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September 1982
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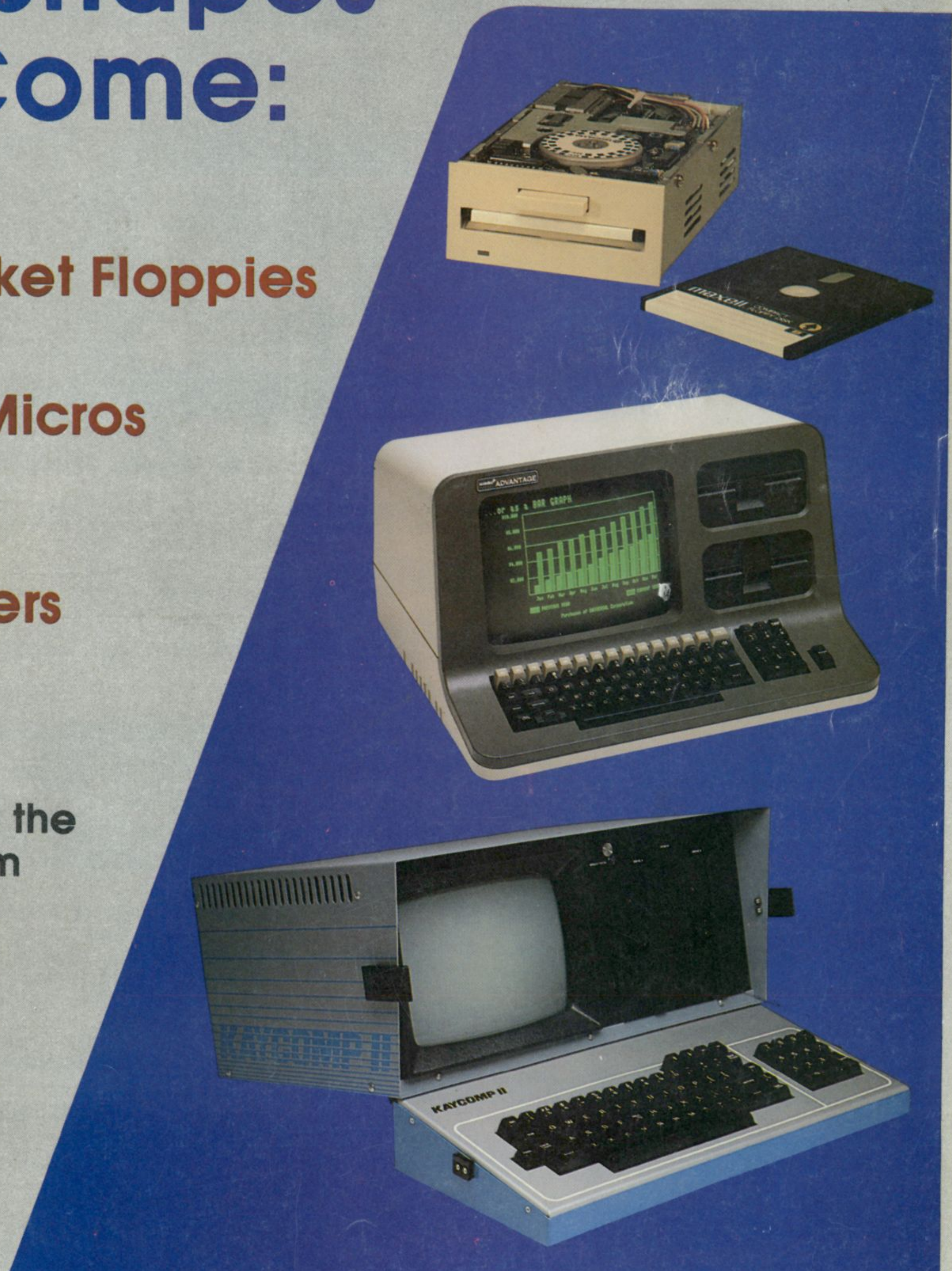

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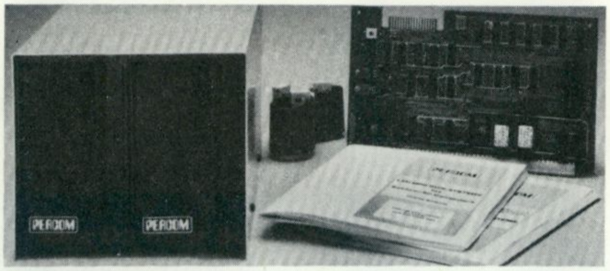

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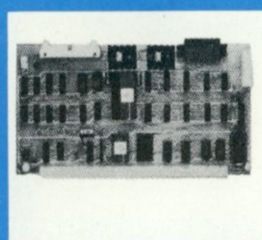

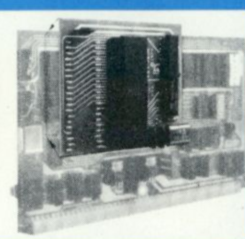

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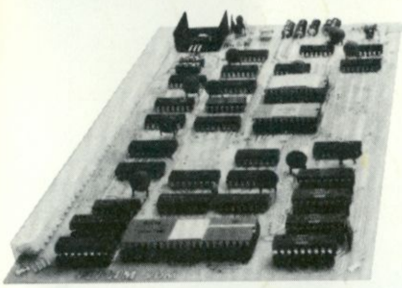

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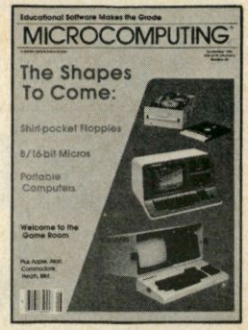

Contents: September 1982
Volume VI No. 9

On the cover: New developments which came out of the National Computer Conference showed a trend toward smaller, higher-density disks; micros with dual processors that can read both 8-bit and 16-bit operating systems; and more-easily transported micros for the microcomputerist on the move. These trends are reflected in the products shown on the cover (from top): a three-inch Micro Floppydisk marketed by Amdek Corporation, North Star's 8/16 Computer and the portable Kaycomp II microcomputer system. *Microcomputing's* report on the NCC begins on page 38.

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MANAGING EDITOR
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PUBLISHER'S REMARKS

By Wayne Green

War Declared On Software Thieves!

The $2,000,000,000 Theft!

That's right, the estimates for software theft for this year are now running to about $2 billion!

Software manufacturers are well aware that their programs are being stolen. . . massively stolen. But since there are no good answers to the problem, they have been trying to live with the disaster. Recent Instant Software estimates of theft indicate that approximately 90% of the Instant Software programs in the hands of users are stolen. Since Instant Software has, for the most part, been dealing with lower priced programs, and these have been particularly prone to theft, it is estimated that Instant Software alone will lose something over $30,000,000 in sales this year as a result of program theft.

How are the programs being stolen? Some are being copied for friends by buyers of the program. We have gotten reports of large scale copying of programs by dealers anxious to add something to promote a computer sale. Then there are the user's groups, where often the major activity of the group is the exchange of programs. One chap wrote a few days ago to brag that he had so far managed to copy over $100,000 worth of programs as part of his local user's group's activities.

While some summer camps make an effort to keep program copying to a minimum, this is almost impossible to monitor. It only takes seconds to copy a whole disk full of programs. . . and minutes to copy many disks of programs. A camper wrote to say that within the first two days of camp he had gotten copies of 2500 programs. . . and that he was having to buy a lot more disks just to make copies from other campers. The kids often bring boxes of disks, full of stolen programs, for swapping.

If one is practical about this, it is kind of stupid to pay for a program when you can steal it. . . and there is no way of getting caught or getting into trouble. I'm not aware of any user ever being brought to justice for program copying. Sure this is illegal, but without any punishment what does "illegal" mean?

There is a need, some feel, for a crackdown on software theft if we are going to see much in the way of significant software developed. Programmers are not going to work for peanuts forever, nor are entrepreneurs going to continue trying to market low cost software if they are not able to get any return for their investment and work. But how *can* there be a crackdown on the friend who gets a copy of programs? How can user clubs be stopped from promoting million dollar thefts? How can computer stores be stopped from giving away hundreds or even thousands of dollars in software in order to promote computer sales?

> One chap bragged that he had copied over $100,000 worth of programs. . . . A camper had copied 2500 programs within the first two days of camp.

Perhaps it is time for some sort of "sting" operation. . . or even a group of them. If one computer store that is part of a chain were to be caught in program theft, it might be possible for the software manufacturers to bring a suit against the headquarters and all of their stores—and that could be a billion dollar suit.

A sting operation against a user's group might enable the software manufacturers to bring a suit against the club and every one of its members, again with figures in the millions of dollars. Yes, it is unfair for some club member who has a lot of assets to be singled out and stripped clean in such a suit, but one has to admit that a few cases like that might bring many computerists to their senses; it might make them wonder, next time someone asks them to run off a program copy, whether the copy is what is wanted. . . or grounds for a lawsuit.

Instant Software took the lead in this field by offering a $10,000 reward for anyone who helped them get a conviction for copying an Instant Software program. This offer still holds, but apparently $10,000 just isn't a lot of money these days because no one has yet come forth with any incriminating evidence.

Wayne Green Publications will be taking a position of leadership in this matter. The first step is toward getting cooperation from other software firms to provide a more significant reward. It is hoped to bring this kitty up to $100,000 in cash for the conviction of someone copying a copyright program. Perhaps this kind of money will succeed where the mere $10,000 failed. The industry would get millions of dollars worth of publicity out of it if they are able to bring off a conviction.

Even a couple of good convictions won't entirely stop program theft, but the obvious fact that this is not only illegal, but a crime that is punishable, should prevent all but the most foolhardy from further thefts. This could easily cut program theft by 75 percent, saving the industry over a billion dollars in lost sales. Good investment.

Yes, I realize that it is unfair to add up the retail prices of stolen programs and think for a moment that the computerists who have stolen them would ever buy all of them. We don't know what the real industry sales would be if people who really wanted the programs had to buy them. We do know that every time a new program is brought out it sells for a few weeks and then sales dwindle off. We also know that the computerist who gets copies of 3000 programs is not going to be able to ever use even a fraction of them. We therefore know that the few programs they are using were probably stolen and otherwise would have brought income to software firms, dealers and programmers.

Taking all of these variables into consideration, my calculations show that software retail sales would be increased by a factor of about five if it were not for program theft. Popular programs should have a life in stores of a year or two, not weeks.

Not untypical is the story of one of the major Instant Software dealers in New York City. He complained that a local store of a large chain sent someone in every few days to look over new programs released by Instant Software. One copy is bought and then this is copied and sent to every store in the chain in the area. From there copies are made for computer buyers and friends of the store salesmen and managers. The dealer estimated that every program bought by this one store resulted in several thousand free copies . . . and just about killed all further sales of the program for him.

In the next few weeks we will be organizing the software firms for an aggressive attack on this problem. If any of you readers are interested in working with the association in setting up a sting operation, you might drop me a line and tell me what you have in mind.□

MICRO QUIZ

Analysis of Algorithms

How many times is "MICRO" printed during the execution of the following program?

```
N=4
FOR I=0 TO N-1
   FOR J=J+1 TO N
      PRINT "MICRO"
   NEXT J
NEXT I
```

(answer on page 15)

By Robert Baker

Commodore Gets Smart

With Terminal Communications Package

STCP

STCP is a Standard Terminal Communications Package for Commodore computers, developed jointly by Eastern House Software and CGRS Microtech. The package includes the necessary hardware and software to drive RS-232-type modems on a Commodore PET/CBM system. Thus you have a wider selection of modems over the IEEE variety, from the inexpensive Signalman modem to the auto-dialing D.C. Hayes Smartmodem.

The hardware portion of STCP is the Portmaker board from Microtech. This board normally provides two RS-232 serial ports via standard 6850 ACIAs. It plugs into one of the spare ROM sockets of your Commodore system—UD4 or UD11, depending on your machine type. Two small clips then connect to one of the expansion connectors (J9) on the system PC board. Installation is quick and easy with no special tools or soldering required.

If you originally had a ROM in the required socket in your system, you can now install it on the Portmaker board. The only restriction is that the last 16 bytes of the ROM are no longer accessible, since this is where the ACIA chip is now located.

The STCP program is 100 percent machine language and about 6K in length. A single Basic starter program is also included to load and configure the STCP software. As supplied, this software package turns your Commodore system into a sophisticated smart terminal. It can also be used as a handy utility for converting disk files from one format to another.

The STCP program is normally run independently, but can be controlled by another machine-language or Basic program. A number of entry points and important locations are described in the documentation. A sample program is included on the disk to illustrate how you can control STCP from another program. Thus you could easily create your own bulletin board system.

As a terminal the system can operate in local mode or transmit in either full- or half-duplex modes. You can transmit data character-by-character as it is typed, a line at a time with screen editing, or transmit complete disk files. Incoming data is normally displayed as it is received, or you can save it to a disk file. In all modes you can get a printed copy of data sent and received, with both Commodore and ASCII printers supported.

A simple status line is always displayed at the top of the screen to indicate current error conditions, terminal status, operating modes, time of day, file names, etc. An internal timer can be set if you need a reminder to log off a system, go to dinner, or whatever.

A Quick Read feature provides a quick and convenient way to load often-used data and command strings from disk with a minimum of key strokes. A sample file is included on the disk with additional information on STCP.

All communications are in standard ASCII, with STCP providing all necessary data conversions. When transferring disk files to or from your Commodore system, STCP supports four different file translation formats:

- Commodore Basic programs
- EHS MAE Assembler/Editor files
- Binary files such as machine-language object code or Word Pro files
- pure ASCII files such as VisiCalc files

For greater flexibility you can filter out or translate special characters. A 128-byte table contains an entry for each of the 128 possible ASCII characters. You can use this table to encrypt and decode transmissions.

Currently only 300 baud is implemented, but a 1200 baud enhancement is expected to be provided to purchasers at no cost when developed. The system supports the standard XON/XOFF control codes to prevent buffer overruns. For nonstandard systems the actual control codes can be modified if required.

You can easily send commands to any disk drive, and not necessarily device 8. Disk commands use the older DOS wedge format, but enclosed in quotes. Thus you can scratch, rename or copy any file at any time.

If necessary you can return to Basic or the machine-language monitor, or you can kill the STCP and reset the system. These and other commands are all selected from a convenient menu so you don't have to remember a whole list of commands. Any further input, like file names and types, is prompted by the system.

I've been using the STCP package heavily for about two weeks with a Signalman modem on my 8032. So far I haven't experienced any problems other than usual phone line noise. The STCP package is well written with good documentation. Once you've played with it for a while you'll find it's easy to use. Having a modem and a good terminal software package like this can really open up a new world of applications for your Commodore system.

The STCP package sells for $129.95 through Eastern House Software (3239 Linda Drive, Winston-Salem, NC 27106). They have a long list of other products for Commodore systems, including one of the best available assembler/editor packages—MAE. You might just want to drop them a line and get a copy of their latest catalog. CGRS Microtech (PO Box 102, Langhorne, PA 19047) also carries the STCP package, at the same price, but refers to it as Compak. The Portmaker board is available separately from them for $69.95.

By the way, CGRS Microtech is the company that supplies the PEDISK systems for Commodore computers. The single-drive five-inch system provides an economical system that can be later expanded. The eight-inch system provides IBM 3740 format and can be programmed to exchange data with minis and mainframe computers.

PEDISK II offers the fastest disk system available for Commodore systems. With a transfer rate of 250K/second it

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typically runs three to four times faster than IEEE bus type drives like those from Commodore. However, you lose compatibility with other Commodore systems and have a new disk operating system to deal with.

Other products from Microtech include the Spacemaker and Romdriver ROM switches at $39.95 and a color video generator board at $139.95. They also offer various software packages and hardware for other systems.

Hex Dump

Many new VIC owners are starting to experiment with data files on tape, or even on disk now that the VIC-1540 disk is available. The best way to learn how to use data files is to write some short test programs and try various combinations, then take a look at the actual data you've written. Sounds easy, but how do you look at a data file to see what it really looks like?

Well, here's a simple utility that will read any data file on tape and display the hexadecimal value of every byte written into the file. (See program listing.) For added convenience it also displays any displayable characters and the relative hex location of each byte from the beginning of the file.

The display contains the four-character location in hex, the hex value of each byte, then the corresponding displayable characters for that line. The program is currently set for four bytes per line for the limited VIC-20 display, but could easily be modified for 40- or 80-column displays by changing the value of L in line 240 for eight or 16 bytes per line.

Looking at the program listing, line 250 opens the first (or next) data file on tape for reading. This line could easily be changed to an appropriate Open command for disk files. Line 280 reads a single byte from the file using the Get# command. This avoids problems associated with Input# and lets you see every character of the file.

Lines 300 to 330 print the hex value of the byte and add displayable characters to a string printed at the end of each line. Lines 340 to 360 increment the byte counter and start a new line when the proper step is reached. Lines 370 to 410 allow stopping and starting the display as desired, while lines 430 to 450 provide decimal-to-hex conversions for the display.

Now you can easily look at the data you create and investigate the exact format of the data file.

Misc

Compute Books has another new book titled *Programming the PET/CBM*, written by Raeto Collin West. This is dubbed "the reference encyclopedia for Commodore PET and CBM users," and rightfully so! It contains more detailed information on the Commodore systems than I have ever seen before in one place, and is probably the most accurate reference available.

It seems aimed at the serious user, with quite a bit of hexadecimal notation and references to machine language. It covers only the 2000, 3000, 4000 and 8000 series machines, but covers them in great detail.

Sections of the book cover Basic syntax and how it works, program and system design, peripherals, graphics and sound, machine code, ROM routines and RAM storage, and various types of programs. The sections on Basic commands provide complete descriptions, valid syntax, examples, special notes, abbreviations, internal system operation and ROM entry points. If you're a serious Commodore user, it's definitely worth the $24.95.

Computant, Inc. (34 Lamplighter Drive, Manchester, CT 06040), recently announced their Computant Patient Accounts Management System for dental offices. It runs on the Commodore 8032 with an 8050 disk and a printer. This is a computerized filing, accounting and billing system designed for use in the small to moderate sized dental practice. It stores the records of up to 3500 patients, including the records of family groups. An expanded version is available for a larger number of patients. Price is $10,500.

Willie Kusche, of Wilserv Industries (PO Box 456, Bellmawr, NJ 08031), recently pointed out a small problem with the CBM 2031 single disk drive when it is used with CBM 3.0 Basic. Apparently the drive can function erratically, responding to a non-load read command when used with this older version of Basic. Willie has found a fix but it involves a patch to the $F000 ROM of the 3.0 Basic ROM set:

```
$F17F: 4C ED FF EA
$FFED: AD 40 E8 29 FB 8D 40 E8
$FFF5: A9 5F 4C 87 F1
```

This patch apparently fixes the erratic reading problems. Willie is offering to supply a replacement ROM with the above patch for $15 to anyone who cannot program his own. By the way, Willie is the author of KMMM Pascal carried by AB Computers of Colmar, PA.

As of September, the *Midnight Gazette* and *The Paper* have combined into one bimonthly publication. At the time of this writing the new publication did not have an official name, but it should be decided soon. It will be available only on a subscription basis, costing $20 for six issues. A subscription card can be found in the *Midnight Compendium* currently on sale, or you can send requests to Jim Oldfield, 635 Maple, Mt. Zion, IL 62549.□

```
100 REM ********************
110 REM *
120 REM * TAPE DATA FILE
130 REM * HEX DUMP UTILITY
140 REM *
150 REM * BY: ROBERT BAKER
160 REM *
170 REM ********************
180 :
190 PRINT"⊐    ▪TAPE HEX DUMP": PRINT: PRINT
200 PRINT"HIT ANY KEY TO HOLD"
205 PRINT"OR CONTINUE DISPLAY": PRINT
210 PRINT"HIT 'Q' TO QUIT"
220 PRINT" (AT ANY TIME)"
230 PRINT: PRINT: PRINT"--------------------"
240 L=4: H$="0123456789ABCDEF"
250 OPEN 1
260 PRINT"⊐TAPE HEX DUMP": PRINT
270 B=0 : GOTO 360
280 GET#1,C$
290 IF ST <>0 THEN PRINT: PRINT"ST =";ST: GOTO 420
300 V=0: IF C$<>"" THEN V=ASC(C$)
310 GOSUB 440: PRINT" ";
320 V=V AND 127: IF V<32 OR V>95 THEN S$=S$+".": GOTO 340
330 S$=S$+C$
340 B=B+1: IF INT(B/L) <> B/L THEN 370
350 PRINT S$: S$=""
360 GOSUB 430: PRINT":";
370 GET C$: IF C$="" THEN 280
380 IF C$="D" THEN 420
390 GET C$: IF C$="" THEN 390
400 IF C$="D" THEN 420
410 GOTO 280
420 CLOSE 1: PRINT: PRINT: END
430 V=INT(B/256): GOSUB 440: V=B-(256*V)
440 V1=INT(V/16): PRINT MID$(H$,V1+1,1);
450 PRINT MID$(H$,V-(16*V1)+1,1);: RETURN
```

Program listing. VIC utility that reads and displays data files.

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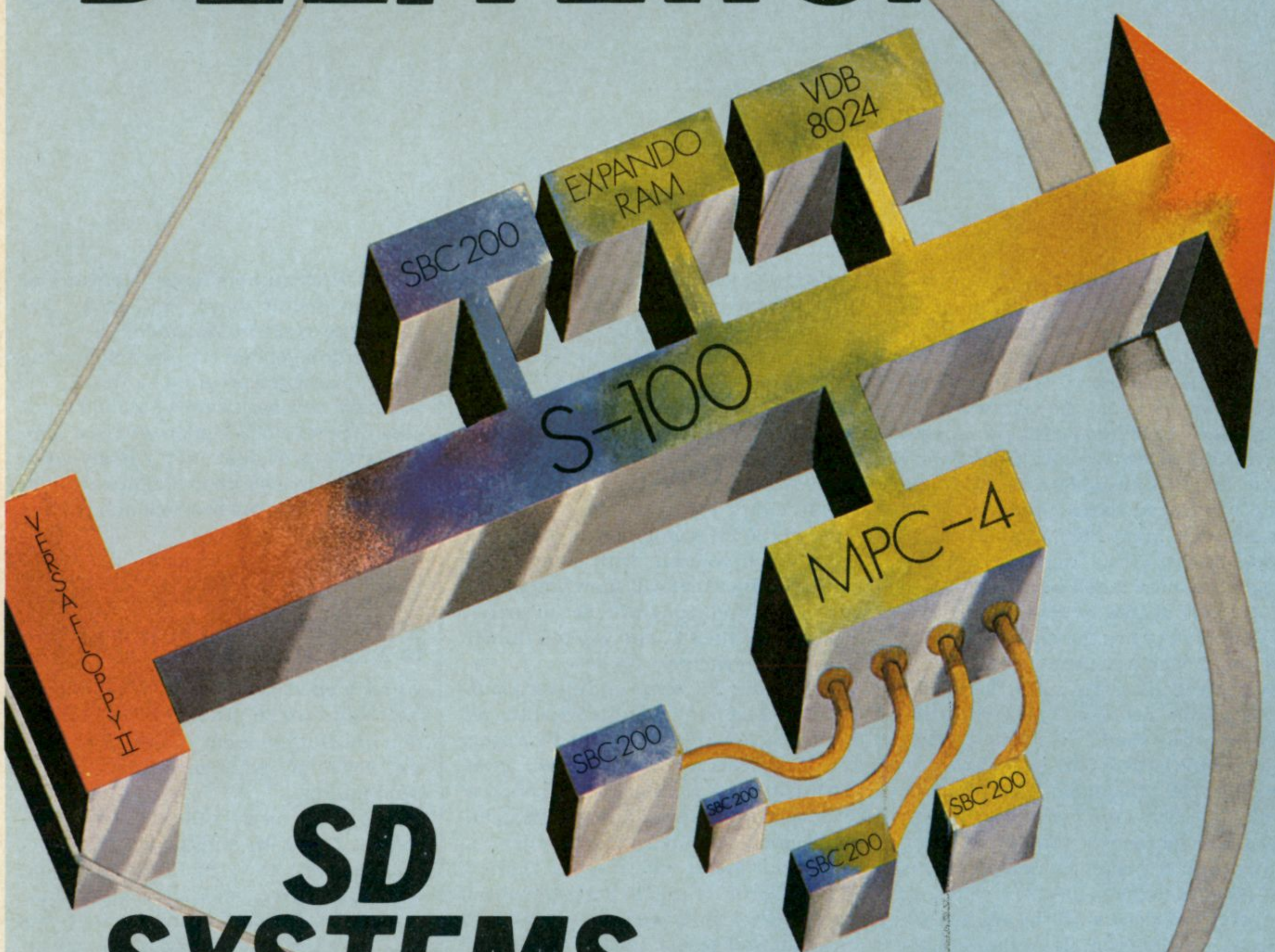

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By Thomas V. Bonoma

What's the Truth About PC?

Column Cuts Through Heat And Smoke

Few microcomputer introductions have generated as much smoke and heat, and as little light, as IBM's move into personal computing. Generally, the trade press agrees that the PC is awesome in a number of respects: the hardware, the graphics capabilities and the documentation to name a few. Equally widespread is the feeling that mistakes were made (one user called the keyboard "the biggest disappointment in my life"), that little or no good software exists, and, on the outer fringes of sanity, that a conspiracy exists on the part of IBM reviewers and commentators to praise the entry out of proportion to what it delivers.

Well, the truth of the matter is that it *is* an awesome machine, that some small mistakes *were* made, and that currently we are in the growth part of the evolutionary life cycle. This means that many potential PC users aren't sure it's the right first choice for them or don't know how to compare their current machine against the added benefits of a PC.

Buyers are faced with the equally significant problems of (1) evaluating the growing avalanche of hardware (single, double or hard disks?), software (which of the word processors do I buy?) and third-party documentation/support (which user's group should I join, and what about that new PC book?), and at the same time, (2) learning the ins-and-outs of their new machine so they can program it to do useful work.

No monthly column can deal with all these issues simultaneously. But my goals in providing a regular space for the PC are to address the concerns I perceive folks struggling with: trying to decide how good the machine is; whether it's worth getting as a first unit (or even putting that Apple or Heath in the closet for); once it's bought, trying to figure out how to make it do something useful; and how to discriminate among all those vendors with their hands out for loose change.

To meet these goals, I'll devote part of each column to general commentary, and sometimes opinion, about the PC in general and how it stacks up against other machines I know and love (mostly, an Apple II, a Heath/Zenith Z-89 and a TRS-80 Model I). In addition, I'll review available software and hardware for the PC, *always* testing it before writing about it, and tell you honestly what you might want to buy and what you ought to avoid. Third, I'll try to give you some sense of the PC's programming capabilities in each column, with some home-baked routines that will show you what is and isn't compatible from other machines to the PC, and where I think it outdistances them.

Sometimes I'll adapt an already-published program to illustrate what the addition of color and some of the PC's other advanced features, like software interrupts, can do for workaday dull Basic routines. And I'll always be sensitive to announcements of upcoming products, to your input about what you've learned, and to the rumor mill to keep you ahead of the pack. I think we can turn some of that heat and smoke into a little light if we work together.

What I Need from You

There are three classes of folks I need to help me do this job: owners, non-owners and vendors. If you're in class one, you're going to be a "heavy hitter" around here. Send me (short) programs showing your machine's capabilities, what you've learned, reports of bugs, general questions, or whatever. Please send paper mail to my home address. If you want a reply, I won't promise but I'll do my best; a self-addressed stamped envelope is requested. Send electronic mail to Source Mail TCD 292 and EMail on Compuserve, 730, 125.

If you're a non-owner, you can also be of great help. What do you like or not like about the PC? What factors will you use in deciding whether to get a(nother) computer? What rumors have you heard, or announcements have you seen, that you'd like to see investigated?

If you're a vendor, are you announcing a new or adapted program for the PC? Do you have new hardware we should know about? Send a description and/or a sample for me to evaluate. If it's really good, I'll make sure everybody knows about it. If it's bad, I'll do my best to laugh you out of business.

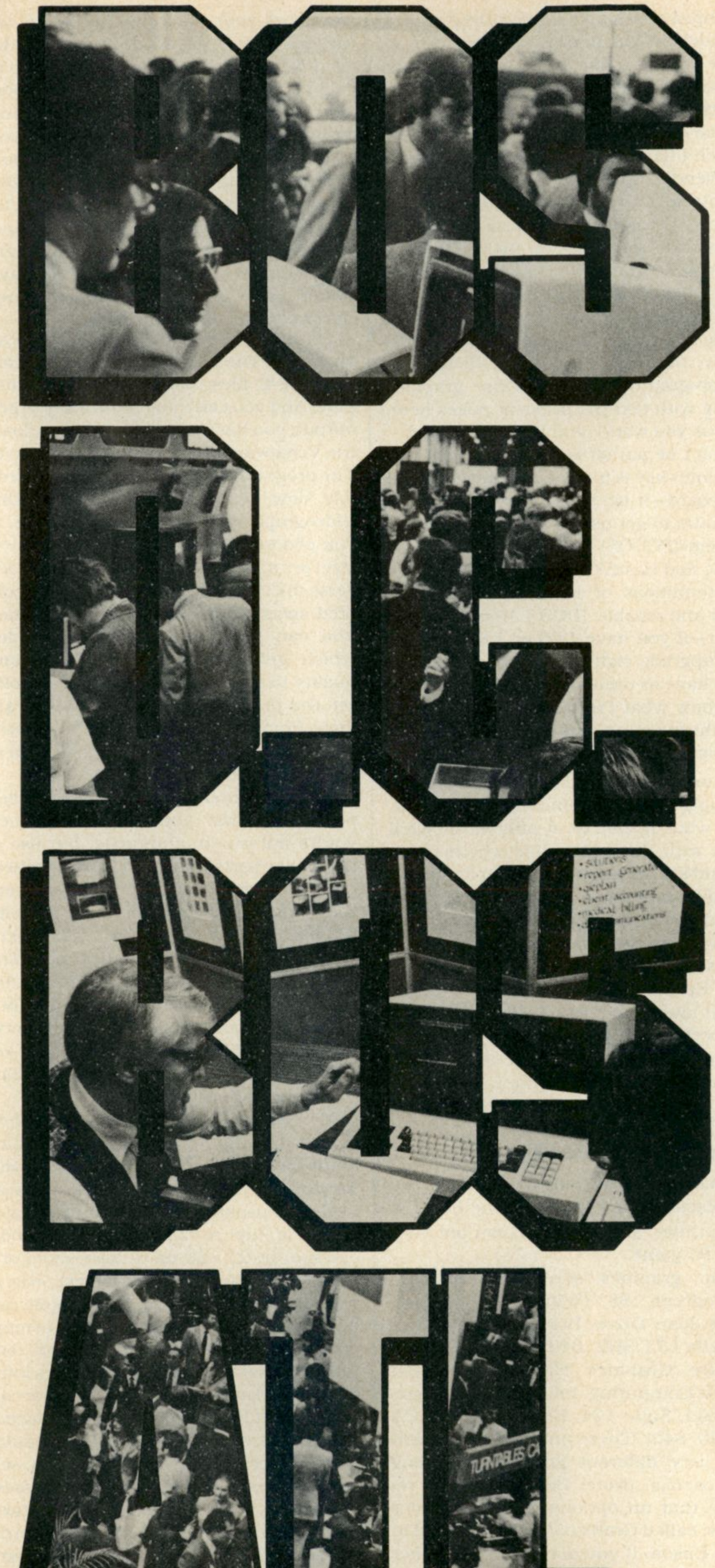
Just How Good Is That Machine?

Pretty good, my friends. What follows is all subjective, and a little bit of a confession too. But I thought you'd rather have the voice of experience than timing benchmarks.

I currently own three micros—an Apple II, a Zenith-89 and the PC. I have access as well to a $20,000 dedicated word processor, and have significant experience with a TRS-80 Model I. If a gun were put to my head and I was ordered to break up every system but one, I'd save the expensive word processor. Fooled you, didn't I? To a writer there's no substitute for a dedicated word processor. WordStar on the PC is a brilliant program, but it can't beat a machine that only does *one* thing and does it very well. No, the PC isn't as good for production writing as a Xerox 860, though it's pretty close!

OK, the choice has to be among the micros, does it? Well then, hands down, I'd keep the PC. It is a pure joy to program.

Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742, is a professor of marketing and an independent consultant, in addition to an addicted computer hobbyist. A psychologist by training, he is the author of a number of books, articles and monographs on marketing, psychology and management.



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It's hard to describe for first-time buyers or novices, but microcomputers can be easy or hard to live with. Much depends on what the designers and software engineers put in them at birth.

The Apple, for example, a machine for which I have much respect, is distinctly unfriendly. I've never had to learn so many calls, peeks, and pokes in my life. The Zenith, one of the best data/word processing machines on the market bar none, is so graphics primitive it's laughable (they've fixed this in the newest introductions). Nope, for my money, the PC is ideal for either the first-timer or (especially) the experienced user—it *likes* to be programmed, *likes* to use graphics along with text (no peeks or pokes here, unless you want), and *likes* to be used.

Don't be put off by those who tell you the enter key is in the wrong place on the keyboard—it isn't, it just takes a couple of hours to get used to it. The operating system (PCDOS) and both regular disk Basic and BasicA are truly excellent implementations of code; they're usable, clear and reliable. (DOS 1.10 is what you want—if you have 1.00 or 1.05, *pay* for the upgrade right away.) Those of you who have or used to have TRS-80 Model I's know what I'm talking about when I say the machine *likes* to be used—you've got one of the best on this score.

In future columns I'll talk about how to configure your machine when you buy it, and what to put on it afterward. We'll start with the basics, like whether you should kill the savings account for a color graphics board and monitor (you should), and whether you need disks more or less than you need color. I'll have some kind and some hard words for the IBM printer (i.e., Epson MX-80FT), and some words about interfacing non-IBM peripherals to the serial port (asynchronous communications adapter). Then, later on, I'll talk about hard disks and such.

Software to Know and Love (?)

This month I'm going to talk about two graphics screen dumps for the IBM Epson printer, and a little-known but very nice PC game.

The graphics screen dumps are Videograph 88 (Windmill Software, 1058 Joan Drive, Burlington, Ontario, Canada L7T 3H2, $49.95) and the Versaware Graphics Hardcopy System (Versa Computing, Inc., 3541 Old Conejo Road, Suite 104, Newbury Park, CA 91320, $40). These programs represent two very different graphics dumping approaches. (Note: Both programs require that an optional set of graphics chips, called Graftrax-80, be installed in your Epson. If you don't know whether you have these, you probably don't. If you have an Epson MX-100 or Epson MX-82, you've got them.)

Videograph 88 is a machine-language (.COM) program which is loaded when you start your machine, and then forgotten until it is needed. It uses the print screen key just like a text dump to let you print out your graphs, computer pornography, or whatever. The program prints one size of figure only, and automatically shades the printed output depending on the screen color and pattern. No options can be chosen by the user. It's a good program because it's simple, it works through a single key once loaded, and it otherwise stays out of your way. It can also be called under program control in Basic.

Versaware's system takes a different approach. The program operates only on saved .PIC files, not on the screen display. And you can't just press a key to get output; you have to save the picture, load the Versaware program, and then run it. The program is slow—indeed, it is incredibly slow, but it gives options that the Videograph system does not. You can, if you choose, decide to make a little (1/4 size) print, or a regular one. You can "reverse ink" the picture—that is, make colored spots black and black ones white. You can print in high-density mode, which gives increased regularity and quality to your picture. And you can offset the printed image (in tenths of an inch) from the left margin of the paper. All in all, a useful set of options which Videograph doesn't allow.

So which should you buy? Well, it depends on what you do. If, like me, you're not much of an artist but use a lot of bar charts that need to be dumped real time from the screen to paper, then the Videograph 88 is the right system for you. But if you can use color reversal, offset and size reduction options, and you can live with using BSave to move a .PIC file to disk and then printing it later, Versawriter's system is very flexible. Unlike other packages I've looked at, both these packages appear to offer value for the money.

Another package I'll tell you about this month is Computer Crossword (Dolphin Software Corp., 318 Country Club Road, Newton, MA 02159, about $40). It's a well-done package that lets you generate complete (up to 25×23 on a monochrome, or 21×20 on a color monitor) crossword puzzles (with clues), solve puzzles already created, and in general have fun. The program (on disk) comes with good documentation and over ten sample puzzles. The program makes limited but welcome use of the PC's color capabilities. It features an interesting mode that veteran crossword puzzlers would pay gold for: While solving a puzzle, select an option and the machine erases any wrong letters you've typed in, leaving all the correct ones alone. Good Lord, computerized cheating! This program would be a very good value at $20, give fair value for the money at $30, and is overpriced at $40. However, it is a nice program, and I don't hesitate to recommend it to you.

New Hardware/Software

I'm sitting on a pile of press releases at least 1½-inches thick of new goodies for the PC. I'll get review copies of what looks worthwhile, check them out and have lots more to say about "what's new" in future columns. Here, let me tell you about three new packages you may want to be aware of.

The Answer for the IBM PC is an electronic card file program to end all filing programs, it would appear from the demonstration disk. The program, written in Forth for the PC, lets you design a wide variety (customer information, classroom data, etc.) of input forms, fill them out and then cross-index the living daylights out of them for future retrieval. North American Business Systems, Inc., the manufacturer, is offering a free VIP Kit with a demo disk and (scanty) promotional material to all IBM PC owners through participating retailers. (Call 1-800-325-1485 for the nearest participating retailer.) Though the program looks very good on the demo disk, it is hard to judge without the documentation, retail price and the ability to actually get in there and muck around with the program. So, you may want to check this one out, but I'll have a fuller evaluation in a couple of columns if you're willing to wait.

IBM's recent release of UCSD Pascal for the PC should have hit your Product Center, independent retailer or Sears by now. If you're a Pascal lover, you'll like this implementation. Five volumes of documentation, six (you'll weep all the way through the backup process) disks, two different compilers, and a good set of utility routines and a disk of extras are included with the system in the now traditional, good IBM bindings. I've only bulled through two of the manuals so far, so I'm no expert, but I'm impressed. The system is configurable for variable amounts of add-in memory (though the manual only says how to implement for 64K. Come on, IBM, how about the memory hogs out here?). *Two* serial communications ports are supported and addressable from "REMIN:" and "REMOUT:" logical devices, though with some jockeying. The special IBMSTUFF unit, which customizes the p-System to the PC, looks like a well-done one as well, with provisions for fairly extensive graphics manipulations. I'll have more on this system after I play with it a while. Price is about $625 at your local retailer.

Finally, another high-priced ($695) piece of software for the PC that I'm getting familiar with. Context Management System's MBA is a combination spreadsheet, database, word processor and graphics processor for the PC. It requires a heavily-equipped machine with 256K memory, two disks and a color graphics board. However, I think it's a great piece of work, and with some revising will set the pattern for future working software. You can enter a normal VisiCalc-type spreadsheet under your clients' names, convert it to a database, extract information for use in a letter to them, and graph (pretty sophisticated graphics, too) the same information without ever leaving your chair or your program. When telecommunications capability (which will be offered free to all buyers in the fall) is added, and some of the slowness of the Pascal spreadsheet implementation is eliminated with better coding, I think this package is going to be hard to beat. You should see a demo of it at participating dealers if you can.

A fellow who's got the right idea about software is A. Fleugelman (Freeware, PO Box 862, Tiburon, CA 94920), who has written a great communications program for the PC called PCTALK. Send him an initialized (single-sided) disk and a self-addressed, stamped envelope, and he'll send it to you free. If you like it, he asks for a contribution of $25 to his Freeware experiment. Great idea, outstanding program—worth twice or three times the asked-for donation.

Finally, on the community/help front, the *Personal Computer Journal* (W. 2317 Garland, Spokane, WA 99205) is a disk-based monthly PC magazine promising working programs, etc. At 85 bucks for a subscription, better let me check it out before you plunk down your money. And The IBM User Group of Toronto (PO Box 1376, Station B, Downsview, Ontario, Canada M3H 5V6) offers a newsletter if you tell them how your system is set up and give them your name, address, telephone, etc., plus $1. For that price, you can try it yourself!

Promises, Promises

Well, I hate to start off a venture by breaking promises, but I've already gone over the space they promised me, and I don't want the *Microcomputing* editors to get the idea I'm crooked as well as verbose. So, my friends, my great programming tutorial subsection, a little program called PCSCRAZL, will have to wait 'til next month. Honest. I promise.□

MICRO QUIZ

(from page 7)

Answer: 10

For a general N:

I = 0 => 1< = J< = N => N vals
I = 1 => 2< = J< = N => N − 1 vals
I = 2 => 3< = J< = N => N − 2 vals
I = N − 2 => N − 1< = J< = N => 2 vals
I = N − 1 => N< = J< = N => 1 val

1 + 2 + . . . + N = (N)(N + 1)/2

LETTERS TO THE EDITOR

Guns, Butter or Travellers Checks?

Your July cover, picturing the Afghanistan guerrillas clustered about an Osborne 1, explains a letter I received recently. It was dot-matrix printed on aluminum coated paper. (See Fig. 1.)

Of course, your article ("Osborne—Behind Guerrilla Lines," by David Kline, July 1982, p. 43) alleged that the Osborne belonged to the journalist, not the guerrillas, but do you seriously believe that with all those guns staring him in the face, he would pick that time to take a firm stand against hardware piracy?

I applaud yet another innovative application for the Osborne 1, with WordStar and MailMerge. (But does it play Yak-Man?)

Walt Bilofsky
The Software Toolworks
Sherman Oaks, CA 91423

> Khyber Pass
> 4 July 1982
>
> The Software Toolworks
> 14478 Glorietta Drive
> Sherman Oaks, CA 91423
>
> Dear Mr. Toolworks:
>
> The freedom fighters of Afghanistan appeal to you, Mr. Toolworks, on this, your Independence Day, to support our fight against those who would extinguish the light of democracy in our poor country.
>
> Your contribution, in guns, butter, or travellers checks, is urgently needed to help us continue our struggle. Your neighbors in Sherman Oaks will admire the engraved certificate you will receive by return mail, naming you and Mrs. Toolworks as Honorary Freedom Fighters.
>
> Please mail the enclosed pledge card today, Mr. Toolworks.
>
> Sincerely,
>
> Muhammad P. Llama^Z

Fig. 1. A letter from Khyber Pass.

Prime Number Nonsense

There's no fanatic like a computer fanatic! Once he's made up his mind, nothing will change it, and he'll do anything to convince you that he's right—including destroying his credibility. What brings on this diatribe is the letter from Dan Farnsworth in the March issue about the 6809 processor (p. 170).

It is true that the 6809 is a faster and easier to use chip than the Z-80 or 6502. It could even be argued that the older 6800 was faster than either of these machines, although that statement would cause long and angry debates.

In any case, comparing a well optimized program, written in assembly language, run on a full-speed machine to a poorly written program, written in Basic, and run on a half-speed machine doesn't tell us much about the relative capabilities of either computer. Or, to put it another way, it's no surprise that an assembly-language program on a 2 MHz 6809 will run 10,000 times faster than a Basic program on a TRS-80. I own, use and like my SWTP 69/A, a 6809-based machine, but really now, let's at least try to pretend to be fair in our comparisons.

I wrote a 6809 prime number program that finds all of the primes from 1 to 10,000 in .26 seconds on a 2 MHz 6809. I have heard of some 6809 programs that will do this in half the time, but I have not seen them run. I have no doubts that another programmer, more clever or knowledgeable than I, could write a faster prime number program, for almost any machine. However, my point is to emphasize the danger of claiming that a particular program is the fastest that will be, or can be, written.

It is true that *one* of the bottom lines in computers is how fast the job gets done, but how *fast* a job gets done and how *well* a job gets done are not the same thing. But in any case, will a prime number program tell you how fast a particular computer will run?

Yes—if you plan on running prime number programs with your computer. But honestly, once you have found all of the prime numbers between 1 and 10,000, what do you do with them? Do they change for reruns of the program? In reality, the prime number programs will give you an idea of the processor's speed, but very few real world programs are limited by the processor. Most programs are limited by I/O speeds, or how fast the machine can print, read or write a disk record, or how long we have to wait for a human being to type in a new set of information. The Z-80 based machine we have at work will cheerfully drive a 600 line per minute printer (in some applications), and the Winchester hard disk means that I hardly ever have to wait for a disk transfer to complete. My 6809 at home is limited by my 80 character per second printer, and my dual 5¼-inch floppies. So, despite the very real superiority of the 6809 over the Z-80, I can do a lot more work on the Z-80 at work. Or, due to the implementation of these two systems, the Z-80 is, in effect, the more powerful machine.

But power is only one measure of a computer's usefulness. Ease of use, flexibility, and the availability of appropriate software tools for the job at hand are far more important than raw speed on a benchmark that is unrelated to the work you intend to do. Similarly, the availability of excellent business software doesn't mean much if you want to use the computer as a dedicated device controller.

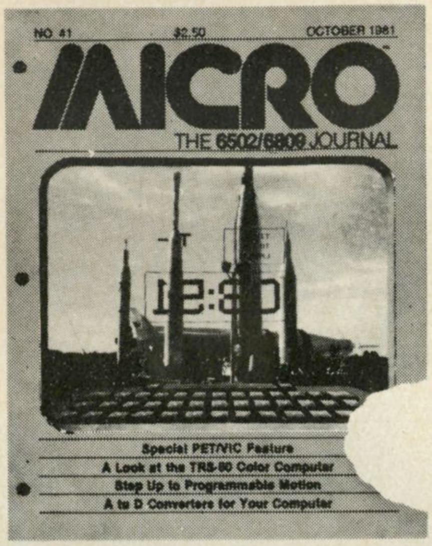
In the last evaluation, computers come in two speed ranges: fast enough and not fast enough to get the required job done in the amount of time available to do it. However, benchmarks like this prime number nonsense will do little to help anyone decide whether or not a given computer will, or will not, meet this simple and yet unyielding benchmark.

Mike Avery
Austin, TX

Sin of Assumption

In my letter (Letters to the Editor, June 1982, p. 24) I was guilty of the sin of assumption. I assumed that the routine (MVI C,54H CALL E53C) changed the Osborne serial baud rate to 9600, because it did communicate with my other computer at a rate much faster than 1200. Several people have called me saying that the routine does not work, so I checked it further. I found that the rate set by this is 19,200 and not 9600, which does not appear to be available without addition of extra hardware. I might add that this

A feast of computing ideas.



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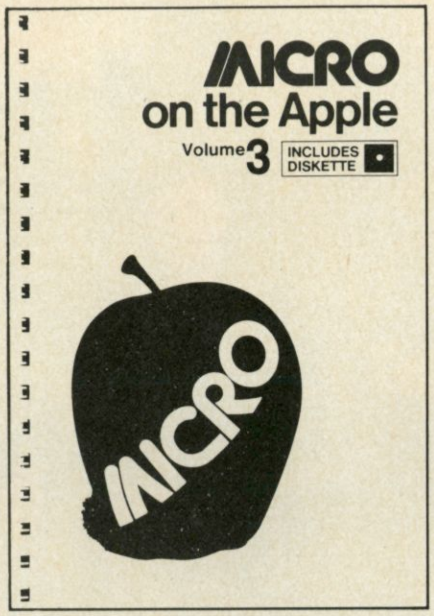

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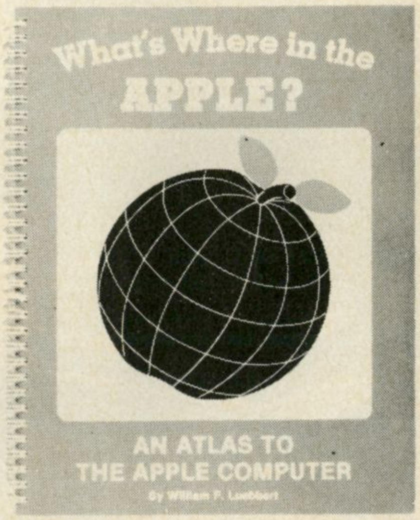

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time I checked the baud rate on a borrowed terminal which ran at 19,200. Clipping jumper J1 on the PC board should double the 300/1200 rates to 600/2400. I have not tested this and therefore will not recommend it. I have no plans for testing this as I am now running parallel and am very happy with it.

Richard Goosman
Hamilton Square, NJ

Kudos for Data Systems

Unfortunately, our industry seems to be a seller's market—almost anyone can set up a small business and stay afloat long enough to lure several of us (often more than a few!) into sending money to order a mail-order product. All of us have heard what can happen to that money—it might disappear entirely, or, at best, take weeks or months before the product is received. Service, support and quality seem to be concepts forgotten by too many of the companies we do business with.

Because of this dim record, I almost always buy from a local dealer, whom I can deal with face to face if I have any questions or problems. Recently, though, I departed from this rule of thumb to purchase ribbon cartridge refills for my Epson MX-80 printer. As the company that I ordered from, Data Systems, Box 99, Fern Park, FL 32730, is about as far away from my Washington address as you can get within the U.S., I expected a long wait for crisp, dark listings. Amazingly, I received my order eight days after I mailed it! This company is truly a gem—if only the larger companies would follow their example. Not only are they incredibly fast, but I can buy six refills for the price of one new cartridge here in the Seattle area.

I will surely do business with Data Systems again; and heartily recommend them to anyone else contemplating "rolling their own" Epson ribbon refills. Good luck to you, Data Systems.

Terry Owen Permenter
Seattle, WA

Computers and Yacht Racing

In early 1981 the Race Management Committee of the United States Yacht Racing Union (USYRU) began collecting computer and calculator programs relating primarily for race and regatta scoring. Most of the programs have been contributed through the courtesy of their authors and are available for a modest cost from the USYRU office in Newport.

The cooperation of the computer and yachting press was greatly responsible for the success of the program to date. Additional programs are desired, especially those devoted to other aspects of sailing such as hull or sail design and measurement.

While USYRU makes available the contributed programs and has a few programs for sale, we'd like to include in the catalog sources of other programs of any nature relating to sailing. Information about other programs should be sent to USYRU, Box 209, Newport, RI 02840.

Evans M. Harrell
Chairman,
Race Management Committee
USYRU
Newport, RI

```
10 '*****SHELL SORT*****
20 DIM A(500)
25 CLS:LPRINT "SHELL SORT":LPRINT
40 INPUT "HOW MANY NUMBERS (2-500)";NN:LPRINT "NN =          ";NN
50 IF NN <2 OR NN>500 THEN END
60 FOR I=1 TO NN
70 A(I)=RND(1)*NN
80 NEXT
85 LPRINT "START TIMING  ";TIME$
90 D=NN:FLAG=0
100 D=INT((D+1)/2)
110 FOR N=1 TO NN-D
120 IF A(N)<=A(N+D) GOTO 150
130 T=A(N):A(N)=A(N+D):A(N+D)=T
140 FLAG=1
150 NEXT
160 IF FLAG=1 THEN FLAG=0:GOTO 110
170 IF D>1 THEN 100
180 LPRINT "STOP TIMING   ";TIME$
190 GOTO 40

SHELL SORT

NN =            200
START TIMING    19:41:55
STOP TIMING     19:42:55
NN =            200
START TIMING    19:43:23
STOP TIMING     19:44:26
NN =            200
START TIMING    19:44:33
STOP TIMING     19:45:32
NN =            200
START TIMING    19:45:40
STOP TIMING     19:46:41
NN =            200
START TIMING    19:46:48
STOP TIMING     19:47:48


NN =            300
START TIMING    19:48:08
STOP TIMING     19:49:57
NN =            300
START TIMING    19:50:06
STOP TIMING     19:51:45
NN =            300
START TIMING    19:51:56
STOP TIMING     19:53:34
NN =            300
START TIMING    19:53:47
STOP TIMING     19:55:19
NN =            300
START TIMING    19:55:28
STOP TIMING     19:56:59

SHELL SORT

NN =            500
START TIMING    19:58:06
STOP TIMING     20:02:39
NN =            500
START TIMING    20:02:57
STOP TIMING     20:07:19
NN =            500
START TIMING    20:07:34
STOP TIMING     20:11:28
NN =            500
START TIMING    20:11:38
STOP TIMING     20:15:46
NN =            500
START TIMING    20:16:00
STOP TIMING     20:20:09
NN =            1
```

Listing 1. Shell sort with run times on the IBM PC under Advanced Basic.

Still More on Speed

With reference to the letter from Mike Smith concerning the Shell Sort (Letters to the Editor, April 1982, p. 26), here is a program incorporating his algorithm together with some run times on the IBM Personal Computer under Advanced Basic. (See Listing 1.)

Although only five runs of each of three sets of numbers were made, it seems to be evident that the IBM PC performs very efficiently.

Harry G. Friedman
Shreveport, LA

Reply:
Mr. Friedman's algorithm is identical to the one I used on our Apple II+. We could therefore conclude that the IBM PC is faster than the Apple for this type of processing.

This is no surprise. Benchmark tests conducted by the Association of Computer Users indicate that the IBM PC is about 20 percent faster than the Apple II+ in their scientific/engineering test (mostly arithmetic processing). But surprisingly (or not surprisingly, if you're an Apple

fan), they found the Apple to be about 50 percent faster than the IBM on their accounts receivable test (heavy on disk I/O). Does this mean that the Apple is faster than the IBM for business applications in general? Someone should run an inventory or A/R program on the IBM PC and then, using the same program, but formatted for the Apple, run the same data on the Apple and report the results.

The difference in arithmetic processing speed is not totally due to the speed of the CPUs or word length. More than likely the difference is in the programming languages. I'm not familiar with IBM's Advanced Basic but I do know that real variables in Applesoft are five bytes long —one byte longer than single precision variables in most languages. This extra eight bits in the mantissa means that each real number has at least nine decimal digits of precision. Could the processing of numbers which are 25 percent longer (in bit length) account for the time difference? If VisiCalc were run on the IBM PC and then on the Apple with the same data, would there be any noticeable differences in speed or accuracy?

Mike Smith
Seward, AK

Unisoft and Unix

Let me compliment you on Phil Hughes' article, "The Operating System of the Future," June 1982, p. 28. It was short, concise and will certainly give the uninitiated a good idea of what to expect from Unix.

There's only one thing missing in the article—a mention of the UniSoft implementation of the Unix operating system on 68000-based systems. While you do mention Xenix (not yet available for 68000-based systems), you do not mention UniSoft (available for 18 systems, among them the CM Technologies product that you do mention in your article).

Bernard Silverman
Director of Marketing
UniSoft Corporation
2405 Fourth St.
Berkeley, CA 94710

The Right Software

In the Computer Blackboard department in your April issue (p. 22), Walter Koetke lists two short Basic programs that he says will work properly on TI and Atari computers but not on some others. While some might get the idea from this that some computers are better than others, all it actually proves is that some software is better than other software at some things. Most of the Basic interpreters available for small computers have what is called a "binary floating point package" in them for doing math, while some have a "BCD floating point package." The binary method is usually chosen because of speed and efficient memory use, but it introduces small errors sometimes, especially in addition, and so the first of Koetke's programs does not work properly. The second program is also affected by these errors, and by the method used to find square roots and the accuracy of the constants (if any) used in the calculations.

The BCD method of doing math is more accurate, and if you have a Basic that uses it, it will probably run both programs correctly. For example, Processor Technology 5K Basic (can you remember back that far?), which is still available in a CP/M version from the CP/M Users' Group, has a BCD package and will run both programs correctly. Another Basic from CP/MUG, Basic-E, has a binary package but can also run the second program correctly (but not the first one). It takes five seconds (on a 2 MHz Z-80) to do it, while PT 5K Basic takes 28 seconds. There are faster BCD packages than PT's, but the binary method usually wins the speed race.

All is not lost if you only have one Basic available and it has a binary package. For example, you can make the first program run correctly by doing it this way:

```
10 FOR C=1 TO 100 STEP .1
20 C=INT(C*10+.5)/10
30 PRINT C
40 NEXT C
```

Line 20 rounds off C to the nearest tenth before it is printed. Similarly, you can round off the first square root to the nearest tenth in the second program and it will run correctly on most Basic interpreters. Just change line 20 to read

```
20 IF INT(SQR(C)*10+.5)/10<>SQR(C)
   THEN 40
```

To illustrate that some software is better than other software at some things, recall that Koetke said that Microsoft Basic only found nine answers with the second program. I found that it not only gets just nine answers, but it takes 11 seconds to do it on my computer, while Heath's Benton Harbor Basic gets all ten and only takes five seconds. But when you run real programs such as business applications under both Basic interpreters, Microsoft runs circles around BH Basic, and with its print using facility to round off numbers automatically, it always gets the figures right, while BH Basic may slip up occasionally.

I guess all of this proves that software is the most important part of the computer. Well-written software will always run well, and hardware deficiencies can usually be bypassed with good software. Get a computer that can run software from a lot of sources and you'll have a winner.

Patrick Swayne
HUG Software Developer
St. Joseph, MI

Micro Software Digest

Compiled by Dan Muse

Vigil

(Reviewed in InfoWorld, *June 14, 1982)*

System Requirements: Commodore VIC 20, any expansion of 3K or more, disk or tape drive
Manufacturer: Abacus Software, PO Box 7211, Grand Rapids, MI 49610
Price: $35
Comments: Vigil is a "programming hobbyist system for the Commodore VIC computers with expanded memory," the review says.

"It permits the programmer to create and move video block graphics," according to the review.

"As a programming language, it provides shortcut graphic routines that would be difficult or impossible to execute in Basic," the review says.

Vigil is quite effective as a home graphic programming package; however, since you must own a Vigil interpreter for commercial game programming, it is limited in this capacity. Reader Service number 409.

DFX

(Reviewed in Peelings II, *April 1982)*

System Requirements: Apple II, 48K bytes, DOS 3.3, Applesoft in ROM or language card, a Hayes Micromodem in slot 2 and a disk drive in slot 6
Manufacturer: Arrow Micro Software, 11 Kingsford, Kanata, Ontario K2K1T5, Canada.
Price: $45
Comments: "This program is well worth the money for anyone who has occasion to transfer files between Apples equipped with the appropriate hardware," says the review.

"The feature that sets DFX apart is its ability to carry on a keyboard 'chat' with the remote user while a file is being transferred," according to the review. There is no noticeable loss of file transfer speed as a result of this.

"The handling of errors is extensive in DFX and exceptionally well done," says the review. This is "the most user-friendly communication package for two Apples." Reader Service number 401.

Hail to the Chief

(Reviewed in School Microware Reviews, *Winter 1982)*

System Requirements: 48K bytes Apple II, one disk drive, Applesoft; 48K bytes TRS-80, one disk drive, DOS Basic; 32K bytes Atari, cassette; 40K bytes Atari, one disk.
Manufacturer: Creative Computing Software, 38 East Hanover Ave., Morris Plains, NJ 07950
Price: $24.95 (on disk)
Comments: In Hail to the Chief, the student's objective is to be elected President of the United States. A strategy must be selected and executed by the student. He must decide what position to take on issues (i.e., energy policy, unemployment, women's rights, health and foreign policy), according to the review.

The student must also handle the financial aspects of his campaign, including fund raising and allocations to promotional projects, the review says.

"This is an excellent program. It creates a level of tension and conflict between position and polls which helps to maintain student interest," according to the review.

The program does require a lot of time to complete and could use more graphics, but on the whole, this is a worthwhile program for the high school or college student, the review says. Reader Service number 406.

Graphtrix

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Applesoft, 48K, Applesoft ROM, graphics printer, DOS 3.3
Manufacturer: Data Transform, Inc., 906 E. Fifth Ave., Denver, CO 80218
Price: $65
Comments: Graphtrix not only prints a Hi-Res screen on your printer, but also allows the user to include graphics, footnotes and superscripts in documents created by the Apple Writer text editor or Editrix (Data Transforms' text editor).

"If you already use Apple Writer, then you will very likely find GT a useful addition to your word processing system," the review says. Reader Service number 423.

Nutrichec Version 2.0

(Reviewed in InfoWorld, *June 7, 1982)*

System Requirements: Apple II Plus, DOS 3.3, 32K bytes RAM, and one disk drive
Manufacturer: WIMS Computer Consulting, 6723 East 66th Place, Tulsa, OK 74171
Price: $59.95
Comments: "Nutrichec is a versatile software package that quickly organizes your food intake into nutritional categories," says the review.

The program is designed for healthy persons from three to 80 years of age, and is not meant for people with special dietary needs, the review says.

Nutrichec provides the user with his "entire diet-and-physical-activity analysis," including a hard copy of the results "in five to ten minutes," according to the review.

"The manual is clearly written, well indexed, and overall is a useful reference tool," the review says.

Although this program may require some practice, it is for the most part easy to use for the inexperienced computer user. Reader Service number 403.

Amper-Sort/Merge

(Reviewed in Micro, *July 1982)*

System Requirements: 48K Apple with Applesoft and DOS 3.3 data files
Manufacturer: S & H Software, Box 5, Manvel, ND 58256
Price: $49.95 (plus $3 postage and handling)
Comments: Amper-Sort/Merge sorts sequential or random access text files. It can sort and merge up to five user-supplied file names at machine-language speeds, according to the review.

The program is "user-friendly with ample prompts," the review says. The user is able to sort large text files because the program "uses work files for multiple merging operation under program control," according to the review.

The user must be able to understand the file names and formats of the data to be sorted; however, the user needs no programming knowledge, the review says. Reader Service 421.

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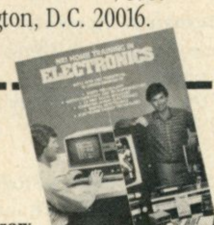

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Key Perfect

(Reviewed in Micro, *July 1982)*

System Requirements: Apple II with 48K RAM, 1 Disk II
Manufacturer: micro-sparc, inc., PO Box 639, Lincoln, MA 01773
Price: $29.95
Comments: Key Perfect is a "utility which computes 'check codes' associated with Apple II program files," the review says.

Although it seems to work, according to the review, "the program is not particularly user-forgiving." For instance, "the program does not allow a catalog command to be issued while it is running." Reader Service number 420.

Personal Check Manager

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Applesoft, 48K Applesoft ROM, one or two drives (printer optional but helpful) DOS 3.3
Manufacturer: Donald Poling, 6929 La Cienega Blvd., Los Angeles, CA 90045.
Price: $30
Comments: "Personal Check Manager has some major weaknesses," the review says. The documentation is unclear and literally hard to read because of light print; also there is no backup capability for the data disk.

The program does have potential, but the review does not recommend use until corrections are made. Reader Service number 425.

REAP

(Reviewed in InfoWorld, *June 14, 1982)*

System Requirements: Apple II, DOS 3.3, 48K RAM, one or more disk drives and 80-columns-plus printer
Manufacturer: Datamost, 9748 Cozycroft Ave., Chatworth, CA 91311
Price: $129.95
Comments: Real Estate Analysis Program (REAP) "attempts to take the work out of providing a comparative analysis of investment potential or real estate properties," the review says.

REAP is "easy to use and can provide you with a ball-park analysis for a variety of real-estate investment situations," according to the review.

The program has adequate error handling and well designed documentation, according to the review.

"The program is well suited for taking a quick and general look at potential real-estate investments." Reader Service number 414.

UFO

(Reviewed in InfoWorld, *June 28, 1982)*

System Requirements: CP/M 1.4 or greater, one disk drive
Manufacturer: Digital Constructs, 130 Main St., Norristown, PA 19401
Price: $75
Comments: UFO (User Friendly Operations) is a collection of utilities designed for a wide variety of applications.

"These utilities will definitely be a welcome addition to your software library if you do much file comparison," the review says.

UFO consists of four programs: ADIF, BDIF, CDIF and DEL. "The first three are file-difference detectors. That is, they compare two input files for one or more differences. The fourth program is an enhanced version of the CP/M ERA function," according to the review.

The programs are "easy to use and well documented and they perform as specified," the review says. Reader Service number 416.

Math and Spelling Strategy

(Reviewed in InfoWorld, *June 28, 1982)*

System Requirements: Apple II Plus or Apple II with Applesoft, DOS 3.3, 48K RAM, one disk drive, color monitor or TV preferred
Manufacturer: Behavioral Engineering (via Special Delivery Software), 230 Mount Hermon Road, Suite 207, Scotts Valley, CA 95066
Price: $45
Comments: Math Strategy and Spelling Strategy explore the technique of Neuro-Linguistic Programming. The technique is based on the premise that people organize their experiences through "sensory representational systems" (i.e., sight, hearing and so on), the review says.

"Furthermore," according to the review, "people exhibit observable 'accessing cues' when they try to reference one of these systems," the review says.

The "accessing cue" that Math Strategy and Spelling Strategy use is eye movement.

According to the author, people "tend to move their eyes up and to the left when recalling an image," the review says.

Therefore, by moving your eyes appropriately when you learn and recall proper responses, you can improve your ability to visualize correct responses, according to the review.

The programs have good documentation and are soundly designed. Students may have to be guided through by an adult the first time—after that they should do well on their own, the review says. Reader Service number 417.

Master Diagnostics Plus

(Reviewed in Nibble, *Vol. 3, No. 1, 1982)*

System Requirements: Apple II, DOS 3.3
Manufacturer: Nikrom Technical Products, 25 Prospect St., Leominister, MA 01453
Price: $75.00
Comments: "An impressive collection of diagnostic routines," according to the review. The documentation is exceptional. "The excellent on-screen prompting provides all the information you need to actually run the tests provided and obtain meaningful results," according to the review. This package should be in the library of every Apple user," the review says. Reader Service number 415.

Electric Duet

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II, 48K, DOS 3.3
Manufacturer: Insoft, 10175 S.W. Barbur Blvd, Suite 202B, Portland, OR 97219
Price: $29.95
Comments: "The Electric Duet is a two voice music synthesizer/interpreter that seems to remain in the tradition of Forte," the review says.

However, it goes beyond Forte in that it can play two notes simultaneously. The ED comes with the option to either play or write music.

"If you think you have the potential to become a computer music programmer, start with this," the review says. Reader Service number 428.

Radar

(Reviewed in InfoWorld, *June 21, 1982)*

System Requirements: System with CP/M, 64K RAM (optimal), one or more disk drives
Manufacturer: Southern Computer Systems, Inc., PO Box 3373A, Birmingham, AL 35225
Price: $495
Comments: "Radar (Random Access Data Acquisition and Retrieval) is a program developed to provide quick and accurate data entry and retrieval," according to the review.

"Speed of operation is definitely the strong point of Radar," the review says.

It is assumed that the user is familiar with installing such programs, the review says, so don't count on help from the documentation. However, generally the documentation contains good information. Reader Service number 430.

GraForth II

(Reviewed in Creative Computing, *July 1982)*

System Requirements: Apple II, 48K bytes and one disk drive
Manufacturer: INSOFT, 10175 Barbur Blvd., Suite 202B, Portland, OR
Price: $75
Comments: "If you really want to produce high quality 3-D animation, buy GraForth II," the review says. However, the review says, for 2-D animation "all the languages are equally good."

"If you've been trucking along with Apple Basic or Pascal, you will appreciate the completeness of this new package," according to the review.

"GraForth II does almost everything that a graphics language should do," the review says. Reader Service number 412.

Apple Pilot

(Reviewed in Creative Computing, *July 1982)*

System Requirements: Apple II Plus, 48K bytes, disk drives (two drives required for authoring)
Manufacturer: Apple Computer, Inc., 10260 Bandley Drive, Cupertino, CA 94017
Price: $150
Comments: Apple Pilot is designed to allow the person unfamiliar with computational details to "develop useful and sophisticated courseware for use in the classroom," the review says.

"Overall this is a useful program and can be put to good use by both the experienced and inexperienced courseware developer," according to the review. Reader Service number 413.

ASCOM 2.0

(Reviewed in InfoWorld, *June 28, 1982)*

System Requirements: IBM PC, PC-DOS, one disk drive minimum, Asynch card and modem
Manufacturer: Dynamic Microprocessor Associates, 545 Fifth Ave., New York, NY 10017
Price: $175
Comments: "The ASCOM (Asychronous Communications) program is a versatile modem-control program for the IBM Personal Computer. It performs most, if not all, of the tasks required for effective communication," according to review.

For the most part the error handling is good; however, a disk-full error causes you to lose any captured information, the review says.

"ASCOM is impressive in its range of options. You'll need a little familiarization" with the program, but common tasks are quite easy, according to the review. Reader Service number 418.

> If you have occasion to use VisiCalc as a planning tool, RVC is a must.

RVC

(Reviewed in Peelings II, *April 1982)*

System Requirements: Applesoft, 48K bytes, Disk II, Hayes Micromodem II
Manufacturer: Arrow Micro Software, 11 Kingsford, Kanata, Ontario K2L1T5, Canada.
Price: $45
Comments: "This is one of the first programs to take a major application program and extend its range by using the modem and telephone," according to the review.

RVC (Reflexive VisiCalc) allows two users of VisiCalc to interact on the same spreadsheet over a telephone line. "This interaction can be used for bargaining, cooperative budget formulation, or a wide variety of other applications," says the review.

"This is a very exciting package," says the review. Without a program such as RVC, there is no way to move data from one Apple to another without being "physically present at the computer where the data is located," according to the review.

"If you have occasion to use VisiCalc as a planning tool with another Apple user, RVC is a must," the review says. Reader Service number 402.

Metric Drill

(Reviewed in School Microware, *Winter 1982)*

System Requirements: Apple II, 48K, Applesoft in ROM, one disk drive
Manufacturer: Hartley Courseware, Inc., PO Box 431, Dimondale, MI 48821
Price: $49.95
Comments: "This program is an effective practice device for use while learning the metric system." The only drawbacks, the review says, are that the teacher may have to help the student select the appropriate lesson and that only two answer choices are provided, so guessing correctly is not too difficult.

One of the advantages is that the teacher can modify the program. Metric drill suggests course/subject and grade levels, the review says.

The program "operates properly and is free of bugs." Reader Service number 419.

SAT Vocab

(Reviewed in School Microware Reviews, *Winter 1982)*

System Requirements: PET 8K bytes
Manufacturer: Microphys, 2048 Ford St., Brooklyn, NY 11229.
Price: Ten programs on tape—$10 each.
Comments: SAT Vocab is an excellent package which prepares students for the Scholastic Aptitude Test, the review says. The flaws are that it is not well structured and graphics are not well used. However, the "prerequisite concepts and vocabulary are quite reasonable" and the program "is free of bugs." Reader Service number 407.

The Home Accountant

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II Plus, 48K, one or two disk drives, printer (132 columns optional) DOS 3.3
Manufacturer: Continental Software, 16724 Hawthorne Blvd., Lawndale, CA 90260
Price: $74.95
Comments: "The program has many capabilities and the power to manipulate and track inputs through the many account categories," according to the review. However, categorizing assets and liabilities into accounts is very time consuming.

The Home Accountant is marketed for the Apple owner who is not necessarily familiar with accounting practices; however, the review says, the documentation does not support the intended user.

The program has many capabilities that are not discussed in the documentation, so it is difficult to effectively use the program. Reader Service number 426.

Volkswriter

(Reviewed in InfoWorld, *June 14, 1982)*

System Requirements: IBM PC under IBM DOS, 128K RAM (recommended), one disk drive (minimum)
Manufacturer: Lifetree Software, Inc., 177 Webster, Suite 342, Monterey, CA 93940
Price: $195
Comments: Volkswriter is "a mix of highs and lows," according to the review.

"Volkswriter is a complete word-processing package designed to use the features of the IBM Personal Computer," the review says.

The review says that Volkswriter does have one serious limitation. "If your system has 64K or less of RAM memory, Volkswriter probably is not for you."

Volkswriter is reasonably easy to use and handles errors well; however, the documentation is lacking in certain areas. The manual does not inform the user that 128K RAM is recommended until page 47. "This information belongs on the cover or the first page of the manual, not in appendix E," the review says. Reader Service number 411.

Datafax

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II Plus, 64K, Runtime Pascal, 2 Disk II, optional printer, DOS 3.3
Manufacturer: Link Systems, 1640 19th St., Santa Monica, CA 90404
Price: $199
Comments: "This is an ideal program to organize all of those notes that accumulate on your desk," according to the review.

"Commands are available at the top level of Datafax to convert Datafax data into an Apple Pascal compatible text file," the review says.

Datafax has a completely different approach to data management in that it offers free form management of relatively large volumes of textual information; however, it cannot perform such functions as mathematical computations and detailed report formatting, the review says.

"Many will find that the program will pay for itself in a short time by reducing the aggravation associated with trying to find a particular piece of information." Reader Service number 427.

Supervyz

(Reviewed in InfoWorld, *June 7, 1982)*

System Requirements: Any Z-80 or 8080 system, CP/M 2.2 or MP/M 1.1, 40K RAM, double-density disk drive helpful, 20×80 CRT screen
Manufacturer: Epic Computer Corporation, 7542 Trade St., San Diego, CA 92121
Price: $95
Comments: "Supervyz is designed to be a user-friendly preprocessor to CP/M," according to the review. The program's menu appears on the screen and the user then types the number that indicates the desired operation.

Supervyz has a lot of little flaws and crudities, the review says, "but once it is set up properly, it does what it is intended to do." Reader Service number 422.

Image

(Reviewed in InfoWorld, *June 14, 1982)*

System Requirements: Z89 or Z90, CP/M 2.2, 48K bytes of RAM, two 5¼- or eight-inch disk drives, and letter quality printer

Manufacturer: Computer Development, Inc., 6700 SW 105th St., Beaverton, OR 97005
Price: $295

Comments: "Image is a word/graphic-processing system that lets you create bar charts, diagrams and block lettering intermixed with normal text," says the review.

The review calls Image "a complete word processor, because it lets you create a text file and print it out in one operation with one program."

Image offers "superb, professionally done" documentation and impressive support. "How many companies have a toll-free number that you can call to get immediate responses to your queries?" the review asks. Reader Service number 404.

Antfarm is "designed to teach programming logic to beginners of all ages. . ."

The Math Machine

(Reviewed in School Microware Reviews, *Winter 1982)*

System Requirements: 48K bytes, Apple II, Applesoft in ROM, one disk, printer optional
Manufacturer: SouthWest EdPsych Services, Inc., PO Box 1870, Phoenix, AZ 85001
Price: $79.95 (two copies provided)
Comments: The Math Machine "gives practice in working elementary math problems ranging from pre-math skills to division," according to the review.

"The Math Machine is a high-quality program. The advantages include a clearly written, comprehensive manual, sequential performance objectives and a teacher-specified reinforcement schedule," the review says.

Each student is allowed to work at his own pace and receives immediate feedback for each response.

The program makes "good use of graphics color and sound," the review says. The program allows a "reasonable number of wrong answers, and responds appropriately to excessive wrong answers," according to the review. Reader Service number 408.

Vectors & Graphics

(Reviewed in Peelings II, *April 1982)*

System Requirements: Apple ROM, 48K bytes, Disk II, DOS 3.3
Manufacturer: Cross Educational Software, PO Box 1536, Ruston, LA 71270
Price: $10
Comments: Vectors & Graphics is designed to be used with a high school or college physics course; it is not designed to teach it, says the review.

The package offers "very little explanation or background information," says the review, so some prior physics-related courses are necessary. Vectors & Graphics is not capable of teaching with the aid of a textbook and instruction.

The program has a short quiz section; however, these questions assume the student has some knowledge not available through the program.

"The program is very poorly error trapped," according to the review. For example, if the student hits reset, "he is knocked out of the program and must start over," says the review.

This program could be useful if a good textbook and instruction were also provided. Reader Service number 400.

Micro-Painter

(Reviewed in InfoWorld, *July 26, 1982)*

System Requirements: Atari 800, 48K RAM, one disk drive, joystick
Manufacturer: Data Soft, Inc., 19519 Business Drive, Northbridge, CA 91343
Price: $34.95
Comments: "Micro-Painter lets you design and paint original pictures;" it can also be used as an "electronic coloring book," because the diskette comes with nine predrawn pictures for you to color, according to the review.

The only flaw, according to the review, is that the documentation is misleading in places. Reader Service number 449.

Class of '82

Educational software is getting better—but don't trash the textbooks yet. Producers still have a lot to learn.

By Lloyd R. Prentice

Current statistics from credible sources are probably the best indicators of growth in the educational software field. But I have another metric. I visit my friend Rick.

Rick first called me some 18 months ago. "My company is thinking about distributing software to schools. Can you recommend products that we should add to our line?"

I was impressed. Rick's company had been selling stuff to schools for more than 100 years—everything from chalk erasers to shuttlecocks.

At that time Rick's office was tucked in the corner of a cavernous warehouse. We threaded down aisles of storage racks that groaned under pallets of blackboards and pencils and scissors and paste, and we entered a space the size of a roomy broom closet. "Our new microcomputer area," Rick announced proudly.

By my next visit the stroll to Rick's area was shorter and less of an adventure. Rick had a new assistant and new space. Their two desks seemed lost in the expanse of the new office.

During my third visit carpenters were hammering away in an adjacent area installing floor-to-ceiling shelves. "Storage for our inventory of software and books," Rick told me. He introduced me to his new secretary.

With each visit I watched the floor of Rick's domain disappear under desks and racks and computer stations. Rick introduced me to the manager of his new retail outlet and hinted at big deals brewing.

My last visit with Rick was just a few days ago and it's clear that lack of space is again crimping his style. My mind flashed back to the cavernous warehouse and for an instant I saw pallets of floppy disks and three-ring binders piled to the fluorescent fixtures high above my head.

There are both pessimists and optimists in the educational software field. One publisher told me that schools just don't have money for software. But Talmis, a respected market research firm, sees sales growing from near zip three years ago to some $75 million by 1985. Certainly my visits with Rick affirm that sales are on the rise. But the big question is—just what is being sold? What's available to help kids learn and how good is it? Progress in these areas is not so easy to gauge.

Recently my company did a detailed survey of the hardware and software products available to educators. We identified 1004 separate software products targeted for grades K through 12. This number, in fact, is misleading since many of the products that we turned up are actually series that include 10, 20 or 30 different units. So we're talking about maybe 1500 to 2000 separate programs. We found programs for art and music, computer literacy, early childhood, guidance, language arts and reading, library skills, mathematics, science, social science, special education and vocational and business education. We also found programs for instructional management and various "authoring" systems to make the process of developing instructional software less of a chore.

These 1004 packages were produced by some 217 companies—169 produce software exclusively, 30 produce both hardware and software and 18 produce both software and books. From the point of view of quantity, then, producers are tripping over one another to get the product out and they seem to be cranking out something for everyone.

But what about quality? How good is the stuff? Here we plunge into a bucket of worms.

There are two sides to the quality question in educational software—technical quality and pedagogy. Technical quality comes down to questions like these:

- Does it run?
- Is it easy to use?
- Are the screens clear, easy to read, appropriately illustrated?
- Is the branching logic correct?
- Is the documentation complete, easy to use and correct?

Pedagogy is somewhat stickier. Indeed, the issue of appropriate pedagogy is the Falkland Islands of education. One camp is looking for structured presentation of content, explicit instructional objectives, accountability and emphasis on basic skills. Another camp wants to create a rich environment of information and tools and leave the learning to the innate curiosity, creativity and "constructionist" instincts of the child. This camp believes that children "construct" their own knowledge at their own pace out of their personal experiences with the physical and social environment.

Clearly, your basic philosophy of education will influence your approach to software development and evaluation.

Lloyd R. Prentice is president of Prentice Associates, Inc., 46 St. Johns St., Boston, MA, a software development and consulting company.

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But there are more concrete dimensions of quality as well:

- Does the content fit into the curricular goals of the educator?
- Is the presentation of content consistent with established learning principles?
- Is the content factually correct?
- Are the words properly spelled and the sentences grammatically correct?
- Does the software motivate the kids?

Unfortunately I have not had the pleasure of reviewing all 2000+ educational programs that turned up in our survey. But from what I've seen there is qualitative progress in at least two areas. First, there is a greater diversity of software in terms of both content and pedagogy. And, second, the best of recent releases reflect both better use of the computer as a medium and more consideration of the user. Here are some notable developments and trends that I would submit to support my case.

High on the list is the release of Logo for both the Apple and the Texas Instruments machines. Logo is a computer language developed at MIT. Its roots are in Lisp, artificial intelligence and the child psychology of Jean Piaget. It's easy for youngsters to master and offers significant expressive power. Versions of Logo for the Apple are available from Terrapin, Inc., Krell Software and Apple Computer Systems, Inc. Logo for the TI machine is available from Texas Instruments. Logo has inspired various other "turtle graphics" systems—Atari Pilot, and Tom Smith's Kidstuff are two examples. The availability of Logo provides a powerful alternative to the tutorial and drill-and-practice modes of computer-assisted instruction.

Another trend is the reworking of drill-and-practice programs into arcade-game formats. Examples are Master Type from Lightning Software, the Arcademic series from Developmental Learning Materials, and Reston's Multiploy. Many of these programs are too martial for my taste, but kids eat them up. This development is important for two reasons. First, it reflects an attempt to understand and exploit the motivational value of the computer and, second, it requires producers to understand more fully the potential of the computer as an expressive medium.

There is also a trend toward simulations. This encourages me for many of the reasons that I've already cited. The Search Series from McGraw-Hill is a hot property right now. The Search Series, developed by Tom Snyder of Massachusetts, helps teach social studies and problem-solving. A strong feature is that each program is designed to encourage group participation.

The Search programs are impressive from the point of view of creative pedagogy, but they are less impressive technically. Take the technical legerdemain of the arcade games and mix it with Tom Snyder's structure and you'd have *some* learning experience. In our survey we found an impressive number of simulations in both the science and social science areas.

Still another trend is the development of educational materials for the home. Most major publishers are eyeing this area carefully and a few, like Reader's Digest, are moving ahead with actual products. Educational programs for the home market must have high entertainment value, must be technically flashier than their counterparts for the classroom and generally have less thorough documentation and instructional management. A lucrative home market increases the incentive for producing top-rate educational materials.

The last trend, which is not as dramatic as the others but is equally important, is that the overall quality of educational packages from the point of view of packaging, documentation, instructional management and user friendliness is on the rise. Two companies praised on these counts by educators I've talked with are Milliken Publishing and Hartley Software. When one publisher establishes new benchmarks of quality in these areas, other publishers will have to meet or exceed them to remain competitive.

Last year (September 1981 *Microcomputing*, p. 86) I wrote that the educational software field is booming. Nothing has changed my mind. There are still problems—uneven quality, inadequate reviewing mechanisms, fragmentary offerings that fail to provide systematic coverage of a given curriculum area. Educators are still plagued with inadequate hardware and the lack of standardization of graphics, disk formats and operating systems. And producers are still vexed by piracy. But in two years the field has come a long way. I see a most promising future.■

Micros on Campus

Will we plan for their arrival or be caught by surprise?

By Thomas Wm. Madron

Colleges and universities have not dealt well with computer technology. Computer installations cost more than schools are accustomed to spending, so administrators are authorizing large sums of money for something they barely understand. This, combined with poor planning, has seriously inhibited effective use of microcomputers in the academic world.

One problem is that the technology changes so rapidly. But you can forecast the rate of change well enough to do short- and medium-range planning.

Failure to Plan

Colleges and universities are buying microcomputers with or without planning. The issue is: will they be used with a coherent policy or neglected?

Poor planning, of course, leads to waste, duplication and inefficiency; most importantly, the micros are not available for general use. One well-known university, for example, found that it had acquired 350 computers, virtually none of which was accessible to the college community.

In such a situation microcomputers will be in the custody of those politically astute enough to acquire them. Those who need them most may have no access at all.

Computing in higher education, as elsewhere, is moving away from batch processing to on-line, interactive systems for both administrative and academic computing. Today we have available to us a greater variety of computing hardware and software than ever before, and this variety is leading to much confusion. A planning time-line should stipulate the distribution between batch processing and interactive processing now, what it is likely to be in one year and what it should be in five years. Interactive computing itself can then be subdivided by asking what share should be processed by smaller decentralized systems (microcomputers).

During the seventies the "economy of scale" argument led to the use of very large, centralized systems. Economy is now likely to lead us to decentralized, distributed and relatively specialized systems. It is at this point that microcomputers will come into their own in higher education.

Focus on Software

Too frequently, decision-makers have focused on hardware rather than on its functions. But the first step should be to identify the functions to be performed and how those functions can be performed most efficiently.

In higher education we may come to different conclusions if we are dealing with academic computing as opposed to administrative computing. There is, however, a role for microcomputers on both sides of the fence.

Some problems, of course, require computing resources that are simply beyond the capabilities of microcomputers today: Problems that require large, reasonably fast, matrix solutions (necessitating large amounts of memory), or problems that require access to large data files, are examples. Sometimes, however, there can be cooperation between large and small computers, with small computers handling problems at the beginning or end of the process while large computers provide intermediate, large-scale processing. This implies that microcomputers on the college campus should have communications capabilities and access to centralized facilities.

Some problems, on the other hand, can be handled directly by small computers. Planning, for example, using budget simulations, linear programming, Markov analysis and forecasting tools, can often be done on microcomputers. Thus, a planning officer, currently doing computations by hand can be given inexpensive personal productivity tools not heretofore available.

Academically, obvious areas for applications include teaching programming languages, which, with a properly structured microcomputer laboratory, could be both more structured and more individualized than is presently true. Likewise, computer-assisted instruction, resisted on large centralized systems because of the resources required, can be effective on small dedicated systems. Unfortunately, most labs are merely rooms full of microcomputers rather than

Address correspondence to Dr. Thomas W. Madron, The Computing Center, North Texas State University, NT Box 13495, Denton, TX 76203.

centers of integrated technology.

When using any computer system, and particularly when using microcomputers, we should first be concerned with the availability of software for the job, then seek hardware to run that software. It would also be well to limit the variety of hardware to those manufacturers that can provide adequate service in a given locale. We might deviate from such a rule when considering microcomputers for process control in laboratories and similar situations.

Before deploying microcomputers, an institution should provide technical support (both software and hardware) for the systems. This support *need not* be as extensive as it is when a microcomputer lab is part of a computer science department. At other times support may be a major problem. I am familiar with no instance of a college or university realistically facing this issue, and it is exacerbated by individuals and departments acquiring computers through independent funding. Consequently, after spending large amounts of money, you may find that the micro has become a dust collector.

One way around this is to establish multiple-microcomputer laboratories rather than spreading machines around in departmental, faculty or administrative offices. Early provision of some machines for development purposes might reduce later problems.

Microcomputers in a Distributed-Computing Environment

If computers are to be used properly, central planning and support is needed. This is especially true if the intent is to provide a distributed-computing environment that will require standardized software allowing computers to properly communicate with one another. While it is not easy to ensure that each microcomputer has appropriate communications software, it's not an overwhelming problem. If a total computing system is being developed, the system's components should be able to do their tasks and then send the results in manageable form to the end user.

Universities have, typically, not designed distributed-computing systems. But the "economy of scale" argument has less impact now than it once did.

Moreover, timesharing is often a zero-sum game; that is, a resource I acquire is a resource not available to anyone else. This is especially true of either dedicated or dial-up ports. If I capture a port on a large system, that port is denied to someone else. Microcomputers used in distributed systems help avoid this problem. Rather, we establish a situation that maximizes everyone's ability to use a total system.

The Economy of Microcomputers

Microcomputers can effectively be used to supplement timesharing systems. A typical terminal work station for a large timesharing system includes a *cheap* terminal, a port, part of a controller, system software and can cost some $7000. A complete microcomputer work station.

The implication is that, used appropriately in a properly planned environment, microcomputers can lead to more effective use of all the computing resources available. Even if we do not choose to establish a distributed-computing system, an integrated approach is still desirable. And in the small college where no large system is available, microcomputers can provide an economic means for making some computing available.

Conclusions

When considering microcomputers, it is important that academic institutions recognize them as tools with potential applications to all disciplines. While computer-science and information-systems programs have special computing needs, academic computing facilities should not be deployed solely for the convenience of these professional programs.

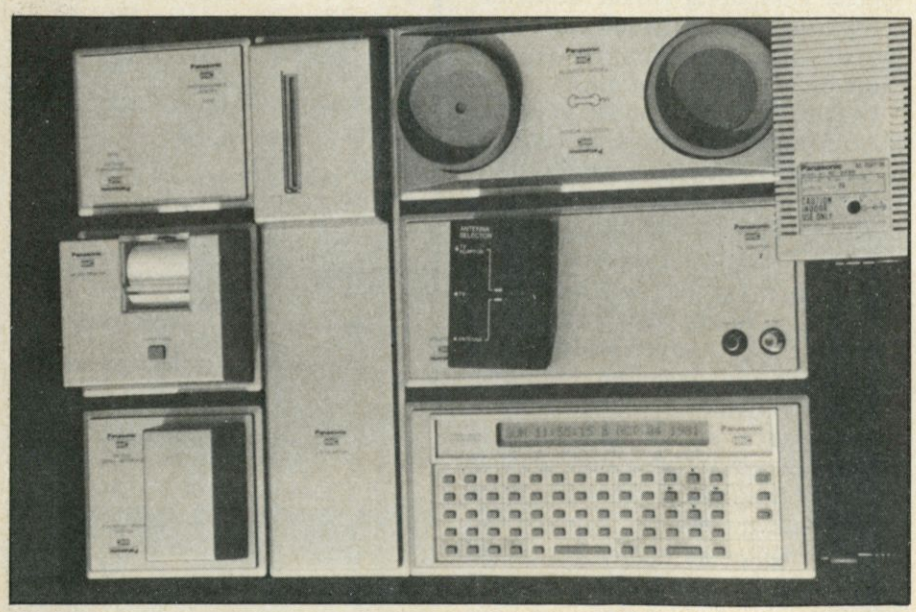
Higher education must confront microcomputers partly in self-defense. Microcomputers are now being widely used in secondary schools throughout the United States. As a result, the demand for quality instruction using computing will be greater in the near future than in the past. Soon entering freshmen will have the technical competence and skill currently imparted in introductory computer-science and/or information-systems courses. Those students will be demanding more than we can currently deliver. We are in much the same situation as higher education must have been in during the first few years following Gutenberg's invention of the printing press. And we must plan for the changes that will take place *with or without us.* ■

Future Trends Take Shape at NCC

Columnist Frank Derfler reports from the Lone Star state that micro systems are becoming more powerful, and designed for the microcomputerist on the move.

By Frank J. Derfler, Jr.

The Epson HX-20 portable microcomputer has a full-function keyboard, RAM and ROM, RS-232C interface and four-line by 20 character display screen packed into a box the size of this magazine. An optional microcassette recorder and printer can be contained within the same package. Internal batteries provide up to 50 hours of operation. The list price of the basic unit is $799. The CX-20 companion modem ($149) is battery operated and completely portable.



The Panasonic Hand Held Computer as it was displayed at the NCC. The modem, television video adapter, extra memory, and printer are all plugged together in building block fashion. The entire unit can be carried in a briefcase.

I just returned from the National Computer Conference in Houston, Texas. The NCC is an annual event which combines the colors and sounds of a carnival with the sophistication of high technology and big business. The event consumed the convention facilities of the Astrodome and every hotel room, rental car and taxi in Houston for a week.

NCC used to be a show only for "big" computers. The lines between "big" mainframe, mini, and "small" microcomputers have now become so blurred that the distinctions hardly seem to apply anymore. Many individual exhibitors at NCC still don't understand the smaller systems and were uncomfortable with the amount of display space devoted to them. Emotions ranging from uneasiness to hostility were evident in the comments and sales pitches coming from several booths.

Other companies, such as Digital Equipment Corporation, now feature computer systems at nearly every level of power and understand how they relate. The DEC booth was one of the most popular at the show.

I think three main themes ran through the NCC exhibits that will be interesting to *Microcomputing* readers: more-portable equipment, much greater disk storage capability, and the integration of 16-bit and eight-bit processors. An interesting sub-theme was the impact of the IBM PC.

Frank J. Derfler (PO Box 691, Herndon, VA 22070) writes the monthly Dial-Up Directory column for Microcomputing.

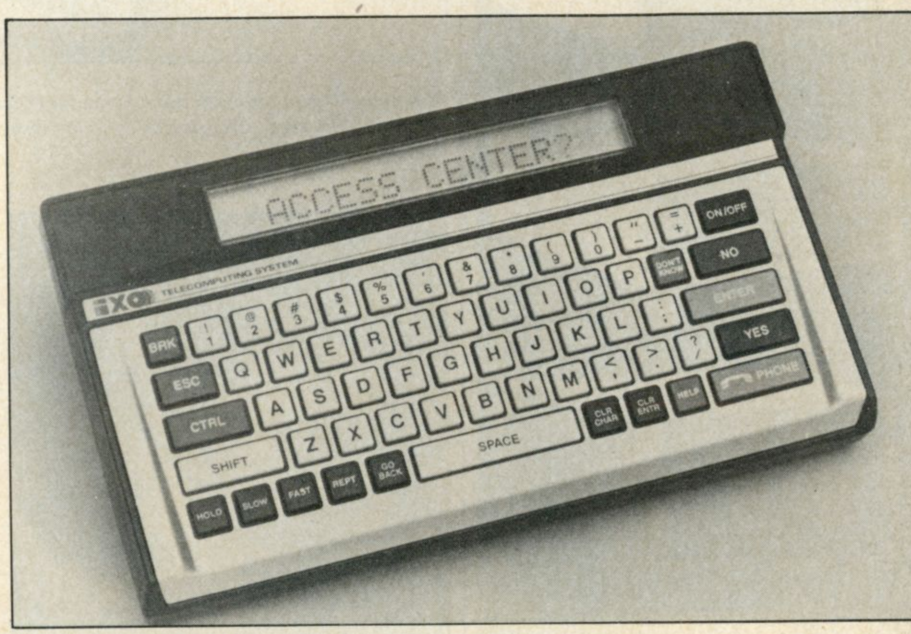
Carry It Away

We are going to have smaller, lighter and more-portable computers and equipment. Several years ago I wrote that Americans love their mobility too much to be tied down to fixed computer systems. I described what I called the Limitation of Location. I must admit that at the time I thought automobile manufacturers might offer a multifunction (including games, appointment calendar and maybe graphic map displays) dashboard computer as an option to car buyers. The new wave of systems I saw at NCC is not tied to the automobile. These systems don't have to be tied to anything!

The Pocketerm is distributed by Charles Schwab & Co., best known as a firm of discount brokers. It is a portable terminal with a built-in modem. It provides either 110 or 300 baud communications service, and retails for about $400.

The Epson HX-20

The Epson HX-20 is almost exactly the size of this page of *Microcomputing*. It is 1.75 inches high and weighs less than four pounds. Into that package, Epson packs a full-size full-stroke keyboard, a four-line by 20-character liquid crystal display, 16K of RAM and 32K of ROM, cassette and cartridge interfaces and an RS-232C port for communications. (Oh yes, there's a CMOS 6301 microprocessor in there somewhere too.) In the same package, you can optionally add a 24-column impact printer, a microcassette for saving and loading programs, and 16K more RAM plus 32K more ROM.



The Telecomputing System from iXO is a portable terminal with a built-in modem and auto-dialing capability. The keys identified as yes, no, don't know *and* help *send specific multicharacter strings which speed the use of data and information services.*

The 20-character screen does not limit the size of the line that can be created. The screen moves around inside of the document so full word processing and programming capabilities are available. The screen displays uppercase, lowercase and graphic characters.

The keyboard has 68 keys which can generate the entire ASCII set including control codes. It also can generate 32 special graphic characters. It has five programmable special-function keys and even a phantom numeric keypad. Under a keyboard control, the U,I,O,J,K,L and M keys become a numeric entry pad for fast entry of statistical data.

Because the system uses low power CMOS technology, its four internal batteries can keep it running for up to 50 hours of operation. Heavy operation of the RS-232C interface and the motors on the printer and recorder may reduce the time between charges.

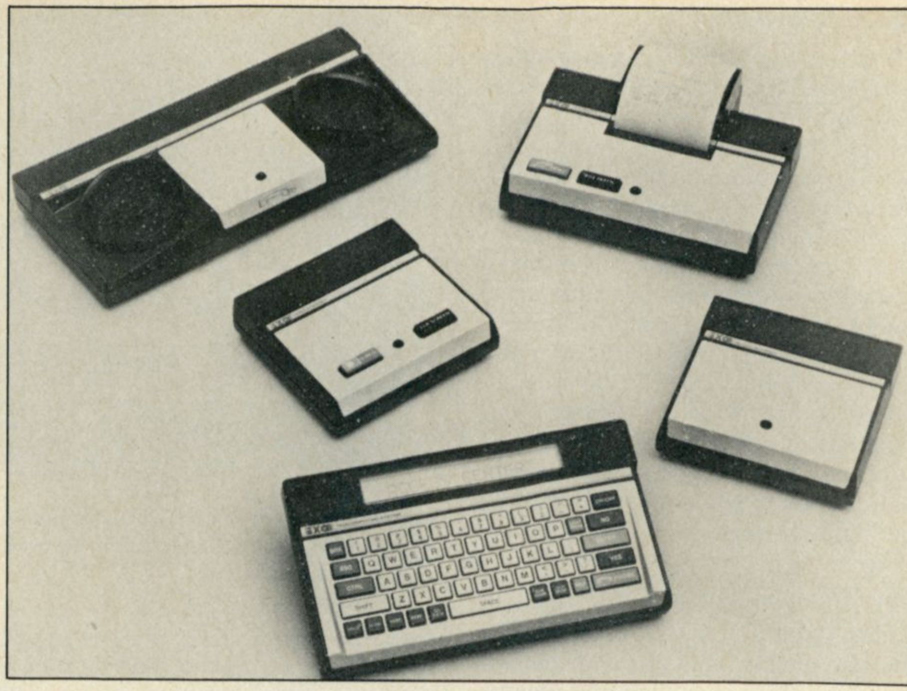
Obviously I was taken with the features of the HX-20, but there were two items that really sold me. The first was the portable, battery-operated modem that is available as an accessory for about $149. The second was the list price of the HX-20 itself—$799.

The HX-20 has the potential for becoming a portable workhorse. It has a practical keyboard and useful interfaces. I wish the screen window were wider than 20 characters, but the characters are large and legible. Time will tell if the screen width becomes a limiting factor in marketing the HX-20, but I don't think it will.

Panasonic HHC

The Epson HX-20 was not the only interesting machine in a small package. Panasonic was displaying a small, flexible and expandable system called the Link Hand Held Computer (HHC). The basic Panasonic HHC comes with a 6502 processor, up to 8K bytes of RAM and a single-line 26-character liquid crystal display, in a package about *half* the size of this page. It has 65 keys on its calculator-type keyboard. At first the HHC appears to be a limited "pocket" computer, but the features that set the Link apart are its expansion and communications capabilities.

The HHC expansion modules plug into the basic machine in building block fashion. The expansion



Four optional peripherals are available for the iXO telecomputing system: a dot matrix printer, a video interface that provides a 32-character by 16-line display on a television set or monitor, an RS-232C interface and an acoustic coupler.

Non-Linear Systems, Inc. introduced double-density disks as a standard feature of its Kaycomp II portable microcomputer system. They claim to have generated $7 million in sales in the first five weeks. The Kaycomp II operates under CP/M and sells at local dealers for $1795.

modules include two different modems for communications (with and without cassette interface), two different thermal printers (40 and 15 columns), a TV adapter that feeds a modulated rf signal to a television set, cassette storage, more RAM, programmed ROM cartridges and even an attache case to carry the complete system. The system can connect directly to an impressive four-color plotter with full paper movement and precise line definition and placement. The plotter is about 9 × 3× 4 inches and weighs 12 ounces.

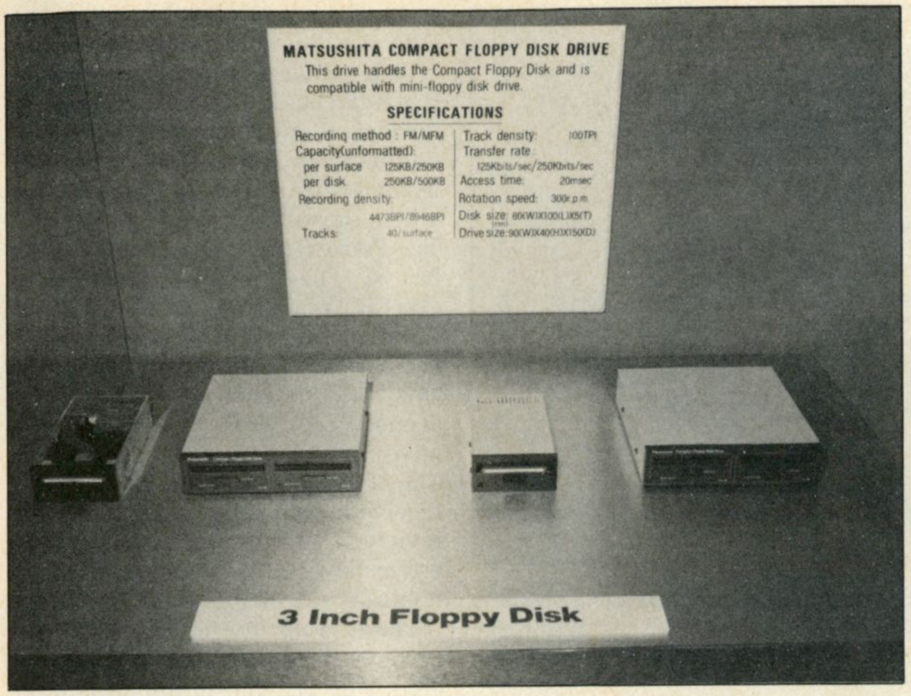
Panasonic has several communications programs for the HHC. These software packages come in small ROM modules which plug into the bottom of the machine. Telecomputing 1 turns the HHC into a dumb terminal with full ASCII transmission capability. Telecomputing 2 lets you transfer files between two HHCs or between an HHC and host computer system.

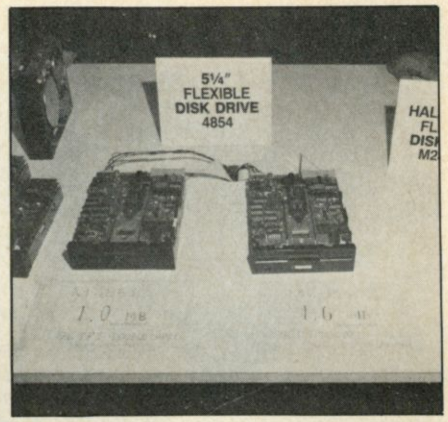
The Panasonic HHC line is not low priced and the options can add up quickly. The basic 8K Panasonic HHC has a list price of $480. The modem with cassette interface lists for $300. You should note, however, that the modems interface directly with the CPU bus, so the optional RS-232C serial port is not needed. A 16K RAM expansion costs $350 and the Telecomputing 2 cartridge sells for $39.95.

The entire HHC with all options becomes a very powerful system. The two major limitations are the size of the keyboard and the single line display. I will comment more on these limitations later because they are shared by two other new communications devices.

Two Pocket Terminals

It is apparent that the people at





Disks continue to become smaller and more dense. Several three-inch and 3½-inch drives are available that pack nearly 500K bytes onto one side of a disk. While the 5¼-inch drives take up more room, they also pack more data onto each disk. Mitsubishi's low-profile 5¼-inch drive can put 800K of data on each side of the disk. That can put 3.2 megabytes of data into each slot of a currently available machine using full size drives.

both Charles Schwab & Co. and iXO, Inc. believe the age of the pocket terminal has arrived. They have each arrived at slightly different solutions to the problem of how to balance features and price.

Pocketerm One is a small and relatively low cost pocket terminal being distributed by Charles Schwab & Co., Inc., 1 Second St., San Francisco, CA 94105. That company is a very large discount brokerage firm handling securities for clients throughout the country. Obviously, they see applications in the areas of business and investments.

Pocketerm is initially being marketed only to corporate purchasers. It is expected to be available to individuals at a suggested retail price of $399 later this year. An optional printer will be available for $250 and a television set adapter is planned.

The iXO Telecomputing System is a pocket terminal and operating support system marketed by iXO, Inc., 6041 Bristol Parkway, Culver City, CA 90230. The hardware portion of the system is a pocket terminal with many user-friendly features. The total service includes a unique and individually tailored automatic terminal programming service provided by iXO.

The iXO system approach makes the terminal meet the needs of each individual. The company maintains an Access Center for Telecomputing System users. Each user is supposed to call this Access Center when the device is first activated. The center will ask the user about the systems to be used with the pocket terminal; it will then download the appropriate log-on protocols and operation parameters into the nonvolatile RAM of the telecomputing system. After that, the user will only have to push one button to get on-line with desired host systems.

The iXO system has made on-line operation easier by including keys

This is the new Sony SMC-70 microcomputer that was released at the National Computer Conference in Houston. In this photo, two 3½-inch microfloppy disk drives and an expansion module have been mounted on the basic computer. The SMC-70 is a Z-80A microcomputer with 64K of RAM. Standard interfaces include a Centronics parallel printer port, an RS-232C serial port, RGB color and black and white composite video, light pen port, key pad interface and tape cassette I/O. In this configuration, with the disks, the unit would sell for about $2600.

This is a typical business configuration of the SMC-70. A dot matrix printer, numeric keypad, monitor and 3½-inch floppy disk drives have been added to the basic computer. The Sony green screen monitor sells for $375. A color monitor capable of accepting either RGB or composite video sells for $895. The monitor stand is another $60.

loaded with special commands often needed to interact with a time-sharing system. These include help, yes, no, go back and others. The yes and no keys, for instance, send either the letter Y or N and a carriage return. This allows quick single-key response to the menu questions asked by many host systems.

The iXO system is also being marketed first to large corporate users. While no single-quantity list price was given, a thumbnail escalation of the wholesale price says that it should list for about $500 in single quantities.

It's interesting to compare the iXO and Pocketerm systems to see the differences in both hardware and concept. Both devices are about the same size. Both display a single line of 16 characters. The Pocketerm uses a green fluorescent display, while the iXO uses liquid crystal.

Both devices include a modem that attaches to the telephone line through a modular plug. The iXO will actually dial the telephone line using either pulse or tone dialing when the phone button is pushed. The Pocketerm has 43 keys, the iXO has 61. They both use the standard QWERTY configuration. Neither device has a full-stroke keyboard.

Both the iXO and Schwab systems have options such as printers and acoustic couplers available. Both have, or will have, video adapters. They both have a buffer which holds received data and which can be reviewed on command. The Pocketerm holds 224 characters, the iXO holds 80.

There is an interesting difference in how the two systems are powered. The Schwab terminal uses rechargeable nicad batteries good for about one hour of operation. It can also operate from an ac recharger/adapter. The iXO uses a Polaroid Polarpulse battery to keep the programmable memory alive when the system is not being used. During use, it takes its operating power from the telephone line if it is not working through an acoustic coupler.

The iXO has other features such as data security that would be of specific interest to corporate users. In common use, the major differences between the units are in the quality of external finish (the iXO is certainly prettier), the display, and the auto-dial and auto log-on capability of the iXO. The user will have to decide if those differences are worth the difference in price.

Small Displays and Big Fingers

These two very well financed corporations have decided that there is a big market for pocket terminals, and they have independently produced products with more similarities than differences. Yet both of these terminals have significant limitations in their operation. The greatest limitation is in the size of the display.

All of the pocket systems use displays that scroll, marquee style, from right to left. At 300 baud, this scrolling is simply too fast for comfortable reading with good retention. The terminals can operate at 110 baud, but this results in slow service and high bills for service and connect charges.

I have used these pocket terminals on information utilities I know very

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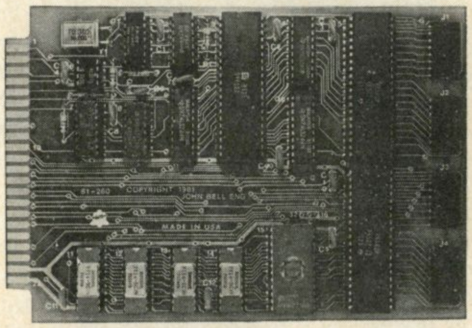

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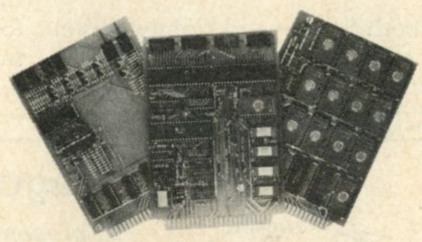

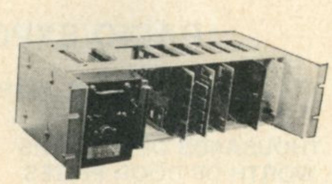

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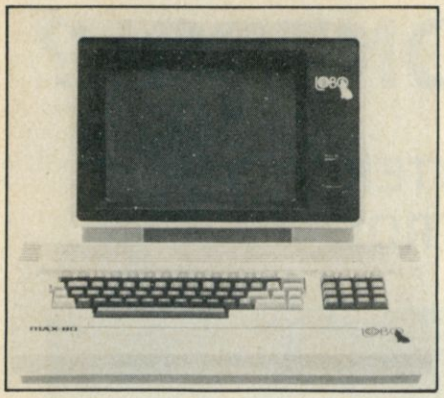


Lobo Drives International introduced their MAX-80 Computer System at NCC. This is a particularly interesting system because it will run both TRS-80 and CP/M software. TRS-80 software is run under LDOS, a TRSDOS-compatible operating system. The basic computer with 64K of RAM, flexible video display (24 lines by 80 characters or TRS-80 16 × 64 and 16 × 32 plus graphics), two serial ports and a parallel port, and a disk controller will list for $800. The drives and monitor must be added. Lobo also introduced new systems such as eight-inch drives and a controller board for the IBM PC. Contact Lobo Drives International, 358 S. Fairview Ave., Goleta, CA 93117.

well (both Source and CompuServe) and I still find them hard to use. A CompuServe menu that makes sense on a CRT is nearly incomprehensible when it is scrolled out along one line.

Where these pocket terminals are really used for communications, they're usually attached to television sets providing a 16-line display. If a larger display is honestly needed for good communications, why not include it in a slightly larger case in the first place?

Similarly, I consider these to be almost one-way communications devices. If I am on the road, I want to be able to send memos, letters and electronic mail back to my office. The keyboards of these pocket devices are quite frustrating to use. Entering words and sentences is very slow and prone to error. While some distributors have recognized this, and have limited the needed keystrokes, I'd rather see an honest and usable keyboard in a slightly bigger box.

I will swim against the tide and predict that, while the pocket terminals like the iXO and Pocketerm will have initial success because of their novelty and strong marketing push, in the long term real portable terminals for business executives, traveling salespeople and investors will have displays of at least four lines, full size keyboards and off-line document review and preparation. Epson, Sony and several other manufacturers are almost there now.

Dense Disks

I said that I had found three themes in the displays at NCC, but so far I have only dealt with portability. Another trend that will have a data communications spin-off is the increasing variety of disk sizes and density. The 3½-inch disks introduced by Sony last year have been joined by a number of smaller and more dense offerings from different companies.

At least two other different 3-inch formats are coming from Japan, and Sinclair may be bringing another

The informal NCC grapevine in the food, registration and transportation lines judged the Victor 9000 to be the best integrated 16-bit business system shown at the National Computer Conference. Victor Business Products is an American company that has been selling business machines for several decades. They have 50 branches and 250 authorized dealers throughout the country. This machine uses an 8088 CPU, with room to increase memory up to 768K. The disks can put over 600K of formatted data on each side. Each machine comes with two serial and two parallel ports. The CRT features tilt and swivel movement with an anti-glare screen. The Victor 9000 is supplied with both MS DOS and CP/M-86. A unique feature of the Victor 9000 is a standard analog coder and decoder aimed primarily at digitizing and reconstructing the human voice. They state that this will be a very important feature in business machines of the future and I certainly agree. But I am surprised that they do not yet provide color graphics as an option. I believe that color will be just as important as voice recognition and voice synthesis in the future office environment. The Victor 9000, with all of these standard features and dual-sided disk drives (2.4 megabytes of storage!) is priced at $5895. Contact Victor Business Products, 3900 North Rockwell St., Chicago, IL 60618.

from England. The Sony 3½-inch drive can record 437.5K bytes of information (unformatted) on each side of the disk. This gives the user nearly a megabyte of storage in a very small package.

The old reliable 5¼-inch drives aren't what they used to be either. Mitsubishi has introduced a drive that can record 800K on one side of a disk. That means that a double-headed 5¼-inch drive can have over 1.6 megabytes of unformatted storage capacity. Several disk manufacturers have already introduced media certified for the Mitsubishi system.

The combination of high-density disks and the trend toward bigger RAMs makes me wonder if the trend toward hard disks will continue. The hard disks give an advantage in speed, but their mechanical and operational problems can be very great. A high-density disk and large RAM may become a better and more reliable combination in many applications.

My forecast calls for ever-increasing capabilities in the density of small drives. This means we will have an even greater hodgepodge of formats with no standards in sight. There are two practical ways to meet this problem. The first is some practical read-only standard or capability. Adam Osborne told me that by the time this article is in print the latest Osborne OS 1's will have the capability to read

The Compass Computer, a new management workstation from Grid Systems, provides decision-makers with ready access to internal and external databases. It includes an extensive array of software, nonvolatile bubble memory, a built-in modem, flat-panel bit-mapped graphics and character display—all in a 9¼-pound package small enough to fit, with room to spare, in a briefcase.

The Vector 8/16-bit microcomputer allows present and future software compatibility. The new Vector 4 offers a choice of several popular operating systems, and calls on 16-bit commands to significantly speed up selected eight-bit operations. Vector 4 is a product of Vector Graphic, Inc., Thousand Oaks, CA.

every 5¼-inch soft-sectored byte-oriented disk with a density under 200K. That includes the disks for a lot of systems, but it still doesn't come close to covering them all.

The second way to meet the problem of disk portability is through data communications. The RS-232C serial data communications port is still the most standardized mass input and output channel available. Data can be transferred and captured in any format, density and medium. The more different kinds of disks we get, the more we need to communicate.

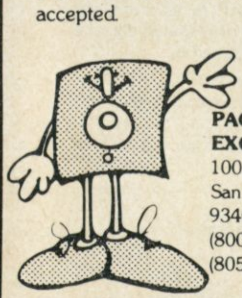
8/16 Bit CPUs

Everybody is getting ready for 16 bits, but some manufacturers wisely don't want to leave the eight-bit software behind. The new Sony SMC-70, shown in the photos, features a Z-80A CPU. But the system can, in Sony's words, be "supercharged" with an optional 8086 16-bit processor.

A very impressive machine from Digital Equipment Corporation is called the Rainbow 100. It comes standard with both a Z-80 and an 8088 processor in a dual CPU configuration. This dual processor can run the CP/M-80 (eight-bit), MS DOS (directly related to PC DOS) and CP/M-86 (16-bit) operating systems. The unique single-spindle, but two-slotted drives can stuff 800K bytes onto two disks. The Rainbow 100 has a color video option. Fully configured, it has more disk storage, and a lower price, than the IBM PC.

Similarly, North Star displayed a version of their Advantage microcomputer which also combines the Z-80 and 8088 microprocessors. Not many details were available, but I was assured it could read IBM PC disks and use both eight- and 16-bit operating systems.

Many other interesting and innovative systems were shown at NCC. The pace of the growth and change in the area of microcomputers continues to increase. I'll try to keep up.■

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Atari in Wonderland

Double the RAM in your Atari 400, and slip through the looking glass with Alice.

By Dietmar May

Atari was beginning to get very tired of sitting by her monitor on the table, and of having nothing to do; once or twice she peeped at the TV screen, but it had only pictures on it, "and what's the use of a monitor," thought Atari, "without programs or graphics?"

So, she was considering in her own MPU (as well as she could, for the blackboard mode made her feel very sleepy and stupid) whether the pleasure of making a program chain would be worth the trouble of turning on the 410 and loading a program, when suddenly a white rabbit with digital eyes ran close by her.

There was nothing so very *remarkable in that, nor did Atari think it so* very *much out of the way to hear the Rabbit say to itself, "Oh dear! Oh dear! I shall be $28!" (When she thought it over it occurred to her she ought to have wondered at this, but at the time it all seemed quite natural.) But when the Rabbit actually* took a real-time clock out of its waistcoat pocket, *and looked at it, and then hurried on, Atari started to a SysRes, for it flashed across her MPU that she had never before seen a rabbit with a real-time clock or a waistcoat pocket to take it out of. And, rushing into Basic, she ran across initialization after it, and was just in time to see it pop down a large program under the hedge.*

In another moment, down went Atari after it, never once considering how in the world she was to get out again.

The program went straight on like a tunnel for some way, then gosubed suddenly down, so suddenly that Atari had not a moment to process a stop before she found herself falling down what seemed to be a very large subroutine.

Either the subroutine was very long, or she fell very slowly, for she had plenty of time as she went down to peek about her and to wonder what was going to happen next. First she tried to peek down and make out what she was coming to, but it was too dark to see anything; then she peeked at the elements of the memory, and saw they were arrays and strings; here and there she saw memory maps and graphics. She took down a var *from one of the elements as she went past; it was labeled "orange marmalade," but to her great disappointment it was empty. She didn't want to drop the* var *for fear of destroying another beneath, so she put it to the S: as she fell past.*

Down, down down. Would the fall never come to an end? "I wonder how many instructions I've fallen by?" she beeped aloud. "I must be getting somewhere near the end of my memor. . ." CRASH!! And there the program stopped with an ERROR 2 IN LINE 574. Poor Atari could never see Wonderland with only 8K bytes of memory.

Address correspondence to Dietmar C. May, 9704 Williamsburg Court, Upper Marlboro, MD 20772.

I have an Atari 400 and have spent many enjoyable hours programming it—especially learning about the graphics. It is a well-designed machine, and, for the money, I'm really glad I didn't buy another (incomparable) machine.

All of the 400 units produced after March 1981 have been shipped with 16K boards. However, many were produced before that date with only 8K of RAM, severely limiting the programming you can do on them. Atari recognized this and provides a factory upgrade that consists of replacement of the 8K board with a 16K board. This upgrade costs $100. And as this is a little too high for many budgets (after all you bought a 400 instead of an 800), there are surely many of you who are still trying to get by on only 8K. This article describes an inexpensive ($30 or less) upgrade in which the 8K board is modified into a 16K board.

The memory board is 3 by 6 inches, and has a standard 44-pin edge connector with .156 inch spacing. The signals on this connector are shown in Table 1. Although the address lines appear to be scrambled, notice that multiplexed signals are next to each other; that is, the 4108/4116 memory chips have only seven address pins, and yet use 14 address lines to decode 16K. This apparent discrepancy is handled by multiplexing: by connecting first the seven lowest address lines to the memory chip and strobing an internal latch, and then the next seven address lines. Those addresses which are multiplexed are, for the most part, next to each other on the edge connector., This was undoubtedly done to simplify PC board layout.

R/$\overline{W}$ Early is used to disable read buffers during a write operation. (See Fig. 4.) $\overline{Ref}$ also disables the read buffers during a refresh cycle while the ANTIC chip does a pseudo-read (strobes the row address latch RAS while addressing the memory properly). S0–S3 are chip select signals which decode on 8K boundaries. This means that 32K bytes are decodable on the memory board. Companies that offer 32K boards use all these signals to decode the memory; the 16K board uses the first two, while the 8K board uses only S0.

1	D0		A	D1
2	D2		B	D4
3	D3		C	D5
4	D7		D	D6
5	A0		E	A2
6	A7		F	A9
7	A1		H	A13
8	A8		J	A4
9	A5		K	A11
10	A3		L	A12
11	A10		M	*
12	A6		N	*
13	R/$\overline{W}$ Late		P	* (S3 – 400)
14	Ø2		R	*
15	RASTime		S	* (S2 – 400)
16	R/$\overline{W}$ Early		T	*
17	$\overline{REF}$		U	$\overline{SEL1}$
18	$\overline{SEL0}$		V	
19	Vcc		W	Vcc
20	Vbb		X	Vbb
21	Vdd		Y	Vdd
22	Vss		Z	Vss

*Note: the 800 uses these pins to shunt the S2–S5 lines between memory boards; this indicates to each board how much memory the previous board has.

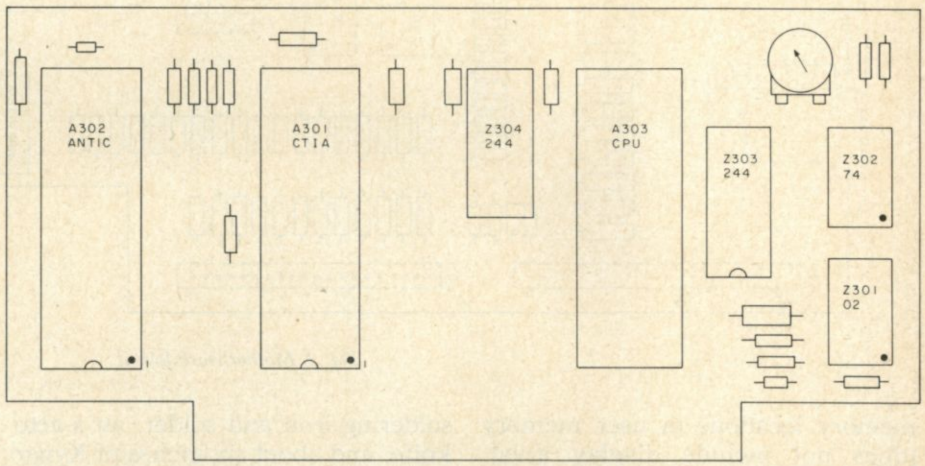
Table 1. Memory board edge connector pinouts.

The 4108s and the 5298s used by Atari are 8K by one-bit memory chips—eight chips are required for 8K bytes of memory. Actually, they are 16K by one-bit rejects sold by the IC manufacturer, in which the lower half of memory tested good, but the upper half had errors, or vice versa. Rather than throwing these away, they're sold by the manufacturer as 8K chips with the stipulation that one address bit (usually A13) is always held low or high. The resistor-jumper network found in the center of the board is used to select which line is held high or low (the 4108s and 5298s have different bad memory pins—see Table 2).

If you have 4108-x0s, you may wish to try this: perform the modifications as listed below, but instead of replacing the 4108s, reuse them. Depending on where the defective bits are located, you may gain 1, 2 or even 4K bytes of RAM. Run the following program to locate the beginning of the defective RAM region:

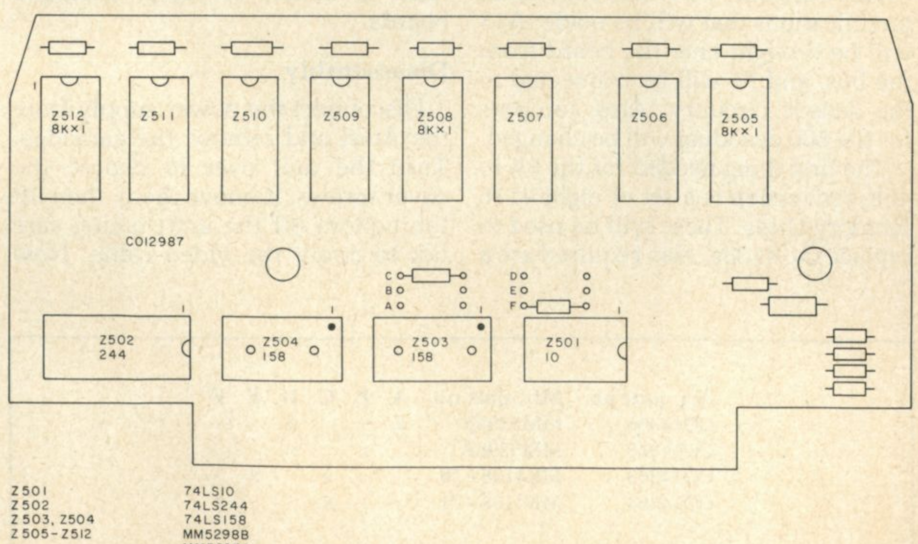
```
10 FOR Z= 1 TO 4: READ D
20 FOR X=8192 TO PEEK(742)*256+
   PEEK(741):POKE X,D: IF PEEK(X)
   < >D THEN? X,D
30 NEXT X:NEXT D:DATA 0,95,165,255:
   REM DATA IS $0,$5A,$A5,$FF TESTS
   ALL BITS
```

This will give a list of all defective



A301	CO12295	CTIA
A302	CO12296	ANTIC
A303	CO14377	6502
Z301		74LS02
Z302	CO14311	7474
Z303	CO14313	74LS244
Z304	CO14313	74LS244

Fig. 1. Atari 400 CPU board layout.



Z501	74LS10
Z502	74LS244
Z503, Z504	74LS158
Z505–Z512	MM5298B
	MM5298A
	MK4108-x0
	MK4108-x1

Fig. 2. Memory board layout.

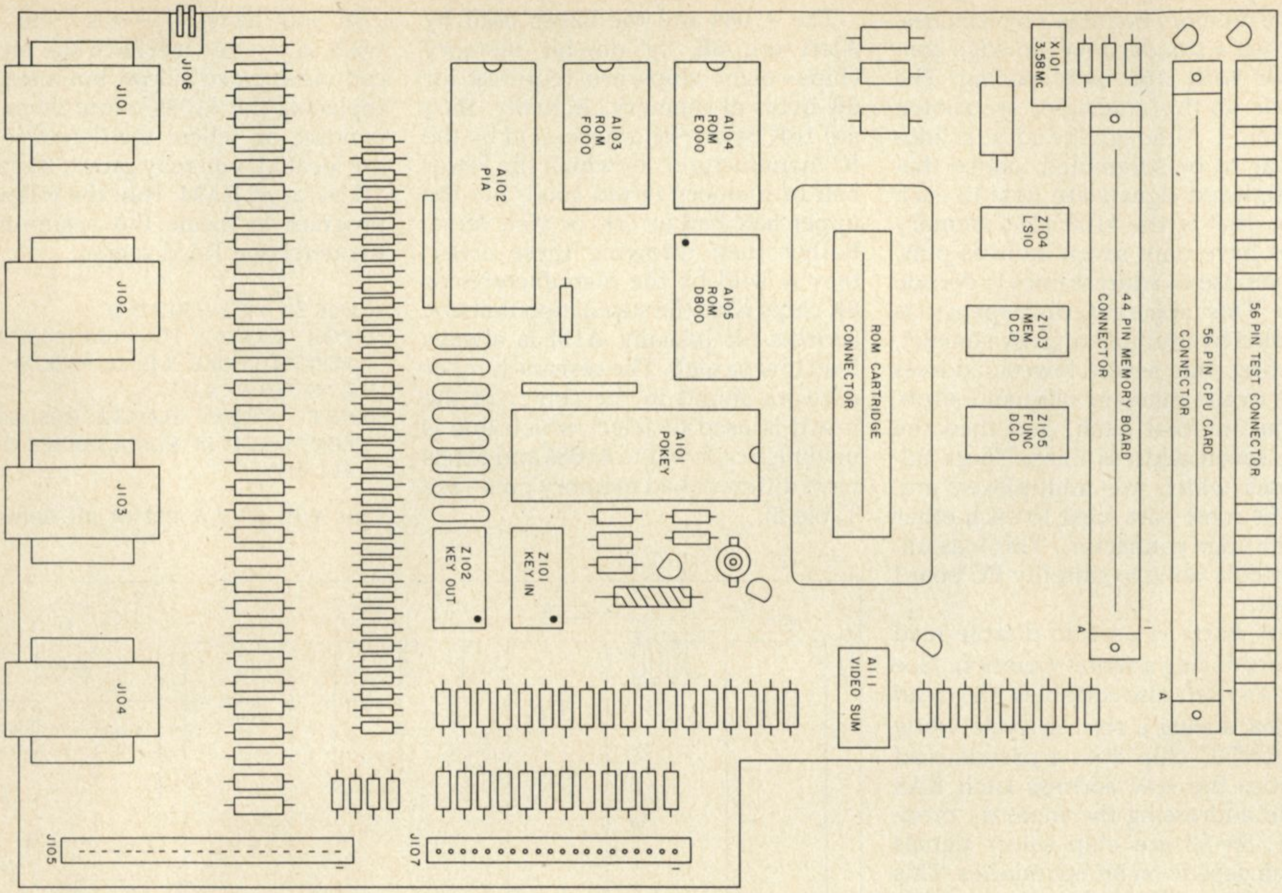


Fig. 3. Motherboard layout.

memory locations in user memory (does not include display area). MEMTOP and OSMEMTOP must be poked with new values so they don't point above defective RAM. I haven't tried this (my RAM is 4108-21), but I would be interested in the results of anyone who does try.

Modification Description

There are only two main functional modifications that will be made: A13 will be brought onto the board from the bus, and S1 will be connected to the decode circuitry. Also, jumpers for the 800 decoding will be changed.

The first thing needed for the 8K to 16K conversion is a set of eight 4116 memory chips. These will be used to replace the 4108s. Also required are a soldering iron and solder, an x-acto knife, and about six inches of Kynar coated wire-wrap wire. Other wire can be used, but the insulation on this kind is extremely heat resistant, and it's less likely to curl away from the solder joint while heating.

WARNING: This modification will void your warranty: don't proceed unless it has expired. Also note that Atari is unable to repair modified boards.

Disassembly

Disconnect the power supply from the Atari and remove the cartridge. Turn the unit over to expose the cover screws. Remove them, then lift the bottom off the unit, taking care not to strain the video cable. Now remove the eight screws holding the aluminum plate to the circuit board. Lift the plate and the cardboard insert.

Two connectors are located in the lower left corner of the motherboard.

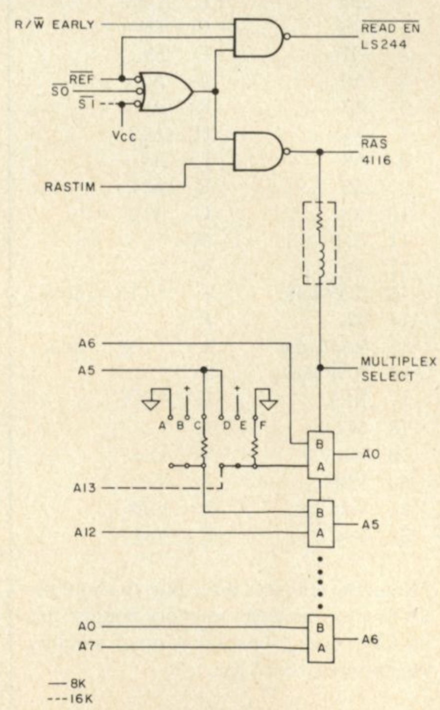


Fig. 4. Decode circuitry.

Ata. part no.	Mfr. part no.	A	B	C	D	E	F
CO14366	MM5298B	x			x		
CO14365	MM5298A		x		x		
CO14363	MK4108 – *0			x		x	
CO14364	MK4108 – *1			x			x

where * is the access time x 100 ns

Table 2. Resistor jumper truth table.

One is for the keyboard and has a ribbon cable plugged in; the other is for the power supply/modulator board. Take care when removing this second connector: hold down the power supply board with your left hand and lift up gently on the motherboard with your other hand. Once the two boards separate, the motherboard can be lifted straight up out of its shielded enclosure.

It is best to remove the complete unit from the plastic, then remove the power supply board from the casting and the mainboard. When reassembling, be certain that the RAM and CPU cards fit properly into the plastic retainer located inside the casting.

Inspection

While the guts of your machine are out and visible, you may wish to learn more about each part's function. The card at the end of the motherboard is the CPU card. (See Fig. 1.) This contains the 6502 processor, the ANTIC chip, the CTIA, timing circuitry, and two 74LS244s to disconnect the MPU from the address bus during screen and memory refresh. See Table 3 for functions of the ANTIC and CTIA chips.

The other card is the memory board (see Fig. 2). The eight ICs at the top are the dynamic RAMs. The 74LS244 disables data-out during refresh. The 74LS158s are the address bus multiplexers, and the 74LS10 performs decode functions.

The motherboard contains the OS ROMs, the POKEY, PIA, memory decoding, clock generator and other miscellaneous circuitry. (See Fig. 3, Table 3.) The ROMs are decoded for \$D800–\$FFFF; the POKEY, PIA, ANTIC and CTIA are at \$D000–D3FF. The connector at the rear of the motherboard provides test points for ease of servicing.

Modifications

Remove the memory card from the motherboard and place it on the aluminum shielding plate, which will short out the pins and provide a grounding plane.

Remove all the ICs by inserting a narrow flat-bladed screwdriver under one side and alternately prying up and pushing under the chips. Use care to avoid bending any of the pins, especially when one side is almost out of the socket. The ICs should be pried out parallel to the circuit board. If necessary, pry up on one side slightly, then on the other. Remove the 4108 chips first, then the four TTL ICs. Handle them by the ends, not by the leads. Place them with their pins down onto the aluminum shielding plate.

- Next, cut the trace between pins 13 and 14 of Z501.
- Also cut the trace between pins T and U on the edge connector.
- Solder a jumper between pin U connector and pin 13, Z501. This connects S1 (second 8K decode) to the RAM enable circuitry.
- Remove the resistor at D, E or F.
- Also be sure that C is jumped, not A or B, which ensures that A5 goes to the RAM as A5. Take some masking tape and cover the lower half of pin H connectors.
- Solder a wire from H connectors to the common side of D,E,F. The tape will prevent solder from building up at the bottom of the connector pin. This connection brings A13 onto the board.

If you have a 400, you're done with the mods, and can replace the ICs starting with the TTL and ending with the 4116s. Be sure that pin 1 on the IC matches the pin 1 silkscreened on the board (pin 1 should be indicated by a notch at the top or a dot in the upper left corner of the chip). The TTL ICs should be in upside down, and the 4116s should have the notch at the top of the card.

When installing the new 4116s, note

Chip name	Function
ANTIC	DMA (direct memory access) control
	NMI (non maskable interrupt) control
	Vertical and horizontal fine scrolling
	Vertical line counter
	WSYNC (wait for horizontal sync)
	Light Pen position registers
CTIA	Priority control (display of overlapping objects)
	Color-Luminance control (transferred from ANTIC)
	Player-Missile objects (four players, four missiles)
	Graphics registers
	Size control
	Horizontal position control
	Collision detection between objects
	Joystick trigger sensing
PIA	Joystick jacks read or write
	Peripheral control and interrupt lines
	IRQ (maskable interrupt request) control from peripherals
POKEY	Keyboard scan and control
	Bidirectional serial port
	POT scan (paddles)
	Audio generators (four channels)
	Timers
	Random number generator

Table 3. Special chip functions.

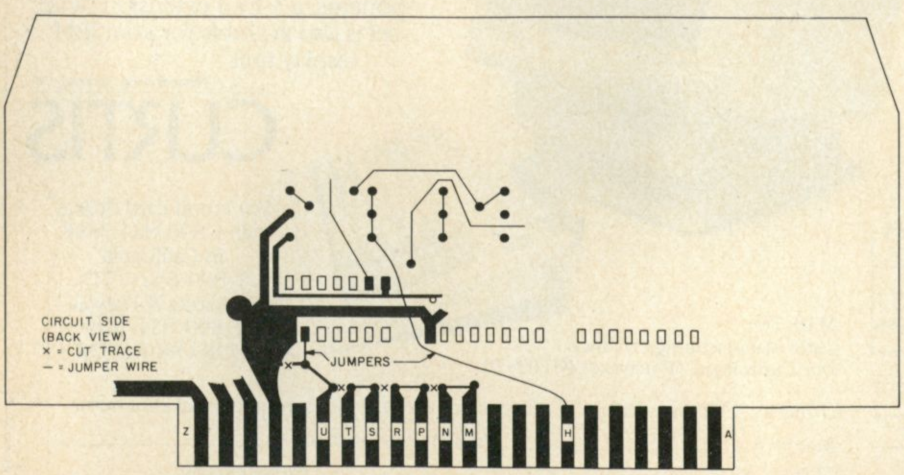


Fig. 5. Memory board mods.

that their pins are spread apart further than the socket, so insertion will be a little tricky. Try either inserting one side part way first, then pushing on the other side slightly; or bend the pins in some, preferably with a pair of needlenose pliers or by pressing each side against a flat surface (e.g., a table top).

If, however, you have an 800, you have several other modifications to make. Cut the traces between edge connector pairs R and S, and N and P. Now jumper these pairs: S and T, P and R, M and N. These are used in the 800 to indicate to other memory slots the size of each board. This is done by shunting the S0–S5 decode lines around onto different pins. Now the boards are completely modified and can be installed after the ICs are replaced.

Installation

Before installing the board, run a finger along both sides of the edge connector to redistribute the anticorrosion paste. Plug the board in backwards, with the chips facing the CPU card (which should face towards the test connector). Plug the keyboard ribbon cable back in if it was removed (this can be a real hassle, so have patience).

Now place the motherboard back over the shielding, and let the plug-in cards drop down. Align the pins of the power supply/motherboard connector and push down firmly. Replace the cardboard insert, and after making sure there's no conductive paste on it, replace the aluminum plate. After fastening this, the bottom can be replaced.

I've found that it's easier to assemble the unit right-side up. To do this, the molded plastic top must be removed. It's held on by two means: the cartridge access door, and a small plastic clip which fits under the front of the keyboard. Open the cartridge door; now pull gently on the front center of the 400 where the joystick jacks are. A small tab should pop out and over the keyboard. The top can then be worked over the cartridge door.

Put the bottom piece on a flat surface. Run the video cable along the slots in the base. Next, take the guts and place them into the base, centering them between the small tabs sticking up. You may find the assembly isn't resting level in the back: lift the back up slightly and pull the video cable up off the base so that it can clear through the notch in the shielding.

Take care not to damage the speaker when replacing it—it's easy to do. Make sure the keyboard and motherboard assembly are all level, replace the top, and tighten the screws down.

Now for the final check. Plug in the power cord, insert Basic, and type in PRINT FRE(0). Your computer should respond with 13326 bytes free. If you still have only 5192 bytes free, check the first three steps in the modification, which connect S1 to the decode circuitry. If you got 13K free, then poke around 8150 and check the screen for garbage; if you *do* get characters to appear on the screen this way, the A13 line isn't connected properly. If nothing happens, check all of the steps in the modification. If the screen display is screwy (bad horizontal hold, garbage appears on power-up, etc.) you may have a bad RAM chip, or an IC pin may have been bent during insertion.

Now that your Atari has 16K, she (and you too) can follow the white rabbit into a programming Wonderland. ■

Everything You Need On a Single Board

This well-designed Z-80 computer from Colonial Data Systems Corp. is loaded with features and compares very favorably to other micros on the market.

By Terry Kepner

The SB-80 from Colonial Data Systems Corp. is one of the newest Z-80 computers on the market. It contains all the features you could want on a single board: 64K bytes of RAM memory, two parallel ports, two serial ports, single and double density floppy disk controller, clock circuit and power supply. Included in the computer's case are two Shugart eight-inch double-density disk drives.

One important aspect of the SB-80 is its 50-pin expansion connector which allows access to all data and address lines coming from the Z-80A. The obvious benefit of this is that it can easily support a host adapter interface for hard disks, expanded memory, additional serial and parallel ports, or any other hardware expansion. This gives it the capabilities of an S-100 bus machine while retaining the simplicity of a single-board computer.

The SB-80 is sold with the CP/M operating system for $2995. It can also operate with MP/M. It is a true CP/M computer and is capable of using almost any program based on CP/M.

Accounts Receivable, Accounts Payable, Mailing List, and many other business programs are available for the SB-80 from S & M Systems, 2 Washington St., Haverhill, MA 01830.

The SB-80 is sold without a terminal (keyboard and video) allowing you to buy only what you need for the system.

Address correspondence to Terry Kepner, PO Box 481, Peterborough, NH 03458.

System Features

The SB-80 (Colonial Data Systems Corp., 105 Sanford St., Hamden, CT 06514) is a single-board computer that uses the Z-80 CPU and operates at 4 MHz. When the system is first turned on, a built-in ROM performs a quick RAM check of the lower 16K bytes of RAM and then bootstraps the CP/M (or MP/M) disk into memory. After the ROM finishes the bootstrap, it "bank switches" itself out of the way leaving only RAM available.

RS-232. The RS-232 capability of the SB-80 is extensive. It has two completely independent, full duplex channels. Data rates can be selected from 50 to 19,200 baud. Each channel's receiver is quadruply buffered, with three eight-bit registers in a first-in-first-out arrangement and the fourth as an eight-bit input shift register. This quad buffering gives the CPU more time to service an interrupt before incoming serial data is lost because the CPU is busy elsewhere.

The transmitters are double buffered with one eight-bit output shift register and one eight-bit buffer register. Each channel has five eight-bit control registers; two eight-bit status registers and two eight-bit sync-character registers. There are also two 16-bit shift registers used for CRC (cyclical redundancy check) generation and checking with appropriate internal feedback. The feedback can be software controlled to use either one of two different CRC codes.

The RS-232 channels operate in any one of three different modes:

- Asynchronous with five, six, seven or eight bits/chr; one, ½, or two stop bits; even, odd or no parity; break generation and detection; parity, overrun and framing error detection; and ×1, ×16, ×32 and ×64 clock modes.
- Binary synchronous operation with internal or external character synchronization; one or two characters; sync characters in separate registers; automatic sync character insertion; and CRC generation and checking.
- HDLC (also called IBM SDLC) operation with automatic zero insertion and deletion; automatic flag insertion; address field recognition; I-field residue handling; valid receive messages protected from overrun; and CRC generation and checking.

In addition to these functions you also have daisychain-priority-interrupt logic so that you can use automatic interrupt vectoring without having to write your own external logic to handle this problem.

The physical setup of these ports is very practical. The RS-232 ports are connected to jumper pads on the circuit board, as are the connections to the DB-25 connectors at the rear of the computer's cabinet. The DB-25 pads and the RS-232 pads are connected together via jumper wires which you can easily change to any arrangement you need. This makes the task of connecting the SB-80 to non-standard RS-232 equipment simple; all you need to know are the pin connections of the hardware. How to do this is explained in the manual.

When the SB-80 is first powered up, channel A is set to 9600 baud and put in the asynchronous communication mode. Channel B is set to 300 baud.

There is one disadvantage to the setup of the RS-232 ports: there are only two pins available for the three signals T×CB, R×CB and DTRB. They are normally configured with T×CB and R×CB on the same pin because most communications will use the same clock speed and phase for both the transmit and receive modes. Because it's rare for the transmit and receive modes to operate at different speeds, I don't think that the lack of a separate pin for each of these three signals is much of a problem.

Parallel ports. There are two parallel ports in the SB-80; both are programmable and TTL compatible. The ports are eight-bit bidirectional, with handshake data control. The handshaking is driven by interrupts from the peripheral device connected to the computer.

There are four modes of operation:

- Byte output
- Byte input
- Bit control
- Byte bidirectional bus (port A only)

As with the serial ports, the parallel ports incorporate daisychain-priority-interrupt logic for automatic interrupt vectoring.

On the parallel ports this interrupt priority means that you can have two terminals connected simultaneously with the computer servicing each terminal only when it receives an interrupt from that terminal. This prevents it from spending half its time checking each terminal to see if there is anything waiting for it.

The port logic is divided into four sections: the control logic, the interrupt control logic, port A I/O logic and port B I/O logic. Each port's logic control is composed of six registers: an eight-bit data-input register, an eight-bit output register, a two-bit mode control register, an eight-bit mask register and eight-bit input/output select register and a two-bit mask control register.

Colonial Data's single-board Z-80 computer, the SB-80.

The mode control register is used to select one of the four possible operation modes (byte input, byte output, byte bidirectional or bit control). Data transfer between the CPU and the peripheral is through the I/O registers. The eight-bit mask register, the eight-bit I/O select registers and the two-bit mask control register are reserved for use only in the bit-control mode. As in a security system with triggers which are either on or off, the bit mode is a very powerful method of connecting the SB-80 to other devices which generate only one condition.

The I/O register allows you to specify each individual bit in the mask register as either an input or an output bit. The mask register itself determines which bits are to be scanned. The two-bit control register lets you specify if the incoming/outgoing bit is going to be either a logical 1 or a logical 0. Therefore, if you have the SB-80 connected to an alarm system of five alarms, the SB-80 doesn't have to poll the alarms one at a time. It works on other tasks instead and only looks at the alarms when it receives an interrupt signal that tells it to scan the parallel port to see which alarm (or any number of them) has sent in a signal of activity.

Timer circuit. The on-board counter/timer is a programmable, four-channel device that provides the counting and timing functions of the SB-80. Each channel is composed of two registers, two counters and their control logic. The two registers are an eight-bit, time-constant register which initializes and re-loads the down-counter at the start. Each time the down-counter reaches 0 there is an eight-bit control register which selects the mode and conditions of the channel's operation. The counters are an eight-bit down-counter which takes the number given to it by the time-constant register and decreases it until it reaches 0, and an eight-bit pre-scaler that can be programmed to divide the 4 MHz clock rate of the computer by either 16 or 256. The pre-scaler determines the rate at which the down-counter decreases.

Expansion adapter. The 50-pin expansion adapter makes the Z-80 CPU bus available for further growth of the SB-80. It has a few nice features in addition to the buffering and availability of the Z-80 Tri-state bus. One of these features is an 8 MHz clock at the connector. This extra clock operates at twice the rate of the system clock and allows you more complex clocking circuitry in external devices than would otherwise be possible.

Another feature allows external circuitry to take control of the internal Z-80 bus if you need it. Another available feature allows you to lock out the internal memory of the SB-80 and lets the external circuitry supply the memory to be used by the SB-80. This provides a simple and effective method of "bank switching" memory into the SB-80 at the control of external circuitry.

Without having to create external

logic, you can daisychain up to four Z-80 peripheral chips into the priority interrupt structure. On-board logic assures that the highest priority device which requests an interrupt will be serviced first. If you find it necessary to add more than four Z-80 chips to the expansion adapter, you can add your own "look ahead" logic and connect up to 30 chips using standard TTL logic circuits.

The SB-80 isn't directly S-100 compatible because all the control and data lines are brought out on the expansion bus and properly buffered. However, it's an easy chore to interface the SB-80 to almost any device on the market. Although it isn't mentioned in the documentation or advertisements, one of the immediate uses of the expansion adapter is the ability to interface the SB-80 with Corvus and Shugart hard disks giving you an option to add up to 80 megabytes of hard-disk storage capacity. In fact, according to Bob Schock, the president of Colonial Data, many of their computers are sold with hard-disk drives as a package deal.

Keyboard interface. The keyboard interface is a simple 8 × 8 switch matrix capable of being connected to a stand-alone keyboard of 62 keys. The

SYSTEM	TYPE	CPU	BITS	SPEED	OPSYS	LANGUAGE	TIME	TESTED BY:
COLONIAL DATA	SB80	Z80	8	4	CP/M2.2	MBasic5.2	661	S & M Systems
ALTOS	8002	Z80	8	4	CP/M2.2	MBasic5.2	662	S & M Systems
CA. COMPSYS	2810	Z80	8	4	CP/M2.2	MBasic5.2	663	Bob Loesch
OHIO SCI	C4-P	6502	8	2	OS65D3.2	Level I Basic	680	
CROMENCO	Z-2H	Z80	8	4	CDOS2.36	32K Basic, SFP	935	Paul Hansknecht
TANDY	TRS-80II	Z80	8	4	TRSDOS	Disk Basic	955	
APPLE	IIPLUS	6502	8	2	DOS 3.2	APLSOFTIIBasic	960	
CROMENCO	Z-2H	Z80	8	4	CDOS2.36	32K Basic,LFP	1130	Paul Hansknecht
OHIO SCI	C3-C	6502	8	1	OS65D	Level I Basic	1346	
HP	HP-85	PROP	8	N/A	N/A	Basic	1380	
BASIC/FOUR	600	8080	8	N/A	N/A	Basic	1404	
ZENITH	Z-89	Z80	8	2	CP/M2.2	MBasic5.2	1500	S & M Systems
IMSAI	I8080	8080	8	2	CP/M2.2	MBasic50	1614	
TANDY	TRS-80III	Z80	8	2	TRSDOS	Disk Basic	1695	William Gollan
EXIDY	SORC'R	Z80	8	2	CP/M1.4	MBasic50	1740	Henry Deutsch
TANDY	TRS-80I	Z80	8	2	TRSDOS	LevelIIBasic	1928	

Table 1. Benchmark test results.

software, using this technique, has complete control of the keyboard including the ability to detect the depression of more than one key.

Floppy disk controller. The SB-80 uses the Western Digital FD1793 for dual-density data bus control and is compatible with the IBM 3740 and the IBM System 34.

The manual. The documentation supplied with the SB-80 is in two, two-inch thick, three-ring binders. The first binder covers the hardware and initial operation of the SB-80; the second binder covers the CP/M operating system that comes with the unit. Binder number one is roughly divided into three sections. The first section covers the main hardware features of the SB-80: first in a brief form that summarizes each feature's attributes, and then in more specific detail.

The first section is about 68 pages and includes seven fold-out pages of hardware schematics. The second section, 25 pages, is the operator's guide to using the SB-80. It tells you how to power it up, what the connectors on the back do and the functions of the lights, switches and doors on the front of the unit. It lists the procedures necessary to turn on the SB-80 and how to make backups of your CP/M system disks. It also gives a brief overview of the CP/M system. The third section is a technical section which includes schematics covering the Shugart disk drives and Boschert power supply sold with the system.

The faults I find with the manual are the same as I find with most manuals. They seem to be written by technical people who assume that you already are familiar with their system, or that you have experience with computers of this type. Technicians will find the manual to be very comprehensive. It supplies all the information necessary to get the SB-80 to do what they want it to do and keep it operational. It is not written for the computer novice.

Colonial Data Systems includes a brief tutorial (25 pages) on the CP/M operating system. They also include an on-line CP/M help command. Typing the word help followed by the command you want explained will result in a display of the definition of the command. They also include a program on their distribution disk called "Help Help" which gives descriptions of the programs on the disk.

To show you how the SB-80 computer compares to the other computers on the market, I included a benchmark test (shown in Table 1, courtesy of Bill Gollan and S & M Systems). All benchmarks were run with a Basic interpreter. Compilers were not used because of their obvious speed advantage, and because interpreters are more available and represent a much wider group of machines. The CPUs of the computers are listed along with the clock speeds (in MHz) at which the computers operate. The operating systems and versions of Basic used are also listed. The last item of each line is the name of the person who actually tested the computer.

The benchmark test is a simple one and uses two nested FOR-NEXT loops and IF-THEN tests. The program used was:

```
140 FOR N=1 TO 1000
150 FOR K=2 to 500
160 LET M=N/K
170 LET L=INT(M)
180 IF L=0 THEN 230
190 IF L=1 THEN 220
200 IF M>L THEN 220
210 IF M=L THEN 240
220 NEXT K
230 PRINT N;
240 NEXT N
250 PRINT "FINISHED"
```

The results of the benchmark test are listed in seconds.

Summary

The SB-80 computer is a well-planned and designed Z-80 computer. Its designers have obviously spent a lot of time and effort in laying out the SB-80 for maximum versatility and convenience. The design of the pin-to-pad RS-232 lines is a much needed setup. More than once I have wanted to connect a standard RS-232 printer to a standard RS-232 port but ran into incompatibility problems. The design of the SB-80 RS-232 ports alleviates this problem.

Another advantage of the SB-80 is the multitude of ready-to-use programs for the CP/M operating system. Although the SB-80 is a new machine, it is not limited by a lack of software.

As you can tell, I am enthusiastic about the capabilities of the SB-80 computer. I think it is definitely one of the better, if not the best, Z-80 computers to be released in the last few years. ■

Micro Money-Maker

Join the bank and insurance magnates of the world in understanding the formula to calculate your future financial value. This useful TRS-80 application can be easily converted to other systems.

By Joseph Najjar

This article illustrates and evaluates the impact of future value calculations in financial transactions. It also describes a program for the TRS-80 Model I or Model III computer that calculates future value.

Future value is the amount an investment is worth at a specific future point. The concept is simple. For instance, if you deposit $100 in a bank that pays 10 percent interest, compounded yearly, the future value after one year would be $110. But interestingly enough, if the bank across the street pays 9.56 percent annual interest compounded monthly, at the end of one year that same $100 would grow to an identical $110.

The importance to the depositor is not the interest rate quoted or how it is compounded, but the balance at the end of the year.

Why Use Future Value

To properly compare amounts of money, they must be compared at the same point in time. For instance, if you compare $100 today with $110 one year from now, you would probably conclude that the $110 is greater than $100. However, if you invested today's $100 at 10 percent interest at the end of one year it would grow to $110. Financially, this means that, assuming interest rates were at 10 percent, $100 today is really equal to $110 one year from now. The future value calculation allows an effective comparison of sums of money, investment returns and financial alternatives at a future period.

Address correspondence to Joseph N. Najjar III, 99 Walker Road, Westwood, MA 02090.

Financial decision-making using large dollar amounts, long periods of time and continuous cash flows can be quite misleading.

As an example, assume you won a $1 million tax-free lottery. It is to be paid to you in denominations of $50,000 per year for 20 years, or you may elect to receive a one-time payment of $350,000. Which would you choose?

Personal circumstances may have a major effect upon the decision. However, the correct financial decision can only be made by a mathematical comparison.

If you chose the $1 million, you would receive $50,000 at the end of each year for 20 years. If, however, you chose the $350,000 and invested it at 13.06 percent compounded yearly, you could also withdraw $50,000 at the end of each year for 20 years, at which time you would have withdrawn the total balance of the account. Thus, this investment would

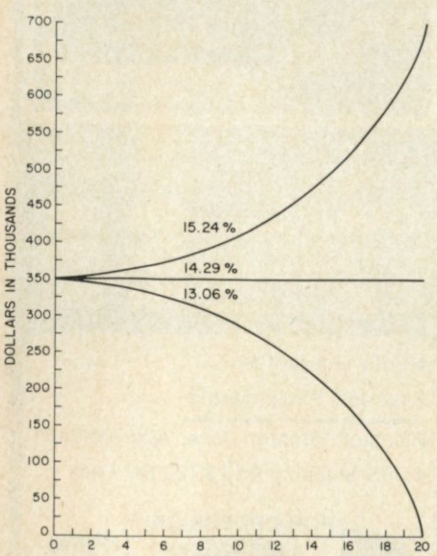


Fig. 1. This chart shows the year-ending balances of $350,000 invested at 13.06 percent, 14.29 percent and 15.24 percent compounded yearly after withdrawing $50,000 per year.

CR_n = Cash flow at period n
i = The assumed interest rate
FV = Future value

$$FV = -CF_n(1+i)^0 - \cdots - CF_3(1+i)^{n-3} - CF_2(1+i)^{n-2} - CF_1(1+i)^{n-1}$$

Fig. 2. Future value formula.

be identical in value to taking the $1 million over 20 years.

If you had been able to invest that same $350,000 at 14.29 percent compounded yearly (only 1.23 percent more than the previous 13.06 percent), you could withdraw $50,000 at the end of each year for an infinite amount of time, and the year-ending balance would always be $350,000.

Better still, if you were able to invest it at 15.24 percent compounded yearly, you could withdraw $50,000 at the end of each year also for an infinite amount of time, with your balance doubling at the end of year number 20 to $700,000.

See Fig. 1 to observe the effect that interest rates have on the year-ending balances.

How to Use Future Value

The future value formula is shown in Fig. 2. The Future Value program in Listing 1 written on a TRS-80 Level II computer requires at least 8K bytes of memory.

Load the program and type RUN. Immediately following this, three columns will appear. The first column is labeled "period number." You can designate the length of a period, but each period must consist of that equal length. For instance, if you consider period 1 to be one month long, you must consider all subsequent periods to be one month long. The computer automatically inserts the period number, it then moves to the second column labeled "cash flow amount" and will await your input. In the cash flow column, enter the cash flow amount for that period. Sign designation is as follows: negative numbers signify money leaving your pocket, going into the investment; positive numbers signify money going into your pocket from the investment.

After putting in the sign designation and the cash flow amount, the cursor moves to column 3 labeled "number of consecutive similar cash flows." This column can save a considerable amount of typing. Let's assume you input a cash flow amount of –$500 for period 1 and that the cash flow amount for periods 2 through 5 is also –$500, equaling a total of five consecutive –$500 cash flows. By typing a five in this column, the computer would automatically input periods two through five at the –$500 value. If this input is less than one or a noninteger, the computer disregards the entire line and asks

*Program listing. Future Value program for the TRS-80. (*Microcomputing *will publish conversions of this program for the Apple, Atari, Commodore, Heath, . . ., submitted by our readers.)*

```
10   CLS
20   '*****************************************************************
30   '*                                                               *
40   '*    THIS PROGRAM CALCULATES THE FUTURE VALUE OF CASH FLOWS     *
50   '*                                                               *
60   '*    WRITTEN BY ... JOE NAJJAR III                              *
70   '*                                                               *
80   '*****************************************************************
90   '
100  '*****************************************************************
110  '*                                                               *
120  '*    INITIALIZE PROGRAM TO ACCEPT 100 DIFFERENT CASH FLOW AMOUNTS *
130  '*                                                               *
140  '*    CF(X)=CASH FLOW AMOUNT NUMBER X                            *
150  '*                                                               *
160  '*    N(X)=NUMBER OF CONSECUTIVE REPETITIONS OF CASH FLOW NUMBER X *
170  '*                                                               *
180  '*****************************************************************
190 C=1:L=193:P=1
200 DIM CF(100),N(100)
210  '*****************************************************************
220  '*                                                               *
230  '*    REQUEST INPUTS FOR CASH FLOW AND CONSECTUTIVE PERIODS      *
240  '*                                                               *
250  '*****************************************************************
260 PRINT @0, 'PERIOD                  CASH FLOW                  NO. OF CONSECUTIVE'
270 PRINT 'NUMBER                  AMOUNT                   SIMILAR CASH FLOWS'
280 PRINT @L,P;TAB(23);
290 A$=''
300 INPUT A$
310 IF A$='END'AND C<>1 THEN 470
320 CF(C)=VAL(A$):IF CF(C)=0 AND A$<>'0' THEN 380
330 PRINT @L+52,'';
340 N(C)=1
350 INPUT N(C):IF N(C)<>INT(N(C))ORN(C)<=0 THEN 380
360 IF N(C)>1 THEN GOSUB 410
370 C=C+1:P=P+1
380 IF L<896 THEN L=L+64
390 PRINT
400 GOTO 260
410 FOR X=2 TO N(C)
420 P=P+1
430 IF L<896 THEN L=L+64
440 PRINT
450 PRINT @L,P;TAB(24);CF(C)
460 NEXT X:RETURN
470 C=C-1
480  '*****************************************************************
490  '*                                                               *
500  '*    REQUEST INTEREST RATE ASSUMPTION AND STORE IN VARIABLE II  *
510  '*                                                               *
520  '*****************************************************************
530 INPUT 'WHAT IS THE ASSUMED INTEREST RATE PER PERIOD (IN %) ';II
540 IF II=0 THEN 530
550 II=II/100
560  '*****************************************************************
570  '*                                                               *
580  '*    CALCULATE THE FUTURE VALUE                                 *
590  '*                                                               *
600  '*****************************************************************
610 NN=0:T=0
620 FOR X=C TO 1 STEP -1
630 FOR Y=1 TO N(X)
640 NN=NN-CF(X)*(1+II)[T
650 T=T+1
660 NEXT Y:NEXT X
670 FV=NN
680  '*****************************************************************
690  '*                                                               *
700  '*   VIDEO DISPLAY OF RESULT                                     *
710  '*                                                               *
720  '*****************************************************************
730 CLS:PRINT:PRINT 'THE FUTURE VALUE IS ----  ';FV
740  '*****************************************************************
750  '*                                                               *
760  '*    ASK IF HARD COPY IS DESIRED                                *
770  '*                                                               *
780  '*****************************************************************
790 A$=''
800 PRINT:INPUT 'DO YOU WANT A HARD COPY PRINT OUT (Y OR N) ';A$
810 IF A$='Y' THEN GOSUB 1010
820 IF A$<>'N' THEN 800
830 A$=''
840  '*****************************************************************
850  '*                                                               *
860  '*    ASK FOR NEW INTEREST RATE ASSUMPTION AND RECALCULATE       *
870  '*                                                               *
880  '*****************************************************************
890 INPUT 'DO YOU WANT TO RECALCULATE AT A DIFERENT INTEREST RATE ';A$
900 IF A$='Y' THEN 530
910 IF A$<>'N' THEN 890
920  '*****************************************************************
930  '*                                                               *
940  '*    ASK IF COMPLETE PROGRAM RERUN IS DESIRED                   *
950  '*                                                               *
960  '*****************************************************************
970 A$=''
980 INPUT 'DO YOU WANT TO RUN AGAIN FROM SCRATCH (Y OR N) ';A$
990 IF A$='Y' THEN RUN
1000 IF A$='N' THEN END ELSE 980
1010 A$='N'
1020 '*****************************************************************
```

More

Listing continued.

```
1030 '*                                                              *
1040 '*    HARD COPY PRINT OUT SUBROUTINE                            *
1050 '*                                                              *
1060 '****************************************************************
1070 FOR X=1 TO 5:LPRINT " ":NEXT X
1080 LPRINT "FUTURE VALUE SUMMARY":LPRINT " "
1090 LPRINT "ASSUMED INTEREST RATE PER PERIOD";II*100;"%":LPRINT " "
1100 LPRINT "CASH FLOW DETAIL":LPRINT " "
1110 LPRINT "PERIOD","","CASH FLOW","NO. OF CONSECTUTIVE"
1120 LPRINT "NUMBER",""," AMOUNT","SIMILAR CASH FLOWS"
1130 LPRINT " "
1140 P=1:FOR X=1 TO C
1150 LPRINT "  ";P,"","  ";CF(X),"         ";N(X)
1160 P=P+N(X):NEXT X
1170 LPRINT " ":LPRINT " ":LPRINT " "
1180 LPRINT "FUTURE VALUE = $";FV:RETURN
```

you to re-enter it.

After you've entered all of the cash flows for all of the periods, type END for the next cash flow amount. A question then appears asking for an interest rate assumption (the interest rate you are currently earning on your investments). It's important that you enter the interest rate for one period's length of time. For instance, if a period was one month long and you were assuming 18 percent interest per year, you would enter the interest as 1.5 (i.e., 18/12 = 1.5). If a period length equaled one year and interest was 18 percent per year, you would enter 18.

Next, the machine—taking up to several seconds—calculates the future value, displays it on the screen and asks if you want a hard copy summary of the analysis (see Fig. 3).

A positive future value is the amount you could put into your pocket from the investment after the last entered period. A negative future value would be the amount of money you would owe on the investment.

Next, a question asks if you would like to recalculate the future value at a different interest rate assumption.

The machine will then ask if you want to start from scratch. An N will end the program.

An Example

Using the steps I've just outlined, let's actually calculate the lottery example.

First type RUN; the three columns will appear. The cursor will fill in the number 1 under the period number column, and then move to the cash flow column looking for an input. The first cash flow is $350,000 leaving your pocket, so enter −$350,000. The cursor will then jump to the next column. Since the next cash flow is not a consecutive similar cash flow, just press the enter key and the computer will automatically assume you want the −$350,000 only in period 1. The computer will then print the number 2 under the period number column and await the next cash flow.

Since you'll be withdrawing $50,000 from the investment into your pocket, enter $50,000. The cursor will then jump to column three. This time you'll enter the number 20, because you'll be taking out $50,000 for 20 consecutive periods. The computer will then automatically fill in the next 19 periods with $50,000.

Now type END for the next cash flow; the interest rate assumption question will appear. Enter the annual interest rate (because each period equals one year) that you feel you can earn and the computer will, after a few seconds, respond with the future value. In my illustration I used 13.06, 14.29 and 15.24 percent to illustrate the interest rates required to generate future values of $0, $350,000 and $700,000 respectively.

Armed now with your new valuable tool, assume your insurance man wants to sell you a retirement plan. Your obligation would be to invest $150 per month for 360 months (30 years), for a total of $54,000. The insurance company's responsibility would then be to pay you $5000 per month for 300 months (25 years) for a total of $1,500,000.

After explaining this, the insurance man asks you if you're interested in the plan. The average person would jump at the chance to turn $54,000 into $1.5 million. But you, knowing better, realize a more sophisticated financial analysis is necessary before coming to a conclusion. You can now evaluate the possibilities of this plan with the Future Value program by comparing it to an investment in a money market fund.

Load and run your Future Value program. In period number 1, enter −$150. Because you're going to make 360 payments (30 years), type in 360 for the number of consecutive similar cash flows.

Next, the computer automatically inputs −$150 for periods 2 through 360, displays it on the screen and moves to period number 361, which is the month during which you start withdrawing $5000 per month. Because this is cash going into your pocket, enter $5000 for the cash flow of period 361. Since you expect to withdraw the $5000 amount for 300 months (25 years) enter 300 for the number of consecutive similar cash flows. The computer will then fill in withdrawals for periods 361 through 660 and the cursor will move to period 661. Type END, signifying the end of the cash flow sequence. The interest rate assumption question will then appear on the screen. Assuming you can earn 1 percent per month, type in 1, which represents this interest rate. The computer, several seconds later, will respond with the future value of $979,312.

From this, your conclusion is that if you had made payments of $150 per month for 360 months and then withdrew $5000 per month for 300 months for an investment that paid you 1 percent per month, you would still have a future value cash balance of $979,312.

Under the terms of the insurance company retirement plan, you would have made the same payments over 30 years, and received the same income over the last 25 years, but would have no value thereafter.

Your own investment, as you can conclude, is far superior to that of the insurance company. It is becoming increasingly clear why insurance companies can pay for such large office buildings.

Now let's assume you are a home builder. You plan to build a house with $60,000 of borrowed funds. You feel certain you can sell the house at $70,900. Your cash disbursements (which you borrow from the bank) are shown in Table 1.

The bank decides to loan you the money at 1.5 percent per month (18 percent per year). You commence

> It is becoming increasingly clear why insurance companies can pay for such large office buildings.

construction, all goes well and you finish at the end of the fifth month. Also at the end of the fifth month, John Jones makes an offer to purchase it at a price of $70,000. You explain your asking price of $70,900 and refuse his offer. Seven months later, Mr. Jones comes back and agrees to pay your $70,900, which makes you very happy.

Using the Future Value Analysis, let's calculate the amount of profit at those two points in time.

First, let's calculate how much money you would have made if you sold it at the end of the fifth month for $70,000. Enter for months 1 through 5: –$20,000, –$15,000, –$10,000, –$7000 and –$8000 respectively. Answer the interest question with 1.5. The future value, in this case, being the amount you owe the bank, is $62,319. If you accepted the $70,000 offer, you would have earned a profit of $7681; i.e., $70,000 (sale price) minus $62,319 (month 5 bank loan balance) equals $7681 (profit).

Because you decided to hold out to get your full asking price of $70,900 and the buyer didn't agree to this until period number 12, you would calculate your earnings as follows. Again enter for periods 1 through 5 –$20,000, –$15,000, –$10,000, –$7000 and –$8000 respectively. Also enter 0 for period 6 and type 7 under the number of consecutive similar cash flows, because for seven months you had no cash flows in this transaction. Again, answer the inter-

Month	Cash Paid Out	Reason
1	$20,000	Purchase land
2	$15,000	Foundation and starting construction
3	$10,000	Finish exterior
4	$ 7,000	Finish interior
5	$ 8,000	Landscaping and appliances
Total	$60,000	

Table 1. Sample cash disbursements to build a house.

est question with 1.5 and the resulting future value, which again represents the amount you owe the bank at that point, will be $69,165. Your profit is then $1735; i.e., $70,9000 (sale price) minus $69,165 (month 12 bank loan balance) equals $1735 (profit). Had you sold the house for $70,000 at the end of the fifth month, your profit would have been approximately 4½ times higher than waiting an additional seven months to achieve your firm asking price of $70,900.

ASSUMED INTEREST RATE PER PERIOD 1.5%

CASH FLOW DETAIL

PERIOD NUMBER	CASH FLOW AMOUNT	NO. OF CONSECTUTIVE SIMILAR CASH FLOWS
1	-20000	1
2	-15000	1
3	-10000	1
4	-7000	1
5	-8000	1
6	0	7

FUTURE VALUE = $69165.1

Fig. 3. Hard copy summary of sample analysis.

Program Construction and Execution

Initialization is in lines 190-200. Line 190 sets needed pointers for the input routine, while line 200 finds variable space for a maximum of 100 nonconsecutive cash flows and the number of consecutive entries for each.

The input routine is from lines 260-470. After this step, the computer retains variables CF(X) (cash flow), N(X) (periods of consecutive cash flows) and C (the number of different entries).

Next, the computer receives your assumed interest rate, lines 530-550, and stores it in decimal form in the variable II.

Next is the calculation routine, lines 610-670. These lines may be used in your own financial program and will store the correct answer in variable FV if the above retained variables contain the appropriate value and II contains the decimal equivalent of the interest rate compounded per period.

The video display sequence, line 730, simply displays the future value on the screen.

Lines 790-830 ask if a hard-copy printout is desired, and if so goes to lines 1070-1180 (the hard-copy printout routine); otherwise the program continues to flow as follows.

The program asks if a new assumed interest rate is desired (lines 890-910), and if so goes to the interest request routine.

The next routine, lines 970-1010, asks if you want a complete rerun. If so, it activates the run command; if not, it ends.■

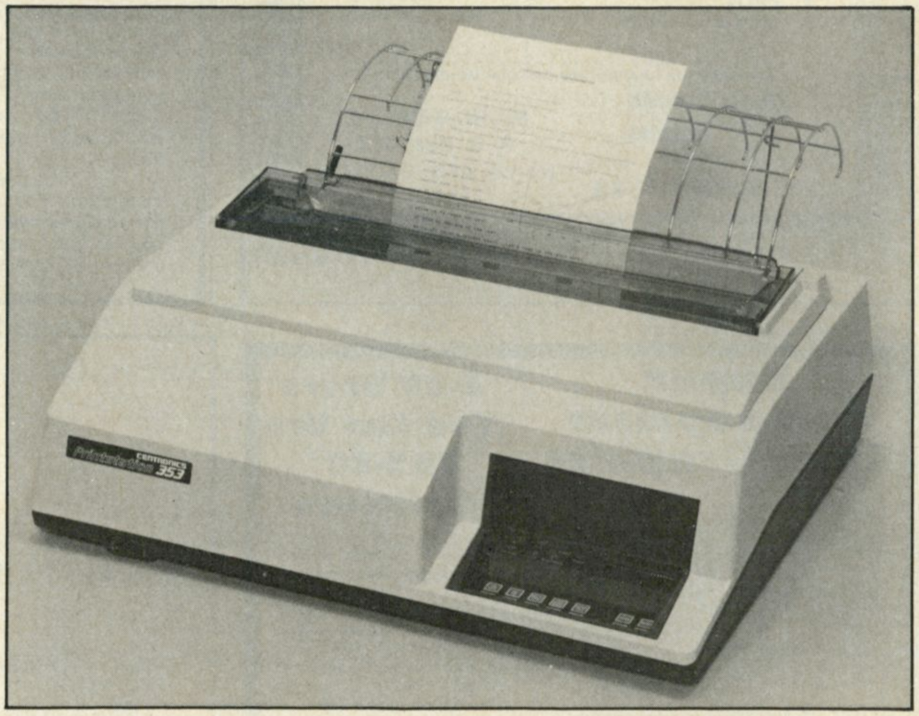
The One Printer Solution

Centronics' Printstation 350 Series answers office needs.

Centronics recently announced a completely new printer family intended as a one printer solution to multiple office needs. A second new office printer is now available (see sidebar).

Billed as a new generation of printers, the Centronics Printstation 350 Series was designed to offer answers to virtually all office needs. Combining new technology with the best in existing printer ideas, it offers users a creative combination of answers to a variety of office problems at a reasonable cost.

The 350 Series are dot matrix printers, with all the traditional advantages of dot matrix over impact printers. They are faster and much quieter than impact printers and have a graphics capability that allows them to produce high-quality diagrams, charts and special, user-designed symbols. They are capable of 200 characters per second in the data processing mode.



The Centronics Printstation 353.

The 350 Series printers also have a built-in correspondence quality mode. This multi-pass capability slows the machines to 50 characters per second, but allows them to produce a print that readers will not be able to distinguish from impact print without close examination. The quality is high enough for business correspondence, report generation and book-length manuscript production.

The machines are designed to switch quickly and easily from fan-fold to cut-paper application. While many printers can theoretically handle either, in most cases changing from one to another is a complex and, at times, dirty job. On the 350 Series changing from fan-fold to cut-sheet paper is simply a matter of backing the fan-fold paper out of the printer and moving a lever. This takes advantage of one of the printers' more distinctive capabilities—the ability to feed cut sheets forward or backward.

This ability is at the heart of the Series 350's unique approach to loading stationery and other cut sheets for printing. Virtually all computer printers today either accept sheets typewriter-style, making it necessary to put the sheets in upside down and backward, or take them from underneath. The Series 350 printers accept sheets from above and in front of the roller. They simply roll them downward along the same track they will follow while being printed. Furthermore, they include an automatic alignment mechanism that insures that each sheet is correctly positioned as it goes into the machine.

Hidden Tractor Feeds

Another distinctive aspect of the printers' design that facilitates changing paper is the placement of the trac-

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tor feeds. Virtually every printer on the market puts these above the printhead so they can pull fan-fold paper through.

This eliminates design problems in the paper feed, but wastes a sheet of paper every time a user removes a document from the machine. The Centronics Printstation 350 Series' tractor feeds are below the printhead, where they push the paper through the machine. This arrangement saves paper by allowing the user to tear off forms an inch above the printhead.

The printers are designed to handle up to six-part forms and can take either top or bottom glued forms. They cannot accept card forms, however. They accept up to 15-inch-wide fan-fold paper and 12-inch-wide cut-sheets. The reason for the narrower cut-sheet paper is that it must fit between the non-removable tractors when it is inserted into the machine. Form lengths are almost totally adjustable thanks to the programmable aspect of the new printers.

Simplified Design

Maintenance is another major issue that Centronics has addressed in several ways. It has minimized the need for major service by building very dependable machines. The modular design has eliminated many moving parts, and the printers have tested to 3000 hours of mean time between failures, averaging out to a full year between maintenance calls. When repairs are needed, the modular design allows technicians to unplug the offending part and replace it, resulting in a very fast turnaround.

Centronics has also simplified normal office maintenance. The printheads (the part that gets the most wear) are designed to snap in simply, making it possible for office staff members to change printheads without calling in a technician.

The messiest maintenance job—changing the ribbon—is also the most frequent. Centronics has addressed this problem in two ways. First, it provides a long-life ribbon with a 10-million-character capacity. Second, when a ribbon does have to be changed, the operator does not have to thread it through the printhead. Instead, each ribbon comes pre-threaded through a clip that snaps into place on the printhead, eliminating direct handling of the ribbon.

"Special" Standard Features

The machines contain a programmable computer chip, which contains eight resident character sets. This allows the printers to handle British, French, German, Italian, Swedish, Finnish, Danish, Norwegian and Spanish characters. Another chip contains a 2000-character buffer, allowing it to hold a business letter or memo in its memory while printing it, freeing the computer for other uses. In addition, the firmware does automatic self-diagnosis on the machines when they are turned on, identifying any problems.

These features, Centronics points out, are standard on these machines. Centronics expects the price range, from $1795 for the basic 200 CPS Data Processing version to $2495 for the high-end machine with multi-

Centronics' Graphics Printer

Centronics Data Computer Corp. now offers the Model 122 graphics dot matrix printer, a heavy-duty printer suited for both data processing and business applications.

The Model 122 is an industrial grade, 132-column data processing printer combined with standard pin-addressable graphics for business processing or design graphics applications. You can select standard alphanumeric printing and pin-addressable graphics, and you also have the choice of six- or eight-pin graphics. This flexibility makes the Model 122 software-compatible with the Centronics Model 739, giving the user a broad base of readily available software packages to perform applications such as trend analysis, business graphics, pie charts, bar codes, CAD/CAM draft plots, and data processing printing.

Standard features of the Model 122 graphics include 120 cps bidirectional, logic seeking printing in the monospaced alphanumeric mode; unidirectional, logic seeking printing in the graphics mode; six- or eight-pin graphics, selectable forms length (from 3½ inches to 15½ inches in ½-inch increments), selectable lines per inch (6, 9 or 18 lpi), "clean hands" ribbon cassette and seven resident international character sets.

The Model 122 also offers adjustable tractor feed, five-part forms capability and graphics resolution of 72 dots per inch vertically and 70 dots per inch horizontally.

Cost of the printer is $1195.■

The Centronics Model 122 graphics dot matrix printer.

pass word processing capabilities, will make the machines an attractive buy for an office with multiple printer needs.

Finally, Centronics has packed all these nice features into surprisingly small and light machines with an attractive design that fits easily on a desk.

About the only feature Centronics has not yet included is an automatic feed mechanism for cut paper. This is used extensively in heavy word processing applications where multiple copies of letters are to be printed. A firm spokesman, however, promises that such a device is just around the corner and will be offered as a future option.

Centronics is planning world-wide distribution of the new Printstation and is already dropping hints about another new office printer to be introduced later this year. With these and other new products announced last year, plus the new capital and expanded manufacturing capabilities, the company has every reason to anticipate a bright future, while users can look forward to better office printers. ■

Fall, 1981

Mr. Thomas Jones
1981 Printer Place
Boston, MA 16745

Dear Mr. Jones

We are pleased to demonstrate the latest advancement in dot matrix printers by Centronics, the CPS 353. The CPS 353 provides near letter quality printing at 50 cps for correspondence documents and standard 7x8 matrix printing at 200 cps for data processing environments. Other features on the Model 353 include pin addressable graphics, up to 10 character pitches, and liquid crystal display to indicate function status and selection. In addition, the Model 353 provides 96 character USASCII and 7 international character sets, plus the capability of a 96 character customer programmable character set.

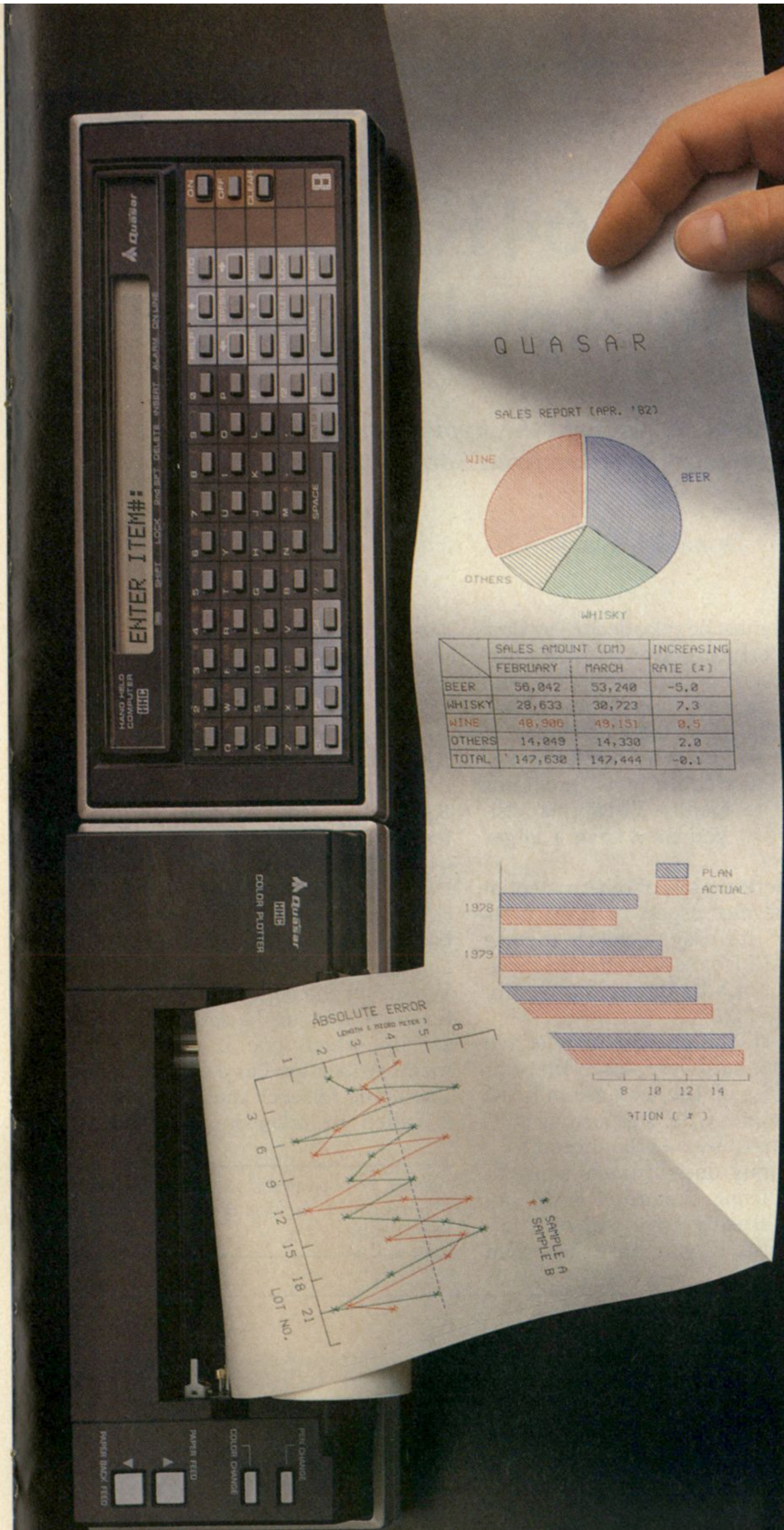
The CPS 350 series is designed as a universal machine, incorporating fan-fold, cut sheet and demand document paper handling systems as well as RS232 and Centronics parallel interfaces. Also included is a power system which allows shipment of one model to satisfy foreign and domestic markets. Coupled with high reliability and low cost of ownership, the CPS 353 satisfies the most diverse price/performance requirements.

This concludes our product demonstration, and we are confident you will agree that the CPS 353 sets the performance standard for quality dot matrix printers in 1981.

Sincerely,

Centronics Data Computer Corporation

Correspondence-quality print from the Printstation 353.



One picture is worth a thousand numbers.

Introducing the new wide-tape Quasar® 4-Color Plotter, driven by the portable with the speed and power of a desktop computer.

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The Quasar HHC is actually a desktop computer you can take with you. Its heart is a fast, powerful 6502 microprocessor, with powerful programming languages—Microsoft BASIC, SnapBASIC and SnapFORTH, and high-memory capacity of up to 8KB RAM and 16KB ROM internal, expandable with external Memory Modules and ROM's or EPROM's in capsules. Operates on rechargeable NiCad batteries and retains data with power off.

The Quasar mainframe has a complete range of intelligent peripherals including a new 40-Character Printer, Telephone Modem/Cassette Interface, RS232 Interface, Color TV Adaptor, I/O Adaptor that works with up to 6 peripherals.

That means the Quasar HHC system can be your personal computer and database,or portable terminal that interacts with a large, central computer, or supplementary system to host computers for data retrieval, collection and transfer.

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Beyond 64K For the Apple

For all you doubting Thomases who thought the Apple was limited to 64K RAM, we give you memory to spare from Saturn Systems.

By Donald J. Black

Most owners of the 48K Apple II can accept the idea of adding 16K RAM. 64K bytes seems natural. But more than 64K seems to be hard to understand. What do you do, for instance, with Saturn Systems' 32K RAM board?

The product is, in fact, quite useful. The organization of the Apple II lends itself nicely to an extra 32K of RAM. Using it isn't as easy as upgrading memory from less than 48K. But with some clever software you can make good use of the extra memory.

One common approach is to put your disk operating system (DOS) and the "alternate" (non-ROM) Basic in the extra memory. This frees practically all of the lower 48 for user programs.

Another approach is to use the extra memory like a high-speed cassette or disk file. You can save and retrieve programs and data. This is much faster than cassette or disk (of course, the RAM must be reloaded every time you turn off the power; it's not a permanent memory like cassette or disk).

Other specific applications have been modified to take advantage of the increased memory available. For example, there are now programs available to modify VisiCorp's VisiCalc so that you may have a larger workspace.

And there are lots of other potential uses. One nice aspect of RAM is its flexibility. It's easy to change the use of the RAM from application to application. Just load a different program, and off you go.

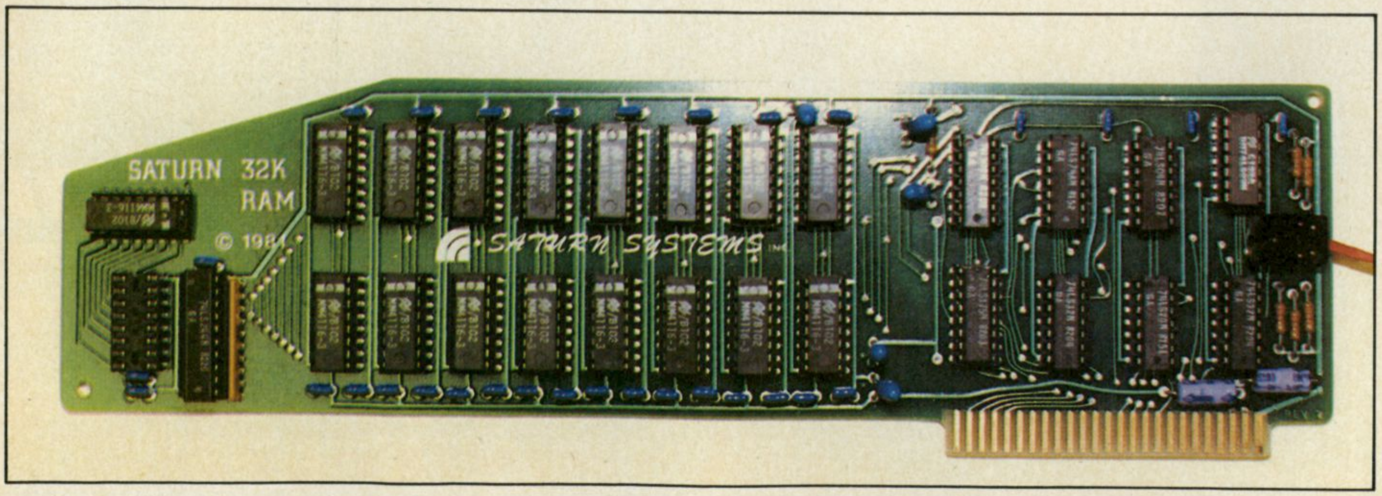
As usual, the answer to effective use of new hardware lies in the software. Most of the expansion RAM boards come with supporting software. Don't buy one that doesn't.

It certainly doesn't make sense to consider using expansion RAM unless you already have 48K of "normal" RAM. If you have less than 48K, it's cheaper to buy additional RAM and plug it into the Apple. For that reason, this article assumes you have 48K of "normal" RAM. The suppliers of expansion RAM boards make the same assumption. I call the extra RAM "expansion RAM" because it expands your system beyond 48K.

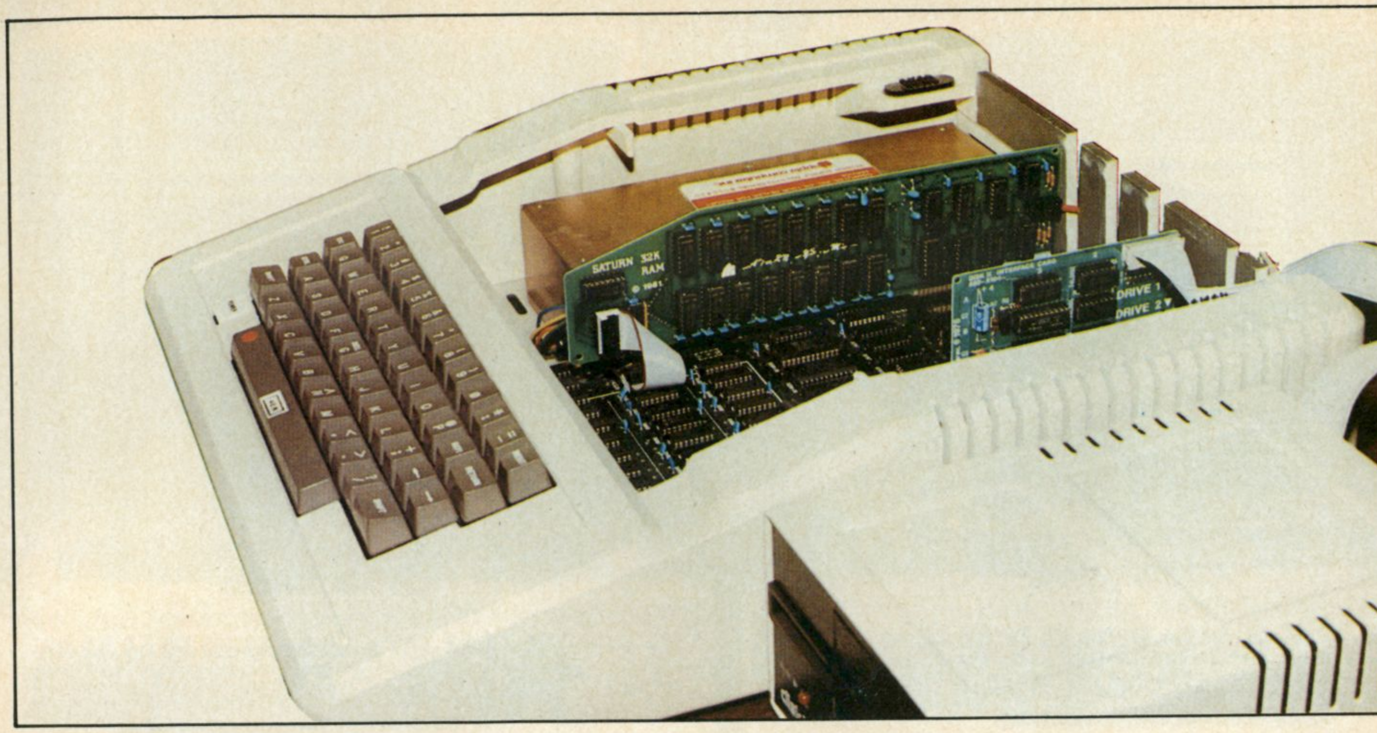
Addressing Memory

To understand how the expansion boards work, you need to know how a computer addresses memory. Whenever the computer wants to refer to a memory location, it must specify which one it wants. Each memory location has a unique name. The name for each memory location is called its *address*. Each address

Address correspondence to Donald J. Black, Micro Solutions, Inc., 411 Barber Ave., Ann Arbor, MI 48103.



Saturn Systems' 32K RAM board.



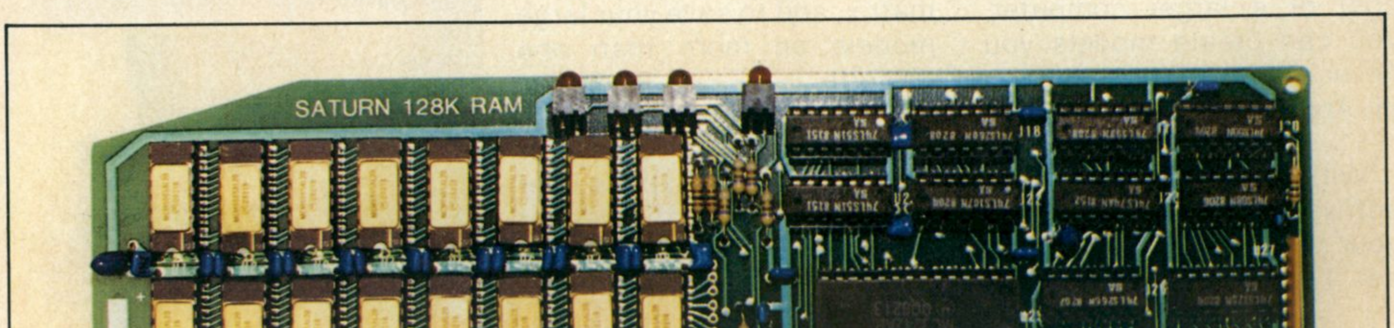
The Apple with a 32K RAM board installed.

specifies one memory location. Addresses are usually integers between zero and some upper limit. The collection of available addresses is called the *address space*.

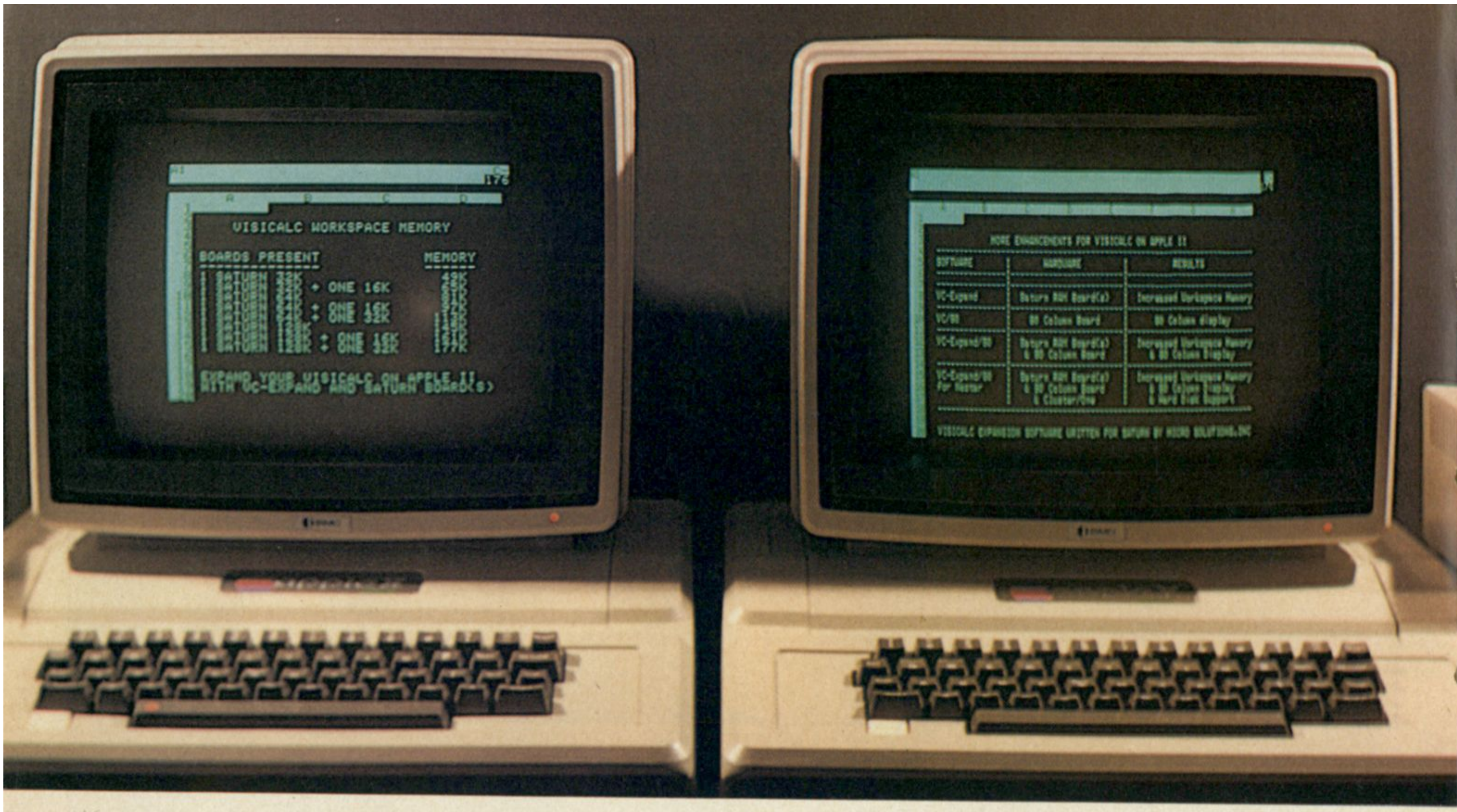
The Apple's 8-bit 6502 microprocessor can specify 65,536 different addresses. Thus, at any time it can address one of 64K different memory locations. The addresses are integers between zero and 65,535. Since programs running on an Apple can address all 64K locations, the address space for any program running on an Apple is the same 64K. (Note that not all of those addresses are necessarily meaningful. If you have less than 48K RAM, your program can look for locations for which there is no memory. If you do this, results are unpredictable.)

The normal Apple memory organization provides 48K addresses for RAM, 4K addresses for I/O and 12K addresses for ROM. Addresses from 0 through 49,151 (0 through BFFF hexadecimal) are normally RAM. 49,152 through 53,247 (C000 through CFFF) are used for I/O. 53,248 through 65,535 (D000 through FFFF) are normally ROM.

This organization provides a use for all of the address space. This is, of course, reasonable. It means, however, that any additional memory must share the same address space. In other words, to access memory on the expansion board, you must turn off some other memory. The I/O portion of the address space is not a viable candidate. For one thing, I/O references are used to turn the expansion memory on and off. Furthermore, programs in the expansion memory might want to do I/O. This leaves the RAM and ROM portions of the address space for potential sharing. The Apple bus structure provides for disabling the normal ROMs. Thus, the ROM portion of the address space is the common choice for



128K RAM board. The 64K board is identical; it is a half-populated 128K board.



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Do you need more memory for your VisiCalc models? Would you like to see them in 80 column display? Do you want hard disk support?

Then you need one of Saturn's VisiCalc expansion systems. For a fraction of the cost of a larger computer, you can create models you never dreamed possible on an Apple II.

With Saturn board(s) and software, you can increase your workspace to as much as 177K. With additional hardware, you can get 80 column display and lower case letters. You can even use the Nestar hard disk system, if you wish.

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Circle 117 on Reader Service card.

A 32K card with your alternate Basic and DOS would justify the price without other applications. But this is only the beginning.

sharing with expansion memory. When the expansion memory is enabled, the ROM area is disabled (although there is a middle ground, which I will discuss later).

Sharing the ROM area probably makes the most sense from the programmer's point of view. That makes the maximum amount of RAM available when the expansion memory is enabled. It also means the expansion memory can simulate such firmware cards as Applesoft or Integer Basic.

Since the expansion RAM cards are larger (have more memory) than the ROM area available for sharing, not all of the expansion memory can be enabled at one time. Most expansion RAM cards use 16K- by 1-bit RAM chips for the actual memory. Multiples of eight chips (for 8-bit bytes) provide multiples of 16K-byte blocks of memory. (Some cards are coming on the market using 64K- by 1-bit memory chips. These will provide multiples of 64K-byte blocks of memory.) The ROM area is only 12K bytes, however. Only 12K of expansion RAM can be enabled at any time.

To accommodate this, the expansion memory cards have the following organization. The memory is divided into 16K blocks. Each 16K block is further divided into an 8K bank and two 4K banks.

As mentioned above, the expansion memory is selected by making memory references to the appropriate addresses in the I/O portion of the address space. The exact addresses depend on the slot containing the card. Naturally, the memory reference instruction to disable a bank cannot be in the bank itself. If it were, the bank would be disabled for the instruction following the memory reference. The next instruction would come from ROM or some other bank. There is a very small chance that this arrangement would be useful. In any case, it would be poor programming practice. Clearly you can't enable a bank with instructions in that bank. If the bank is not enabled, you can't access the bank to execute the instructions.

Only one bank should be enabled at any time. To switch from one bank to another, you should disable the first bank before you enable the second. This means you shouldn't enable one bank with instructions in another bank. (Note, though, that if your program is in the 8K bank, it can switch 4K banks as desired.)

This means that using the expansion memory requires some support code in the lower RAM area. You at least need instructions to enable or disable the desired banks. Basic programs require machine-language subroutines to switch between Basic (in ROM or expansion memory) and expansion memory. Basic programs probably need other machine-language subroutines to use the expansion memory, too.

A number of uses for expansion memory spring to mind. First, of course, it can simulate the firmware cards or language card. You can have both Integer Basic and Applesoft in the ROM area of the address space. Switching from ROM Basic to the alternate Basic becomes much faster. Also, you don't lose the RAM space for the alternate Basic. This would be useful if you use both Basics.

To enable expansion memory, you select one of the 16K blocks. The 8K bank and one of the 4K banks are enabled. You may select either 4K bank. You may not enable both 4K banks at the same time. With a 32K card, there are four possible combinations of banks which can be enabled. There are two 8K banks, and each 8K bank has two corresponding 4K banks.

What It Means to You

The 16K blocks are independent of each other. Within a 16K block, either 4K bank can be enabled with the 8K bank. Usually, though, you will consider that you have a 12K bank and a 4K bank.

For each selection of banks, there are four possible settings. Both RAM read and RAM write may be on or off. The four settings are:

1. RAM read on, RAM write on
2. RAM read on, RAM write off
3. RAM read off, RAM write on
4. RAM read off, RAM write off

Case 1 is a normal setting for using the expansion memory as RAM. Case 2 simulates a ROM. Once the RAM is loaded (using a RAM write setting), the RAM can be write-protected.

Case 3 is interesting. The RAM read is off, but RAM write is on. In this situation, memory-read references will fetch data from some other source. This might be your normal ROM or another memory bank. Memory-write references do write into this bank. This setting provides a convenient way to copy data from ROM into expansion memory. You could also use this setting to copy data from one 16K block to another (you should select case 2 for the source block and case 3 for the destination).

Case 4 means the block is off. If all blocks on all cards are off, you've selected the normal ROM.

A 12K bank is also just the right size to contain a disk-operating system (DOS). With the right changes, and support software in low RAM, a DOS can be made to run in expansion memory. The support software consists mainly of code to enable and disable the appropriate banks as you enter and exit the DOS. Putting the DOS in expansion memory frees the 10.5K of low RAM normally used by the DOS. This provides a substantial increase in the size of the programs you can write. With no other special software your Basic program space just gained 10K bytes.

Both the alternate Basic and DOS use a 12K bank. Both leave a 4K bank unused. Also, if you don't use the alternate Basic, you wouldn't want to dedicate a 12K bank to it. You might also have a firmware or language card. Thus, with one 32K card, you have 8K, or possibly 20K, available for other applications. You might also consider more than one expansion memory card.

A 32K card with your alternate Basic and DOS would be quite an increase in capability. It probably would justify the price without other applications. But this is only the beginning of potential uses for expansion memory.

There are now 64K and 128K boards available from Saturn Systems. Imagine using VisiCalc with a 48K Apple II, and 32K and 128K RAM boards. This would give you 177K to work with.

The nice thing about these applications is that they require no programming by you to use the RAM boards. Most users are buying solutions, not just untamed computing power. If you want to go further, the application package from Saturn Systems may be for you.

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An Application Package

Saturn Systems Inc. (3940 Trade Center Drive, Ann Arbor, MI 48104) offers an application package to take advantage of the additional expansion memory. This package consists of a set of subroutines callable from either Integer Basic or Applesoft. The subroutines provide storage and retrieval of information in expansion memory. In a sense, the subroutines let you create and access temporary files. The files can be accessed much faster than disk files, however.

The primary functions provided are:

- Store a program in expansion memory
- Fetch a program from expansion memory and run it (this provides chaining)
- Store a portion of a program in expansion memory
- Fetch a portion of a program (this provides overlaying)
- Store an array in expansion memory
- Fetch an array from expansion memory
- Exchange an array between low RAM and expansion memory

There are other support functions such as deleting files. The package takes care of keeping track of available space. It allocates space for new files. It finds existing files when requested. The package will use as many banks in as many cards as you wish.

With this package you can put frequently-used programs in expansion memory. Then you can load them for execution much faster than from disk. In a menu-driven system, this can be quite useful. You can also do your own overlaying within a single large program. If you have large volumes of data, you can effectively increase the amount of data kept in memory.

Conclusion

The RAM cards provide an interesting example of our ability to exceed presumed limits. A lot of people thought an Apple couldn't have more than 48K RAM. They thought an Apple certainly couldn't have more than 64K RAM (the Apple is limited to a 64K address space, after all). But here we are with 80K, 96K and 112K (thanks in part to some foresight by the Apple designers). The 64K and 128K cards are now available. And beyond that, who knows?■

the four screws that go into the recessed bottom holes in the base of the computer.

The tape recorder is mounted in the same way except that the top of the recorder never comes off completely. Just lay the top off to the side. As a precaution, when you screw the rear of the base into the wood, cover the top of the screws with two layers of electrical tape so the wires won't touch them. If you have a disk drive instead of a cassette recorder, it can probably be mounted the same way.

Another method of mounting is to epoxy large Velcro strips on the board and its components. You should roughen up the surfaces so the epoxy will hold a little better. This mounting technique is not as secure, but it does make it easier to remove the units. I mounted the joysticks this way.

In order to mount the power transformer, screw a closed eyehook into the board, on each side of the transformer. Then attach two cable ties or string into the eyehooks over the transformer.

I spliced the transformer and recorder line cords together to a ten-foot line cord, then enclosed the splices in a plastic box filled with silicon sealant to make it kid-proof. You could also use an extension cord with two or more sockets. Place the socket side into a plastic box, plug the other cords into it and cover the box.

When you're finished you can wrap the video and power cords around the computer for storage. You may also want to place a handle on one or more sides of the board for easy carrying. Mounting rubber feed on the bottom of the board will protect whatever it rests on. ■

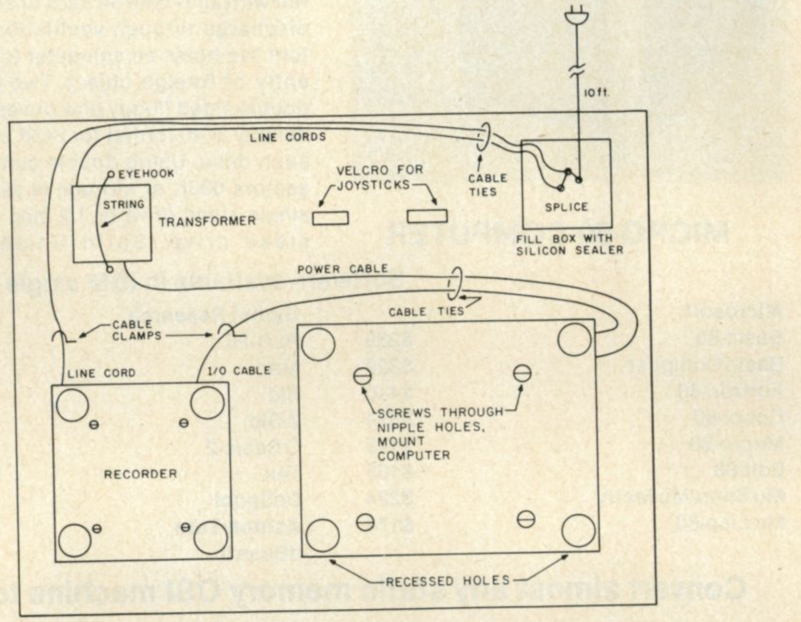

Fig. 1. The diagram shows placement of components on the board, and where to drill access holes.

A Number Pad For Apple II Users

For people who have lots of data to enter—and only two hands to do so—this simple number pad for the Apple is a real time-saver.

By James J. King

Entering lots of numerical data from the Apple II's keyboard can be tedious and frustrating because the numerals are on the top row, and you must press the return key at the end of the number entry. Using one hand at the keyboard is troublesome because so much hand movement is required—and reset lurks nearby. If you use both hands for entering numbers, you might have trouble keeping visual contact with the data you are reading from.

A solution in Applesoft is to change the meanings of the keys, so that in effect a number pad is created from the existing keyboard. Because I prefer to use my right hand for keeping track of the data I want to enter, I converted the left portion of the keyboard. Table 1 represents the keys I use for the number pad and their meanings.

The number pad is written as a subroutine. Disk owners might want to have the number pad captured in a text file to be executed as needed. Listing 1 has the number pad at lines 100–109. Lines 500 and on are for a program to enter data and to calculate the mean and standard deviation of that data.

Line 100 reads the ASCII values from line 101 into the array JY(J). Line 102 GETs N$. The PRINT after the GET is necessary to provide a return not supplied by GET. Line 103 checks to see if N$ has an ASCII value the same as one held in JY(J), and if it does, EN$ is concatenated by STR$(J), which is a number from 0 to 9. Line 104 supplies the decimal point, and 105 the negative sign. Line 106 checks to see if the escape key was pressed; if so, an error was made, so empty EN$. Line 107 checks to see if the space bar was pressed; if so, the number is complete, so return to main program. Line 108 checks to see if C was pressed, which would indicate that all the numbers had been entered; if so, go to 610 to compute the results. Line 109 simply catches any other character that might have been typed. Line 570 calls the subroutine.

Until you get used to the new meanings you might consider placing masking tape on the selected keys. Of course if you frequently use special constants or operations, you could define other keys for their use.■

Address correspondence to Dr. James J. King, Assoc. Prof. of Counselor Education, The University of Wisconsin, Platteville, WI 53818.

Listing 1. Apple II keyboard conversion.

```
5  REM APPLESOFT EXAMPLE OF A NUMBER PAD AS A SUBROUTINE
(LINES 102-109)
10  TEXT : GOTO 500: REM SKIP OVER NUMBER PAD ROUTINE
99  REM *** NUMBER PAD ROUTINE ***
100  FOR J = 0 TO 9: READ JY(J): NEXT :RETURN :REM
INITIALIZE KEY SUBSTITUTION
101  DATA 83,49,50,51,52,81,87,69,82,65 : REM ASCII FOR
KEYS S 1 2 3 4 Q W E R A
102  VTAB 10: CALL -868:PRINT EN$;: GET N$: PRINT : REM
DISPLAY NUMBER SO FAR... "PRINT" IS TO SUPPLY "RETURN"
FOR THE "GET"
103  FOR J = 0 TO 9: IF ASC(N$) = JY(J) THEN EN$ = EN$ +
STR$(J): GOTO 102:REM IS N$ ONE OF THE CODED DIGITS?
104  NEXT :IF N$ = "D" THEN EN$ = EN$ + ".": GOTO 102:
REM "D" = "."
105  IF N$ = "F" THEN EN$ = EN$ + "-": GOTO 102: REM "F"
= "-" (NEGATIVE SIGN)
106  IF N$ = CHR$(27) THEN EN$ = "": GOTO 102: REM
CHR$(27) = "ESC" = ERROR SO EMPTY EN$
107  IF N$ = " " THEN RETURN: REM SPACE BAR = THIS
NUMBER IS COMPLETE SO BACK TO MAIN PROGRAM
108  IF N$ = "C" THEN 610: REM "C" = ALL THE NUMBERS
HAVE BEEN ENTERED
109  GOTO 102: REM A CHARACTER WAS TYPED THAT IS NOT
```

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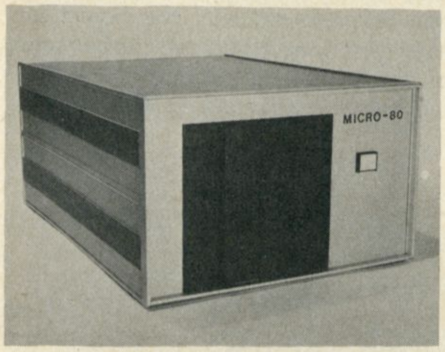

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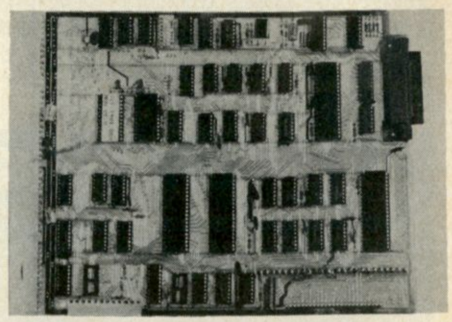

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Listing continued.

```
USED FOR THE NUMBER PAD
500  HOME: DIM EN(150): GOSUB 100
510  PRINT "ENTER UP TO 150 NUMBERS...CALCULATE     MEAN
AND STANDARD DEVIATION"
520  VTAB 3: HATB 10: PRINT "1=1 4=4 E=7 ESC=ERROR"
530  HTAB 10: PRINT "2=2 Q=5 R=8 SB=# DONE"
540  HTAB 10: PRINT "3=3 W=6 A=9 C=ALL DONE"
550  HTAB 10: PRINT "S=0 F='-'   D='.'"
555  FOR N = 1 TO 150
560  VTAB 8: CALL -868: PRINT "READY FOR # ";N
570  GOSUB 102
580  EN(N) = VAL(EN$): EN$ = ""
590  SX = SX + EN(N): X2 = X2 + EN(N) * EN(N)
600  NEXT N
610  N = N - 1:M = SX / N:D = SQR(1 / (N - 1) * (X2 / N
- M*M ))
620  VTAB 15: PRINT "N=";N;" SUM X=";SX;" SUM X*X=";X2
630  PRINT "MEAN=";M
640  PRINT "SDEV=";D
650  END
```

Key Meaning	Key Meaning	Key Meaning	Key Meaning
1=1	Q=5	A=9	C=All numbers entered
2=2	W=6	S=0	ESC=Error
3=3	E=7	D=. (decimal point)	s-bar=Indicates end of number
4=4	R=8	F=– (negative sign)	

Table 1. Number pad equivalents the author uses.

The Portable Atari

Move over, Osborne. This author has hit upon an idea that makes the Atari a little easier to carry around.

By Marvin Shuldman

I bought an Atari 400 for its superb graphics, inexpensive software, and educational value; my oldest child is only four, but computers are like ice cream to kids. When I had hooked everything up on the family room floor—computer, joysticks, tape recorder and 26-inch color TV—the picture was so beautiful I could read letters from eight feet away.

The problem was where to put our new acquisition. We had no space for a table in the room so every time I wanted to use the Atari, it would take me half an hour to drag everything out of the closet. There were two line cords, joystick cords, the recorder cable and the transformer output plug. Putting everything on the floor in front of the TV made the room look like an engineer's nightmare, and I'd begun to dread using the Atari.

My solution was to mount everything on one board, so all I'd have to do is plug in the TV video cable, and plug one line cord into the wall.

As you can see from Photo 1, everything is neatly placed. I mounted all cables to the board with plastic cable clamps.

Layout is not critical, but you must consider electrical safety. I used a 24 × 18 × 1/2 inch formica-covered wooden board. A plywood board would work just as well.

Photo 1. I've mounted computer, recorder, power supply and cables firmly to the board. The joysticks attach with Velcro.

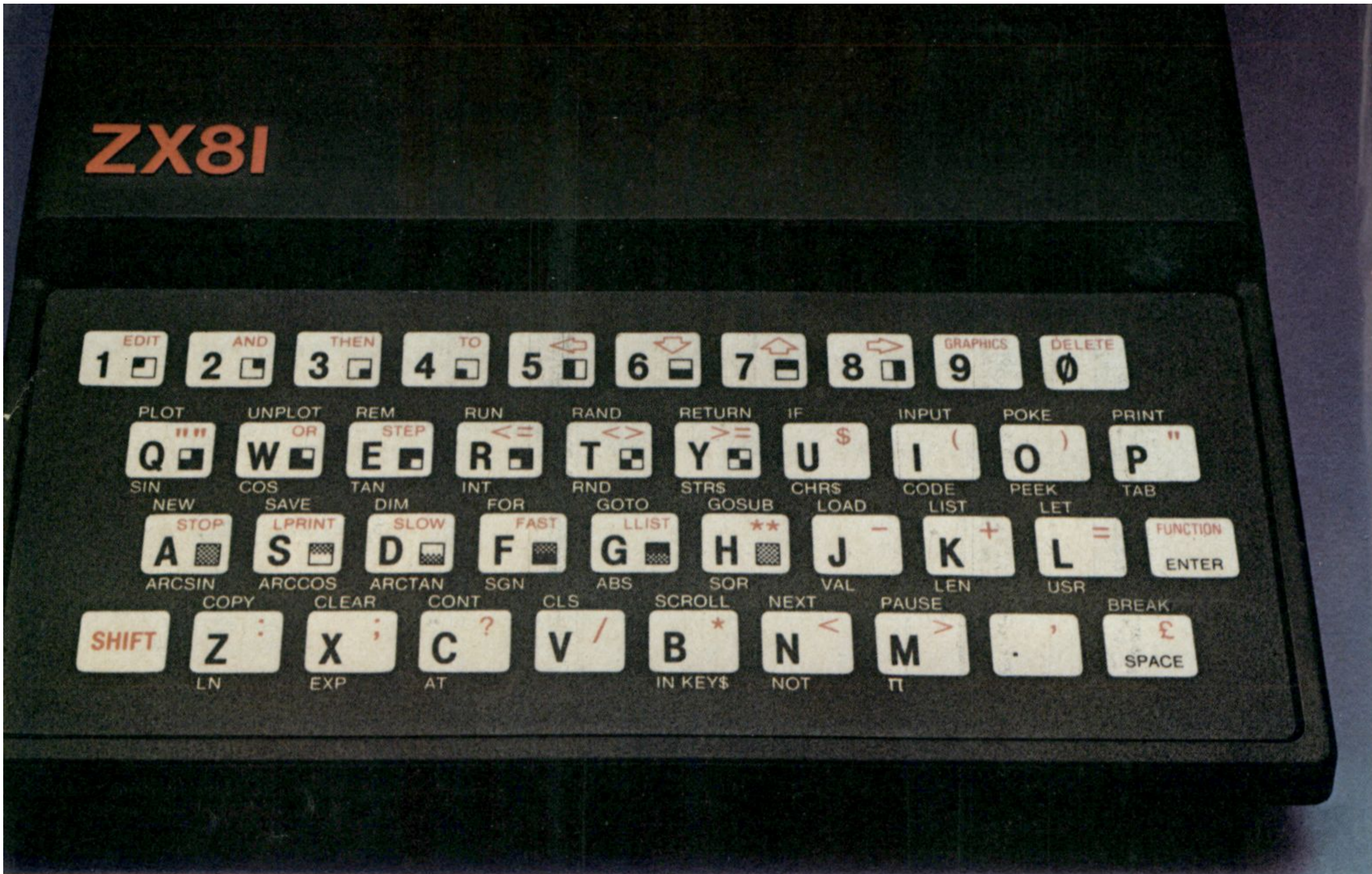
First remove the four rubber nipples on the bottom of the computer by just pulling them out. They can be pushed back in if you don't need the board anymore, so save them. Unscrew the four recessed screws from the bottom of the computer. The top of the computer will then lift up. Unplug the keyboard gently from the bottom cable and the top will be completely free.

Temporarily place the bottom part of the computer where you would like it on the board. Using a pencil, put a mark in each one of the nipple holes. (See Fig. 1.) Also place an approximate mark near each of the recessed mounting holes.

Remove the computer, and drill four holes where the nipple marks are for mounting the base to the board. Drill a hole about 1/2 inch in diameter at each mark you made near the recessed base holes, so you can stick a screwdriver through the bottom of the board to gain access to the recessed screws whenever you want to remove the top of the computer.

Mount the computer base with a flathead machine screw through each of the four nipple holes. Carefully plug in the keyboard top and replace

Address correspondence to Marvin Shuldman, 28 Tyndall Road, Kendall Park, NJ 08824.



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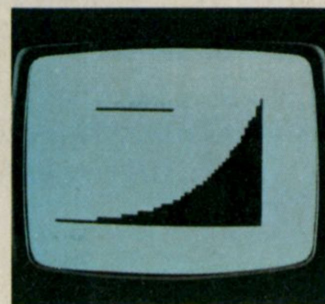

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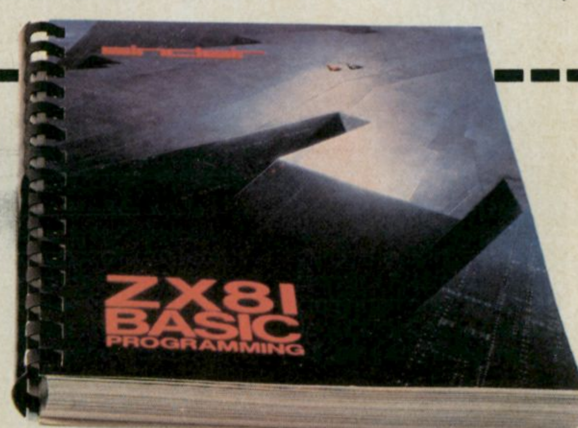

Black Friday

This stock market simulation for the Commodore and Atari systems lets you hone your buying and selling skills in preparation for the real thing.

By Robert W. Baker

This game program provides a realistic simulation of the stock market. It allows one to four players to play a game lasting ten years (or rounds).

The original program (see Jan. 1977 *Byte*, p.56) was written for a DEC-10 time-sharing system and was not easily converted for home computer systems. Since then I've rewritten the program for both the Commodore PET/CBM and the Atari 400/800 systems. Both programs are included (see Listings 1 and 2). The PET version requires a 16K-byte memory and will run on either 40- or 80-column machines. The Atari version requires 24K minimum.

The object of the game is to shrewdly invest $5000 in the game's ten securities, buying and selling each year in an attempt to become the wealthiest player. Each year all players receive dividends on every paying stock worth $50 or more. Then each player gets a chance to sell any stocks he owns or buy any stocks he wants.

The player must have enough money to purchase the stocks indicated and must actually own the stocks being sold. If not, an error message is displayed and the player must re-enter the transaction. As each transaction is completed, the table is updated to show the player's new holdings and cash on hand. When all players have completed their transactions, the next year's values are computed and the game continues. At the end of ten years, each player's net worth is calculated and the wealthiest player wins!

If the value of any stock falls to zero, that stock goes bankrupt and all shares are surrendered. The value is then re-established at $100. If the value reaches $150, stocks will split and any players owning shares will receive the extra shares. When splitting, the value of the stock is halved (rounded up to the next highest dollar).

The tables printed each year give the year number, the type of market (bull or bear), the change in value of each stock(+/-), the current price, and the number of shares each player owns of all stocks. Any dividends received for the year will be shown along with each player's total cash on hand.

The available securities and their respective dividends per share are shown in Table 1.

Simple Program Description

Matrix M is used to record each player's holdings, cash on hand, and dividends or interest for each year. The market changes for each year are determined by first selecting at random one of the 36 market vectors in Matrix A. Each of these vectors can be selected only once during the game; element 10 is set to 1 when a vector is used.

The data vectors in this matrix alternately represent bull and bear markets. For a bull market, a vector is selected from matrix U; for a bear market, a vector is selected from matrix E.

This price change vector, again selected at random, is added to the market vector and stored in vector T to record the price change for that year. The price changes are also added to vector F, which keeps track of the current price of each stock. Vector I contains the dividends-per-share values, and Vector S$ contains the valid stock abbreviations.

Listings 1 and 2 are for Commodore and Atari versions of the program. As you can see, a fair amount of typing is involved, with a number of data statements. I'm willing to provide copies on tape or disk for either system if you'll include $5 to cover costs. Anyone overseas, please include additional postage. For Commodore systems I can provide 4040 or 8050 format disks; for Atari systems I can only provide DOS 1.0 format disks for the 810 drive. Tapes can be supplied for either system but I'd prefer to send disks whenever possible. Be sure to let me know exactly what you want. ■

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

Abbrev.	Security name	Div./Share
HIB	Highway Improvement Bonds	$5
XP	X-Pando Corporation	$1
SP	Seaside Properties Inc.	none
ODM	Old Dog Mutual Funds	$4
RD	Rubble Development	$7
SO	Slippery Oil Company	none
BT	Bumpy Transportation	none
KA	Krash Auto Company	$2
ZE	Zap Electronics	$6
BPL	Blinkey Power & Light	$6

Table 1. Stock market securities and dividends.

HIB—Highway Improvement Bonds (yield 5%). An excellent state bond with good security and income potential, but no appreciation.

XP—X-Pando Corporation (yield 1%). A rapidly expanding industrial firm that reinvests most earnings on research, causing low yield. The price-to-earnings ratio is extremely high.

SP—Seaside Properties Inc. (no yield). Good appreciation prospects but no dividends. In the immediate future, however, the proposed beach cleanup program could have great effect on earnings.

ODM—Old Dog Mutual Fund (yield 4%). A common stock mutual fund that represents a good, steady income, with only fair appreciation.

RD—Rubble Development (yield 7%). A high income real estate investment with steadily depreciating capital assets.

SO—Slippery Oil Company (no yield). Very speculative investment since profits go toward new oil wells. No dividends are expected.

BT—Bumpy Transport Company (no yield). High appreciation investment with a good outlook depending on the administrative ability of its new board of directors. No dividends are expected since all profits are recycled into the company.

KA—Krash Auto Company (yield 2%). A medium size auto company representing a somewhat high price-to-earnings ratio with a low yield.

ZE—Zap Electronics Inc. (yield 6%). A highly speculative, high income stock with a fair to poor long term prospect.

BPL—Blinkey Power and Light (yield 3%). A steadily growing utility company in an established industrial area.

Table 2. Securities prospectus.

Listing 1. Black Friday stock market simulation for the Atari 400/800 computers.

```
100 REM ***** ATARI BLACK FRIDAY ****
110 REM
120 REM .......ROBERT W. BAKER.......
130 REM
140 REM 15 WINDSOR DR, ATCO, NJ 08004
150 REM
160 REM ****************************
170 REM
180 DIM R$(20),S$(32),C$(20)
185 C$=CHR$(125):FOR X=2 TO 20:C$(X,X)=CHR$(29):NEXT X
190 PRINT C$(1,5);"%%% BLACK FRIDAY STOCK MARKET GAME %%%"
200 DIM A(36,10),U(11,9),E(11,9),M(4,12),I(10),T(10),F(10)
220 S$="*HIBXP SP ODMRD SO BT KA ZE BPL*"
230 PRINT :PRINT "       *** INITIALIZING DATA! ***"
240 FOR X=1 TO 10:READ N:NEXT X
250 FOR N=1 TO 36:FOR J=1 TO 9:READ X
260 A(N,J)=X:NEXT J:NEXT N
290 FOR R=1 TO 2:FOR N=1 TO 11:FOR J=1 TO 9:READ X
300 IF R=1 THEN U(N,J)=X
310 IF R=2 THEN E(N,J)=X
320 NEXT J:NEXT N:NEXT R
325 REM === STOCK YIELDS (DIVIDENDS)
330 DATA 5,1,0,4,7,0,0,2,6,3
340 RESTORE :FOR N=1 TO 10:READ X:I(N)=X:F(N)=0:T(N)=100:NEXT N
350 FOR N=1 TO 4:FOR J=2 TO 12:M(N,J)=0:NEXT J:M(N,1)=5000:NEXT N
360 FOR N=1 TO 36:A(N,10)=0:NEXT N:Y=0
370 PRINT C$(2,5);"NUMBER OF PLAYERS (1 TO 4) ";
380 INPUT R$:P=VAL(R$):IF P>4 OR P<1 THEN 370
382 REM ==============
384 REM COMPUTE PRICES
386 REM ==============
390 PRINT C$(1,2);"*** COMPUTING NEXT YEAR ***":PRINT :PRINT
395 W1=0:D=INT(11*RND(0)+1)
400 C=INT(36*RND(0)+1)
410 IF A(C,10)=1 THEN 400
450 FOR N=2 TO 10:IF INT(C/2)<>INT((C-1)/2) THEN 470
460 R$="BULL":F(N)=A(C,N-1)+U(D,N-1):GOTO 480
470 R$="BEAR":F(N)=A(C,N-1)+E(D,N-1)
472 REM =================
475 REM CHECK STOCK SPLITS
476 REM =================
480 T(N)=T(N)+F(N):IF T(N)<150 THEN 530
```

More

Listing 1 continued.

```
490 Z=3*(N-1)+2:PRINT "*** ";S$(Z,Z+2);" STOCKS SPLIT ***"
500 J=INT(T(N)/2):IF T(N)/2 THEN T(N)=J:GOTO 520
510 T(N)=J+1
520 FOR J=1 TO P:M(J,N+1)=M(J,N+1)*2:NEXT J
522 REM =================
525 REM CHECK BANKRUPTCIES
527 REM =================
530 IF T(N)>0 THEN 570
540 T(N)=100:FOR J=1 TO P:M(J,N+1)=0:NEXT J
550 Z=3*(N-1)+2:PRINT "*** ";S$(Z,Z+2);" WENT BANKRUPT ***"
560 PRINT "THESE STOCKS ARE BEING SURRENDERED"
570 NEXT N
572 REM ==============
575 REM UPDATE DISPLAY
577 REM ==============
580 FOR N=1 TO P:M(N,12)=0
590 FOR J=1 TO 10:IF T(J)>=50 THEN M(N,12)=M(N,12)+(I(J)*M(N,J+1))
600 NEXT J:M(N,1)=M(N,1)+M(N,12):NEXT N:Y=Y+1
620 PRINT C$(1,1);"%%%  YEAR  ";Y;"  %%%%  ";R$(1,4);" MARKET  %%%"
630 IF Y<>11 THEN 640
635 PRINT CHR$(28);:FOR X=1 TO 5:PRINT CHR$(31);:NEXT X:PRINT " CLOSING  "
640 PRINT :PRINT "      +/-    NEW   --PLAYER HOLDINGS---"
650 PRINT "STK  CHNG COST .1..  .2..  .3..  .4..":PRINT
660 FOR X=1 TO 10:GOSUB 950:NEXT X:PRINT :PRINT "DIV'S THIS YR ";
665 R$="     "
670 FOR J=1 TO P:Z=5-LEN(STR$(M(J,12))):PRINT " ";M(J,12);
673 IF Z>=1 THEN PRINT R$(1,Z);
675 IF J=4 THEN PRINT CHR$(28);
676 NEXT J:PRINT :GOSUB 980
680 IF Y=11 THEN 1020
682 REM ===================
685 REM PLAYER TRANSACTIONS
687 REM ===================
690 FOR N=1 TO P
700 GOSUB 880
710 PRINT "PLAYER# ";N;" (B=BUY,S=SELL,D=DONE) ";
715 INPUT R$:IF R$(1,1)="D" THEN 870
720 IF R$(1,1)="S" THEN 780
730 IF R$(1,1)<>"B" THEN 700
735 REM --- BUY SHARES ---
740 GOSUB 900:PRINT "NUMBER OF SHARES BUYING ";
750 INPUT R$:R=VAL(R$):IF R<1 THEN PRINT "BAD INPUT!":GOTO 820
760 IF R*T(X)>M(N,1) THEN PRINT "NOT ENOUGH MONEY!":GOTO 820
770 M(N,X+1)=M(N,X+1)+R:M(N,1)=M(N,1)-(R*T(X)):GOTO 850
775 REM --- SELL SHARES ---
780 GOSUB 900:PRINT "NUMBER OF SHARES SELLING ";
790 INPUT R$:R=VAL(R$):IF R<1 THEN PRINT "BAD INPUT!":GOTO 820
800 IF R<=M(N,X+1) THEN M(N,X+1)=M(N,X+1)-R:M(N,1)=M(N,1)+(R*T(X)):GOTO 850
810 PRINT "NOT ENOUGH SHARES!"
820 FOR X=1 TO 100:NEXT X
840 GOTO 700
845 REM --- UPDATE DISPLAY ---
850 POKE 84,0:PRINT C$(2,5);:FOR J=1 TO X:PRINT CHR$(29);:NEXT J:GOSUB 950
860 FOR J=1 TO (12-X):PRINT CHR$(29);:NEXT J:GOSUB 980:GOTO 700
870 NEXT N:GOTO 390
872 REM ======================
875 REM *-*-* SUBROUTINES *-*-*
877 REM ======================
880 GOSUB 890:FOR J=1 TO 4:GOSUB 1000:NEXT J
890 POKE 84,0:PRINT C$(2,20);:RETURN
900 PRINT "STOCK ABREV ";:INPUT R$:IF LEN(R$)=3 THEN 910
903 IF LEN(R$)<>2 THEN 940
906 R$(3,3)=" "
910 W1=0:FOR J=0 TO 9:X=J+1
920 IF R$(1,3)=S$((J*3)+2,(J*3)+4) THEN W1=1:J=9
930 NEXT J:IF W1=1 THEN RETURN
940 GOSUB 890:PRINT CHR$(29);:GOSUB 1010:GOTO 900
950 GOSUB 1010:Z=3*(X-1)+2:PRINT S$(Z,Z+2);"  ";F(X);
960 Z=5-LEN(STR$(F(X)))
965 R$="     ":PRINT R$(1,Z);T(X);
967 Z=4-LEN(STR$(T(X))):PRINT R$(1,Z);
970 FOR J=1 TO P:Z=5-LEN(STR$(M(J,X+1))):PRINT " ";M(J,X+1);
973 IF Z>=1 THEN PRINT R$(1,Z);
975 IF J=4 THEN PRINT CHR$(28);
976 NEXT J:PRINT :RETURN
980 GOSUB 1010:PRINT "CASH TOTAL =  ";
985 R$="     "
990 FOR J=1 TO P:Z=5-LEN(STR$(M(J,1))):PRINT " ";M(J,1);
993 IF Z>=1 THEN PRINT R$(1,Z);
995 IF J=4 THEN PRINT CHR$(28);
996 NEXT J:PRINT :RETURN
999 REM NEXT LINE HAS 39 SPACES...
1000 PRINT "                                       ";CHR$(28):RETURN
1010 GOSUB 1000:PRINT CHR$(28);:RETURN
1020 FOR N=1 TO P:FOR J=1 TO 10:M(N,1)=M(N,1)+(T(J)*M(N,J+1)):NEXT J:NEXT N
1030 PRINT :PRINT "NET WORTH =    ";:GOSUB 990
1040 PRINT :PRINT :PRINT "PLAY AGAIN (Y OR N) ";
1050 INPUT R$:IF R$(1,1)="N" THEN PRINT CHR$(125);:END
1060 IF R$(1,1)="Y" THEN PRINT CHR$(125);:GOTO 340
1070 PRINT CHR$(28);:GOSUB 1010:GOTO 1040
0
1072 REM ======================
1075 REM *-*-*  GAME DATA *-*-*
1077 REM ======================
1080 DATA 0,0,0,0,0,0,0,0,0,5
1090 DATA 0,0,0,0,0,-25,0,0,0
1100 DATA 0,0,0,0,0,0,15,0,0
1110 DATA 0,0,0,-5,0,0,0,0,0
1120 DATA 0,0,0,0,0,0,0,0,0,5
1130 DATA 0,0,0,0,0,5,0,0,0
1140 DATA 0,0,0,0,0,10,0,0,0
1150 DATA 0,10,0,0,0,0,0,0,0
1160 DATA 0,0,0,0,0,15,0,0,0
```

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Listing 1 continued.

```
1170 DATA 0,-5,0,0,0,0,0,0,0
1180 DATA 8,5,5,0,0,0,7,0,0
1190 DATA 0,0,0,0,0,0,0,-25,0
1200 DATA 0,0,0,0,0,0,0,10,0
1210 DATA 0,-10,0,0,0,0,0,0,0
1220 DATA 0,5,0,0,0,0,0,0,0
1230 DATA 10,0,0,0,0,0,0,0,0
1240 DATA 0,0,0,0,17,0,0,0,0
1250 DATA 0,0,0,0,-15,0,0,0,0
1260 DATA 0,0,0,0,0,0,0,10,0
1270 DATA 0,0,0,0,0,0,-15,0,0
1280 DATA 0,0,0,0,0,0,10,0,0
1290 DATA 0,0,0,0,0,0,-15,0,0
1300 DATA 0,0,-8,0,8,0,0,5,0
1310 DATA -10,0,0,0,0,0,0,0,0
1320 DATA 8,0,0,0,0,0,0,0,0
1330 DATA 0,0,0,0,0,0,-5,0,0
1340 DATA 0,0,3,0,0,0,0,0,4
1350 DATA -8,0,0,0,0,0,0,0,0
1360 DATA 0,0,0,5,0,0,0,0,0
1370 DATA 0,0,0,0,-10,0,0,0,0
1380 DATA 0,0,0,0,0,0,10,0,0
1390 DATA -8,-5,0,0,0,0,-7,0,0
1400 DATA 10,0,0,0,0,0,0,0,0
1410 DATA 0,0,0,0,0,0,0,0,-14
1420 DATA -10,0,0,0,0,0,0,0,0
1430 DATA 0,0,0,0,0,-5,0,0,0
1440 DATA -2,-10,-7,-9,-2,-9,-7,-16,-4
1450 DATA 26,16,25,8,-14,21,14,-4,17
1460 DATA 18,23,11,12,46,18,-5,34,15
1470 DATA 23,28,-2,11,56,19,30,29,14
1480 DATA 20,15,15,7,-20,15,13,-10,12
1490 DATA 17,21,13,-2,37,23,23,19,14
1500 DATA 19,24,17,9,-5,26,13,-7,15
1510 DATA 11,18,14,11,67,15,22,18,13
1520 DATA 13,31,1,14,-11,18,18,-14,10
1530 DATA 14,-8,19,-1,-9,25,-10,13,19
1540 DATA 24,24,23,20,51,27,38,33,18
1550 DATA 12,14,13,10,10,20,21,25,8
1560 DATA 7,-6,10,-10,30,6,-19,22,-2
1570 DATA 9,10,7,-5,-20,12,21,18,7
1580 DATA 7,8,5,-6,-40,3,16,-14,4
1590 DATA 8,6,4,-4,40,8,4,-12,3
1600 DATA 6,4,3,3,-15,5,8,-8,5
1610 DATA 5,7,-1,-3,45,6,-10,10,4
1620 DATA -2,6,-3,-8,-20,7,10,14,6
1630 DATA 11,11,-5,-7,30,10,-11,-18,-4
1640 DATA -5,13,-8,6,25,4,18,-22,-4
1650 DATA -8,-10,-10,-15,-20,-20,-23,-25,-7
```

Listing 2. Black Friday for PET.

```
100 REM ***** PET BLACK FRIDAY *******
110 REM
120 REM         ROBERT W. BAKER
130 REM
140 REM  15 WINDSOR DR, ATCO,NJ 08004
150 REM
160 REM ******************************
170 :
180 POKE59468,12
190 PRINT"▒▒▒▒▒▚▚▚  BLACK FRIDAY STOCK MARKET GAME  ▚▚▚"
195 REM      ↑ CLR/HOME & 4 CURSOR DOWNS
200 DIM A(36,10),U(11,9),E(11,9),M(4,12)
210 FOR N=1 TO VAL(RIGHT$(TI$,2)):X=RND(1):NEXT N
220 S$="*HIBXP SP ODMRD SO BT KA ZE BPL*"
230 PRINT:PRINT"*** INITIALIZING DATA!"
240 FOR X=1 TO 10:READ N:NEXT
250 FOR N=1 TO 36:FOR J=1 TO 9:READ X
260 A(N,J)=X:NEXT J,N
290 FOR R=1 TO 2:FOR N=1 TO 11:FOR J=1 TO 9:READ X
300 IF R=1 THEN U(N,J)=X
310 IF R=2 THEN E(N,J)=X
320 NEXT J,N,R
330 DATA 5,1,0,4,7,0,0,2,6,3
340 RESTORE:FOR N=1 TO 10:READ I(N):F(N)=0:T(N)=100:NEXT N
350 FOR N=1 TO 4:FOR J=2 TO 12:M(N,J)=0:NEXT J:M(N,1)=5000:NEXT N
360 FOR N=1 TO 36:A(N,10)=0:NEXT N:Y=0
370 PRINT"▒▒▒▒NUMBER OF PLAYERS (1 TO 4)    1▒▒▒";
375 REM      ↑ 4 CURSOR DOWN                    ↑ 3 CURSOR LEFT
380 INPUT R$:P=VAL(R$):IF P>4 OR P<1 THEN 370
382 REM ===============
385 REM COMPUTE PRICES
387 REM ===============
390 PRINT"▒▒*** COMPUTING NEXT YEAR ***▒▒":W1=0:D=INT(11*RND(1)+1)
395 REM   ↑ CLR/HOME & CURSOR DOWN        ↑ 2 CURSOR DOWN
400 C=INT(36*RND(1)+1)
410 IF A(C,10)=1 THEN 400
450 FOR N=2 TO 10:IF INT(C/2)<>INT((C-1)/2) THEN 470
460 R$="BULL":F(N)=A(C,N-1)+U(D,N-1):GOTO 480
470 R$="BEAR":F(N)=A(C,N-1)+E(D,N-1)
474 REM ===================
475 REM CHECK STOCK SPLITS
477 REM ===================
480 T(N)=T(N)+F(N):IF T(N)<150 GOTO 530
```

More →

Listing 2 continued.

```
490 PRINT"*** ";MID$(S$,3*(N-1)+2,3);" STOCKS SPLIT ***"
500 J=INT(T(N)/2):IF T(N)/2=J THEN T(N)=J:GOTO 520
510 T(N)=J+1
520 FOR J=1 TO P:M(J,N+1)=M(J,N+1)*2:NEXT J
522 REM ==================
525 REM CHECK BANKRUPTCIES
527 REM ==================
530 IF T(N)>0 THEN 570
540 T(N)=100:FOR J=1 TO P:M(J,N+1)=0:NEXT J
550 PRINT"*** ";MID$(S$,3*(N-1)+2,3);" WENT BANKRUPT ***"
560 PRINT"THESE STOCKS ARE BEING SURRENDERED"
570 NEXT N
572 REM ==============
575 REM UPDATE DISPLAY
577 REM ==============
580 FOR N=1 TO P:M(N,12)=0
590 FOR J=1 TO 10:IF T(J)>=50 THEN M(N,12)=M(N,12)+(I(J)*M(N,J+1))
600 NEXT J:W1=TI:M(N,1)=M(N,1)+M(N,12):NEXT N:Y=Y+1:IF W1<1 THEN 620
610 IF TI-W1<30 GOTO 610
620 PRINT"▒▒▒▒ YEAR ";Y;" ▒▒▒ ";R$;" MARKET ▒▒▒"
630 IF Y=11 THEN PRINT"▒▒▒▒▒▒CLOSING "
635 REM                ↑CURSOR UP & 5 CURSOR RIGHT
640 PRINT TAB(5);"▒+/-   NEW   —PLAYER HOLDINGS---"
650 PRINT"STK  CHNG PRICE .1..  .2..  .3..  .4..":PRINT
660 FOR X=1 TO 10:GOSUB 950:NEXT X:PRINT:PRINT"DIV'S THIS YR";
670 FOR J=1 TO P:PRINT TAB(15+((J-1)*6));M(J,12);:NEXT J:PRINT:PRINT:GOSUB 980
680 IF Y=11 THEN 1020
682 REM ===================
685 REM PLAYER TRANSACTIONS
687 REM ===================
690 FOR N=1 TO P
700 GOSUB 880
710 PRINT"▒PLAYER"N"▒(B=BUY,S=SELL,D=DONE)   ?▒▒▒";:INPUT R$:IF R$="D" THEN 870
715 REM   ↑RVS      ↑RVS OFF                 ↑3 CURSOR LEFT
720 IF R$="S" GOTO 780
730 IF R$<>"B" GOTO 700
735 REM === BUY SHARES ===
740 GOSUB 900:PRINT"NUMBER OF SHARES BUYING   ?▒▒▒";:REM ← 3 CURSOR LEFT
750 INPUT R$:R=VAL(R$):IF R<1 THEN PRINT"BAD INPUT!":GOTO 820
760 IF R*T(X)>M(N,1) THEN PRINT"NOT ENOUGH MONEY!":GOTO 820
770 M(N,X+1)=M(N,X+1)+R:M(N,1)=M(N,1)-(R*T(X)):GOTO 850
775 REM === SELL SHARES ===
780 GOSUB 900:PRINT"NUMBER OF SHARES SELLING   ?▒▒▒";:REM ← 3 CURSOR LEFT
790 INPUT R$:R=VAL(R$):IF R<1 THEN PRINT"BAD INPUT!":GOTO 820
800 IF R<=M(N,X+1) THEN M(N,X+1)=M(N,X+1)-R:M(N,1)=M(N,1)+(R*T(X)):GOTO 850
810 PRINT"NOT ENOUGH SHARES!"
820 W1=TI
830 IF TI-W1<60 GOTO 830
840 GOTO 700
845 REM === UPDATE DISPLAY FOR TRANSACTIONS ===
850 PRINT"▒▒▒▒▒";:FOR J=1 TO X:PRINT"▒";:NEXT J:GOSUB 950
855 REM   ↑HOME & 4 CURSOR DOWN      ↑CURSOR DOWN
860 FOR J=1 TO (13-X):PRINT"▒";:NEXT J:GOSUB 980:GOTO 700
865 REM                      ↑CURSOR DOWN
870 NEXT N:GOTO 390
872 REM ================================
875 REM *-*-*  S U B R O U T I N E S *-*-*
877 REM ================================
880 GOSUB 890:FOR J=1 TO 4:GOSUB 1000:NEXT J
890 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒":RETURN
895 REM   ↑HOME & 19 CURSOR DOWN
900 PRINT"STOCK ABREV   ?▒▒▒";:INPUT R$:R$=LEFT$(R$+"   ",3)
905 REM                ↑ 3 CURSOR LEFT
910 W1=0:FOR J=0 TO 9:X=J+1
920 IF R$=MID$(S$,J*3+2,3) THEN W1=1:J=9
930 NEXT J:IF W1=1 THEN RETURN
940 GOSUB 890:PRINT"▒";:GOSUB 1010:GOTO 900
945 REM                ↑ CURSOR DOWN
950 GOSUB 1010:PRINT MID$(S$,3*(X-1)+2,3);SPC(2);F(X);
960 PRINT SPC(4-LEN(STR$(F(X))));T(X);
970 FOR J=1 TO P:PRINT TAB(16+((J-1)*6));M(J,X+1);:NEXT J:PRINT:RETURN
980 GOSUB 1010:PRINT"CASH TOTAL =";
990 FOR J=1 TO P:PRINT TAB(15+((J-1)*6));M(J,1):PRINT"▒";:NEXT J:PRINT:RETURN
992 REM LAST LINE USES CURSOR UP
995 REM NEXT LINE HAS 39 SPACES
1000 PRINT"                                       ":RETURN
1010 GOSUB 1000:PRINT"▒";:RETURN:REM ← CURSOR UP
1020 FOR N=1 TO P:FOR J=1 TO 10:M(N,1)=M(N,1)+(T(J)*M(N,J+1)):NEXT J:NEXT N
1030 PRINT:PRINT"NET WORTH  =";:GOSUB 990
1040 PRINT:PRINT:PRINT"PLAY AGAIN (Y OR N)   N▒▒▒";:REM ←3 CURSOR LEFT
1050 INPUT R$:IF R$="N" THEN PRINT"▒":END: REM ←CLEAR/HOME
1060 IF R$="Y" THEN PRINT"▒":GOTO 340: REM ← CLR/HOME
1070 PRINT"▒";:GOSUB 1010:GOTO 1040:REM ← CURSOR UP IN PRINT
1072 REM =======================
1075 REM *-*-*  GAME DATA  *-*-*
1077 REM =======================
1080 DATA 0,0,0,0,0,0,0,0,5
1090 DATA 0,0,0,0,0,-25,0,0
1100 DATA 0,0,0,0,0,0,15,0,0
1110 DATA 0,0,0,-5,0,0,0,0,0
1120 DATA 0,0,0,0,0,0,0,0,5
1130 DATA 0,0,0,0,0,5,0,0,0
1140 DATA 0,0,0,0,0,10,0,0,0
1150 DATA 0,10,0,0,0,0,0,0,0
1160 DATA 0,0,0,0,0,15,0,0,0
1170 DATA 0,-5,0,0,0,0,0,0,0
1180 DATA 8,5,5,0,0,0,7,0,0
1190 DATA 0,0,0,0,0,0,0,-25,0
1200 DATA 0,0,0,0,0,0,0,10,0
1210 DATA 0,-10,0,0,0,0,0,0,0
1220 DATA 0,5,0,0,0,0,0,0,0
```

More →

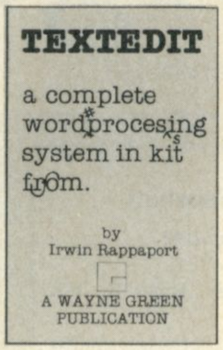
Listing 2 continued.

```
1230 DATA 10,0,0,0,0,0,0,0,0
1240 DATA 0,0,0,0,17,0,0,0,0
1250 DATA 0,0,0,0,-15,0,0,0,0
1260 DATA 0,0,0,0,0,0,0,10,0
1270 DATA 0,0,0,0,0,0,-15,0,0
1280 DATA 0,0,0,0,0,0,10,0,0
1290 DATA 0,0,0,0,0,0,-15,0,0
1300 DATA 0,0,-8,0,8,0,0,5,0
1310 DATA -10,0,0,0,0,0,0,0,0
1320 DATA 8,0,0,0,0,0,0,0,0
1330 DATA 0,0,0,0,0,0,-5,0,0
1340 DATA 0,0,3,0,0,0,0,0,4
1350 DATA -8,0,0,0,0,0,0,0,0
1360 DATA 0,0,0,5,0,0,0,0,0
1370 DATA 0,0,0,0,-10,0,0,0,0
1380 DATA 0,0,0,0,0,0,10,0,0
1390 DATA -8,-5,0,0,0,0,-7,0,0
1400 DATA 10,0,0,0,0,0,0,0,0
1410 DATA 0,0,0,0,0,0,0,0,-14
1420 DATA -10,0,0,0,0,0,0,0,0
1430 DATA 0,0,0,0,0,-5,0,0,0
1440 DATA -2,-10,-7,-9,-2,-9,-7,-16,-4
1450 DATA 26,16,25,8,-14,21,14,-4,17
1460 DATA 18,23,11,12,46,18,-5,34,15
1470 DATA 23,28,-2,11,56,19,30,29,14
1480 DATA 20,15,15,7,-20,15,13,-10,12
1490 DATA 17,21,13,-2,37,23,23,19,14
1500 DATA 19,24,17,9,-5,26,13,-7,15
1510 DATA 11,18,14,11,67,15,22,18,13
1520 DATA 13,31,1,14,-11,18,18,-14,10
1530 DATA 14,-8,19,-1,-9,25,-10,13,19
1540 DATA 24,24,23,20,51,27,38,33,18
1550 DATA 12,14,13,10,10,20,21,25,8
1560 DATA 7,-6,10,-10,30,6,-19,22,-2
1570 DATA 9,10,7,-5,-20,12,21,18,7
1580 DATA 7,8,5,-6,-40,3,16,-14,4
1590 DATA 8,6,4,-4,40,8,4,-12,3
1600 DATA 6,4,3,3,-15,5,8,-8,5
1610 DATA 5,7,-1,-3,45,6,-10,10,4
1620 DATA -2,6,-3,-8,-20,7,10,14,6
1630 DATA 11,11,-5,-7,30,10,-11,-18,-4
1640 DATA -5,13,-8,6,25,4,18,-22,-4
1650 DATA -8,-10,-10,-15,-20,-20,-23,-25,-7
READY.
```

Microcomputing welcomes conversions of this program for the Apple, Heath, IBM PC and Sinclair.

Wayne Green Books

NEW ARRIVALS



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by Irwin Rappaport

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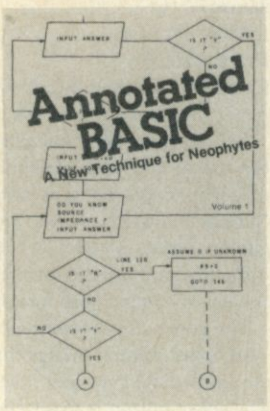

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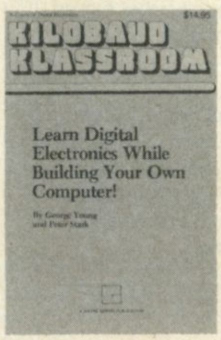

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Game Digest

Edited by Dan Muse

Pool 1.5

(Reviewed in Peelings II, *April 1982)*

System Requirements: Apple II, 48K bytes, game paddles
Manufacturer: Innovative Design Software, Inc., PO Box 1658, Las Cruces, NM 88004
Price: $34.95
Comments: "Pool 1.5 is easy to play, fascinating to watch and extremely challenging," according to the review.

Four games can be selected: eight ball, rotation, straight pool and nine ball. The player selects the aim, speed and English he wants to put on the ball before each shot.

"The accuracy of the animation is a thing of beauty: the speed, color and clarity of the individual balls are totally unimpaired regardless of the number in motion at the time," according to the review.

One of the attractions of Pool 1.5 is that you control it. The game will indicate when you are doing something wrong, such as moving the ball across the demarcation line after a scratch, but it will not prevent you from doing it if you want to.

Pool 1.5 is "highly recommended," says the review. Reader Service number 433.

Computer Foosball

(Reviewed in Softline, *May 1982)*

System Requirements: Apple II, 48K bytes and disk
Manufacturer: Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827
Price: $29.95
Comments: Foosball is back. The popular barroom and pool hall game has been computerized. The result is "amazing video simulation" and remarkably accurate animation, according to the review.

"Video foosball can be played with one, two or four players," according to the review. One slight difference between video foosball and the original game is that in the computerized version the rows of men move simultaneously; each row moved independently in the original game, the review says.

"As in the original, the pace often becomes frenetic: The ball zooms, wobbles and careens around the arena. Until the players develop some skill and timing, much of the scoring will result from the ball accidentally bouncing into the goals." Reader Service number 436.

Caverns of Mars

(Reviewed in Softline, *May 1982)*

System Requirements: Atari 400 or 800, disk only, 16K bytes
Manufacturer: Atari, Inc., Box 427, Sunnyvale, CA 94086
Price: $39.95
Comments: "Ray Bradbury's Mars was never this much fun," says the review.

In Caverns of Mars the player starts off at the top of a large subterranean shaft. The object is to pilot a spaceship through the Martian caverns' twists and turns. The game consists of six levels progressing in difficulty as the shafts become trickier and the enemy ships more formidable.

The game offers several helpful features. "An option button allows the player to cycle immediately to any level for practice. The select button is a godsend; it allows the game to be placed on hold. . . very useful for the panic-stricken moment after destroying the cavern and discovering you must do it again," the review says.

"This game is great; you'll find it difficult to tear yourself away," according to the review. Reader Service number 435.

Swashbuckler

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II, 48K, DOS 3.3 only
Manufacturer: DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311
Price: $34.95
Comments: "Swashbuckler is a real-time animated duel between you, who control the swordsman, and various and sundry scurly, wretched, and generally vicious computer opponents," says the review.

The movements of your swordsman are controlled by the keyboard. You are first confronted by one pirate, but he proves to be not much of a challenge and soon you have opponents on both sides.

"The overall playability and challenge and atmosphere of the game are pleasing. It is a good piece of work." Reader Service number 446.

Hadron

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II, 48K, DOS 3.2/3.3
Manufacturer: Sirius Software, Inc., 10364 Rockingham Drive, Sacramento, CA 95827
Price: $34.95
Comments: "Hadron will provide you with the thrill of flying a space fighter and going into battle with it," the review says.

"The object of the game is to track enemy fighters back to their star base and destroy the base," according to the review. After destroying the enemy base your fuel and ammunition are replenished and you move to the next level of difficulty.

The view you see from within your spacecraft is "spectacular," according to the review. "For you to fully appreciate the view, a good quality color TV or color monitor is a must." Reader Service number 445.

Knight of Diamonds

(Reviewed in Softline, *May 1982)*

System Requirements: Apple II, Apple III (emulation mode), 48K, disk Wizardry: "Proving Ground of the Mad Overlord."
Manufacturer: Sirtech, 6 Main St., Ogdensburg NY 13669
Price: $34.95
Comments: Knight of Diamonds is a sequel to Wizardry Proving Ground. KOD complements and enriches the popular Proving Ground game.

Knight of Diamonds is a six-level dungeon with several new twists. "There are individual quests and objectives on each level. The objects of these quests are required for the final quest on the sixth level."

"Unless you have a copy of Proving Ground, you cannot play KOD, much as you must learn to walk before you can run," the review says. Reader Service number 448.

Welcome to the Game Room. Each month this section will feature Micro Game Digest, reviews of computer games currently available and articles dealing with the low-end, home/game computers—Atari, Vic. . . . So read on and let the games begin.

Track Attack

(Reviewed in Peelings II, *May-June 1982)*

System Requirements: Apple II, 48K, DOS 3.2/3.3
Manufacturer: Broderbund Software, Inc., 1938 Fourth St., San Rafael, CA 94901
Price: $29.95
Comments: "The object of the game is to capture gold from a moving train without getting clobbered by either the train or the phantom watchman's car," the review says. The player can multiply the value of the gold by "jumping on the train, controlling it and capturing a second series of gold pieces," the review says.

"If you are looking for an easy arcade game, forget this one," according to the review. The main reason for the difficulty is the car. It cannot stop, move backward or turn around, so the player must always think ahead.

Also, the car does only what the player tells it to do. "If you don't give it a command, it will randomly pick a direction at an intersection.

"Initial reaction may be frustration followed either by disinterest or determination to master the game," the review says. Reader Service number 444.

Microwave

(Reviewed in Softline, *May 1982)*

System Requirements: Apple II or Apple III (emulation mode), 48K bytes and disk.
Manufacturer: Cavalier Computer, Box 2032, Del Mar, CA 92014
Price: $34.95
Comments: Microwave is an innovative variation of the popular eat-the-dots games, according to the review.

The game features a teddy bear that you must maneuver through a series of complex mazes. The object of the game is to pick up various merchandise while avoiding exploding grenades and dodging "a gang of bizarre-looking aliens, so that you can proceed to the next maze."

Your teddy collects hammers, wrenches, calculators and other items scattered around the maze. The objects disappear as the bear passes over them. "As many as four aliens are in pursuit, planting grenades in the path the bear must take to pick up paraphernalia," the review says.

There are other features to the game that make it challenging. "If you've become bored with the more traditional games of this genre, this may be just what you're looking for." Reader Service number 437.

Minotaur

(Reviewed in Softalk, *May 1982)*

System Requirements: Apple II or Apple III in emulator mode, 48K and one disk drive.
Manufacturer: Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827
Price: $34.95
Comments: "This arcade-style game puts you in the role of Theseus, hero of Greek mythology, whose task is to search for the Minotaur in a maze and kill the unholy wretch," the review says.

A maze has four levels connected by stairways. The Minotaur always resides on the fourth level of a maze, but various room monsters and Minotaur henchmen lurk in the hallways waiting, according to the review.

Things are available that the player can use to help in the search.

"Minotaur is a game with a lot of punch." Reader Service number 442.

Olympic Decathlon

(Reviewed in Micro, *June 1982)*

System Requirements: Apple II with 48K
Manufacturer: Microsoft Consumer Products, 10700 Northrup Way, Bellevue, WA 98004
Price: $29.95
Comments: Olympic Decathlon is not for children. It requires coordination and timing, according to the review. It is "one of the most difficult games on the market."

"The program simulates all events of an actual decathlon," says the review. "Exceptional graphics and good instruction" are featured in Olympic Decathlon.

The documentation is well written and offers clues for strategy. Reader Service number 432.

Peeping Tom

(Reviewed in Softalk, *May 1982)*

System Requirements: Apple II or Apple III (emulation mode), 48K and one disk drive.
Manufacturer: Micro Lab, 2310 Skokie Valley Road, Highland Park, IL 60035
Price: $35.95
Comments: "Peeping Tom is difficult and challenging, a good twist on an old theme," according to the review.

In this game you control a ship and you have an enemy that you must destroy; however, this foe is behind shuttered windows, the review says.

"As soon as you shoot an enemy, the portion of the window it was behind opens," the review says. Reader Service number 443.

Threshold

(Reviewed in Peelings II, *April 1982)*

System Requirements: Apple II, 48K, Disk II, DOS 3.2 and 3.3
Manufacturer: On-Line Systems, 36575 Mudge Ranch Road, Coarsegold, CA 93614
Price: $39.95
Comments: "Threshold is highly recommended if you are a fan of shoot-'em-up space games," says the review.

The Threshold ship has a hyperwarp driver which will slow time and speed for other objects. "The energy consumption in this mode of operation is immense so it can only be used once," according to the review.

Some other constraints are that the lasers are very sensitive to heat. So if you fire them too quickly you will have a temporary power loss. There is also a limited fuel supply. You can refuel in mid-mission, but you must reach the rendezvous point to do this.

"The sound effects are great," says the review. This is "a superb arcade game." Reader Service number 434.

Tumblebugs

(Reviewed in Softline, *May 1982)*

System Requirements: Apple II, Apple II Plus, 48K bytes; Atari 400 or 800, 24K bytes, disk
Manufacturer: Datasoft, 19524 Business Center Drive, Northbridge CA 91324
Price: $29.95
Comments: In Tumblebugs you are trying to get through a complex maze, eating white dots along the way, while eight tumblebugs chase you. "Sound like Pac-man? You should have it so easy," the review says.

The mazes are difficult and the tumblebugs are relentless, according to the review. Also, since the program creates a random maze each time you play, you can't memorize the paths.

Technically, Tumblebugs is excellent and the animation is good, according to the review.

"Tumblebugs is a solid game. . . . It could stand some variety, but it certainly does not lack challenge," the review says. Reader Service number 431.

While Snake Byte doesn't offer massive waves of attacking aliens or flights through space, it is a fun and challenging game both for young people and adults.

Snake Byte

(Reviewed in Creative Computing, *July 1982)*

System Requirements: 48K bytes Apple, disk drive
Manufacturer: Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827
Price: $29.95
Comments: The object of this game is to maneuver a snake through a series of rooms, eating apples along the way. When the snake eats ten apples he moves on to another room.

The game is not without danger. The player selects a game with either one, two or no perilous plums, according to the review. "These plums bounce around each room, and are deadly if they contact the head of the player's snake," the review says.

This might sound fairly easy; however, even though the snake is short when the game begins, its body grows with each apple eaten, the review says.

"While Snake Byte doesn't offer massive waves of attacking aliens or flights through space, it is a fun and challenging game, both for young people and adults," according to the review. Reader Service number 438.

Zork II

(Reviewed in Softline, *May 1982)*

System Requirements: Apple II, Apple III (emulation mode), Atari 400/800, IBM PC, NEC eight-inch CP/M; 32K bytes, disk.
Manufacturer: Infocom, 6 Faneuil Hall Marketplace, Boston MA 02109
Price: $39.95
Comments: "Zork II takes up where Zork leaves off (although you need not have played Zork I to play Zork II)," according to the review.

The game places you deep in the land of Zork. "Here you'll meet the Wizard of Frobozz, a formidable foe who'll appear randomly to thwart your efforts at solving the many riddles in the game."

The adventure is complete with volcanoes, dragons, princesses, unicorns and a collection of other creatures. This is a totally text game; however, the descriptions are "fascinating and detailed," the review says.

"Zork II is an adventure fit for master adventurers; those of you who are new to adventuring may find the game more of a challenge than you bargained for," the review says. Reader Service number 447.

Dueling Joysticks

Put more joy into your computing by adding two more joysticks to your VIC, thus letting up to three people play at the same time.

By Russell A. Grokett, Jr.

Remember the day you got your first program that used a joystick? How you went out, bought a pair (seems they're usually boxed in pairs) and came home to find out VIC has room for only one joystick?

"You mean only one person can play on VIC at a time? Oh well, I guess I've got a spare joystick. Maybe one of these days someone will come out with a way to add another joystick to VIC."

That day has arrived! For less than $10 you can add connections for, not one, but two more joysticks, letting up to three people play at the same time! These connections are made through a plug-in slot, on the back of VIC, called the user I/O port.

What's a User Port?

VIC has several sockets (ports) for accessories like printers, cassette decks and extra memory (see Fig. 1). One of these sockets, called the user port, allows VIC to be connected to the outside world. With it you can add a printer, modem, voice synthesizer or, as in our case, extra joysticks.

This user port is similar to the user port on the Commodore PET computer. PET owners had a problem worse than VIC owners—PET doesn't even have one joystick port available! Well, that didn't stop dedicated Space Invader fans. Early in PET history owners discovered the secrets of the user port. They quickly set up a standard for connecting a pair of joysticks to the user port. Then it was back to the more important task of obliterating those nasty invaders.

VIC owners can benefit from those earlier labors and add more joysticks to their machines, too!

How Do I Do It?

First, let's take a look at the VIC user port in Fig. 2. If you see the pins marked JOY0, JOY1, JOY2, etc., forget them! They are connected directly to the game port and your existing joystick. Instead, let's look at the pins marked PB0 to PB7.

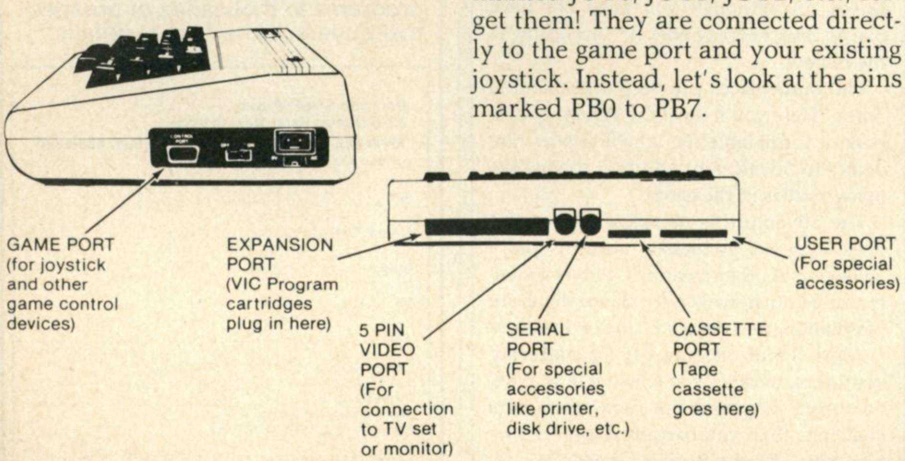


Fig. 1. VIC sockets to accommodate accessories.

These pins make up part of a parallel input/output port, which allows VIC to send or receive data one byte at a time. Since there are eight bits in a byte, the port has to have eight lines (or pins), one for each bit, in order to be parallel. Conversely, a serial port sends its data one bit at a time over one line. By grounding any combination of the eight lines, we can send VIC data that can be used in our program.

In order to ground those data lines we need switches. It just so happens that the Atari joystick has those switches! Each joystick has four direction switches and one push-button switch. By pushing the joystick, one or more of those switches are closed. Connect the direction switches so that each one closes the circuit between ground and one of the port data lines. Wire the push-button switches so that each one closes two circuits, instead of one. This setup lets you use two Atari joysticks on one parallel port.

To VIC, the user port looks like just another eight-bit memory location. By peeking at the memory location 37136, VIC reveals the status of the data lines as a number between 0 and 255. Normally, the port reads 255 (all bits are ones). When a data line is grounded, that bit becomes a zero, changing the number read by the peek. Decoding our new joysticks is done almost the same as decoding VIC's existing joystick.

Address correspondence to Russell A. Grokett, Jr., 401 Monument Road, #171, Jacksonville, FL 32211.

Hardware

Use the PET standard joystick interface, shown in Fig. 4, when wiring to VIC. (There are several standard PET interfaces available; this is one of the most widely used.)

The hardware needed for this project consists of the following: a DB-25P connector; a 12-position, 24-contact edge connector with .156 inch pin spacing, such as CINCH 251-12-30-160; four 1N914 diodes (or equivalent); and, of course, two Atari-type joysticks. Since the DB-25P connector allows two joysticks to be plugged into it, the cost of separate DB-9P (the standard connector) is saved. Fig. 3 shows the pin layout for a typical Atari-type joystick.

The DB-25P may be wired to the edge connector by using Fig. 4. Pin numbers for the DB-25P are marked on the connector. The edge connector pins used by this project are on the bottom row of the connector and are lettered A to N. Note that the edge connector can be incorrectly plugged in upside down. There is no polarization, so be careful! It is advisable to mark the top of the connector "this side up" as a reminder.

Note the diodes connecting the push buttons to the user port. When a button is pressed, VIC's parallel port reacts as though the joystick is being pushed up and down simultaneously (a rather improbable condition!).

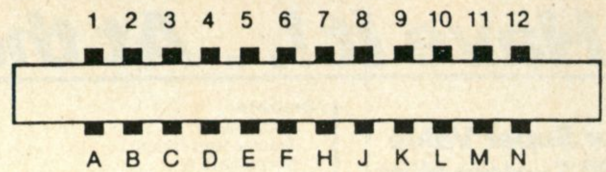
VIC can then be programmed to know that whenever it sees that condition, a button has been pushed. The diodes prevent the real up and down switches from closing both circuits. Be sure to observe the polarity of the diodes when installing them. The cathodes or banded ends connect to the joystick buttons (pins 14 and 22 on the DB -25P).

Software

The Basic subroutine in Listing 1 is designed as a general-purpose decoder for the two joysticks. It returns a value the same as the subroutine for the VIC game port as shown in the *VIC Programmers Manual.*

Just add this subroutine to any program when you want to use dual joysticks and GOSUB 9000 whenever you want to check the joysticks.

The DB-25P connector and the diodes should be available from local computer or electronics stores. The edge connectors are a bit harder to find, though. One source for all of the connectors and joysticks, as well as programs using dual joysticks, is Rak Electronics, PO Box 1585, Orange Park, FL 32073.■



Pin #	Type	Note	Pin #	Type	Note
1	GND		A	GND	
2	+5V	100mA MAX.	B	CB1	
3	RESET		C	PB0	
4	JOY0		D	PB1	
5	JOY1		E	PB2	
6	JOY2		F	PB3	
7	LIGHT PEN		H	PB4	
8	CASSETTE SWITCH		J	PB5	
9	SERIAL ATN IN		K	PB6	
10	+9V	100mA MAX.	L	PB7	
11	GND		M	CB2	
12	GND		N	GND	

Fig. 2. The VIC user port.

Pin #	Function
1	Up Switch
2	Down Switch
3	Left Switch
4	Right Switch
5	Not Used
6	Push Button
7	Not Used
8	Ground
9	Not Used

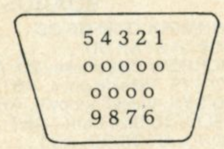


Fig. 3. Atari joystick pin layout.

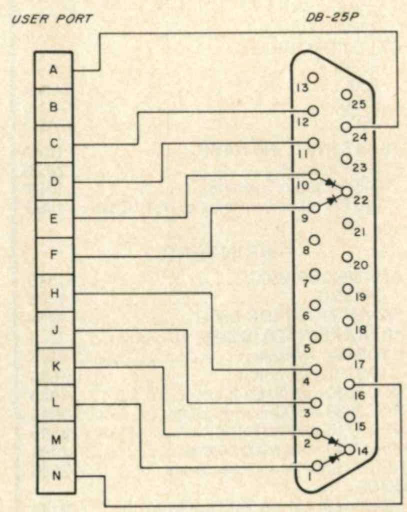


Fig. 4. DB-25P to edge connector wiring.

```
10   DIM JS(15): PC=37136
20   FOR I=0 TO 15
30   READ JS(I)
40   NEXT I
50   DATA 0,0,0,0,0,-23,-21
60   DATA -22,0,21,23,22,0
70   DATA -1,1,0
100  REM * CHECK JOYSTICK
110  GOSUB 9000
120  PRINT J1;F1,J2;F2
130  GOTO 110
9000 P=PEEK(PC):J1=JS(P AND 15)
9010 J2=JS((0.0625*P)AND 15)
9020 F1=-((P AND 12)=0):F2=-((P AND 192)=0):RETURN
```

PC is the user port memory location.

J1,J2 are joysticks one and two, respectively.

F1,F2 are the fire buttons on the joysticks.

Listing 1. VIC joystick program.

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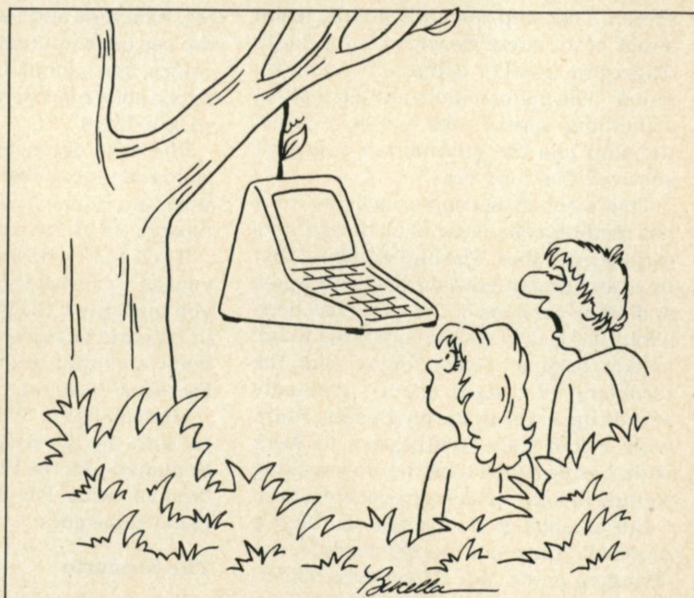

"I'm not sure, but I think it's an Apple."

Invaders, Pac-Man Games Predominate

Edited by Dan Muse

Atari Space Invaders

The only "official"
Space Invaders game
For personal computers

At long last the sneers of Apple owners can be laid to rest. We Atari owners are now the proud possessors of the only "official" Space Invaders game for personal computers. All others, no matter how much they resemble the classic arcade game, cannot even legally be called Invaders. We have the real thing.

Actually, Invaders purists will probably be disappointed in the Atari Space Invaders. Though the game concept remains the same, the actual playing field has been modified considerably. Gone are the simple little black-and-white aliens. Yellow, red, aqua, white, blue and pink aliens in amazing animation descend on unprotected laser guns. (You get five guns instead of the old three.) The racks of aliens, rather than appearing all at once, emerge slowly from a rocket ship at the left of the screen. That ship descends slightly when a rack of the enemy is wiped out, prior to disgorging another batch to be exterminated. (The manual hints tantalizingly at something special that happens when the ship hits the ground, but I haven't survived that long yet.)

That's not all, of course; as usual Atari has made excellent use of all the features of their machines. The big complaint that most arcade gamers have had with Apple and other versions of the game has been about the lack of sound compared to the arcade original. That sound, like the throbbing of distant drums, gradually speeds up as the game progresses. Atari, with a four-voice synthesizer to work with, has provided those nerve-wracking sounds to help spoil your concentration.

But as good as this version is, there's more. We have not merely a single, unchanging game, but *12* versions. Different versions change the speed of the enemy laser beams, the number of laser guns you have (the Atari term is "lives") and, most diabolical of all, whether or not the lasers of the enemy *home in on you.*

This is not a game you'll get tired of when you've figured out how to get the highest score (as is the case with Apple versions). In fact, the appearance of the "mystery ship" in this Atari version seems to be random.

At $19.95 you'll want to add Atari Space Invaders to your game library. It's an easier game for kids to understand as well. Besides, think of all the quarters you'll save!

William L. Colsher
Lisle, IL

Snakman

A Pac-Man-type
Game for the
Commodore VIC-20

These days a computer just isn't a computer unless it can play Space Invaders, Asteroids and Pac-Man. Some scorn the use of computers as mere game machines, but, I admit, I love to sit in front of a good color monitor with a fresh new joystick in hand.

The thrill of mastering a game, while all too short, is great. You see, I'm a kid. I saved my money and bought the Commodore VIC-20 to play and write games.

If you want a review of a game, who do you turn to? Ask the kids! They can tell you instantly if the game is any good. So in this article you're hearing it from the horse's mouth, so to speak. Do you like Pac-Man? Read on.

Microdigital in Webster, NY, provides us with the latest version of Pac-Man—Snakman—for the VIC. In case you're unfamiliar with Pac-Man, here's how a usual game goes.

The Scenario

You are placed in a maze with all the halls filled with white dots and an occasional gray dot. In the center of the maze is a chamber which contains four ghost-like creatures. At the start of the game these creatures are unleashed from their chamber in search of you.

Your mission is to eat all the white dots while evading the ghosts. To your advantage you have the gray colored dots. When you eat the gray dots, the ghosts turn white (you thought ghosts were white! No, these are colors) and do their best to get away from you, and for good reason! When the ghosts turn white, you have the opportunity to eat them.

The eaten ghosts return to the chamber and re-emerge ready to go after you again. They don't give up easily!

After about 15 seconds a long, low note is sounded to warn you that the ghosts will soon regain their colors and resume the chase after you. Points are scored for each white dot and ghost eaten.

You may also score bonus points by eating objects ranging from a star to a kettle. These objects appear randomly in a spot above the ghosts' chamber. While there is a certain risk in coming so close to the ghosts' home base, the points scored are well worth it. After eating a whole maze of dots, more dots appear and the ghosts get tougher. You are allowed to be eaten three times. That, ladies and gentlemen, is Snakman!

Mobility

Mobility is an important factor in a fast-paced game like Snakman. You must have excellent control to twist your way through the maze eating as many dots as possible while evading the ghosts.

Snakman may be played using either the keyboard or a joystick. Both provide good movement but the joystick is the easier of the two to use.

The game also has somewhat of a type ahead feature. That is, you may make a turn before you actually have another hallway to turn onto. This way you can develop a sort of rhythm in "snaking" your way through the maze.

Circle 19 on Reader Service card.

Playability

One of the nice features of the original Pac-Man is that its ghosts are actually smart. They love nothing better than closing in on you for a tasty meal (and another quarter). Snakman is no exception. As the levels of play increase, the ghosts become increasingly harder to evade. It's very well done and almost like the original.

Graphics and Sound

The game screen and characters are obviously composed of the programmable-character set available on the VIC. The maze graphics are fairly coarse, but the overall picture presented is clean and causes little eye strain (great for those all-night marathons!).

Sound is another thing. During the entire game a high-pitched warbling sound accompanies your every move. I found that after an hour of play it was necessary to turn the volume down or off. A satisfying Ka-Chunk occurs when you eat a white dot or ghost.

Conclusion

Considering the memory available on an unexpanded VIC (5K bytes), Snakman is a programming feat. The price of $16.95 is a bargain compared to versions for other computers, which cost upward of $30. The game is fun to play and definitely a good buy.

(Microdigital, 752 John Glenn Blvd., Webster, NY 14580.)

Bill Price
Mountain Lakes, NJ

Galactic Chase

An addicting Arcade game for The Atari 400/800

Those of you who have enjoyed the arcade game GALAXIAN will have a blast, literally, with Galactic Chase.

It runs in 16K for the Atari 400/800 computer and uses joysticks. One or two players can play. It is written in machine language and is very fast and smooth on the screen. The graphics and sound are extremely well done and make very good use of the Atari graphic capabilities.

Loading Galactic Chase is very simple. Just insert the tape into the 410 recorder and push the play button, then turn on the computer, while holding down the start button, and hit return.

The tape will load in about two minutes. The sound you hear is higher pitched than the usual CLOAD tape because, according to the manufacturer, of the higher recording speed.

You start the game by selecting one of the two options: number 1 for novice commanders (like myself) or number 2 for more experienced galactic commanders. Number 2 speeds up the attackers and slows down your missiles.

When the screen first appears it looks like the game will be as easy as shooting fish in a barrel. Your command ship on the bottom of the screen has horizontal movement. There is a fleet of assorted aliens on the top of the screen, Space Invaders style, but that is where the easy part ends.

After you take your first few shots at those poor unsuspecting alien ships, they break out of formation and dive bomb your ship, dropping bombs and trying to crash into your command ship.

You must move back and forth across the screen firing your missiles to get the alien ships. If you sit still too long they will home in on you (remember, this is a computer you are dealing with). If you must crash into an alien ship make sure you hit it head on and your magnetic repellers will destroy it.

The ships are worth more points when they are attacking than they are in formation. Should your command ship be destroyed, you have two more in reserve which will pop onto the screen at the demise of the previous ship.

If you manage to destroy all of the alien ships in the fleet, you are rewarded with another invasion. The more fleets you destroy the more difficult they get until you reach the 31st (31st???) level where an invisible ray disables your missile launcher and slows down your missiles.

This game also keeps track of your high score on the screen so you have something to shoot for.

This game is very addicting, so be prepared for marathon sessions. I would recommend this game for all people from eight to 80 who enjoy arcade-type games.

(Spectrum Computers, 26618 Southfield, Southfield, MI 48076.)

Richard D. Prill
Pompano Beach, FL

Munchkin and Invaders

Enjoyable Heath games For those Up to the challenge

First, I must say that these games should not be played by those with faint hearts, or weak forearms. Also, those with only a few hours to spend defending the world from an invading horde of outer space creatures, or avoiding little creatures with voracious appetites probably should not attempt these games.

What, one might ask, are the two games being reviewed here? Munchkin is another name for Pac-Man, while Invaders pits the player against an unending horde of invading creatures, presumably from outer space. Whatever their origin, they have an unlimited reserve. They march across the screen in ranks five deep by ten wide. Their formation is perfectly aligned and dressed, to the envy of any military man.

At first glance, the immediate conclusion would be that the formation would make the creatures easier to destroy. Not so, because it is possible for the defender's projectile to go completely through the invader's ranks without scoring a single hit.

The defender starts with three cannons. Each time the invaders score a hit on the defender's cannon, it is lost. Lose three cannons without replenishing them and the fate of the world is in the hands of the invaders. More on how to replenish the cannon later. The defender is able to (and in fact must) move the cannon back and forth across the bottom of the screen (on the 24th line), firing at the invaders by hitting the space bar on the keyboard and hiding behind a set of four barriers. The barriers eventually succumb to the incessant barrage of invaders' bombs and are destroyed. The degree of barrier destruction is dependent on the defender's proficiency: destroy the invaders before they destroy all three cannons or completely destroy the barriers.

While they exist, the barriers allow the defender to stop for a brief respite (scratch an itchy nose which has never before itched, flex stiff fingers, etc.) or hide briefly against the invaders' bombs. Unfortunately, the barriers do not afford enough protection to allow the defender much of a respite. Some players I have seen playing the game actually prefer to destroy the barriers with their own cannon, thereby offering a clear field of fire at the invaders.

The creatures march across the screen, dropping bombs which eventually destroy the defender's barriers. At indeterminate intervals, the invaders advance one row toward the defender. All the while, the invaders drop bombs which usually strike the protective barriers, although not always. All too often, the bombs hit the defender's cannon. As in baseball, three strikes and you're out. Unlike baseball, it is possible to increase the number of "outs" the defender is allowed.

As the invaders march across the screen, they are accompanied at random intervals by a mother ship which moves from left to right across the top of the screen. The point value of the ship varies, depending, it would appear, on the number of invaders on the screen. The minimum value is 50 points, while the maximum seems to be 250. The higher values

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seem to be available only when there are a lot of creatures on the screen, thereby protecting the ship and preventing a clean shot.

The defender scores by hitting the invaders and as many mystery ships as possible. As stated earlier, there are five ranks of invaders. The closest rank has a point value of ten points per invader. Since it is more difficult to hit the far ranks, they have an increased point value (30 points).

As the defender's score is increased, there are certain point levels at which the number of cannons left is increased by one. Since I am not, and do not profess to be, a proficient Invaders player, I cannot say with certainty at exactly what levels the cannons are replaced (besides, that would detract from the excitement of playing a new game). I can only say that one must reach 1500 points before a cannon is replaced. Fifteen hundred points may not sound like much, but with those bombs raining on the defender, a rank novice will require a few games before the first cannon is replaced. Of course if no cannons have been lost thus far, the defender receives an extra one.

After the initial 1500 point level, it seems that the next cannon is replaced about 500 points later, and in increments of 500 points. It is a testimony to the degree of concentration required that I was unable to accurately determine at what point level the defender is given more cannons.

After one horde of invaders is defeated, another appears on the screen. The defender's barriers are partially rebuilt. I suppose that if the game lasted long enough, the defender might be left with no protective barriers at all. It should be noted that the invaders release their bombs more rapidly with each new generation of creatures.

> I personally cannot play Invaders very long before I get a headache

Thus, a combination of a greater frequency of bombs and fewer barriers to hide behind, coupled with forearm fatigue, conspire to doom the defender. If the defender is able to record a new high point score, the program asks for the defender's name, which is written to a disk file, there to be recorded for eternity or until someone beats that score. At the bottom of the screen is the high point score to beat. No fair using a text editor to edit the point file!

One feature of the game which should appeal to anyone who has ever fired a weapon at a moving target is the fact that the defender's projectiles simulate a ballistic trajectory: they have a finite time of flight relative to the target's speed. Thus, it is necessary to lead the target in order to hit it. That is especially true for the farther targets. Adding to the challenge is the fact that the creatures increase their speed across the screen as they get closer to the barriers. Therefore, it is necessary to judge the speed of the creature at which you are aiming each and every time. I can see that this game would have definite benefits in reinforcing marksmanship training which teaches leading the target.

Munchkin is less violent in the sense that no one is being shot at or bombed; one must simply avoid being eaten by a pack of Munchkins (a.k.a. Pac-Men) with voracious appetites. As there is probably no kid of any age who has not seen, or at least heard of, Pac-Man, there is little need to go into much detail of the object of the game. Munchkin seems to have very accurately captured the Pac-Man action, less, of course, the sound effects.

There are books on the market which detail a strategy to outsmart the little creatures. I have not purchased one, so I cannot vouch for whether or not the same strategy will work here. I have noticed, however, a very welcome flaw in the game. If the player puts his creature in one of the blind areas of the maze and does not move him, the creatures we are trying to eat become disoriented. This lets the player retire to the refrigerator for a much-needed libation, stretch, or to soothe an upset spouse who wishes to hear a human voice rather than incessant beeps from the terminal.

Munchkin uses slightly different graphics characters than Pac-Man. When the Munchkin has acquired a power point, the face of the Munchkin changes, and a prompt appears at the bottom of the screen. This signifies that the Munchkin is able to eat the bad guys. The prompt at the bottom of the screen is difficult to see because of the concentration required, but the face change of the Munchkin partly compensates for that.

Both games have the same scorekeeping methods, and offer the opportunity to better one's score or try to beat another's. The instructions which accompany the disk (dual formatted for HDOS and CP/M on the same disk) are excellent. They even tell how to modify the game to create different versions (change the speed of play, change what the creatures look like, what the maze looks like, etc). In the event that the player wishes to change the graphics, such as the appearance of the creatures, a graphics editor, such as The Software Toolworks' ED-A-SKETCH, is required.

Both games pit the player against himself, and therein lies the appeal. Because the highest score attained is displayed on the 25th line, it is always there as a reminder that improvement is possible.

Both games use graphics extensively. Invaders, by its very nature, uses more graphics. The creatures are constantly moving, which means that each creature must be drawn in one position, left there for a predetermined period of time, then erased and moved to the next position. Because of the relatively low data rate of the H-19 terminal (compared to the repaint rate of the graphics), the screen appears to tear from time to time.

I personally cannot play Invaders very long before I get a headache, although my experiences do not seem to be universal in that respect. Forearm fatigue, mentioned earlier, is a result of having to keep the fingers of the right hand poised above the right-hand keypad, ready to press any of the arrow keys to move the cannon or creature left or right, or in the case of Munchkins, up or down. I have found that my nerves become rather frayed also. Therefore, for me at least, the games are not relaxing if played for more than half an hour at one sitting.

I must say in all honesty that I have thoroughly enjoyed reviewing these two video games from The Software Toolworks. My two-and-a-half-year-old daughter takes great delight in sitting on my lap, pounding on the keyboard space bar, and shouting, "I got one!" when playing Invaders. While I would not recommend playing them as a steady diet, they certainly have their place in any well stocked library of home computer programs.

Invaders is catalogue number 214; Munchkin is catalogue number 217. Both cost $19.95 plus $2 per order for shipping and handling. Both will run on any H-8/H-17/H-19 system or any H/Z-89 running HDOS or CP/M.

(The Software Toolworks, 14478 Glorieta Drive, Sherman Oaks, CA 91423.)

J.C. Hassall
Blacksburg, VA

A Quick and Dirty Input Port

Convert an unused ROM space to add another input port to a single board computer.

By Ladimer S. Nagurney

While adapting a single board computer to an instrumentation system, I needed an additional eight-bit input port. Although I could have added another PIA using the expansion capabilities of the board, I searched for a simpler means of expanding. Lacking on-board wire-wrapping area or additional IC space I wondered if some of the unused programmable read-only memory (PROM) space could be converted into an input port.

The spare on-board ROM socket was for one of the generic, byte-wide ROMs (2316, 2332) or EPROMs (2708, 2716) that use +5 V and ground. Except for the number of address lines, they have identical pinouts (Table 1). Replacing the ROM with tri-state buffers gated by the ROM chip enable provides a port that takes up a lot of address space, but no additional board space. Tri-state buffers, such as the Octal 74LS240 (inverting) or 74LS241 (non-inverting), can be used to buffer the input data.

Because I wanted the system to be one-board and was unsure of the driving capabilities of the bus, I did not want to extend the bus. A 20-pin DIP socket was mounted on top of a 24-pin DIP header attached by short bare wires (see Table 2). This assembly was plugged into the ROM socket. A cable of nine wires for the data plus ground was attached to the input pins of the buffer and routed to a connector on the computer enclosure. After testing, the space between the socket and the header was potted with five-minute epoxy to insure both mechanical stability and electrical insulation.

The port is enabled whenever a read operation to the address space of the ROM occurs. For example, if the ROM was a 2716 located beginning at A000 this would be any address between A000 and A7FF. Any instruction that reads from these memory locations may be used to input data.

This idea can be used with any system that has an extra ROM socket or on the ROM board of a larger system. Even if the memories do not use only +5 V and ground, this idea may be used. For example, with a 1702 board all you have to do is provide a separate ground connection. ■

	2316B 2K×8	2332 4K×8	2708 1K×8	2716 2K×8
01	9	9	9	9
02	10	10	10	10
03	11	11	11	11
04	13	13	13	13
05	14	14	14	14
06	15	15	15	15
07	16	16	16	16
08	17	17	17	17
CE*	20	20	20	20
+5 V	24	24	24	24
GND	12	12	12	12

*Note: CE is enabled when low.

Table 1. Pinout diagrams for popular memory chips.

Function	ROM pin	74LS240(1)pin
CE*	20	1,19
D1	9	5
D2	10	7
D3	11	9
D4	13	12
D5	14	14
D6	15	16
D7	16	18
D8	17	3
+5 V	24	20
GND	12	10
D1 in		15
D2 in		13
D3 in		11
D4 in		8
D5 in		6
D6 in		4
D7 in		2
D8 in		17

Table 2. Pinout connections for ROM socket assembly.

Address correspondence to Ladimer S. Nagurney, 123 Burlington St., Providence, RI 02906.

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PRM-28100	*MX-100 w/GRAFTRAX-plus*	**$754.95**

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PRA-27088	*Serial intf & 2K buffer*	**$99.95**
PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27086	*IEEE 488 card*	**$59.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-27097	*GRAFTRAX-plus MX-80, FT*	**$59.95**
PRA-27197	*GRAFTRAX-plus MX-100*	**$64.95**
PRA-27090	*MX-80, FT print head*	**$44.95**
PRA-27190	*MX-100 print head*	**$49.95**
PRA-27083	*MX-80 ribbon cart.*	**$13.95**
PRA-27101	*MX-100 ribbon only*	**$9.95**

BETTER THAN EPSON ! - Okidata

Microline 82A *80/132 column,* ***120 CPS,*** *9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking,* ***both serial & parallel interfaces included,*** *front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*

PRM-43082	*Friction & pin feed*	**$499.95**

Microline 83A *132/232 column, 120 CPS, forms up to 15" wide, removable tractor, plus all the features of the 82A.*

PRM-43083	*with FREE tractor*	**$744.95**

Microline 84 *132/232 column, Hi-speed 200 CPS, full dot graphics built in, plus all the features of the 83A.*

PRM-43084	*Centronics parallel*	**$1149.95**
PRM-43085	*Serial with 2K buffer*	**$1249.95**
PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-43081	*2K hi speed serial card*	**$99.95**
PRA-43082	*Hi-res graphics ROMs 82A*	**$49.95**
PRA-43083	*Hi-graphics ROMs 83A*	**$49.95**
PRA-43088	*Tractor option for 82A*	**$49.95**
PRA-43080	*Extra ribbons pkg. of 2*	**$9.95**

8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

NEC-8023A	*8023 parallel*	**$499.95**
NEC-8023-01	*8023 ribbon*	**$11.95**

PRINTER PALS - F.M.J. Inc.

Desk top printer stand and continuous form paper holder.

PRA-99080	*for MX-80, MX-80FT, Oki 82A, NEC*	**$29.95**
PRA-99100	*for MX-100, Oki 83A & 84*	**$34.95**
PRA-99700	*for letter quality printers*	**$49.95**

Jade Bus Probe

THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

Double-high S-100 board which displays all 96 IEEE S-100 signals without the expense of an ocilloscope or a front panel

TSX-200B	*Bare board*	**$59.95**
TSX-200K	*Kit*	**$119.95**
TSX-200A	*A&T*	**$149.95**

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

Dual 8" Sub-Assembly Cabinet

END-000420	*Bare cabinet*	**$59.95**
END-000421	*Cabinet kit*	**$225.00**
END-000431	*A & T*	**$359.95**

8" Sub-Systems - Single Sided, Double Density

END-000423	*Kit w/2 FD100-8Ds*	**$975.00**
END-000424	*A & T w/2 FD100-8Ds*	**$1175.00**
END-000433	*Kit w/2 SA-801Rs*	**$999.95**
END-000434	*A & T w/2 SA-801Rs*	**$1195.00**

8" Sub-Systems - Double Sided, Double Density

END-000426	*Kit w/2 DT-8s*	**$1224.95**
END-000427	*A & T w/2 DT-8s*	**$1424.95**
END-000436	*Kit w/2 SA-851Rs*	**$1274.95**
END-000437	*A & T w/2 SA-851Rs*	**$1474.95**

5¼" Disk Drives

Tandon TM100-1 *single-sided doubla-density 48 TPI*
MSM-551001 $248.95 ea 2 for **$219.95 ea**

Shugart SA400L *single-sided double-density 40 track*
MSM-104000 $234.95 ea 2 for **$224.95 ea**

Shugart SA455 *half-size double-sided 48 TPI*
MSM-104550 $349.95 ea 2 for **$329.95 ea**

Shugart SA465 *half-size doule-sided 96 TPI*
MSM-104650 $399.95 ea 2 for **$379.95 ea**

Tandon TM100-2 *double-sided double-density 48 TPI*
MSM-551002 $324.95 ea 2 for **$298.95 ea**

Shugart SA450 *double-sided double-density 35 track*
MSM-104500 $349.95 ea 2 for **$329.95 ea**

Tandon TM100-3 *single-sided double-density 96 TPI*
MSM-551003 $324.95 ea 2 for **$298.95 ea**

Tandon TM100-4 *double-sided double-density 96 TPI*
MSM-551004 $448.95 ea 2 for **$419.95 ea**

MPI B-51 *single-sided double-density 40 track*
MSM-155100 $234.95 ea 2 for **$224.95 ea**

MPI B-52 *double-sided double-density 40 track*
MSM-155200 $344.95 ea 2 for **$334.95 ea**

MPI B-91 *single-sided double-density 77 track*
MSM-155300 $369.95 ea 2 for **$359.95 ea**

MPI B-92 *double-sided double-density 77 track*
MSM-155400 $469.95 ea 2 for **$459.95 ea**

5¼" Cabinets with Power Supply

END-000216	*Single cab w/power supply*	**$69.95**
END-000226	*Dual cab w/power supply*	**$94.95**

8" Disk Drives

Shugart SA810 *half-size single-sided double-density*
MSF-108100 $424.95 ea 2 for **$394.95 ea**

Shugart SA860 *half-size double-sided double-density*
MSF-108600 $574.95 ea 2 for **$549.95 ea**

Shugart SA801R *single-sided double-density*
MSF-10801R $394.95 ea 2 for **$389.95 ea**

Shugart SA851R *double-sided double-density*
MSF-10851R $554.95 ea 2 for **$529.95 ea**

Tandon TM848-1 *single-sided double-den thin-line*
MSF-558481 $424.95 ea 2 for **$394.95 ea**

Tandon TM848-2 *double-sided double-den thin-line*
MSF-558482 $574.95 ea 2 for **$549.95 ea**

Qume DT-8 *double-sided double-density*
MSF-750080 $524.95 ea 2 for **$498.95 ea**

Mitsubishi M2894-63 *double-sided double-density*
MSF-289463 $549.95 ea 2 for **$524.95 ea**

Siemens FDD 100-8 *single-sided double-density*
MSF-201120 $384.95 ea 2 for **$349.95 ea**

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Hard Disk Drives

12 MEGABYTE SUB-SYSTEM - DayStar

12 Megabyte Winchester sub-system for most CP/M based microcomputers including Apple II, S-100, IBM PC, NEC, Xerox, TRS-80 II, Heath H-89, and others. Sub-system includes interface, controller, cabinet, power supply, CP/M software patch, & cables - ready to just plug in and run. A 1 Megabyte back-up drive is also available.

MSH-531010	*S-100 sub-system*	**$2095.00**
MSH-531020	*Apple II sub-system*	**$2095.00**
MSH-531030	*NEC sub-system*	**$2095.00**
MSH-531040	*Xerox sub-system*	**$2095.00**
MSH-531050	*TRS-80 II sub-system*	**$2095.00**
MSH-531060	*IBM PC sub-system*	**$2095.00**
MSH-531099	*1 Megabyte back-up*	**$699.95**

12 MEGABYTE WINCHESTER - Tandon

5¼" hard disk drive for hi-speed mass storage.

MSH-550603	*Bare 5¼" drive*	**$1094.95**

Letter Quality Printers

TP-1 LETTER QUALITY - SCM

10 CPS daisy wheel printer from Smith Corona.

PRD-45101	*Centronics parallel*	**$699.95**
PRD-45102	*Rs-232C serial*	**$749.95**

LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

PRD-11001	*Centronics parallel*	**$959.95**
PRD-11002	*RS-232C serial model*	**$999.95**

STARWRITER F-10 - C. Itoh

New 40 CPS daisy wheel printer with full 15" carriage, uses standard Diablo print wheels and ribbons, both parallel and serial interfaces included.

PRD-22010	*Starwriter F-10*	**$1495.95**

80 CPS LETTER QUALITY - Fujitsu

High speed daisy wheel printer with both RS-232C serial & Centronics parallel interfaces, emulates NEC 5510, Diablo 630, Qume, and will interface to the IBM Personal Computer, features include Z-80 CPU, 16K buffer (48K optional), bi-directional printing, & baud rates up to 19.2K

PRD-86100	*Fujitsu with 16K*	**$2895.00**
PRD-86200	*Fujitsu with 48K*	**$3195.00**
PRA-86000	*Adjustable tractor*	**$190.00**

Software

PLANNER CALC - Target Software

Spread sheet (what if ?) program designed with the user in mind, user oriented (simple english) commands allow you to quickly master this powerful software package, supplied on disk for most CP/M based systems.

SFA-12251052M	*Apple II 5¼" CP/M*	**$49.95**
SFC-12251050F	*SS SD 8" CP/M*	**$49.95**
SFC-12251053F	*Xerox 8" CP/M*	**$49.95**
SFC-12251053M	*Xerox 5¼" CP/M*	**$49.95**
SFX-12251051M	*NEC 5¼" CP/M*	**$49.95**

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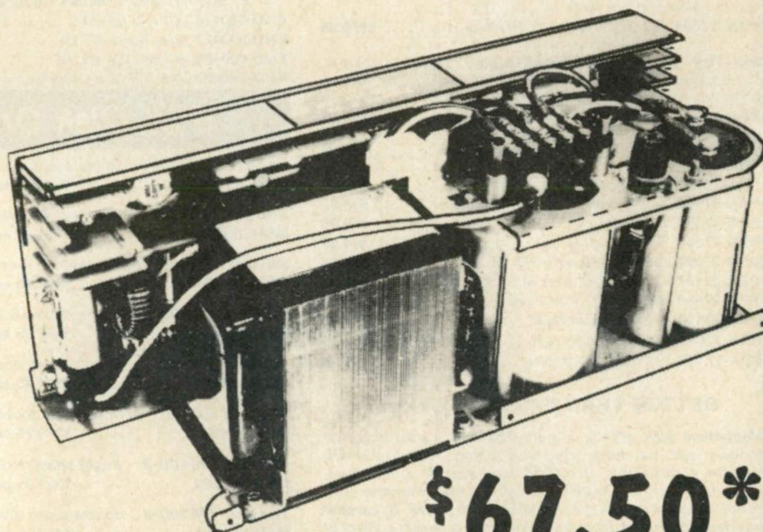
This is the perfect supply for almost any computer application and gives you one supply that can drive logic, bipolar and MOS circuitry. Read the specs and think about owning one — but don't think too long. We have a limited quantity and this is a one time buy.

FEATURES:

Output voltages:	+12V @ 7A + 5V @ 10A (remote sense) –12V @ 7A
Regulation:	2% Line & Load
Ripple:	200mv @ full load
Fuses:	3 (one primary, two DC sections)
Input:	117VAC
Overvoltage Protection:	SCR type all 3 outputs
Overcurrent:	Automatic foldback non-latching
Thermal Protection:	Klixon® sensor shuts down all 3 voltages
Output Section:	High efficiency Switching Darlingtons
Packaging:	Open frame, common chassis unitized
Weight:	21 pounds
Size:	6 x 5-1/2 x 12



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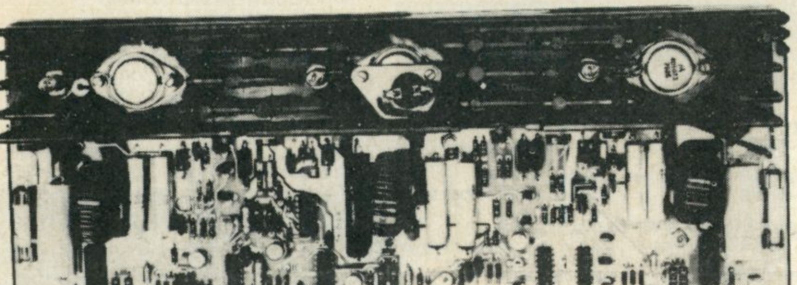

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By changing 4 parts the +12 section can be raised to +24 @ 5A with the same regulation and features. If you need power for your floppies (or hard disk) this Mod Kit will fill the bill.

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				Each	100 pcs
2101	256 x 4		(450ns)	1.95	1.85
5101	256 x 4	(cmos)	(450ns)	4.95	3.95
2102-1	1024 x 1		(450ns)	.89	.85
2102L-2	1024 x 1	(LP)	(250ns)	1.69	1.55
2102L-4	1024 x 1	(LP)	(450ns)	1.29	1.15
2111	256 x 4		(450ns)	2.99	2.49
2112	256 x 4		(450ns)	2.99	2.79
2114	1024 x 4		(450ns)	8/16.95	1.95
2114L-2	1024 x 4	(LP)	(200ns)	8/15.95	1.90
2114L-3	1024 x 4	(LP)	(300ns)	8/18.95	2.25
2114L-4	1024 x 4	(LP)	(450ns)	8/17.95	2.10
2147	4096 x 1		(55ns)	9.95	call
TMS4044-4	4096 x 1		(450ns)	3.49	3.25
TMS4044-3	4096 x 1		(300ns)	3.99	3.75
TMS4044-2	4096 x 1		(200ns)	4.49	4.25
MK4118	1024 x 8		(250ns)	9.95	call
TMM2016-200	2048 x 8		(200ns)	call	call
TMM2016-150	2048 x 8		(150ns)	call	call
HM6116-4	2048 x 8	(cmos)	(200ns)	call	call
HM6116-3	2048 x 8	(cmos)	(150ns)	call	call
HM6116-2	2048 x 8	(cmos)	(120ns)	call	call
HM6116LP-4	2048 x 8	(LP)(cmos)	(200ns)	call	call
HM6116LP-3	2048 x 8	(LP)(cmos)	(150ns)	call	call
HM6116LP-2	2048 x 8	(LP)(cmos)	(120ns)	call	call
Z-6132	4096 x 8	(Qstat)	(300ns)	34.95	call

LP = Low Power   Qstat = Quasi-Static

DYNAMIC RAMS

				Each	100 pcs
TMS4027	4096 x 1		(250ns)	2.50	2.00
MK4108	8192 x 1		(200ns)	1.95	call
MM5298	8192 x 1		(250ns)	1.85	call
4116-120	16384 x 1		(120ns)	8/29.95	call
4116-150	16384 x 1		(150ns)	8/18.95	1.95
4116-200	16384 x 1		(200ns)	8/13.95	call
4116-250	16384 x 1		(250ns)	8/11.95	call
4116-300	16384 x 1		(300ns)	8/13.80	call
2118	16384 x 1	(5v)	(150ns)	4.95	call
MK4816	2048 x 8	(5v)	(300ns)	24.95	call
4164-200	65536 x 1	(5v)	(200ns)	call	call
4164-150	65536 x 1	(5v)	(150ns)	call	call

EPROMS

				Each	8 pcs
1702	256 x 8		(1us)	4.95	4.50
2708	1024 x 8		(450ns)	3.75	3.50
2758	1024 x 8	(5v)	(450ns)	9.95	8.95
TMS2516	2048 x 8	(5v)	(450ns)	6.95	5.95
2716	2048 x 8	(5v)	(450ns)	4.95	3.95
2716-1	2048 x 8	(5v)	(350ns)	9.00	8.50
TMS2716	2048 x 8		(450ns)	9.95	8.95
TMS2532	4096 x 8	(5v)	(450ns)	9.95	7.95
2732	4096 x 8	(5v)	(450ns)	9.95	7.95
2732A-2	4096 x 8	(5v)	(200ns)	call	call
2764	8192 x 8	(5v)	(450ns)	call	call
TMS2564	8192 x 8	(5v)	(450ns)	call	call
MC68764	8192 x 8	(5v)	(450ns) (24pin)	call	call

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/Cm²)	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320	X	32	15,000	595.00

Z-80

2.5 Mhz	
Z80-CPU	3.95
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	5.75
Z80-SIO/0	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95
4.0 Mhz	
Z80A-CPU	6.00
Z80A-CTC	8.65
Z80A-DART	18.75
Z80A-DMA	27.50
Z80A-PIO	6.00
Z80A-SIO/0	22.50
Z80A-SIO/1	22.50
Z80A-SIO/2	22.50
Z80A-SIO/9	19.95
6.0 Mhz	
Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50
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Z6132	34.95
Z8671	39.95

8200

8202	34.95
8205	3.50
8212	1.85
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8237	19.95
8238	4.95
8243	4.45
8250	14.95
8251	4.75
8253	9.25
8253-5	9.85
8255	4.75
8255-5	5.25
8257	8.50
8257-5	8.95
8259	6.90
8259-5	7.50
8272	39.95
8275	29.95
8279	9.50
8279-5	10.00
8282	6.65
8283	6.65
8284	5.70
8286	6.65
8287	6.50
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6802	10.9
6808	13.9
6809E	19.9
6809	12.9
6810	2.9
6820	4.9
6821	4.9
6828	14.9
6840	12.9
6843	34.9
6844	25.9
6845	16.9
6847	12.2
6850	3.4
6852	5.7
6860	10.9
6862	11.9
6875	6.9
6880	2.9
6883	24.9
68047	24.9
68488	19.9
6800 = 1MHZ	
68B00	10.9
68B02	22.2
68B09E	29.9
68B09	29.9
68B10	7.9
68B21	12.9
68B45	35.9
68B50	12.9
68B00 = 2 MHZ	

6500

1 MHZ	
6502	5.9
6504	6.9
6505	8.9
6507	9.9
6520	4.3
6522	8.7
6532	11.2
6545	22.5
6551	11.8
2 MHZ	
6502A	9.9
6522A	11.7
6532A	12.4
6545A	28.5
6551A	12.9
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32K S-100 EPROM CARD
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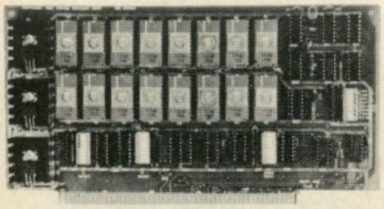


$79.95
KIT

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED
ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $9.95 Ea. With Above Kit.

KIT FEATURES:
1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

64K S100 STATIC RAM
$349.00 KIT

NEW!
LOW POWER!
RAM OR EPROM!

BLANK PC BOARD
WITH DOCUMENTATION
$55

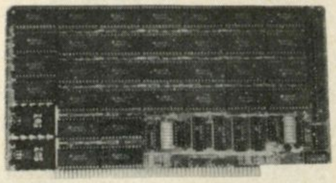
SUPPORT ICs + CAPS
$17.50

FULL SOCKET SET
$14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $299

ASSEMBLED AND TESTED ADD $40

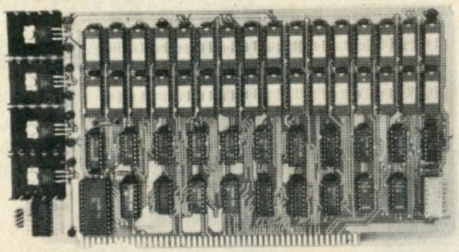


FEATURES:
* Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
* Fully supports IEEE 696 24 BIT Extended Addressing.
* 64K draws only approximately 500 MA.
* 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
* SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
* 2716 EPROMs may be installed in any of top 48K.
* Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
* Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
* BOARD may be partially populated as 56K.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!
$149.95 KIT

FOR 4MHZ
ADD $10

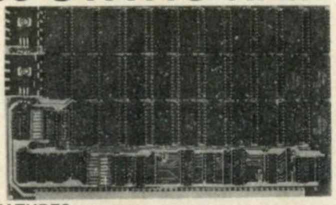


KIT FEATURES:
1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-$33
LOW PROFILE SOCKET SET-$12
SUPPORT IC'S & CAPS-$19.95
ASSEMBLED & TESTED-**ADD $35**

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM
$259.00 (48K KIT)



NEW!
LOW POWER!
RAM OR EPROM!

BLANK PC BOARD
WITH
DOCUMENTATION
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SUPPORT ICs + CAPS
$18.00

FULL SOCKET SET
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56K Kit $309

64K Kit $359

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FEATURES:
* Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
* Fully supports Extended Addressing.
* 64K draws only approximately 500 MA.
* 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
* Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
* 2716 EPROMs may be installed anywhere on Board.
* Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
* One Board supports both RAM and EPROM.
* RAM supports 2MHZ operation at no extra charge!
* Board may be partially populated in 16K increments.

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COMPLETE KIT!
$84.95
(WITH DATA MANUAL)

BLANK PC BOARD W/DATA
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KIT FEATURES:
* TWO GI SOUND COMPUTER IC'S.
* FOUR PARALLEL I/O PORTS ON BOARD.
* USES ON BOARD AUDIO AMPS OR YOUR STEREO.
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* ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
* PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
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* USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

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UART SALE!

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TR1602B

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SMC #CRT 5037. PROGRAMMABLE FOR 80 x 24, ETC. VERY RARE SURPLUS FIND. WITH PIN OUT. $12.95 EACH.

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74LS00	.25	74LS85	1.15	74LS168	1.75	74LS295	1.05
74LS01	.25	74LS86	.40	74LS169	1.75	74LS298	1.20
74LS02	.25	74LS90	.65	74LS170	1.75	74LS324	1.75
74LS03	.25	74LS91	.89	74LS173	.80	74LS352	1.55
74LS04	.25	74LS92	.70	74LS174	.95	74LS353	1.55
74LS05	.25	74LS93	.65	74LS175	.95	74LS363	1.35
74LS08	.35	74LS95	.85	74LS181	2.15	74LS364	1.95
74LS09	.35	74LS96	.95	74LS189	9.95	74LS365	.95
74LS10	.25	74LS107	.40	74LS190	1.00	74LS366	.95
74LS11	.35	74LS109	.40	74LS191	1.00	74LS367	.70
74LS12	.35	74LS112	.45	74LS192	.85	74LS368	.70
74LS13	.45	74LS113	.45	74LS193	.95	74LS373	1.75
74LS14	1.00	74LS114	.50	74LS194	1.00	74LS374	1.75
74LS15	.35	74LS122	.45	74LS195	.95	74LS377	1.45
74LS20	.25	74LS123	.95	74LS196	.85	74LS378	1.18
74LS21	.35	74LS124	2.99	74LS197	.85	74LS379	1.35
74LS22	.25	74LS125	.95	74LS221	1.20	74LS385	1.90
74LS26	.35	74LS126	.85	74LS240	1.29	74LS386	.65
74LS27	.35	74LS132	.75	74LS241	1.29	74LS390	1.90
74LS28	.35	74LS136	.55	74LS242	1.85	74LS393	1.90
74LS30	.25	74LS137	.99	74LS243	1.85	74LS395	1.65
74LS32	.35	74LS138	.75	74LS244	1.29	74LS399	1.70
74LS33	.55	74LS139	.75	74LS245	1.90	74LS424	2.95
74LS37	.55	74LS145	1.20	74LS247	.75	74LS447	.37
74LS38	.35	74LS147	2.49	74LS248	1.25	74LS490	1.95
74LS40	.35	74LS148	1.35	74LS249	.99	74LS624	3.99
74LS42	.55	74LS151	.75	74LS251	1.30	74LS668	1.69
74LS47	.75	74LS153	.75	74LS253	.85	74LS669	1.89
74LS48	.75	74LS154	2.35	74LS257	.85	74LS670	2.20
74LS49	.75	74LS155	1.15	74LS258	.85	74LS674	9.65
74LS51	.25	74LS156	.95	74LS259	2.85	74LS682	3.20
74LS54	.35	74LS157	.75	74LS260	.65	74LS683	2.30
74LS55	.35	74LS158	.75	74LS266	.55	74LS684	2.40
74LS63	1.25	74LS160	.90	74LS273	1.65	74LS685	2.40
74LS73	.40	74LS161	.95	74LS275	3.35	74LS688	2.40
74LS74	.45	74LS162	.95	74LS279	.55	74LS689	2.40
74LS75	.50	74LS163	.95	74LS280	1.98	74LS783	24.95
74LS76	.40	74LS164	.95	74LS283	1.00	81LS95	1.69
74LS78	.50	74LS165	.95	74LS290	1.25	81LS96	1.69
74LS83	.75	74LS166	2.40	74LS293	1.85	81LS97	1.69
						81LS98	1.69

74S00

74S00	.44	74S85	2.39	74S169	5.44	74S274	19.95
74S02	.48	74S86	1.44	74S174	1.09	74S275	19.95
74S03	.48	74S112	1.59	74S175	1.09	74S280	2.90
74S04	.79	74S113	1.98	74S181	4.47	74S287	4.75
74S05	.79	74S114	1.50	74S182	2.95	74S288	4.45
74S08	.48	74S124	2.77	74S188	3.95	74S289	6.98
74S09	.98	74S132	1.24	74S189	14.95	74S301	6.95
74S10	.69	74S133	.98	74S194	2.95	74S373	3.45
74S11	.88	74S134	.69	74S195	1.89	74S374	3.45
74S15	.70	74S135	1.48	74S196	4.90	74S381	7.95
74S20	.68	74S138	1.08	74S197	4.25	74S387	5.75
74S22	.98	74S139	1.25	74S201	14.95	74S412	2.98
74S30	.48	74S140	1.45	74S225	8.95	74S471	9.95
74S32	.98	74S151	1.19	74S240	3.98	74S472	16.85
74S37	1.87	74S153	1.19	74S241	3.75	74S474	17.85
74S38	1.68	74S157	1.19	74S244	3.98	74S482	15.60
74S40	.44	74S158	1.45	74S251	1.90	74S570	7.80
74S51	.78	74S161	2.85	74S253	7.45	74S571	7.80
74S64	.79	74S162	3.70	74S257	1.39		
74S65	1.25	74S163	3.75	74S258	1.49		
74S74	.69	74S168	4.65	74S260	1.83		

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	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39

ST = SOLDERTAIL

8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
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ICL8038	3.95
ICM7107A	5.59
ICM7208	15.95

7400

7400	.19	74136	.50
7401	.19	74141	.65
7402	.19	74142	2.95
7403	.19	74143	2.95
7404	.19	74145	.60
7405	.25	74147	1.75
7406	.29	74148	1.20
7407	.29	74150	1.35
7408	.24	74151	.65
7409	.19	74152	.65
7410	.19	74153	.55
7411	.25	74154	1.40
7412	.30	74155	.75
7413	.35	74156	.65
7414	.55	74157	.55
7416	.25	74159	1.65
7417	.25	74160	.85
7420	.19	74161	.70
7421	.35	74162	.85
7422	.29	74163	.85
7423	.29	74164	.85
7425	.29	74165	.85
7426	.29	74166	1.00
7427	.29	74167	2.95
7428	.45	74170	1.65
7430	.19	74172	5.95
7432	.29	74173	.75
7433	.45	74174	.89
7437	.29	74175	.89
7438	.29	74176	.89
7440	.19	74177	.75
7442	.49	74178	1.15
7443	.65	74179	1.75
7444	.69	74180	.75
7445	.69	74181	2.25
7446	.59	74182	.75
7447	.69	74184	2.00
7448	.69	74185	2.00
7450	.19	74132	.45
7451	.23	74190	1.15
7453	.23	74191	1.15
7454	.23	74192	.79
7460	.23	74193	.79
7470	.35	74194	.85
7472	.29	74195	.85
7473	.34	74196	.79
7474	.35	74197	.75
7475	.49	74198	1.35
7476	.35	74199	1.35
7480	.59	74221	1.35
7481	1.10	74246	1.35
7482	.95	74247	1.25
7483	.50	74248	1.85
7485	.65	74249	1.95
7486	.35	74251	.75
7489	4.95	74259	2.25
7490	.35	74265	1.35
7491	.40	74273	1.95
7492	.50	74276	1.25
7493	.49	74279	.75
7494	.65	74283	2.00
7495	.55	74284	3.75
7496	.70	74285	3.75
7497	2.75	74290	.95
74100	1.00	74293	.75
74107	.30	74298	.85
74109	.45	74351	2.25
74110	.45	74365	.65
74111	.55	74366	.65
74116	1.55	74367	.65
74120	1.20	74368	.65
74121	.29	74376	2.20
74122	.45	74390	1.75
74123	.55	74393	1.35
74125	.45	74425	3.15
74126	.45	74426	.85
74128	.55	74490	2.55

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4000	.35	4528	1.25
4001	.35	4531	.95
4002	.25	4532	1.95
4006	.95	4538	1.95
4007	.29	4539	1.95
4008	.95	4543	2.70
4009	.45	4555	.95
4010	.45	4556	.95
4011	.35	4581	1.95
4012	.25	4582	1.95
4013	.45	4584	.95
4014	.95	4585	.95
4015	.95	4702	12.95
4016	.45	74C00	.35
4017	1.15	74C02	.35
4018	.95	74C04	.35
4019	.45	74C08	.35
4020	.95	74C10	.35
4021	.95	74C14	1.50
4022	1.15	74C20	.35
4023	.35	74C30	.35
4024	.75	74C32	.50
4025	.35	74C42	1.75
4026	1.65	74C48	1.20
4027	.65	74C73	.65
4028	.80	74C74	.85
4029	.95	74C76	.80
4030	.45	74C83	1.95
4034	2.95	74C85	1.95
4035	.85	74C86	.95
4040	.95	74C89	4.50
4041	1.25	74C90	1.75
4042	.75	74C93	1.75
4043	.85	74C95	1.75
4044	.85	74C107	1.00
4046	.95	74C150	5.75
4047	.95	74C151	2.25
4049	.55	74C154	3.25
4050	.55	74C157	1.75
4051	.95	74C160	2.00
4053	.95	74C161	2.00
4060	1.45	74C162	2.00
4066	.75	74C163	2.00
4068	.40	74C164	2.00
4069	.35	74C165	2.00
4070	.35	74C173	2.00
4071	.30	74C174	2.25
4072	.30	74C175	2.25
4073	.30	74C192	2.25
4075	.30	74C193	2.25
4076	.95	74C195	2.25
4078	.30	74C200	5.75
4081	.30	74C221	2.25
4082	.30	74C373	2.75
4085	.95	74C374	2.75
4086	.95	74C901	.80
4093	.95	74C902	.85
4098	2.49	74C903	.85
4099	1.95	74C905	10.95
14409	12.95	74C906	.95
14410	12.95	74C907	1.00
14411	11.95	74C908	2.00
14412	12.95	74C909	2.75
14419	4.95	74C910	9.95
4502	.95	74C911	10.00
4503	.65	74C912	10.00
4508	1.95	74C914	1.95
4510	.95	74C915	2.00
4511	.95	74C918	2.75
4512	.95	74C920	17.95
4514	1.25	74C921	15.95
4515	2.25	74C922	5.59
4516	1.55	74C923	5.95
4518	1.25	74C925	6.75
4519	1.25	74C926	7.95
4520	1.25	74C927	7.95
4522	1.25	74C928	7.95
4526	1.25	74C929	19.95
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FND-357 (359)	.375"	CC	.75
FND-500 (503)	.5"	CC	.99
FND-507 (510)	.5"	CA	.99

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	1-99	100-up
Jumbo Red	.10	.09
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Jumbo Yellow	.18	.15

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LM566	Function Gen.	1.49
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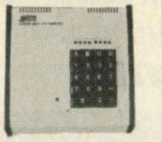

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DTE-HK (case only — 3½"Hx8¼"Wx8¾"D) **$44.95**

JE610 ASCII Encoded Keyboard Kit

The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

JE610/DTE-AK (After assembled as pictured above) ... **$124.95**

JE610 Kit 62-Key Keyboard, PC Board, & Components (no case). . . . **$ 79.95**

K62 62-Key Keyboard (Keyboard only) . . . **$ 34.95**

DTE-AK (case only — 3¼"Hx11"Wx8¾"D) **$ 49.95**

NEW! **JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT** Kit/ Provides -12VDC from incoming 5VDC . **$9.95**

JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95

JE205 Adapter Brd. (to JE200) ±5,±9 & ±12V. . $12.95

JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. . $19.95

HP-Display Sale-National

5082 Series — 0.43 Inch — 7-Segment

Part Number	Color	Description	1-3 Price	SALE PRICE
5082-7650	Hi Eff Red	CA - LHD	.99	4/$2.49
5082-7651	Hi Eff Red	CA - RHD	.99	4/$2.49
5082-7653	Hi Eff Red	CC - RHD	.99	4/$2.49
5082-7656	Hi Eff Red	Overflow ± 1RHD	.99	4/$2.49
5082-7660	Yellow	CA - LHD	.99	4/$2.49
5082-7661	Yellow	CA - RHD	.99	4/$2.49
5082-7663	Yellow	CC - RHD	.99	4/$2.49
5082-7670	Green	CA - LHD	.99	4/$2.49
5082-7671	Green	CA - RHD	.99	4/$2.49
5082-7673	Green	CC - RHD	.99	4/$2.49
5082-7676	Green	Overflow ± 1RHD	.99	4/$2.49
5082-7750	Red	CA - LHD	.99	4/$2.49
5082-7751	Red	CA - RHD	.99	4/$2.49
5082-7756	Red	Overflow ± 1RHD	.99	4/$2.49
5082-7760	Red	CC - RHD	.99	4/$2.49

CA-Comm. Anode CC-Comm. Cathode LHD/RHD-Left/right hand dec.

UTIC

Mini Stereo AM/FM Receiver

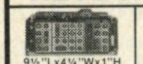
CLOSE-OUT!

WITH HEADPHONES For Joggers, Cyclists, Skaters & Sports Events

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅞" x 4⅞" x 1". Wt. 6 oz.

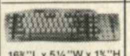
Model 2830 . . . . $29.95

KEYBOARDS — POWER SUPPLIES



9½"Lx4¼"Wx1"H

ALPS 26-KEY CALCULATOR KEYBOARD
Features: 7 Position, 3 Position and 2 Position Switches (ON/OFF). These are from Olivetti's Top of the Line. Mechanical SPST Switching: 22-pin Edge Card Connection.
Part No. KB26 . . . . $1.95 each or 2/$3.49

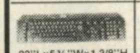


16⅜"L x 5¼"W x 1⅜"H

MICRO SWITCH 69-KEY KEYBOARD
Data Entry Keyboard, Encoded Output: 8-bit Parallel EBC DIC. Switching: Hall Effect, 24-pin Edge Card Connection. Complete with Pin Connection.
Part No. KB69SD12-2 . . . . $19.95 each

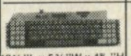
16¾"L x 5½"W x 1⅜"H

DATANETICS 74-KEY KEYBOARD
ASCII Encoded Keyboard, Output: Even Parity ASCII, Supply voltage +5, -12 volt. Switching: Mechanical SPST — 50-pin Connection. Complete with Pin Connection.
Part No. KB354 . . . . $29.95 each



23"Lx5¾"Wx1-3/8"H

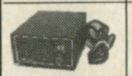
MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.
Part No. 85SD18-1 . . . . $29.95 each



18¼"L x 5¾"W x 1⁵⁄₁₆"H

MICRO SWITCH 88-KEY KEYBOARD (PARALLEL ASCII)
Data Entry Keyboard used in a Diablo 1640 Terminal. Supply Voltage: +5V, -12V. Switching: Hall Effect — 10-pin Edge Card Connection. Schematic included. Uses 8048 Encoder Chip.
Part No. 88SD22 . . . . $69.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech
Output +5VDC @ 1 amp (also +30VDC) reg. Input 115VAC 60Hz. Two-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. Size: 6½"W x 7"D x 2¼"H. Wt. 3 lbs.
Part No. PS51194 . . . . $19.95 each



POWER SUPPLY — 5VDC @ 1 AMP REGULATED B Industries
Output +5VDC @ 1 amp, +36-42VDC adj. 400mA or less, 30VAC (isol.) @ 1.5 amp. Input 115VAC 60Hz. Circ. brkr. re-set button. Blk. self-encl. case w/4 rubber feet. 6 ft., 3 cond. blk. pow. cord. On/off switch. 6¾"W x 7¾"D x 3-7/8"H - wt. 7 lbs.
Part No. PS407D . . . . $24.95 each

POWER SUPPLY — 5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 8 ft. blk. pow. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94VO . . . . $49.95 each

POWER PAC — Heavy Duty Multi-Voltage Power Supply — 5VDC, 12VDC, 24VDC
Output: +5VDC @ 30A, +12VDC @ 2A, -12VDC @ 4A & +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Reg.: ± .15% line & load comb. Ripple: 10MV peak to peak (3MV RMS). Overvolt. protect.: 5V, +12V, -12V. Overcur. protect. incl. 15½"L x 6"H x 11-7/8"D. Wt. 40 lbs.
Part No. 285-016 . . . . $89.95 each

SORENSEN Regulated Power Supplies

SOC 2-6 (Pictured)

Sorensen's open construction (SOC) power supplies are series-regulated solid-state systems, designed to provide reg. DC voltages at 6 levels (2-28 v/range). These units are open-framed on sturdy black anodized aluminum for excellent mounting.

FEATURES: 115/208/230VAC Input @ 50-63Hz. Low Ripple: 1.5mVrms, 5mV P-P maximum. Adjustable current limit. Voltage adjustment control. All schematics and specifications supplied with unit. Series A,B,C,E have three mounting surfaces (Series F, bottom mounting only).

Part No.	Series	Output Voltage Adjustment Range min.	max.	Output Current amps (Adc) @40°C	@50°C	@60°C	Size (Inches)	Weight	Price
SOC 2-6	B	1.9	2.1	6.0	4.9	3.8	5.62 x 4.88 x 2.50	4.3 lbs.	$19.95
SOC 2-25	F	1.9	2.1	25.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	29.95
SOC 5-3	A	4.75	5.25	3.0	2.4	1.8	4.00 x 4.88 x 1.62	2 lbs.	24.95
SOC 5-18	E	4.25	5.25	18.0	15.0	12.0	14.00 x 4.88 x 2.75	12 lbs.	39.95
SOC 5-25	F	4.25	5.25	25.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 12-11	E	11.4	12.6	11.0	9.2	6.8	14.00 x 4.88 x 1.62	12 lbs.	44.95
SOC 12-15	F	11.4	12.6	15.0	12.75	9.5	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 15-5	C	14.25	15.75	5.0	4.2	3.5	7.00 x 4.88 x 3.37	6.6 lbs.	39.95
SOC 15-9.5	E	14.25	15.75	9.5	7.6	5.6	14.00 x 4.88 x 1.62	12 lbs.	44.95
SOC 15-13	F	14.25	15.75	13.0	10.5	8.0	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 28-0.8	A	26.6	29.4	0.8	.64	.45	4.00 x 4.88 x 1.62	2 lbs.	24.95

Powertec Sub-Modular DC Power Supplies

22D300 (Pictured)

SM Series power supplies include rectifying, filtering, regulating, overload and overvoltage protection functions. You need only connect the sub-module to the appropriate secondary transformer tap and bolt the unit to a heatsink.

REGULATION: LINE: .10% for a change from -10% to +10% input voltage. LOAD: 15% for a 0-100% load change (units below 5V output maintain 5V regulation). OUTPUT RIPPLE: 1mV RMS, 3mV P-P typical. 5mV P-P maximum. INPUT CHARACTERISTICS: Requires low-level AC input. Derate output current 15% for operations at 50Hz.

Part Number	-100 *4.75V to 7.0V	-200 *7.0V to 10.5V	-300 *10.5V to 15.75V	-500 *22.0V to 30.0V	Power Transformer Requirements (Transformers Not Included) Primary	Secondary	Size (Inches)	Wt.	Price
22AA-300			0.23A		115–120VAC	17VAC .5A no CT	2.50 x 3.00 x .98	2 oz.	$14.95
22B-200		2.2A			115–120VAC	22VAC .3A w/CT	3.00 x 5.75 x 1.18	8 oz.	14.95
22B-300			1.7A		115–120VAC	28VAC 2.5A w/CT	2.75 x 5.75 x 1.18	8 oz.	19.95
22C-100	6.0A				115–120VAC	16VAC 8A w/CT	2.80 x 7.50 x 1.18	8 oz.	24.95
22C-500				2.5A	115–120VAC	48VAC 3A w/CT	2.80 x 7.50 x 1.18	8 oz.	24.95
22D-300			6.8A		115–120VAC	28VAC 10A w/CT	3.00 x 7.00 x 3.30	2 lbs.	24.95
22E-100	18.00A				115–120VAC	16VAC 24A w/CT	2.90 x 7.00 x 3.30	2 lbs.	29.95

*Voltage Adjustment Range — Current ratings apply over entire voltage range.

★ SHIPMENT IN 24 HOURS ★

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6:00AM to 6:00PM (PST)

Call: (415) 592-8097

TRY US! Satisfaction Guaranteed

JUMPER AND CABLE ASSEMBLIES

Custom Jumpers! *Custom Cables!*

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	3.20
DJ14-2-14	924106-24	14	double end	24"	3.49
DJ14-3-14	924106-36	14	double end	36"	3.79
DJ16-1	924112-12	16	single end	12"	1.85
DJ16-2	924112-24	16	single end	24"	2.19
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	3.35
DJ16-2-16	924116-24	16	double end	24"	3.69
DJ16-3-16	924116-36	16	double end	36"	4.05
DJ24-1	924122-12	24	single end	12"	2.69
DJ24-2	924122-24	24	single end	24"	3.39
DJ24-3	924122-36	24	single end	36"	3.95
DJ24-1-24	924126-12	24	double end	12"	4.79
DJ24-2-24	924126-24	24	double end	24"	5.29
DJ24-3-24	924126-36	24	double end	36"	5.89
DJ40-1	924132-12	40	single end	12"	5.89
DJ40-2	924132-24	40	single end	24"	6.79
DJ40-3	924132-36	40	single end	36"	7.69
DJ40-1-40	924136-12	40	double end	12"	10.95
DJ40-2-40	924136-24	40	double end	24"	11.89
DJ40-3-40	924136-36	40	double end	36"	12.79

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4-foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-4	4 feet	1-DB25P	$ 9.95 ea.
DB25S-4	4 feet	1-DB25S	10.95 ea.
DB25P-4-P	4 feet	2-DB25P	16.95 ea.
DB25P-4-S	4 feet	1-DB25P/1-DB25S	17.95 ea.
DB25S-4-S	4 feet	2-DB25S	18.95 ea.

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢ each
Send 88¢ Postage for your *FREE* 1982 JAMECO CATALOG
Prices Subject to Change

Call for Quantity Discounts

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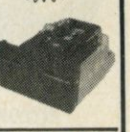
PHONE ORDERS WELCOME — (415) 592-8097

9/82

5¼" Mini-Floppy Disc Drive

Pertec Computer Corp.

FOR TRS-80 MODEL I, III (Industry Standard)



Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6 amps max., +5VDC (±0.25V) 0.8 amps max. Unit as pictured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3½ pounds. Size: 5¾"W x 8"D x 3¼"H

Limited Quantity!

Part No.	Price
FD200 — Single-sided, 40 tracks, 250K bytes capacity	$179.95
FD250 — Double-sided, 35 tracks, 438K bytes capacity	$199.95

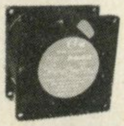
EXPAND YOUR TRS-80 to 16K, 32K or 48K

**Model 1 = From 4K to 16K Requires (1) One Kit
Model 3 = From 4K to 48K Requires (3) Three Kits
Color = From 4K to 16K Requires (1) One Kit
**Model 1 equipped w/Expansion Board up to 48K (2) Two Kits Req'd.
— One Kit Required for each 16K of Expansion —

TRS-80 16K Conversion Kit — Kit comes complete with 8 each MM5290 (UPD416/4116) 16K Dynamic RAM (*ns) & documentation for conversion.

TRS-16K2 *150ns $16.95
TRS-16K3 *200ns $14.95
TRS-16K4 *250ns $10.95

Pee Wee Boxer Fan



- 36cfm free air delivery
- 3.125" sq. x 1.665" depth
- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz
- For Apple users

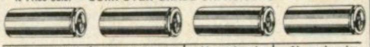
PWS2107U Cleaned & tested (used) . . . **$ 7.95 ea.**
PWS2107F New . . . . **$12.95 ea.**

Muffin® Fan

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth.
- 10 yrs. cont. duty at 20°C
- Impedance protected, ambients to 70°C
- 115V 50/60Hz 14W Wt. 17 oz.

MU2A1-U Cleaned & tested (used) . . . . **$ 7.95 ea.**
MU2A1-N New . . . . **$12.95 ea.**

½ Price Sale! — **COMPUTER GRADE CAPACITORS** — ½ Price Sale!



mfd	wvdc	price	mfd	wvdc	price	mfd	wvdc	price	mfd	wvdc	price
250	150	1.95	4,500	50	3.95	20,000	20	2.95	43,000	10	5.95
500	200	2.49	5,500	25	4.49	21,000	15	3.95	45,000	5	5.95
1,250	3	.99	6,100	40	2.49	22,000	15	4.95	52,000	20	5.95
1,500	25	1.95	7,000	60	4.95	23,000	7	1.95	55,000	15	5.95
1,500	50	2.95	10,000	15	2.95	23,000	10	2.95	58,000	20	5.95
2,000	10	2.95	10,000	16	3.95	23,000	20	3.95	65,000	10	7.95
2,100	200	2.95	11,000	19	4.95	24,000	20	2.95	73,800	5	7.95
2,250	100	3.95	13,000	16	2.95	27,000	10	2.95	80,000	15	9.95
2,300	33	2.95	14,000	13	2.95	32,500	25	4.95	90,000	10	8.95
2,500	15	2.95	15,500	10	4.95	40,000	25	5.95	120,000	15	10.95
3,000	25	1.95	18,000	10	3.95	42,000	10	4.95	160,000	10	8.95
3,600	40	3.95									

OVER 200 OTHER VALUES AVAILABLE

SALE! Just deduct 50% of price listed above!

JOYSTICKS

JS-5K (Pictured)

JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JS-150K	150K Linear Taper Pots	$4.75
JVC-40	40K (2) Video Controller in Case	$4.95

UV-EPROM Eraser

8 Chips — 51 Minutes

1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

UVS-11EL Replacement Bulb $16.95

DE-4 UV-EPROM Eraser $79.95

Mostek DC/DC Converter

+5 VOLTS TO -9 VOLTS

1¼"L x 7/8"H x 1/4"D

Input: +5V. Output:-9V (regulated) @ 30mA. Printed circuit mounting.

DC10 . . . . $2.95 ea. or 2/$4.95

Wall Transformers AC and DC Types

AC250 (Pictured)

Part No.	Input	Output	Price
AC 250 (above)	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
AC9004	117V/60Hz	9.2VAC 2.5 amp	$2.95 or 2/$4.95
DC 800	120V/60Hz	8VDC 400mA	$1.95 or 2/$2.95
DC6912	120V/60Hz	6,9,12VDC 300mA	$9.95
DV5490	117V/60Hz	9.5VDC 275mA	$2.49 or 2/$3.95
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95 or 2/$4.95

MOTOROLA AM/FM Stereo Push Button Car Radio

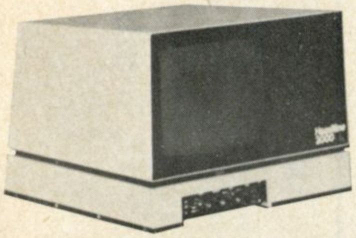
FOR VOLKSWAGEN SCIROCCO, RABBIT, AUDI 5000 AND FOX (with minor adjustments, can be used in any automobile)

Includes bezel trim & everything pictured. Two ea. 4x6 speakers & grille (1½" deep). All cables & leads for hook-up. Incl. all Instruction Manuals for easy installation. Cut-out dim.: 7"W x 1¾"H x 6½"L.

Model 5VW3901 . . . . $49.95

Circle 41 on Reader Service card.

SELECTRONICS

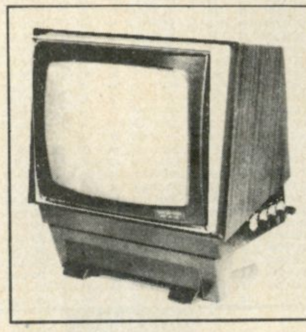


HAZELTINE 2000

* 12" green phos tube
* adjustable baud rate from front
* remote keyboard w/numeric keypad
* insert & delete, chacacter & line mode, and cursor control functions
* external printer & cassette ports
* modem cable w/DB-25 connector
* shipping wt. 65lbs.
* $300.00 f.o.b. our warehouse

MONITORS

12" black & white monitor. Wide band, will display 80 x 24 char. 10K or 75Ω input impedance, composite video input. Transformer power supply.
Shpt. Wt. 30#
Price: $55 ea.
Used with all computers such as: TRS-80, Apple, and many others.
Complete manual $5.00.
(Also in green phos $80.00 ea.)



HAZELTINE 1000

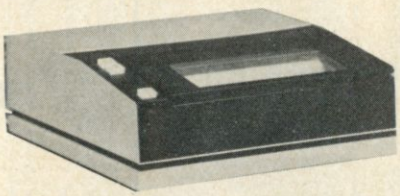
* 12 × 80 characters
* shipping wt. 47lbs.
* $150.00 f.o.b. our warehouse

HAZELTINE TAPE CASSETTES

* dual tape drives
* digitaly records &duplicates
* data files can be prepared off line
* recording rate 2400 baud
* records 400 bits per inch
* tape speed 6" per second
* shipping wt 33 lbs.
* operators manual inc.
* $125.00 fob our warehouse

TEXAS INSTRUMENT 750
THERMAL PRINTERS

* parallel interface
* upper & lower case
* excellent condition
* shipping wt. 30lbs.
* $90.00 f.o.b. our warehouse



PERKIN-ELMER CAROUSEL 350 TERMINAL

Only Selectronics could bring you this unbelievable opportunity to own the finest high quality KSR terminal ever made. These machines originally listed for more than $4200. Check these outstanding features:

* Letter quality printing with upper and lowercase
* Microprocessor controlled
* 76-key alphanumeric keyboard with 10-key numeric pad
* EIA RS232C asynchronous serial interface
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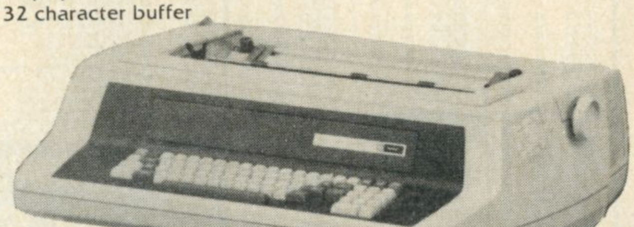

* Full or half duplex
* Parity—odd, even, none
* Replacable print cups and elements

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Shpt. Wt. 100# our warehouse

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Price: $1.00 ea. 6/$5.00

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2. Add Level B to convert to S100
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4. Plug in Level E here: accepts Microsoft BASIC or Editor/Assembler in ROM
5. Add two S100 boards
6. Add you own custom circuits (prototyping area)
7. Connect terminal

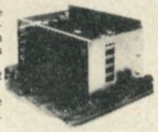
EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just $129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: *8085 Central Processing Unit*, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone!) ... *Four 8-bit plus one 6-bit input/output ports* from which you can input and output your programs, as well as control exterior switches, relays, lights, etc. ... a cassette interface that lets you store and reload programs you've learned to write ... *deluxe 2,000 byte operating system/monitor* makes it easy to learn computing in several important ways ● It allows simpler, faster writing and entering of programs ● It permits access by you to all parts of the system so you can check on the status of any point in the program ● It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) ● ... and it does much more!

You get all this in the starting level (Level A) of the Explorer/85 for only **$129.95**. Incredible! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

☐ Level A computer kit (Terminal Version) ... **$129.95** plus $3 P&I.*
☐ Level A kit (Hex Keypad/Display Version) ... **$129.95** plus $3 P&I.*

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.
☐ Level B kit ... **$49.95** plus $2 P&I.*
☐ S100 bus connectors (two required) ... **$4.85** each, postpaid.



LEVEL C — Add still more computing power: this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.
☐ Level C kit ... **$39.95** plus $2 P&I.*
☐ S100 bus connectors (five required) ... **$4.85** each, postpaid.

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of a memory directly on the motherboard, or add 16k to 64k of memory by means of a single S100 card, our famous "JAWS."
Level D kit: (CHECK ONE) ... ☐ 4k on-board ... **$49.95** plus $2 P&I*; ☐ 16k S100 "JAWS" ... **$149.95** plus $2 P&I*; ☐ 32k S100 "JAWS" ... **$199.95** plus $2 P&I*; ☐ 48k S100 "JAWS" ... **$249.95** plus $2 P&I*; ☐ 64k S100 "JAWS" ... **$299.95** plus $2 P&I*.

LEVEL E — An important "building block," it activates the 8k ROM/EPROM space on the motherboard. Now just plug in our 8k Microsoft BASIC or your own custom programs.
☐ Level E kit ... **$5.95** plus 50¢ P&I.*

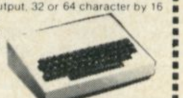
Microsoft BASIC — It's the language that allows you to talk English to your computer! It is available three ways:
☐ 8k cassette version of Microsoft BASIC (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see above) ... **$64.95** postpaid.
☐ 8k ROM version of Microsoft BASIC (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS.") ... **$99.95** plus $2 P&I.*
☐ Disk version of Microsoft BASIC (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) ... **$325** postpaid.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the assembler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.
☐ Editor/Assembler (Cassette version; requires Level "B" and 8k (min.) of RAM — we suggest 16k "JAWS" — see above) ... **$59.95** plus $2 P&I.*
☐ Editor/Assembler (ROM version supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") ... **$99.95** plus $2 P&I.*

8" FLOPPY DISK — A remarkable "building block." Add our 8" floppy disk when you need faster operation, more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M programs.
☐ 8" Floppy Disk Drive ... **$499.95** plus $12 P&I.*
☐ Floppy Controller Card ... **$199.95** plus $2 P&I.*
☐ Disk Drive Cabinet & Power Supply ... **$69.95** plus $3 P&I.*
☐ Drive Cables (set up for two drives) ... **$25.00** plus $1.50 P&I.*
☐ CP/M 2.2 Disk Operating System: includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs ... $150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).
☐ AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet ... **$39.95** plus $2 P&I.*

NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either a CRT monitor or a TV set (if you have an RF modulator).
☐ Hex Keypad/Display kit ... **$69.95** plus $2 P&I.*



☐ **FASTERM - 64 TERMINAL KIT** — Featuring a 56 key ASCII Keyboard, 128 character set upper and lower case, 75 ohm output, 8 baud rates, 150 to 19,200 (switch selectable), RS232/C or 20 MA output, 32 or 64 character by 16 line formats, complete with Deluxe Steel Cabinet and Power Supply ... **$199.95** plus $3 P&I.*

☐ RF Modulator kit (allows you to use your TV set as a monitor) ... **$8.95** postpaid.
☐ 12" Video Monitor (10MHz bandwidth) ... **$139.95** plus $5 P&I.*
☐ Deluxe Steel Cabinet for the Explorer/85 ... **$49.95** plus $3 P&I.*
☐ Fan for cabinet ... **$15.00** plus $1.50 P&I.*

ORDER A SPECIAL-PRICE EXPLORER/85 PAK—THERE'S ONE FOR EVERY NEED.

☐ **Beginner Pak** (Save $26.00) — You get Level A (Terminal Version) with Monitor Source Listing ($25 value) AP-1, 5-amp. power supply, Intel 8085 Users Manual ... (Reg. $199.95) SPECIAL **$169.95** plus $4 P&I.*
☐ **Experimenter Pak** (Save $53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1,5-amp. power supply ... (Reg. $279.95) SPECIAL **$219.95** plus $6 P&I.*
☐ **Special Microsoft BASIC Pak** (Save $103.00) — You get Levels A (Terminal Version), B, D (4k RAM), E, 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Listing, and AP-1, 5-amp. power supply ... (Reg. $439.70) SPECIAL **$329.95** plus $7 P&I.*
☐ Add a Rom-Version Text Editor/Assembler (Requires levels B and D or S100 Memory) ... **$99.95** plus $2 P&I*.

Starter 8" Disk System – Includes Level A, B floppy disk controller, one CDC 8" disk-drive, two-drive cable, two S100 connectors; just add your own power supplies, cabinets and hardware ... ☐ (Reg. $1065.00) SPECIAL **$999.95** plus $13 P&I.* ... ☐ 32k Starter System, **$1045.95** plus $13 P&I.* ☐ 48k Starter System, **$1095.95** plus $13 P&I.* ☐ 64k Starter System, **$1145.95** plus $13 P&I.*
☐ Add to any of above Explorer steel cabinet, AP-1 five amp. power supply, Level C with two S100 connectors, disk drive cabinet and power supply, two sub-D connectors for connecting your printer and terminal ... (Reg. $225.95) SPECIAL **$199.95** plus $13 P&I.*
☐ **Complete 64K System** Wired & Tested ... **$1650.00** plus $26 P&I.*
☐ Special! Complete Business Software Pak (Save $625.00) — Includes CP/M 2.2 Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package ... (Reg. $1325) SPECIAL **$699.95** postpaid.

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333 Litchfield Road, New Milford, CT 06776

ANNOUNCING TWO NEW TERMINALS

Smart • Fast • Graphics • Matching Modem and $295 Printer

Netronics announces a state of the art breakthrough in terminals, now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanges, electronic bulletin boards ... and more every day!!!

Netronics offers two new terminals, both feature a full 56 key/128 character typewriter-style keyboard, baud rates to 19.2 kilobaud, a rugged steel cabinet and power supply. The simplest one, FASTERM-64, is a 16 line by 64 or 32 character per line unit, with a serial printer port for making hard copy of all incoming data, and optional provisions for block and special character graphics. The "smart" version, SMARTERM-80, features either 24 line by 80 characters per line or 16 by 40 characters per line, it offers on-screen editing with page-at-a-time printing, 12,000 pixel graphics, line graphics, absolute cursor addressing, underlining, reverse video, one-half intensity and much more ... simply plug them into your computer or our phone modem and be on-line instantly. Use your TV set (RF modulator required) or our delux green-phosphor monitor pictured above. For hard copy just add our matched printer.

Price breakthrough!!! Own the FASTERM-64, a complete terminal kit, ready to plug in for just $199.95 or order the SMARTERM-80 kit for just $299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today ... we even supply the necessary subscription forms.

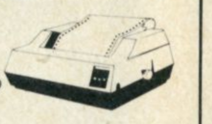
More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-64 ... DISPLAY FORMAT: 64 or 32 characters/line by 16 lines ... 96 displayable ASCII characters (upper & lower case) ... 8 baud rates: 150, 300, 600, 1200, 2400 4800, 9600, 19, 200, (switch sel.) ... LINE OUTPUT: RS232/C or 20 ma current loop ... VIDEO OUTPUT: 1V P/P (EIA RS-170) ... CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling ... REVERSE VIDEO ... BLINKING CURSOR ... PARITY: off, even or odd ... STOP BITS: 1, 1.5, 2 ... DATA BITS PER CHARACTER: 5, 6, 7 or 8 ... CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell ... PRINTER OUTPUT: prints all incoming data ... 1K ON BOARD RAM ... 2K ON BOARD ROM ... CRYSTAL CONTROLLED ... COMPLETE WITH POWER SUPPLY ... OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters ... ASCII ENCODED KEYBOARD: 56 key/128 characters.

SMARTERM-80 ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 19, 200 ... LINE OUTPUT: RS232/C or 20 ma current loop ... VIDEO OUTPUT: 1V pp (EIA RS-170) ... EDITING FEATURES: insert/delete line, insert/delete character, forward/back tab ... LINE OR PAGE TRANSMIT ... PAGE PRINT FUNCTION ... CURSOR POSITIONING: up, down, right, left, plus absolute cursor positioning with read back ... VISUAL ATTRIBUTES: underline, blink, reverse video, half intensity, & blank ... GRAPHICS: 12,000 pixel resolution block plus line graphics ... ON-SCREEN PARITY INDICATOR ... PARITY: off, even or odd ... STOP BITS: 110 baud 2, all others 1 ... CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block ... PRINTER OUTPUT ... 60 OR 50 Hz VERTICAL REFRESH ... BLINKING BLOCK CURSOR ... CRYSTAL CONTROLLED ... 2K ON BOARD RAM ... ASCII ENCODED KEYBOARD: 56 key/128 character ... 4K ON BOARD ROM ... COMPLETE WITH POWER SUPPLY.

TELEPHONE MODEM 103 O/A ... FULL DUPLEX, FCC APPROVED ... DATA RATE: 300 baud ... INTERFACE: RS232/C and TTY ... CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel ... NO POWER SUPPLY REQUIRED.

ASCII KEYBOARD ASCII-3 ... 56 KEY/128 CHARACTER ASCII ENCODED ... UPPER & LOWER CASE ... FULLY DEBOUNCED ... 2 KEY ROLLOVER ... POS OR NEG LOGIC WITH POS STROBE ... REQUIRES +5 & -12V DC (SUPPLIED FROM VIDEO BOARDS)



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☐ COMPLETE FASTERM-64 TERMINAL (includes FASTVID-64 video board ASCII-3 keyboard, steel cabinet and power supply) ... kit $199.95 plus $3 P&I ... wired & tested $249.95 plus $3 P&I ... graphics option: add $19.95 to each of above
☐ COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video board, ASCII-3 keyboard, steel cabinet and power supply) ... kit $299.95 plus $3 P&I ... wired and tested $369.95 plus $3 P&I
☐ FASTVID-64 VIDEO BOARD (requires +5 & -12V DC) ... kit $99.95 plus $3 P&I ... graphics option add $19.95 ... wired & tested $129.95 plus $3 P&I ... graphics option add $19.95
☐ SMARTVID-80 VIDEO BOARD (requires +5 & +/-12V DC) ... kit $199.95 plus $3 P&I ... wired & tested $249.95 plus $3 P&I
☐ DELUXE STEEL TERMINAL CABINET ... $19.95 plus $3 P&I
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☐ POWER SUPPLY (powers ASCII-3 keyboard & video boards) ... kit only $19.95 plus $2 P&I
☐ ZENITH VIDEO MONITOR (high resolution green phosphor) ... wired & tested $149.95 plus $6 P&I
☐ TELEPHONE MODEM MODEL 103 O/A ... wired & tested $189.95 plus $3 P&I
☐ DOT MATRIX PRINTER Comet I ... wired & tested $299.95 plus $10 P&I
☐ RF MODULATOR MOD RF-1 ... kit only $8.95 plus $1 P&I
☐ 3FT-25 LEAD MODEM/TERMINAL OR PRINTER/TERMINAL CONNECTOR CABLE ... $14.95 ea plus $2 P&I

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ONE

Some of you may have noticed that some other vendors have started to advertise CompuPro products. Frankly, we're amused that it has taken them this long to see that you want state-of-the-art IEEE/696 S-100 products. The discriminating user wants boards that meet the IEEE standard, not just any board with 100 pins that is obsolete before it is sold. We've known this for years; that is why we have continued to grow while others have had to cut back. To attract your business, they try to copy us and cut the price, often by as little as five cents. Rather than cut price, we offer the best combination of price, performance, and support in the business. We at Priority One are proud of what we offer for that extra five cents. Priority One Electronics is more than just a computer store or mail order house — we're an Authorized CompuPro Systems Center. Priority One is the first place you should turn to for business, scientific, and industrial computing solutions. Here are just five examples of what that extra five cents buys:

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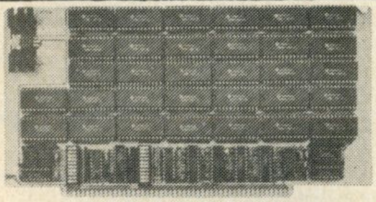


CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of **BYTE**

RAM 17 - 64K CMOS STATIC RAM

RAM 17, 10 MHz, 2 Watt, DMA Compatible 24 Bit Addressing

Part No.	Description	List Price	Our Price
KIGBT175A64	64K A&T	$599.00	$550.00
KIGBT175C64	64K CSC	$750.00	$699.00

RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit

(816) RAM 16 10 MHz, 32K x 16 or 64K x 8

IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

KIGBT180A	64K A&T	$650.00	$599.00
KIGBT180C	64K CSC	$750.00	$699.00

(816) NEW! RAM 21 - 128K STATIC RAM

RAM 21 12MHz, 128K x 8 or 64K x 16 **WOW!**

IEEE/696 8 or 16 Bit 1.2 Amps, 24 Bit Addressing

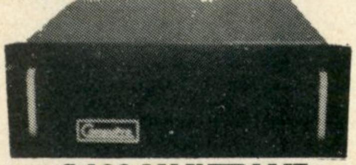
KIGBT190A	128K A&T	$1695.00	$995.00
KIGBT190C	128K CSC	$1895.00	$1795.00

STATIC MEMORY BOARDS

RAM 20 - 32K STATIC RAM

RAM 20 10 MHz, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

KIGBT164AA8	8K A&T	$210.00	$190.00
KIGBT164AC8	8K CSC	$280.00	$260.00
KIGBT164AA16	16K A&T	$285.00	$260.00
KIGBT164AC16	16K CSC	$355.00	$325.00
KIGBT164AA24	24K A&T	$355.00	$325.00
KIGBT164AC24	24K CSC	$425.00	$385.00
KIGBT164AA32	32K A&T	$425.00	$385.00
KIGBT164AC32	32K CSC	$495.00	$450.00



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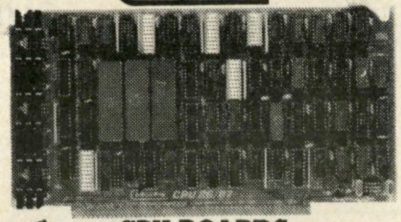
110V 60Hz CVT Mainframe uses famous 20 slot COMPUPRO Motherboard. 55 lbs.

KIGBTENC20RM	20 Slot Rack Mount	$895.00	$825.00
KIGBTENC20DK	20 Slot Desk Top	$825.00	$760.00

CompuPro™



NEW!

CPU BOARDS

CO-PROCESSOR 8086/8087 (816)

16 bit 8 or 10 MHz 8086 CPU with sockets for 8087 and 80130

Part No.	Description	List Price	Our Price
KIGBT186A	A&T 8MHz 8086 only	$695.00	$ 625.00
KIGBT186C	CSC 10MHz 8086 only	$850.00	$765.00
KIGBT186A87	A&T with 8087 option*	$1295.00	$1225.00
KIGBT186C87	CSC with 8087 option*	$1550.00	$1456.00

**8087 Limits clock speed to 5MHz*

DUAL PROCESSOR 8085-8088

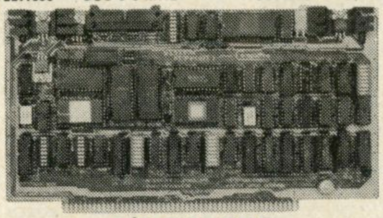
6 or 8 MHz Provides true 16 Bit Power with a standard 8 bit S-100 bus

KIGBT1612A	A&T 6Mhz	$425.00	$399.00
KIGBT1612C	CSC 6/8 MHz	$525.00	$498.00

CPU-Z Z80 CPU

2/4 MHz Z80 CPU 24 Bit Addressing

KIGBT160A	A&T	$295.00	$280.00
KIGBT160C	CSC 3-6 MHz	$395.00	$375.00



I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K EPROM or RAM provision, 15 levels of interrupt, real time clock, optional math processor

Part No.	Description	List Price	Our Price
KIGBT162A	Assembled & Tested	$399.00	$360.00
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KIGBT8231	Math Chip		$195.00
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KIGBT162AM1	A&T with 8231 Math Chip		$555.00
KIGBT162CM1	CSC w/8231 Math Chip		$655.00
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KIGBT1748C	CSC 200 hr. 8 Port	$849.00	$750.00
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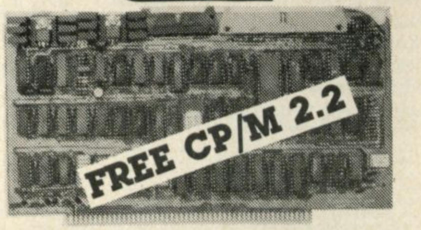

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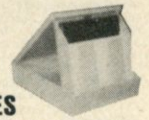

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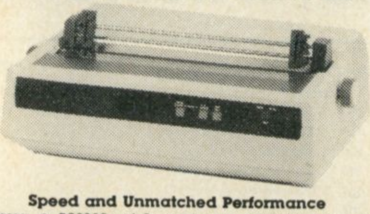

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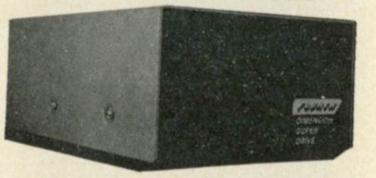

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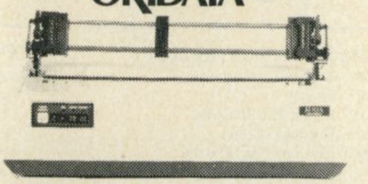

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- 6x9or12 Matrix for graphics
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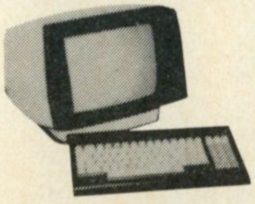

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*As used in the IBM P.C.

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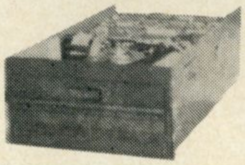

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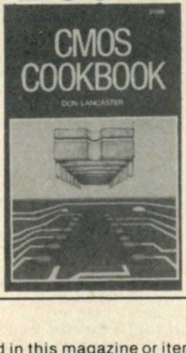

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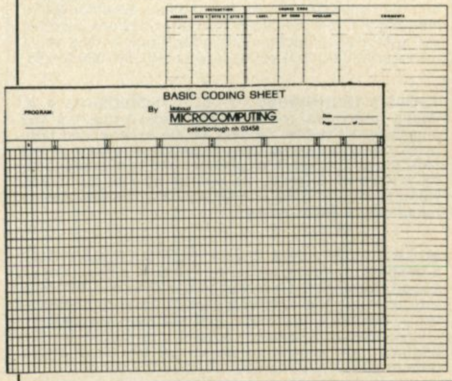

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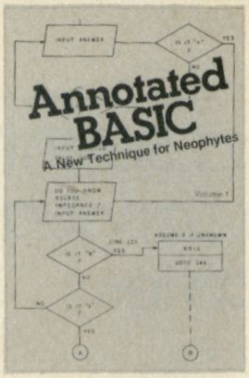

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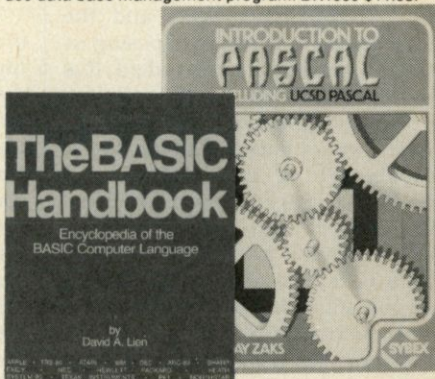

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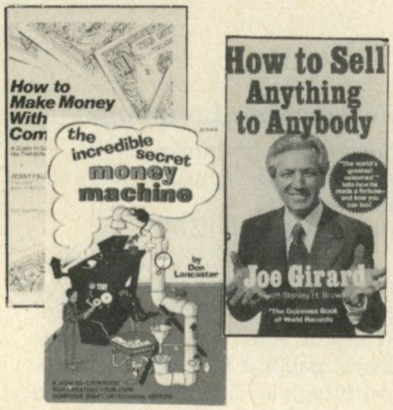

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Pascal for Engineers and Scientists
Master Apple Machine Language
PET Games, Games, Games
Playing the Market
Definitely Not for Dilettantes

Pascal Programs for Scientists and Engineers

Alan R. Miller
Sybex, 1981
2344 Sixth St.
Berkeley, CA 94710
Paperback, 374 pp., $16.95

This book shows how far the microcomputer industry has come from its game-playing origins; Miller leads us through the mazes of Gauss-Jordan eliminations, Shell-Metzner sorts and the Romberg method instead of exposing us to caves, dragons or alien invaders. It is an important addition to the growing group of publications which help microcomputer owners take full advantage of the capabilities of these remarkable devices. The special advantages of Pascal for development and maintenance of complex programs are well illustrated. The book is not for absolute beginners (unless you are content to copy and use programs without making any adaptations for your own use), but it makes an excellent complement to an introductory book such as Luehrmann and Peckham's *Apple Pascal—A Hands-On Approach*. (For a review of this book see *Microcomputing*, April 1982, p. 180.)

Among the best features of the book are the many clear examples of top-down programming, a widely cited advantage of Pascal. Time and again, Miller takes the reader through derivation of the equations on which a program is based, writes a simple version which is quite easy to understand but does not give the desired precision, capacity, etc., and then goes on to progressively more complex versions with additional features. Anyone who works through these programs will learn a lot about programming in general and Pascal in particular. People in a hurry can just enter the final versions and still get their money's worth.

My initial impression of the book was that the title is backwards; it seems to be written for engineers first and scientists second. Nevertheless, scientists who make extensive use of simultaneous equations and complex curve fitting should find it useful, at least in some parts.

Like the other Sybex books I have seen, it is very well produced; the type is clear, easy to read and well spaced. The programs are the easiest to read and enter that I have ever seen. Typesetting doesn't usually merit comment, but it is really quite remarkable in Miller's book, and it is certainly much better than in most programming books.

The programs in the book are written in Standard Pascal; this has some advantages and some disadvantages. The programs can be used on any computer which has a Pascal implementation, but they can't take advantage of special features (such as graphics) which make some versions of the language so attractive. I think the use of Standard Pascal was a wise choice, and Miller has been very careful to make as clear as possible the ways in which various extensions of the language might be utilized. The generality of Miller's approach is shown by the first chapter which presents programs for evaluating the limitations of various Pascal compilers, and programming approaches to bypass some compiler deficiencies are specified. It's hard to imagine a Pascal implementation with which this book could not be used.

The second chapter deals with simple mean and standard deviation calculations and random number generations. A chapter on vector and matrix operations leads logically into solution of simultaneous equations, and this is followed by a chapter on linear curve fitting. (This chapter is enhanced by a rather clever procedure for simulating curve plots using a conventional printer; the 80-character resolution is clearly not suitable for publications, but it does give a good idea of how well the curve fits the points.) Subsequent chapters deal with sorting of numerical data (bubble, Shell-Metzner and quick sorts are covered), advanced curve fitting and equation solving, and numerical integration of the area under a curve by several methods (trapezoidal rule, Simpson's Integration and the Romberg method). Finally, two approaches to nonlinear curve-fitting equations are presented, and the last chapter includes advanced applications such as calculation of normal distribution curves and the Gaussian, Gamma and Bessel functions. A useful appendix includes a summary of the major features of Standard Pascal and a brief bibliography precedes the rather limited index.

From my point of view, the only important deficiency in the book is its lack of statistical programs. Only mean and standard deviation calculations are presented. For my fellow biomedical scientists, an additional chapter including standard error calculations, t tests, analysis of variance, etc., would have enhanced the usefulness of this attractive book. My advice to prospective purchasers is to spend a few minutes in your local computer store looking over the book to see if it fits your needs. If it does, buy it; you certainly won't have any trouble following, entering or using the programs.

James R. Florini
Syracuse, NY

Apple Machine Language

Don Inman and Kurt Inman
Reston Publishing Company, Inc., 1981
Reston, VA 22090
Paperback, 224 pp., $12.95

Many computer hobbyists avoid machine-language programming. Convinced that it is too difficult to master, they leave machine language alone and work with high-level languages such as Basic or Pascal.

Apple Machine Language explains programming in the Apple's native tongue in a clear and understandable manner. It guides the reader from Basic, through the monitor program, and finally to the Apple mini-assembler. Each segment of the book is filled with numerous examples.

The book is divided into twelve chapters and three appendices. It's well organized and reveals careful and thoughtful planning. It covers fairly advanced topics as well, such as binary and BCD mathematical methods, multiple byte arithmetic and two's complement representation. Practical uses for the various techniques are given in graphics, arithmetic and game examples.

Exercises are given at the end of each chapter. These are helpful in determining if the preceding information was learned correctly. Answers to the exercises are provided as well. Though the book is intended for use by an individual, it can easily be adapted for a classroom situation.

In order to get the most out of *Apple Machine Language*, it would help to know something about Basic and be familiar with the Apple II computer. Without a bit of prior knowledge, some things in the book might be a bit confusing.

Since the book uses the Apple mini-assembler, it is not possible to do many of the examples on an Apple II Plus without the Integer Basic card. This is because the mini-assembler, step and trace, and Sweet 16 interpreter are located in the Integer Basic ROMs. The book is written assuming the user has both Integer and Applesoft Basic available, although all examples are given in Applesoft Basic.

Apple Machine Language is a very good introduction to machine and assembly language. It removes the mystique that surrounds programming in zeros and ones, and makes it understandable, practical and rewarding.

Robert Swirsky
Cedarhurst, NY

PET Games and Recreations

Mac Oglesby, Len Lindsay and
Dorothy B. Kunkin
Reston Publishing Co., Inc., 1981
Reston, VA 22090
Paperback, 256 pp., $9.95

PET Games and Recreations contains program listings for twenty simple games and a tongue-in-cheek discussion of PET programming techniques. The programs provided are intended for use with both new and old versions of the Commodore PET/CBM computers. Most of the programs make use of PET's effective but limited screen graphics capabilities. Do not expect any exotic graphics from these programs.

The collection of games includes several simple games designed and/or revised for use with the PET. They have been separated into four categories—games of chance like In Between, plan-ahead games like Tic Tac Toe and Brainbuster, reasoning games that include the classic Hurkle, and language and counting skills games such as Crossword Puzzle.

It is strange that two types of games that are best suited to PET's limited graphics capabilities are not represented in this book. Real-time action games (like Pong or Breakout) and Adventure games that are entertaining but use few graphics are absent.

Six recreational project programs that do provide entertaining activities using bouncing balls and other animation complete the program selection of the book.

The last chapter is a frivolous discussion of some unusual PET programming techniques, added almost as an afterthought.

Each of the program listings is introduced with a commentary about game background. The program listings reproduced in the book were printed using a NEC Spinwriter. This method provides clear, legible print and should insure accurate program listings.

It took about an hour to input the listing of In Between. Two hours of debugging and getting the graphics to look right followed. I discovered that it is difficult to count spaces and interpret graphic symbols correctly, even from the Spinwriter listing. I also noted that a few lines of the In Between listing are not reproduced as intended. Lines 25216, 25219 and 25264 use spaces instead of the backspace character (←). The symbol for this character is supposed to be a tilde (~) according to the introduction in the text.

At least nine of the programs contained in the book are available on a single cassette tape from Reston Publishers Software, 11480 Sunset Hills Road, Reston, VA 22090. My experience indicates that this tape may be worthwhile, especially if you are interested in more than a few of the games included in *PET Games and Recreations*.

An investment in *PET Games and Recreations* should be worthwhile if you have never modified any of the many games available in the public domain to run with PET graphics.

S.J. Gradijan
Carrollton, TX

Playing the Stock & Bond Markets with Your Personal Computer

L. R. Schmeltz
Tab Books Inc., 1981
Blue Ridge Summit, PA 17214
Paperback, 308 pp., $9.95

L. R. Schmeltz says his book is aimed at relative novices—in regard to both computer programming and stock market knowledge. His aim is accurate. Experienced programmers and investors probably will learn little. But if you are indeed a novice in both areas, you should get a reasonable return on your ten dollars.

The programs included are in Basic, specifically Applesoft. Suggestions for converting to other Basics are included, but fall far short of hitting the mark, at least as compared to Microsoft Basic. Don't do what I did, namely type in the first long program with the thought of doing the rework on the screen. I ended up with seven pages of Basic code—over 300 lines—which I abandoned before getting it to run.

I'm a sucker for trying programs. I always figure I'll learn something even if I have no particular use for a specific program. And such was the case here. "Fundamental Analyst" uses both sequential and random files, a personal weak point. Great learning stuff, I thought. Well I learned all right. I can now use, at least hesitantly, Microsoft's file systems—but they're so different from Apple's I would have had to completely redo Schmeltz's program. And I didn't really want that particular program that badly.

"Fundamental Analyst" requests 17 pieces of financial data on each of three companies. The data was difficult to collect, in that I needed an annual report, Value Line Investment Survey reports and current newspapers to amass them. And I still had question marks on some items. Current assets and liabilities, sure. But year end inventory? Par value of preferred stock? And annual reports are just that—annual. Getting truly current data would be an almost impossible chore, certainly if any number of firms were to be examined.

The data was used to calculate various financial ratios, such as operating profit margin, current ratio, and sales to fixed assets. Many of the results might be better found in Standard and Poor data sheets or from the Value Line service (available in libraries if you don't want to spend the $300 a year).

The second program is "Stock Trend Analyst," which calculates a moving average over a period of time. Again, a major data problem if you want to look at one stock one day and several others the next day. Still, getting the program up and running will add to the skills of a nonprofessional programmer.

The final program is "Dollar Cost Averaging Analyst," which simply keeps track of shares and share prices of a stock you buy on a dollar-averaging basis (that is, buying a constant dollar amount of stock at fixed intervals). The theory is you buy fewer shares when the price is high, more when the price is low, and your average price is thus reasonable. Such an investment program is most easily expedited when buying mutual fund shares, a procedure that clearly negates the need for a computer program to follow the results. But again, by getting the program up and running you'll end up a bit smarter.

What about the stock investment advice generally? Not bad. It's very basic, and my favorite approach is not discussed (select an industry group, then select the best-looking stock within that group). Apart from a mildly distracting habit of using too many exclamation points (one is too many—two or three on a page is downright irritating), Schmeltz offers advice which is quite sound.

For investment novices, I would suggest first reading the classic *How to Buy Stocks* by Louis Engel (a Bantam paperback). This is the beginner's bible, frequently given to investors if they buy through a full-service broker.

Schemltz includes an extensive bibliography, a glossary of computer terms, a handy glossary of investment terms, a list of additional information sources and a very interesting 18-page listing of commercially available investment programs —including an expanded package of his own, for Apple, of course.

The listings are large and clear. The few charts and tables are also clear but the photos are inexcusably muddy.

Is the book worth buying? Yes, for Apple users who would like to get some more programming practice while learning something about investment in common stocks. For non-Apple users, probably not. Schmeltz uses the Applesoft POKE graphics command to format the output to the screen—very unlike Microsoft use. And the awkwardness of the rest of the formatting commands will irritate those whose Basic offers print using (Schmeltz accurately notes how much neater the program could be with print using). Yes, conversion is possible, but at the cost of a lot of work—more than I was willing to do.

Although I personally found the programs themselves to be of marginal interest, I believe there are definite benefits to be gained from the book—you'll learn something about stock market investment and get some forced-draft practice in Applesoft.

Dex Hart
Miami, FL

Interfacing to S-100/IEEE 696 Microcomputers

Sol Libes and Mark Garetz
Osborne/McGraw-Hill, 1981
630 Bancroft Way
Berkeley, CA 94710
Paperback, 340 pp., $15.99

Interfacing to S-100/IEEE 696 Microcomputers is exactly what the title implies—it's the complete book on the philosophy, technique and methods of connecting any and all devices to the S-100 bus. There is virtually nothing that is left out of this work.

The book is not intended for the casual game dilettante or even the serious business programmer. The reader will need to have a thorough knowledge of electronics, including digital theory. The book assumes you understand digital logic functions, how to use TTL integrated circuits, how to read schematics and how to translate a schematic into a working circuit board. A basic knowledge of computer hardware is a must, and the ability to program in assembly language is an absolute necessity.

The book is marvelous. Everything you want to know about S-100 interfacing is in the book, including theory, specific hardware and circuits, and applications software both in flowchart form and actual assembly listings. The reader may have to dig a little to find the circuits he needs for his own application, but rest assured, they're in there. All he has to do is put them together. However, I must caution you—only the *interface* is discussed in the book, the peripherals themselves are not covered.

The text begins with a complete description of S-100 bus signals. The IEEE-696 standard is used as the basis of all the discussions, as this standard has become the yardstick against which all S-100 systems are measured. For those who still use the older buses, a comparison of a few of the other definitions are given, as well as the IEEE-696 standard. The book defines the function, polarity, whether active high or active low, symbol, and timing relationships for all 100 lines on the S-100 bus. There is even a section on proper termination of the individual lines.

There is an entire chapter on the timing relationships for the signals on the bus, and how they apply to various purposes and applications. Complete diagrams of the signals and their relative timing are given. Anyone who has ever tried to design a circuit board for any bus will appreciate this section.

The text shows all the circuits needed to derive all sorts of chip enable signals from the bus lines. The circuits for memory read and write, I/O transfers, wait states, buffers and many others are shown in detail. There is a discussion of address decoders, a full list of memory chips, and how to make both RAM (random access memory) and ROM (read only memory) boards using many of the popular RAM and EPROM chips.

Input and output is the most common use of interfacing to any computer. The book covers it well and in great detail. There is a complete discussion of I/O ports, I/O mapping, memory mapping and handshaking. We see at every turn the specific circuits and chips to be used. Both parallel and serial interfacing are covered, with several methods of doing each with many of the popular interfacing chips, including the popular 6820, 8255 and 6520. The short section on handshaking is written as clearly as I have ever seen it done.

There is an entire chapter on the hazards and pitfalls (with solutions) of interfacing to the real world. Unfortunately, it leaves off much of the theory of ADCs and DACs, but a complete treatment of these subjects can (and has) taken an entire book all by itself.

The serious computer enthusiast or technician will find the chapter on interrupt techniques very useful. There is also a whole chapter on timers and counters, which every person who uses microcomputers in scientific applications will find indispensable.

For the hobbyist, experimenter, technician or scientific user, the last chapter is one called simply, Useful Circuits, which is a glorious hodgepodge of little tricks of the trade.

There is, naturally, a collection of full appendices.

Whenever I write a book review, I always try to be even-minded about the book. I try to list an equal number of good and bad qualities. I ran into trouble with this work. I'm afraid that my list of shortcomings boils down to just a few picky little items. Those qualities are entirely concerned with some of the notation used in the text and the diagrams. My complaint is that the notation is not standard. Instead of drawing in pull-up resistors, they are represented by a diamond shape in the line they are supposed to pull up. A group of 8 or 16 wires all traveling to and from the same place is represented by a single line with the number of wires above it. In the text, and also in some drawings, active-low lines, instead of being represented by the mnemonic with a bar over it, are noted as the mnemonic with an asterisk in front of it. There is nothing wrong with this notation—it just takes a little getting used to, and could be confusing to someone not as well initiated in the finer points of electronic theory. I personally would have preferred the standard notations.

The S-100 bus has endured well. For those who want more from their S-100 computer than they can afford to buy, or for those who want to tinker with their machines and try to build peripherals or memory for it, this book gets my highest recommendation.

Gordon W. Wolfe
Metairie, LA

More from Commodore

A wide range of computers has been introduced by Commodore Business Machines, Inc., The Meadows, 487 Devon Park Drive, Wayne, PA 19087. For games-and-graphics enthusiasts, the Max Machine is an inexpensive game machine with limited programming capability. It is built around the new 6510 microprocessor chip, and produces 16-color graphics. Using a special sound interface device, the Max can generate three voices with a nine-octave range; programmable ADSR, programmable filter and variable resonance are available for high-quality sound. Price is $179.95. At the high end of the range, the BX256 is a multiprocessor computer for professional users. This 256K-byte micro features an 8088 16-bit processor for CP/M-86 compatibility. An attached 80-column green phosphor screen and built-in dual disk drives provide an efficient business package. The BX256 costs $2995.

Commodore is also offering the P128 and B128 6509-based microcomputers. Both come with 128K RAM (expandable to 256K), and both can be used for sound synthesis. The PET P128 interfaces with a color monitor or TV to display 16-color high-resolution graphics; it costs $995. The Commodore B128 includes an adjustable 80-column display screen, detachable keyboard and dual drives; price is $1695.

The Commodore 64 is an interesting hybrid, designed for versatility. It can use VIC 20 peripherals, and runs many programs and files written for PET and CBM computers. With the addition of an IEEE-488 cartridge, the Commodore 64 can run other Commodore peripherals, including CBM disk drives and printers. A PET emulator makes it operate like a PET in many respects, and a Z-80 add-on processor board turns the Commodore 64 into a CP/M machine. The basic configuration costs $595. Reader Service number 467.

DEC Micros

Digital Equipment Corp.'s Rainbow 100 personal computer. The LA50 dot matrix printer, shown at left, is one of three printer options.

Digital Equipment Corp., Maynard, MA 01754, has introduced a new series of modular microcomputers.

The Rainbow 100 runs both eight-bit and 16-bit software; the machine is designed to automatically read programs in either format without the need for operator intervention. Its CP/M-86/80 operating system makes it compatible with the widest possible variety of off-the-shelf software. It can be used as a stand-alone unit or be interfaced with DECmate, PDP-11 or other large systems. The Rainbow 100 has a detached low-profile keyboard, a standard 12-inch monitor, dual floppy disk storage, 64K bytes of random-access memory, I/O ports and self-test diagnostics. It costs $3245; upgrades are available.

The DECmate II is a multipurpose stand-alone system targeted primarily for office management. It features an advanced word processing software package, and can be linked to other computers via communications software. It runs COS-310 operating system and DIBOL programming language. Price is $3745.

The Professional series, comprising the Professional 350 and 325 microcomputers, features the PDP-11/23 CPU chip, 256K bytes of memory and true multitasking operating system. The 325's 19-inch-wide system contains the processor, power supply, communications ports and dual five-inch floppy disk drives. The 350's wider unit also contains space for an optional Winchester drive. The Professional 325 is priced at $3995; the Professional 350 is $4995. The Winchester option costs $3500. Other options are available. Reader Service number 471.

The Commodore Max Machine.

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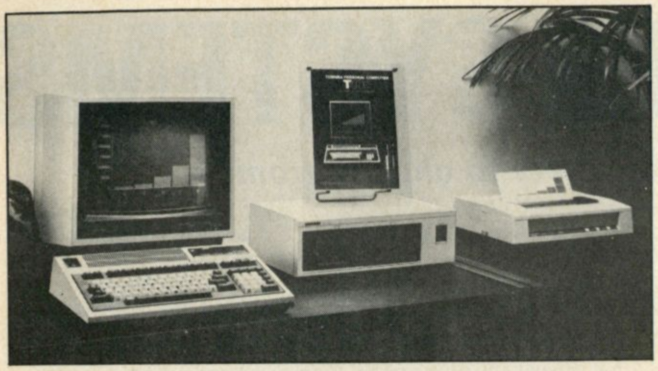


The T100, Toshiba's personal computer, is available with a variety of hardware and software options.

personal computer is aimed at operators of small businesses. The T100 boasts three standard memory units, up to 1M external floppy disk memory, several input/output video screen arrangements and high-resolution color graphics. For main memory, the T100 uses a 64K-byte RAM; it also uses a 32K-byte ROM for Basic language and a 16K RAM for video. Optional RAM and ROM packs offer the flexibility of easily transporting files and programs between home and office machines. The basic configuration costs $2485.

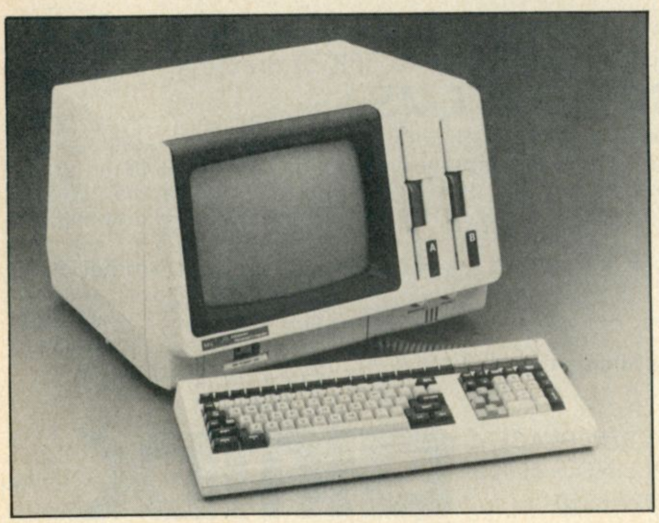
Toshiba America, Inc., Information Systems Division, 2441 Michelle Drive, Tustin, CA 92680. Reader Service number 477.

NEC Advanced PC

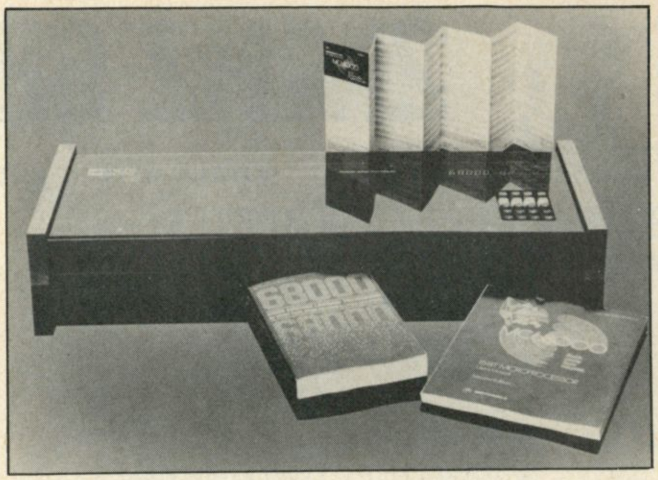
The Advanced Personal Computer, from NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173, is based on the 16-bit 8086 microprocessor. This 128K-byte micro runs CP/M-86. The APC comes in two versions—color and monochrome. The monochrome model includes a single 1M eight-inch floppy disk drive and a green-screen monitor; price is $3298. The color model has two disk drives and a high-resolution monitor that can display eight-color graphics; it costs $4998. Reader Service number 473.

The Micro 68000

The Micro 68000, from Computer Systems Associates, Inc., is a self-contained trainer/prototyping system for engineers and technicians. It comes with a 6 A switching power supply, 20-key keyboard, 28-digit hexadecimal display, 80-bit binary display and keyboard monitor program. The Micro is the only trainer that allows direct entry of machine code.



NEC Information Systems' Advanced Personal Computer.



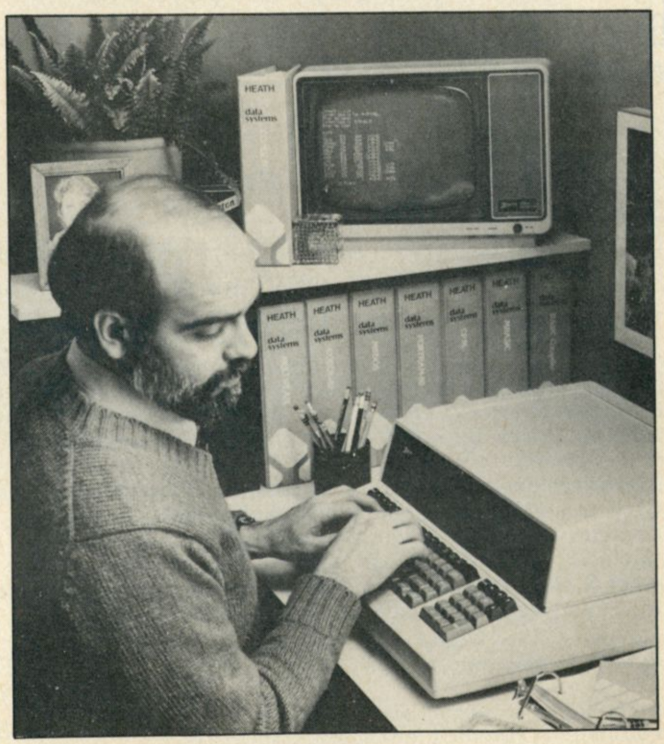
Computer System Associates' Micro 68000 trainer system.

The Micro 68000 comes with a copy of *68000 Assembly Language Programming Book* (Osborne-McGraw-Hill) and *16 Bit Microprocessor Users Manual*. Price is $985.

Computer System Associates, Inc., 7562 Trade St., San Diego, CA 92121. Reader Service number 469.

Zenith's 8/16 Machine

A new series of desk-top computers was introduced by Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025. The Z100 series includes both eight-bit and 16-bit microprocessors, a five-slot S-100 bus, 128K bytes of RAM and an integral keyboard. Eight-color graphics enhance its value as a design tool. Digital or RGB output is standard. The basic Z-100 includes one disk drive and costs $3249. The low-profile Z-110 includes two drives and also has monochrome composite video output; price is $3999. The Z-120 incorporates a 12-inch green phosphor screen, and costs $4099. Zenith also offers a high-resolution RGB color monitor for $699. Reader Service number 479.



The low-profile Z100 computer from Zenith Data Systems.

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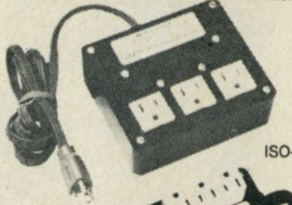

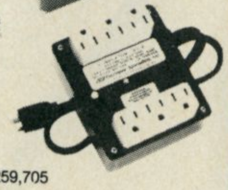

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The HSDS Software has more than One Year's FIELD Experience. The latest HSDS version adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, definable directory size, and many utilities including bulk copies between floppy and hard drives, multiple purge, Superzap, and Directory Catalog System. Full program compatibility with TRSDOS 2.0a is maintained. Mixed floppy and hard drive operation is supported.

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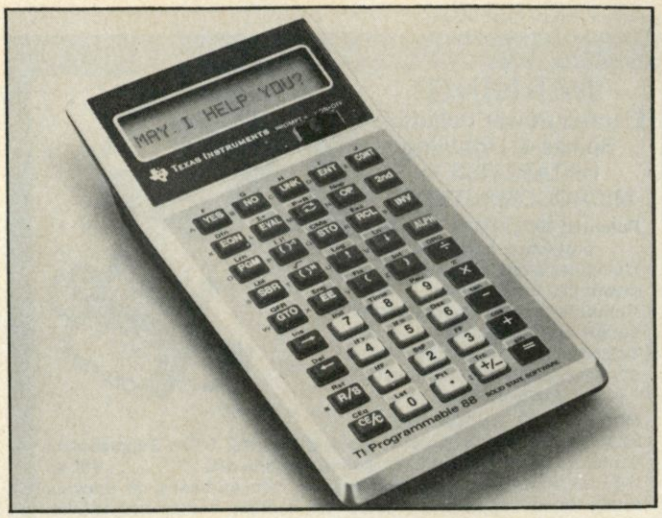


The TI-88's 16-character alphanumeric liquid crystal display represents each of 128 characters clearly and precisely.

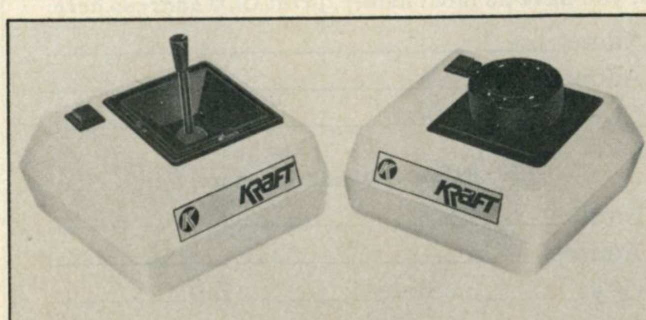
A Sophisticated Handheld Computer

The TI-88 Programmable Calculator can be interfaced with its accessory peripherals to provide a portable computer system with nonvolatile memory features. A built-in user prompting response function helps the user work through difficult programming questions step-by-step. Numbers, upper/lowercase letters, punctuation, superscripts, common Greek letters and other special characters are represented. An enhanced algebraic operating system lets the user enter formulas as written on paper, without transposing to more intricate computer notation. Two module supports will accommodate Constant Memory modules for memory expansion or Solid State Software modules for fast access to professionally-written programs. A rechargeable battery, tone beeper and timekeeping features are incorporated. The TI-88 Programmable Calculator costs $350; Constant Memory modules are $50 each; and Solid State Software modules average $40 each.

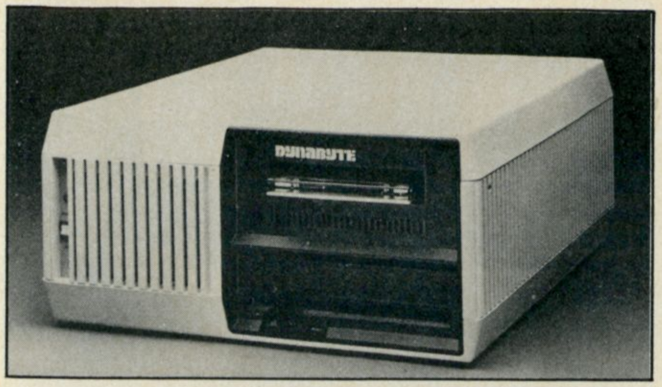
Texas Instruments, Inc., PO Box 10508, Lubbock, TX 79408. Reader Service number 476.

Fine-Tuned Control

Long-life linear potentiometers, selectable stick operating characteristics and styled enclosures are features of a new line of precision joysticks and paddles announced by Kraft Systems, Inc., 450 W. California Ave., PO Box 1268, Vista, CA 92083. These products are designed for plug-in compatibility with Apple II, TRS-80 and IBM Personal Computers. The joysticks feature instantly selectable spring return centering or free-floating operation, with electrical centering adjustments on each axis. Reader Service number 472.



Paddles and joysticks from Kraft Systems add a new dimension of control to your Apple, TRS-80 or IBM PC.



Dynabyte's Monarch computer.

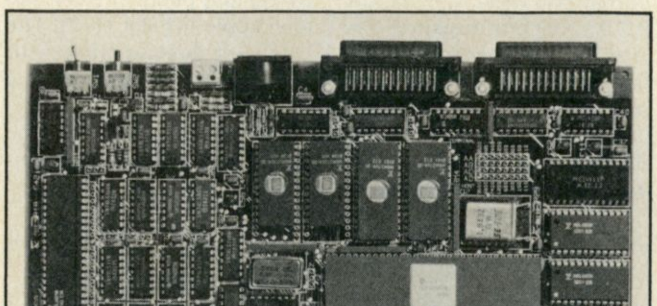
Versatile 16-Bit Box

The Dynabyte Monarch multiuser computer system offers a large selection of both eight-bit and 16-bit operating systems: Monarch supports CP/M, MP/M II, CP/M-86, MP/M-86, UNIX, Oasis-8, Oasis-16 and Business Basic. The 8 MHz 8086 and 6 MHz Z-80B support up to 16 users, allowing concurrent operation of both eight- and 16-bit software. Monarch was designed for word processing, financial modeling and other business applications—as well as networking and communications. Monarch's Model 6600 standard configuration includes 256K bytes of RAM, 19M bytes of Winchester disk storage, nine RS-232 serial ports, one RS-422 high-speed port, one parallel port and an eight-inch IBM-compatible disk drive for under $11,000.

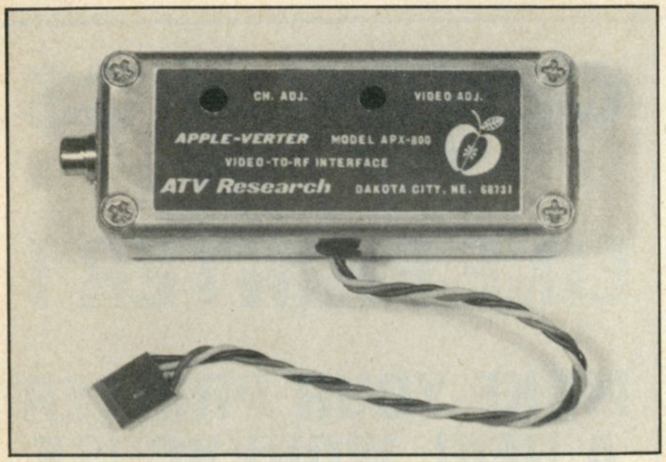
Dynabyte Business Computers, 521 Cottonwood Drive, Milpitas, CA 95035. Reader Service number 480.

68000-Based Single Board Computer

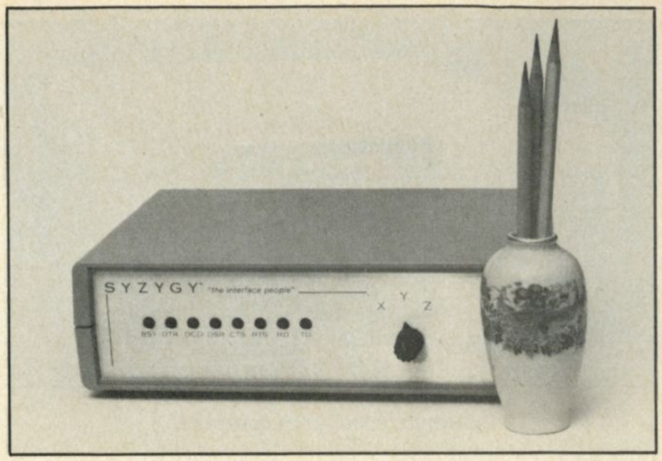
The 68 Magnum 16/32-bit single board computer is offered by Intellimac, Inc., 6001 Montrose Road, Sixth Floor, Rockville, MD 20852. The 68 Magnum stand-alone computer combines the MC 68000 CPU (6 MHz version) with 128K bytes of 200 nanosecond RAM. The board features 16K bytes of operating system EPROM, 16K bytes of user EPROM, two RS-232 serial ports with selectable baud rates, a parallel port, audio cassette serial I/O port, three 16-bit programmable timers and reset and abort function switches. By adding a power supply, terminal and off-line storage device, you can create your own 16/32-bit computer system. Price is $745. Reader Service number 481.



The 68 Magnum single board computer, from Intellimac, Inc.



The Apple-Verter APX-800 mounts inside your Apple and plugs into your color TV.



The Syzygy Serial Switchbox.

Apple Modulator

A high-fidelity, color video modulator is available from ATV Research, 13th and Broadway, Dakota City, NE 68731. The Apple-Verter Model APX-800 is a high-VHF-band tunable modulator for the Apple II computer. It mounts inside the Apple and plugs into the existing power/video plug. A direct-connect antenna cable is supplied. By operating above normal computer harmonics, in the high-VHF band (tunable channels 7–10), the APX-800 exhibits high stability; this makes it ideal for use on non-tunable, quartz-locked TV receivers. A built-in 5 V regulator lets you use the modulator on other computer systems with power sources anywhere from 8–24 V dc. Price is $29.95. Reader Service number 465.

Vector Graphic Micro

The Vector 4's 8/16-bit architecture makes it an ideal system for developing sophisticated 16-bit applications, according to Vector president, Lore Harp. The computer will be available with a choice of operating systems, to provide maximum program development flexibility. The Vector 4 comes with 128K bytes of main memory, using 64K RAM chips, and is expandable to 256K. Memory mapping logic allows the Z-80 to access the entire memory in increments as small as 2K. The Vector 4's main memory is time-shared between the CPU and video display controller. Software control of the display controller allows fast access to screen memory for high-resolution graphics, and also allows the screen memory to be moved anywhere in main memory. The Model 4/20 dual floppy disk system costs $4495. The Model 4/30, with single floppy disk drive and Winchester 5M hard disk, costs $5995.

Vector Graphic, Inc., 500 N. Ventu Park Road, Thousand Oaks, CA 91320. Reader Service number 478.

Switched-On Box

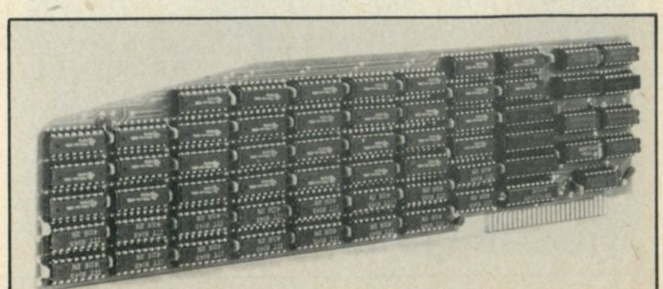
An RS-232 Serial Switchbox (P/N232SB) is available from Syzygy, 256 West San Bernardino Road, Covina, CA 91723. The box measures 7 × 10 × 3 inches; it permits manual switching of a common port to any of three distribution ports. All components are solidly mounted on a 9×6 inch PC board. Four internally mounted ten-pole socket-mounted DIP switches allow each port to be separately configured for normal or null-modem use, and can enable, disable and jumper lines 4, 5, 6, 8 and 20. The versatile switching permits rapid configuration of the Syzygy XYZ Serial Switchbox for CRT terminals, LQ printers and CPU ports. A CPU port can select any of three different printers or terminals, or three different CPU ports can select one printer or terminal. Reader Service number 475.

Apple Disk Emulator

Synetix Industries, Inc., 15050 N.E. 95th, Redmond, WA 98052, now offers a single board Solid State Disk Emulator (SSD) for the Apple II or Apple II Plus. The SSD is available in either a single disk version (147K bytes) or dual disk version (294K bytes) and plugs directly into any Apple I/O slot (1–7). The Emulator is compatible with Apple DOS 3.3, Apple Pascal and CP/M.

The single disk is $550; the dual disk is $950. Reader Service number 474.

The Vector 4 8/16-bit microcomputer, from Vector Graphic.



The Synetix Solid State Disk Emulator.

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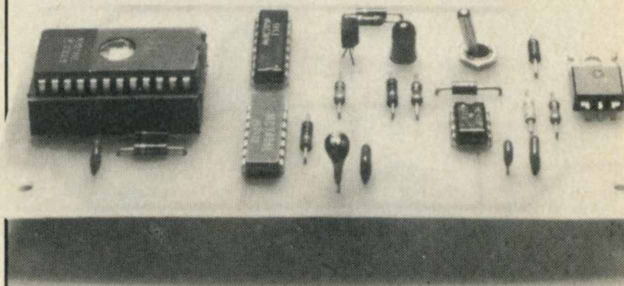
EPROM PROGRAMMER

Shown assembled. EPROM not included.



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Burtronix Protocard III system.

Apple III Interface

The Burtronix Protocard III is a new interface card for the Apple III computer. The card uses proven circuitry to interface a parallel interface chip to the Apple hardware bus, and lets the user put custom circuits right on the board and connect them to the Protocard's 6522 chip. Room is provided on the board for either a 26-pin ribbon connector (supplied) or a 25-pin D-type connector (also supplied) for external connections.

A software driver on disk is provided to link the Protocard III to Business Basic, Pascal or any other software that uses the SOS drivers. All communication with the Protocard III is handled by printing and reading simple strings from Pascal or Basic. Complete instructions are provided. Price is $195.

Burtronix, 1667 N. O'Donnell Way, Orange, CA 92667.

The Amdek Micro Floppydisk drive holds two three-inch cartridges.

Rigid Disk

The new Micro-Floppydisk dual drive from Amdek Corp., 2420 E. Oakton St., Suite E, Arlington Heights, IL 60005, offers 1M capacity and is plug-compatible with standard five-inch floppy drives. The Amdek drive has a built-in power supply and accommodates two three-inch cartridges. Cartridges, which are priced about the same as standard floppies, feature flip-top head covers that protect the disks from dust, scratches or fingerprints. The hinged cover automatically flips open when the cartridge is inserted in the drive unit. Micro-Floppydisk drive costs $899. Reader Service number 464.

VIC-20 Expansion

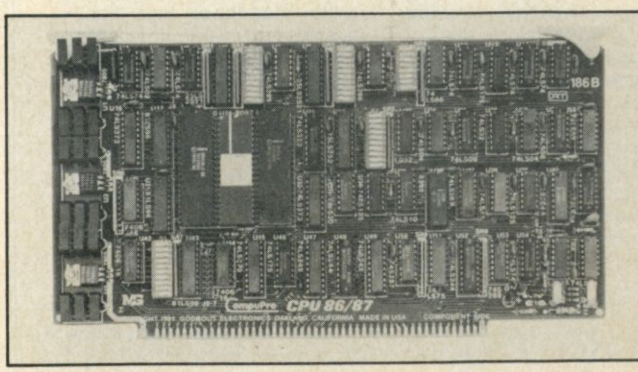
The "Cardboard" is an expansion motherboard for Commodore's VIC series computers. The board has six slots that will accept any VIC-compatible cartridge in any configuration. Blocks of memory can be switched in or out with on-board switches, as can utility ROMs and games. The Cardboard lets you increase RAM up to 40K and also use several utility ROMs. A system reset switch is included on the Cardboard, so you can restart games without turning off the computer. Units can be daisy-chained. The Cardboard costs $119.95.

Cardco, Inc., 3135 Bayberry St., Wichita, KS. Reader Service number 466.

S-100 Board Provides 16-Bit Capability

An 8086/8087 microprocessor board from CompuPro Systems, Oakland Airport, CA 94614, gives you the 16-bit advantage, as well as provision for adding a mathematics coprocessor and operating system firmware. The CPU 86/87 is compatible with IEEE-696/S-100 standards, and is available in either 8 or 10 MHz versions. The board accommodates both eight- and 16-bit words; its on-board logic can read or write two bytes serially for eight-bit applications, or pass word-wide values for 16-bit operation. Users can mix both types of device on one system.

CompuPro's new board accepts Intel's 8087 math processor and 80130 operating system firmware. The math processor offers high-speed number crunching, and the firmware adds an eight-level vectored interrupt controller, three interval timers, and a choice of silicon-based operating systems: the iRMX-86 kernel or CP/M-86. Price is $695 for the 8 MHz and $850 for the 10 MHz version. Reader Service number 468.



CompuPro's 8086/8087 CPU board provides 16-bit capability.

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Software for Hard Science

Several new eduational packages promise to make it easier to learn chemistry. Computer Aided Instruction for General Chemistry includes from 50 to 70 drills, exercises and problems per program covering every major topic in undergraduate general chemistry. Each of the 20 programs is designed to be interactive; the student can select random subtopics, restart the program or stop at any point to load a new program. The software is available for TRS-80 Model III, Apple II and Commodore PET microcomputers.

Concentrated Chemical Concepts provides introductory chemistry for allied health students. Written for the Apple II microcomputer, this package of drill and practice exercise programs covers topics in general, organic and biological chemistry. Interactive programs include simulations, problem-solving drills, term and definition matches and a unique nomenclature drill. The package takes advantage of Apple color, graphics and sound.

Prelab Studies for General, Organic and Biological Chemistry reviews selected concepts encountered in the laboratory. Topics covered represent areas that usually require a special effort by instructors to ensure full student understanding. The program reinforces numerical and decision-making skills needed in the lab. For Apple II only.

John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. Reader Service number 483.

Special Education

Administrative software for the special education departments of public and private schools is being distributed by Creative Educational Service, 36 River Ave., Monmouth Beach, NJ 07750. The IEP/MS system manages "individual education programs" for handicapped students; these programs are now required by federal law. The management system leads the user through the process of preparing all necessary reports. IEP/MS is available for Apple, TRS-80 and CP/M-based microcomputers. Reader Service number 485.

The 25th Hour

A series of timesaving software for both professional and personal use is available from Softrend, Inc., PO Box 1462, Charlottesville, VA 22902. The 25:01 Time Scheduler/Organizer provides automatic scheduling of recurring activities, optional reminders for events, appointment scheduling and daily activity calendar. All entries are checked for appointment conflicts and weekend dates are flagged. The package can handle any number of people. It costs $99.

The 25:02 Magazine/Book Reference program locates article references or other information from various journals, newspapers and books. Entries are stored and recalled by publication, author, primary and secondary topics, and key words. Price is $69.

Each package in the series incorporates extensive screen prompting, optional use of printer, and advanced file handling techniques. They run on the IBM Personal Computer. Reader Service number 486.

SuperPilot

A versatile extension of the Apple Pilot software language has been announced by Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. SuperPilot joins several new products in Apple's series to help educators and industrial trainers create lessons and illustrations for computer-aided instruction. It features graphics enhancement, easy debugging and external video control. SuperPilot runs on an Apple II or Apple II Plus with 64K RAM. Price is $200. Reader Service number 484.

Telecommunication Software

Two new programs have been added to the NTD-II series of traffic optimization software. These programs improve management of long distance costs by adding the Other Common Carrier (OCC) option and Exchange (NNX) analysis. The NTD-1C Toll Statement Analyzer is preprogrammed with OCC Analysis data to provide a breakdown of hours per month of WATS-eligible and OCC-eligible traffic. This program can also determine Foreign Exchange (FX) feasibility. The cost is $1250.

The NTD-6B Multiple WATS Band Designer will configure the most complete optimization of facilities to carry a user's traffic. Options include WATS, FX, MCI, Sprint and SBS rate tables to provide optimum routing capabilities. Price is $2300.

These programs run on the HP-85, Apple II or other CP/M-based microcomputers. For more information write to HTL Telemanagement, Ltd., 1300 Old Chain Bridge Road, Suite 5, McLean, VA 22101. Reader Service number 487.

Number Cruncher

The TK!Solver program gives professionals in engineering, business and other fields the ability to quickly and easily solve problems involving math calculations and analysis. TK!Solver application packages contain predefined models for various fields; each model has preset equations, tables and values relevant to individual problems; the models can be modified to suit specific situations. In mechanical engineering, for instance, TK!Solver application packages can be used to solve problems of tensile and torsion stress analysis, piping layout and design, sizing of hydraulic and pneumatic actuators, beam deflection and cost efficiency. A TK!Solver model for investment management and analysis is particularly useful for calculating investment yields. And the TK!Solver program can be used for teaching any concept of high school science that involves mathematical description, whether in biology, chemistry or physics. Among the models developed for the high school science package are population growth, radioactive decay, projectile motion and chemical equilibrium. TK!-Solver is currently available for the Apple and IBM Personal Computer.

Software Arts, Inc., 675 Massachusetts Ave., Cambridge, MA 02139. Reader Service number 488.

VIC-20 Quartet

Three new packages for HAMs and a fourth for file maintenance are offered by RAK Electronics, PO Box 1585, Orange Park, FL 32073. VIC File is a multipurpose file system that automatically expands available memory. Commands include Load, Save, Print, Add, Change, Sort and Delete. Requires minimum 3K expansion. Price is $9.95.

WAS Record is an Amateur Radio program that maintains your Worked All States record for HAM Radio with a need/worked/confirmed status and the call of the station

worked for each state. WAZ Record maintains Worked All Zones records. DXCC Record maintains your DXCC Record. Each Amateur Radio program costs $6.95. The WAS and WAZ Record programs require a 3K memory expansion; DXCC requires an 8K expansion. Reader Service number 495.

Apple Is a Learning Machine

Two programs for children are available from The Learning Company, 4370 Alpine Road, Portola Valley, CA 94025. Moptown is a set of 11 logic games; Magic Spells is a word game combining large text, color graphics and music. The programs were designed to guide children through a series of adventures that promote original thinking. There is no violence, and there are no "wrong" answers to discourage the child. Reader Service number 482.

Datacomm for Apple

"Hello Central" puts the Apple microcomputer in direct communication with other computer systems—mainframes, minis and micros. It also taps into hundreds of databases such as Dow Jones and The Source. Messages or whole files can be transferred using a text buffer with 180,000-character capacity. "Hello Central" can be used as an automatic telephone dialer to handle unattended computer hookups.

Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360. Reader Service number 494.

Dental Aide

The Dental Management System is an integrated package for the solo practitioner. The system performs billing, receivables, patient recall, insurance form preparation, management reporting and so on for over 2500 patients. Stored information is instantly accessible. The program runs on the Apple II. Price is $1500.

SmithRick Associates, 113 Trenton Lane, Greer, SC 29651. Reader Service number 496.

Mystery Adventure For Atari

The Nightmare is an enigmatic adventure for the Atari 400/800 personal computer. Unsure whether his surroundings are "real" or merely apparent, the player finds himself trapped within a shadowy castle—the dwelling at the depths of his unconscious. As the player moves his joystick, the computer reveals (in full color graphics) the frightening and bizarre contents of the castle. The heavy iron door behind him is sealed, and only one means of escape is possible. The player must retrieve his mind's eye, lost in the tunnel of death, and return with it to the sealed door. Then and only then can he return to conscious reality. Price is $29.95.

Epyx, PO Box 4247, Mountain View, CA 94040. Reader Service number 493.

VisiCalc File Linker

The Consolidator, from Omega MicroWare, Inc., 222 S. Riverside Plaza, Chicago, IL 60606, operates on VisiCalc files to link them together and allow manipulation of totals—without requiring the user to reenter information. For example, The Consolidator will total the results of four weekly reports to get monthly results, using only information that has already been entered and saved. The Consolidator will also print out VisiCalc commands and formulas, and the locations to which they apply. For Apple II microcomputers. Price is $49.95. Reader Service number 492.

Apple Graphing

PFS:Graph, an easy-to-use graphics software package, is available for the Apple II. Graph is the first graphics package that can stand alone or interface directly with PFS databases or VisiCalc to produce bar, line or pie charts of presentation quality in minutes. Line and bar graphs can be mixed or matched, and up to four graphs can be displayed on a single set of axes. Bar graphs can be stacked or comparative. Other features include automatic formatting, scaling, legend labeling and pattern fill. Graph interfaces with Silentype and Epson printers, as well as the HP 7470A plotter. Price is $125.

Software Publishing Corp., 1901 Landings Drive, Mountain View, CA 94043. Reader Service number 491.

Type Right

A touch-typing tutorial is offered by Barron Enterprises, 714 Willow Glen Road, Santa Barbara, CA 93105. Type Right is a complete course of 22 typing programs. The beginner will find all necessary instructions displayed on the screen, but documentation is provided for the programmer who wants to make adaptations. Type Right emphasizes accuracy first, then speed. The program computes words per minute, with errors subtracted. Five games are included to keep the student's interest. Type Right runs on the Commodore PET and CBM 8032; disk/cassette available for 40-column systems—disk only for 80-column. Price is $30.95. Reader Service number 490.

Heath Terminal Software

Generic Software, PO Box 1154, Troy, MI 48099, offers an HDOS V2.0 device driver to control data input and display for the H19 terminal. SFDVD allows H19 screen form access to user programs written in Benton-Harbor Basic, MBasic, Fortran-80 and assembly language. With SFDVD, data collection and file update systems can be easier to use. User-written applications programs need only be concerned with reading and writing data variables; SFDVD will manage all of the terminal input and data display functions. SFDVD requires an H8-H19/H89 system with 48K RAM. Price is $19.95 at most Heathkit Electronic Centers; add $2 for shipping/handling if ordered directly from Generic Software. Reader Service number 489.

CALENDAR

Robotics Conference

"Robot Research Developments and Applications in Canada" is the title of a conference jointly sponsored by the Central Ontario Chapter of Robotics International of Society of Manufacturing Engineers and National Research Council of Canada. This conference will be held at Delta Inn, Mississauga (Toronto), Ont. on September 20–21.

Further details of the conference can be obtained from RI-SME Conference Secretariat, 6535 Mississauga Road, Mississauga, Ont. Canada. L5N 1A6.

IEEE COMPCON Fall '82

COMPCON Fall '82, sponsored by the IEEE, will be held Sept. 20–24 at the Capital Hilton Hotel in Washington, D.C. The topic of this conference will be Computer Networks. COMPCON Fall '82 will provide the forum for the researcher, vendor, user or legislator to explore and exchange ideas on the underlying technologies, applications and public policy issues for the 80s.

For further information contact COMPCON Fall '82, PO Box 639, Silver Spring, MD 20901. 301-589-3386.

MEDcomp 82

MEDcomp 82, the medical professions computer show, will be held Sept. 23–25 at The Hilton Hotel, Philadelphia, PA.

For further information contact the IEEE Computer Society, PO Box 639, Silver Spring, MD 20901.

Fall Conference on Classroom Applications of Computers

Computer-Using Educators will hold the third annual Fall Conference on Classroom Applications of Computers in San Jose, CA, on October 1 and 2.

The schedule includes exhibits as well as workshops and six hour-long sessions covering computer-related classroom activities. Curriculum topics will include all levels of education from preschool through post-secondary.

For more information concerning membership in Computer-Using Educators or the conference write to Don McKell, Conference Coordinator, Computer-Using Educators, PO Box 18547, San Jose, CA 95158.

ACM-IEEE Fifteenth Annual Workshop on Microprogramming

The fifteenth annual workshop on microprogramming (MICRO-15) jointly sponsored by ACM, SIGMICRO and IEEE TC-MICRO will be held October 5–7, in Palo Alto, CA.

A tutorial covering current issues in firmware engineering will be presented on the preceding day, October 4, by Dr. Ted Lewis.

For more information contact Dr. Joseph Fisher, MICRO-15 Program Chairman, Yale University, Box 2158, Yale Station, New Haven, CT 06520.

NECOM '82

NECOM '82, a computer show for OEMs, sophisticated end users, dealers and distributors, will be held at the Boston Marriot Hotel, Commonwealth Ave., Newton, MA, on Oct. 12, from 1–7 P.M.

For more information contact Norm DeNardi Enterprises, 289 S. San Antonio Rd., Suite 204, Los Altos, CA 94022. 415-941-8440.

EdCom '82

The National Computer Conference and Expo for Educators will be held October 21–24 at the L.A. Convention Center, Los Angeles, CA.

EdCom '82 will feature over 200 seminars, workshops, demonstrations, exhibits, and hundreds of computers for in-depth tutorials and hands-on sessions.

Presentation topics designed for educators at all levels of expertise will include computer-aided instruction, administrative uses, classroom management, programming, research applications, authoring languages and literacy. All of these sessions will be conducted by nationally recognized professionals in the field of computer education.

For more information contact Jayne LaFountain, EdCom '82, 2629 N. Scottsdale Road, Scottsdale, AZ 85257.

Applefests

Applefest, an exposition featuring Apple and Apple-compatible products including computers, software, peripherals, accessories and publications, will be held in several different locations this fall. Applefest/Minneapolis will be held Sept. 16–19 at the Minneapolis Auditorium and Convention Hall. Applefest/Houston will be held Oct. 28–31 at the Houston Civic Center. Applefest/San Francisco will be held Nov. 18–21 at the Brooks Hall. Admission to each event is $5.

For more information contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

Mid-Atlantic Computer Show & Office Equipment Exposition

The Mid-Atlantic Computer Show & Office Equipment Exposition will be held Oct. 28–31 at the Armory/Starplex in Washington, D.C.

For more information contact Computer Expositions, Inc., PO Box 3315, Annapolis, MD 21403. 301-263-8044; toll-free, 1-800-368-2066.

Virginia Tech Workshops

Virginia Polytechnic Institute and State University in Blacksburg, VA, will hold two workshops on microcomputer interfacing. Personal Microcomputer Interfacing and Scientific Instrumentation Automation will be held Nov. 8–12. Microcomputer Interfacing, Design and Programming Using the Z-80/8085/8080 will be held Nov. 15–17.

For further information contact Dr. Linda Leffel, C.E.C., Virginia Tech, Blacksburg, VA 24061. 703-961-4848.

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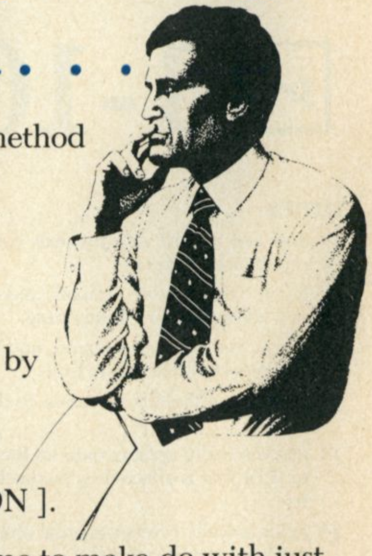

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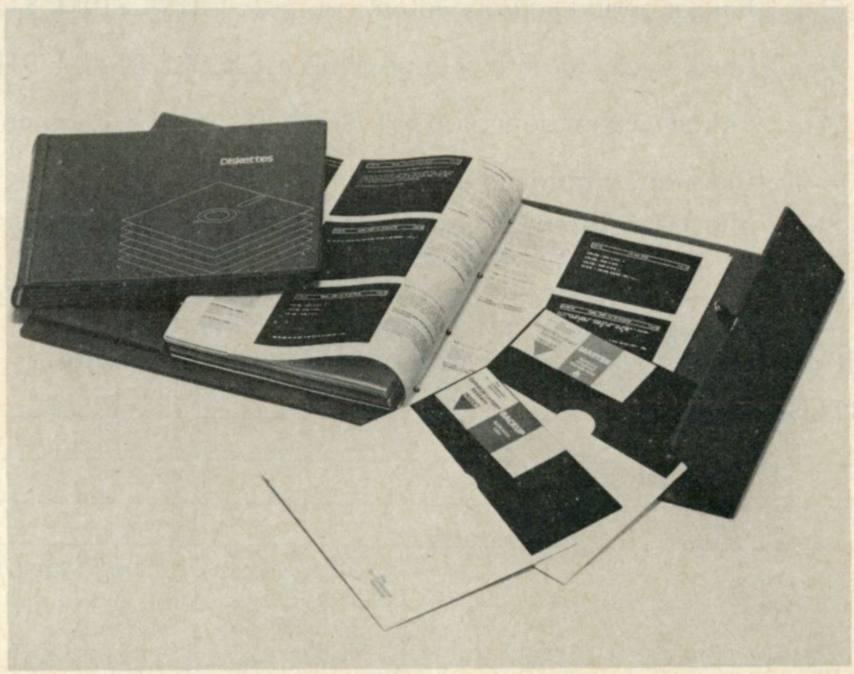

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POSITION ________________________

COMPANY NAME ________________________

ADDRESS ________________________

CITY ____________________ **STATE** ____ **ZIP** ________

TELEPHONE ________________________

98

Instant Software™

Peterborough, N.H. 03458 USA   A subsidiary of Wayne Green Inc.

(from page 162)

- Automatic single, double spacing.
- Automatic press-return-to-continue message. You set the maximum number of lines to be presented on the screen. This feature prevents long messages from scrolling out of sight.
- Automatic insertion of up to nine different variables in the text with an imbedded code.

Manual

The 52-page manual discusses the operation of these functions in detail. An Applesoft programmer should have no trouble using the enhancements, no matter what his level of expertise.

It includes examples, giving you not only a thorough understanding of the functions, but also a head start in finding applications for them. The examples are repeated on the disk, so you don't have to code them yourself.

Conclusion

You can, of course, fake all these enhancements without using Apple Spice. But that takes extra coding and slows down execution of the program. I found Apple Spice to be a worthwhile addition to Applesoft—one that will make future programming projects much easier and more satisfying.

Probably the best thing about Apple Spice is the fact that these utilities are loaded in machine language from the disk to your Apple's memory, and are made a part of the program you are developing. If you are developing a program for sale, you are only asked to credit the manufacturer on screen (in the format shown in the manual), to send two copies of the program to the manufacturer, and to not include instructions for using Apple Spice in the package you sell. Since the buyer doesn't need that information anyway, it sounds fair enough. Apple Spice sells for $29.95.

(Adventure International, PO Box 3435, Longwood, FL 32750.)

David Goodfellow
Seattle, WA

VisiDex

Remembers and retrieves
Items of interest
Easily and promptly

VisiCorp's (formerly Personal Software) VisiDex is difficult to categorize. It is not a son of VisiCalc. I would rather borrow a term from psychology, and call the program a free-floating database.

VisiCorp is careful in attaching a label. It says that VisiDex is a computerized index card (true), and lists 101 ways in which it can be used. VisiDex is a difficult program to master, but worth the effort for those willing to spend a few hours learning all the intricacies.

As a database, each record consists of one Apple screen of up to 20 lines or a maximum of 799 characters. The amount of data that can be put on one disk depends on the length of each record. The program tells you—whenever you load the data screen—of the available space, which starts with a maximum of about 131,000 characters. It is unlikely that you will run out of space on any one disk, since you will soon find out that it is desirable to separate different kinds of data on different disks.

There are no fields, as in ordinary databases. Instead, you enter whatever information you care to in a variety of ways on one 40-character by 20-line screen. This is then saved as one record.

Data can be entered from the keyboard in normal uppercase, in inverse video or as flashing characters. The latter two are especially useful when printing out information, since the program asks whether or not inverse (or flashing) characters should be printed. In this manner you can have data on your screen for informational purposes which will not be printed on your address labels, for instance. According to the manual, it is possible to use lowercase with all common L.C. adapters. I was not able to get my computer into lowercase mode. The shift key modification is probably needed for that, although the manual does not mention it.

Instead of fields, you use keywords. A record can be cross-indexed with up to 32 six-character words. Even more keywords can be used if the words are shorter. In retrieving information, a keyword will quickly get you the screen or screens you want. An imaginative use of the ampersand (&) in finding information makes it possible to obtain any data previously put on a record. With or without a keyword, the program will search out a word or number added after the & symbol and retrieve the record. When using the & symbol, retrieval just takes longer. Don't start a keyword with a space, or you won't be able to retrieve it. Fig. 1 shows a single example of a set of purchase orders.

```
********************************
*ORDER NO:      6245           *
*VENDOR         ROBERST CORP.  *
*CUSTOMER       PAY MORE       *
*ORDER DATE     3-12-81        *
*DEL. DATE      7-15-81        *
*                              *
*ITEM     120 # 104 PENCILS    *
*         120 # 106 PENS       *
********************************
```

Fig. 1. Sample set of purchase orders with VisiDex.

```
********************************
*ORDER NO:                     *
*VENDOR                        *
*CUSTOMER                      *
*ORDER DATE                    *
*DEL. DATE                     *
*                              *
*ITEM                          *
*                              *
********************************
```

Fig. 2. "Orders" template.

The keyword is Orders. Unless you want to cross-reference, it is advisable not to have more than one keyword per record. If you have a long list of orders with different vendors, but want to see only those from the Roberst Corp., search for Orders&Roberst or &Roberst. A list of all Roberst purchase orders will appear.

Practically any kind of printout format can be designed easily and quickly within the limits of the 40 by 20 format. An elegant and convenient way to do this is with the /KE command, plus the # symbol in front of a keyword. #-Keyword puts you in the design-a-template mode. Fig. 2 is an example of the template for the "Orders" form of Fig. 1.

After you design the template and recall it with its keyword, data can be entered for each record, even by an inexperienced operator. After saving the record on disk, the next blank template appears automatically with an audible beep.

A calendar function is available for reminders of appointments or important dates of any kind. A reminder screen will appear up to 14 days ahead when the data diskette is loaded. Any record can have a calendar function. You can add an audible alarm to the calendar function if you have a clock card. I did not test it, since I don't have one.

Documentation is well-written and consists of a table of contents, 162 pages of instructions and an alphabetical index. Read the instructions, follow the 94 pages of tutorial with hands on your computer, and you will have an idea of VisiDex. Many hours of experimentation will still be required to operate the program properly. I think once it is mastered you will like it.

VisiDex is designed to work with one disk drive. A second drive adds little to its versatility, except for the ability to read and write text files. This can only be done with two disk drives.

You might think that VisiDex was designed with the idea of selling floppy disks. The program works beautifully as long as you plan the collecting of your data well in advance and keep dissimilar data on separate disks. For instance, don't mix your names-and-addresses with purchase orders, supplies or an index of books or records. If you do, and then try to print an alphabetical listing of addresses and telephone numbers, you will get your titles of books and/or records, supplies and purchase orders mixed in.

The reason for this is a curious lack of choice in commands. When you choose to print, you can sort or select a keyword, but not both. When you print with the sort command, every screen of your disk will be printed in alphabetical or numerical order, once for each keyword. That is why I suggested above that you use one keyword per record only, unless you want to cross-index. The lack of more than one keyword can be overcome by the use of the ampersand (&) function.

When sorting numerically, the program first looks at the first digit of your number. For example, 3, 125, 19, 8, 235 will be printed in the order 125, 19, 235, 3, 8. To get the order right you have to enter the above numbers as 003, 125, 019, 008, 235. This will make the program sort them correctly. The documentation does not explain this. I found out the hard way.

VisiDex is a versatile program that will remember innumerable items of interest and retrieve them easily and promptly. It is not the speediest program around, since information is recalled from the disk. When entering data you won't have to worry about a power outage. Each screen is saved on disk before the next one can be entered. The only data you could lose would be the one being worked on.

VisiDex will remind you of appointments and important dates during the current year as well as those in the future. Although the price ($200) is a bit high, it can and should be used as a database where mostly reminding and collecting and retrieval of simple information are required.

VisiDex requires Apple II or II+ with 48K, one disk drive, 3.3 DOS, a monitor or TV and preferably a printer.
(VisiCorp, 2895 Zanker Road, San Jose, CA 95134.)

G.R. Brieger
Redmond, WA

P-Lisp

The first Lisp Interpreter for The Apple II

Little is known about Lisp in the world of microcomputers. This otherwise convenient language for artificial intelligence has so far failed to gain much attention in this field, primarily because it uses memory in megabytes.

P-Lisp is beginning to change all that, especially for Apple II owners. The P in P-Lisp stands for the company where Steven Cherry developed the language, Pegasys Systems Co., Inc., of Philadelphia.

Like most of the Lisps on the market for micros, P-Lisp is an interpreter. Like your basic interpreter, it reads and interprets each expression you type as soon as you press enter. P-Lisp was the first Lisp interpreter designed especially for the Apple II.

I wish I could say that Lisp is easy to learn and that anyone can just sit down and master it. However, if you have never tried programming in APL, Pascal or Basic, many of the concepts in Lisp will take some getting used to.

The lists which are processed in Lisp are similar to string arrays in Basic. In Lisp, however, any element of a list can be a list, and any element of that list can be a list, etc. This is a characteristic of Lisp which allows you to conveniently associate information—such as associating the color "red" with the attribute "color" for the object "ball." Ball could also have other attributes that could be as specific as "manufacturer," with which the name "Spaulding" could be associated.

Aside from lists, Lisp processes "atoms." Atoms are similar to variable names in Basic, but they can be any length in P-Lisp and up to about 30 characters in other interpreters. Atoms can also be function names, like print in Basic. Function names can be defined in Lisp (as they can in APL, for example). Functions can also call themselves, an act called recursion, which repeats the function the same way a goto to a previous line in a Basic program would.

In Lisp, however, when a function is called by itself, all values of all variables are saved at their current value before the function is executed again. This feature of recursion makes all previous values of the variables available when you return to that state of the function (the state before it was called). Basic destroys the value of the variables each time they are used in a function.

Another useful feature of Lisp is that variables can be localized as in APL functions. This means that you can use a handy variable name in more than one function. Without altering its value in any other function, you can call one function in which the variable name appears.

To associate attributes with objects in Basic, I would set up an attribute array:

DIM BL$(n,2) where "n" is the number of attributes the ball will have, such as size, hardness, color and manufacturer.

I would then assign "color" and "red" to the same value of "n" in BL$:

BL$(1,1) = "COLOR"
BL$(1,2) = "RED"

So far, so good. In Basic, I must know in advance that I am going to have attributes, and that there are going to be no more than a certain number of them (up to "n").

In P-Lisp I do not need to know in advance that an object will have attributes. At any time in the program the association can be accomplished by typing:

(PUT 'BALL 'COLOR 'RED)

The real advantage of Lisp is in recall. If I want to know what color the ball is, all my program has to say is

(GET 'BALL 'COLOR)

Imagine the for-next loop in Basic, searching through the values of BL$(n,1) for a match and then printing BL$(n,2). (Do not try to imagine the Basic program for processing attributes for a list of objects, please.)

Because a lot of this kind of searching is done in artificial intelligence, Lisp has functions like put and get which are built into it. Incredibly, at least one implementation of Lisp for micros has omitted these key associative functions. Another, not for Apple, does not provide a printer output function.

More Than a Toy

The sheer size of memory required is one of the main reasons why artificial intelligence experts tend to dismiss the micro Lisps as toys having limited usefulness.

The sample Eliza program that Gnosis gives away with the purchase of P-Lisp does not seem to suffer much from the memory limitations. It carries on a spirited conversation that offers little evidence of being generated by a toy.

The key to learning Lisp is not in the size of the programs you write but in the knowledge of the behavior of Lisp's functions. It seems to me that the value of the implementations of Lisp for microcomputers is that they make the language accessible for so much less money than the larger machines.

In P-Lisp most of the functions of mainframe Lisp are implemented as built-ins; this means they are available whenever you load Lisp from disk.

A minor shortcoming which results from the lack of memory space in microcomputers is the limited number of times a function can call itself. In P-Lisp, space for the recursion stack can be increased at the expense of program or data space (allowing for more recursions). In most cases, except for mathematical calculations (not a Lisp forte, in any case), P-Lisp's default setting—which allows 128 recursions—is perfectly adequate.

Learning to Lisp with P-Lisp

P-Lisp provides excellent documentation. This is particularly welcome since offerings for the microcomputer—particularly from younger firms—often neglect the documentation area. Gnosis supplies an excellent tutorial and a complete, clear user manual.

This tutorial consists of a ring binder full of short, easy-to-digest chapters, and a disk file, called "book," which has examples referred to in the text and a number of useful help functions.

Appropriate quotations at the beginning of each chapter set the easy-going tone for the tutorial. The frequent puns keep the reader from getting bored.

The user manual is written on a professional level with a complete listing of the built-in functions which shows schematically what arguments each requires.

The written material is under constant review. The fact that the sheets are punched allows Gnosis to frequently add corrections.

Conclusion

From a technical standpoint P-Lisp is the best fit for the Apple II. Because it was designed for the machine, many Apple II commands—including graphics commands—are directly available in P-Lisp.

Also, no extra circuit boards are required. Other implementations of Lisp which run on the Apple require either UCSD Pascal (card or disk), or a Z-80 card.

The best way to look at P-Lisp is as a trainer or tutorial for the larger, compiled versions of Lisp. After all, who wants to sit at the console of a half-million dollar mainframe and enter a Lisp program full of beginner's errors?

The combination of its technical fitness for the Apple II and the excellent tutorial documentation makes the P-Lisp interpreter the best in its class.

(Gnosis, 4005 Chestnut St., Philadelphia, PA 19104.)

Max A. Lebow
Philadelphia, PA

QuickTrace

A relocatable machine Language program for The Apple II

Assembly- and machine-language programmers often need the capability for slowing program execution to facilitate following the sequence of instructions executed. Older mainframe computers provided switches which allowed the user to start and stop program execution, execute instructions one at a time, or change the contents of the program counter or a memory location. These features were included when the first microcomputers were introduced.

The designers of the Apple II computer, however, like several other microcomputer developers, eliminated these features. As a consolation, the old monitor ROMs of the Apple II contain routines which allow single stepping through machine-language code. This is the step command which decodes and displays each instruction in disassembled form, executes the instruction, and then displays the contents of the internal registers of the 6502.

A similar command, trace, will step through instructions continuously until a BRK instruction is encountered or the reset button is pressed.

Both commands are helpful in debugging machine-language code; however, their usefulness is very limited, and there are many instances in which they cannot be used. For example, since the disassembled instructions and register contents are displayed on the active output device (usually the CRT), it is not possible to observe the output generated by the program while simultaneously tracing the execution of programs which produce graphics displays. Also, if a program changes the output hooks which point to the output device handler, it is possible to lose trace information. Finally, the machine-language step and trace commands were not included in the new autostart monitor ROMs of the Apple II Plus.

> Commercially-available programs rarely provide the features I expect to find.... QuickTrace exceeded my expectations.

To overcome these deficiencies, Aurora Systems has introduced the program QuickTrace, written by John Rogers. QuickTrace is a relocatable machine-language program which provides extremely versatile single-step and trace execution of programs.

Three modes of operation are available: single-step, trace and background. The first two are enhanced versions of the Apple step and trace commands; the third, background mode, permits tracing with no output until a user-defined stop condition is met, at which time execution is returned to single-step mode.

This background mode is useful for fast execution of debugged routines or monitor routines while retaining single-step tracing of other program segments. Switching between modes is permitted and simply requires pressing ESC to return to single-step mode and then "T" or "B" for trace or background modes.

During single-step or trace modes the four lower lines of the display device are usually used to show the tracing information. The user can determine how much of this information is to be displayed and whether output is to the CRT or to a printer. The display of information to the CRT can be suppressed so conflict with the graphics or text output of a traced program is avoided.

Tracing information includes a disassembled display of the last instruction executed and the next instruction to be executed, the contents of the 6502 registers, the top six values on the system stack and the stack pointer.

The actual data address referenced by each instruction is displayed along with the contents of that location whether addressing is by a direct, indirect or relative addressing mode. In addition, the contents of several user-definable locations may be displayed at each step.

Six commands are available. They provide the conditions under which execution in the trace and background modes are halted. These conditions include stopping if: a given address is referenced; a referenced address lies within a given range; the accumulator, X register or Y register contains a specified value; a user-defined location contains a certain value; or a specified opcode is encountered.

Commercially-available programs rarely provide all the features that I expect to find in professional works. QuickTrace, however, exceeded my expectations for a trace routine for the Apple II. Since obtaining QuickTrace, I have used it to debug several of my own programs and to help understand the operation of several others.

I have found it relatively easy to use; although knowledge of 6502 machine language is, of course, important for its use. I am finding this program to be an invaluable aid for debugging machine-language code. I recommend its use to assembly-language programmers at all levels of expertise.

(Aurora Systems, Inc., 37 S. Mitchell, Arlington Heights, IL 60005. $50.)

Larry Gonzalez
Chicago, IL

Catalog V4.12

A disk cataloging program That lists, sorts and reports On database entries

The Scene

Six different programmers have been working on four different CP/M-based microcomputer development systems (MDSs) for over three years. In addition to the desired results, the programmers were left with several undesirable byproducts: over two hundred floppy disks containing bits and pieces of programs, data and texts documenting them. Add to the confusion the fact that two of the original programmers have gone, and are no longer available to help sort out what they have left behind. And one of these programmers had the nasty habit of labeling all experimental programs X.ASM or QQ.FOR.

The Cleanup

After a couple of years of experimentation, the project had settled down to the point where it was necessary to weed out all the unneeded disks, programs, etc.

What could be safely discarded? It was

necessary to retain at least one copy of all the preliminary programs, just in case. But with too many duplicate names of too many partially debugged programs on too many disks with too little supporting documentation, the cleanup was not easy.

Enter Catalog V4.12

With the arrival of the disk cataloging program from SRX Systems, the cleanup took only a couple of days. First, all the old disks were cataloged without any attempt at a preliminary cleanup.

Then the entire catalog was listed. Duplicate copies of programs were instantly visible, as were those instances of program fragments hiding under undecipherable names. These identifications were made easy because Catalog not only lists all programs and each disk on which they are found, but also sorts them by size, recognizing size differences of as little as 128 bytes.

What Catalog Does

Each disk to be cataloged is assigned a number between one and 255. This disk ID can be typed in by the operator, or made hard by a directory entry on the disk. In either case, Catalog reads the disk directory and creates a database entry for each file named in the directory. In addition to the file name, the file size is stored in the database. Files with the same name, but with sizes differing by as little as 128 bytes, will be cataloged as separate entries.

Each database entry, therefore, identifies a file by name and size, and includes a list of each disk on which that file can be found. For users of CP/M versions 2 and higher, Catalog also keeps track of user number and read/write (R/W) protection status of each file.

After the database entries have been created, comments can be added by the operator, further identifying each disk and file in the database.

With all the disks entered into the database, Catalog can then display reports in several formats on the console, or print them out on the list device, under operator control. The reports can include all of the information in the database, or selected subsets of disk or file listings.

Operating Catalog

The 18-page manual supplied by SRX Systems can be digested in a couple of minutes, and operation of the program can then begin. In the example situation described above, the disks were first manually sorted by estimated age, and each assigned a number. CATALOG.COM was then copied onto an empty disk in drive A: When loaded, it asks for the current data. This is entered by the operator, and the program is ready to read disks or write reports.

In response to the program's prompt of Catalog, the operator can simply enter B: and a carriage return if the disk to be cataloged in drive B has a valid disk number in its directory. If not, the operator can enter B:57, for example, and the disk will be assigned the ID of 57; however, a hard ID will not be created in that disk's directory. That task is left to the operator.

Almost faster than you can notice, Catalog will have read the directory track from the disk in drive B, and will begin sorting the data into a database file on drive A. While this is happening, the operator can remove the disk from drive B, and have another inserted by the time Catalog is done writing the data file. A whole stack of disks can be read into the database in a few minutes.

Generating Reports

With all the disks entered into the database, the operator can then extract the desired information.

After entering the current date, the operator enters DISKS to get a listing of all the disks in the database. The report lists each disk in the database by number, the total file contents in K bytes, the disk's last update date and the comments assigned to each disk. Catalog even throws in a total of all the files on all the disks.

Any subset of disks can be reported, by entering DISKS 10–23 (to list disks 10 through 23 inclusive) or DISKS 15– (to list all disks from 15 up) or DISKS–12 (to list disks 1 through 12). Disks as cataloged do not need to have contiguous numbering. Unassigned numbers will not be shown by DISKS.

Finding Files Using Wildcards

Catalog V4.12 includes a database search routine that is even more powerful than the CP/M convention wildcards. If the operator enters FIND MON, the program searches for all occurrences of file names that include the characters MON in any position within the file name. This comes in handy when you can't remember exactly what you called a file, but do recall at least a sub-string within the file name.

List a Single Disk

When entering a single disk number, the disk is identified, along with all the files on the disk. You can inspect the directory of any of your disks at any time without having to put them in a drive. And you get more than a simple directory listing, since the comments assigned to the disk and all its files are also included.

List All Your Files

The database created by Catalog is a quick and powerful reference. The entire database can also be listed to the console or printer by using the wildcard extension*.*

The Source

Catalog V4.12 is available on single density IBM format eight-inch floppy disks. You might want to check with SRX Systems as to current format availabilities and pricing.

Addendum

The program is available in standard eight-inch, Micropolis Mod I, Micropolis Mod II and North Star double-density formats.

SRX advises that they will make a reasonable effort to furnish the program on other formats and invite inquiries.

(SRX Systems, 2812 Westberry Drive San Jose, CA 95132, $75.)

Ken Barbier
Borrego Springs, CA
Addendum furnished by
Steven Guralnick
Daly City, CA

Spice Up Your Applesoft
VisiSeries Introduces an Index
First Apple Lisp Interpreter
A Better Debugging Aid
Disk Cleanup Is a Snap

Apple Spice

Enhances Applesoft
And makes programming
Easier and more satisfying

Applesoft is a good, no-nonsense, floating-point version of Basic for your Apple II—but it has its weak points. Apple Spice strengthens three areas of Applesoft to make the programmer's life easier. It adds print using, string search and if-then-else to the Applesoft vocabulary.

In addition, it contains an extended input package and a screen output package, which enhance input and output with wraparound (no more broken words) and other features which will be discussed later. By a strange coincidence, these additions address the only major weaknesses I am aware of in Applesoft.

Apple Spice comes on a DOS 3.2 disk (unprotected) with the invitation to back it up and/or convert to DOS 3.3. Its routines may be made a part of any program you are writing, so you will not have to run Apple Spice before running a program which uses it.

Print Using

Rounding off numbers on screen or paper requires (for me, at least) the subroutine listed below. This must be called whenever a variable must be printed.

```
500  REM***ROUNDOFF***
510  N=2: S=7
520  X$=""+STR$ ( INT
     (X*10^N+.5))
530  Q=LEN (X$)-(VAL (X$)<0)
540  PRINT SPC
     (S-Q*(Q>N+1)-(N+2)*
     (Q<=N+1)));
550  PRINT MID$ (X$,1+(VAL
     (X$)<0),
     (Q<=N)+(Q-N)*(Q>N));
560  PRINT MID$
     ("0.00",1+((N+1)<Q),
     1+(N-Q+2)*(Q<N+2));
570  PRINT RIGHT$ (X$,^*(Q>N)
     +(Q-1)*(Q<=N));
580  X=0
590  RETURN
```

Formatting text is even worse because each case is different and a subroutine simply doesn't do the job. It gets really complicated when a rounded-off number must follow a string variable—then both techniques have to be used.

A routine that prints a billing total based on time and rate, using standard Applesoft, would go something like this:

```
600  WIDE=85: X=HO*RA
610  FOR I=1 TO WIDE-65: PRINT
     "";:
     NEXT I: PRINT HO; " HOURS
     AT ";RA;" = ";: FOR I=1 TO
     WIDE -(71-(LEN (STR$ (HO)))):
     PRINT "";: NEXT I: PRINT "$";:
     GOSUB 500
```

In this example, HO is the total hours, RA is the rate and X is the total charge (multiply HO times RA). This is the number that the subroutine at line 500 rounds off.

Print using does away with all that fuss. With the help of Apple Spice I can replace lines 500 through 610 with the following:

```
600  HTAB 5: PRINT HO " HOURS AT
     $";RA;" = ";: & PRINT
     "$####.##",HO*RA
```

Sure makes life easy, doesn't it? Print using allows you to print numeric values in a specified format. The "#" reserves space for a numeral; those that are not used become leading spaces. The command supports commas, floating dollar signs and asterisk fill, and has an overflow indicator.

String Search

String search in Applesoft is slow, slow, slow! String search in Apple Spice is fast, fast, fast! You don't need the Applesoft MID$ function to search a string for another string imbedded in it. This does away with tedious coding and slow searching.

One of the nice things about this function is that you can search a user's input for key words. If a key word is found, the computer makes one response; if no key word is found, the computer makes a different response. This makes dialogue between the Apple and its user fast, simple and almost human.

If-Then-Else

The if-then command is a powerful one, and is frequently used in most Applesoft programs. But it only covers one side of the coin. If the expression is true, the command is carried out, as are subsequent commands or expressions on the line. But if the expression is false, nothing is done. The computer simply goes on to the next line of the program ignoring everything on the line that contained the if-then. Life would be easier if it were possible to perform some positive action when the if-then is false.

If-then-else makes it possible.

Extended Input Package

The extended input package makes entering data from the keyboard easier to control. It includes the following:

- Word wrap. Words which do not fit on one line are moved down, rather than split.
- Maximum string length. This feature rejects all input exceeding a string length that you have defined.
- Control character filter. All control characters are ignored on input.
- Selective character filter. You may select up to 20 characters which will be replaced by spaces on input.

These features take a great deal of drudgery out of coding.

Screen Output Package

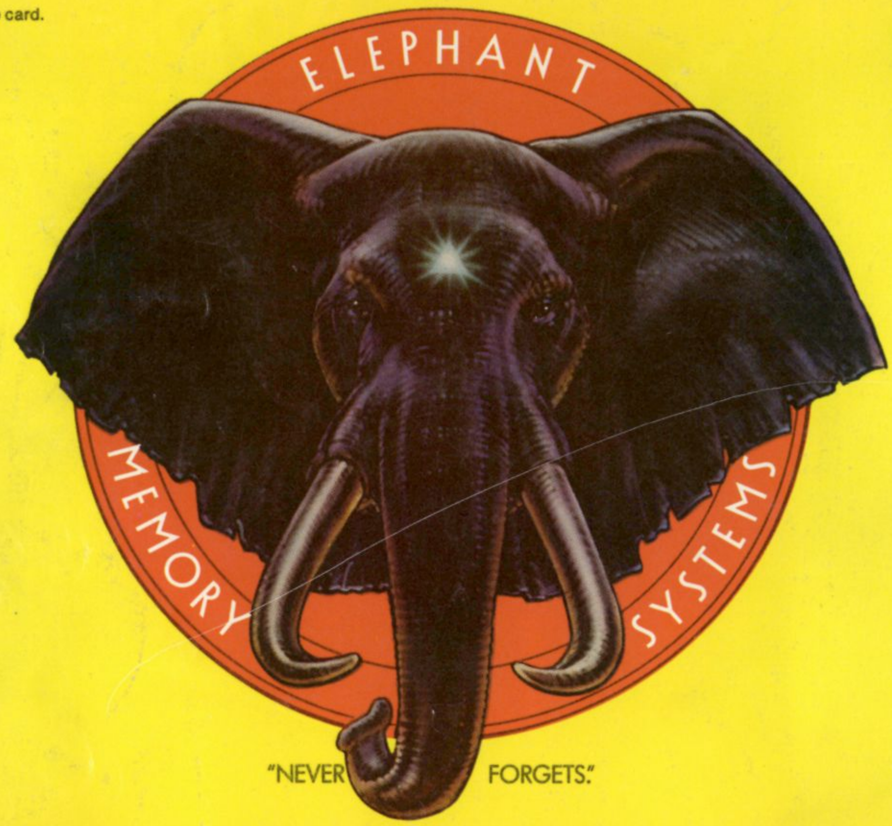
The Screen Output Package means just that—it works only on the screen, not on the printer. It includes the following features:

- Word wraparound—no more broken words.

(continued on page 155)

REMEMBER:

Circle 355 on Reader Service card.



MORE THAN JUST ANOTHER PRETTY FACE.

Says who? Says ANSI.

Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

But just who is "subcommittee X3B8" to issue such pronouncements?

They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

In fact, if you'd like a copy of this formidable document, for free, just let us know and we'll send you one. Because once you know what it takes to make an Elephant for ANSI . . .

We think you'll want us to make some Elephants for you.

ELEPHANT.™ HEAVY DUTY DISKS.

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