        * published in an applications note by
        * Southwest Technical Products Co., Inc.
        * FOR USE WITH SWTbug OR MIKbug MONITORS

        * TEST BYTES STORED IN MEMORY ARE THE SUM
        * OF THE LSB AND MSB OF THE MEMORY ADDRESS.
        * ADJACENT MEMORY LOCATIONS AND ADJACENT
        * MEMORY PAGES CONTAIN UNIQUE TEST DATA

A002                    ORG    $A002     SCRATCHPAD RAM ON uC BOARD

A002          LOMEM     RMB    2         MEMORY TEST START ADDRESS
A004          HIMEM     RMB    2         TEST ENDING ADDRESS
E07E          PDATA1    EQU    $E07E     MONITOR OUTPUTS A STRING OF
                *                        DATA TO TERMINAL POINTED
                *                        TO BY INDEX REG.  DATA ARE
                *                        OUTPUT UNTIL $04 END-OF-STRING/
E1D1          OUTEEE    EQU    $E1D1     MONITOR OUTPUT TO TERMINAL
E0CA          OUT2HS    EQU    $E0CA     MONITOR OUTPUT TWO HEX DIGITS
                *                          AND SPACE TO TERMINAL
E0C8          OUT4HS    EQU    $E0C8     MONITOR OUTPUT FOUR HEX DIGITS
                *                          AND SPACE TO TERMINAL
E19D          MCL       EQU    $E19D     CHARACTER STRING CONTAINING
                *                        AN ASCII <CR>, <LF>, THREE NULLS,
                *                        A '$' AND $04 END-OF-STRING MARKER

A014                    ORG    $A014     UNUSED SPACE IN SCRATCHPAD RAM

A014 00       CTR       FCB    0         TEST PASS COUNTER
A015 00       STORE     FCB    0         BIT MISMATCHED
A016 00       INXMSB    FCB    0         ADDRESS INCREMENT STORAGE
A017 00       INXLSB    FCB    0

                * LOAD MEMORY WITH TEST DATA

A018 FE A0 02 START     LDX    LOMEM     GET STARTING ADDRESS
A01B 8D 39    LOOP1     BSR    INCRX     INCREMENT INDEX REGISTER
A01D A7 00              STA A  0,X       PUT CONTENTS OF A REG IN MEMORY
A01F 08                 INX              BUMP INDEX REG TO NEXT ADDRESS
A020 BC A0 04           CPX    HIMEM     END OF MEMORY TO BE TESTED?
A023 26 F6              BNE    LOOP1     NO -- LOOP AND DO NEXT

                * CHECK THE MEMORY DATA CONTENTS

A025 FE A0 02           LDX    LOMEM     GET TEST START ADDRESS
A028 8D 2C    LOOP2     BSR    INCRX     CALCULATE DATA
```

```
A02A A8 00              EOR A  0,X       'EXCLUSIVE OR' A REG WITH
                  *                      MEMORY CONTENTS
A02C 26 35              BNE    ERROR     DO NOT MATCH - ERROR
A02E 08           RETURN INX              BUMP INDEX REG TO NEXT ADDRESS
                                       8-4-81  TSC ASSEMBLER  PAGE    1

A02F BC A0 04           CPX    HIMEM     SEE IF ALL DONE
A032 20 16              BRA    JUMP      STEP OVER MEMORY USED BY MONITOR

A048                    ORG    $A048

A048 A0 18              FDB    START     START ADDRESS FOR USE WITH
                  *                      MONITOR 'G'O COMMAND
A04A 26 DC        JUMP  BNE    LOOP2     NOT THRU - LOOP UNTIL DONE
A04C 86 2B              LDA A  #$2B
A04E BD E1 D1           JSR    OUTEEE    PRINT IT ON TERMINAL
A051 7C A0 14           INC    CTR       BUMP THE PASS COUNTER
A054 20 C2              BRA    START     REPEAT THE TEST

                  * ROUTINE TO CALCULATE TEST DATA FROM
                  * THE MEMORY-LOCATION ADDRESS

A056 FF A0 16     INCRX STX    INXMSB    SAVE MEMORY-ADDRESS POINTER
A059 B6 A0 16           LDA A  INXMSB    GET THE HI ADDRESS BYTE
A05C BB A0 17           ADD A  INXLSB    ADD IN THE ADDRESS LSB
A05F BB A0 14           ADD A  CTR       ADD IN THE COUNTER
A062 39                 RTS              RETURN TO CALLER

                  * ERROR PRINTOUT ROUTINE

A063 CE E1 9D     ERROR LDX    #MCL      POINT TO <CR>, <LF> STRING
A066 BD E0 7E           JSR    PDATA1    HAVE MONITOR PRINT IT
A069 CE A0 14           LDX    #CTR
A06C BD E0 CA           JSR    OUT2HS    PRINT COUNTER IN HEX
A06F BD E0 CA           JSR    OUT2HS    PRINT BAD BITS IN HEX
A072 BD E0 C8           JSR    OUT4HS    PRINT HEX ADDRESS
A075 FE A0 16           LDX    INXMSB    RESTORE ADDRESS TO INDEX REG
A078 20 B4              BRA    RETURN    LOOP AND DO NEXT

                        END

NO ERROR(S) DETECTED
```

Listing 4

```
                  * PRINT-DRIVER UTILITY

                  * FILE NAME: LIST4.SRC
                  * ASSEMBLED AS: PRINT.SYS

                  * DRIVER ROUTINE FOR EPSON MX-80 PRINTER
                  * WITH RS-232-C SERIAL INTERFACE -- 1200 BAUD

                  * FOR OPERATION ON SMOKE SIGNAL BROADCASTING
                  * 6800 MICRCOMPUTER OPERATING UNDER FLEX DOS.
                  * SERIAL PRINTER PORT (ACIA) -- PORT 2B

F7EA              PACIA  EQU    $F7EA     PRINTER ACIA -- SLOT 2B

ACC0                     ORG    $ACC0

                  * INITIALIZE PRINTER-PORT ACIA

ACC0 86 03        PINIT  LDA A  #$03      MASTER RESET COMMAND
ACC2 B7 F7 EA           STA A  PACIA      CLEAR PRINTER ACIA
ACC5 86 15              LDA A  #$15       f/16,8 BITS, NO PARITY, 1 STOP BIT
ACC7 B7 F7 EA           STA A  PACIA      CONFIGURE ACIA
ACCA 39                 RTS               RETURN TO FLEX DOS

                  * INDEX REG. TEMP STORE & PRINT-READY FLAG

ACCB              XTEMP  RMB    2          INDEX REG. TEMP STORE
ACCD FF           PFLAG  FCB    $FF        PSEUDO PRINT-READY FLAG

                  * FORCED FLEX DOS PRINT-READY CHECK

ACCE 7D AC CD     PCHK   TST    PFLAG      CHECK FOR READY BIT
ACD1 39                  RTS               RETURN TO FLEX

                  * CHARACTER OUTPUT TO PRINTER
                  * CALLED FROM FLEX DOS

ACE4                     ORG    $ACE4

ACE4 FF AC CB     POUT   STX    XTEMP      SAVE INDEX REG. ON ENTRY
```

```
ACE7 37                PSH B             STACK B REG. ON ENTRY
ACE8 F6 F7 EA  TEST    LDA B  PACIA      GET ACIA STATUS BYTE
ACEB 57                ASR B             SHIFT STATUS BYTE TWO BITS
ACEC 57                ASR B             TO RIGHT -- READY BIT IN CARRY
ACED 24 F9             BCC    TEST       IF NOT READY TRY AGAIN
ACEF B7 F7 EB          STA A  PACIA+1    PUT DATA BYTE INTO ACIA
ACF2 33                PUL B             RESTORE B REGISTER
ACF3 FE AC CB          LDX    XTEMP      RESTORE INDEX REGISTER
ACF6 39                RTS               RETURN TO FLEX

                       END

NO ERROR(S) DETECTED
```

Sports record-keeper

This program runs on an Apple II Plus.

continued from page 59

SPORTS

```
 LOAD INITTSPORTS
]

]

]LIST

5  INPUT " N = ";N
10  INPUT " M = ";M
15  INPUT "S = ";S
20  DIM TEAM$(N + 1)
30  DIM ST(N,M,3,S)
40 D$ =  CHR$ (4)
45  INPUT "NAME OF SPECIAL STATIS
    TIC ";FAC$
50  PRINT D$;"OPEN NAMES"
60  PRINT D$;"WRITE NAMES"
70  FOR I = 0 TO N + 1
80  PRINT TEAM$(I)
90  NEXT I
95  PRINT FAC$
100  PRINT D$;"CLOSE NAMES"
110  PRINT D$;"OPEN DB"
120  PRINT D$;"WRITE DB"
130  FOR I = 0 TO N
140  FOR J = 0 TO 3
150  FOR L = 0 TO M
160  FOR K = 0 TO S
170  PRINT ST(I,L,J,K)
180  NEXT K
190  NEXT L
200  NEXT J
210  NEXT I
220  PRINT D$;"CLOSE DB"
230  END

]
```

SPORTS INIT

```
]LIST

1 N = 28:M = 16:S = 2
2 X1 = .4:X2 = .2:X3 = .2:X4 = .2

3 YR = 1
5 D$ =  CHR$ (4)
10  DIM TEAM$(N + 1): DIM T(N + 1
    ): DIM S(1): DIM C(M)
20  DIM ST(N,M,3,S)
30  REM  ************************
    *******
40  REM        LOAD DATA BASE
50  REM  ************************
    *******
60  HOME
70  PRINT : PRINT : PRINT : PRINT
    : PRINT
80  PRINT  TAB( 12);"LOADING DATA
    "
90  PRINT D$;"OPEN NAMES"
100  PRINT D$;"READ NAMES"
110  FOR I = 0 TO N + 1
120  INPUT TEAM$(I)
130  NEXT I
135  INPUT FAC$
140  PRINT D$;"CLOSE NAMES"
150  PRINT D$;"OPEN DB"
160  PRINT D$;"READ DB"
170  FOR I = 0 TO N
180  FOR J = 0 TO 3
190  FOR K = 0 TO M
200  FOR L = 0 TO S
210  INPUT ST(I,K,J,L)
220  NEXT L
230  NEXT K
240  NEXT J
250  NEXT I
260  PRINT D$;"CLOSE DB"
300  REM  ************************
     *******
310  REM                MENU
320  REM  ************************
     *******
350  HOME
360  PRINT : PRINT  TAB( 15);"MAI
     N MENU": PRINT
370  PRINT  TAB( 3);"1. ENTER TEA
     M NAME"
380  PRINT  TAB( 3);"2. ENTER SCO
     RE"
390  PRINT  TAB( 3);"3. PRINTER O
     N"
400  PRINT  TAB( 3);"4. PRINTER O
     FF"
410  PRINT  TAB( 3);"5. SAVE DATA
     "
420  PRINT  TAB( 3);"6. TEAM SUMM
     ARY"
430  PRINT  TAB( 3);"7. RANKINGS"

440  PRINT  TAB( 3);"8. RECORD AG
     AINST OPPONENTS"
450  PRINT  TAB( 3);"9. PREDICTIO
     NS"
460  PRINT  TAB( 2);"10. SELECT S
     EASON"
465  PRINT  TAB( 2);"11. EXIT"
470  PRINT : INPUT "ENTER SELECTI
     ON ";C
480  ON C GOTO 510,600,850,870,90
     0,1110,1800,2000,2400,2800,2
     900
500  REM  ************************
     *******
502  REM             ENTER TEAM NAM
     E
505  REM  ************************
     *******
510 NT =  VAL (TEAM$(0))
520  HOME
530  PRINT : PRINT : PRINT  TAB(
     3);"TEAM NUMBER ";NT + 1
540  INPUT "NAME ";TEAM$(NT + 1)
545 NT = NT + 1:TEAM$(0) =  STR$
     (NT)
550  GOTO 350: REM  RETURN TO MEN
     U
590  REM  ************************
     *******
592  REM             ENTER SCORE
595  REM  ************************
     *******
600  GOSUB 7000: REM  ENTER TEAM
     NAMES
610  HOME
650  PRINT : PRINT  TAB( 3);" POI
     NTS SCORED BY ";TN$
660  INPUT S1
670  PRINT : PRINT  TAB( 3);" POI
     NTS SCORED BY ";OP$
680  INPUT S2
682  IF S1 < 0 THEN 350
683  IF S2 < 0 THEN 350
685 NG = ST(T1 - 1,0,0,YR - 1) +
     1
690 ST(T1 - 1,NG,0,YR - 1) = S1:S
    T(T1 - 1,NG,2,YR - 1) = S2
695 NC = ST(T2 - 1,0,0,YR - 1) +
     1
700 ST(T2 - 1,NC,0,YR - 1) = S2:S
    T(T2 - 1,NC,2,YR - 1) = S1
710  PRINT  TAB( 3);"VALUE OF ";F
     AC$;" FOR ";OP$
720  INPUT S2
730  PRINT  TAB( 3);"VALUE OF ";F
     AC$;" FOR ";TN$
740  INPUT S2
750 ST(T1 - 1,NG,3,YR - 1) = S1:S
    T(T2 - 1,NG,3,YR - 1) = S2
780 ST(T2 - 1,NC,1,YR - 1) = T1
790 ST(T1 - 1,NG,1,YR - 1) = T2
792 ST(T1 - 1,0,0,YR - 1) = NG
795 ST(T2 - 1,0,0,YR - 1) = NC
800  GOTO 350: REM  RETURN TO MEN
     U
840  REM  ************************
     *******
842  REM           PRINTER ON/OFF
845  REM  ************************
     *******
850 PR = 1
860  GOTO 350
870 PR = 0
880  GOTO 350
890  REM  ************************
     *******
892  REM          SAVE DATA
895  REM  ************************
     *******
900  PRINT D$;"OPEN NAMES"
910  PRINT D$;"WRITE NAMES"
920  FOR I = 0 TO N + 1
930  PRINT TEAM$(I)
940  NEXT I
945  PRINT FAC$
950  PRINT D$;"CLOSE NAMES"
960  PRINT D$;"OPEN DB"
970  PRINT D$;"WRITE DB"
980  FOR I = 0 TO N
990  FOR J = 0 TO 3
995  FOR L = 0 TO M
1000  FOR K = 0 TO S
1010  PRINT ST(I,L,J,K)
1020  NEXT K
1025  NEXT L
1030  NEXT J
1040  NEXT I
1050  PRINT D$;"CLOSE DB"
1060  GOTO 350: REM  RETURN TO ME
     NU
1090  REM  ************************
     *******
1092  REM           SUMMARY
1095  REM  ************************
     *******
```

```
1110  HOME
1115  PRINT : PRINT : INPUT "TEAM
     NAME ";TN$
1120  FOR I = 1 TO N
1125  IF TN$ = TEAM$(I) THEN 1135

1130  NEXT I
1135 T1 = I
1140  PRINT : PRINT : PRINT  TAB(
     3);"1. ";TN$;" SCHEDULE"
1145  PRINT  TAB( 3);"2. ";TN$;"
     W/L RECORD "
1147  PRINT  TAB( 3);"3. RETURN T
     O MENU"
1150  PRINT : PRINT : INPUT "SELE
     CTION ";S3
1155  IF S3 = 1 THEN 1170
1160  IF S3 = 2 THEN 1220
1165  GOTO 350
1170 NG = ST(T1 - 1,0,0,YR - 1)
1175  HOME
1180  PRINT :CT = 0
1182  IF PR = 1 THEN  PR# 1
1185  FOR I = 1 TO NG
1190 OP$ = TEAM$(ST(T1 - 1,I,1,YR
     - 1))
1195  PRINT TN$; SPC( 2);ST(T1 -
     1,I,0,YR - 1); SPC( 2);OP$; SPC(
     2);ST(T1 - 1,I,2,YR - 1)
1200  NEXT I
1205  PR# 0
1210  PRINT : INPUT "NEXT ";C$
1215  GOTO 1140
1220 TM = T1: GOSUB 9000
1225 W1 = W:L1 = L:R1 = T:P1 = TS
     :G1 = TG
1230  GOSUB 9500
1235 W2 = W:L2 = L:R2 = T:P2 = TS
     :G2 = TG
1240 W3 = 0:L3 = 0:T3 = 0:W4 = 0:
     L4 = 0:T4 = 0
1245  FOR I = 0 TO N + 1:T(I) = 0
     : NEXT I
1250 NG = ST(T1 - 1,0,0,YR - 1)
1255  FOR I = 1 TO NG
1260 II = ST(T1 - 1,I,1,YR - 1)
1265  IF T(II) = 1 THEN 1350
1270 T(II) = 1
1275 TM = II
1280  IF TM = 0 THEN 1350
1285  GOSUB 9000
1290 W3 = W3 + W
1295 L3 = L3 + L
1300 T3 = T3 + T
1310  GOSUB 9500
1320 W4 = W4 + W
1330 L4 = L4 + L
1340 T4 = T4 + T
1350  NEXT I
1360  HOME
1365  IF PR = 1 THEN  PR# 1
1370  PRINT  TAB( 12);TEAM$(T1)
1380  PRINT : PRINT  TAB( 10);"SE
     ASON"; SPC( 10);"TOTAL"
1390  PRINT : PRINT "WINS"; SPC(
     8);W1; SPC( 13);W2
1400  PRINT "LOSSES"; SPC( 6);L1;
      SPC( 13);L2
1410  PRINT "TIES"; SPC( 8);R1; SPC(
     13);R2
1420  PRINT "POINTS"; SPC( 6);P1;
      SPC( 12);P2
1430  PRINT " SCORED"
1440  PRINT : PRINT "POINTS"; SPC(
     6);G1; SPC( 12);G2
1450  PRINT " GIVEN"
1460  PRINT : PRINT : PRINT "OPPO
     NENTS"
1470  PRINT " WINS"; SPC( 7);W3; SPC(
     13);W4
1480  PRINT " LOSSES"; SPC( 5);L3
     ; SPC( 13);L4
1490  PRINT " TIES"; SPC( 7);T3; SPC(
     13);T4
1492  GOSUB 12000
1494  PRINT : PRINT : PRINT "THE
     SUMMARY SCORE FOR ";FAC$;" I
     S ";FC
1500  PRINT : PRINT : PRINT : INPUT
     "NEXT ";C$
1510  PR# 0
1520  GOTO 1140
1790  REM  ***********************
     *******
1792  REM        TEAM RANKINGS
1795  REM  ***********************
     *******
1800  HOME
1802  IF PR = 1 THEN  PR# 1
1805  PRINT  TAB( 3);"TEAM"; SPC(
     18);"WINS"; SPC( 3);"LOSSES"

1806 CT = 0
1810  FOR I = 1 TO N
1815 CT = CT + 1
1820 TM = I
1830  GOSUB 9000
1840 LL =  LEN (TEAM$(TM))
1850 LL = 26 - LL
1860  PRINT TEAM$(TM); SPC( LL);W
     ; SPC( 5);L
1870  IF CT < 21 THEN 1910
1880  PR# 0
1885 CT = 0
1890  PRINT : INPUT "NEXT ";C$
1900  IF PR = 1 THEN  PR# 1
1910  NEXT I
1920  PR# 0
1925  PRINT : INPUT " RETURN TO M
     ENU ";C$
1930  GOTO 350: REM  RETURN TO ME
     NU
1990  REM  ***********************
     *******
1992  REM        RECORD AGAINST OP
     PONENT
1995  REM  ***********************
     *******
2000  HOME
2010  GOSUB 7000
2020 T1 = T1 - 1
2105 W = 0:L = 0:T = 0:S1 = 0:S2 =
     0
2110  FOR I = 0 TO S
2120  FOR J = 1 TO M
2130  IF ST(T1,J,1,I) = T2 THEN 2
     150
2140  GOTO 2240
2150  IF ST(T1,J,0,I) < ST(T1,J,2
     ,I) THEN 2190
2160  IF ST(T1,J,0,I) > ST(T1,J,2
     ,I) THEN 2210
2170 T = T + 1
2180  GOTO 2220
2190 L = L + 1
2200  GOTO 2220
2210 W = W + 1
2220 S1 = S1 + ST(T1,J,0,I)
2230 S2 = S2 + ST(T1,J,2,I)
2240  NEXT J
2250  NEXT I
2260  IF PR = 1 THEN  PR# 1
2270  PRINT : PRINT  TAB( 3);"THE
      RECORD OF ";TN$;" AGAINST "
     ;OP$
2280  PRINT : PRINT "THEY MET ";W
     + L + T;" TIMES"
2290  PRINT : PRINT " WINS "; SPC(
     4);W
2300  PRINT " LOSSES "; SPC( 2);L
2310  PRINT " TIES "; SPC( 4);T
2320  PRINT : PRINT "TOTAL POINTS
      SCORED "; SPC( 3);S1
2330  PRINT : PRINT "TOTAL POINTS
      GIVEN "; SPC( 4);S2
2340  PRINT : PRINT
2350  PR# 0
2360  INPUT "RETURN TO MENU ";C$
2370  GOTO 350
2390  REM  ***********************
     *******
2392  REM        PREDICTION
2395  REM  ***********************
     *******
2400  HOME
2410  GOSUB 7000
2510 TM = T1:P4 = 0
2515  FOR II = 0 TO 1
2520  GOSUB 9000
2530 P1 = W / (W + L + T)
2540 P2 = TS / (TS + TG):P4 = P4 +
     (TS - TG) / 2
2550  GOSUB 10100
2560 P3 = W / (W + L + T)
2565  GOSUB 12000
2566 P5 = FC
2570 S(II) = X1 * P1 + X2 * P2 +
     X3 * P3 + X4 * P5
2580 TM = T2
2590  NEXT II
2600  HOME
2605  IF PR = 1 THEN  PR# 1
2608  PRINT : PRINT : PRINT  TAB(
     15);"I PREDICT"
2610  IF S(0) > S(1) THEN 2650
2620  IF S(0) = S(1) THEN 2670
2630  PRINT : PRINT : PRINT  TAB(
     8);OP$;" OVER ";TN$
2640  GOTO 2690
2650  PRINT : PRINT : PRINT  TAB(
     8);TN$;" OVER ";OP$
2660  GOTO 2690
2670  PRINT : PRINT : PRINT  TAB(
     10);"THE MATCH WILL BE TIED"

2680  GOTO 2710
2690 PP = 5 *  ABS (S(0) - S(1)) +
     .8 *  ABS (P4)
2695 PP =  INT (PP)
2700  PRINT : PRINT  TAB( 14);"BY
     ";PP;" POINTS"
2710  PRINT : PRINT : INPUT "DO Y
     OU WANT ANOTHER PREDICTION?
     ";C$
2720  IF C$ = "Y" THEN 2400
2725  PR# 0
2730  GOTO 350
2790  REM  ***********************
     *******
2792  REM            SEASON
2795  REM  ***********************
     *******
2800  HOME
2810  PRINT : PRINT : PRINT : PRINT
     : PRINT
2820  INPUT "       SEASON (1-3) "
     ;YR
2830  GOTO 350
2890  REM  ***********************
     *******
2892  REM             EXIT
2895  REM  ***********************
     *******
2900  END
6990  *  *  *  *  *  *  *  *  *  *  *
      *  *  *  *  *  *  *  *  *  *  *
      *  *  *  *  *  *  *  *  *  *  *
      *  *  *
6992 FINDTEAMNAMESUBR
6995  *  *  *  *  *  *  *  *  *  *  *
      *  *  *  *  *  *  *  *  *  *  *
      *  *  *  *  *  *  *  *  *  *  *
      *  *  *
7000  INPUT "TEAM NAME ";TN$
7010  INPUT "OPPONENT ";OP$
7020  FOR I = 1 TO N
7030  IF TN$ = TEAM$(I) THEN 7060

7040  IF OP$ = TEAM$(I) THEN 7080

7050  GOTO 7090
7060 T1 = I
7070  GOTO 7090
7080 T2 = I
7090  NEXT I
7100  RETURN
8990  REM  ***********************
     *******
8992  REM         W/L RECORD SUBR
8995  REM  ***********************
     *******
9000 W = 0:T = 0:L = 0:TS = 0:TG =
     0
9008 Q1 = TM - 1:Q2 = YR - 1
9010 N1 = ST(Q1,0,0,Q2)
9015  IF N1 = 0 THEN 9120
9020  FOR IJ = 1 TO N1
9030 TS = TS + ST(TM - 1,IJ,0,YR -
     1)
9040 TG = TG + ST(TM - 1,IJ,2,YR -
     1)
9050 K = ST(TM - 1,IJ,0,YR - 1) -
     ST(TM - 1,IJ,2,YR - 1)
```

```
9060  IF K < 0 THEN 9090
9070  IF K > 0 THEN 9100
9080 T = T + 1: GOTO 9110
9090 L = L + 1: GOTO 9110
9100 W = W + 1
9110  NEXT IJ
9120  RETURN
9490  REM  ***********************
     *******
9492  REM        TOTAL W/L SUBR
9495  REM  ***********************
     *******
9500 TY = YR
9510 Z1 = 0:Z2 = 0:Z3 = 0:Z4 = 0:
     Z5 = 0
9520  FOR YR = 1 TO 3
9530  GOSUB 9000
9540 Z1 = Z1 + W
9550 Z2 = Z2 + L
9560 Z3 = Z3 + T
9570 Z4 = Z4 + TS
9580 Z5 = Z5 + TG
9590  NEXT YR
9600 W = Z1:L = Z2:T = Z3:TS = Z4
     :TG = Z5:YR = TY
9610  RETURN
9990  REM  ***********************
     *******
9992  REM     LIST TEAMS SUBR
9995  REM  ***********************
     *******
10000  HOME
10005 CT = 0
10010  FOR IJ = 1 TO N
10015 CT = CT + 1
10020  PRINT  TAB( 3);IJ; SPC( 2)
     ;TEAM$(IJ)
10030  IF CT < 20 THEN 10050
10035 CT = 0
10040  PRINT : INPUT "NEXT ";C$
10050  NEXT IJ
10060  INPUT " TEAM NUMBER ";C
10070  RETURN
10090  REM  ***********************
     *******
10092  REM      OPPONENTS RECORD
10095  REM  ***********************
     *******
10100 W5 = 0:T5 = 0:L5 = 0:K = 0:
     TP = TM
10110 N1 = ST(TP - 1,0,0,YR - 1)
10120  FOR IJ = 1 TO M
10130 C(IJ) =  - 1
10140  NEXT IJ
10150  FOR IJ = 1 TO N1
10160 TM = ST(TP - 1,IJ,1,YR - 1)

10170  FOR JI = 1 TO IJ - 1
10180  IF TM = C(JI) THEN 10230
10190  NEXT JI
10200 C(IJ - 1) = TM
10210  GOSUB 9000
10220 W5 = W5 + W:T5 = T5 + T:L5 =
     L5 + L
10230  NEXT IJ
10240 W = W5:T = T5:L = L5:TM = T
     P
10250  RETURN
12000 N1 = ST(TM - 1,0,0,YR - 1)
12005 AV = 0
12010  FOR IJ = 1 TO N1
12015 AV = AV + ST(TM - 1,IJ,3,YR
     - 1)
12020  NEXT IJ
12030 FC = AV / N1
12040  RETURN

]
```

Golf handicapping

This program runs on an Apple II.

continued from page 61

```
TYPE NAME OF TOURNAMENT?
TYPE NAME OF TOURNAMENT?HACKERS GOLF TOURNAMENT
NAME OF COURSE
PEOPLES COUNTRY CLUB
DATE-DO NOT USE COMMAS
?JULY 1980
GIVE PAR FOR EACH HOLE,SEPARATE EACH    HOLE WITH A COMMA
GIVE FIRST NINE HOLES AND HIT RETURN
 1,2,3,4,5,6,7,8,9
5,3,4,4,4,3,4,4,4
GIVE NEXT NINE HOLES
?4,4,4,5,3,4,4,4,4
5 3 4 4 4 3 4 4 4     35
4 4 4 5 3 4 4 4 4     36
IF ABOVE IS CORRECT TYPE Y,ELSE N
?Y
NUMBER OF PLAYERS SHOULD NOT EXCEED 100
SCORES ARE INPUT IN GROUPS OF 9 EACH
HOLE SEPARATED BY A COMMA. NO HOLE TO
BE SCORED MORE THAN TWICE PAR
NAME OF PLAYER NO.1
?MICKEY MOUSE
SCORES FOR FIRST 9 HOLES
 1,2,3,4,5,6,7,8,9
?5,6,7,6,5,4,4,5,4
SCORES FOR SECOND NINE HOLES
?5,6,7,5,7,6,6,8,5
MICKEY MOUSE
5 6 7 6 5 4 4 5 4     46
5 6 7 5 6 6 6 8 5     54
TOTAL SCORE =100
HOLE 14 IS CHANGED TO TWICE PAR
IF ABOVE IS CORRECT TYPE Y,ELSE TYPE N
?Y
NAME          SCRATCH  HOLES  ADJ    NET
MICKEY MOUSE    100      3.5     2    79
IS THERE ANOTHER PLAYER (Y/N)
?Y
NAME OF PLAYER NO.2
?
BREAK IN 330
```

HACKERS GOLF TOURNAMENT
PEOPLES COUNTRY CLUB
JULY 1980

NAME	SCORE	HDCP	NET	PAR 71	5	3	4	4	4	3	4	4	4	4	4	4	5	3	4	4	4	4
HENRY SANDBAGGER	80	7	73		4	5	4	3	4	5	6	5	4	4	5	4	3	4	5	6	5	4
BILL BAILEY	90	13	77		6	5	4	5	5	6	4	5	5	5	5	5	6	5	4	5	5	5
JACK SMEED	99	21	78		5	6	7	6	5	6	6	6	5	5	6	6	6	5	4	5	5	5
HANK NICKELS	95	16	79		5	6	5	5	6	6	5	5	6	5	5	5	4	5	6	5	6	5
MICKEY MOUSE	100	21	79		5	6	7	6	5	4	4	5	4	5	6	7	5	6	6	6	8	5
SAM HACKER	105	25	80		7	6	5	6	7	6	6	6	5	5	6	7	6	5	4	5	6	7

```
GOLF HDCP CALLAWAY
10  DIM ES%(18)
20  DIM N$(99)
30  DIM A%(15),R%(99)
40  DIM S%(99,19)
50  DIM P%(17)
60  DEF  FN A(X) =  INT (X + .5)
70  HOME
80  PRINT "GOLF HANDICAP CALLAWAY SYSTEM"
90  PRINT "TYPE NAME OF TOURNAMENT";: INPUT NT$
100  PRINT "NAME OF COURSE";: INPUT C$
110  PRINT "DATE-DO NOT USE COMMAS";: INPUT DA$
120  PRINT "GIVE PAR FOR EACH HOLE,SEPARATE EACH
     HOLE WITH A COMMA"
130  PRINT "GIVE FIRST NINE HOLES AND HIT RETURN"
140  PRINT " 1,2,3,4,5,6,7,8,9"
150  INPUT P%(0),P%(1),P%(2),P%(3),P%(4),P%(5),P%(6),
     P%(7),P%(8)
160  PRINT "GIVE NEXT NINE HOLES"
170  INPUT P%(9),P%(10),P%(11),P%(12),P%(13),P%(14),P%(15),
     P%(16),P%(17)
180  FOR I = 0 TO 9 STEP 9
190 T% = 0
200  FOR J = I TO I + 8
210  PRINT P%(J);" ";
220 T% = T% + P%(J)
223  IF FL = 1 THEN T2% = T%: GOTO 230
225 T1% = T%
230  NEXT J
240  PRINT  SPC( 4)T%
245 FL = 1
250  NEXT I
255 TT% = T1% + T2%
260  PRINT "IF ABOVE IS CORRECT TYPE Y,ELSE N"
270  INPUT A$
280  IF A$ = "N" THEN 120
290  PRINT : PRINT "NUMBER OF PLAYERS SHOULD NOT EXCEED 100"
300  PRINT "SCORES ARE INPUT IN GROUPS OF 9 EACH
     HOLE SEPARATED BY A COMMA.
     NO HOLE TO  BE SCORED MORE THAN TWICE PAR"
310 I = 0
320  PRINT : PRINT "NAME OF PLAYER NO.";I + 1
330  INPUT N$(I)
340  IF  LEN (N$(I)) > 18 THEN  PRINT
```

```
    "NUMBER OF CHARACTERS IN NAME CANNOT EXCEED 18
    SO PLEASE SHORTEN AND REENTER": GOTO 320
350  PRINT "SCORES FOR FIRST 9 HOLES"
360  PRINT " 1,2,3,4,5,6,7,8,9"
370  INPUT S%(I,2),S%(I,3),S%(I,4),S%(I,5),S%(I,6),S%(I,7),
    S%(I,8),S%(I,9)  ,S%(I,10)
380  PRINT "SCORES FOR SECOND NINE HOLES"
390  INPUT S%(I,11),S%(I,12),S%(I,13),S%(I,14),S%(I,15),
    S%(I,16),S%(I,17), S%(I,18),S%(I,19)
400  PRINT N$(I)
410 S1% = 0
420 X = 0
430  FOR J = 2 TO 10
440  IF 2 * P%(J - 2) < S%(I,J) THEN X = X + 1:ES%(X) =
    J - 1:S%(I,J) = P% (J - 2) * 2
450  PRINT S%(I,J);" ";
460 S1% = S1% + S%(I,J)
470  NEXT J
480  PRINT  SPC( 4)S1%
490 S2% = 0
500  FOR J = 11 TO 19
510  IF 2 * P%(J - 2) < S%(I,J) THEN X = X + 1:ES%(X) =
    J - 1:S%(I,J) = P% (J - 2) * 2
520  PRINT S%(I,J);" ";
530 S2% = S2% + S%(I,J)
540  NEXT J
550  PRINT  SPC( 4)S2%
560 S%(I,1) = S1% + S2%
570  PRINT "TOTAL SCORE =";S%(I,1)
580  IF X < > 0 THEN  FOR J = 1 TO X: PRINT "HOLE ";ES%(J);
    " IS CHANGED TO TWICE PAR": NEXT
590  PRINT "IF ABOVE IS CORRECT TYPE Y,ELSE TYPE N":
    INPUT A$
600  IF A$ = "N" THEN  PRINT "REENTER": GOTO 320
610  PRINT
620  REM    CALC.CALLOWAY AT  S%(I,0)
630  PRINT "NAME"; SPC( 10)"SCRATCH"; SPC( 2)"HOLES";
    SPC( 2)"ADJ"; SPC( 4)"NET"
640  PRINT N$(I);
650 TB = 16 -  LEN (N$(I)): IF TB < 1 THEN TB = 1
660  PRINT  SPC( TB)S%(I,1);
670  IF S%(I,1) < TT% + 1 THEN S%(I,0) = S%(I,1): PRINT
    SPC( 5)"0"; SPC(  5)"0";: GOTO 1040
680  FOR J = 0 TO 15:A%(J) = S%(I,J + 2): NEXT
690  REM  SORT HOLE SCORES
700  FOR J = 0 TO 14
710 K = J + 1
720  IF A%(J) =  > A%(K) THEN 770
730 X% = A%(J)
740 A%(J) = A%(K)
750 A%(K) = X%
760 FLAG = 1
770  NEXT J
780  IF FLAG = 1 THEN FLAG = 0: GOTO 700
790  IF S%(I,1) > TT% + 3 THEN 850
800 X = A%(0) / 2
810 S%(I,0) = S%(I,1) -  FN A(X) + (TT% + 3 - S%(I,1))
820 Y = TT% + 3 - S%(I,1)
830  PRINT  SPC( 5)".5"; SPC( 3)Y;
840  GOTO 1040
850  REM   3 OVER PAR
860 Y =  INT ((S%(I,1) - (TT% - 1)) / 5)
870 Y = (Y + 1) / 2
880  IF Y > 6 THEN Y = 6
890  PRINT  SPC( 6)Y;
900 K = 0:S%(I,0) = S%(I,1)
910  FOR J = 0 TO  INT (Y - 1)
920 S%(I,0) = S%(I,0) - A%(J)
930 K = K + 1
940  NEXT J
950  IF Y =  INT (Y) THEN 990
960  REM  1/2 OF NEXT HOLE
970 X = A%(K) / 2
980 S%(I,0) = S%(I,0) -  FN A(X)
990  REM  ADJUSTMENT
1000 Q = S%(I,1) + 71 - TT%
1010 R = (Q -  INT (Q / 5) * 5) - 2
1020  PRINT  SPC( 5)R * ( - 1);
1030 S%(I,0) = S%(I,0) - R
1040  PRINT  SPC( 4)S%(I,0)
1050  PRINT "IS THERE ANOTHER PLAYER (Y/N)": INPUT A$
1055  IF  LEN (A$) > 1 THEN  PRINT "ONE LETTER ONLY": GOTO 1050
1056  IF A$ = "Y" THEN I = I + 1: GOTO 320
1057 N = I + 1
1060  PRINT "DO YOU WANT RESULTS PRINTED (Y/N)": INPUT P$
1070  PRINT : IF P$ = "Y" THEN  PRINT "TYPE Y IF YOU WANT
    INDIVIDUAL HOLE  SCORE PRINTED-YOU SHOULD HAVE AT LEAST
    A 80  COLUMN PRINTER FOR THIS--ELSE TYPE N": INPUT PW$:
    PRINT
1080  IF P$ < > "Y" THEN 1090
1082  PRINT "PR#1"
1084  PRINT "K"
1086  PRINT "80N"
1090 S = (40 -  LEN (NT$)) / 2: PRINT : PRINT  SPC( S)NT$
1100 S = (40 -  LEN (C$)) / 2: PRINT : PRINT  SPC( S)C$
1110  IF S < 10 THEN S = 10
1120  PRINT  SPC( S)DA$;:S = 32 - S -  LEN (DA$)
1130  PRINT  SPC( S)"PAR ";TT%;" ";
1140  IF PW$ = "Y" THEN  FOR J = 0 TO 17: PRINT P%(J);" ";: NEXT
1150  PRINT : PRINT : FOR J = 0 TO N - 1:R%(J) = J: NEXT : REM
    SET RANK I      N SEQUENCE
1160 FLAG = 0
1170  FOR C = 0 TO N - 2
1180 I = R%(C):K = R%(C + 1)
1190  FOR J = 0 TO 18
1200  IF S%(I,J) < S%(K,J) THEN 1270
1210  IF S%(I,J) > S%(K,J) THEN 1230
1220  NEXT J
1230 FLAG = 1
1240 A% = R%(C)
1250 R%(C) = R%(C + 1)
1260 R%(C + 1) = A%
1270  NEXT C
1280  IF FLAG = 1 THEN 1160
1290  HOME
1300  PRINT "NAME"; SPC( 16)"SCORE"; SPC( 2)"HDCP"; SPC( 3)"NET"
1310  FOR C = 0 TO N - 1
1320  PRINT
1330 I = R%(C)
1340  PRINT N$(I);
1350 TB = 24 -  LEN (N$(I)) -  LEN ( STR$ (S%(I,1)))
1360  PRINT  SPC( TB)S%(I,1);
1370 X = S%(I,1) - S%(I,0)
1380 TB = 6 -  LEN ( STR$ (X))
1390  PRINT  SPC( TB)X;
1400 TB = 7 -  LEN ( STR$ (S%(I,0)))
1410  PRINT  SPC( TB)S%(I,0);
1420  IF PW$ = "Y" THEN  PRINT  SPC( 2);: FOR J = 2 TO 19:
    PRINT S%(I,J);"  ";: NEXT : PRINT
1425  IF PW$ < > "Y" THEN  PRINT
1430  NEXT C
1440  END
```

Counting pins by computer

This program runs on a TRS-80 Model I.

continued from page 153

BOWLER

```
50  REM APR 20 '79 GOOD VERSION ALTERED DEC 29 '79 FOR DOS  AND PRINTING - NAME IS 'BOWLER'
100 INPUT"THIS IS THE VERSION FOR PRINTING <EN> TO CONTINUE";PK
150 CLEAR 6000
200 DEFSTRA,G:DEFINTX,S,Y,P,W,L,F
250 DIMA$(23),G$(8,33),GS$(1),GW$(33),X1(33),X2(9),X3(9),T4(33)
300 F$="BOWL7980":INPUT"FILE TO BE READ <BOWL7879> OR <BOWL7980 -END>";F$
350 OPEN"I",1,F$
400 FORX=1TO23:READA$(X):NEXT:INPUT#1,GS$(1):FORX=1TO33:
  INPUT#1,GW$(X):NEXT:FORX=8TO0STEP-1:INPUT#1,GN$(X):NEXT
450 CLS:INPUT"FIRST WEEK, LAST WEEK";F,L:INPUT"PLAYER NO.";B:INPUT"ALLEY NO.";N:INPUT"OPPONENT";O
500 IF EOF(1) THEN 900
550 INPUT#1,P,W:IFP=0 GOTO 900
575 IF W>L THEN 900
600 IFW<F ORW>LTHENINPUT#1,ZZ$:GOTO500
650 IFB<9ANDB<>PTHENINPUT#1,ZZ$:GOTO500
700 IFN<32ANDN<>VAL(MID$(GW$(W),6,2))THENINPUT#1,ZZ$:GOTO500
750 IFO<16ANDO<>VAL(MID$(GW$(W),8,2))THENINPUT#1,ZZ$:GOTO500
800 INPUT#1,G$(P,W):IFLEN(G$(P,W))<>27THENPRINT"DATA WRONG";P;W;G$(P,W);LEN(G$(P,W)):STOP
850 GOTO500
900 CLOSE
950 CLS:PRINT"CHOICES:":PRINT"HI/LO VALUES, EACH GAME & AVG (1)":PRINT"OVERVIEW FOR ONE PLAYER
  (2)":PRINT"COMPREHENSIVE - ALL PLAYERS & TEAM (3)":INPUT"TEAM RECORD VS SELECTED OPPONENTS
  (4)";I1:ON I1GOTO5950 ,1100 ,4750 ,2000
1000 GOTO950
1050 STOP
1100 FORW=FTOL:FORV=1TO3:PRINT@RND(1024),HB:HB=HB+1:
  IFVAL(MID$(G$(B,W),(V*9-8),3))>70THENT(7,V)=T(7,V)+1:GOTO1200
1150 NEXTW:IFW>LTHEN1350
1200 S=0:R=3:FORU=0TO6:T(U,V)=T(U,V)+VAL(MID$(G$(B,W),(V*9-8+S),R))
1250 IFU=0THENS=2:R=1
```

```
1300 S=S+1:NEXTU:NEXTV:NEXTW
1350 FORU=0TO7:FORV=0TO3:T(U,0)=T(U,0)+T(U,V):NEXT:NEXT:  U=0:CLS:LPRINTMID$(GW$(F),1,5);
 " TO  ";MID$(GW$(L),1,5);"  LANES: ";:IFN=99LPRINT"ALL   ";:GOTO1450
1400 LPRINTN;" & ";N+1;
1450 LPRINT" VS: ";:IFO=99LPRINT"ALL TEAMS":GOTO1550
1500 LPRINTMID$(G$(1),(O*15-14),15)
1550 LPRINT"OVERVIEW FOR - ";GN$(6):LPRINT"DESCRIPTION:      FIRST    SECOND   THIRD  SERIES
 SERIES/3"
1600 LPRINT"PINFALL     ";:GOSUB1900 :LPRINT"STRIKES     ";:  GOSUB1900 :LPRINT"SPLITS
 ";:GOSUB1900      :LPRINT"BEER FR LOST";:GOSUB1900 :LPRINT"DIMES COLL  ";:GOSUB1900
1650 LPRINT"DIMES PAID  ";:GOSUB1900 :LPRINT"DIMES MISSED";:GOSUB1900 :LPRINT" :LPRINT
 "GAMES       ";:GOSUB1900
1700 U=0:LPRINT" ":LPRINT" ":LPRINTTAB(25)A$(3):  LPRINT"DESCRIPTION:     FIRST  SECOND   THIRD
 SERIES     SERIES/3":LPRINT"PINFALL     ";:GOSUB1950
1750 LPRINT"STRIKES     ";:GOSUB1950 :LPRINT"SPLITS      ";:GOSUB1950 :LPRINT"BEER FR LOST";
 :GOSUB1950
1800 LPRINT"DIMES COLL  ";:GOSUB1950 :LPRINT"DIMES PAID  ";:  GOSUB1950 :LPRINT"DIMES MISSED";
 :GOSUB1950    :LPRINT" ":LPRINT"GAMES       ";:GOSUB1900
1850 PRINTMEM:END
1900 LPRINTUSINGA$(1);T(U,1);T(U,2);T(U,3);T(U,0);T(U,0)/3:U=U+1:RETURN
1950 LPRINTUSINGA$(23);T(U,1)/T(7,1);T(U,2)/T(7,2);T(U,3)/T(7,3);3*T(U,0)/T(7,0);T(U,0)/T(7,0):
 U=U+1:RETURN
2000 CLS:LPRINT"RECORD AGAINST ";MID$(GS$(1),(O*15-14),15):  LPRINTTAB(11)"HDCP
 FIRST    SECOND     THIRD  SERIES"
2050 FORW=FTOL:IFVAL(MID$(GW$(W),8,2))<>0THEN2300
2100 FORV=1TO3:FORP=1TO8:IFVAL(MID$(G$(P,W),(V*9-8),3))=0THEN2200
2150 T(0,V)=T(0,V)+VAL(MID$(G$(P,W),(V*9-8),3))
2200 NEXTP:T(0,0)=T(0,0)+T(0,V):S(V)=T(0,V)+VAL(MID$(GW$(W),13,3)):
 T(0,V)=0:NEXTV:S(0)=T(0,0)+3*(VAL(MID$(GW$(W),13,3)))
2250 GOSUB2350 :S(1)=0:S(2)=0:S(3)=0:S(0)=0
2300 T(0,0)=0:NEXTW:LPRINTTAB(25)"WON";W1;"  LOST";L1:END
2350 LPRINTMID$(GW$(W),1,5);:LPRINT"      ";MID$(GW$(W),13,3);  "    US
 ";:LPRINTUSINGA$(1);S(1);S(2);S(3);S(0):  LPRINTVAL(MID$(GW$(W),6,2));"&";VAL(MID$(GW$(W),6,2))+1;"
 ";MID$(GW$(W),10,3);"   THEM";
2400 FORX=1TO3:S2(X)=VAL(MID$(GW$(W),(13+3*X),3)):IFS2(X)<400THENS2(X)=S2(X)+1000
2450 S2(0)=S2(0)+S2(X):NEXT:LPRINTUSINGA$(1);S2(1);S2(2);S2(3);S2(0):FORX=0TO3:
 IFS(X)>S2(X)THENW1=W1+2
2500 IFS(X)<S2(X)THENL1=L1+2
2550 IFS(X)=S2(X)THENW1=W1+1:L1=L1+1
2600 NEXT:S2(0)=0:LPRINT:RETURN
2650 DATA"     ##,###    ##,###  ##,###  ##,###   ##,###    ##,###", "       ###    ###.##
 ###.##  ###.##     $,###.##    ###.##","xxx A V E R A G E S xxx"
2700 DATA"PLAYER     GAMES     FIRST  SECOND   THIRD   SERIES  SERIES/3",
 "NO.          T O T A L   P I N F A L L"
2750 DATA"NO.            T O T A L   S T R I K E S","NO.          T O T A L   S P L I T S", "NO.
 TOTAL BEER FRAMES LOST","NO.            TOTAL DIMES COLLECTED"
2800 DATA"NO.       T O T A L   D I M E S   P A I D","NO.       TOTAL DIME OPPORTUNITIES MISSED",
 "FIRST GAME"
2850 DATA"SECOND GAME"," THIRD GAME","TOTAL SERIES ","PINFALL ","STRIKES ","SPLITS ",  "BEER
 FRAMES PAID      ","DIMES COLLECTED ","DIMES PAID ","DIME OPPORTUNITIES MISSED "
2900 DATA"    ###.##  ###.##  ###.##  $,###.##   ###.##"
3300 STOP
3350 CT(0)=0:X1(0)=0:X2(0)=0:X3(0)=0:T4(0)=0
3400 FORP=1TO8:FORW=FTOL:IF8<9ANDB<>PTHEN3650
3450 IFN<32ANDN<>VAL(MID$(GW$(W),6,2))THEN3650
3500 IFO<16ANDO<>VAL(MID$(GW$(W),8,2))THEN3650
3550 X1(P)=VAL(MID$(G$(P,W),S,R)):X2(P)=VAL(MID$(G$(P,W),S+9,R)):X3(P)=VAL(MID$(G$(P,W),S+18,R)):
 X1(9)=X1(9)+X1(P):X1(0)=X1(0)+X1(P):X2(9)=X2(9)+X2(P):
 X2(0)=X2(0)+X2(P):X3(9)=X3(9)+X3(P):X3(0)=X3(0)+X3(P)
3600 IFX1(P)>70THENCT(P)=CT(P)+1
3650 NEXT:X1(P)=X1(9):X1(9)=0:X2(P)=X2(9):X2(9)=0:X3(P)=X3(9):X3(9)=0:T4(P)=X1(P)+X2(P)+X3(P):
 T4(0)=T4(0)+T4(P):CT(0)=CT(0)+CT(P):NEXT:CT(0)=CT(0)/5:RETURN
3700 R1=R1+1:LPRINT" ":LPRINT" ":CLS:LPRINTMID$(GW$(F),1,5);" TO ";MID$(GW$(L),1,5);"  LANES: ";
3750 IFN=99LPRINT"ALL    ";:GOTO3850
3800 LPRINTN;" & ";N+1;
3850 LPRINT" VS: ";:IFO=99LPRINT"ALL TEAMS":GOTO3950
3900 LPRINTMID$(GS$(1),(O*15-14),15)
3950 LPRINTTAB(13)A$(R1):LPRINTA$(4):LPRINT" ":FORP=8TO0STEP-1:LPRINTGN$(P);:
 LPRINTUSINGA$(1);CT(P)*3;X1(P);X2(P);X3(P);T4(P);T4(P)/3:IFP=1THENLPRINT" "
4000 NEXT
4050 LPRINT" ":LPRINT" ":LPRINT" "
4100 CLS:LPRINTTAB(25)A$(3):LPRINTTAB(13)A$(R1):LPRINTA$(4):LPRINT" ":ONERRORGOTO4300
 :FORP=8TO0STEP-1
4150 LPRINTGN$(P);:LPRINTUSINGA$(2);CT(P)*3;X1(P)/CT(P);X2(P)/CT(P);X3(P)/CT(P);T4(P)/CT(P);
 T4(P)/CT(P)/3:    IFP=1THENLPRINT" "
4200 NEXT
4250 RETURN
4300 RESUME4200
4350 LPRINTTAB(1)A$(J+15);A$(CX+12);" - ";GN$(P):RETURN
4400 S=1:R=3:GOTO6000
4450 S=4:R=1:GOTO6000
4500 S=5:R=1:GOTO6000
4550 S=6:R=1:GOTO6000
4600 S=7:R=1:GOTO6000
4650 S=8:R=1:GOTO6000
4700 S=9:R=1:GOTO6000
4750 PRINT"ANSWER YES OR NO (Y OR N) FOR EACH:":INPUT"PINFALL";GH(1):INPUT"STRIKES";GH(2):
 INPUT"SPLITS";GH(3):INPUT"BEER FRAMES LOST";GH(4):INPUT"DIMES COLLECTED";GH(5)
4800 INPUT"DIMES PAID";GH(6):INPUT"DIME OPPORTUNITIES MISSED";GH(7)
4850 S=1:R=3:IFGH(1)="Y"GOSUB3350 :GOTO4950
4900 R1=5:GOSUB3350:GOTO5000
4950 R1=4:GOSUB3700
5000 S=4:R=1:IFGH(2)="Y"GOSUB3350 :GOTO5100
5050 R1=R1+1:GOTO5150
5100 GOSUB3700
5150 S=5:IFGH(3)="Y"GOSUB3350 :GOTO5250
5200 R1=R1+1:GOTO5300
5250 GOSUB3700
5300 S=6:IFGH(4)="Y"GOSUB3350 :GOTO5400
5350 R1=R1+1:GOTO5450
5400 GOSUB3700
5450 S=7:IFGH(5)="Y"GOSUB3350 :GOTO5550
5500 R1=R1+1:GOTO5600
5550 GOSUB3700
5600 S=8:IFGH(6)="Y"GOSUB3350 :GOTO5700
5650 R1=R1+1:GOTO5750
5700 GOSUB3700
5750 S=9:IFGH(7)="Y"GOSUB3350 :GOTO5850
5800 GOTO5900
5850 GOSUB3700
5900 PRINTMEM:END
5950 INPUT"WHICH PLAYER (CARY-7 DON-6 DAN-5 ROG-4 JIM-3 TOM-2 DAVE-1)";P:  FORX=1TO7:PRINTX;"=
 ";A$(X+15);:NEXT:INPUTJ:CLS:ONJGOTO4400 ,4450 ,4500 ,4550 ,4600 ,4650 ,4700
6000 FORW=FTOL:IFVAL(MID$(G$(P,W),1,3))=0THEN6300
6050 C9=C9+1:X1(W)=VAL(MID$(G$(P,W),S,R)):T4(W)=T4(W)+X1(W):IFC9=1THENXL=X1(W)
6100 GOTO6200
6150 FORW=FTOL:X1(W)=T4(W):IFX1(W)>0THENC9=C9+1:IFC9=1THENXL=X1(W)
6200 IFX1(W)=>XHTHENXH=X1(W):D1$=MID$(GW$(W),1,5):E1=VAL(MID$(GW$(W),6,2)):O1=VAL(MID$(GW$(W),8,2))
6250 IFX1(W)<=XLANDVAL(MID$(G$(P,W),1,3))<>0THENXL=X1(W):D2$=MID$(GW$(W),1,5):E2=VAL(MID$(GW$(W),6,2)):
 O2=VAL(MID$(GW$(W),8,2))
6300 NEXT:GOTO6450
6350 D2$="IGH":E2=98:O2=1
6400 ONERRORGOTO6350
6450 GOSUB4350 :LPRINT"HIGHEST";:LPRINTXH,D1$,E1;" & ";E1+1,MID$(GS$(1),(O1*15-14),15):  LPRINT"LOWEST
 ";:LPRINTXL,D2$,E2;" & ";E2+1,MID$(GS$(1),(O2*15-14),15)
6500 FORW=FTOL:LPRINTX1(W);:T=T+X1(W):IFVAL(MID$(G$(P,W),1,3))<>0THENC=C+1ELSEC=C+0
6550 ONERRORGOTO6800
6600 NEXT
6650 LPRINT"  AVG";INT(100*T/C+.5)/100:IFCX=3LPRINTINT(100*T/C+.5)/300
6700 T=0:C=0
6750 GOTO6850
6800 LPRINT0:RESUME6750
6850 CX=CX+1:XH=0:XL=0:C9=0:IFCX<3THENS=S+9:GOTO6000
6900 IFCX=3GOTO6150
7000 END
```

BOWLDATA/A79

```
50 REM THIS PROGRAM CONTAINS DATA WHICH CAN BE UPDATED - THEN IS PRINTED OUT TO FILE WHICH PROGRAM
'BOWLER'
READS AND USES
60 REM THIS PROGRAM IS NAMED 'BOWLDATA/A79' - CURRENT AS OF APRIL 18, 1980 (END OF SEASON)
70 DIMGN$(34),GN$(9)
75 OPEN"O",1,"BOWL7980"
90 READGS$(1):PRINT#1,GS$(1);",";:FORX=1TO33:READGW$(X):PRINT#1,GW$(X);",";:
NEXT:FORX=8TO0STEP-1:READGN$(X):PRINT#1,GN$(X);",";:NEXT
100 READ P,W:IF P=0 THEN 8000
200 READ G$:IF LEN(G$)<>27THEN PRINT"DATA WRONG";P;W;G$;LEN(G$):STOP
300 PRINT#1,P;",";W;",";G$;","
400 GOTO 100
500 STOP
4100 DATA"LAURELTON #1   LAURELTON #2   TUCKER PRINTERTERRIBLE FIVE   PANORAMA BARBERROC'S ROLLERS
BOULEVARD   REST.HANK'S FIVE    PORT DELUXE    DERLETH #1    DERLETH #2    FRED'S FIVE    ROCH.
CATERER'SKLEIN BIRCHER   KINSELLA REST. "
4200 DATA"SEP0618071171499949902900","SEP13311320922697595397 8","SEP20290417818401496899 7",
"SEP27170614617195494916 8","OCT04251420616599496694 0","OCT11230313314988970 07",
"OCT18211020316508096504 9","OCT25270514816197187697 6"
4210 DATA"NOV01230114115999905494 9","NOV08210228415795693001 4","NOV15190815315603103196 1",
"NOV29271122113196897399 6","DEC06291518415093004996 4","DEC13170914515798796610 8",
"DEC20251214314100492302 7","DEC27190914414403501698 1"
4220 --- ETC. ---
4900 DATA"BLIND","CARY ","DON  ","DAN  ","ROG  ","JIM  ","TOM  ","DAVE ","TOTAL"
5000 DATA7,1,"14931041114414102213121042 1",6,1,"10821141012311041113222003 1",
5,1,"13111002013832002112621042 1",4,1,"19241002018742002219521003 1"
5040 DATA3,1,"14222002216931041218330142 1",7,2,"16942002116931042121650042 0",
6,2,"17251041119041103114331003 1",5,2,"14513002113520042119330081 0"
5080 DATA4,2,"14211002214910003118040103 0",3,2,"16832141116730042019150003 0",
7,3,"19461002115624103315531004 1",6,3,"13621041215422042313811043 2"
5120 DATA5,3,"15522102216931003315031004 2",4,3,"17011041115310003318841182 1",
3,3,"17921002121361081121270043 1",7,4,"15142080017620003416431102 2"
5160 DATA6,4,"16931002013621181316121002 2",5,4,"11711102115120003313313002 3",
4,4,"16831002117921003316730002 3",3,4,"19331002218440042217451080 1"
5200 ---ETC.---
6470 DATA 7,33,"19750004120061003119251104 3",6,33,"15023104116242042116130043 2",
5,33,"20360043118630142021071082 1",4,33,"15742082118531042015611004 1",3,33,
"16853043018142003017442043 0"
6897 DATA 0,0
6899 STOP
8000 CLOSE
8100 PRINT"FINISHED WRITING DATA TO FILE 'BOWL7980'"
8500 PRINT"THIS IS YOUR CHANCE TO 'SAVE' THIS FILE BEFORE CONTINUING ON TO RUN 'BOWLER' - SAVE AS
'BOWLDATA/A79',A":STOP
9000 RUN"BOWLER"
9999 END
```

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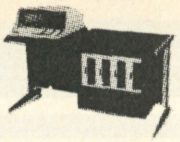

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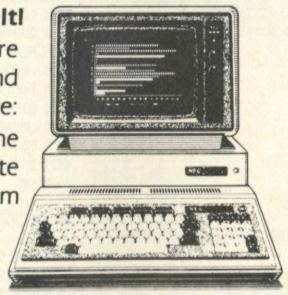

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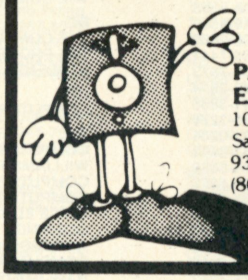

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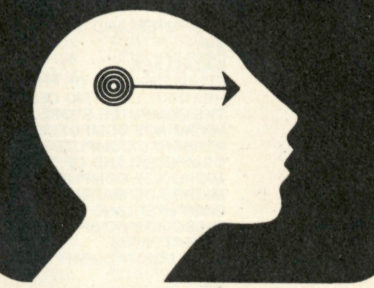

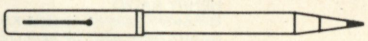

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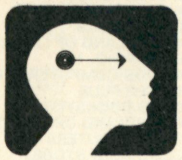

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YDI ELECTRS.	02194	(617) 449-1005
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BETHESDA COMPUTERS	20014	(301) 657-1992
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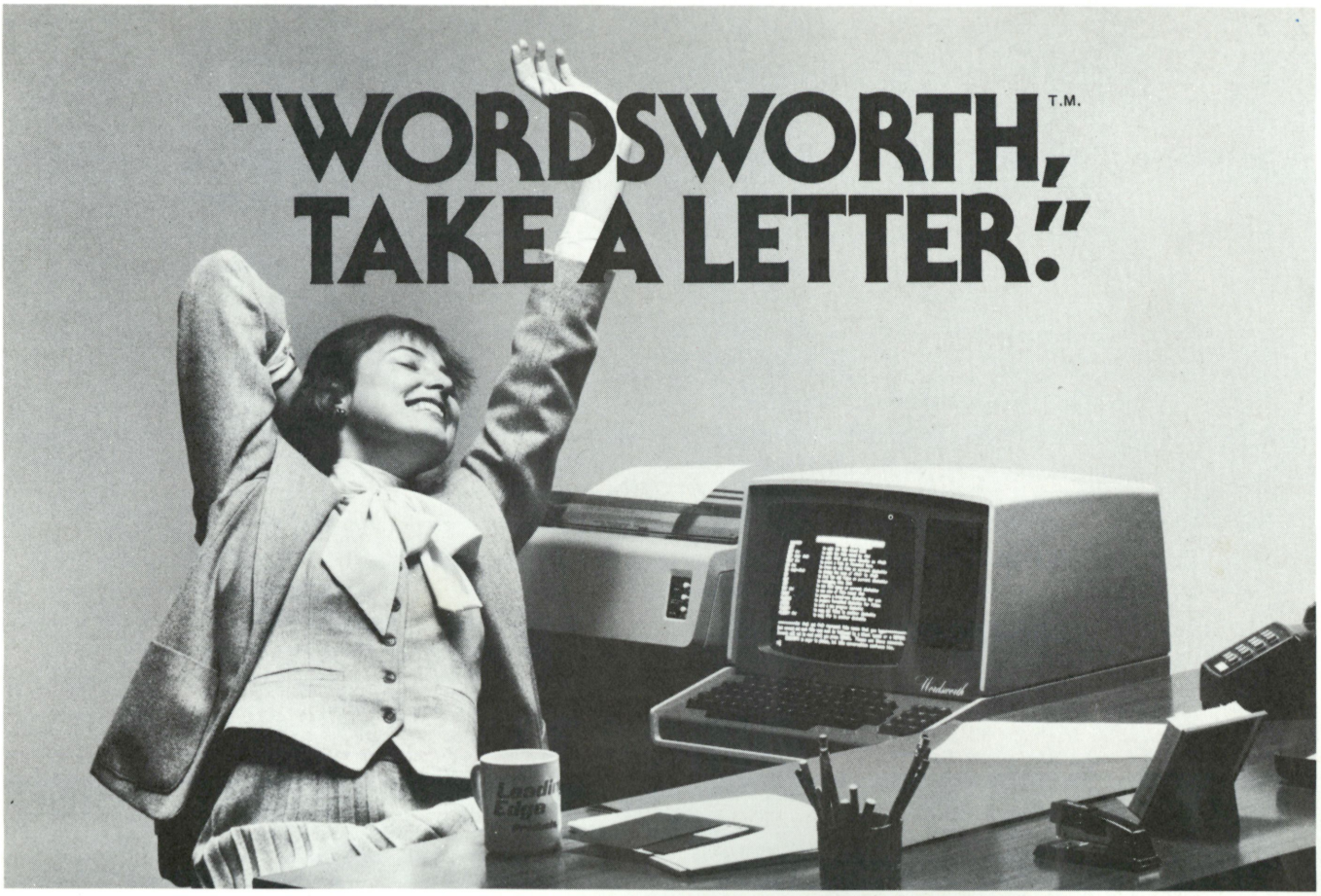

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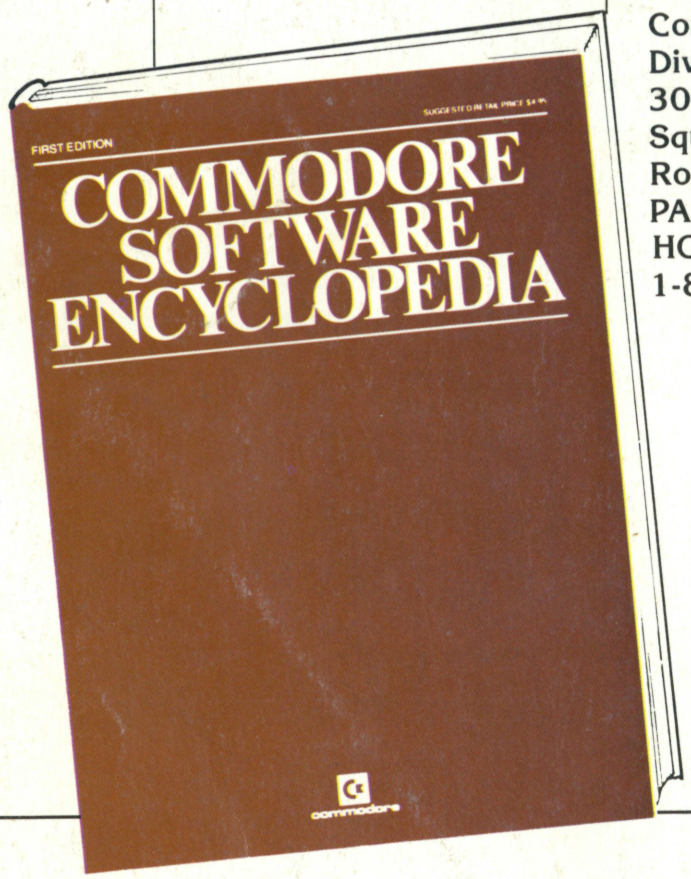

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