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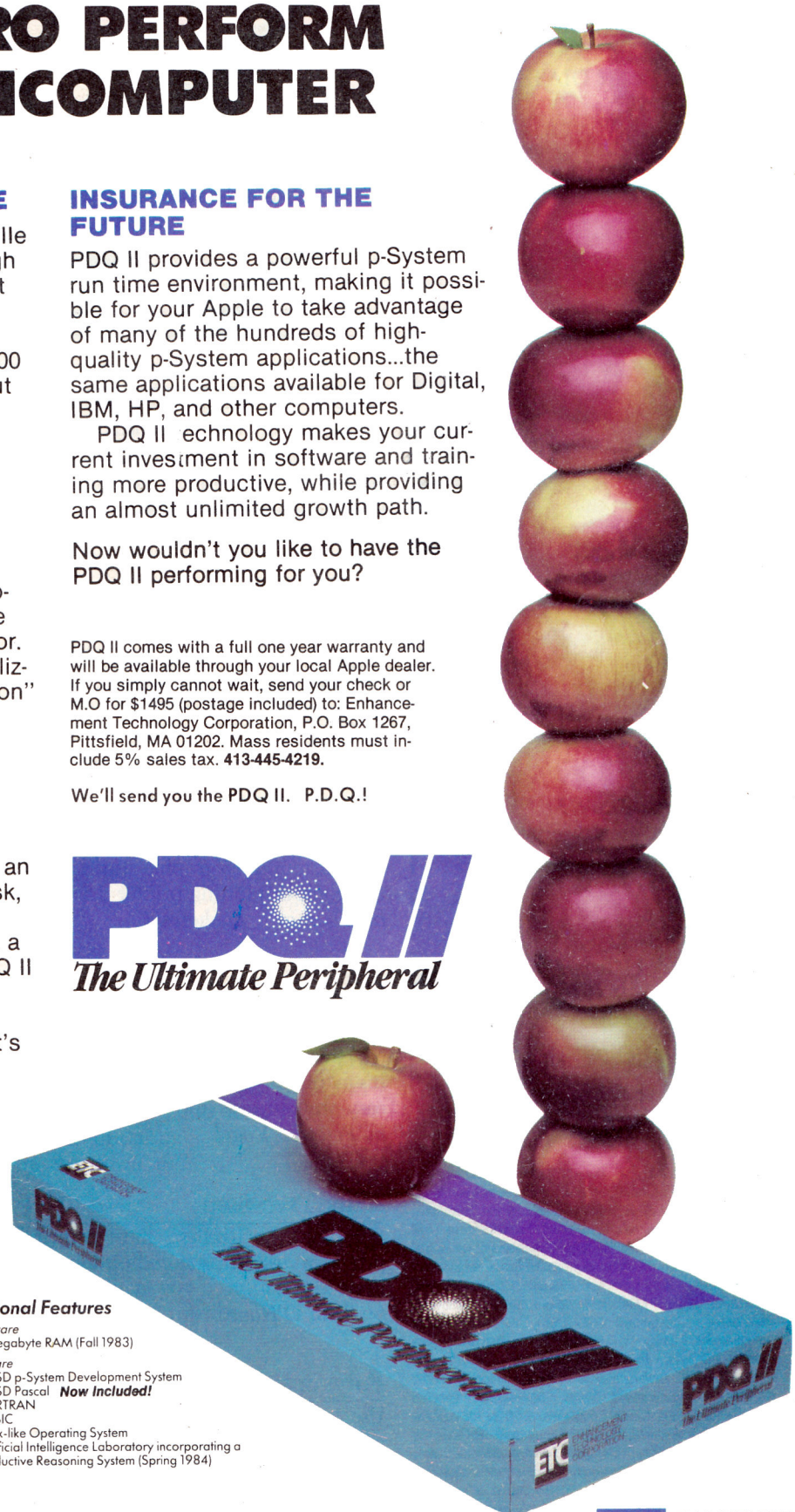

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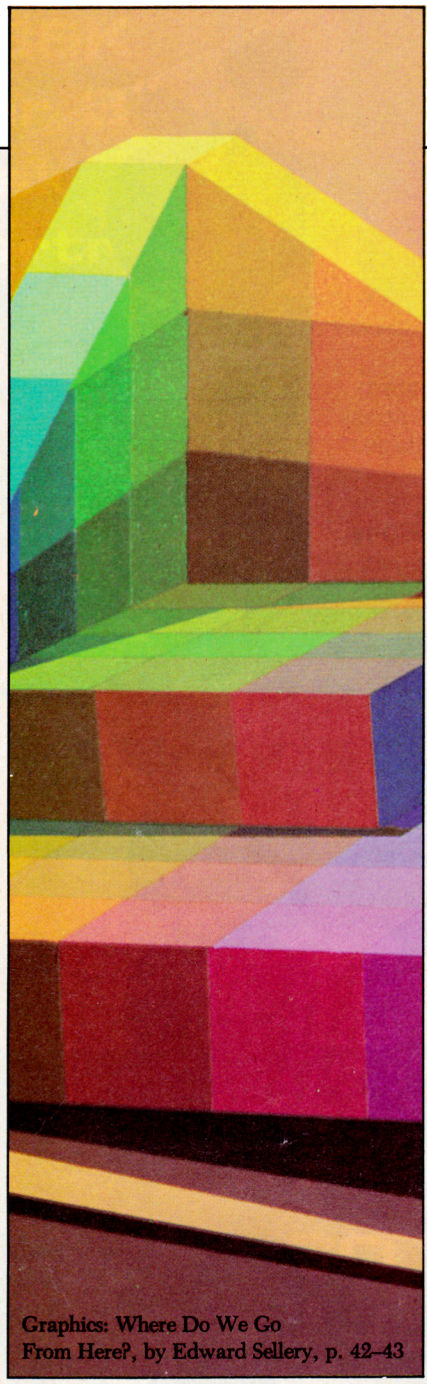

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Cover art by Nancy Kaplan Peabody

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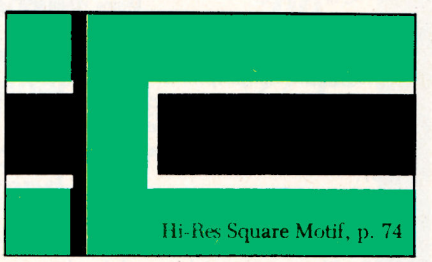

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Remarks from The Publisher... Wayne Green



Both the Apple and low end computers will benefit if we run articles on ways for businesses (and even homes or schools) to hook some midget computers such as the Timex or VICs together into a network using an Apple host.

As you may be aware, the sale of Timex computers has dropped disastrously in recent months. This is partly due to the fierce price competition from better systems such as the VIC, Atari and T.I. and partly due to the rising chorus of frustrated Timex users who are telling friends not to waste their money.

The Timex people made some very serious marketing errors. Oh, they got the 1000 into tens of thousands of retailers and sold thousands by mail order. But selling a system to Middle America is a different ball game.

Surveys of new gadget sales show rather clearly that there is a hard core of people who go for new things. But before a true fad can develop, this vanguard has to be enthused enough to get the message to the second wave. In the case of the Timex, the first wave became discouraged with the quality of the product, with the poverty of software available and with the almost total lack of information on how to cope with it.

It's a bit late to save Timex. Their problems are probably beyond salvage. But with some articles on using these inexpensive midgets, we may at least be able to take advantage of them while they are still around. So let's see some work on it.

***

The big promotion of the mouse as a controller for the Lisa is unleashing an attack of mice. Is this the controller of the future or just another passing fancy?

Let's try to approach this whole question unemotionally and work it out. Firstly, the main purpose of the mouse so far is as a control unit for the Lisa. This is a computer system which is aimed at the executive. Indeed, the only software that comes with it—and nothing else works with it that I know of—is for the executive.

Okay, let's continue from there. I'm an executive, so I have some feel for this type of operation. I may not be entirely typical, but I'm at least in the ball park. The mouse is designed to roll on the desk where the computer is situated. Now that's probably alright if the executive is using a standard desk and sits in a secretarial chair that is designed for data inputting the computer.

Two problems there. First, when I do have a computer on my desk I also have the desk piled with papers and there is no way to roll around the mouse. Secondly, I normally have my computer down at a level handy for me to type—where I can sit in a low chair for conferences and swing around to the computer. There's no desk space for the mouse at all, just a computer at my knees.

Apparently I'm not the first one to recognize this problem. I've read that some users put the mouse on the floor and run it with their foot. That news immediately swung my mind into action. For foot use one needs a mouse strap—a new product I can put on the market. The world, as we all know, is ready to beat a path to my door and my better mouse strap. Any interested investors? ■

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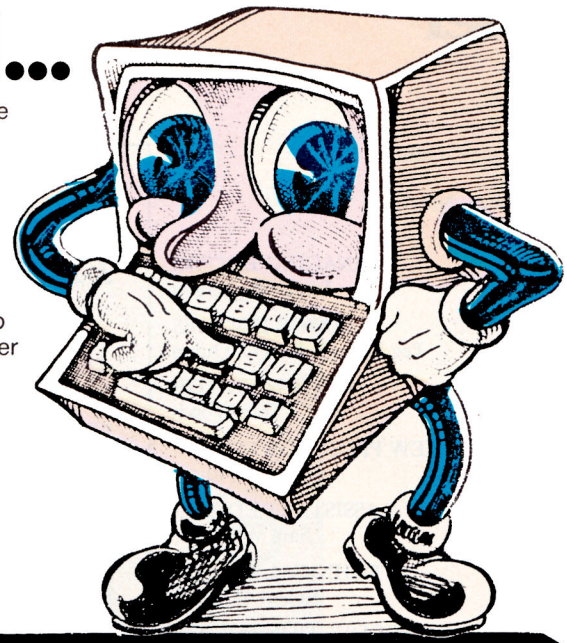

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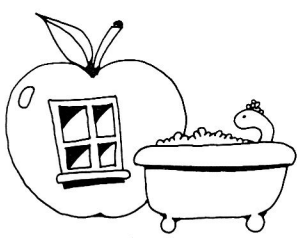

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A Graphic Portrayal

If you seek an orderly entry into Apple graphics, Craig Daniels' article (with listings) on lo-res one-liner graphics will bring you up to operating speed quickly and painlessly. At that point perhaps you'll want to move right into something else, say, Spirals and Polygons or Hi-Res Square Motif, back-to-back articles by Alan Foxx.

Some people are practical by nature, demanding that everything, including graphics, have some sort of real life application. For this type of individual we present The Amazing Histogram, an article that lucidly describes the techniques you'll need to know in order to first sort your business or scientific data and then get it into graph form.

And then there are those who derive great pleasure from graphics "just for graphics' sake." We refer this group to Aztec Two-Step by Tom O'Haver. There's only one thing you're going to like better than this program's constantly changing patterns of shapes and colors, and that's its length; it's only two lines long!

Attention, owners of MX-80 printers: Did you know that your Epson is capable of generating some very remarkable contour plots? It can, that is, if you have the right printer driver for it. Of course, we just happen to have one for you in this issue. Look for it under Tom Zuchowski's byline.

Collapsing Spirals, by Peter Vogel, won't take you very long to key in, but it's guaranteed to give hours of entertainment while advancing your knowledge of programming.

Let's say you've just created the quintessential computer art. And let's say you want to save it on disk. What you need is Picture Filer, by John Stephenson. Simply put, it's a Pascal utility program that allows you to make a permanent record of your artistic triumphs.

Just for good measure, we've included two reviews of graphics products. The first is a major software offering called The Illustrator, and it can do a whole lot more than its name might imply. The second is a software-hardware combination called the Gibson Light Pen.

Leaving our graphics section, we encounter the first installment in a series on educational software for home and school. Many of you will no doubt recognize Molly Watt's byline.

And if you're ready for a real change of pace then heat up the old soldering iron and dive right into a pair of hardware construction articles. The first shows you how simple it is to whip up your own Apple EPROM emulator. The second takes you step by step through the procedure for building a modulator (for using your Apple in conjunction with your TV set). Of course, you can always go out and *buy* a modulator if you're in a real rush, and the article discusses that, too.

If you've ever slogged your way through lousy documentation you'll know what Ann Baldridge is talking about in Programming 10, Documentation 3. Use her tried and true techniques and your next attempt at writing documentation will result in a truly user-friendly product.

Finally, if you've ever experienced that sinking feeling that comes as your system crashes, make sure to read our brand new column, Apple Clinic. Chances are good that many of those expensive repair bills are unnecessary. . . you just have to learn a few troubleshooting tricks.

Those are the highlights of this edition, but we've purposely held back mentioning a few items in the interest of maintaining the element of surprise. Tune in again next month when we'll have our first buyer's guide to word processors ready for you. ■



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Fermentations

by Sam Whitmore
inCider staff

Apple's Appeal

That you're reading *inCider* proves you fly the Apple flag. But unless you're the new Rip Van Winkle, you've observed the deluge of entrants into the microcomputer market—behemoths and babes—all fighting for billions of personal, business and educational dollars.

Those who bought an Apple II integer machine a few years ago had few alternatives to consider. Now, with technological advancements and a wealth of new competitors, many Apple owners may gallop to greener pastures.

Common sense dictates the so-called "low end" market would attract the most new buyers, but their purchases haven't spurred the industry. Early shakers Texas Instruments and Atari have taken a pummeling. The Timex/Sinclair, unlike its namesake, has stopped ticking. The Commodore VIC-20 at first sold briskly, but has been cannibalized by the vastly superior Commodore 64, whose price has dipped under $200. Tandy's Color Computers have annihilated Mattel's and Atari's share of the home video game market, and have forced Coleco to roll out Adam (many analysts say prematurely), a low end micro of their own.

Moral: Companies cannot live by dilettantes alone—and Apple knows that. "We have always said that we're not interested in competing in the under $500 toy computer market," says Rene Olsen, Apple's Manager of Product Publicity. "We're interested in providing value to individuals, and we feel we do that in the price/performance range we're now in."

The survivors in the Microcomputer Sweepstakes must produce useful, competitively-priced machines for the professional. "Image is important," Rene Olsen says, "but when you come down to it, it's product as well. In the office marketplace, our challenge is to provide total solutions to business problems. We think the way to stand behind our innovative, creative image is to provide a product line that innovative, creative people are going to want."

By positioning itself as a business problem solver (Apple III, Lisa), Apple has pitted itself squarely against The Monolith—IBM. This may be an Apple magazine, but let's not kid ourselves: IBM has devoured competitors like a cloud of locusts—in part because of its godlike reputation. As our patriarch Wayne Green once said, "No purchasing agent ever got fired for buying IBM."

"I can't give you the exact numbers," says Lyle McGuire, spokesperson for IBM's PC Division, "but I can tell you this: Between January and May of this year, we produced and shipped more systems than we did during all of 1982. And in June 1983, we shipped more systems than we did during January, February and March of '83."

Those contemplating a computer purchase may well be seduced by the IBM juggernaut, but an Apple is no poorer a choice. Says Gintel & Co. market analyst Don Sinsabaugh: "I think IBM is a major force who can dominate any market with their name. When Wayne Green says that no one will lose his job by buying an IBM product, he's right. But by the same token, Apple has so many machines out there—by my estimate well over a million—that no one will lose his job for buying an Apple, either."

Considering Apple's development of machines using the 16-bit Motorola 68000 microprocessor (installed in the Lisa and slated for the Mackintosh), where does that leave the true blue 6502 machines—the II, II Plus, IIe and III? "Since Apple considers the business market their primary market," says analyst Sinsabaugh, "their second generation products will be Lisa on the high end and Mackintosh on the low end. They'll bring out the Mackintosh at $2000 and gradually reduce it to the price of a good typewriter. The Lisa's $10,000 price eventually will be cut in half.

"But the Apple II will turn out to be the Model T of the computer industry. You have an incredible base of software and hardware add-ons that allow you to do more with the Apple II than any other machine around."

"In spite of the time and money we've invested in 68000-based technology," adds Apple's Rene Olsen, "and because the Lisa's impact will build slowly, we are still heavily dependent on 6502 technology for our revenues and expect to be for some time. Therefore, we're very committed to enhancing it. For example, our introduction of PRO-DOS will increase the compatibility of IIe software with the Apple III."

Don Sinsabaugh lays matters to rest. "You can do more with your Apple product than you can even with your IBM product. Apple has a reputation of building a quality product, and supporting that product such that the user isn't afraid it's going to die. As far as what's to come, other people have what they call second generation products, but in terms of software, Lisa is head and shoulders above anything else you'll see around today. Apple is a company for the future."

So, before you turn this page, realize that you fly the flag of a pioneer of the microcomputer industry, a present-day leader, and a company that will be in business for as long as you live. ■

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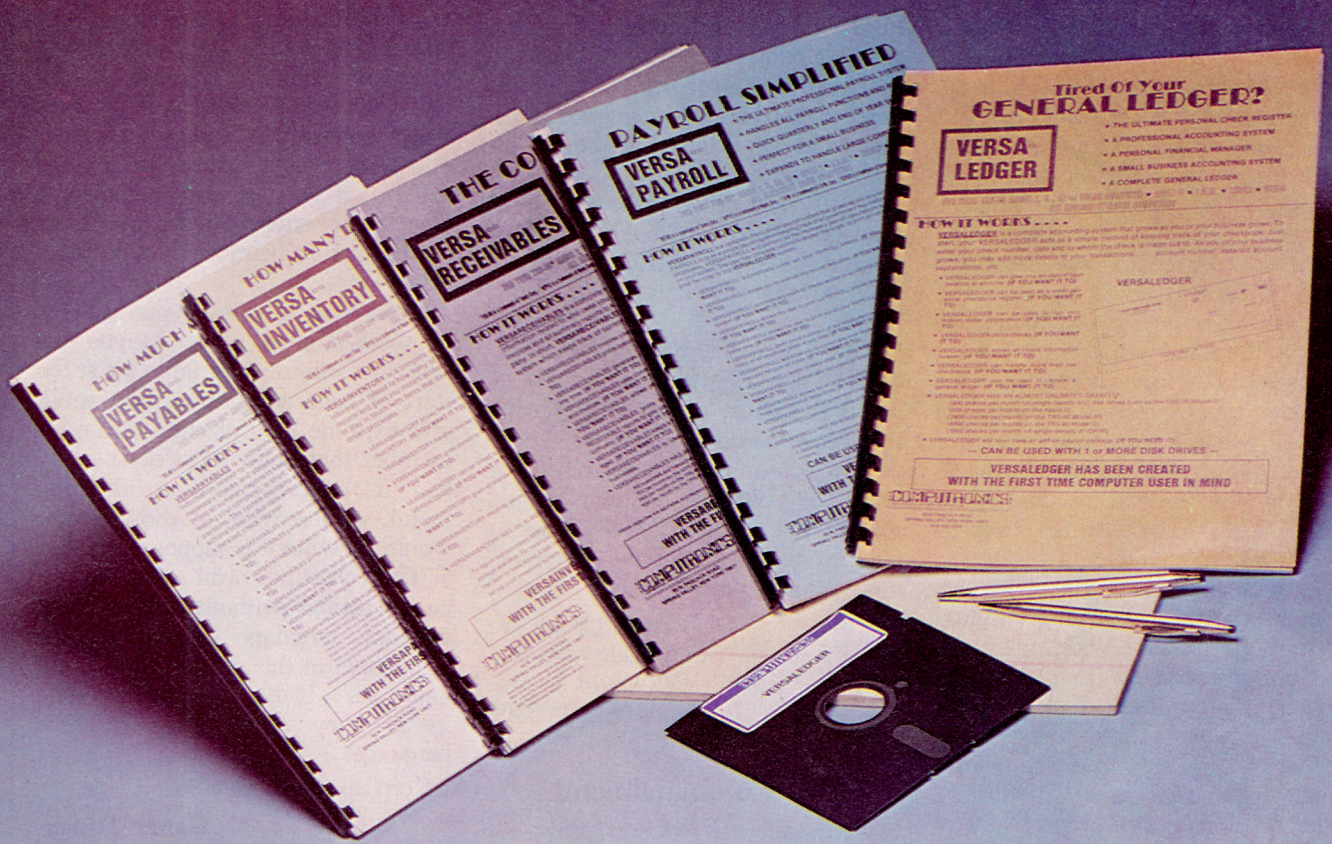

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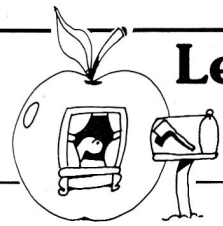
Letters



Flying with SuperPILOT

It was exciting to read Dr. Stephen M. Weissmann's laudatory remarks concerning Apple's SuperPILOT in the September issue of *inCider*. I am a member of the adjunct faculty of Nova University's computer studies department in Fort Lauderdale, Florida. This department offers a master's degree and an educational specialist's degree to teachers interested in learning about computers so that they can carry their knowledge back to the classroom.

The introductory courses that the students take include a course in PILOT which I have the pleasure of teaching. Fantastic lessons are developed by the students in this course using Apple PILOT and SuperPILOT—lessons that would be impossible to create in any other language without a great deal of programming background. It is a rewarding experience to witness the excitement of the students as they marvel at their accomplishments. These very same people who, only weeks before, might have been striken with fear when turning on a computer.

Dr. Weissmann is correct in his claim that Apple's SuperPILOT affords the novice the opportunity to create an interactive CAI lesson complete with graphics and music tailored to meet the needs of his/her own educational setting. I do, however, disagree with his statement that PILOT is not as rich a language as Basic or Logo. I chose to author a program in SuperPILOT as part of the master's degree thesis requirements of Nova University. In doing so, I discovered the fantastic capabilities of the language, capabilities that I hope to make maximum use of in authoring CAI and in my teaching at Nova University.

Sheila Nelin
660 NW 74 Avenue
Plantation, FL 33317

Those Sarcastic Editors

Regarding your comment to Jerry Krogy ("Jerry, what do do in your spare time besides copying?"): I found it snotty, not the least bit funny (I honestly hope this isn't your idea of humor or cuteness) and a shame that you felt compelled to issue a slap in the face to someone who wished to express their honest opinion regarding what he believed to be an excellent program.

Don't be surprised if the number of readers writing letters to the editor decline—no one wishes to be made to feel foolish, especially in a public forum.

Your comment, though, did bring up an interesting thought: Just think of all the effort directed to copying programs which could otherwise be put to more productive activites if only the software industry would realize that their products are so overpriced (for us "home computer" users). It isn't funny!

Dr. Kenneth Buchholz
Southgate Apt. 13-J
272 Ward Avenue
Bordentown, NJ 08505

The Five Commandments

Here's another letter of praise for the great job *inCider* is doing. There are now dozens of microcomputing magazines to choose from, but very few provide articles of the quality *inCider* has consistently offered.

I do have one gripe, though, concerning the programs published in computer magazines. Yes, people really *do* type them in and try to make them run. We even keep ancient issues piled in great stacks, hoping corrections will be published. Now, therefore, the following laws are proposed regarding program listings:

1. **Thou shalt not number program lines beginning with zero.** What if someone wanted to put a remark statement up front with good information like the program title, or the citation to the article, or even the author's name? Are you trying to conserve numbers?

2. **Thou shalt not number program lines consecutively.** Why not number by tens? If it's in Applesoft, run Renumber on it before you publish it.

3. **Thou shalt not pack 239 characters into a program line.** Some of us might want to list the program for debugging purposes. It's very entertaining to watch my printer type 160 characters in column 80, but I wonder if it's really necessary. Good program design is no longer determined by the price of a byte of core memory. I have not yet encountered a line of Basic that had to be more than 80 characters long.

4. **Thou shalt put a few remarks in for us weak-minded types.** Maybe the first time you use a variable, or at the start of each subroutine, you could give us some kind of clue. Please remember that many of us don't really care if the program does anything useful, we just want to know how it would do what it is supposed to do.

5. **Thou shalt not print assembly language listings without the resultant machine language opcodes.** There are people in this world who do not have assemblers, but that doesn't mean they don't use machine language.

Keep up the good work.

Gareth Tucker
PO Box 236
Deep River, CT 06417

Thou hast said a mouthful, Brother Tucker.

Booklet Lives Up To Its Title

I read with interest the review by Timothy Daniel (July 83) of the booklet *Screen Writer II Made Easy* by Judy Mandell. Like Mr. Daniel, I also found the Screen Writer program initially difficult to master. The manual provided by On-Line Systems was of little assistance due to its complexity not only in its depth but in computer jargon as well.

While I was searching for a tool to ease into the ScreenWriter program, *Screen Writer II Made Easy* was recommended to me. In the introduction to her booklet Ms. Mandell states the following:

"I have chosen a simple format to get you started. There are more sophisticated and in some case, more efficient ways of using Screen Writer II. When you become fascile (sic)



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with Screen Writer II, I encourage you to study the manual and become acquainted with more complex word processing skills."

Perhaps Mr. Daniel should have read the introduction before he purchased the manual. *Screen Writer II Made Easy* is all it claims to be and more. Today, when we are seeing increasing use of computers in schools even in the primary grades, the booklet, with its simple format and layman's terms is a necessary and invaluable instrument both for teaching and basic reference.

Charles Almy
414 East Waters Street
Charlottesville, VA 22901

Bar Code *inCider*?

In the August issue you encourage us to index and file the contents of your magazine. I have a suggestion for you.

How about bar coding the table of contents? It would sure be a lot easier to enter this data if all we had to do was wave a reading wand over the magazine.

I realize that right now most of us don't have bar code readers (I don't). And I realize that the software for building a file that way probably hasn't been written yet. (So what?)

But why not do it for a few months and see if it catches on!

Raymond J. Schuerger, DVM
Thornwood Vet. Hospital
Pittsburgh, PA 15205

Well now, Ray, that's one of the more interesting ideas we've heard lately and so we've done a little checking into it. Aside from the problems you mentioned, there are some limitations as to how much textual information can be encoded into a given amount of bar code. We talked with Jim Tennyson of Advanced Business Technology (Saratoga, CA). Jim's company offers systems for bar code reading, and he tells us that some computerists have put together their own wands for as little as $50. The necessary gear might be a little too pricey for the average person; it depends on whether a user feels the end justifies the initial investment. Perhaps other applications would help support such a purchase.

If we get enough letters lobbying for a bar coded table of contents, there's every likelihood we'll put the idea to work.

Heat-Sinking Missive

I am a charter subscriber to *inCider* and enjoy your magazine. I am also a mechanical engineer who works for a heating and ventilating contractor. Having subscribed to various other magazines, I find very few articles dealing with engineering in general, and HVAC in particular.

It is difficult to conceive that no one has addressed this issue. I am most interested in locating information and software relating to my area of expertise. If software has already been written I don't want to reinvent the wheel, so to speak. And if it is has not I'll write my own and let you know about it.

Specifically, what I'd like to see are programs dealing with load calculations for BTU heat loss when sizing HVAC for a building, estimation of materials and labor when pricing a project, and any other software dealing with mechanical engineering.

Mel Zeoli
PO Box 485
Hillsboro, NH 03244

You might try these software houses, both of whom market programs for your industry:

Utilities Engineering, Box 299, Brigantine, NJ 08203 (609) 266-1774; and McClintock Corp., PO Box 430980, 7000 SW 62nd Ave., Miami, FL 33143 (305) 666-1300.

The following tongue-in-cheek piece was submitted by Janet Schwartz.

An Open Letter To My Husband

To My Darling Husband,

I am sending you this letter in a bogus software company envelope so that you will be sure to read it. Please forgive the deception, but I thought you should know what has been going on at home since your Apple computer entered our lives two years ago.

The children are doing well. Tommy is seven now and is a bright, handsome boy. He has developed quite an interest in the arts. He drew a family portrait for a school project. All of the figures were good, but yours was excellent! The chair and the back of your head are very realistic. You would be very proud of him.

Little Jennifer turned three in September. She looks a lot like you did at that age. She is an attractive child and quite smart. She still remembers that you spent the whole afternoon with us on her birthday. What a grand day for Jen, despite the fact that it was stormy and the electricity was out.

I am also doing well. I went blonde about a year ago and was delighted to discover that it really is more fun! Lars—I mean—Mr. Swenson, the department head, has taken an interest in my career and has become a good friend to us all. I have also discovered that the household chores are much easier since I realized that you didn't mind being vacuumed, but that feather dusting made you sneeze.

The house is in good shape. I had the living room painted last spring. I'm not sure if you noticed it. I made sure that the painters cut air holes in the drop cloth so you wouldn't be disturbed.

Well, my dear, I must be going. Uncle Lars—Mr. Swenson, I mean—is taking us all on a ski trip and there is packing to do. I have hired a housekeeper to take care of things while we are away. She'll keep things in order, fill your coffee cup, and bring your meals to your desk, just the way you like it. I hope you and the Apple have a lovely time while we are gone. Tommy, Jen and I will think of you often—try to remember us while your disks are booting.

Love,
Mary

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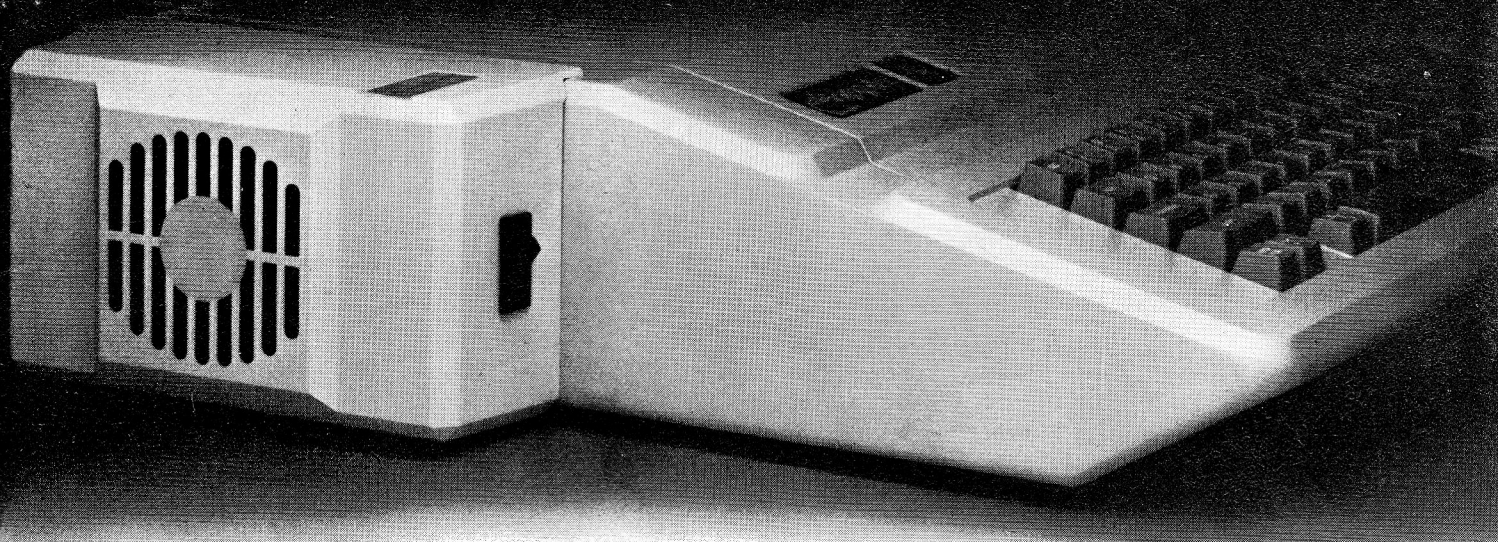

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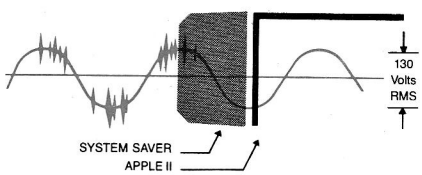
The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

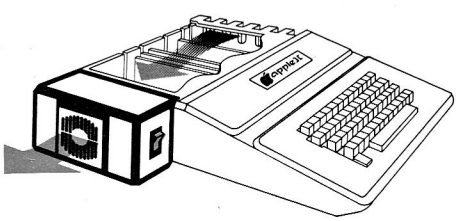


By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you add 80 columns or more memory to your Apple II you need SYSTEM SAVER.

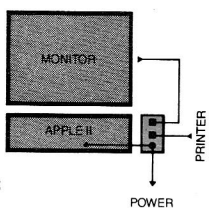
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.



SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.



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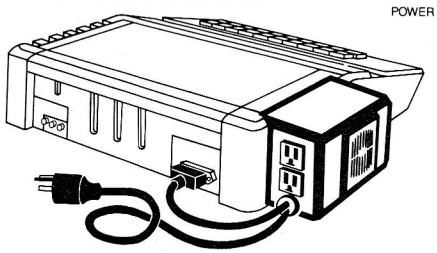

The heavy duty switch has a pilot light to alert when system is on.You'll never use the Apple power switch again!

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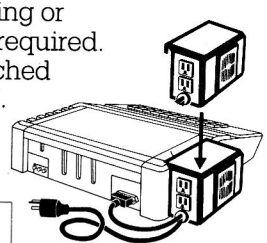

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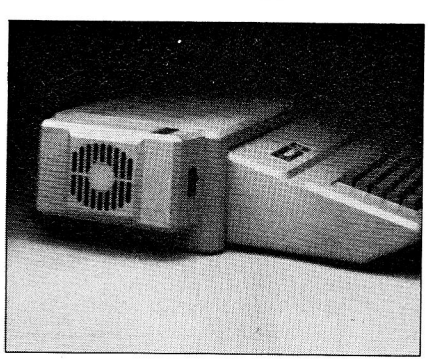

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Check on software compatability *before* you buy the hardware—it's your responsibility. Call the software vendor or manufacturer & get some recommendations.

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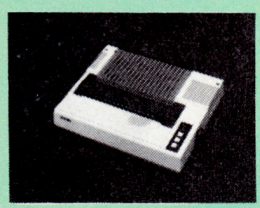

The **FX-80** features 160 cps, a correspondence font, 10, 12 & 17 cpi, italics, double-strike/width/emphasis, etc., dot graphics, friction/pin feed (the adjustable tractor is optional) & a 2K buffer. The 256 programmable characters use the 2K buffer space. The **FX-100** is the 136 column version & includes an adjustable tractor.

The **RX Series** replaces the MX, & offers 100 cps print speeds, but nothing more remarkable.

RX-80	**$399.88**
MX-80 F/T	**$469.88**
MX-100	**$664.88**
FX-80	**$564.88**
FX-80 Tractor	**$39.88**
FX-100	**$769.88**

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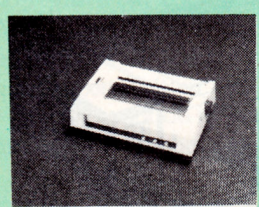


C. Itoh's venerable **Prowriter** has speed (120 cps), a buffer (1.5K), 10, 12, & 16 cpi (plus a proportional font with correspondance quality) and dot graphics (160x144 dpi). One of our biggest sellers. The **Prowriter 2** has the same specs, but in a 136 column format.

Prowriter	**$399.88**
Prowriter 2	**$719.88**

STAR MICRONICS

Gemini 10X/15



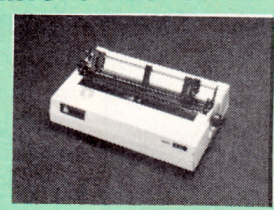
The **Gemini 10X** features 120 cps, 10, 12, 17 cpi, italics, a correspondance font, 120 x 144 dpi graphics matrix & a 1K buffer. **Gemini 10X**'s comes with friction/tractor feed & use plain spool ribbons. The **Gemini 15** is the 132 column version, & it has a proportional font.

Star's **Delta 10** features both parallel & serial interfaces, 160 cps print speed, an 8K buffer, plus all of the Gemini 10X fonts.

Gemini 10X	**$329.88**
Gemini 15	**$499.88**
Delta 10	**$539.88**

OKIDATA

Microline Series



The Microline 92 (80 col) & **93** (132 col) are ideal for word processing. They offer a 160 cps draft mode, a 40 cps correspondance mode, 10, 12 & 17 cpi (w/double-width), pin/friction feed (tractor is optional on the **92**) & dot-addressable graphics (120 x 1444). Centronics parallel interface is standard; the serial (RS-232C) interface is optional.

The **Microline 82A** (80 col) & **83A** (132 col) are data crunchers, period. They print 120 cps, at 10 & 16 cpi (5/8 double-width). Dot-addressable graphics are optional.

The **Microline 84** (132 col) is the Step 2 version, featuring 200 cps at 10, 12, & 17 cpi (w/double-width), all with a correspondance mode & dot addressable graphics. Parallel or serial (RS-232C) interfaces available.

Microline 82A	**$389.88**
82A/92 Tractor	**$59.88**
Roll Paper Holder	**$49.88**
Microline 83A	**$599.88**
82A/83A Okigraph 1 Graphics ROM	**$49.88**
Microline 92	**$459.88**
Microline 93	**$759.88**
92/93 RS-232C Interface	**$99.88**
Microline 84	**$1024.88**
w/RS-232C Interface	**$1139.88**

Smith-Corona
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Here's the printer you've been waiting for. The Smith-Corona **Memory Correct III Messenger** is ideal for the home or small office. It combines the features of an electric typewriter ***and*** a letter-quality printer. And it's designed to handle both jobs with ease.

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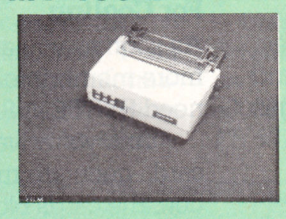
Memory Correct III Messenger **$629.88**

MANNESMANN TALLY

MT-160 L



The **MT-160 L** is the newest of the correspondence quality printers. It has speed (160 cps), 8 fonts, parallel & serial interfaces, friction/tractor feed, & menu-driven installation for easy set-up from the control panel—no more digging around for the dip switches. It's remarkably compact & efficient, & the print quality is superior. This year's sleeper. The **MT-180 L** is the 136 column version. A new, low cost draft printer, the **Sprite**, is also available.

MT-160 L	**$679.88**
MT-180 L	**$849.88**
MT-Spirit	**$329.88**

We sell other dot matrix printers, including the **Anadex WP-6000, DP-9501, DP-9620 & DP-9625** & **IDS's Prism 80, Prism 132 & MicroPrism**, & the **Inforunner Riteman**. You can call **(603) 881-9855** for technical details. For prices, or to order, call **(800) 343-0726**.

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The C. Itoh **Starwriter** offers top speed at a good price. **Starwriter** uses Diablo code, wheels & ribbons, has a 40 cps print speed, 1/48" line space, 1/120" horizontal spacing—ideal for proportional modes. (For real speed freaks, there's the **Printmaster**, at 55 cps. Same specs as above.)

Starwriter Parallel	**$1219.88**
Printmaster Parallel	**$1569.88**

SILVER REED

EXP-550



Why buy a Transtar when you can buy from the guys who make them? The Silver Reed **EXP-550** is a 16 cps, 132 column letter-quality printer with *true* Diablo 1610/1620 emulation, making it compatible with most word processing software. It's ideal for medium duty office work. Add a buffer & you'll have a versatile printing system. If speed's not a factor, the **EXP-500** at 12 cps (80 col) is available as well

EXP-550	**$699.88**
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EXP-500	**$459.88**

We sell a variety of other letter-quality printers, including the **Comrex ComRiter, Diablo 620 & 630**, the **NEC 3530 & 7730,** the **Qume Sprint 11+**, the **Smith Corona TP-1 & 2**, plus many others. Call **(603) 881-9855** for technical details. For prices, or to order, call **(800) 343-0726**.

INTERACTIVE STRUCTURES

Pkaso

The **Pkaso** is our interface card of choice. It's dedicated to a specific printer, which means you'll get to use *all* the features on that printer. **Pkaso** can dump text or graphics from the screen, rotate graphics 90° to the printer, printing in 16 shades of grey (halftoning), etc. It has excellent documentation, plus a demo disk with utilities on it for VisiCalc, AppleWriter and others. Printers covered include the C. Itoh/NEC/Apple DMP, Epson MX/FX Series, Gemini 10/15, IDS Prism Series*, Okidata 80/90 Series & Centronics Series.

Pkaso Interface	**$139.88**
*IDS Prism (Color)	**$159.88**

ORANGE MICRO

Grappler +

The **Grappler +** is an excellent choice if you have more than one printer, but the **Grappler +** does not fully support every single feature on every printer. The **Bufferboard** lets you add 16K a print buffer, but only for the **Grappler+**.

Grappler +	**$149.88**
Bufferboard (16K)	**$149.88**

APPLE COMPATABILE

Parallel Card

We aren't stuck on a single vendor here. Tymac, Quadram or Microtek parallel cards all perform well.

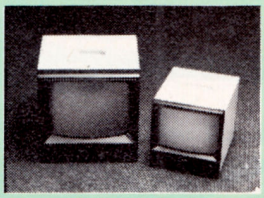
Parallel Card	**$89.88**

Monitors

We can't imagine why people want RGB monitors on Apples or Franklins, but we get an order a month. Take our word for it—unless you're doing something unusual, composite video output is more than sufficient. As regards amber monitors, read on...

USI

Pi Monitors



Our love affair with the **Pi 3** amber monitor continues. The concensus is yes, amber is easier on the eyes in the long run. So is the **Pi-3**'s 20MHz bandwidth and sharp, clear phosphor. Comes in 9 or 12", & in green.

Pi-3 (12" amber) **$189.88**
Pi-4 (9" amber) **$159.88**

AMDEK

300 (12" green) **$149.88**
300A (12" amber) **$159.88**
310 (12" green) **$199.88**
310A (12" amber) **$199.88**
Color I+ (Com) **$319.88**
Color II (RGB) **$649.88**
Color III (RGB) **$379.88**

NEC

JB1205M (12" green) **$179.88**
JB1205M (12" amber) **$179.88**
JC1203 (12" RGB) **$639.88**

Modems

Internal? External? 300 baud? Or 1200? 200 baud makes sense if you're on-line during the day. If you're on-line late at night, 300 baud may be all you need. As always, research this stuff *before* you buy.

US ROBOTICS

Password



The **Password** is a direct connect originate/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Features include auto dial/answer, auto mode/ speed select, full/half duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Comes with an RS-232C cable, power supply & modular cable.

Password **$379.88**

FRANKLIN *Ace 1000*



The **Ace 1000** is an Apple-compatabile computer with 64K RAM, hi-res graphics, 8 slots, a cooling fan, numeric keypad, 40 column w/upper-lower case & joystick ports. The ***Ace 1000*** can use any Apple II/II+ hardware or software—we tested it in our showroom and sold many of these units with Rana Drives and Videx cards, to make whole systems. It's about as compatabile as any computer can be short of being an Apple. Definitely the bigger bang for the buck.

Ace 1000 ..... **$CALL**

DC HAYES

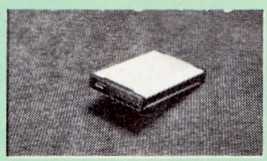
Micromodem II

The **Micromodem II** is an originate/answer, auto dial/answer, full/half duplex internal modem for the Apple/Franklin systems. It includes a communications package, modem board, cables and complete documentation. A suprior product.

Micromodem II $309.88

DC HAYES

Smartmodems



The **Smartmodems** are originate/answer, auto dial/answer, full/half duplex modems. There are two external modems (300 & 300/1200 baud) & the **1200B** (300/1200 internal for the PC) that includes the Softcom II software. Modular phone cable & power supply included. (RS-232C cable is optional).

"Stack" Smartmodems
300 baud **$219.88**
300/1200 baud **$539.88**
Internal Smartmodem
1200B w/Softcom II **$459.88**

NOVATION

AppleCat II

The **AppleCat II** is a 300 baud originate/answer, auto dial/answer, full/half duplex internal modem for the Apple/Franklin systems.

AppleCat II $319.88

NOVATION
Smartcat (300 baud) **$199.88**
Smartcat (1200 baud) **$499.88**

Peripherals

The big question these days is IIe compatability. It's touch-and-go in some cases. You should check with the manufacturers to be certain, but also ask us—we're a gold mine of info sometimes.

MICROSOFT

Premium Pack

The Microsoft **Premium Package** includes Z80 Softcard for CP/M™, Videx's Videoterm for 80 column display, a 16K RAMcard and Thom Hogan's book on CP/M™. If you're thinking about an upgrade, this is it.

Premium Package **$474.88**

If you've already got 64K RAM (Franklin, for example), get the Z80/ Softcard Combo. Same spec's, but *without* 16K RAMcard.

Z80/Videx Combo **$444.88**

Z80 Softcard **$229.88**
16K RAMcard **$74.88**

SATURN SYSTEMS

Accelerator II

The **Accelerator II** makes an Apple II run 3½ times faster than it normally does. We've tried it on our Franklin, and everyone's been impressed. High-speed 6502 processor and 64K memory. Comes with pre-boot.

Accelerator II **$409.88**

RAMboards by Saturn
32K Memory Board **$179.88**
64K Memory Board **$274.88**
128K Memory Board **$389.88**

VIDEX

VideoTerm

The **VideoTerm** 80-column card is something of a standard. It gives you 80-column display on the Apple/ Franklin, with upper/lower case. It's a must for CP/M™ or Pascal. Comes with or without the Soft Video Switch, which lets you enable or disable the 80 columns from your keyboard.

VideoTerm w/switch **$234.88**
VideoTerm w/out switch ... **$204.88**

VIDEX

UltraTerm

The **UltraTerm** 80-column card gives you up to 160 columns as well as an 80-column display on the Apple/Franklin, with upper/lower case. It's great for spreadsheets, word processing, or any application where 80 columns isn't enough. New video enhancements make it an exceptional package.

UltraTerm **$304.88**

VIDEX

Enhancer II

Apple keyboard enhancer type-ahead buffer, repeat, shift/cap lock, programmable keys, full ASCII (upper/lower case).

Enhancer II **$109.88**

QUADRAM

eRAM



An **eRAM** gives IIe users 80 columns and 63K of additional memory (1K gets used in the character set).

eRAM Board **$119.88**

RANA SYSTEMS

Elite-1

The **Elite-1**'s are single-sided, with 163K storage, 84ms access time & 13 or 16 sectoring. You also get an Enhancer Disk free, which lets you access 5 extra tracks. The **Controller Card** can run four drives—Apples, Rana's or whatever—in any combination. The **Elite-2**'s are double-sided drives, **Elite-3**'s are 80 track drives.

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by Bill O'Brien

Cold Steel and Software

Sometimes, living in New York and writing, or performing any useful function, for that matter, can be conflicting options. Last night, it being the beginning of July, my time, I found myself in an unusual situation. My brother lives next door to me in my apartment building, and about 9:30 PM I heard his dog barking. I knew he wasn't home, but I thought he might have come back for something he'd forgotten. I called him. There was no answer. I went to my door, looked out through the peephole and saw his door was ajar. I called him again, still no answer. You know what I'm about to say, right?

Well, when I opened my door, the first guy was just running past me to the stairwell. Surprised, he dropped the bundle he was carrying. I'm no hero, and I've never pretended to be one. Whatever he'd had the time to steal was now on the floor. So, I let him run away and stooped down to pick up the "stash."

It was then that I discovered the plural of the word thief. The second one came rushing out as I bent down, and he had the knife. As he ran towards me, he slashed me with it. The thrilling climax of the story is that I've got about 30 stitches in my arm and a few more in the muscle underneath the skin and it hurts like heck.

Believe it or not, that's not the point (forgive the pun) of the episode. If you happen to live in a building with a door buzzer or buzzer/intercom, find out who it is first, before you let them in.

With your kind indulgence, some thanks are in order as well. To the person on the 911 emergency line who answered after only three rings and had the presence of mind to mention that I should calm down and wrap something around my arm, thank you. I don't know if I would have thought of it at that time.

To the gentlemen in blue from the 34th precinct who distorted time and space to arrive not more than five minutes after the call was placed, four thanks, two to each of you. The first is for getting there so quickly, the second for packing me off in the patrol car and getting me to the hospital with equal dispatch, despite the overt stupidity of the drivers who wouldn't get out of your way, lights, sirens and all.

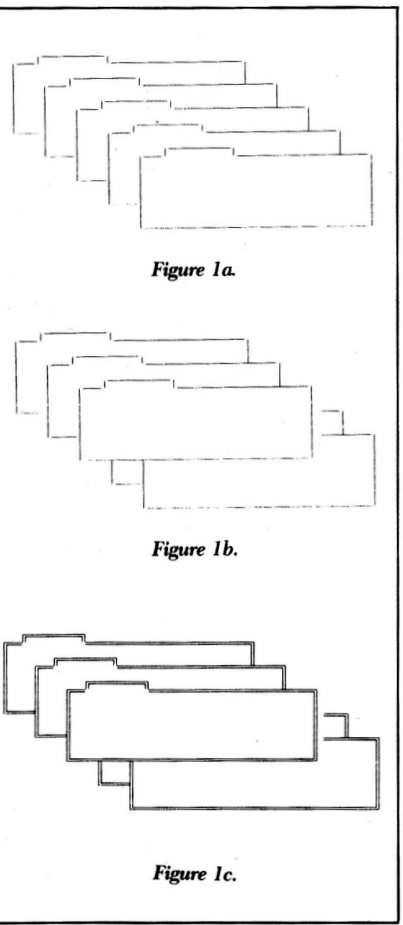


Figure 1a.

Figure 1b.

Figure 1c.

Finally, to the folks at Presbyterian Hospital, and in particular the Emergency Room staff and Doctor Rosen, thank you all. Despite the typical Friday evening battleground casualties, the overcrowded ER and a shortage of staff, I was treated with humanity and sensitivity. Also, the stitching job Doctor Rosen did on my arm is so good that I'll be sending him all my shirts from now on. (No saline, and can I have them back by Thursday?) By the way, it doesn't hurt when it happens, only afterward.

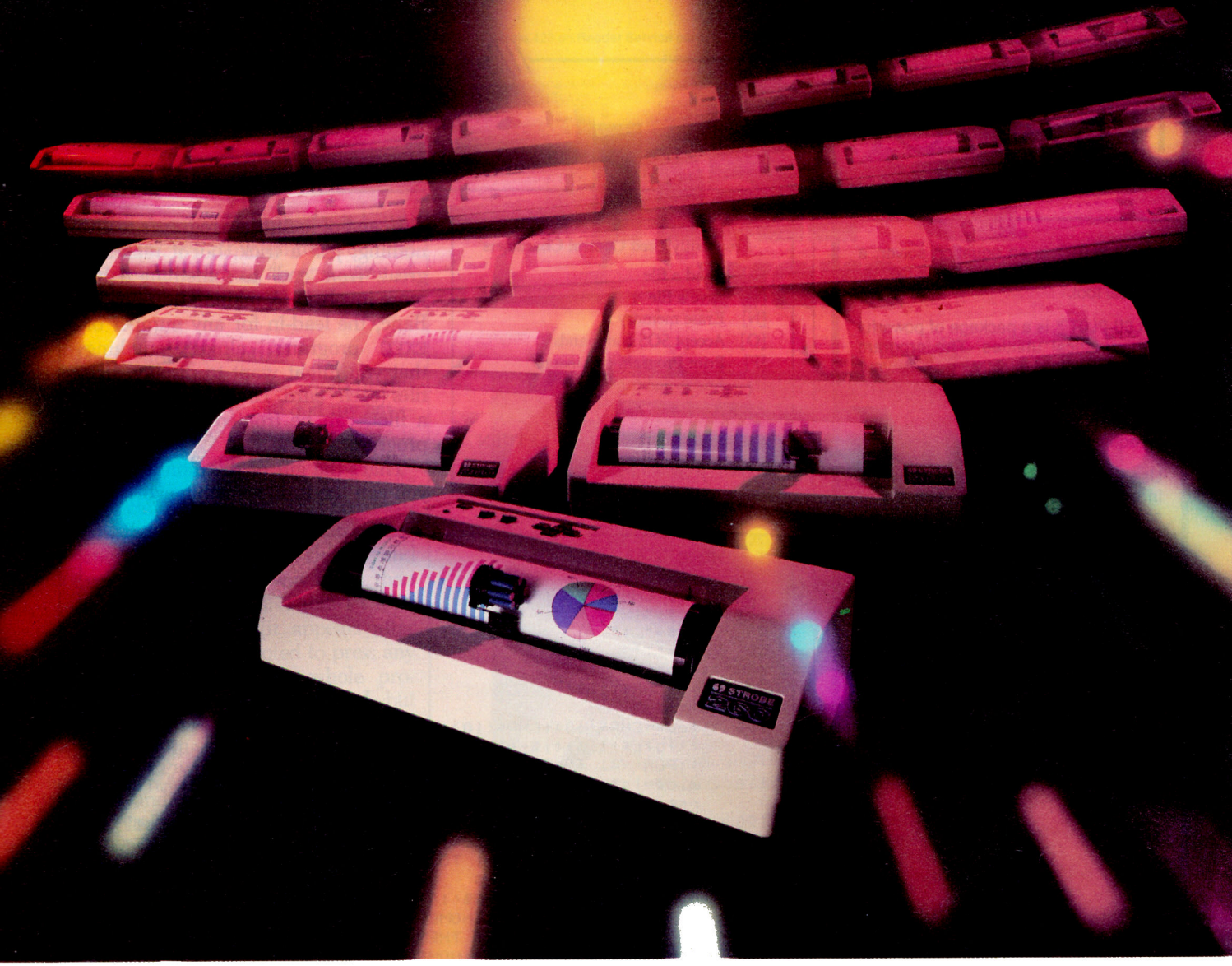
APPLE3STUFF

There's a big hullabaloo going on about VisiOn and the Lisa type screens and how marvelous they are. Well, they are. But you can emulate some of the tricks used if you don't hope for too much (not that you should settle for too little, though).

Take a look at Listing 1. Using characters found in the Standard Apple III character set, you can create a screen image like that found in Figure 1a. By checking which keys are pressed, you can then cause one of the underlying figures to overlay the rest for emphasis (Figure 1b).

This alone is no great feat, but if you rearrange a few of the Apple III characters with a program like Font Generator III from Apollo Software, you can produce an even more pleasing display. Listing 2 demonstrates the use of the ASCII characters numbered 142 through 149 after they have been "massaged"; and Figure 1c will show you the results of your handiwork.

Address correspondence to Bill O'Brien, WABASA Consulting & Management, 111 Brook St., Scarsdale, NY 10583.



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The Strobe 260 is the first eight-pen plotter and software package available for under $1,000. With just a few keystrokes on your computer, the system produces superb high-resolution charts, drawings and transparencies with up to eight automated color breaks. The even more economical Model 200 produces the same wide range of graphics with a single pen which may be changed manually.

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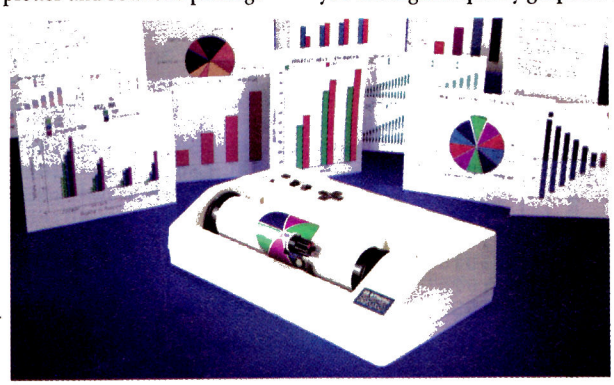
Every feature of the new Strobe Graphics System is designed to give you the highest quality graphics quickly, easily and inexpensively. The system also looks very nice on your desk. So visit your local dealer today and see how much better the best can be.



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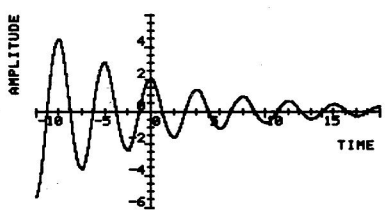

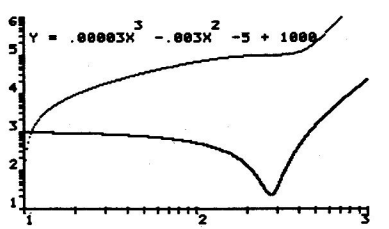

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Frequently Used Control Characters

[L] Load a file
[S] Save a file
[N] Erase memory
[O] Accept SOS commands
[P] Print Program commands
[Q] Additional functions menu
(for help, enter "?")
Enter your selection or RETURN

Table 1. Applewriter III opening menu.

In and of itself, the program's really nothing, just a trick, but it makes a great "front end" to something a bit more involved. A mailing list done in Basic, the lead-in for any number of EXEC programs, almost anything that you might want to display, like files (each "card" could be a record in a file), can be fronted by this short program.

That's the gift of the month; see if you can use it on something, or, bet-

```
5    HOME
10    ulc$="¦"+CHR$(150)
20    urc$=CHR$(150)+"¦"
30    llc$="¦_"
40    lrc$="_¦"
50    rs$="¦"
60    ls$="¦"
70    tl$=CHR$(150)
80    bl$="_"
100    top$=CHR$(10)+CHR$(10)+ulc$:top$=top$+tl$+tl$+CHR$(1
       1)+ulc$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+urc$+CHR$(10
       ):FOR x=1 TO 20:top$=top$+tl$:NEXT:top$=top$+urc$
110    mid$=ls$:FOR x=1 TO 36:mid$=mid$+" ":NEXT:mid$=mid$+
       rs$
120    FOR x=1 TO 3:mtd$=mtd$+CHR$(13)+CHR$(10)+mid$:NEXT
125    FOR x=1 TO 4:mbd$=mbd$+CHR$(13)+CHR$(10)+mid$:NEXT
130    bottom$=llc$:FOR x=1 TO 34:bottom$=bottom$+bl$:NEXT:
       bottom$=bottom$+lrc$
140    bottom$=CHR$(13)+CHR$(10)+bottom$
150    WINDOW 9,1 TO 47,11:HOME
155    GOSUB 250:IF rdraw=1 THEN RETURN
160    WINDOW 14,5 TO 53,14:HOME
165    GOSUB 250:VPOS=1:HPOS=33:PRINT rs$;:IF rdraw=1 THEN
       RETURN
170    WINDOW 19,8 TO 57,17:HOME
175    GOSUB 250:VPOS=1:HPOS=33:PRINT rs$;:IF rdraw=1 THEN
       RETURN
180    WINDOW 24,11 TO 62,20:HOME
185    GOSUB 250:VPOS=1:HPOS=33:PRINT rs$;:IF rdraw=1 THEN
       RETURN
190    WINDOW 29,14 TO 67,23:HOME
195    GOSUB 250:VPOS=1:HPOS=33:PRINT rs$;:IF rdraw=1 THEN
       RETURN
200    olda$=a$:GET a$:IF VAL(a$)>6 OR VAL(a$)<1 THEN a$=ol
       da$:GOTO 200
205    IF VAL(olda$)=0 THEN 220
207    IF VAL(a$)>VAL(olda$) THEN rdraw=1:FOR x=VAL(olda$)
       TO VAL(a$)-1:ON x GOSUB 160,170,180,190:NEXT x:rdraw
       =0:GOTO 200
210    rdraw=1:ON VAL(olda$) GOSUB 1000,1010,1020,1030:rdra
       w=0
220    ON VAL(a$) GOSUB 300,350,400,450
230    GOTO 200
250    HOME:PRINT top$;mtd$;mbd$;bottom$;
255    RETURN
300    rdraw=1:GOSUB 150:rdraw=0:RETURN
350    rdraw=1:GOSUB 160:rdraw=0:RETURN
400    rdraw=1:GOSUB 170:rdraw=0:RETURN
450    rdraw=1:GOSUB 180:rdraw=0:RETURN
1000    GOSUB 160:GOSUB 170:GOSUB 180:GOSUB 190:RETURN
1010    GOSUB 170:GOSUB 180:GOSUB 190:RETURN
1020    GOSUB 180:GOSUB 190:RETURN
1030    GOSUB 190:RETURN
```

Listing 1. Apple III Business Basic program to create a fancy screen image.

ter still, see if you can make it better still. Now, we move on to something completely different, the meaning of Applewriter III.

The Meaning of Lutus

There are very few people in this world to whom I would doff my hat—in their number is Paul Lutus. He is an excellent composer of sweet symphonies that play out upon Apple products. Applewriter III is no exception. It was the first word processing program I acquired for the III and for quite a while it was more than enough for my needs. Table 1 shows the opening menu (it appears after you have been prompted to press any key to continue). The whole program, in fact, is menu oriented, but the menus are neatly tucked out of sight until they're needed.

Your choices at this point are obvious and somewhat limited unless you plod ahead to look at the fourth and sixth options. Don't do that just yet. Had you a file in memory (a document that you'd typed), you could save it, or, having already saved one, recall it. Throughout Applewriter III, the convention used is [CHAR], where you would be expected to hold the control key and press the chosen character, CHAR, to produce the desired effect. Since this is your first such invasion of the program, it's expected that you'll hit return. Pressing that key puts you into the editing screen, which is 23 lines long. The top line of the display is a data or status line that indicates the total memory available, the length of the current document, the current cursor position relevant to the document as a whole and the name of the document being produced. Alternately, you can remove the data line by pressing the escape key (it's restored in the same way). When you enter the editing environment, you are in the insert mode. And, like most other Apple III specific programs, the cursor keys are completely functional and are augmented by additional keystrokes as indicated in Table 2.

Your basic editing needs are cared for by the functions illustrated in

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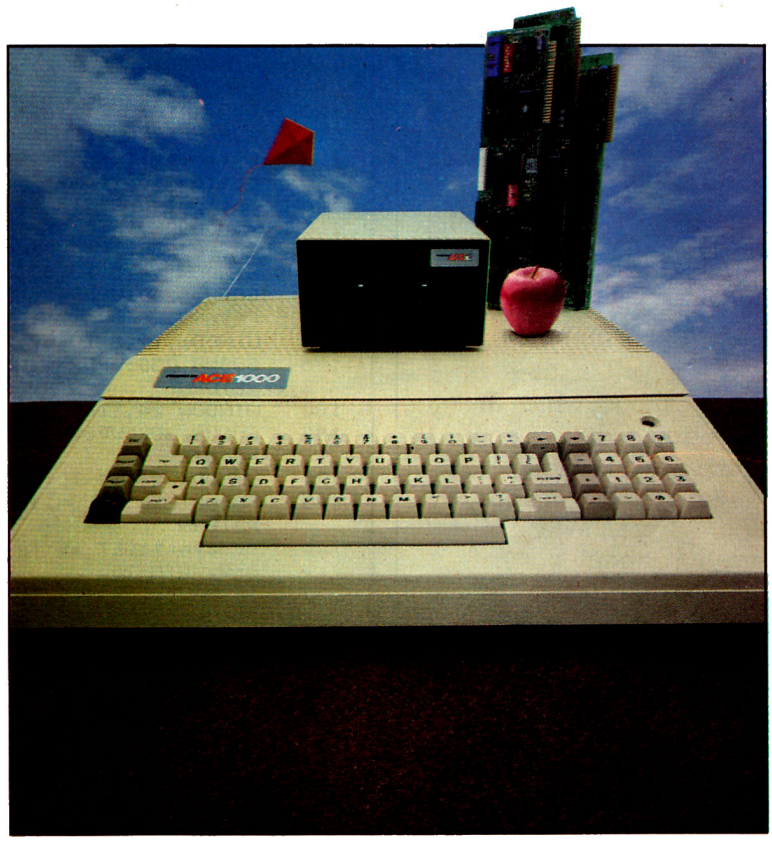

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IC

Listing 2. Business Basic program that demonstrates use of certain ASCII characters.

```
5    HOME
10    ulc$=CHR$(142)
20    urc$=CHR$(145)
30    llc$=CHR$(144)
40    lrc$=CHR$(147)
50    rs$=CHR$(146)
60    ls$=CHR$(143)
70    tl$=CHR$(148)
80    bl$=CHR$(149)
100    top$=CHR$(10)+CHR$(10)+ulc$:top$=top$+tl$+tl$+CHR$(1
      1)+ulc$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+tl$+urc$+CHR$(10
      ):FOR x=1 TO 26:top$=top$+tl$:NEXT:top$=top$+urc$
110    mid$=ls$:FOR x=1 TO 38:mid$=mid$+" ":NEXT:mid$=mid$+
      rs$
120    FOR x=1 TO 3:mtd$=mtd$+CHR$(13)+CHR$(10)+mid$:NEXT
125    FOR x=1 TO 4:mbd$=mbd$+CHR$(13)+CHR$(10)+mid$:NEXT
130    bottom$=llc$:FOR x=1 TO 38:bottom$=bottom$+bl$:NEXT:
      bottom$=bottom$+lrc$
140    bottom$=CHR$(13)+CHR$(10)+bottom$
150    WINDOW 9,1 TO 49,11:HOME
155    GOSUB 250:IF rdraw=1 THEN RETURN
160    WINDOW 14,5 TO 55,14:HOME
165    GOSUB 250:VPOS=1:HPOS=35:PRINT rs$;:IF rdraw=1 THEN
      RETURN
170    WINDOW 19,8 TO 59,17:HOME
175    GOSUB 250:VPOS=1:HPOS=35:PRINT rs$;:IF rdraw=1 THEN
      RETURN
180    WINDOW 24,11 TO 64,20:HOME
185    GOSUB 250:VPOS=1:HPOS=35:PRINT rs$;:IF rdraw=1 THEN
      RETURN
190    WINDOW 29,14 TO 69,23:HOME
195    GOSUB 250:VPOS=1:HPOS=35:PRINT rs$;:IF rdraw=1 THEN
      RETURN
200    olda$=a$:GET a$:IF VAL(a$)>6 OR VAL(a$)<1 THEN a$=ol
      da$:GOTO 200
205    IF VAL(olda$)=0 THEN 220
207    IF VAL(a$)>VAL(olda$) THEN rdraw=1:FOR x=VAL(olda$)
      TO VAL(a$)-1:ON x GOSUB 160,170,180,190:NEXT x:rdraw
      =0:GOTO 200
210    rdraw=1:ON VAL(olda$) GOSUB 1000,1010,1020,1030:rdra
      w=0
220    ON VAL(a$) GOSUB 300,350,400,450:GOTO 200
250    HOME:PRINT top$;mtd$;mbd$;bottom$;
255    RETURN
300    rdraw=1:GOSUB 150:rdraw=0:RETURN
350    rdraw=1:GOSUB 160:rdraw=0:RETURN
400    rdraw=1:GOSUB 170:rdraw=0:RETURN
450    rdraw=1:GOSUB 180:rdraw=0:RETURN
1000    GOSUB 160:GOSUB 170:GOSUB 180:GOSUB 190:RETURN
1010    GOSUB 170:GOSUB 180:GOSUB 190:RETURN
1020    GOSUB 180:GOSUB 190:RETURN
1030    GOSUB 190:RETURN
```

Left Arrow	Cursor left
Right Arrow	Cursor right
Up Arrow	Cursor up
Down Arrow	Cursor down

SHIFT-Left Arrow	Cursor left 24 characters or to the next (left-oriented) space
SHIFT-Right Arrow	Cursor right 24 characters or to the next (right-oriented) space
[B] (Control-B)	Cursor to beginning of document
[E] (Control-E)	Cursor to end of document
[J] (chars)	Jumps cursor to next occurrence of "chars"

Table 2. Cursor control commands.

Table 3, Editing Commands. Two points to note are the [V] (control-V) and the [Z] (control-Z) commands. The former lets you use characters that might normally be unavailable for such odd purposes as printer enhancement control. These can be imbedded in the text at any point to allow on/off enhancements such as underlining, boldface, double strike, etc., if they are available on your printer. The latter finds good use while preparing charts or columnar data. Where AW3 wraps a word around to the next line should it exceed the screen boundaries, [Z] lets you continue along to arrange accurate columns of numbers.

If, during your typing, you should need to use one of AW III's special functions, you can retrieve the help screens by holding down the open-apple key and the ? (question mark). Your reward is the menu shown in Table 4, which details those functions. You've seen the Cursor Movement options, and Delete/Retrieve is somewhat detailed in the Editing Commands table. Control-T ([T]) activates the tab selection, asking you if you'd like to (C)lear, (S)et or (P)urge. The first clears a single tab position, the second sets a tab at the current cursor position, while the third clears all tabs that have been set. Tab settings can be saved and retrieved by pressing [Q] (control-Q) and the number 2 to save the Tab file, and [Q] and the number 1 to call it back. ([Q] leads us to the Additional Functions Menu, which I'll deal with in a little while).

Glossary commands are outlined in Table 5. This is another minor wonder of AW3. As I mentioned above, control characters can be inserted into the text to accommodate the most stubborn printers. However, some of the directions needed might be several characters long. To avoid typing them each time, AW3 lets you create a glossary of the commands you'll be using, each defined by a single character.

Loading previously typed text is a task made simple by using Table 6. They are intensive and also incorporate block handling commands for

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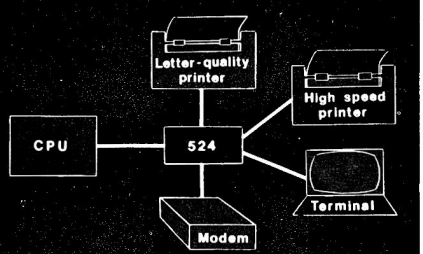

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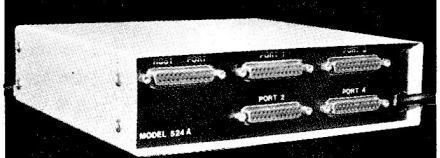

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[ESCAPE]	Toggles data line on/off.
[TAB]	Moves cursor to next Tab position.
[CONTROL][<--]	Delete character left.
[CONTROL][-->]	Retrieves character deleted.
[CONTROL][C]	Uppercase lock toggle.
[CONTROL][D]	Toggles the multi-word handling functions between delete and replace (the data line displays a greater than sign or less than sign, depending on whether replace or delete is toggled).
[CONTROL][F]/text1/text2/[A]	Finds all occurrences of text1 and replaces them with text2. If the A option is omitted, Apple Writer will ask if text1 should be replaced or if it should go on to the next occurrence.
[CONTROL][N]	Clears contents of (new's) memory.
[CONTROL][R]	Toggles insert mode on/off.
[CONTROL][T]	Set/Clear/Purge Tabs (select by typing the letter – S, C, or P – of the option you want).
[CONTROL][V]	Allows control characters to be imbedded in the text (toggles the ability on/off).
[CONTROL][W]	Word insert or delete (depending on the Control D toggle).
[CONTROL][X]	Paragraph insert or delete (depending on the Control D toggle).
[CONTROL][Y]	Split screen enable/disable.
[CONTROL][Z]	Enable/disable word wrap-around.

Table 3. Editing commands.

transferring sections of text already in memory to other positions within the current document as well as loading both complete files and sections of text from larger files stored on the disk.

Save Commands (Table 7) also include what is typically described as "Block Store" functions as well as the normal saving of text to disk. Notice that in both cases you can obtain a catalog, and the filename used may be the wildcard character, "=", normally associated with SOS.

Jumping a little, let's look at Table 8, the SOS commands available while using Applewriter. Some interesting things to note about these commands are, first, that the Catalog function is a full display of all file statistics, including the number of free blocks on a disk. To determine how much free space is actually on the disk in relation to the length of any document, multiply the number of free blocks by 512—there are 512 characters in a block. Also, setting the time and date, even for those of us who have no clock, will at least give us a comparison method for determining the last version of a file. AW3 "stamps" each file either with the Create time, for a newly saved file, or with a Modified time if it's a new version we're saving over an old one. When backing up from a hard disk,

Help Screen Menu

1 Command Summary
2 Cursor Movement
3 Upper/Lowercase
4 Delete/Retrieve text
5 Tabs
6 Glossary
7 Save Files
8 Load Files
9 Find/Replace text
10 Embedded Print Commands

Enter Your Selection (1–10):

Table 4. Applewriter III HELP screen display.

[CONTROL][G][?](char)(text)	Defines an entry of (text) in the glossary represented by (char).
[CONTROL][G](char)	Recalls the glossary text defined by (char).
[CONTROL][G][*]	Deletes all glossary entries.

Table 5. Glossary commands.

the date stamping method is useful to cull revised documents from the general confusion of ponderous writing endeavors. Again note that the features supported are those that are typically used under SOS.

One of the other commands worthy of mention is the [C] (control-C) command. This is a toggle between an upper- and lowercase capability that is a bit different than most. Simply moving the cursor across pretyped characters will change their

"This is one of the few programs that I've seen with this capability."

case depending on the direction of the toggle (U/L). You can disable this feature by pressing the space bar.

Also, [Y] will let you split the screen. That too is a bit odd, and this is one of the few programs that I've seen with that capability. Suppose that at one point in the document you had typed in a word that could cause a spelling problem later on. Some four or five pages later you must type in the word again. Initially, since everyone is on a deadline and everything has to be done at the last minute (it just works out that way), you type it in as well as you can remember it. Rather than trying to keep jumping back and forth to find the correct spelling, find it once, press [Y], and scroll down to the next occurrence. The original word (or phrase for that matter), will remain in view while half the screen scrolls to the new spot you're looking for. There are some other benefits of [Y] such as being able to review a previous version (one that hasn't been overwritten yet) of the current document against the current revision, but, as the manual suggests, [Y] does not create two identical text files nor allow editing of two separate documents at once; you are simply looking

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(All commands prefixed by typing [CTRL][L])

.Dn/FILENAME	Load the entire file, FILENAME, located on drive n into memory.
?	Displays a catalog of disk drive (you are asked which drive to look at).
=	Load the file that is displayed on Apple Writer III's data line.
.Dn/FILENAME!marker1!marker2!	Loads a section of text from the file FILENAME which starts with the text marker1 and ends with marker2.
.Dn/FILENAME!marker!	Loads all text from the file FILENAME, beginning with the text marker.
.Dn/FILENAME!!marker!	Loads all text from the file FILENAME, starting at the beginning and ending with the text marker.
.Dn/FILENAME!marker1!marker2!A	Loads all occurrences of the text between and including the two markers.
.Dn/FILENAME!marker1!marker2!N	Loads all occurrences of the text between the markers, exclusive of the markers themselves.
!marker1!marker2!	Copies the text segment from the current file in memory to the present cursor position.
.Dn/FILENAME!	Displays the file FILENAME on the screen without loading it into memory.

Table 6. Applewriter III LOAD commands.

(All commands are preceded by [CONTROL][S])

.Dn/FILENAME	Saves entire contents of memory to the disk in device number n. This will write over any file already on the disk with the same name.
?	Displays the catalog (you are asked to specify a drive).
=	Saves entire contents of memory to the disk and filename listed on the Apple Writer III data line.
.Dn/FILENAME!marker!	Saves the segment of text in memory beginning at the cursor position and ending with (including) the marker.
.Dn/FILENAME +	Adds the current contents of memory to a file specified by FILENAME.

Table 7. Applewriter III SAVE commands.

at two locations of the same file at once.

Now that we've thoroughly exhausted most of the commands in AW3, we can print our file. Table 9, Print/Program Commands, can be enabled by pressing [P]?[return]. Once inside, you can alter any or all of the parameters seen, although the default values shown will usually be sufficient. Any of these values (with the exception of the first three) can be entered directly from the program. To do this, start on a new line and enter a ".", similar to the "Dot Commands" found in WordStar, followed by the feature you wish to change and its new value. You can print directly from your document by typing [P] and the letters NP (for New Print).

Also, there are times when an indent will be called for. In quoting a reference source, perhaps, you might wish to emphasize the quoted section by changing the left and right margins. While it is perfectly legal to insert the new values in text with an AW3 Dot Command, keeping track of the varying margin values can sometimes be a chore. You can perform the same function by using the

variable containing the margin position (RM, LM, TM or BM) and adding the indented value to it. Entering .LM + 2 would indent the left margin two additional spaces, while .LM – 2 would restore it to its original value.

Likewise, setting artificial page breaks (either absolute or relative to the number of lines remaining on the page) is simply a matter of using .FF or .FF(number) (where (number) is the number of lines you have selected as the minimum allowable), while suppressing the printing of portions of the document can be accomplished by using .EP0 and reactivated by .EP1.

All of which leads to the additional functions menu (Table 10). Typing [Q] leaves you in the wonderful position of being able to load or save Tab files, preconstructed Print/Program files, or a glossary or character set. Up to a point, that wasn't really an important feature until the folks at Interactive Structures came along with their PKASO card. If you're using that card, you can also print with whatever character set you decide to load in.

The Ballot

If all of this seems good to you, you're not far from wrong, but you're not altogether right, either. The cursor movements in AW3 are extremely spastic. The vertical cursor movements are indeed flights of fantasy. Instead of ending up either above or below the character where it was typed, AW3 counts 80 characters and deposits the cursor there. Sounds normal, doesn't it? Unfortunately, it doesn't take into account the trailing spaces it has inserted whenever it wraps a word around, so the cursor movements are, in fact, willy-nilly across the screen. I found it annoying.

On the plus side, using the control and left-arrow keys is probably the most intelligent approach to deleting a character and still maintaining the true design of the key; but making the delete function subject to the direction of the cursor ([D]), can, at times, be confusing. Headers and footers are well executed, but they

SOS Commands

1 Catalog
2 Rename File
3 Lock File
4 Unlock File
5 Delete File
6 Set Time and Date
7 Set Prefix

Enter Your Selection (1–7):

Table 8. SOS commands available from Applewriter III.

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Command	Effect
[P]NP	Prints text currently in memory; press ESCAPE to stop
[P]CP	Continue Printing
[P]?	Displays Print Format Options
LM(number)	Set left margin (Default 9)
PM(number)	Indents/Outdents paragraph margin; value relative to "LM"
RM(number)	Sets right margin (Default 79)
TM(number)	Sets top margin (Default 1)
BM(number)	Sets bottom margin (Default 1)
PN(number)	Sets the "page number" value (Default 1)
PL(number)	Sets the number of printed lines (Default 58)
PI(number)	Sets the form length (Page Interval) (Default 58)
LI(number)	Sets line spacing (Single = 0 Default)
SP(0 or 1)	Continuous forms (0) or single sheet (0)
PD(device)	Select output device (Default Printer)
CR(0 or 1)	Software (1) or printer supplied (0) line feed
LJ	Left justify (Default)
FJ	Full justify (right and left)
CJ	Center text
RJ	Flush right
TL(text)	Specify header
BL(text)	Specify footer (trailing text)

Table 9. Print/Program commands.

become imbedded in the Print/Program file when they are processed through the document. Few bits of literary mastery contain a header on the first page. With AW3, it is more than possible to wind up in that situation unless you specifically guard against it.

The data line, although useful, is not very informative. I really don't care where in the document I am, relative to the document as a whole. I would much rather be told where I am relative to the page I'm currently on.

The glossary function, although useful for priming recalcitrant printers into performing printing marvels, unleashes not the defined character, but the entire definition to which we have applied that character, producing a messy display. I don't like that either.

In general, it doesn't appear to be as facile as Word Juggler or, though it does try, as artful as WordStar. Perhaps, if Mr. Lutus had spent a tad more time on the program, it would have been great. Perhaps, as is the won't of genius, he reached the 99% completion point and grew bored with it; that would explain the small

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discrepancies in an otherwise fine rendition.

What we've seen so far, then, is Word Juggler in the lead with, since we are a nation obsessed with grades, a 97 percent; WordStar is close behind with a 94 percent (because of the high entry price even though it's selling, as WordStar III, for $375); and Applewriter III trails with an 88 percent because of promises unfulfilled.

The Meaning of Subjective

There were two other programs I wanted to cover. One of them, Word III, I bought; the other, Word Weaver III, was sent to me. I'm only going to deal with them briefly, and the reasons for that should become clear.

Bob Huelsdonk is the creator of Word Weaver III, distributed through Synergistic Software. Unless I have come across another Huelsdonk, I believe this gentleman has made significant contributions to the world of the Apple II through his work with *C.A.L.L. Apple.*

Additional Functions Menu

1 Load Tab File
2 Save Tab File
3 Load Print/Program Value File
4 Save Print/Program Value File
5 Load [G]lossary File
6 Toggle Carriage Return Display
7 Load Character Set
8 Quit Apple Writer

Enter Your Selection (1–8):

Table 10. Additional functions available in Applewriter III.

Unfortunately, he has approached the III with what can only be described as an Apple II mentality. Apparently, WW3 is a basic program that uses the Apple-supplied READ-CRT .INV module to power it. The highlight of the program appears to be geometric text output; I was reluctant to delve into the bombastic 36-page manual. With documentation this poor, can the programming be very accommodating? I didn't even bother to run the program.

With Word III, by System Decisions Group, distributed by Westico, I actually booted the disk. Numbered among my other vices is simplemindedness, and I was utterly perplexed. Upon reading the manual, I discovered that Word III is my friend, and as such I shouldn't seek to overwork it. Since it is my friend, I didn't want to do that, so I put it away to rest, in peace. Another $90 shot to heck.

I don't consider either of these programs worth the necessary time or trouble, and if that offends anyone's sensibilities, I might care, if I didn't respect the III so much. Had I wanted Apple II quality, I would have not sold my II and bought the III in the first place; a comparatively

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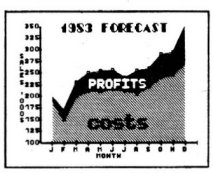



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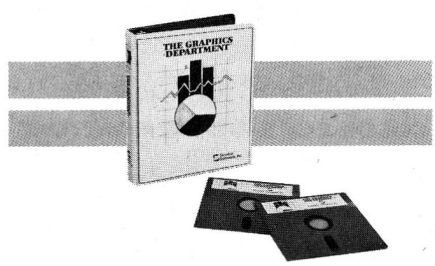

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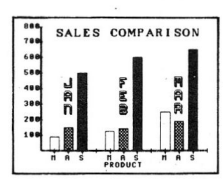

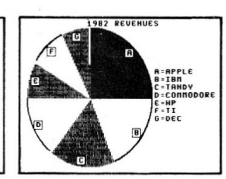

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So ends the word processing overview, although I would invite anyone with a package to send it in for future review (or even re-review). I promise that I'll be caustic and abusive only if it is deserved. Likewise, if anyone has a program deserving of attention, I'd be more than happy to go through it (even if under the fabled CP/M operating system) and present it here (although the same rules apply).

In the Nick of Time

A few columns ago I mentioned a problem I was having with my Apple III. It centered around a "Device Dependent Error #34" message I got whenever I tried to format a disk. Barry Collins from Collins Communications in Demopolis wrote in with the most plausible explanation. Apparently, SOS 1.3 is the culprit, or more rightly, the 1.3 .FMTDX drivers supplied with it as updates. After secluding himself from the world in a dark and musty laboratory, Barry emerged bedraggled and weary but with useful information in hand. It seems that the new format driver is somewhat forgiving up to about 10 percent over speed, but is insistent that no drive be more than 1 percent below speed.

> "I promise that I'll be caustic and abusive only if it's deserved."

So, for all those who have dutifully converted to the new drivers on the update disk, keep that in mind. If knowledge really is power, score one for our side; and if there's any word from Apple about it, I'll let you know. For now, thank you, Barry.

Future Stock

Next month will be my annual product round-up with an emphasis on hard disks for the III. For those of you who are unaware, there is more than one, and some have surprising sizes. Also included will be a look at the IS PKASO card and the new offering from Votrax, the Personal Speech System.

In the meantime, I hope everyone enjoys an excellent Thanksgiving with all the turkey and trimmings you can handle (for some reason, mine always resembles lasagne). Until next time, live long and program.

Ciao bene, AppleAmerica! ■

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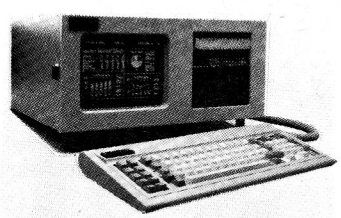

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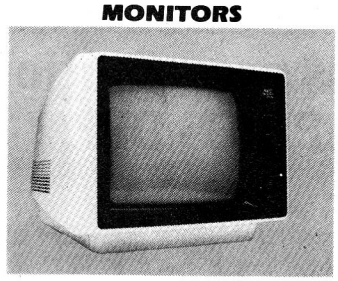

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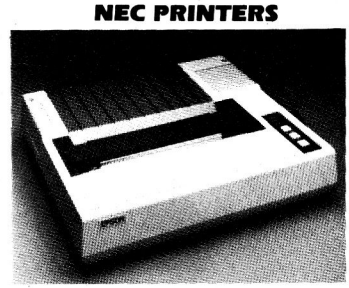

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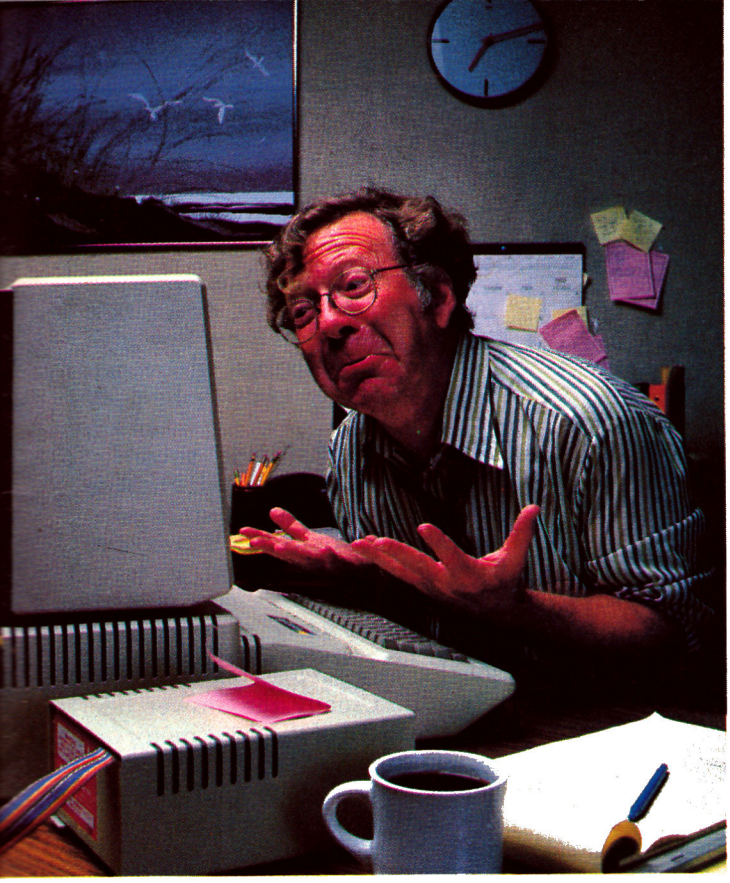

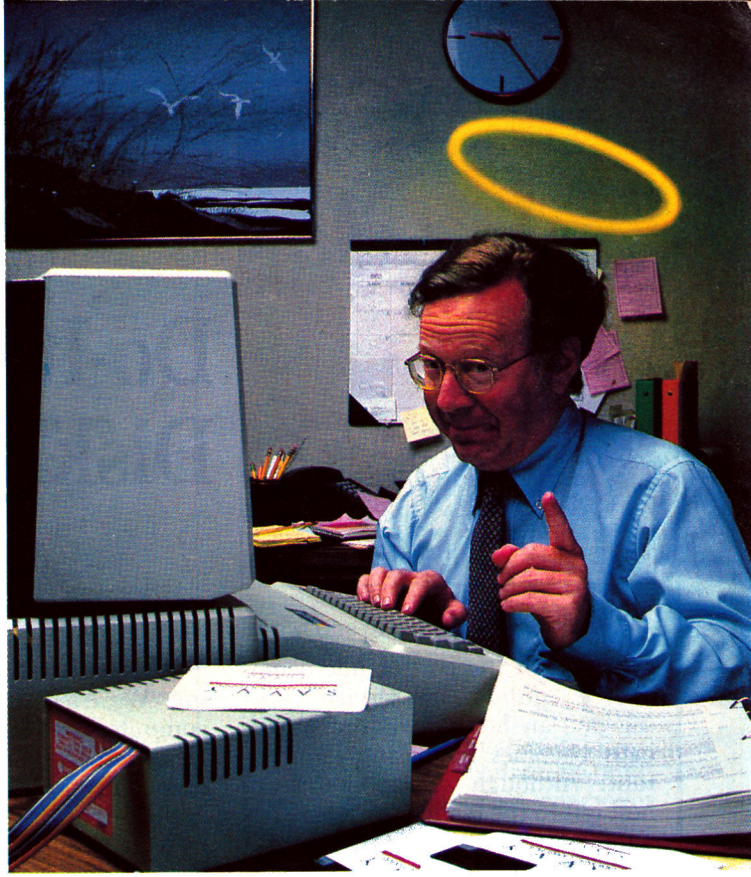

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Apple Clinic

by Earle Hancock

Do-It-Yourself Disk Drive Repair

With the cost of microcomputer repair service reaching $60 an hour, avoiding service calls becomes increasingly important. Although some repairs are best left to the technician, there *are* many remedies you can perform yourself. In fact, my experience shows that over one-half of all repairs could have been accomplished without a technician's aid. Here's an example.

Several months ago one of my clients experienced an intermittent problem with booting; during a program's operation the computer would appear to stop functioning altogether. It's difficult to isolate causes of intermittent failures because the breakdown occurs only occasionally. (Remember the last time you tried to point out a sporadic rattle or squeak to your mechanic? It's never there when he is.)

Repeated testing revealed nothing. We tried the disks in another computer and they worked fine. Near desperation, we removed the disk controller card and in so doing noticed that the connecting fingers were tarnished. We cleaned them by rubbing them with a pencil eraser. This procedure requires a light hand. Rub the surface of each leg the long way rather than across several legs at once (take care to prevent accidental lifting of the conductive surface from the circuit board). In addition, we sprayed the fingers of Slot six with a low flash point tuner cleaner. Since the problem did not recur, we assumed the contact between the disk controller card and the computer wasn't clean enough.

Other failures are more predictable. Why a disk will boot on one system but not on another is a question that arises at least once or twice a month. Usually the answer lies with the speed of the drive motor or the adjustment of the 0 track alignment stopper. Due to normal wear these settings move out of tolerance fairly often—every two or three months on a busy computer system.

The disk speed adjustment requires a special program or a 60-cycle strobe light. There are several reliable disk speed programs available. Usually they are sold as part of a larger package such as Locksmith by Omega Software, Copy II + or Filer by Central Point

Earle Hancock has directed the microcomputer project at Minuteman Regional Vocational School, Lexington, MA for three years. He is a member of the Boston Computer Society and other computer organizations. Address correspondence to him at 6 Birch Rd., Wenham, MA 01984.

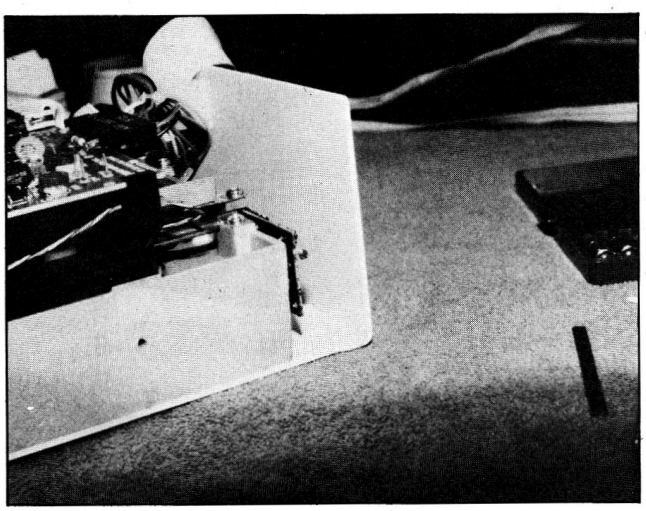


Photo 1. A disassembled disk drive with disk speed trimmer pot at center.

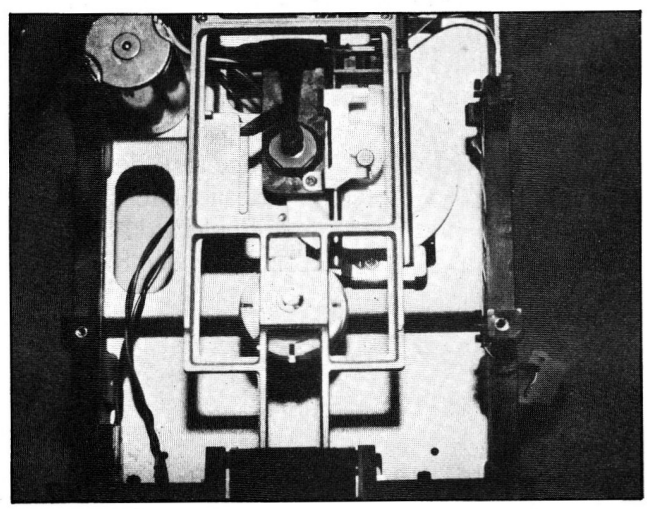


Photo 2. Disk drive in bird's eye view. Alignment stopper at top center.

Software and Brain Surgeon by Nikrom. A strobe or fluorescent light will work fine, but you must remove the bottom cover to get to the pulley wheel with the strobe marks.

Having chosen which way to measure the disk speed, remove the cover of the disk drive (and the bottom cover if using a strobe). The top cover is held in place by four Phillips screws; remove them and slide the cover backwards until it's free. Four more screws will be exposed—these hold the bottom in place.

Locate the disk speed trimmer pot as shown in Photo 1. Boot the disk speed program and, using a non-conducting alignment tool or small screwdriver, adjust the drive speed to your satisfaction.

The adjustment of the 0 track stopper is considerably more difficult and sensitive, so don't attempt it if you're not completely comfortable with the directions that follow.

In order for the disk drive mechanism to correctly position the read/write head, it must have a reference point to work from. This calibration point is provided by the 0 track alignment. The alignment stopper (see Photo 2 and the diagram) must be set to a gap of 20/1000 at the two places shown in the diagram. Remove the printed circuit board that covers the mechanism. This board must be out of the way, but still connected so that the drive will operate. Boot the disk drive so that the track stepping mechanism returns to the 0 track (you may stop the disk from spinning at this point by pressing RESET). To adjust the stopper, loosen the holding screw, set the gap and retighten the screw. Reboot and check the gap. No other adjustments should be attempted inside the disk drive.

A perennially baffling problem results from an improperly set switch on an Integer Basic firmware card. The switch controls the selection of the monitor ROM that you'll access when you turn the computer on. The Integer card monitor ROM is the old style (Apple II) monitor without routines to tell the computer to boot the disk operating system (DOS) when power is turned on. With the switch in the up position you'll get the machine language prompt "*" when you power up.

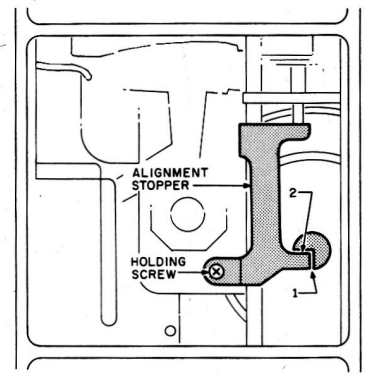


Figure. Enlargement of alignment stopper pictured in Photo 2.

"Keeping your computer in good working order and fixing problems when they occur is much easier if you're organized."

Normally that switch is set in the down position, enabling the monitor ROM on the main circuit board; the monitor ROM in an Apple II Plus does boot DOS on power up. Be sure the Integer Basic card switch is set as you like it. If you're confronted with the machine language prompt and you wish to boot a disk, press shift control-P and the disk drive will boot normally.

Why would anyone have the selection switch set in the up position if it causes so much trouble? The answer is they wouldn't, but the switch protrudes ever so slightly from the back of the case right near the power switch. It is quite easy for the switch to be moved while fumbling for the on/off switch.

No introduction to Apple II repair would be complete without mentioning a special integrated circuit called the 74LS125 chip. Found on the analog to digital (A to D) conversion card in the disk drive, this little chip has ruined many a day. When this chip fails, it usually announces that fact by filling the air around the Apple with the acrid smell of fried electrical components. On one occasion I found one of these chips had literally blown its top and spread tiny bits (no pun intended) of plastic throughout the inside of the drive.

Such chip failures can result from the improper removal or installation of the disk drive controller card. This card, or any other for that matter, cannot be inserted or removed with the power on. During removal or installation the card's fingers can touch more than one pin in the slot, causing a short circuit. Should you find that your 74LS125 needs replacing, do it yourself. The chip is readily available from electronic parts stores and will cost less than $5.

Remove the disk drive cover and identify the chip (see diagram). Using a chip puller, remove the old and replace with the new. Pay close attention to the alignment of the legs or pins on the chip. Each pin must seat completely in its corresponding hole in the chip holder. Using a strong light, check each pin carefully before reassembling the drive. Remember: power *off* before removing or installing anything inside the computer or drive.

Keeping your computer in good working order and fixing problems when they occur is much easier if you're organized. Ask yourself some questions about what to do when a repair problem arises. Pretend that you are explaining the problem to a repairman. Many times this approach will be enough. Most problems succumb to an organized attack. In any case, even if you can't fix it yourself, you will have better defined the problem—making your technician's job easier and less expensive for you. ■

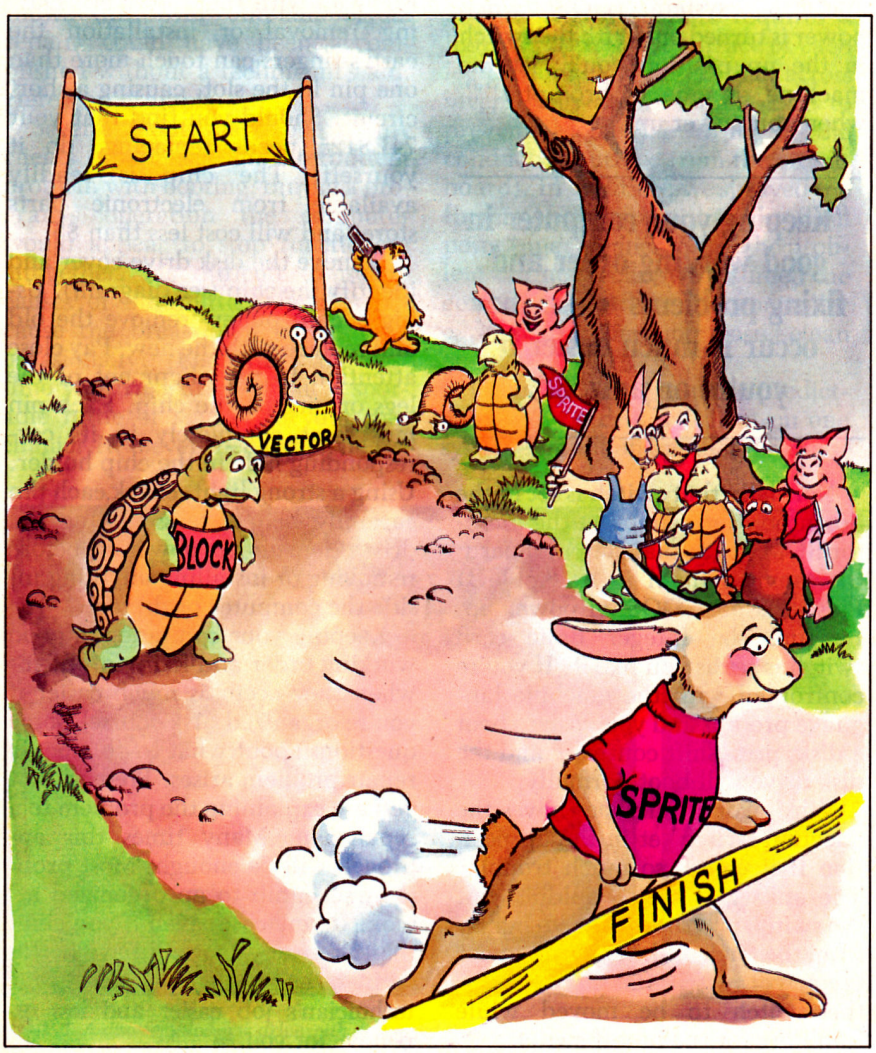
Fudge It!

by Don Fudge

The Tortoise and the Hare

If you've read the last few issues of *inCider*, you probably already know about the new SuperSprite board from Synetix, and the StarSprite I software from Avant-Garde. This system, the next graphics and sound step for the Apple, offers sprite graphics, 35 video planes, simultaneous Apple 6502 and sprite graphics (synchronized on the same screen), voice synthesis (ECHO hardware on the SuperSprite board), and a sound generator programmable for three tones and simultaneous sound effects and graphics.

Perhaps most important of all, this system is easy to use from Applesoft Basic. It uses a unique language, Amperspite, I've developed during the past year as an intermediary.



I've just completed tests comparing the SuperSprite/StarSprite system with other types of Apple graphics, and this month's column presents the results of that testing. The task was to move a 32-by-32 white square across the screen from X = 0 to X = 209, one hi-res unit at a time. See Table 1 for a summary of the results.

Test times are slow for many of the configurations because of limitations of 6502 graphics. A 1024-dot 32-by-32 shape is a heavy load for block shapes and a super-heavy load for vector shapes.

Testing Details

In all cases 32-dot-by-32-dot shapes were used. The sprite was at size 1, magnification 1, and occupied 32 bytes of memory. All bytes had the value 255. The vector shape was drawn using as little memory as possible with Super Shape Draw and Animate. It still took up 518 bytes, but that isn't really surprising when you consider that each vector-plotting byte is limited to two dot-plots, and 32 × 32 = 1024 dots. The vector shape table, BLOCKV (,A2360,L518) (Listing 1), was loaded in and SCALE was set to 1, rotation (ROT) was set to 0, and the 2360 starting address was inserted into Apple's shape table location with POKE 232,56:POKE 233,9.

All through vector shape animation and block shape animation POKE – 16300,0 chooses hi-res page 1, POKE – 16299,0 chooses page 2, POKE

Address your thoughts and questions to Don Fudge at Avant-Garde Creations, PO Box 30160, Eugene, OR 97403.

```
0930- FF FF 00 00 FF FF 00 00
0938- 01 00 04 00 2D 2D 2D 2D
0940- 2D 2D 2D 2D 2D 2D 2D 2D
0948- 2D 2D 2D 35 36 36 36 36
0950- 36 36 36 36 36 36 36 36
0958- 36 36 36 27 24 24 24 24
0960- 24 24 24 24 24 24 24 24
0968- 24 24 3C 36 36 36 36 36
0970- 36 36 36 36 36 36 36 36
0978- 36 36 27 24 24 24 24 24
0980- 24 24 24 24 24 24 24 24
0988- 24 3C 36 36 36 36 36 36
0990- 36 36 36 36 36 36 36 36
0998- 36 27 24 24 24 24 24 24
09A0- 24 24 24 24 24 24 24 24
09A8- 3C 36 36 36 36 36 36 36
09B0- 36 36 36 36 36 36 36 36
09B8- 27 24 24 24 24 24 24 24
09C0- 24 24 24 24 24 24 24 3C
09C8- 36 36 36 36 36 36 36 36
09D0- 36 36 36 36 36 36 36 27
09D8- 24 24 24 24 24 24 24 24
09E0- 24 24 24 24 24 24 3C 36
09E8- 36 36 36 36 36 36 36 36
09F0- 36 36 36 36 36 36 27 24
09F8- 24 24 24 24 24 24 24 24
0A00- 24 24 24 24 24 3C 36 36
0A08- 36 36 36 36 36 36 36 36
0A10- 36 36 36 36 36 27 24 24
0A18- 24 24 24 24 24 24 24 24
0A20- 24 24 24 24 3C 36 36 36
0A28- 36 36 36 36 36 36 36 36
0A30- 36 36 36 36 27 24 24 24
0A38- 24 24 24 24 24 24 24 24
0A40- 24 24 24 3C 36 36 36 36
0A48- 36 36 36 36 36 36 36 36
0A50- 36 36 36 27 24 24 24 24
0A58- 24 24 24 24 24 24 24 24
0A60- 24 24 3C 36 36 36 36 36
0A68- 36 36 36 36 36 36 36 36
0A70- 36 36 27 24 24 24 24 24
0A78- 24 24 24 24 24 24 24 24
0A80- 24 3C 36 36 36 36 36 36
0A88- 36 36 36 36 36 36 36 36
0A90- 36 27 24 24 24 24 24 24
0A98- 24 24 24 24 24 24 24 24
0AA0- 3C 36 36 36 36 36 36 36
0AA8- 36 36 36 36 36 36 36 36
0AB0- 27 24 24 24 24 24 24 24
0AB8- 24 24 24 24 24 24 24 3C
0AC0- 36 36 36 36 36 36 36 36
0AC8- 36 36 36 36 36 36 36 27
0AD0- 24 24 24 24 24 24 24 24
0AD8- 24 24 24 24 24 24 3C 36
0AE0- 36 36 36 36 36 36 36 36
0AE8- 36 36 36 36 36 36 27 24
0AF0- 24 24 24 24 24 24 24 24
0AF8- 24 24 24 24 24 3C 36 36
0B00- 36 36 36 36 36 36 36 36
0B08- 36 36 36 36 36 27 24 24
0B10- 24 24 24 24 24 24 24 24
0B18- 24 24 24 24 3C 36 36 36
0B20- 36 36 36 36 36 36 36 36
0B28- 36 36 36 36 27 24 24 24
0B30- 24 24 24 24 24 24 24 24
0B38- 24
```

Listing 1. BLOCKV.

230,64 chooses to draw on page 2, and POKE 230,32 chooses to draw on page 1. POKE – 16304,0:POKE – 16297,0 chooses hi-res graphics, and POKE – 16302,0 chooses full-screen graphics. CALL 62450 (an Applesoft routine) erases the screen.

XDRAW is always used for both drawing and erasing. VT means vertical top coordinate of a block shape, VB means vertical bottom, HL means horizontal left coordinate, HR means horizontal right. There are only 40 possible horizontal block-shape coordinates (0–39), because these coordinates refer to horizontal byte-columns, not horizontal pixel coordinates. There are 192 (0–191) possible vertical coordinates with block shapes.

I made one of the block shapes shorter than the rest so the page-flipping block-shape animation routine (the last one) on the demo program appears to "breathe." This marker makes it possible to see exactly how often the seven-shape sequence starts over again. See Table 2 for all the manipulations involved in dealing with page-flipping block-shape sequences.

The block shape table used in the test contained seven shapes, all 31 high by 5 wide. Each of these seven shapes was part of a sequence created automatically with Hi-Res Secrets' automatic block-shape creator. These are called *pre-shifted shapes*. They are necessary because single block shapes must do animation in multiples of seven; they cannot move less than seven dots per byte, unless slow, clumsy shift-animation routines are used, as outlined in Hi-Res Secrets.

The reason for this restriction is that block shapes are data arrays full of hi-res bytes that must be loaded into one-byte-capacity hi-res screen addresses (locations). Bytes are either loaded in location Z or location Z + 1, which are seven hi-res pixels apart.

In order to load a hi-res data byte partly into one screen address and partly into another, you need the pre-shifted shapes. Then Z plus 4/7, as it were, becomes feasible to load into, since the original block shape has had all its bytes shifted anywhere from 0 to 6 bits each. This shifting creates the pre-shifted shape sequence in which the shapes are one dot apart in their data-byte structures. Seven shifts are unneeded because when you move right seven coordinates, you simply add 1 to both HL and HR,

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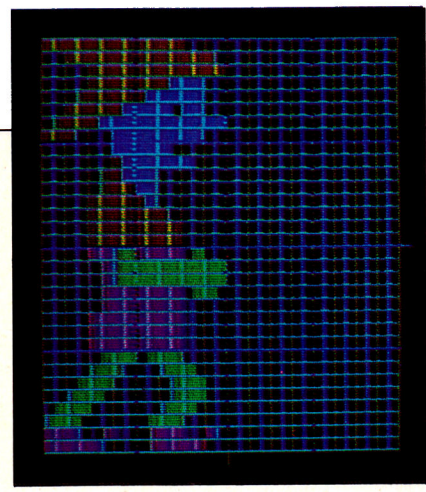
the horizontal block shape coordinates. (And you use the first shape, #1, in the saved sequence, the one whose bytes never got any shifting.)

Now look at the block shape sequence table, BLOCKS, A2304, L1792 in Listing 2. If you decide to key in the enclosed DEMO program, Listing 3, and the two shape tables, you'll want to know how to do it best. Each of BLOCKS' seven shapes start at an even memory page location—$900, $A00, $B00, $C00, $D00, $E00, $F00. But each is only 192 bytes long, so $C0 to $FF of each of these shapes is unnecessary to key in. Once you get to $BF, hit return and begin at the next page boundary.

Also, the actual dimensions of the block shape are 32 by 6, but I used 31 by 5 (in lines 148, 150, 200, 210). Here's why. Look at line 148. VT equals 0 and VB equals 31. That's 32 separate numbers if you use 0 to 31 inclusively, *which you do*. Same trick for width.

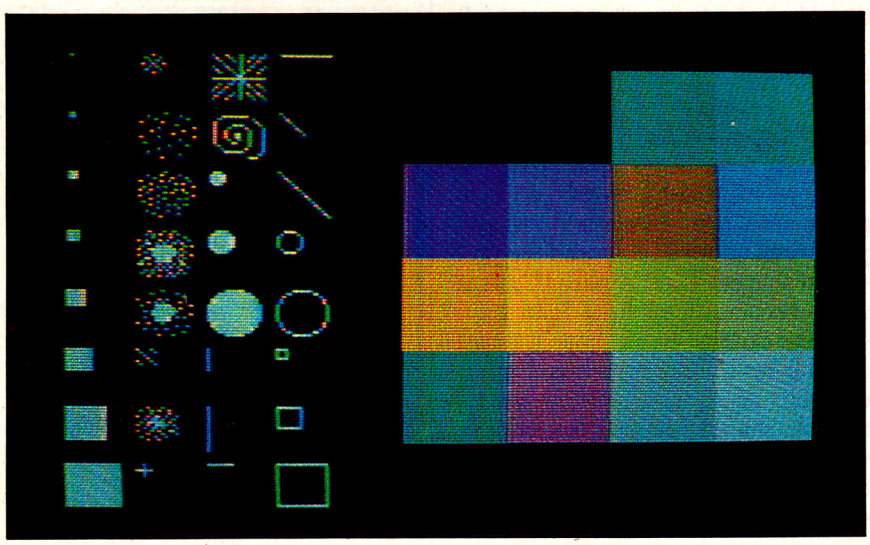


Multi-color StarSprite shape being constructed.

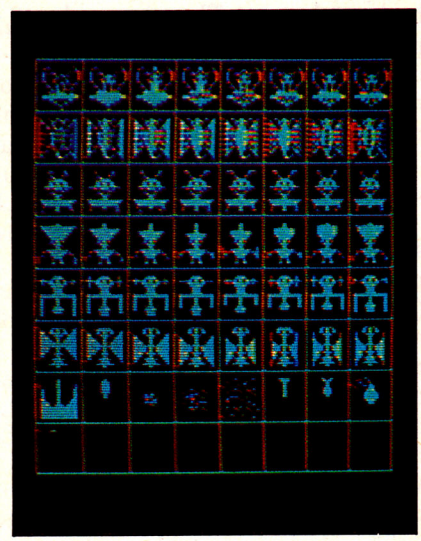
Listing 2. BLOCKS.

```
0900- 00 00 00 00 00 00 00 1F
0908- 7F 7F 7F 7E 00 1F 7F 7F
0910- 7F 7E 00 1F 7F 7F 7F 7E
0918- 00 1F 7F 7F 7F 7E 00 1F
0920- 7F 7F 7F 7E 00 1F 7F 7F
0928- 7F 7E 00 1F 7F 7F 7F 7E
0930- 00 1F 7F 7F 7F 7E 00 1F
0938- 7F 7F 7F 7E 00 1F 7F 7F
0940- 7F 7E 00 1F 7F 7F 7F 7E
0948- 00 1F 7F 7F 7F 7E 00 1F
0950- 7F 7F 7F 7E 00 1F 7F 7F
0958- 7F 7E 00 1F 7F 7F 7F 7E
0960- 00 1F 7F 7F 7F 7E 00 1F
0968- 7F 7F 7F 7E 00 1F 7F 7F
0970- 7F 7E 00 1F 7F 7F 7F 7E
0978- 00 1F 7F 7F 7F 7E 00 1F
0980- 7F 7F 7F 7E 00 1F 7F 7F
0988- 7F 7E 00 1F 7F 7F 7F 7E
0990- 00 1F 7F 7F 7F 7E 00 1F
0998- 7F 7F 7F 7E 00 1F 7F 7F
09A0- 7F 7E 00 1F 7F 7F 7F 7E
09A8- 00 1F 7F 7F 7F 7E 00 1F
09B0- 7F 7F 7F 7E 00 1F 7F 7F
09B8- 7F 7E 00 00 00 00 00 00
09C0- 24 24 24 24 24 24 24 3C
09C8- 36 36 36 36 36 36 36 36
09D0- 36 36 36 36 36 36 36 27
09D8- 24 24 24 24 24 24 24 24
09E0- 24 24 24 24 24 24 3C 36
09E8- 36 36 36 36 36 36 36 36
09F0- 36 36 36 36 36 36 27 24
09F8- 24 24 24 24 24 24 24 24
0A00- 00 3F 7F 7F 7F 7C 00 3F
0A08- 7F 7F 7F 7C 00 3F 7F 7F
0A10- 7F 7C 00 3F 7F 7F 7F 7C
0A18- 00 3F 7F 7F 7F 7C 00 3F
0A20- 7F 7F 7F 7C 00 3F 7F 7F
0A28- 7F 7C 00 3F 7F 7F 7F 7C
0A30- 00 3F 7F 7F 7F 7C 00 3F
0A38- 7F 7F 7F 7C 00 3F 7F 7F
0A40- 7F 7C 00 3F 7F 7F 7F 7C
0A48- 00 3F 7F 7F 7F 7C 00 3F
0A50- 7F 7F 7F 7C 00 3F 7F 7F
0A58- 7F 7C 00 3F 7F 7F 7F 7C
0A60- 00 3F 7F 7F 7F 7C 00 3F
0A68- 7F 7F 7F 7C 00 3F 7F 7F
0A70- 7F 7C 00 3F 7F 7F 7F 7C
0A78- 00 3F 7F 7F 7F 7C 00 3F
0A80- 7F 7F 7F 7C 00 3F 7F 7F
0A88- 7F 7C 00 3F 7F 7F 7F 7C
0A90- 00 3F 7F 7F 7F 7C 00 3F
0A98- 7F 7F 7F 7C 00 3F 7F 7F
0AA0- 7F 7C 00 3F 7F 7F 7F 7C
0AA8- 00 3F 7F 7F 7F 7C 00 3F
0AB0- 7F 7F 7F 7C 00 3F 7F 7F
0AB8- 7F 7C 00 3F 7F 7F 7F 7C
0AC0- 36 36 36 36 36 36 36 36
0AC8- 36 36 36 36 36 36 36 27
0AD0- 24 24 24 24 24 24 24 24
0AD8- 24 24 24 24 24 24 3C 36
0AE0- 36 36 36 36 36 36 36 36
0AE8- 36 36 36 36 36 36 27 24
0AF0- 24 24 24 24 24 24 24 24
0AF8- 24 24 24 24 24 3C 36 36
0B00- 00 7F 7F 7F 7F 78 00 7F
0B08- 7F 7F 7F 78 00 7F 7F 7F
0B10- 7F 78 00 7F 7F 7F 7F 78
0B18- 00 7F 7F 7F 7F 78 00 7F
0B20- 7F 7F 7F 78 00 7F 7F 7F
0B28- 7F 78 00 7F 7F 7F 7F 78
0B30- 00 7F 7F 7F 7F 78 00 7F
0B38- 7F 7F 7F 78 00 7F 7F 7F
0B40- 7F 78 00 7F 7F 7F 7F 78
0B48- 00 7F 7F 7F 7F 78 00 7F
0B50- 7F 7F 7F 78 00 7F 7F 7F
```

Listing continued.



SuperSprite's 16 VDP colors, illustrated by the palette of the Sprite Painting utility.



Sample StarSprite library.

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Now, choose from a full line of high grade outlet strips featuring the XP4 with its Extended Protection against spikes, surges and line noise!

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Extended protection for valuable equipment and programs.

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- Normal and common mode suppression
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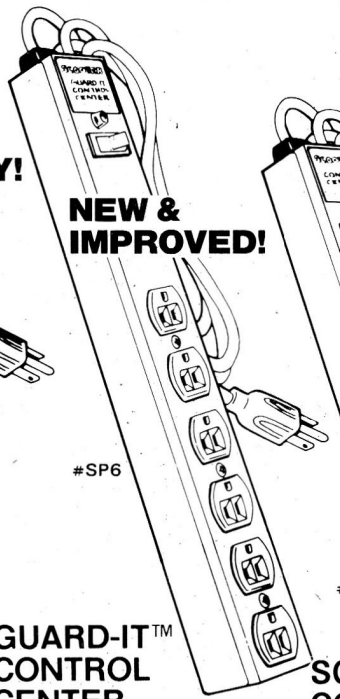
- Noise filtering: more than 20db, 2-100 mhz
- Power indicator light
- 4 protected outlets
- Maximum spike current: 6000 amps (8x20 ms)
- Clamping spike voltage: 225 (Ipk – 100 amps, 8x20 ms)
- Pulse life: 10^8 cycles (switching transients)
- Extended 3-Year Protection Warranty



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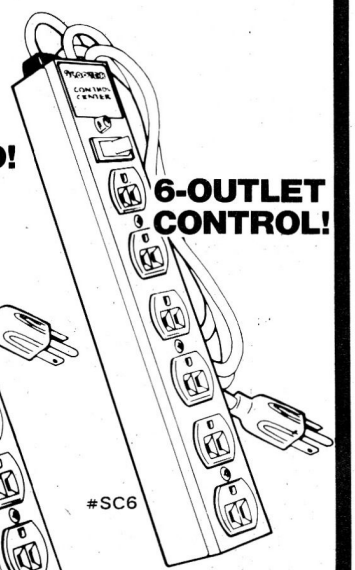
Now with improved surge and spike protection devices and surge failure indicator light.

- 6 protected outlets
- Normal and common mode suppression
- Surge failure indicator light
- Maximum spike current: 6000 amps (8x20 ms)
- Clamping spike voltage: 250 (Ipk – 100 amps, 8x20 ms)
- UL listed
- 1-Year Warranty



SCOOTER CONTROL CENTER

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The right choice for applications and areas where surge and spike protection isn't required.

- A high grade outlet strip for home, office and factory
- 6 grounded outlets
- Power indicator light
- UL listed
- 1-Year Warranty

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I-1183

Circle 85 on Reader Service card.

Graphics Task Performed: Moving a white 32 × 32 block from X = 0 to X = 209 on the screen.

Program and Routine	Shape Type	Drawing Method Type	Animation Quality	Screen Flipping?	Time (sec.)
DEMO, enclosed, first routine	vector	XDRAW from Basic	terrible	no	67
DEMO, enclosed, second routine	vector	XDRAW from Basic	good, except way too slow!	yes	70
DEMO, enclosed, third routine	block	EOR in CALLed block shape routine (called from Basic)	terrible	no	8
DEMO, enclosed, fourth routine	block	EOR in CALLed block shape routine (called from Basic)	good, but slow	yes	18
Hi-res Secrets, 28A, option (H), two-page flipping vector shape DEMO in assembly	vector	all mach. lang., used XDRAW routine (Applesoft's) from mach. lang.	good, but slow	yes	63
Hi-res Secrets, 28A, option (D), two-page flipping block shape DEMO in assembly, with inputs	block	all mach. lang., used my mach. lang. block shape drawing routine from mach. lang.	slightly unsteady around the edges, but otherwise ok; speed ok, but not great	yes	5
For B = 0 TO 209: &AX6,B:NEXT (Ampersprite command in an Applesoft FOR... NEXT)	sprite	simple coordinate update from Ampersprite	excellent animation quality, speed	no need	0.77

Table 1. Test results.

Screen # for Display	Screen # for Draw	Erase Shape #	Draw Shape #	Erase H L	Draw H L
1	2	1	3	0	0
2	1	2	4	0	0
1	2	3	5	0	0
2	1	4	6	0	0
1	2	5	7	0	0
2	1	6	1	0	1
1	2	7	2	0	1
2	1	1	3	1	1
1	2	2	4	1	1
2	1	3	5	1	1
1	2	4	6	1	1
2	1	5	7	1	1
1	2	6	1	1	2
2	1	7	2	1	2
1	2	1	3	2	2
2	1	2	4	2	2
etc.	etc.	etc.	etc.	etc.	etc.

Table 2. Block shape sequence manipulation table associated with DEMO.

Notice, when you look at the 1792 bytes of the BLOCKS table, how long and memory-wasting this block shape method is. Compare it to 32 bytes in a row of $FF 's, which is all the sprite program needs in the way of sprite pattern data bytes. And compare the simple FOR...NEXT sprite-running algorithm with the long routine required to make the block shapes look decent (with screen flipping).

By the way, you must POKE 104,96: POKE 24576,0 in your Hello program before running DEMO, or it won't work.

TESTTB (Listing 4) is the block-shape drawing and scanning routine. A CALL 2116 activates it. It doesn't matter what you key in from $800 to $843, as long as you're not going to be using the scanning function of TEST-TB. For more on block-shape scan-

Listing continued.

```
0B58- 7F 78 00 7F 7F 7F 7F 78
0B60- 00 7F 7F 7F 7F 78 00 7F
0B68- 7F 7F 7F 78 00 7F 7F 7F
0B70- 7F 78 00 7F 7F 7F 7F 78
0B78- 00 7F 7F 7F 7F 78 00 7F
0B80- 7F 7F 7F 78 00 7F 7F 7F
0B88- 7F 78 00 7F 7F 7F 7F 78
0B90- 00 7F 7F 7F 7F 78 00 7F
0B98- 7F 7F 7F 78 00 7F 7F 7F
0BA0- 7F 78 00 7F 7F 7F 7F 78
0BA8- 00 7F 7F 7F 7F 78 00 7F
0BB0- 7F 7F 7F 78 00 7F 7F 7F
0BB8- 7F 78 00 7F 7F 7F 7F 78
0BC0- FF FF 00 00 FF FF 00 00
0BC8- FF FF 00 00 FF FF 00 00
0BD0- FF FF 00 00 FF FF 00 00
0BD8- FF FF 00 00 FF FF 00 00
0BE0- FF FF 00 00 FF FF 00 00
0BE8- FF FF 00 00 FF FF 00 00
0BF0- FF FF 00 00 FF FF 00 00
0BF8- FF FF 00 00 FF FF 00 00
0C00- 01 7F 7F 7F 7F 70 01 7F
0C08- 7F 7F 7F 7F 70 01 7F 7F
0C10- 7F 70 01 7F 7F 7F 7F 70
0C18- 01 7F 7F 7F 7F 70 01 7F
0C20- 7F 7F 7F 7F 70 01 7F 7F
0C28- 7F 70 01 7F 7F 7F 7F 70
0C30- 01 7F 7F 7F 7F 70 01 7F
0C38- 7F 7F 7F 7F 70 01 7F 7F
0C40- 7F 70 01 7F 7F 7F 7F 70
0C48- 01 7F 7F 7F 7F 70 01 7F
0C50- 7F 7F 7F 7F 70 01 7F 7F
0C58- 7F 70 01 7F 7F 7F 7F 70
0C60- 01 7F 7F 7F 7F 70 01 7F
0C68- 7F 7F 7F 7F 70 01 7F 7F
0C70- 7F 70 01 7F 7F 7F 7F 70
0C78- 01 7F 7F 7F 7F 70 01 7F
0C80- 7F 7F 7F 7F 70 01 7F 7F
0C88- 7F 70 01 7F 7F 7F 7F 70
0C90- 01 7F 7F 7F 7F 70 01 7F
0C98- 7F 7F 7F 7F 70 01 7F 7F
0CA0- 7F 70 01 7F 7F 7F 7F 70
0CA8- 01 7F 7F 7F 7F 70 01 7F
0CB0- 7F 7F 7F 7F 70 01 7F 7F
0CB8- 7F 70 01 7F 7F 7F 7F 70
0CC0- FF FF 00 00 FF FF 00 00
0CC8- FF FF 00 00 FF FF 00 0C
0CD0- FF FF 00 00 FF FF 00 00
0CD8- FF FF 00 00 FF FF 00 04
0CE0- FF FF 00 00 FF FF 00 00
0CE8- FF FF 00 00 FF FF 00 5C
0CF0- FF FF 00 00 FF FF 00 00
0CF8- FF FF 00 00 FF FF 00 20
0D00- 03 7F 7F 7F 7F 60 03 7F
0D08- 7F 7F 7F 60 03 7F 7F 7F
0D10- 7F 60 03 7F 7F 7F 7F 60
0D18- 03 7F 7F 7F 7F 60 03 7F
0D20- 7F 7F 7F 60 03 7F 7F 7F
0D28- 7F 60 03 7F 7F 7F 7F 60
0D30- 03 7F 7F 7F 7F 60 03 7F
0D38- 7F 7F 7F 60 03 7F 7F 7F
0D40- 7F 60 03 7F 7F 7F 7F 60
0D48- 03 7F 7F 7F 7F 60 03 7F
0D50- 7F 7F 7F 60 03 7F 7F 7F
0D58- 7F 60 03 7F 7F 7F 7F 60
0D60- 03 7F 7F 7F 7F 60 03 7F
0D68- 7F 7F 7F 60 03 7F 7F 7F
0D70- 7F 60 03 7F 7F 7F 7F 60
0D78- 03 7F 7F 7F 7F 60 03 7F
0D80- 7F 7F 7F 60 03 7F 7F 7F
0D88- 7F 60 03 7F 7F 7F 7F 60
0D90- 03 7F 7F 7F 7F 60 03 7F
0D98- 7F 7F 7F 60 03 7F 7F 7F
0DA0- 7F 60 03 7F 7F 7F 7F 60
0DA8- 03 7F 7F 7F 7F 60 03 7F
0DB0- 7F 7F 7F 60 03 7F 7F 7F
0DB8- 7F 60 03 7F 7F 7F 7F 60
0DC0- FF FF 00 00 FF FF 00 00
0DC8- FF FF 00 00 FF FF 00 00
0DD0- FF FF 00 00 FF FF 00 00
0DD8- FF FF 00 00 FF FF 00 00
0DE0- FF FF 00 00 FF FF 00 00
0DE8- FF FF 00 00 FF FF 00 00
0DF0- FF FF 00 00 FF FF 00 00
0DF8- FF FF 00 00 FF FF 00 00
0E00- 07 7F 7F 7F 7F 40 07 7F
0E08- 7F 7F 7F 40 07 7F 7F 7F
0E10- 7F 40 07 7F 7F 7F 7F 40
0E18- 07 7F 7F 7F 7F 40 07 7F
0E20- 7F 7F 7F 40 07 7F 7F 7F
0E28- 7F 40 07 7F 7F 7F 7F 40
0E30- 07 7F 7F 7F 7F 40 07 7F
0E38- 7F 7F 7F 40 07 7F 7F 7F
0E40- 7F 40 07 7F 7F 7F 7F 40
0E48- 07 7F 7F 7F 7F 40 07 7F
0E50- 7F 7F 7F 40 07 7F 7F 7F
0E58- 7F 40 07 7F 7F 7F 7F 40
0E60- 07 7F 7F 7F 7F 40 07 7F
0E68- 7F 7F 7F 40 07 7F 7F 7F
0E70- 7F 40 07 7F 7F 7F 7F 40
0E78- 07 7F 7F 7F 7F 40 07 7F
0E80- 7F 7F 7F 40 07 7F 7F 7F
0E88- 7F 40 07 7F 7F 7F 7F 40
0E90- 07 7F 7F 7F 7F 40 07 7F
0E98- 7F 7F 7F 40 07 7F 7F 7F
0EA0- 7F 40 07 7F 7F 7F 7F 40
0EA8- 07 7F 7F 7F 7F 40 07 7F
0EB0- 7F 7F 7F 40 07 7F 7F 7F
0EB8- 7F 40 07 7F 7F 7F 7F 40
0EC0- FF FF 00 00 FF FF 00 00
0EC8- FF FF 00 00 FF FF 00 18
0ED0- FF FF 00 00 FF FF 00 00
0ED8- FF FF 00 00 FF FF 00 74
0EE0- FF FF 00 00 FF FF 00 00
0EE8- FF FF 00 00 FF FF 00 38
0EF0- FF FF 00 00 FF FF 00 00
0EF8- FF FF 00 00 FF FF 00 1C
0F00- 0F 7F 7F 7F 7F 00 0F 7F
0F08- 7F 7F 7F 00 0F 7F 7F 7F
0F10- 7F 00 0F 7F 7F 7F 7F 00
0F18- 0F 7F 7F 7F 7F 00 0F 7F
0F20- 7F 7F 7F 00 0F 7F 7F 7F
0F28- 7F 00 0F 7F 7F 7F 7F 00
0F30- 0F 7F 7F 7F 7F 00 0F 7F
0F38- 7F 7F 7F 00 0F 7F 7F 7F
0F40- 7F 00 0F 7F 7F 7F 7F 00
0F48- 0F 7F 7F 7F 7F 00 0F 7F
0F50- 7F 7F 7F 00 0F 7F 7F 7F
0F58- 7F 00 0F 7F 7F 7F 7F 00
0F60- 0F 7F 7F 7F 7F 00 0F 7F
0F68- 7F 7F 7F 00 0F 7F 7F 7F
0F70- 7F 00 0F 7F 7F 7F 7F 00
0F78- 0F 7F 7F 7F 7F 00 0F 7F
0F80- 7F 7F 7F 00 0F 7F 7F 7F
0F88- 7F 00 0F 7F 7F 7F 7F 00
0F90- 0F 7F 7F 7F 7F 00 0F 7F
0F98- 7F 7F 7F 00 0F 7F 7F 7F
0FA0- 7F 00 0F 7F 7F 7F 7F 00
0FA8- 0F 7F 7F 7F 7F 00 0F 7F
0FB0- 7F 7F 7F 00 0F 7F 7F 7F
0FB8- 7F 00 0F 7F 7F 7F 7F 00
0FC0- FF FF 00 00 FF FF 00 00
0FC8- FF FF 00 00 FF FF 00 00
0FD0- FF FF 00 00 FF FF 00 00
0FD8- FF FF 00 00 FF FF 00 00
0FE0- FF FF 00 00 FF FF 00 00
0FE8- FF FF 00 00 FF FF 00 00
0FF0- FF FF 00 00 FF FF 00 00
0FF8- FF FF 00 00 FF FF 00 00
```

Circle 56 on Reader Service card.

AMPERGRAPH

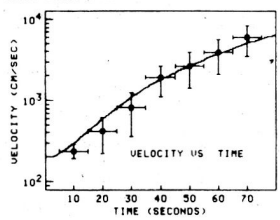
AMPERGRAPH is a powerful, easy-to-use relocatable graphics utility for the Apple II +/e. AMPERGRAPH adds twenty-two Applesoft commands that allow effortless generation of professional-looking plots of scientific or financial data. All of the necessary scaling and screen formatting is accomplished with just a few, simple Applesoft lines.

Unlike most other plotting systems for the Apple II which are stand-alone systems, the AMPERGRAPH utility provides extended BASIC graphics language macros that you can use directly in your own Applesoft programs. The additional commands are &SCALE, &LIMIT, &AXES, &GRID, &FRAME, &LOG X, &LOG Y, &LABEL AXES, &LABEL, &VLABEL, &CENTER LABEL, &CENTER VLABEL, &DRAW, &PENUP, &CROSS, &OPEN SQUARE, &CLOSED SQUARE, &OPEN CIRCLE, &CLOSED CIRCLE, &ERROR BARS, &DUMP (to dump the graph on a Silentype printer) and &*DUMP (to link with AMERDUMP, see below).

$45.00

SAMPLE AMPERGRAPH PROGRAM LISTING:

```
10 &SCALE, 0, 80, 80, 13000
15 LX$ = "TIME (SECONDS)":LY$ = "VELOCITY
   (CM/SEC)"
20 &LOG Y: &LABEL AXES, 10, 10
25 LABEL$ = "VELOCITY VS. TIME":&LABEL, 30,
   200
30 FOR T = 0 TO 80:&DRAW, T, 150 + T!2:NEXT T
35 FOR T = 10 TO 70 STEP 10
40 &CLOSED SQUARE, T,
   (150 + T!2)*(.8 + .4*RND(3) )
45 &ERROR BARS, 5, T!2/2
50 NEXT T:&DUMP
```



AMPERDUMP

AMPERDUMP is a high-resolution graphics dump utility which can be used either in menu-driven mode, or directly from your Applesoft program, with, or without AMPERGRAPH. The following printers will work with AMPERDUMP: Epson MX-80, FX-80, MX-100; Apple DMP, NEC PC-8023A-C, C. ITOH 1550, 8510A/B, 8600. AMPERDUMP offers many features which are not available in other graphics dump routines:

- Horizontal magnifications: 3 with Epson printers (2.33 to 6.99 inches); 12 with all others (1.75 to 7.78 inches)
- Vertical magnifications: 9 with Epson printers (0.88 to 7.96 inches); 6 with all others (1.33 to 8.00 inches)
- Horizontal and vertical magnifications can be specified independently.
- Normal / Inverse dumps
- Fast
- Adjustable horizontal tab
- Easy to use
- Compatible with AMPERGRAPH
- Relocatable

$40.00

The AMPERGRAPH and AMPERDUMP graphics utilities require an Apple II +/e (or Apple II with language card). The AMPERDUMP utility requires one of the following interface cards: Epson, Apple, Grappler, Interactive Structures, Mountain Computer, Epson Type2, Tymac, or Microbuffer II.

AMPERGRAPH and AMPERDUMP are available from your dealer or order direct. Include $2.00 for shipping and handling; Wisconsin residents add 5% sales tax.

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ning (creating), see my March and April '83 *inCider* columns. For TESTTB and all other machine language programs, use CALL – 151 to access the monitor and type 800:, or whatever, and begin keying in hex numbers separated by spaces. Hit return before line 7 (the seventh text line of your input) is reached. Use memory dumps like 800.89F to see how you're doing and to check addresses.

Implications

What do I need to say? The hare so outran the tortoise that the tortoise was, for all intents and purposes, not even in the race. Even the race against the machine language animator was no contest. Sprites are programmable objects that have been purposely made to animate extremely smoothly and quickly. And video display processors like the TMS9918A of the SuperSprite board are purposely made to manipulate sprites and pattern graphics.

The graphics on a normal Apple all have to filter through the bottleneck known as the 6502. This microprocessor is a wonderful calculating device and supports the Applesoft language nicely, but when it comes to graphics it's slow, clumsy and unnecessarily complex.

"Even the race against the machine language animator was no contest."

I've felt for a couple of years now that the Apple would not be stuck with the 6502 processor for graphics much longer. It's like what Mr. Natural said in an old Zap comic book: "Use the right tool for the job."

Actually, I have had a ball doing HPLOT and block shapes, XDRAW and fill routines, etc., for the 6502. But as my tests in this article point out, it really is time for Apple graphics to mature and get back up to state-of-the-art level. Don't you agree? I welcome your comments. ■

```
10 D$ =  CHR$ (4): PRINT D$"BLOADBLOCKV"
20  HGR2 : POKE  - 16302,0: ROT= 0: SCALE= 1: POKE 232
     ,56: POKE 233,9
30  TEXT : HOME : PRINT "VECTOR XDRAW; NO SCREEN FLIPP
     ING.": FOR QW = 1 TO 3000: NEXT : POKE  - 16299,0
     : POKE  - 16297,0: POKE  - 16304,0
40 Y = 10
50  FOR A = 0 TO 209: XDRAW 1 AT A,Y
70  XDRAW 1 AT A,Y: NEXT
100  HGR : POKE  - 16302,0: HCOLOR= 3: ROT= 0: SCALE=
     1: XDRAW 1 AT 1,Y: POKE  - 16300,0: POKE 230,64: XDRAW
     1 AT 0,Y
102  TEXT : HOME : PRINT "VECTOR XDRAW; SCREEN FLIPPIN
     G.": FOR QW = 1 TO 3000: NEXT : POKE  - 16304,0: POKE
      - 16297,0
105  FOR A = 1 TO 209 STEP 2
120  POKE 230,64: POKE  - 16300,0: XDRAW 1 AT A - 1,Y:
      XDRAW 1 AT A + 1,Y
130  POKE 230,32: POKE  - 16299,0: XDRAW 1 AT A,Y: XDRAW
     1 AT A + 2,Y
140  NEXT
145  PRINT D$"BLOADTESTTB": PRINT D$"BLOADBLOCKS"
148 VT = 0:VB = 31: POKE 252,VT: POKE 253,VB:S = 1: POKE
     7,S
149  TEXT : HOME : PRINT "BLOCK XDRAW; NO SCREEN FLIPP
     ING.": FOR QW = 1 TO 3000: NEXT : POKE  - 16304,0
     : POKE  - 16297,0: POKE 230,32: CALL 62450
150  FOR HL = 0 TO 29:HR = HL + 5: POKE 255,HL: POKE 2
     54,HR
160 S = S + 1: IF S > 7 THEN S = 1: NEXT : GOTO 170
165  POKE 7,S: CALL 2116: CALL 2116: GOTO 160
170  POKE 230,32: CALL 62450: POKE 230,64: CALL 62450
171  TEXT : HOME : PRINT "BLOCK XDRAW; SCREEN FLIPPING
     .": FOR QW = 1 TO 3000: NEXT : POKE  - 16304,0: POKE
      - 16297,0
200 S = 1: POKE 230,64:HL = 0:HR = 5: POKE 255,HL: POKE
     254,HR: POKE 7,S: CALL 2116:S = 2: POKE 7,S: POKE
     230,32: CALL 2116
205 S = 1:SW = 1
210  FOR HL = 0 TO 29: POKE 255,HL:HR = HL + 5: POKE 2
     54,HR
220 SW =  NOT SW: IF SW = 0 THEN  POKE 230,64: POKE  -
     16300,0: GOTO 240
230  POKE 230,32: POKE  - 16299,0
240  POKE 7,S: CALL 2116: POKE 7,S + 2: IF S + 2 > 7 THEN
      POKE 7,(S + 2) - 7
245  IF S > 5 THEN  POKE 255,HL + 1: POKE 254,HR + 1: CALL
     2116: POKE 255,HL: POKE 254,HR: GOTO 260
250  CALL 2116
260 S = S + 1: IF S > 7 THEN S = 1: GOTO 300
280  GOTO 220
300  NEXT
```

Listing 3. DEMO.

```
0800- A0 09 A6 07 CA E0 00 F0
0808- 04 C8 4C 04 08 98 85 FB
0810- A9 00 85 FA A5 FD 85 06
0818- A2 00 A0 00 20 11 F4 A4
0820- FE A2 00 B1 26 81 FA 88
0828- 18 E6 FA D0 02 E6 FB C0
0830- FF F0 04 C4 FF B0 EC C6
0838- 06 A5 06 C9 FF F0 04 C5
0840- FC B0 D5 60 A0 09 A6 07
0848- CA E0 00 F0 04 C8 4C 48
0850- 08 98 85 FB A9 00 85 FA
0858- A5 FD 85 06 A2 00 A0 00
0860- 20 11 F4 A4 FE A2 00 A1
0868- FA 51 26 91 26 88 18 E6
0870- FA D0 02 E6 FB C0 FF F0
0878- 04 C4 FF B0 EA C6 06 A5
0880- 06 C9 FF F0 04 C5 FC B0
0888- D3 60 00 00 20 EA A2 4C
```

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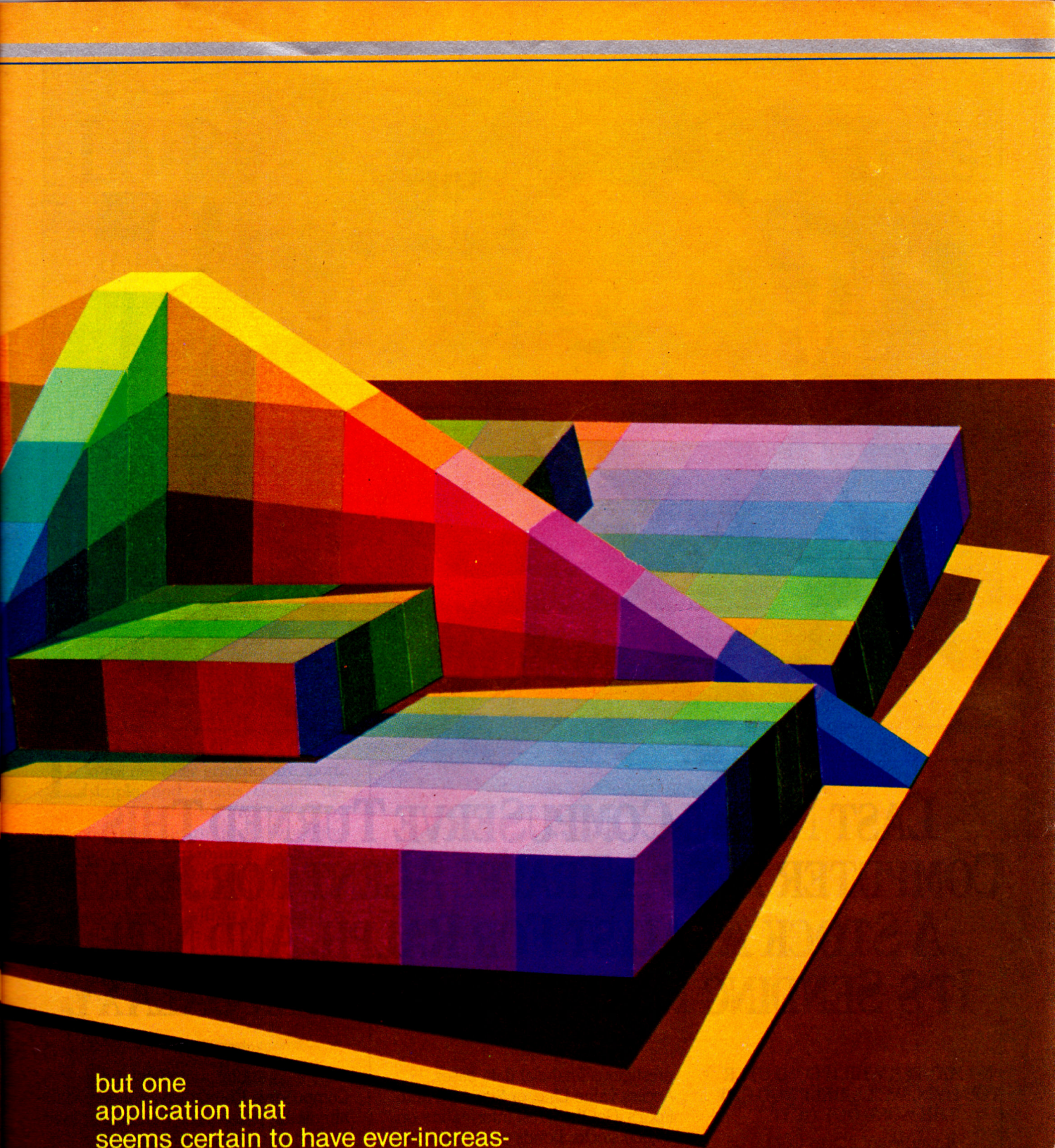
Graphics

Where Do We Go From Here?



The development of machines and software capable of creating graphic images on a video display continues to be one of the most exciting features of the microcomputer revolution. The utility of computer-generated graphics is demonstrated by the plethora of business graphics packages available today. Computer graphics are also invaluable in education and entertainment programs. They have an impact that cannot be matched by text alone.

But what of the future? The trends toward greater graphics resolution, more and improved colors, and multiple video planes are apparent. What are not so apparent are the new applications that will become possible as the technology matures. It is foolhardy, perhaps, to speculate upon what the future will bring,



but one application that seems certain to have ever-increasing impact is computer graphics to create art. Computers seem destined to become the next important medium of the visual arts.

As with photography, there will be much resistance to the inclusion of computer art in the phalanx of the 'legitimate' arts. In the end, however, this resistance will prove immaterial. What matters, after all, is not the medium, but the message. Sorry Marshall McLuhan.

King Tut's Revenge, acrylic on canvas, by Edward Sallery



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Lo-Res One-Liner Graphics

by Craig Daniels

Lo-res one-liner graphics are short, simple and create elegant designs—what more can you ask? They help beginners learn about graphing and simple programming techniques (especially loops), but challenge more experienced programmers to make complex designs within the one-line restriction.

Lo-res graphics use three plotting commands to plot small, colored rectangles on a 40 × 40 grid in any of 16 colors:

PLOT X,Y	plots a single colored rectangle
HLIN X1,X2 AT Y	plots a colored horizontal line
VLIN Y1,Y2 AT X	plots a colored vertical line.

Listing 1 includes four examples of the designs you can produce with just one program line (lines 510, 520, 530, 540). The remainder of the program creates a menu displaying the name of each design, and allows you to run

Write to Craig Daniels at the Stress Research Center, University of Hartford, West Hartford, CT 06117.

Listing 1. The complete one-liner program listing.

```
 10  REM  ************************
 12  REM  *                      *
 14  REM  *   LORES ONE-LINERS   *
 18  REM  *                      *
 20  REM  *         BY           *
 22  REM  *    CRAIG DANIELS     *
 24  REM  *                      *
 26  REM  ************************
 28 :
 31  DIM A$(26): DIM C(39)
 35 M$ =  CHR$ (91): REM  LEFT BRACKET
 40 :
 49  REM ----- MENU HEADING -----
 50  TEXT : HOME : INVERSE
 60  FOR K = 1 TO 5
 63  VTAB (K + 1): HTAB 2
 65  FOR J = 1 TO 36: PRINT " ";: NEXT
 70  NEXT
 75  NORMAL
 80  FOR K = 1 TO 3
 83  VTAB (K + 2): HTAB 5
 85  FOR J = 1 TO 30: PRINT " ";: NEXT
 87  NEXT
 90  VTAB 4: HTAB 7: PRINT "ONE LINE GRAPHICS PROGRAMS"
     ;
 94 :
 95  REM  ----- MENU TITLES -----
101 A$(1) = " PSYCHOSPIRAL "
102 A$(2) = " PATCHWORK SQUARES "
103 A$(3) = " 3 COLOR SQUARES "
104 A$(4) = " PATCHWORK L'S "
148 :
```

Listing continued.

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Listing continued.

```
149  REM -- MENU PRINT/SELECT --
150  FOR K = 0 TO 2
152  VTAB 7: CALL  - 958: TEXT
155  FOR J = 1 TO 8
160  VTAB (J + 8): HTAB 5:L = K * 8 + J
165  IF L = 26 OR A$(L) = "" THEN  VTAB 17: HTAB 4: PRINT
     M$;"+] RUN ALL PROGRAMS": GOTO 180
167  PRINT M$; CHR$ (L + 64);"] ";A$(L)
170  NEXT J
175  VTAB 20: HTAB 4: PRINT M$;"SPC] MORE SELECTIONS"
177 :
180  VTAB 23: INVERSE :
185  PRINT "TYPE LTR OF DESIRED PROGRAM";: NORMAL : PRINT
     "  ";: GET Z$:Z =  ASC (Z$) - 64
186  IF Z$ = "+" GOTO 450
190  IF Z$ = " " THEN  NEXT K
195  IF ((Z < 1 OR Z > 26) AND (Z$ <  > "+" OR Z$ <  >
     " ")) THEN  VTAB 23: HTAB 1: FLASH : GOTO 185
200  IF A$(Z) = "" THEN  VTAB 23: HTAB 1: FLASH : GOTO
     185
215 :
219  REM ---- MAIN PROGRAM -----
225  GOSUB 345
230  GOSUB 380
240  GOSUB 410
260  PRINT "     ";M$;"A] AGAIN"
265  VTAB 24: PRINT "     ";M$;"N] NEW SELECTION     ";M
     $;"E] EXIT    ";: GET Y$
270  IF Y$ = "A" GOTO 225
275  IF Y$ = "N" GOTO 50
280  TEXT : HOME : END
295 :
296 :
297  REM ========================
298  REM =      SUBROUTINES      =
299  REM ========================
300 :
340  REM --- RUN CHOSEN PROG ---
345  HOME
350  ON Z GOSUB 510,520,530,540,550,560,570,580,590,60
     0,610,620,630,640,650,660,670,680,690,700,710,720
     ,730,740,750,760: RETURN
360 :
370  REM ------ DELAY ----------
380  FOR J = 1 TO 1700: NEXT : RETURN
390 :
400  REM ---- DE?PLAY TITLE ----
410  VTAB 21: HTAB 1: CALL  - 958
415  VTAB 23: INVERSE : PRINT A$(Z);: NORMAL
420  RETURN
440 :
445  REM ---- RUN ALL PROGS ----
450  FOR Z = 1 TO 26
455  IF A$(Z) = "" GOTO 265
465  GOSUB 345
470  GOSUB 380
475  GOSUB 410
480  GOSUB 380
485  NEXT Z
490  GOTO 265
495 :
498  REM ========================
499  REM =  ONELINE PROGRAMS    =
500  REM ========================
510  GR : FOR J = 1 TO 30: FOR K = 20 TO 21: COLOR=  INT
     ( RND (K) * 14 + 1): FOR L = 0 TO 16 STEP 2:P = K
      + L:M = K - L +  INT ((20 / K - 1) * 30): VLIN P
     ,M AT M: HLIN M,P AT M: VLIN M,P + 2 AT P: HLIN P
     ,M - 2 AT P + 2: NEXT : NEXT : NEXT : RETURN
520  GR : FOR K = 1 TO 3: FOR J = 0 TO 39:C(J) =  INT
     ( RND (J) * 14 + 1): NEXT : FOR X = 0 TO 19: FOR
     Y = 0 TO 19:W = 19 - X:R = X + 20:S = Y + 20: COLOR=
     C(W + Y): PLOT W,Y: COLOR= C(38 - X - Y): PLOT R,
     S: COLOR= C(39 -  ABS (R - Y)): PLOT R,Y: COLOR=
     C(39 -  ABS (W - S)): PLOT W,S: NEXT : NEXT : FOR
     J = 1 TO 6 ^ 4: NEXT : NEXT : RETURN
530  GR : FOR K = 1 TO 80:X =  INT ( RND (1) * 32):B =
      INT ( RND (1) * 32): FOR J = 1 TO 3:C(J) =  INT
```

Listing continued.

Listing continued.

```
      ( RND (1) * 14 + 1): NEXT : COLOR= C(1): FOR Y =
      B TO B + 5: HLIN X,X + 5 AT Y: NEXT : COLOR= C(2)
      : FOR Y = B + 1 TO B + 4: HLIN X + 1,X + 4 AT Y: NEXT
      : COLOR= C(3): HLIN X + 2,X + 3 AT B + 2: HLIN X +
      2,X + 3 AT B + 3: NEXT : RETURN
540   GR : FOR K = 1 TO 10: FOR H = 0 TO 1:C =  - 2 + H
       * 4:A =  - 18 * H + 19:B = 18 * H + 1: FOR J = A
       TO B STEP C: COLOR=  INT ( RND (J) * 14 + 1):M =
      39 - J: VLIN 0,J AT J: HLIN 0,J AT J: VLIN 39,M AT
      J: HLIN 0,J AT M: VLIN 0,J AT M: HLIN 39,M AT J: VLIN
      39,M AT M: HLIN 39,M AT M: NEXT : FOR X = 1 TO 80
      0: NEXT : NEXT : NEXT : RETURN

550 :          630 :          710 :
560 :          640 :          720 :
570 :          650 :          730 :
580 :          660 :          740 :
590 :          670 :          750 :
600 :          680 :          760 :
610 :          690 :
620 :          700 :
```

either individual or all selections in sequence. Changing line 490 to GOTO 450 will produce continuous cycling when all selections are chosen.

The menu accommodates up to 26 one-liners. To add each new one, insert two new program lines as shown below. New# equals the number of existing one-liners + 1.

LINE# 100 + new#	A$(new#) = "name of new one-liner"
LINE# 500 + 10*new#	one-liner program : RETURN

Since there are nine open line numbers between each one-liner you could possibly cheat and expand your one-liners into two- or three-liners without altering the overall program; however, the challenge is the one-line restriction.

The Main Program

The main program is straightforward. DIM C(39) in line 31 actually belongs to line 520, but is located in line 31 to avoid a REDIM'D ARRAY error if this selection is rerun more than once. Line 350 is somewhat cumbersome since Applesoft does not permit variable names as line numbers in GOSUB commands. The blank lines 550–760 are included to avoid an UNDEF'D STATEMENT error.

Listings 2 and 3 are easy-to-read listings of the first two one-liners. One-liners are generally easier to write and debug than multi-line programs, but try to use all characters saving techniques you can—such as single letter real number variable names/arrays rather than integers (saves the % each time you use the variable name), and variables for repeated math sequences (e.g., P and Q in line 510; W, R and S in line 520). When you finally fit one-liners on one line, be sure to eliminate all spaces within and between commands, since a single line in Applesoft can contain a maximum of 239 characters and spaces.

These two one-liners use different plotting approaches. Line 510 uses HLIN and VLIN to plot a spiral (L loop), plots a second spiral in a new color (K loop) one unit larger than the first, and then repeats this sequence 30 times (J loop). Colors are created as needed to plot each spiral. In contrast, line 520 uses only the PLOT command and stores in the C array 39 numbers to be used as needed to set the plotting color. This one-liner divides the screen into four quadrants, plots a vertical stripe of 19 squares (each square a different color) in each quadrant (Y loop), repeats this sequence moving from the center of the design to the edge of screen (X loop), and finally repeats the entire sequence three times (K loop).

Some good beginner one-liners are:

- Fill the screen with a changing series of horizontal or vertical stripes of different widths and colors.
- Use one of the four plot sequences in line 520 to fill the screen with diagonal stripes of different colors.

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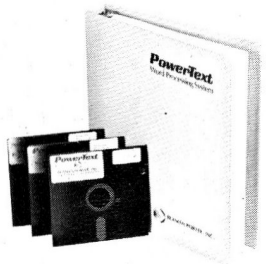

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More advanced projects include animated figures and elaborate kaleidoscope patterns. Also, hi-res one-liners easily can be included by changing line 345 to read HOME:HGR. Happy one-lining! ■

```
----------------------
510   GR
    : FOR J = 1 TO 30
    :   FOR K = 20 TO 21
    :     COLOR= INT ( RND (K) * 14 + 1)
    :     FOR L = 0 TO 16 STEP 2
    :       P = K + L
    :       M = K - L + INT ((20 / K - 1) * 30)
    :       VLIN P,M AT M
    :       HLIN M,P AT M
    :       VLIN M,P + 2 AT P
    :       HLIN P,M - 2 AT P + 2
    :     NEXT
    :   NEXT
    : NEXT
    : RETURN
```

Listing 2. A one-liner graphic program.

```
----------------------
520   GR
    : FOR K = 1 TO 3
    :   FOR J = 0 TO 39
    :     C(J) = INT ( RND (J) * 14 + 1)
    :   NEXT
    :   FOR X = 0 TO 19
    :     FOR Y = 0 TO 19
    :       W = 19 - X
    :       R = X + 20
    :       S = Y + 20
    :       COLOR= C(W + Y)
    :       PLOT W,Y
    :       COLOR= C(38 - X - Y)
    :       PLOT R,S
    :       COLOR= C(39 - ABS (R - Y))
    :       PLOT R,Y
    :       COLOR= C(39 - ABS (W - S))
    :       PLOT W,S
    :     NEXT
    :   NEXT
    :   FOR J = 1 TO 6 ^ 4
    :   NEXT
    : NEXT
    : RETURN
```

Listing 3. Another one-liner graphic program.

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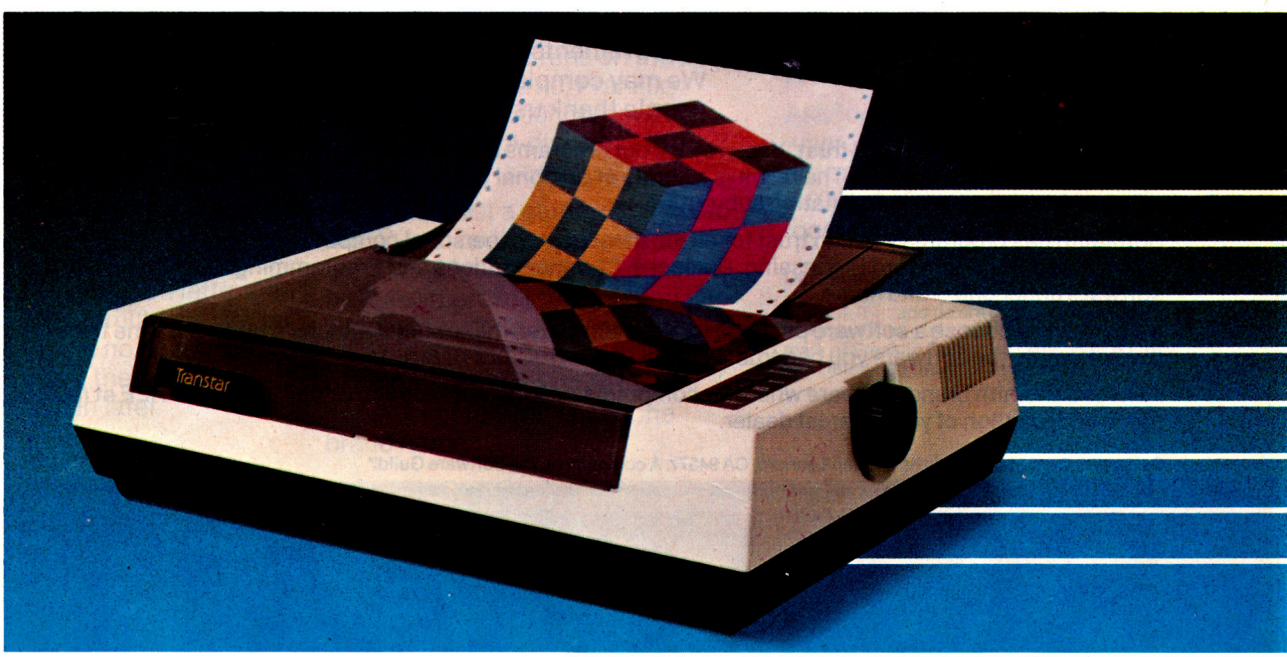

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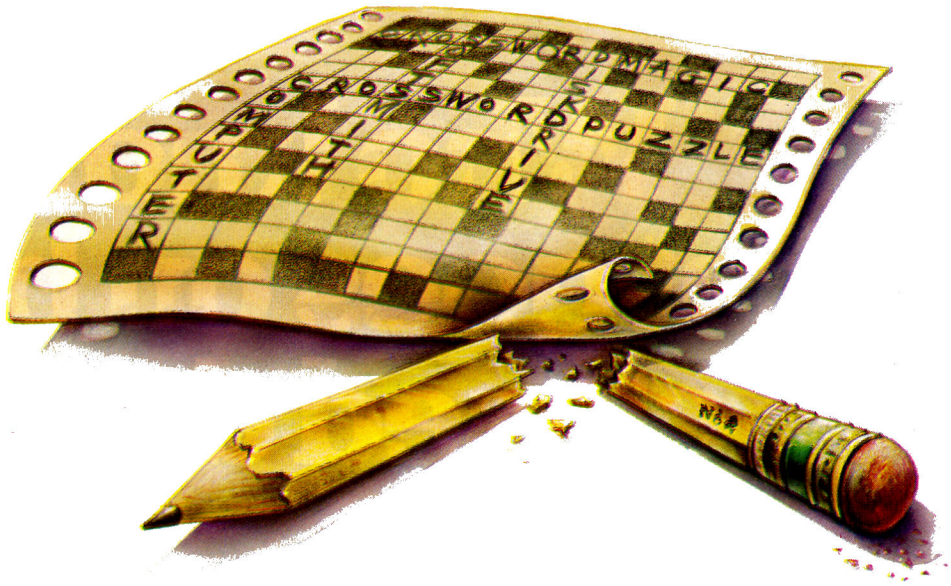

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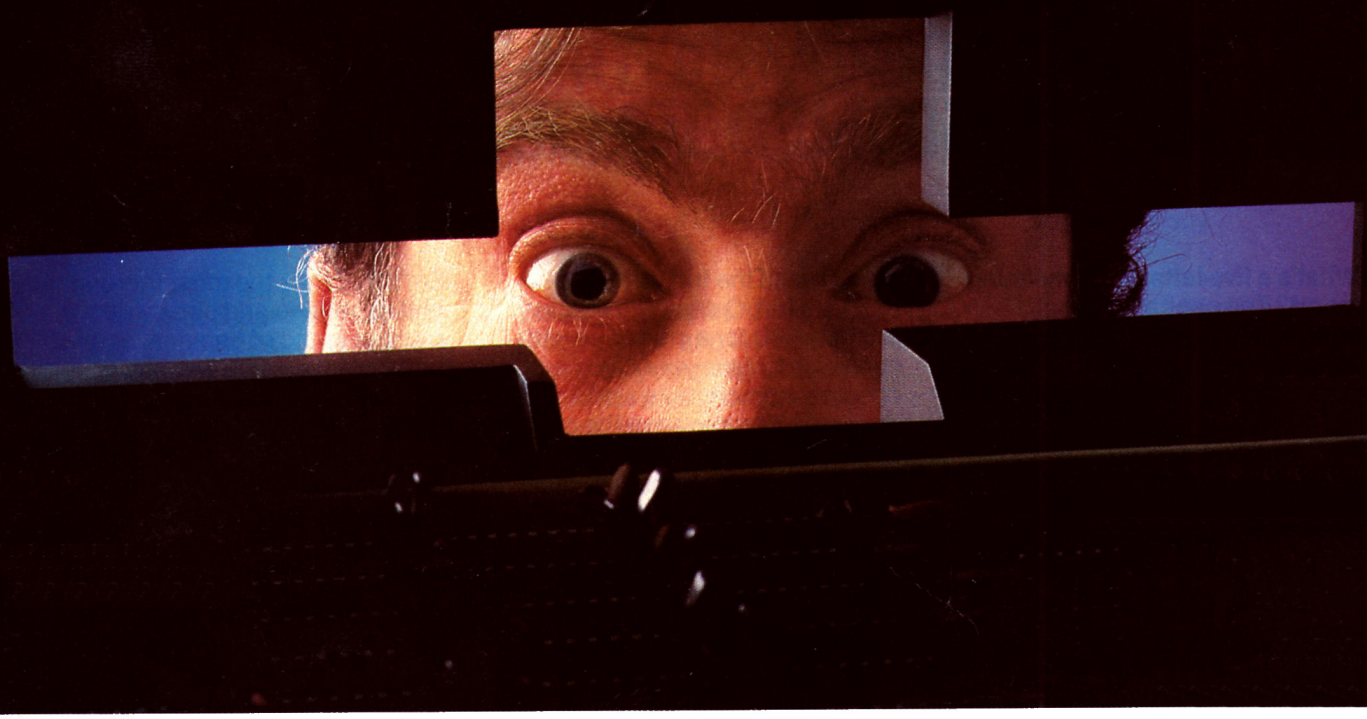

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The Amazing Histogram

Suddenly, raw data springs to life when it's spelled out in graph form.

by H. Vandermeulen and R.E. DeWreede

Histograms are useful for analyzing frequency distributions of data, a task common to almost all fields of science and business. This histogram drawing program sorts real numbers in up to 30 categories, creating histograms as flexibly as possible.

Use the Sort program (Listing 1) to enter raw data. The program arranges your data in order from lowest number to the highest with a "Quicksort" algorithm, using any label you choose for each number and future shading information. The program saves the data to disk as a text file. The Histogram program then uses the text file (Listing 2) to draw the histograms. Car# (Listing 3) is a shape table for all characters and numbers on the Apple keyboard, ASCII decimal code 32 to 90.

The Sort Program

First, the program asks if you wish to enter data from the keyboard, or from a text file on the disk (lines 4 and 5). To start you *must* enter from the keyboard. You are then asked for a file name (anything you want). Next, enter the amount of numbers to sort. Several variables then are dimensioned (line 25) and your data entry begins.

The program asks you to enter a label number, the number to be sorted and shading for each line of data. The label number is a variable identifying the number to be sorted.

Listing 1. Sort program for data.

```
1  TEXT : INVERSE : HOME
2  GOSUB 3200
3  NORMAL : PRINT " "
4  PRINT "ENTER DATA FROM 1. KEYB
     OARD OR 2. FROM A TEXT FILE
     ON DISK."
5  INPUT "WHICH DO YOU WANT? (1 O
     R 2) ";SQ1
6  IF SQ1 = 2 THEN 2000
7  INPUT "TELL ME THE NAME FOR YO
     UR FILE HERE ";NAME$
10 PRINT "TELL ME THE AMOUNT OF
     NUMBERS TO"
15 INPUT "SORT. ";N
25 DIM LABEL(N),SIZE(N),FERT(N),
     TT( INT (N / 10) + 15)
30 FOR I = 0 TO N - 1
35 PRINT " "
40 PRINT "TELL ME THE LABEL#,COM
     MA,"
41 PRINT "NUMBER TO BE SORTED,CO
     MMA,"
42 PRINT "AND LASTLY SHADING"
43 PRINT "(1=SHADE, 0=NOSHADE) F
     OR LINE"
44 PRINT "NUMBER ";I + 1
45 PRINT " "
46 INPUT "ENTER DATA HERE ";LABE
     L(I),SIZE(I),FERT(I)
60 NEXT I
61 PRINT : INPUT "DO YOU NEED TO
      CORRECT ANY OF THE DATA? Y/
     N ";Q2$
62 IF Q2$ = "Y" THEN  GOSUB 2040
     : REM
115 SIZE(N) = 99999999
120 P = 0:Q = N
125 PP = 0
130  IF P >  = Q THEN 170
135 K = Q + 1
139  GOSUB 1145
140  IF J - P < Q - J THEN 150
143  GOSUB 400
144  GOTO 160
150  GOSUB 500
160 PP = PP + 2
165  GOTO 130
170  IF PP = 0 THEN 190
175 Q = TT(PP):P = TT(PP - 1):PP =
     PP - 2
180  GOTO 130
190  PRINT "FINISHED"
191  PRINT " ": PRINT " "
192  PRINT NAME$: PRINT " "
193  PRINT  TAB( 3)"LABEL"; TAB(
     12)"NUMBER SORTED"; TAB( 28)
     "SHADING"
194  PRINT " "
210  FOR X = 0 TO N - 1
211  PRINT  TAB( 5)LABEL(X); TAB(
     18)SIZE(X); TAB( 31)FERT(X)
212  PRINT " "
213  NEXT X
214  PR# 0: INPUT "DO YOU WANT A
     HARD COPY OF THE RESULTS? Y/
     N ";Q1$
215  IF Q1$ = "Y" THEN 217
216  IF Q1$ = "N" THEN 3000
217  PR# 1: PRINT " ": PRINT " "
218  GOTO 192
```

Listing continued.

Address correspondence to H. Vandermeulen and R.E. DeWreede, Department of Botany, University of British Columbia, Vancouver, B.C., Canada V6T 2B1.

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Listing continued.

```
400 TT(PP + 1) = P
405 TT(PP + 2) = J - 1
410 P = J + 1
499  RETURN
500 TT(PP + 1) = J + 1
505 TT(PP + 2) = Q
510 Q = J - 1
599  RETURN
1145 V = SIZE(P):I = P:J = K
1146 A = LABEL(P)
1147 B = FERT(P)
1160 J = J - 1: IF SIZE(J) <  = V
     THEN 1170
1165  GOTO 1160
1170 I = I + 1: IF SIZE(I) >  = V
     THEN 1180
1175  GOTO 1170
1180  IF J <  = I THEN 1200
1181 TSIZE = SIZE(I)
1182 SIZE(I) = SIZE(J)
1183 SIZE(J) = TSIZE
1184 TLABEL = LABEL(I)
1185 LABEL(I) = LABEL(J)
1186 LABEL(J) = TLABEL
1187 TFERT = FERT(I)
1188 FERT(I) = FERT(J)
1189 FERT(J) = TFERT
1199  GOTO 1160
1200 SIZE(P) = SIZE(J)
1202 SIZE(J) = V
1203 LABEL(P) = LABEL(J):LABEL(J)
     = A
1204 FERT(P) = FERT(J):FERT(J) =
     B
1999  RETURN
2000  INPUT "NAME OF TEXT FILE TO
     BE USED? ";NAME$
2010 D$ =  CHR$ (4)
2020  PRINT D$;"OPEN";NAME$
2021  PRINT D$;"READ";NAME$
2022  INPUT N
2023  DIM LABEL(N),SIZE(N),FERT(N
     )
2024  FOR E = 0 TO N - 1
2025  INPUT LABEL(E),SIZE(E),FERT
     (E)
2026  NEXT E
2027  PRINT D$;"CLOSE";NAME$
2030  GOTO 61
2040  INPUT "WHICH LINE OF DATA D
     O YOU WANT TO CHANGE? ";AN
2055  PRINT "ENTER NEW LABEL#, NU
     MBER TO BE SORTED, AND SHADI
     NG FOR DATA LINE NUMBER ";AN

2056  PRINT " "
2060  INPUT "PRINT HERE ";LABEL(A
     N - 1),SIZE(AN - 1),FERT(AN -
     1)
2070  INPUT "MORE CORRECTIONS? Y/
     N ";TN$
2080  IF TN$ = "Y" THEN 2040
2090  RETURN : REM
3000  INPUT "DO YOU WANT TO SAVE
     THE RESULTS TO DISK FILE? Y/
     N ";Q3$
3010  IF Q3$ = "N" THEN  END
3020 D$ =  CHR$ (4)
3030  PRINT D$;"MON C,I,O"
3040  PRINT D$;"OPEN "NAME$
3050  PRINT D$;"DELETE"NAME$
3060  PRINT D$;"OPEN"NAME$
3070  PRINT D$;"WRITE "NAME$
3080  PRINT N
3090  FOR C = 0 TO N - 1
3100  PRINT LABEL(C);",";SIZE(C);
     ",";FERT(C)
3110  NEXT C
3120  PRINT D$;"CLOSE "NAME$
3130  END
3200  PRINT "THIS PROGRAM IS CALL
     ED SORT, USE IT"
3210  PRINT "TO CREATE A TEXT FIL
     E OF NUMBERS"
3220  PRINT "SORTED FROM LOWEST T
     O HIGHEST"
3230  PRINT "WHICH CAN THEN BE US
     ED IN THE"
3240  PRINT "HISTOGRAM PROGRAM."
3310  RETURN
```

In biology, this could be an animal identification number. The number to be sorted is any real number; the program works on this number and drags along the label number and shading information with it. This could be the weight of the specified animal. The shading input distinguishes the number to be sorted within the actual histogram. Keeping with our biology analogy, we could enter "1" (shade) if the specified animal is fertile. The more fertile animals of a given weight, the more the histogram bar corresponding to that weight will be shaded.

You continue merrily entering data until you're asked if you want to correct any data (61). If you erred, enter the line number to be corrected and plug in the new values. When you're finished, the sort results are listed. You then can get an optional hard copy of the results or save them to disk.

The Histogram Program

You can label the axes as you see fit. The program is arranged to give each category's frequency of occurrence, so the y-axis is usually labelled "Frequency" (230–250). One to thirty categories are possible. The interval size option tells the computer how "wide" you want the categories to be (340–360).

This point is critical. For example, if the Sort program indicates that your largest animal weighed 20.52 grams and you chose ten categories, your interval size must be 2.1 or greater in order to include that largest data point in the histogram. The program would count all weights that fall between >0 and $<=2.1$, then >2.1 and $<=4.2$ and so on, all the way to >18.9 and $<=21$ where the weight 20.52 would be counted.

The program's maximum interval size is three characters; 2.1 and 999 are O.K., but not .001 or 30.1. Three characters should be plenty. If not, play with lines 1520 to 1560 and 1650 to 1690 till you get what you want. You have a choice of drawing an x-axis number for each category or every second category, all the way up to every fifth category. Use up to four

Listing 2.
Histogram program.

```
1  LOMEM: 16400
2  HIMEM: 37200
5  REM  PROTECTING HGR PAGE#1, AB
     OVE
10  HOME
20  TEXT : INVERSE
30  PRINT "THIS PROGRAM IS FOR DR
     AWING FREQUENCY"
40  PRINT "HISTOGRAMS OF UP TO 30
      CATEGORIES FROM"
50  PRINT "NUMBERS ARRANGED BY SO
     RT."
70  INPUT "DO YOU WISH TO PROCEED
     ? Y/N ";Q1$
80  IF Q1$ = "Y" THEN 100
90  IF Q1$ = "N" THEN  NORMAL : END

100 D$ =  CHR$ (4): NORMAL
110  PRINT D$;"BLOAD CAR#,A37300"

120  HOME : TEXT : NORMAL
130  INPUT "NAME OF TEXT FILE TO
     BE USED ";NAME$
140 D$ =  CHR$ (4)
150  PRINT D$;"OPEN";NAME$
160  PRINT D$;"READ";NAME$
170  INPUT N: DIM LABEL(N),SIZE(N
     ),FERT(N)
180  FOR A = 0 TO N - 1
190  INPUT LABEL(A),SIZE(A),FERT(
     A)
200  NEXT A
210  PRINT D$;"CLOSE";NAME$
220  PRINT " "
230  PRINT "TELL ME THE NAME FOR
     THE Y-AXIS"
240  PRINT "(NOT MORE THAN 17 CHA
     RACTERS"
250  INPUT "LONG). ";Y$
260 YM =  LEN (Y$)
270  IF YM > 17 THEN 230
280  PRINT " "
290  REM  MUST ARRANGE SORT NUMBE
     RS NOW
300  PRINT "TELL ME THE NUMBER OF
      CATEGORIES (NOT"
310  INPUT "MORE THAN 30). ";KT
320  IF KT > 30 THEN 300
330  PRINT " ": INVERSE
340  PRINT "THE INTERVAL SIZE YOU
      WANT FOR THE"
350  PRINT "X-AXIS, N.B. UP TO 3
     CHARACTERS ONLY!"
360  INPUT "E.G. 10 ";XNT
370  NORMAL : PRINT " "
380  PRINT "CHOOSE EVERY FIRST, S
     ECOND -UP TO"
390  PRINT "FIFTH X-AXIS NUMBER T
     O BE"
400  INPUT "PRINTED. (1,2,-,5) ";
     ZAP
410  PRINT " ": IF ZAP > 5 GOTO 3
     80
420  PRINT "CHOOSE 3 OR 4 CHARACT
     ERS FOR"
430  INPUT "EACH X-AXIS NUMBER ";
     TCH
440  REM  PUTTING THE SORT NUMBER
     S INTO CLASSES NOW
450 SKT = KT - 1
460  DIM BAR(SKT),SBAR(SKT)
470  FOR B = 0 TO SKT
480 C = 0:D = 0
490  FOR E = 0 TO N - 1
500  IF SIZE(E) > XNT * B AND SIZ
     E(E) <  = XNT * (B + 1) THEN
     BAR(B) = C + 1:C = C + 1: IF
     FERT(E) > 0 THEN SBAR(B) = D
      + 1:D = D + 1
510  NEXT E
520  IF C = 0 THEN BAR(B) = 0
530  IF D = 0 THEN SBAR(B) = 0
540  NEXT B
550  REM  NOW TO GET Y-AXIS HEIGH
     T
560  DIM TT(10),DUM(KT)
570  FOR F = 0 TO SKT
580 DUM(F) = BAR(F)
590  NEXT F
600 DUM(KT) = 32767
610 G = 0:H = SKT
620 PP = 0
630  IF G >  = H THEN 870
640 I = H + 1
650 V = DUM(G):J = G:K = I
660 K = K - 1: IF DUM(K) <  = V THEN
     680
670  GOTO 660
```

Listing continued.

characters for each x-axis number drawn.

Once the program has tallied the number of data points falling into each category (this can take over a minute with the largest files—be patient), it tells you the height of the y-axis (910–920); this is the height of the largest histogram bar. Then enter your own height for the y-axis. It must be equal to or greater than the height the computer gives you, or you'll chop off the tallest histogram bar. Next, choose an interval size for the y-axis that divides evenly into the y-axis length you've chosen. The interval size you pick must be three characters or less or you'll interfere with the drawing of the y-axis name. Your final entry is the name for the x-axis (1060–1080).

Once the histogram is drawn, the program asks if you want to create another one. If so, the program goes to line 120 and begins again. Repeatedly drawing histograms of the same data set helps you develop one which best suits your needs.

The Shape Table

You must save the Car# shape table onto the same disk as the Histogram program. To do this, enter the monitor by typing CALL-151 or by hitting Reset. An asterisk (*) will appear if you're in the monitor. The shape table's decimal address is 37300; you must enter the hexadecimal equivalent, 91B4. Then type in a colon, followed by all hexadecimal numbers in listing 3, in order, including spaces. Once they've been entered in one continuous stream, hit Return. Save the shape table to disk by typing:

BSAVE CAR#, A37300, L693

The Histogram program was designed to run on a 48K system with DOS booted. If your system has 32K, delete line 1 and change HIMEM (line 2) to 8190. Change the address of Car# (line 110) to 16400. While you're at it, don't forget to change the starting address information on line 1150. It should read:

1150 POKE 232,16 : POKE 233,64

Good luck with this program, and let us know what you think! ■

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Listing continued.

```
680 J = J + 1: IF DUM(J) >  = V THEN
    700
690  GOTO 680
700  IF K <  = J THEN 750
710 TDUM = DUM(J)
720 DUM(J) = DUM(K)
730 DUM(K) = TDUM
740  GOTO 660
750 DUM(G) = DUM(K)
760 DUM(K) = V
770  IF K - G < H - K THEN 820
780 TT(PP + 1) = G
790 TT(PP + 2) = K - 1
800 G = K + 1
810  GOTO 850
820 TT(PP + 1) = K + 1
830 TT(PP + 2) = H
840 H = K - 1
850 PP = PP + 2
860  GOTO 630
870  IF PP = 0 THEN SLLY = DUM(SK
    T): GOTO 900
880 H = TT(PP):G = TT(PP - 1):PP =
    PP - 2
890  GOTO 630
900  REM  SOME MORE INFO BEFORE D
    RAWING HISTOGRAMS
910  PRINT "THE HEIGHT OF THE Y-A
    XIS MUST BE EQUAL"
920  PRINT "TO OR GREATER THAN ";
    SLLY / N
930  PRINT " "
940  INPUT "TELL ME THE HEIGHT FO
    R THE Y-AXIS ";HBAR
950  IF HBAR < SLLY / N THEN 910
960  PRINT " ": INVERSE
970  PRINT "THE INTERVAL SIZE YOU
     WANT FOR THE"
980  PRINT "Y-AXIS, N.B. UP TO 3
    CHARACTERS ONLY!"
990  PRINT "E.G. .02 (Y-AXIS HEIG
    HT/INTERVAL SIZE"
1000  INPUT "MUST BE <=12 ";YNT
1010  NORMAL
1020  IF YNT > HBAR THEN 960
1030 HX = HBAR / YNT
1040  IF HX > 12 THEN 960
1050  PRINT " "
1060  PRINT "TELL ME THE NAME FOR
     THE X-AXIS"
1070  PRINT "(NOT MORE THAN 40 CH
    ARACTERS"
1080  INPUT "LONG). ";X$
1090 XL =  LEN (X$): PRINT " "
1100  IF XL > 40 THEN 1050
1110  PRINT "THANK YOU, HERE IS Y
    OUR HISTOGRAM"
1120  REM  NOW TO DRAW THE STUFF
1130  HGR : HCOLOR= 3: ROT= 0: SCALE=
    1
1150  POKE 232,180: POKE 233,145
1160  REM  NOW TO PLOT THE Y-AXIS
    , WITH INTERVAL NUMBERS
1170 FAC = 120 / HX
1180 FAC =  INT (FAC)
1190 HX =  INT (HX)
1200  FOR L = 1 TO HX
1210  HPLOT 26,125 TO 28,125 TO 2
    8,125 - FAC * L TO 26,125 -
    FAC * L
1220  DRAW 18 AT 25,129
1230 AB = YNT * L
1240 AB = AB + .0001
1250 K$ =  STR$ (AB)
1260  FOR M = 1 TO 3
1270 FY =  ASC ( MID$ (K$,M,1))
1280  DRAW FY - 30 AT 15 + (M - 1
    ) * 5,129 - FAC * L
1300  NEXT M
1310  NEXT L
1320  REM  NOW TO PLOT THE Y-AXIS
    LABEL
1330  FOR O = 1 TO YM
1340 LY =  ASC ( MID$ (Y$,O,1))
1350 YSPACE = 65 - (3 * YM) + (O -
    1) * 7
1360  DRAW LY - 30 AT 5,YSPACE
1420  NEXT O
1430  REM  NOW TO PLOT THE X-AXIS
     WITH INTERVAL NUMBERS
1440 FRY = 239 / KT
1450 FRY =  INT (FRY)
1460  FOR P = 1 TO KT
1470  HPLOT 28,127 TO 28,125 TO 2
    8 + FRY * P,125 TO 28 + FRY *
    P,127
1480  NEXT P
1490  IF ZAP > 1 THEN 1610
1500  DRAW 18 AT 30,135
1510  FOR Q = 1 TO KT
1520 XB = XNT * Q
1530 XB = XB + .00001
1540 Z$ =  STR$ (XB)
1550  FOR R = 1 TO TCH
1560 FX =  ASC ( MID$ (Z$,R,1))
1570  DRAW FX - 30 AT 24 + (R - 1
    ) * 5 + FRY * Q,135
1590  NEXT R
1600  NEXT Q
1605  GOTO 1740
1610  FOR Q = ZAP TO KT STEP ZAP
1620  HPLOT 28 + FRY * Q,127 TO 2
    8 + FRY * Q,130
1630  HPLOT 28,127 TO 28,130
1640  DRAW 18 AT 30,138
1650 XB = XNT * Q
1660 XB = XB + .00001
1670 Z$ =  STR$ (XB)
1680  FOR R = 1 TO TCH
1690 FX =  ASC ( MID$ (Z$,R,1))
1700  DRAW FX - 30 AT 24 + (R - 1
    ) * 5 + FRY * Q,138
1720  NEXT R
1730  NEXT Q
1740  REM  NOW TO PLOT THE X-AXIS
    LABEL
1750  FOR S = 1 TO XL
1760 LX =  ASC ( MID$ (X$,S,1))
1770 XSPACE = 130 - (3 * XL) + (S
    - 1) * 7
1780  DRAW LX - 30 AT XSPACE,154
1840  NEXT S
1850  REM  NOW TO PLOT THE HISTOG
    RAMS
1860  FOR T = 0 TO SKT
1870 U = T + 1
1880 BR = 120 * BAR(T) / (HBAR *
    N)
1890 BR =  INT (BR)
1900  HPLOT 28 + FRY * T,125 TO 2
    8 + FRY * T,125 - BR TO 28 +
    FRY * U,125 - BR TO 28 + FRY
     * U,125
1910  NEXT T
1920  REM  NOW TO SHADE THE HISTO
    GRAMS
1930  FOR W = 0 TO SKT
1940 AX = W + 1
1950 BS = 120 * SBAR(W) / (HBAR *
    N)
1960 BS =  INT (BS)
1970  FOR CX = 0 TO BS
1980  HPLOT 28 + FRY * W,125 - CX
    TO 28 + FRY * AX,125 - CX
1990  NEXT CX
2000  NEXT W
2050  INPUT "DO YOU WANT TO DO AN
    OTHER HISTOGRAM? Y/N ";Q3$
2060  IF Q3$ = "Y" THEN  CLEAR : GOTO
    120
2070  IF Q3$ = "N" THEN  TEXT : HOME
    : END
```

Listing 3. Shape Table.

```
91B4- 3C 00 7E 00
91B8- B4 00 B6 00 BC 00 95 00
91C0- A5 00 B0 00 BB 00 C6 00
91C8- CF 00 D5 00 DB 00 E5 00
91D0- EE 00 F3 00 FA 00 FD 00
91D8- 07 01 10 01 15 01 1E 01
91E0- 28 01 31 01 3B 01 45 01
91E8- 4E 01 5B 01 66 01 6D 01
91F0- 73 01 7C 01 85 01 91 01
91F8- 99 01 A5 01 B1 01 BC 01
9200- C5 01 CE 01 D8 01 E1 01
9208- EC 01 F9 01 01 02 09 02
9210- 13 02 1A 02 27 02 35 02
9218- 3E 02 47 02 51 02 5D 02
9220- 67 02 6F 02 78 02 85 02
9228- 93 02 A3 02 AB 02 B5 02
9230- 00 00 3E 24 2D 36 04 00
9238- 00 00 D8 0C 18 24 24 00
9240- 08 18 08 18 08 D8 FE 24
9248- 00 08 18 38 3F 27 28 2D
9250- E5 1F 16 16 0D 0C 18 04
9258- 00 1B 3F 28 2D E0 3F 60
9260- 2D 1C 27 00 20 37 DF 0C
9268- 0C 0C 0C DF 37 25 00 F8
9270- 3F 60 E5 1C 0C 15 56 2A
9278- 20 00 08 18 08 18 08 D8
9280- BB 04 00 18 1C 24 64 04
9288- 00 D8 63 24 E4 04 00 08
9290- 18 18 1F 0C 18 0D 17 04
9298- 00 08 18 08 D8 3F 0C 16
92A0- 04 00 DB 0D 18 04 00 08
92A8- 18 08 D8 3F 04 00 D8 04
92B0- 00 08 18 08 18 B8 17 17
92B8- 17 04 00 D8 3F 20 24 0C
92C0- AD 36 26 00 D8 24 24 24
92C8- 00 18 3F 67 0C 0C E4 3F
92D0- 04 00 D8 3F 4C 21 24 1C
92D8- 3F 56 25 00 D8 24 24 BC
92E0- 17 2E 0D 04 00 D8 3F 4C
92E8- 21 1C 3F 24 2D 25 00 D8
92F0- 3F 20 24 0C B5 6F 32 04
92F8- 00 D8 1B 0C 0C 0C 24 3F
9300- 27 00 D8 3F 20 0C 18 0C
9308- AD 16 3E 08 18 27 00 D8
9310- 3B 4C 0D 18 24 1C BF 0E
9318- 25 00 08 18 D8 0C 18 04
9320- 00 DB 0C 0C 18 04 00 08
9328- D8 3B 38 60 0D 18 04 00
9330- 08 18 18 3F 0C 38 0D 04
9338- 00 08 D8 DB 0D 18 0D 18
9340- 1C 0F 18 04 00 D8 0C 18
9348- 64 1C BF 04 00 38 3F 0F
9350- 18 24 64 2D 15 3E 37 25
9358- 00 18 24 24 1C BF 36 36
9360- 0D 18 28 04 00 D8 3F 24
9368- 24 2C AD 1E 77 31 04 00
9370- 18 3F 0F 18 24 64 2D 04
9378- 00 D8 3F 24 24 2C AD 36
9380- 26 00 18 3F 27 24 24 2D
9388- B5 3B 04 00 D8 1B 24 24
9390- 2C 2D D6 27 00 18 3F 0F
9398- 18 24 64 2D 96 3E 20 00
93A0- 18 24 24 FC 33 36 36 0D
93A8- 18 08 18 25 00 18 3F 0C
93B0- 24 24 6F 04 00 D8 3B 68
93B8- 24 24 6F 04 00 E0 1C 1C
93C0- 1C 6C F1 DE 36 26 00 18
93C8- 3F 27 24 24 04 00 20 24
93D0- 24 17 17 0F 18 0F 18 36
93D8- 36 26 00 18 24 24 FC 33
93E0- 36 36 0D 18 08 18 15 04
93E8- 00 D8 3F 20 24 0C AD 36
93F0- 26 00 D8 1B 24 24 2C AD
93F8- F6 27 00 23 20 24 1C BF
9400- 16 30 76 25 00 18 1C 1C
9408- 1C 24 2D 15 1E BF 36 04
9410- 00 D8 3F 4C 21 1C 3F 60
9418- 2D 04 00 D8 24 24 3C 6F
9420- 29 04 00 D8 3F 20 24 6C
9428- 31 36 26 00 D8 0F 18 0F
9430- 18 24 6C 49 33 36 1E 04
9438- 00 20 24 24 DF 33 36 36
9440- 0D 18 0D 18 15 04 00 20
9448- 1C 1C 1C 1C 96 32 0D 18
9450- 68 08 18 0D 18 04 00 D8
9458- 24 E4 1C 4D F1 04 00 18
9460- 3F 67 2B 28 28 20 3F 27
9468- 00 00
```

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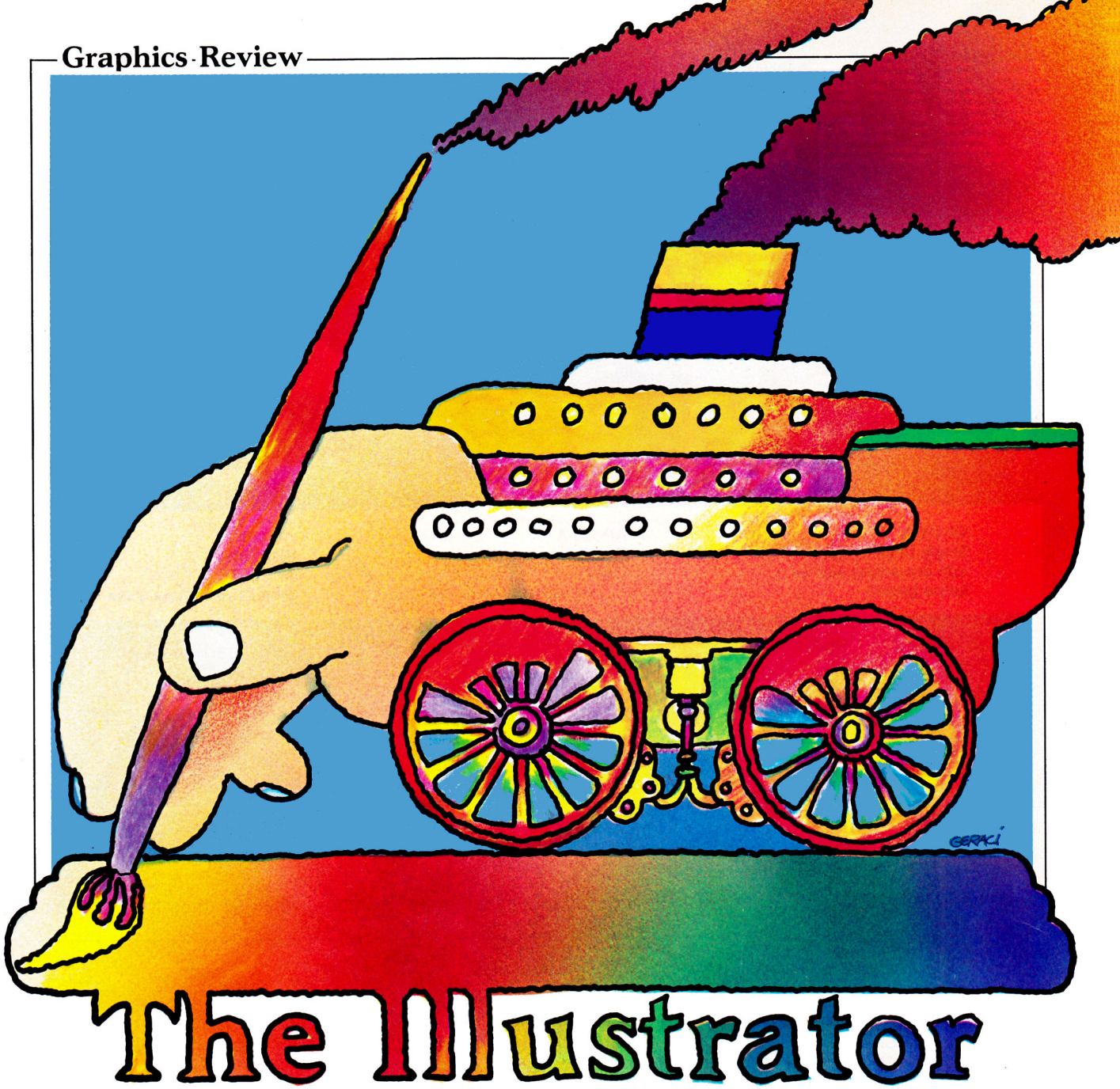

The Illustrator

by Greg Glau

Probably the worst thing about The Illustrator from Island Graphics is that you have to decide what to create with it. Simply put, this program, for $150, lets you draw on your Apple just about anything you like—freeform. You use a joystick or game paddle to move your brush around the screen and paint where you wish, in whatever color you like.

But you're not limited to just that. You can also use the keyboard or a graphics tablet for input. Of course, a joystick is more fun to use than the keyboard, but those of us whose hands shake a little will find our paintings a little erratic, too.

The keyboard in particular lets you draw exactly what you want, as you move the cursor that is the focus of drawing around in small increments. If you use the keyboard, you need to pull up a help screen to know which keys move the cursor. These keys were different in an earlier version of the manual and, unfortunately, my version doesn't list them.

I don't have a graphics tablet, so I didn't try The Illustrator with one. I did try to align my nonexistent tablet according to the instructions in the package, but the system just hung. Although you should be able to change how you communicate with The Illustrator, and switch from a joystick or game paddle to the keyboard to the graphics tablet and back again, the version I used, Beta Test, had to be cold-booted to make a change.

The system requires just one Apple disk drive (DOS 3.3), although if you have two drives you can use one for the program disk and another to store your pictures on. While The Illustrator doesn't have a built-in ability to print your creations, they can be accessed

Greg Glau lives in Arizona where he is in, what else, the refrigeration business. You can write your comments to him at PO Box 1627, Prescott, AZ 86302.

and printed with other packages. All of the examples for this review were printed using a program called Graftrix.

While the system says it uses menus, these are really displays that outline the available commands. You start with the main menu, which lists most of the drawing commands. The majority of these commands are mnemonic—D for draw, L for line, and so on—but there are so many commands that mnemonic representation is not always the case. Also, some of the commands in my early manual didn't match up with what appeared on the screen.

"Brushes"

An especially fascinating part of The Illustrator is what it calls "brush sets." These are collections of designs, simple or complex, in various sizes, that you create and save on disk. You use these designs for making brush strokes, or you can have them fill in parts of your drawing. The system comes with a set of 90 designs. A dozen of these are shown in Figure 1.

The manual notes that a brush can be as small as one pixel (the smallest dot that can be displayed on the screen) or as large as 58-by-32 dots. The Illustrator will reject a larger brush size if you try to create one.

The program I tried came with the letters of the alphabet and numerals 1–9 as an additional brush set. However, this is a long way from the promised character generator that would let you type text onto your pictures. You must pull each individual character off disk as you use it. Figure 2 is a floor plan done with The Illustrator that shows the text characters available in the package I used. Island Graphics says their latest version, probably available by the time you read this, will provide for typing text onto pictures.

You use just Apple's main colors to paint with, but they can be mixed in *any combination* you wish. While this might sound like official government talk, The Illustrator claims this allows 17.2 *billion* color combinations. They explain how this works, too, and you can create the color mixtures you want right on-screen.

A one-keystroke command changes the colors in a picture to their complements, which in effect (on a green and white monitor) reverses the colors in your image.

The Illustrator asks you to verify before it erases anything. Reset starts the system over, so watch out or you'll lose a picture in memory. The system loads itself and its pictures rapidly.

You can draw a border or frame around your picture, and use what The Illustrator calls "rubber band" lines to show, before the final drawing is made, exactly where these border lines will be. Unfortunately, the explanation in the manual of what rubber band lines are is poor.

I would like to have a grid to overlay on drawings to help scale them. This would be particularly helpful when copying something from another medium. And an erase function would help; to get rid of a mistake now, you must re-do the area in whatever background color you're using, which in effect covers up the mistake.

The manual has a lot of technical detail on DOS functions that may be unfamiliar to the average user. The manual is not tutorial. While things are explained, there are no workable examples to help you understand. And it could be organized a little better. For instance, you don't find out how to use the keyboard for input until you're pretty far along. However, this may all change and be better in the final version.

A later test model of the package in-

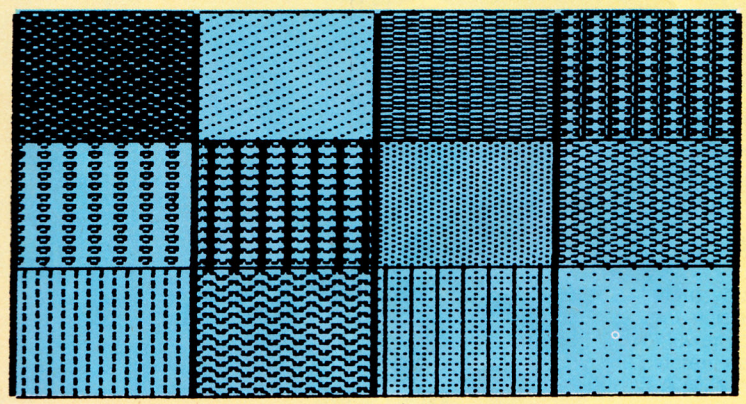

Figure 1. A dozen of The Illustrator's painting patterns.

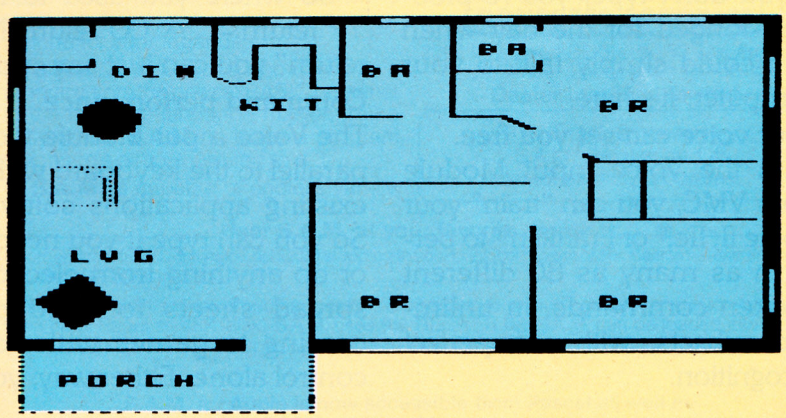

Figure 2. A floor plan done with The Illustrator using text characters available in the test version.

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cludes a picture-shrinking feature, along with a good explanation of the process. And you can move a complete image around on the screen, both side-to-side and up-and-down.

The Illustrator has an unusual "magnify" feature that expands the area of the screen around the cursor to seven times as large as the original so you can correct individual dots. All commands are functional, too, in the magnified mode.

You're allowed to save your pictures, of course, and recall them for more work. There's even a "quick" save, to secure a drawing as you're working on it, in case of a power failure. Picture files can be renamed and locked, too.

"An unusual 'magnify' feature expands the area of the screen around the cursor seven times."

What's the bottom line? The Illustrator is a flexible system that enables you to create about any image you want on your Apple's screen. *It really lets you paint.* And it offers unrestricted variation in shading for the color combinations you can use.

Before I'd buy The Illustrator, I'd want to make sure the manual has been upgraded so what it says matches what you see, and that the features promised on the box are included in both the manual and on disk. This has been promised by Island Graphics. And I'd want to have a hard-copy printing program that will load pictures and print them.

As I said earlier, the final version should be available by the time you read this. If you have a use for this sort of package, give The Illustrator a try at your local store. I think you'll be impressed.

For further information contact Island Graphics, Box V, Bethel Island, CA 94511. ■

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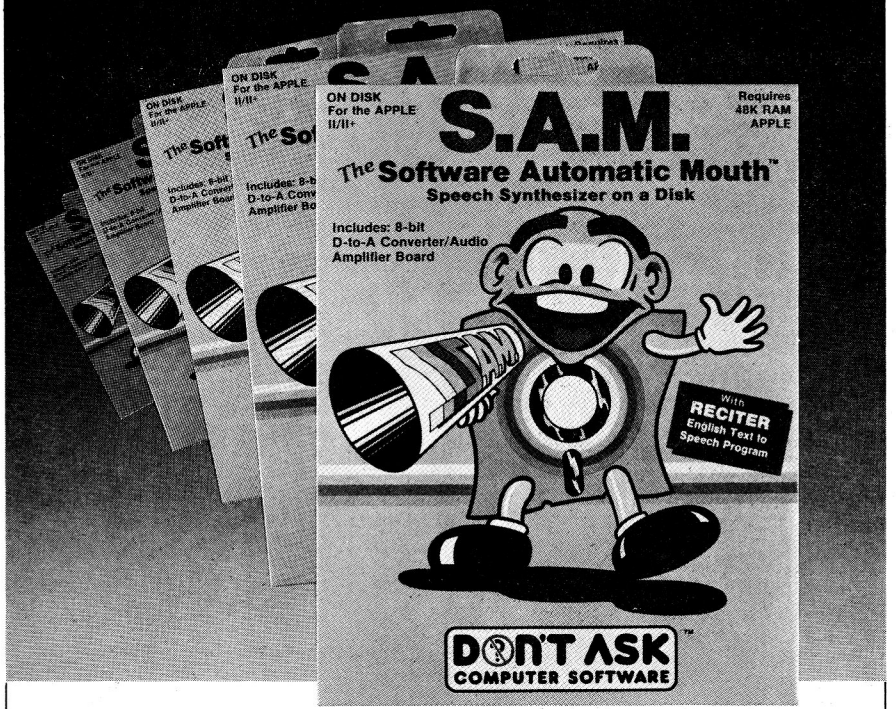

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S.A.M. programmed by Mark Barton.

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The Plot Thickens

For those of you with an Epson and Graftrax, here's an update on Paul Schubert's contour plotting program in our February issue. Now you too can amaze your friends!

by Thomas J. Zuchowski

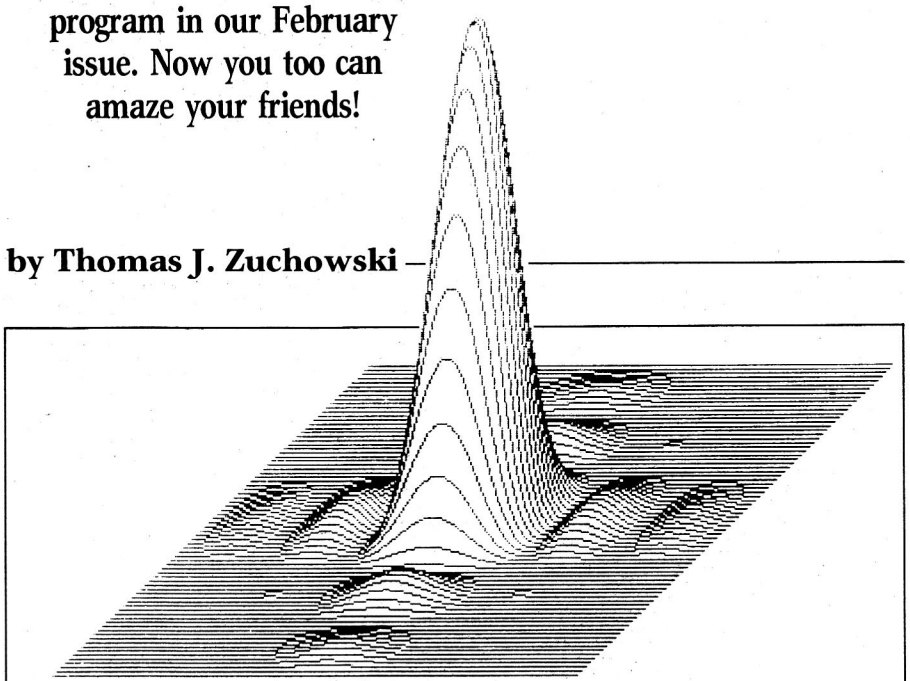


Figure. Diffraction intensity pattern from a square aperture, made using Paul Schubert's Contour Plot program and graphics routines.

If you're like me, you're sometimes at a loss to impress people who want to know what you can do with your Apple. For this reason I was overjoyed to find Paul Schubert's Contour Plot program, Listing 2 in the "Getting Higher on Graphics" article in the February '83 *inCider*. This is just the kind of thing I'm always looking for to add to my repertoire of "Look at this!" programs and demos.

However, there was a fly in the ointment: Schubert's program is written for use with a Silentype printer. I've got nothing against the Silentype; I just don't have one. In fact, I've never even seen one. Obviously, I needed to adapt his program for my equipment. The printer driver presented here is written for the Epson MX-80 with Graftrax Plus and the standard Epson parallel interface card.

The following additions must be made to the Control Plot program:

```
365 PR# 1: PRINT CHR$ (27)"A" CHR$(7):
    REM SET LINE SPACING TO 7 DOTS
375 PR# 0
```

Schubert's assembly listing of graphics routines, Listing 3 in the February article, requires these changes:

```
0490          .BY $8D $BC
0640 C36284 .DE C7 + 2
0650 C16734 .DE C36284 + 2
```

Then delete lines 5560–6540 and substitute my assembly listing.

Those who don't understand how to run the MX-80 from machine language, and can't figure it out from my comments, should refer to the Epson MX Graftrax manual, page J-4.

If you would like to reproduce the plot pictured here in the Figure (Figure 4 in Schubert's article), change these lines in the original Control Plot listing:

```
10  X = ABS(X – 10)
12  IF X = 0 THEN X = X1
14  X1 = X
16  IF Y = 0 THEN Z = 0:RETURN
18  Z = (SIN(X)/X)^2*(SIN(Y)/Y)^2
221 X = 0:Y = ABS(J*YF/PY – 10):GOSUB 10
```

Be patient with this program! The plot takes over an hour to compute. Its limits are 20, 20, and 0.8.

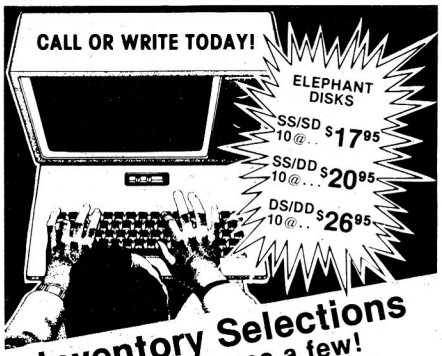
This listing should be easy to modify for any combination of dot matrix printer and interface that has graphics capability. The requirements are that you be able to POKE a byte to your buffer, and PEEK the printer-ready line. If you need to initialize every line with graphics set-up control codes, as with the Epson, put them in the CRLF space in reverse order. Otherwise, delete the part of the code that sends the CRLF data to the printer. ■

Address correspondence to Thomas J. Zuchowski, 304 Wood Run Court, Winston-Salem, NC 27103.

```
:ASM
                        556  *
                        557  * PRINTER OUTPUT MODULE FOR MX-80
                        558  *
                        559  PRNT     EQU  $C090      ;EPSON INTERFACE PRINTER BUFFER
                        560  PNTRDY   EQU  $C1C1      ;PRINTER READY
9145: 00 00 00          561  PIXBYT   HEX  00,00,00,00,00,00,00
9148: 00 00 00
914B: 00
914C: 01 90 4B          562  CRLF     HEX  01,90,4B,1B,3E,1B,0A
914F: 1B 3E 1B
9152: 0A                563  *
                        564  *PRINT OUT 400X399 IMAGE
                        565  *
9153: A2 28             566  PRINT    LDX  #C36284    ;INITIALIZE ROW ADDRESS
9155: A0 00             567           LDY  #N1
9157: 20 D9 8F          568           JSR  XTOY
915A: A2 06             569  FORN1    LDX  #06        ;LF AND INIT PRINTER GRAPHICS
915C: BD 4C 91          570  NXTLN    LDA  CRLF,X
915F: 8D 90 C0          571           STA  PRNT       ;POKE CHAR INTO PRINTER BUFFER
9162: AD C1 C1          572  PEEK1    LDA  PNTRDY     ;CHECK PRINTER READY LINE
9165: 30 FB             573           BMI  PEEK1      ;BRANCH IF NOT READY
9167: CA                574           DEX
9168: 10 F2             575           BPL  NXTLN
916A: A2 18             576           LDX  #C0        ;INIT PIN COLUMN LOOP
916C: A0 02             577           LDY  #D1
916E: 20 D9 8F          578           JSR  XTOY
9171: A2 00             579  FORD1    LDX  #N1        ;BYTE ADDR=ROW ADDR + PIN COL.
9173: A0 02             580           LDY  #D1
9175: 20 5E 8F          581           JSR  XPLUSY
9178: A2 08             582           LDX  #S1
917A: 20 A8 8F          583           JSR  ACCTOX
917D: CA                584           DEX
917E: 20 E8 8F          585           JSR  XTOPTR
9181: A2 06             586           LDX  #6         ;GET COLUMN OF 7 BYTES
9183: 38                587  LBL1     SEC
9184: A5 06             588           LDA  MAPPTR
9186: E9 32             589           SBC  #50
9188: 85 06             590           STA  MAPPTR
918A: B0 02             591           BCS  CARSET
918C: C6 07             592           DEC  MAPPTR+1
918E: B1 06             593  CARSET   LDA  (MAPPTR),Y
9190: 9D 45 91          594           STA  PIXBYT,X
9193: CA                595           DEX
9194: 10 ED             596           BPL  LBL1
9196: A0 07             597           LDY  #7         ;SHIFT COL OF DOTS INTO A REG
9198: A2 06             598  SHIFT    LDX  #6
919A: 7E 45 91          599  ROLAGN   ROR  PIXBYT,X
919D: 2A                600           ROL
919E: CA                601           DEX
919F: 10 F9             602           BPL  ROLAGN
91A1: 8D 90 C0          603           STA  PRNT
91A4: AD C1 C1          604  PEEK     LDA  PNTRDY
91A7: 30 FB             605           BMI  PEEK
91A9: 88                606           DEY
91AA: 10 EC             607           BPL  SHIFT
91AC: A2 02             608  NEXTD1   LDX  #D1        ;NEXT BYTE
91AE: 20 B4 8F          609           JSR  INCREX
91B1: A2 2E             610           LDX  #C49
91B3: A0 02             611           LDY  #D1
91B5: 20 7C 8F          612           JSR  XMINUY
91B8: 10 B7             613           BPL  FORD1
91BA: A2 00             614  NEXTN1   LDX  #N1        ;NEXT ROW
91BC: A0 2C             615           LDY  #C350
91BE: 20 7C 8F          616           JSR  XMINUY
91C1: A2 00             617           LDX  #N1
91C3: 20 A8 8F          618           JSR  ACCTOX
91C6: A2 00             619           LDX  #N1
91C8: A0 2A             620           LDY  #C16734
91CA: 20 7C 8F          621           JSR  XMINUY
91CD: 10 8B             622           BPL  FORN1
91CF: 60                623           RTS
```

Program listing. *Replacement lines for Paul Schubert's graphics routines to adapt them to an MX-80/Graftrax Plus printer configuration.*

Circle 318 on Reader Service card



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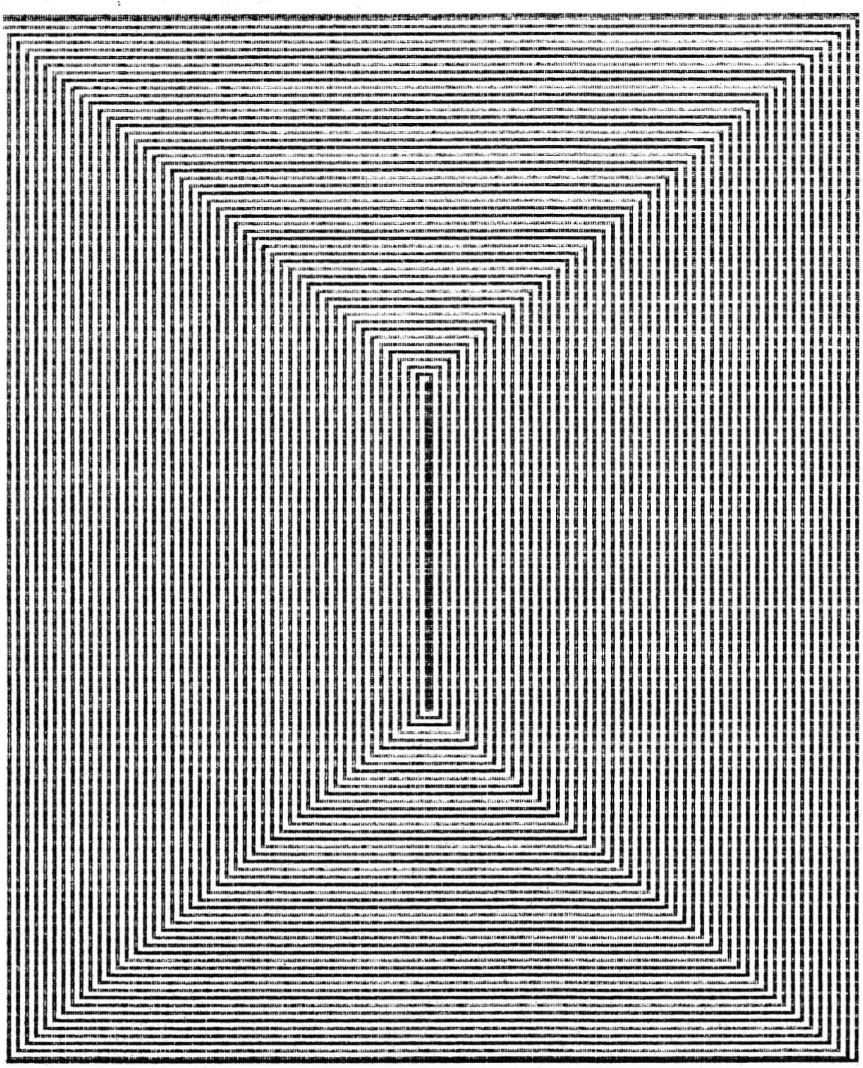
Graphic Goodies

by Peter L. Vogel

Collapsing Spiral

One of the more encouraging aspects of the Apple II, at least for beginners, is the ease with which you can assemble those eye-pleasing graphics routines, whether they be lo- or hi-res.

As a learning tool, short graphics programs are second to none. In addition, they make great attention getters at the beginning of a longer program. With a little experimentation, a collection of these routines builds in short order.



Collapsing Spiral is a rather compact hi-res routine. A rectangular spiral, that gives the illusion of either a pyramid or a tunnel (depending on your perspective), is displayed. The depth of the spiral is set with variable S in statement 160—I suggest values in the range 1–10 inclusive.

As a variation on this program change the GOTO in line 260 to GOTO 180 and add 185 IF Y > 191 – S THEN Y = 0. ■

```
100 REM COLLAPSING SPIRAL
110 REM HI-RES GRAPHICS
120 REM SET 'S' FOR SPIRAL
    INCREMENT
130 HGR2
140 HCOLOR = 3
150 N = 1
160 S = 2
170 X = 0:Y = 0:XMAX = 279:YMAX = 191
180 FOR I = 1 TO 192 / (2 * S)
190 HPLOT X,Y TO XMAX – X,Y TO
    XMAX – X,YMAX – Y
200 X = X + S
210 HPLOT XMAX – (X – S),YMAX – Y TO
    X,YMAX – Y
220 Y = Y + S
230 HPLOT X,YMAX – (Y – S) TO X,Y
240 NEXT I
250 N = N + 1
260 IF (N/2) = INT(N/2) THEN HCOLOR
    = 4: GOTO 160
270 GOTO 140
```

Program listing. *Collapsing Spiral.*

Address correspondence to Peter L. Vogel, 1763 Western Drive, Port Coquitlam, B.C., Canada V2X 3B5.



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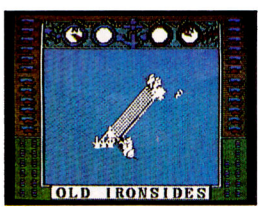

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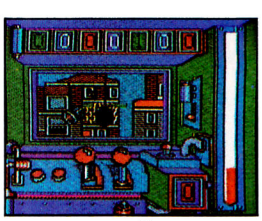

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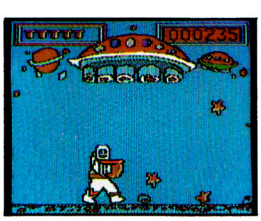

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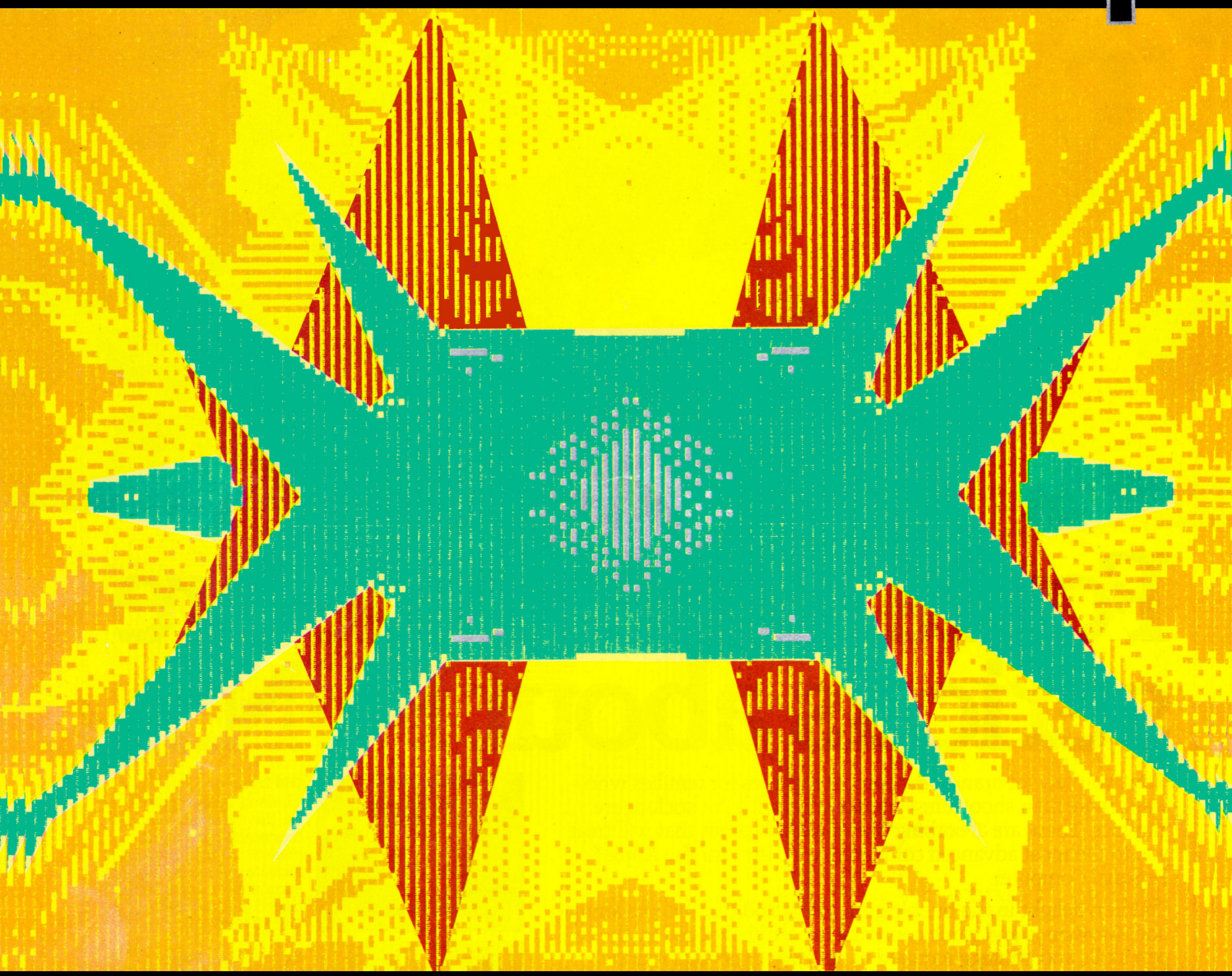

Would you believe that such an interesting, changing display can be produced by a Basic program only two lines long? Try it and see! It is equally effective on a color or black-and-white monitor.

```
10  T = 2:OF = 140:EI = 95:HGR 2:N = 80:OX =
    140:OY = 94: HCOLOR = 4:M  = 130:FOR
    K = 1 TO 100: X = INT (RND (1)*M + OF):
    Y = INT(RND(1)*N + EI): FOR I = 1 TO N
    STEP T:X =  X – T:Y = Y–T

20  RY = T*EI – Y:RX = T*OF–X: HPLOT
    OX,OY TO X,Y: HPLOT XO,OY TO RX,Y:
    HPLOT XO, YO TO RX,RY: HPLOT OX,YO
    TO X,RY: NEXT I: HCOLOR = 7 *RND
    (1):OX = X:OY = Y:YO = RY:XO = RX:
    NEXT K
```

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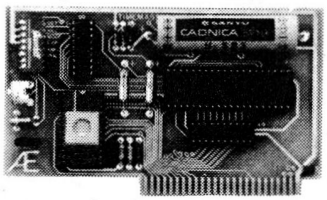

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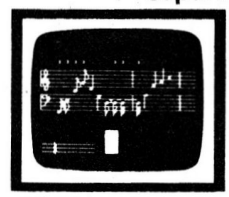

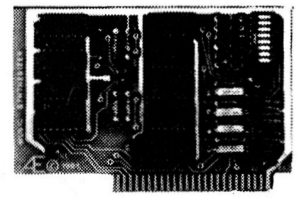

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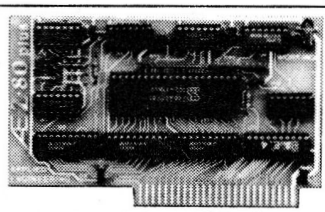

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VISION80	375	YES	YES	YES	YES	NO	NO	NO
OMNIVISION	295	NO	YES	NO	NO	NO	YES	YES
VIEWMAX80	219	YES	YES	YES	YES	NO	NO	YES
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Polygons and Spirals

Programs for composing variations on a visual theme.

by Alan Foxx

```
10  REM  SIMPLE POLYGON
20  HGR : HCOLOR= 3
30 PI = 3.14159
40 INC = PI / 5
50 DIAM = 75
60  FOR I = 0 TO PI + INC STEP IN
    C
70 R = DIAM *  SIN (I) + 0.5
80 X = R *  SIN (I) + 100
90 Y = R *  COS (I) + 80
100  IF I = 0 THEN  HPLOT X,Y
110  HPLOT  TO X,Y
120  NEXT I
```

Listing 1. Simple polygon generator.

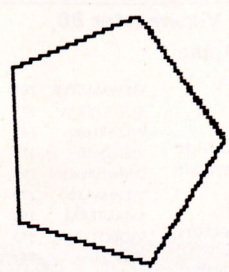

Figure 1. A simple polygon.

```
10  REM  NONCONCENTRIC POLYGONS
20  HGR : HCOLOR= 3
30 PI = 3.14159
40 INC = PI / 5
50  FOR DIAM = 150 TO 10 STEP  -
    10
60  FOR I = 0 TO PI + INC STEP IN
    C
70 R = DIAM *  SIN (I) + 0.5
80 X = R *  SIN (I) + 65
90 Y = R *  COS (I) + 80
100  IF I = 0 THEN  HPLOT X,Y
110  HPLOT  TO X,Y
120  NEXT I
130  NEXT DIAM
```

Listing 2. Non-concentric nested polygon generator.

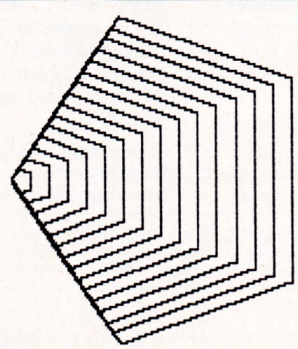

Figure 2. Non-concentric nested polygons.

Computer-generated designs are both fascinating to look at and useful. In this tutorial, I'll describe how to generate polygons and spirals without using turtle graphics, but rather with polar equations.

Simple Polygons

Listing 1 is a program that generates simple polygons on an Apple II. As it appears, the program produces a five-sided polygon (pentagon) like the one in Figure 1. If you want to change the number of sides, alter line 40. Suppose you want an eight-sided polygon (octagon). Line 40 should read:

```
40 INC = PI / 8
```

If you want a hexagon, a polygon with six sides, then make line 40 read:

```
40 INC = PI / 6
```

To vary the size of the polygon, change line 50. Currently, the polygon

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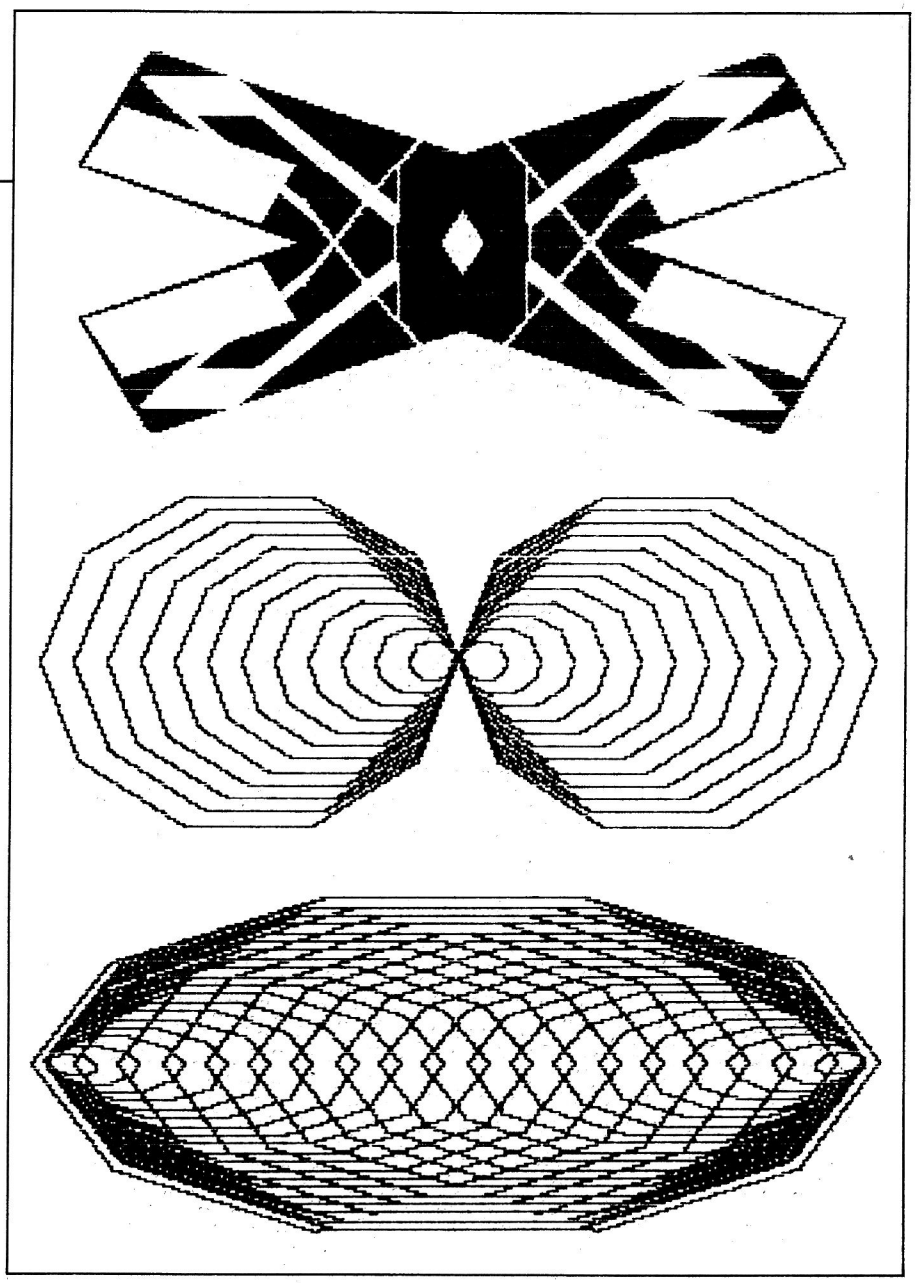
Figure 3.
Symmetrical polygon designs.



```
10  REM    ************
20  REM   *  POLYGONS  *
30  REM   * WRITTEN BY *
40  REM   * ALAN  FOXX *
50  REM    ************
60  GOTO 80
70  FOR D = 1 TO 3000: NEXT D: RETURN
    : REM  DELAY
80 PI = 3.14159
90  REM  POLYGON 1
100  HGR : HCOLOR= 3
110 INC = PI / 4
120  FOR DIAM = 150 TO 80 STEP  -
    1
130  FOR I = 0 TO PI + INC STEP I
    NC
140 R = DIAM *  SIN (I) + 0.5
150 X = R *  COS (1 - I) + 20.5
160 Y = R *  SIN (PI *  COS (I)) /
    2 + 50.5
170  IF I = 0 THEN  HPLOT X,Y:X1 =
    X:Y1 = Y
180  HPLOT X,Y TO X1,Y1
190  HPLOT X,159 - Y TO X1,159 -
    Y1
200  HPLOT 279 - X,Y TO 279 - X1,
    Y1
210  HPLOT 279 - X,159 - Y TO 279
     - X1,159 - Y1
220 X1 = X:Y1 = Y
230  NEXT I: NEXT DIAM
240  HCOLOR= 0
250 PI = 3.15159:INC = PI / 5
260  FOR DIAM = 200 TO 170 STEP  -
    1
270  FOR I = 0 TO PI + INC STEP I
    NC
280 R = DIAM *  SIN (I) + 0.5
290 X = R *  SIN (I) *  COS (1 -
    I) / 2.2 + 160
300 Y = R *  COS ( SIN ( COS (I))
    ) / 2 + 50.5
310  IF I = 0 THEN  HPLOT X,Y:X1 =
    X:Y1 = Y
320  HPLOT X,Y TO X1,Y1
330  HPLOT X,159 - Y TO X1,159 -
    Y1
340  HPLOT 279 - X,Y TO 279 - X1,
    Y1
350  HPLOT 279 - X,159 - Y TO 279
     - X1,159 - Y1
360 X1 = X:Y1 = Y
370  NEXT I: NEXT DIAM
380  GOSUB 70
390  REM  POLYGON 2
400  HGR : HCOLOR= 3
410 INC = PI / 10
420 DIAM = 10
430  FOR J = 1 TO 12
440  FOR I = 0 TO PI + INC STEP I
    NC
450 R = DIAM *  SIN (I) + 0.5
460 DIAM = DIAM + 1
470 X = R *  SIN (I) + 140
480 Y = R *  COS (I) + 80
490  IF DIAM = 11 THEN  HPLOT X,Y
    :X1 = X:Y1 = Y
500  HPLOT X1,Y1 TO X,Y: HPLOT 27
    9 - X1,Y1 TO 279 - X,Y
510 X1 = X:Y1 = Y
520  NEXT I: NEXT J
530  GOSUB 70
540  REM  POLYGON 3
550  HGR
560 DIAM = 10
570  FOR J = 1 TO 19
580  FOR I = 0 TO 3.14159 + INC STEP
    INC
590 R = DIAM *  SIN (I)
600 DIAM = DIAM + 1.3
610 X = R *  SIN (I) + 5
620 Y = R *  COS (I) / 2 + 80
630  IF DIAM = 11.3 THEN  HPLOT X
    ,Y:X1 = X:Y1 = Y: GOTO 650
640  HPLOT X,Y TO X1,Y1: HPLOT 27
    9 - X,Y TO 279 - X1,Y1:X1 =
    X:Y1 = Y
650  NEXT I: NEXT J
660  GOSUB 70
670  HOME : TEXT : END
```

Listing 3. Symmetrical polygon generator.

is about 75 dots across. Make it bigger by using a higher number in line 50, and vice versa.

Nested Polygons

The program in Listing 2 is similar to the previous one, except many polygons are drawn within each other, as in Figure 2.

Listing 3 is a collection of modified versions of Listings 1 and 2. It incorporates symmetry and various polar equations, and produces designs like those in Figure 3.

Here's how the symmetry algorithm works. If the program uses a split screen (279-by-159), then whenever the computer plots a dot at x,y, it will also plot a dot at 279 – x,y, as well as at 279 – x,159 – y and x,159 – y. If the program uses full-screen graphics, then whenever the computer places a dot at x,y, it will also plot three more dots at 279 – x,y, 279 – x,191 – y, and x,191 – y.

Spirals

To produce spirals, use the polygon algorithm, but put each polygon through a succession of small turns. The program in Listing 4 creates a collection of spirals as in Figure 4. Each spiral can be modified easily to produce different effects. Like most graphics programs of this kind, you can't really tell how an experimental design will look until it is generated on the screen.

Spiral 5 is done using a modification of the spiral formula, even though it does not look like a spiral at all. Spiral 5 can also be done in color; the rest

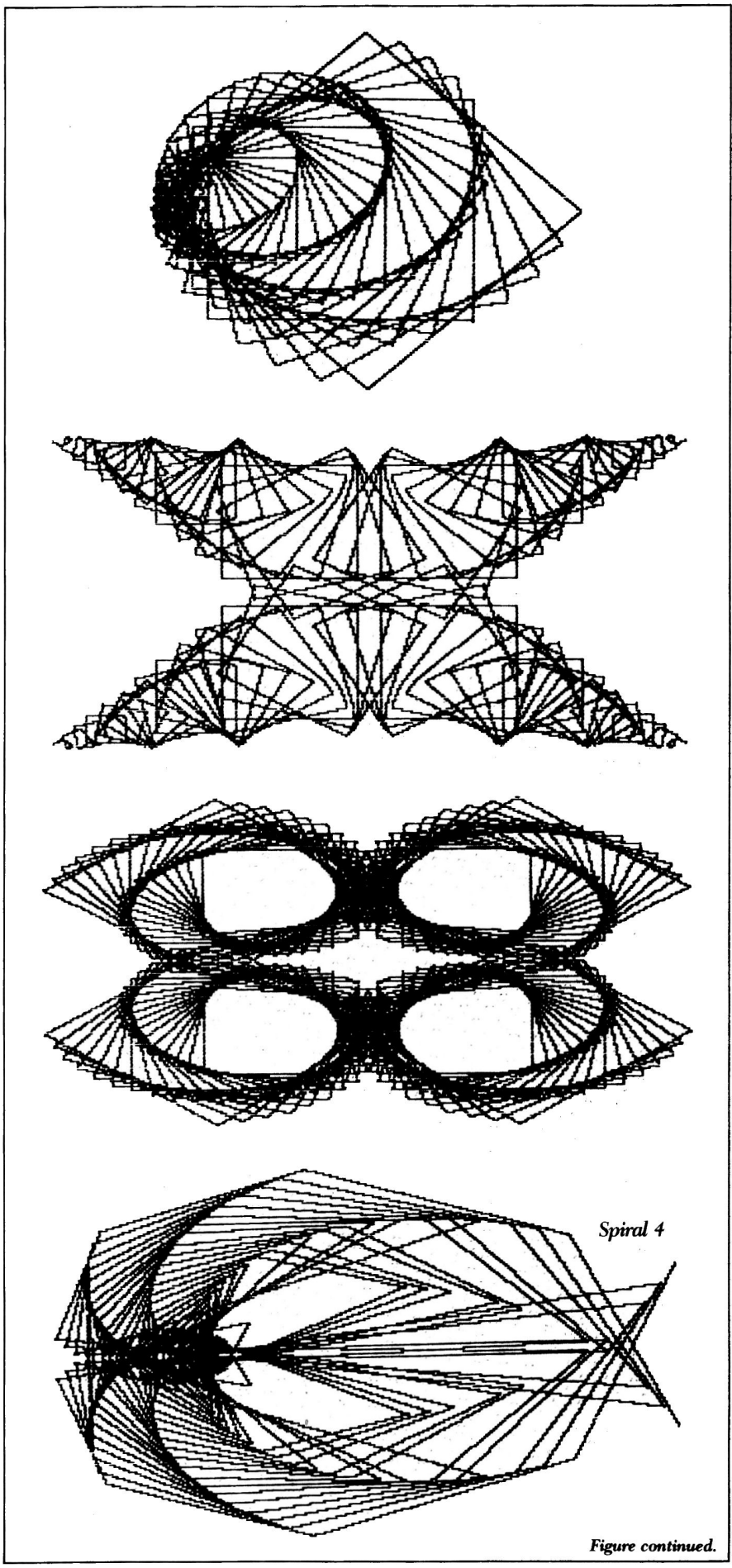


Figure continued.

Figure 4.
Spiral designs made by rotating polygons.

Listing 4. Spiral polygon generator.

```
10  REM   ************
20  REM   *  SPIRALS.  *
30  REM   * WRITTEN BY *
40  REM   * ALAN  FOXX *
50  REM   ************
60 :
70  GOTO 90
80  FOR D = 1 TO 3000: NEXT D: RETURN
     : REM  DELAY
90 PI = 3.14159
100 :
110  REM  SPIRAL 1
120 :
130  HGR2 : HCOLOR= 3
140 INC = PI / 4
150 DIAM = 0
160  FOR ST = 0 TO PI STEP INC /
     8
170 DIAM = DIAM + 5
180  FOR I = ST TO ST + PI STEP I
     NC
190 R = DIAM *  SIN (I) + 0.5
200 X = R *  SIN (I) + 70
210 Y = R *  COS (I) + 96
220  IF I = 0 THEN  HPLOT X,Y: GOTO
     240
230  HPLOT  TO X,Y
240  NEXT : NEXT
250  GOSUB 80
260 :
270  REM  SPIRAL 2
280 :
290  HGR2 : HCOLOR= 3
300 INC = PI / 4
310 DIAM = 0
320 XC = 4:YC = 16
330  FOR ST = 0 TO 2.35 STEP INC /
     6
340 DIAM = DIAM + 5
350  FOR I = ST TO ST + PI STEP I
     NC
360 XC = XC + 0.9:YC = YC + 0.65
370 R = DIAM *  SIN (I) + 0.5
380 X = R *  SIN (I) + XC
390 Y = R *  COS (I) + YC
400  IF I = 0 THEN  HPLOT X,Y:XP =
     X:YP = Y
410  HPLOT X,Y TO XP,YP: HPLOT 27
     9 - X,Y TO 279 - XP,YP
420  HPLOT X,191 - Y TO XP,191 -
     YP: HPLOT 279 - X,191 - Y TO
     279 - XP,191 - YP:XP = X:YP =
     Y
430  NEXT : NEXT
440  GOSUB 80
450 :
460  REM  SPIRAL 3
470 :
480  HGR2 : HCOLOR= 3
490 INC = PI / 4
500 DIAM = 150
510  FOR ST = 0 TO 1.24 STEP INC /
     12
520 DIAM = DIAM - 3
530  FOR I = ST TO ST + PI STEP I
     NC
540 R = DIAM *  SIN (I) + 0.5
550 X = R *  SIN (I) + 130
560 Y = R *  COS (I) / 1.6 + 58
570  IF I = 0 THEN  HPLOT X,Y:XP =
     X:YP = Y
580  HPLOT X,Y TO XP,YP: HPLOT 27
     9 - X,Y TO 279 - XP,YP
590  HPLOT X,191 - Y TO XP,191 -
     YP: HPLOT 279 - X,191 - Y TO
     279 - XP,191 - YP:XP = X:YP =
     Y
```

Listing continued.

are strictly black and white.

Spiral 4 uses a different type of symmetry algorithm. In spiral 4, whenever a dot is placed at 279 – x,y, another dot is placed at 279 – x,191 – y. No dot is placed at x,y or x,191 – y in spiral 4. ■

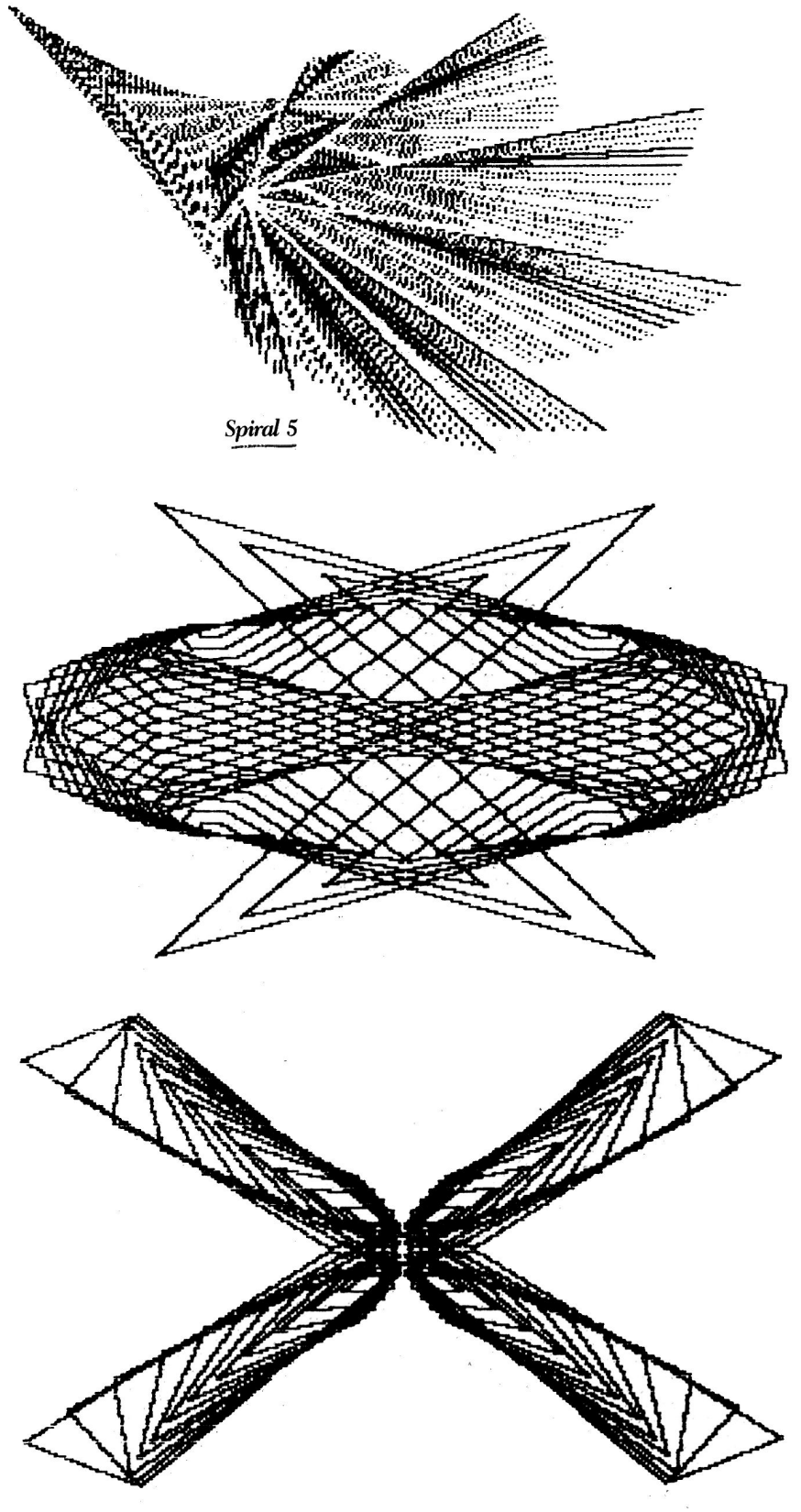
Listing continued.

```
600  NEXT : NEXT
610  GOSUB 80
620 :
630  REM  SPIRAL 4
640 :
650  HGR2 : HCOLOR= 3
660 INC = PI / 4
670 DIAM = 0
680  FOR ST = 0 TO 1.898 STEP INC
     / 12
690 DIAM = DIAM + 20
700  FOR I = ST TO ST + PI STEP I
     NC
710 R = DIAM *  SIN (I * 0.1) + 0
     .5
720 X = R *  SIN (I) / 1.4 + 205
730 Y = R *  COS (I) / 1.9 + 100
740  IF I = 0 THEN XP = X:YP = Y
750  HPLOT 279 - X,Y TO 279 - XP,
     YP
760  HPLOT 279 - X,191 - Y TO 279
      - XP,191 - YP:XP = X:YP = Y

770  NEXT : NEXT
780  GOSUB 80
790 :
800  REM  SPIRAL 5
810 :
820  HGR2
830 XP = 0:YP = 0
840 INC = PI / 7.5
850 DIAM = 33
860  FOR ST = 0 TO 1.089 STEP INC
     / 20
870 DIAM = DIAM + 3
880  HCOLOR=  INT ( RND (1) * 7) +
     1
890  FOR I = ST TO ST + PI STEP I
     NC
900 R = DIAM *  SIN (I) + 0.5
910 X = R *  SIN (I) + 70
920 Y = R *  COS (I) + 96
930  IF I = 0 THEN  HPLOT X,Y: GOTO
     960
940 XP = XP + 0.2:YP = YP + 0.2
950  HPLOT X,Y TO XP,YP
960  NEXT : NEXT
970  GOSUB 80
980 :
990  REM  SPIRAL 6
1000 :
1010  HGR2 : HCOLOR= 3
1020 INC = PI / 4
1030 DIAM = 0
1040  FOR ST = 1 TO 1.51 STEP INC
      / 20
1050 DIAM = DIAM + 40
1060  FOR I = ST TO PI + ST STEP
     INC
1070 R = DIAM *  SIN (I * 0.1) +
     0.5
1080 X = R *  SIN (I) / 1.4 + 205

1090 Y = R *  SIN (1 - I) / 1.8 +
     140
1100  IF I = 1 THEN  HPLOT X,Y:XP
      = X:YP = Y
1110  HPLOT 279 - X,Y TO 279 - XP
     ,YP
1120  HPLOT X,Y TO XP,YP: HPLOT X
     ,191 - Y TO XP,191 - YP
1130  HPLOT 279 - X,191 - Y TO 27
     9 - XP,191 - YP:XP = X:YP =
     Y
1140  NEXT : NEXT
1150  GOSUB 80
1160 :
1170  REM  SPIRAL 7
1180 :
1190  HGR2 : HCOLOR= 3
1200 INC = PI / 3.4
1210 DIAM = 139
1220  FOR ST = 0 TO 0.85 STEP INC
      / 12
1230 DIAM = DIAM - 10
1240  FOR I = ST TO ST + PI STEP
     INC
1250 R = DIAM *  SIN (I) + 0.5
1260 X = R *  SIN (I) + 140
1270 Y = R *  COS (1 - I) / 1.2 +
     100
1280  IF I = 0 THEN  HPLOT X,Y:XP
      = X:YP = Y
1290  HPLOT X,Y TO XP,YP: HPLOT 2
     79 - X,Y TO 279 - XP,YP
1300  HPLOT X,191 - Y TO XP,191 -
     YP: HPLOT 279 - X,191 - Y TO
     279 - XP,191 - YP:XP = X:YP =
     Y
1310  NEXT : NEXT
1320  GOSUB 80
1330 :
1340  HOME : TEXT : END
```

Figure continued.



Spiral 5

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by Alan Foxx

Have you ever wanted to create interesting hi-res patterns on the Apple but couldn't because you didn't understand complex math? Then the following programs should interest you.

Take a look at the program listing for Hi-Res Square Motif #1 (Figure and Listing 1). As you can see in lines 80–130, this program is full of HPLOT statements without complex math formulas. Each of the other programs (Figures and Listings 2–4) is no more than a slight modification of this first one.

The numbers in the DATA statements represent the colors that appear in the design. As the computer plots lines, it works through these numbers sequentially. For instance, the DATA statement 120 DATA 1,0,3,1,-1 in the Square Motif #4 program (Listing 4) produces a green line, a black line, a white line, two green lines, a black line, a white line, two green lines, a black line, and so on. Number one stands for green, zero stands for black, and three stands for white in hi-res graphics.

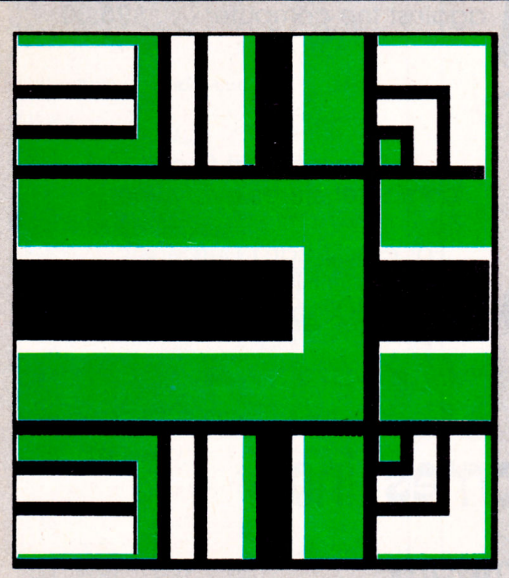
The negative one at the end of the data list tells the computer to go back to the beginning of the list and start the color sequence over again. By changing the data list you change the color combination of that particular design.

Look at line 40 of Square Motif #4. As with all of the examples in this article, the computer reads in the number of a color and stores it in the variable C. It then immediately checks to see if that number is equal to negative one. If it is, then the computer starts reading numbers from the beginning of the data list again.

Experiment to see what designs you can come up with. Try your own color combinations and modify the numbers in the FOR statements. But keep them between 0 and 155 or your program might not work. These numbers represent the rows and columns of the design.

Each design is restricted to a portion of the hi-res screen. It starts in column 0 and ends in column 159, and starts at row 0 and ends at row 159. ■

You can write to Alan Foxx at 28090 Tavistock Trail, Southfield, MI 48034.



```
10  REM  SQUARE MOTIF #1
20  HGR
30  FOR I = 80 TO 120 STEP 40
40  FOR J = 0 TO 156 STEP 4
50  READ C: IF C =  - 1 THEN  RESTORE : READ C
60  HCOLOR= C
70  FOR K = J TO J + 3
80  HPLOT K,I TO K,I + 36
90  HPLOT I,K TO I + 36,K
100  HPLOT I,159 - K TO I + 36,159 - K
110  HPLOT 159 - I,159 - K TO 120 - I,159 - K
120  HPLOT K,159 - I TO K,120 - I
130  HPLOT 159 - I,K TO 120 - I,K
140  NEXT K
150  NEXT J: NEXT I
160  HCOLOR= 4: HPLOT 0,0 TO 159,0 TO 159,159 TO 0,159 TO 0,0:
      HPLOT 0,158 TO 160,158: HPLOT 0,157 TO 160,157
170  DATA 4,4,4,7,5,5,5,5,5,4,5,5,4,7,7,4,7,7,7,5,-1
```

Listing 1. Program for Square Motif #1.

Figure 1. Square Motif #1.

```
10  REM SQUARE MOTIF #2
20  HGR
30  FOR I = 0 TO 40 STEP 40
40  FOR J = 0 TO 155 STEP 4
50  READ C: IF C =  - 1 THEN  RESTORE : READ C
60  HCOLOR= C
70  FOR K = J TO J + 4
80  HPLOT K,I TO K,I + 56
90  HPLOT 156 - K,I TO 156 - K,I + 56
100  HPLOT 156 - K,156 - I TO 156 - K,100 - I
110  HPLOT K,156 - I TO K,100 - I
120  HPLOT I,156 - K TO I + 56,156 - K
130  HPLOT I,K TO I + 56,K
140  HPLOT 156 - I,156 - K TO 100 - I,156 - K
150  HPLOT 156 - I,K TO 100 - I,K
160  NEXT K
170  NEXT J: NEXT I
180  HCOLOR= 0: HPLOT 0,0 TO 156,0 TO 156,156 TO 0,156 TO 0,0
190  DATA   0,0,1,1,1,1,1,3,1,3,3,0,-1
```

***Listing 2.** Program for Square Motif #2.*

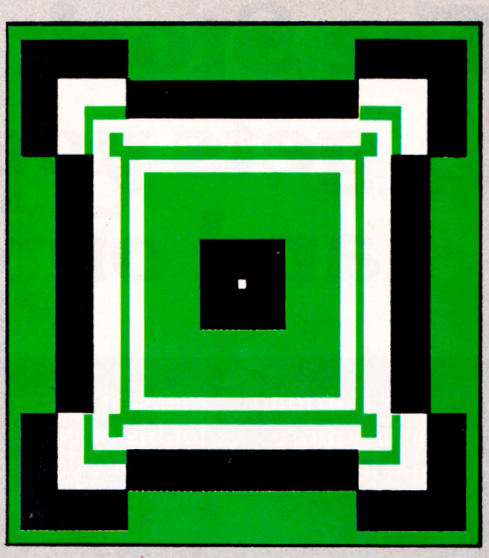
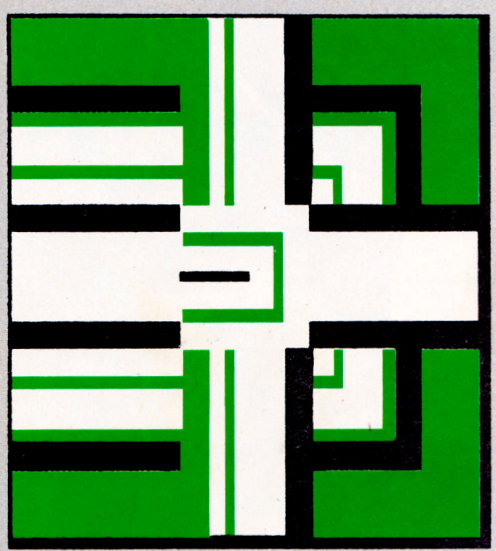


***Figure 2.** Square Motif #2.*



```
10  REM SQUARE MOTIF #3
20  HGR
30  FOR I = 60 TO 100 STEP 40
40  FOR J = 0 TO 155 STEP 4
50  READ C: IF C =  - 1 THEN  RESTORE : READ C
60  HCOLOR= C
70  FOR K = J TO J + 4
80  HPLOT K,I TO K,I + 56
90  HPLOT 156 - I,K TO 100 - I,K
100  HPLOT I,156 - K TO I + 56,156 - K
110  HPLOT I,K TO I + 56,K
120  HPLOT 156 - I,156 - K TO 100 - I,156 - K
130  HPLOT K,156 - I TO K,100 - I
140  NEXT K
150  NEXT J: NEXT I
160  HCOLOR= 0: HPLOT 0,0 TO 156,0 TO 156,156 TO 0,156 TO 0,0
170  DATA  1,3,3,3,1,0,0,1,1,1,1,1,3,1,3,3,3,3,0,0,3,3,-1
```

***Listing 3.** Program for Square Motif #3.*

***Figure 3.** Square Motif #3.*

```
10  REM SQUARE MOTIF #4
20  HGR
30  FOR I = 155 TO 0 STEP  - 4
40  READ C: IF C =  - 1 THEN  RESTORE : READ C
50  HCOLOR= C
60  FOR K = I TO I + 4
70  HPLOT K,K TO 159 - K,K
80  HPLOT K / 2,K TO 159 - (K / 2),K
90  HPLOT K,K TO K,159 - K
100  NEXT K
110  NEXT I
120  DATA  1,0,3,1,-1
```

***Listing 4.** Program for Square Motif #4.*

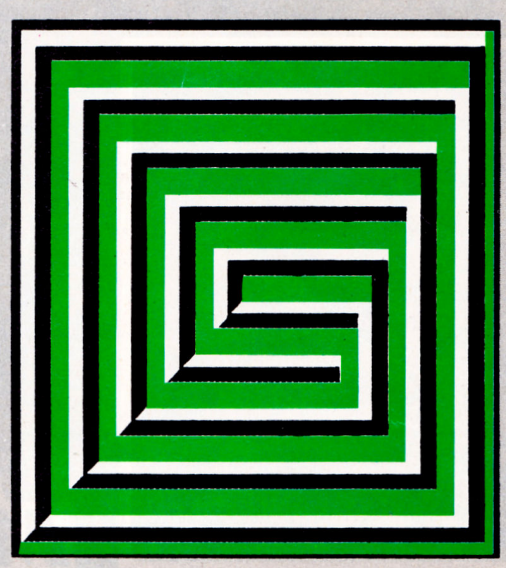


***Figure 4.** Square Motif #4.*

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Picture Filer

You can use this handy library unit and utility to store Pascal or DOS hi-res images onto disk and to access these images from your Pascal programs.

by John Stephenson

Now you can save pictures created with the Apple Pascal 1.1 Turtlegraphics commands to disk. Using the unit I describe in this article, Apple Pascal programmers can store and retrieve high-resolution images. As an important extra, drawings and charts created with many Apple DOS 3.3 graphics software packages can be integrated into Pascal programs.

Unit PF, short for PictureFiler, is a collection of routines designed specifically for the Apple II. Organized as a library unit, these routines are controlled by client programs. A utility program (see Listing 3) shows how to use Unit PF to store and retrieve images under keyboard control.

Defining Unit PF

Listing 1 shows the contents of the file PF.TEXT. It is the interface and body of Unit PF. All function and procedure calls as well as all public constants, types and variables begin with the letters "pf" to help avoid name conflicts with client programs.

The listing starts with a compiler directive. The swapping option (s+) is

Address correspondence to John Stephenson, 9118 Smith Ave., N. Bergen, NJ 07047.

Listing 1. PF.TEXT unit.

```
                                    {$s+,i-,g+}
                                UNIT pf { picture FILE };

                  { UNIT pf manages the storage AND retrieval OF
                    graphic images on floppy diskette. -jcs 3/83 }

                                        INTERFACE
CONST
    pfmaxsize          =          33;      { max # images per standard floppy }
TYPE
    pfname             = STRING[30];
    pfblock            = PACKED ARRAY [0..511] OF 0..255;
    pfcatrecord        = PACKED RECORD
            signature   : INTEGER;
            maxindex    : 0..pfmaxsize;
            name        : ARRAY[1..pfmaxsize] OF pfname;
            END;
VAR
    { pfresult contains                    meaning
                0                  normal completion OF called routine
              128                  NOT valid picfile
              129                  can NOT exceed pfmaxsize images per FILE
              130                  no room IN picfile
              131                  no such picture IN picfile
              132                  general error IN loading dos picture image
              133                  unable TO READ/WRITE 16 block image TO disk
                                   (possibly NOT enough contiguous room on floppy)

              other                same as ioresult
     }

    pfresult           :INTEGER;
    pffile             :FILE;
    pfcat              : PACKED RECORD CASE BOOLEAN OF
                    TRUE:   (info:pfcatrecord);
                    FALSE:  (blocks:PACKED ARRAY[0..2]OF pfblock);
                    END;

    PROCEDURE pfclose;
    FUNCTION  pfopen   (filename:STRING):BOOLEAN;
    FUNCTION  pfcreate (filename:STRING; size:INTEGER):BOOLEAN;
    FUNCTION  pfsave   (name:pfname):BOOLEAN;
    FUNCTION  pfload   (name:pfname):BOOLEAN;
    PROCEDURE pfdisplay;
    FUNCTION  pfdosload(device:INTEGER;filename:STRING):BOOLEAN;
    FUNCTION  pfdelete (name:pfname):BOOLEAN;
    PROCEDURE pfon;
    PROCEDURE pfoff;
```

Listing continued.

Listing continued.

```
                                IMPLEMENTATION

                              {$i implement.text}

                                BEGIN {UNIT pf}

WRITELN('Unit PF (PictureFile) Version 1.0 [3/83] (c) 1983 John Stephenson');
{$r-}
lotsaspaces[0]:=chr(255);
{$r+}
fillchar(lotsaspaces[1],255,chr(32));
zerocatalog;
pfcat.info.maxindex:=0;
screen.a:=hirespage1;
release(screen.v) {protect hirespage1};
pfresult:=0;
END.
```

Listing 2. IMPLEMENT.TEXT unit.

```
CONST
    blocksize       =   511;            sectorsize      =   255;
    eightk          =  8191;            successful      =     0;
    identification = 13579;             hirespage1      =  8192;
    shopage1        =-16300;            textmode        =-16303;
    hiresmode       =-16297;            graphicmode     =-16304;
    fullscreengraphics=-16302;

TYPE
    byterange                   = 0..255;
    sectorrange                 = 0..sectorsize;
    blockrange                  = 0..blocksize;
    eightkrange                 = 0..eightk;
    image                       = PACKED ARRAY[eightkrange] OF byterange;
    commandtype                  = (readrecord,writerecord);
    trippletype                  = (addr,valu,foto);
    memory                       = PACKED RECORD CASE trippletype OF
                    addr:    (a:INTEGER);
                    valu:    (v:^INTEGER);
                    foto:    (f:^image);
                    END;
VAR
    lotsaspaces                  : STRING[255];
    screen                       : memory;
    bloxmoved                    : INTEGER;

    PROCEDURE uppercase (VAR ch:CHAR);
    { convert any lowercase CHAR into uppercase }
    BEGIN
    IF((ch)='a')AND(ch(='z')) THEN ch:=chr(ord(ch)-ord('a')+ord('A'))
    END;

    PROCEDURE shiftstring (VAR s:STRING);
    { convert any lower CASE STRING chars into uppercase }
    VAR
            i:INTEGER;
            c:CHAR;
    BEGIN
    i:=0;
    WHILE (i(length(s)) DO
        BEGIN i:=i+1; c:=s[i]; uppercase(c); s[i]:=c END;
    END;

    FUNCTION findblocknumber (recnumber:INTEGER): INTEGER;
    { convert a pf RECORD number into a relative block number.  relative
      blocks 0..2 are the pf catalog AND block 3 etc are images }
    BEGIN findblocknumber:=(16 * recnumber)-13 END;

    FUNCTION diskio (command:commandtype; recnumber:INTEGER): BOOLEAN;
    { transfer an image from disk TO high resolution PAGE 1 OR from
      high resolution PAGE 1 TO disk }
    BEGIN
    CASE command OF
        writerecord:
            bloxmoved:=
                blockwrite(pffile,screen.f^[0],16,findblocknumber(recnumber));
        readrecord:
            bloxmoved:=
                blockread (pffile,screen.f^[0],16,findblocknumber(recnumber));
        END{CASE};
    IF(bloxmoved=16) THEN BEGIN diskio:=TRUE; pfresult:=0 END
    ELSE BEGIN diskio:=FALSE; pfresult:=133 END;
    END;

    PROCEDURE zerocatalog;
    { initialize an empty pfcatalog }
    BEGIN fillchar(pfcat.blocks[0],sizeof(pfcatrecord),chr(0)) END;

    PROCEDURE pfclose;
    { CLOSE the FILE }
    BEGIN zerocatalog; CLOSE(pffile); pfresult:=ioresult  END;

    FUNCTION pfopen    ((filename:STRING):BOOLEAN);
    { open a pf FILE }

        FUNCTION checksignature:BOOLEAN;
        { verify its a pf FILE }
```

Listing continued.

turned on, causing the compiler to shift different parts of itself in and out of RAM during the compilation process. This yields more room for symbol space, and is required when compiling units under Apple Pascal 1.1. The io-checking option (i−) is turned off. Unit PF will take responsibility for handling its own input/output errors. Finally the goto option (g+) is turned on, allowing label declarations and the goto construct. Minor use is made of the goto.

All units begin with the reserved word UNIT followed by a name. As Unit PF uses no other units, the reserved word INTERFACE follows. The part of the unit visible to client programs is therein defined.

The CONST section sets pfmaxsize to 33, the largest number of images that may be contained in any image file.

The TYPE section defines pfname, pfblock and pfcatrecord. Pfname is a string of up to 30 characters used to reference an image in an image file. Pfblock defines a packed array of 512 bytes intended to buffer the contents of Pascal disk block in RAM. Using three fields, pfcatrecord defines housekeeping information about the image files created by unit PF. The signature field is for a special number that differentiates a PF image file from other files. The maxindex field contains the maximum number of images that may be contained within a specific image file, set when the file is created. The name field contains the array map of names associated with relative disk blocks.

The VAR section allocates the global variables pfresult, pffile, and pfcat. Pfresult is analogous to the system variable IORESULT. It contains integer condition codes as specified in the listing. Querying this variable allows programs to handle error conditions with graceful degradation. Pffile is the image file, simply a file of contiguous disk blocks. The Apple Pascal system handles the transport of blocks of information to and from disk through the intrinsic calls BLOCKREAD and BLOCKWRITE. Unit PF handles all other interpretation and management of these blocks. Pfcat is a three block area beginning every image file. It contains organizational data about the

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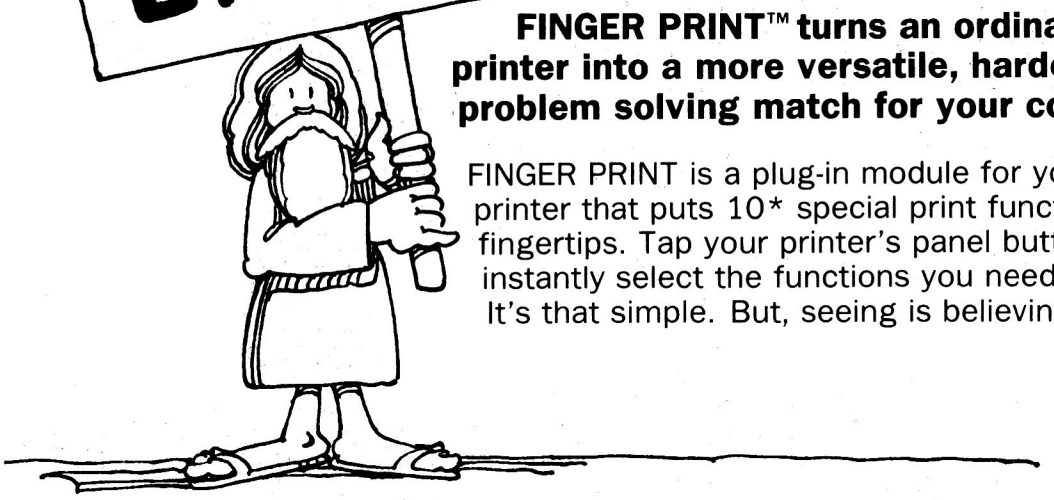

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Listing continued.

```
        BEGIN checksignature:=(pfcat.info.signature=identification) END;

        PROCEDURE reportstatus;
        ( exception condition EXIT )
        BEGIN pfresult:=ioresult; pfopen:=FALSE; EXIT(pfopen) END;

    BEGIN (pfopen)
    pfresult:=0;
    RESET(pffile,filename);
    IF(ioresult()successful)THEN reportstatus;
    bloxmoved:=blockread(pffile,pfcat.blocks[0],3,0);
    IF(bloxmoved()3) THEN reportstatus
    ELSE IF (checksignature) THEN ( its a genuine picture FILE )
        BEGIN pfopen:=TRUE; pfresult:=successful END
    ELSE ( the FILE opened is NOT a valid picture FILE, so )
        BEGIN pfclose; pfopen:=FALSE; pfresult:=128 END;
    END;

    FUNCTION writecat(index:INTEGER; name:pfname):BOOLEAN;
    ( WRITE pfcatalog image TO relative disk blocks 0..2 )
    BEGIN
    pfcat.info.name[index]:=name;
    bloxmoved:=blockwrite(pffile,pfcat.blocks[0],3,0);
    writecat:=(bloxmoved=3);
    END;

    FUNCTION pfcreate ((filename:STRING; size:INTEGER):BOOLEAN);
    ( lock an empty pf FILE into the disk directory )

        PROCEDURE reportstatus;
        ( exception EXIT )
        BEGIN
        pfcreate:=FALSE;
        pfresult:=ioresult;
        pfclose;
        EXIT(pfcreate)
        END;

    BEGIN (pfcreate)
    pfresult:=0;
    IF ((size(1)OR(size)pfmaxsize))THEN
        BEGIN pfresult:=129; pfcreate:=FALSE; EXIT(pfcreate) END;
    zerocatalog;
    pfcat.info.signature:=identification;
    pfcat.info.maxindex:=size;
    CLOSE(pffile);
    REWRITE(pffile,filename); IF (ioresult()successful) THEN reportstatus;
    IF NOT(diskio(writerecord,size)) THEN EXIT(pfcreate);
    IF NOT(writecat(1,'')) THEN reportstatus;
    CLOSE(pffile,lock); IF(ioresult()successful) THEN reportstatus;
    pfcreate:=pfopen(filename);
    END;

    FUNCTION findname (name:pfname) : INTEGER;
    ( return index OF named picture OR 0 IF NOT found )
    VAR i:INTEGER; foundit:BOOLEAN;
    BEGIN
    foundit:=FALSE;
    i:=pfcat.info.maxindex;
    IF(i)0) THEN REPEAT
        IF(pfcat.info.name[i]=name) THEN foundit:=TRUE ELSE i:=i-1
    UNTIL ((foundit)OR(i=0));
    findname:=i;
    END;

    FUNCTION pfsave    ((name:pfname):BOOLEAN);
    ( WRITE image TO FILE IF an open slot is available )
    VAR i:INTEGER;

        FUNCTION findopenslot (name:pfname) : INTEGER;
        ( return an open slot index OR 0 IF FILE is full )
        VAR location:INTEGER; foundit:BOOLEAN;
        BEGIN
        foundit:=FALSE;
        location:=pfcat.info.maxindex;
        IF (location)0) THEN REPEAT
            IF(pfcat.info.name[location]='') THEN
                foundit:=TRUE ELSE location:=location-1
        UNTIL((foundit)OR(location=0));
        findopenslot:=location;
        END;

    BEGIN (pfsave)
    pfresult:=0;
    IF (findname(name)=0) THEN
        IF(findopenslot(name)<>0) THEN
            IF (diskio(writerecord,findopenslot(name))) THEN
                pfsave:=writecat(findopenslot(name),name)
            ELSE pfsave:=FALSE
        ELSE
            BEGIN
            pfsave:=FALSE;
            pfresult:=130;
            END
    ELSE
        IF(diskio(writerecord,findname(name))) THEN
            pfsave:=writecat(findname(name),name)
        ELSE pfsave:=FALSE;
    END;
    FUNCTION pfload    ((name:pfname):BOOLEAN);
    ( transfer an image TO high resolution PAGE 1 OR return FALSE
      IF the named image is NOT found )
    BEGIN
    pfresult:=0;
    IF (findname(name)=0)THEN BEGIN pfresult:=131; pfload:=FALSE END
```

Listing continued.

file. This structure is placed in the interface section so that client programs may know the names of various images contained in a specific image file.

The following functions and procedures are the heart of Unit PF. These are the routines which, when called by programs linked to Unit PF, are responsible for the management and

"Each image requires 16 blocks for storage and each file requires three blocks for overhead."

movement of images between Pascal's high-resolution screen 1 and picture files on disk.

Pfclose closes an existing image file and sets the pfcat to an empty state.

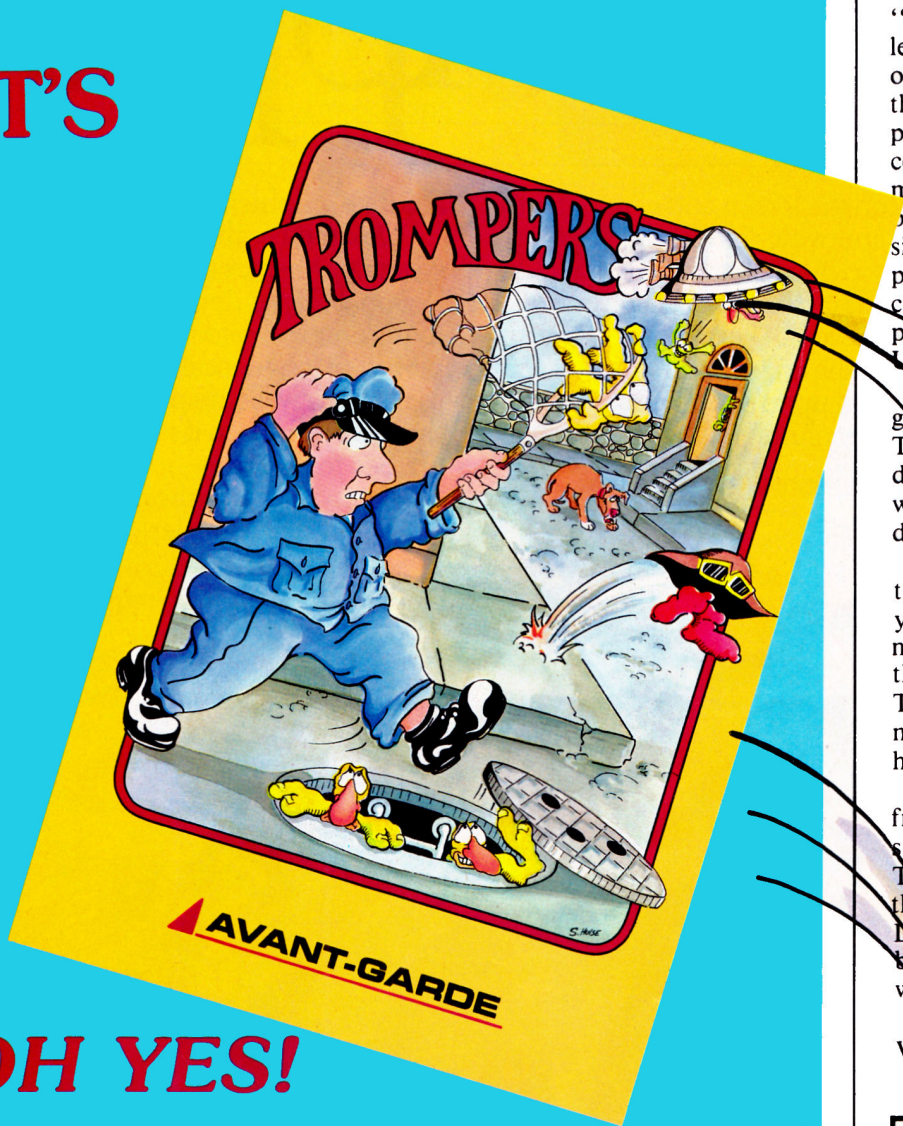
Pfopen accesses an existing image file, according to the filename parameter. If the file can be opened then the function returns true, otherwise false. The client program examines the global variable pfresult to obtain specific status information about the success of this and any Unit PF call after control returns from the unit.

Pfcreate initializes a new image file. It uses the filename parameter to name the file. It uses the size parameter to allocate sufficient disk blocks required for the maximum number of images that the programmer plans to store in the file. Each image requires 16 blocks for storage and each file requires three blocks for overhead. An image file that could contain up to ten images (size = 10) would, therefore, need 163 contiguous disk blocks. Pfcreate returns true if the file was successfully locked into Pascal's disk directory, otherwise false.

Pfsave returns true if the byte pattern occupying Apple's high-resolution space is successfully written to an

OH NO!

IT'S



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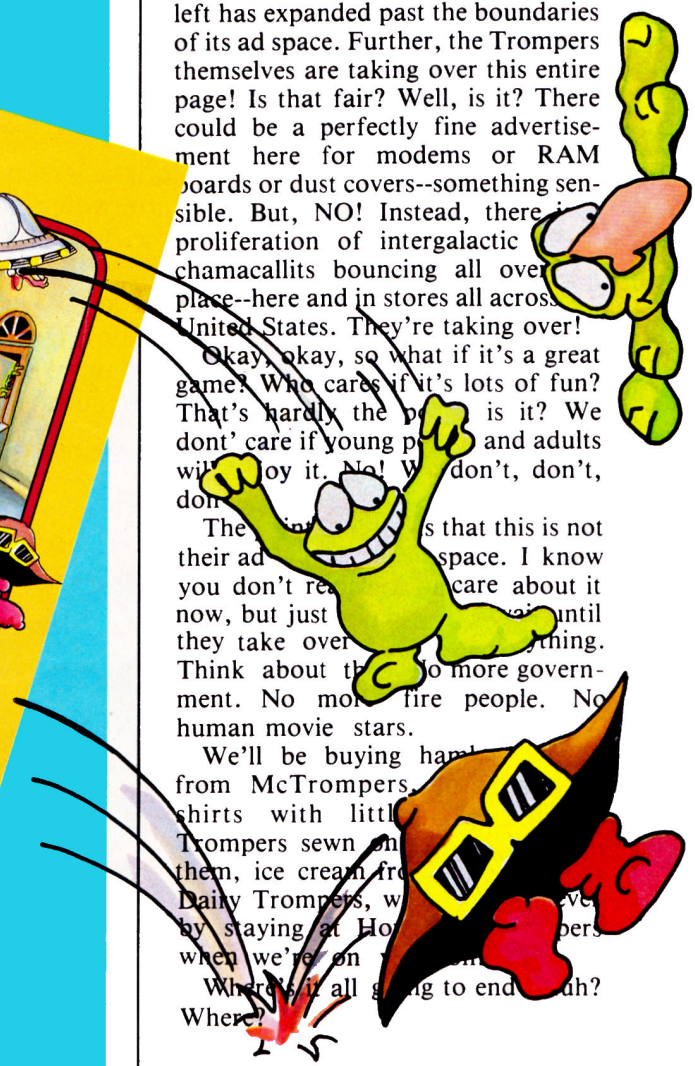

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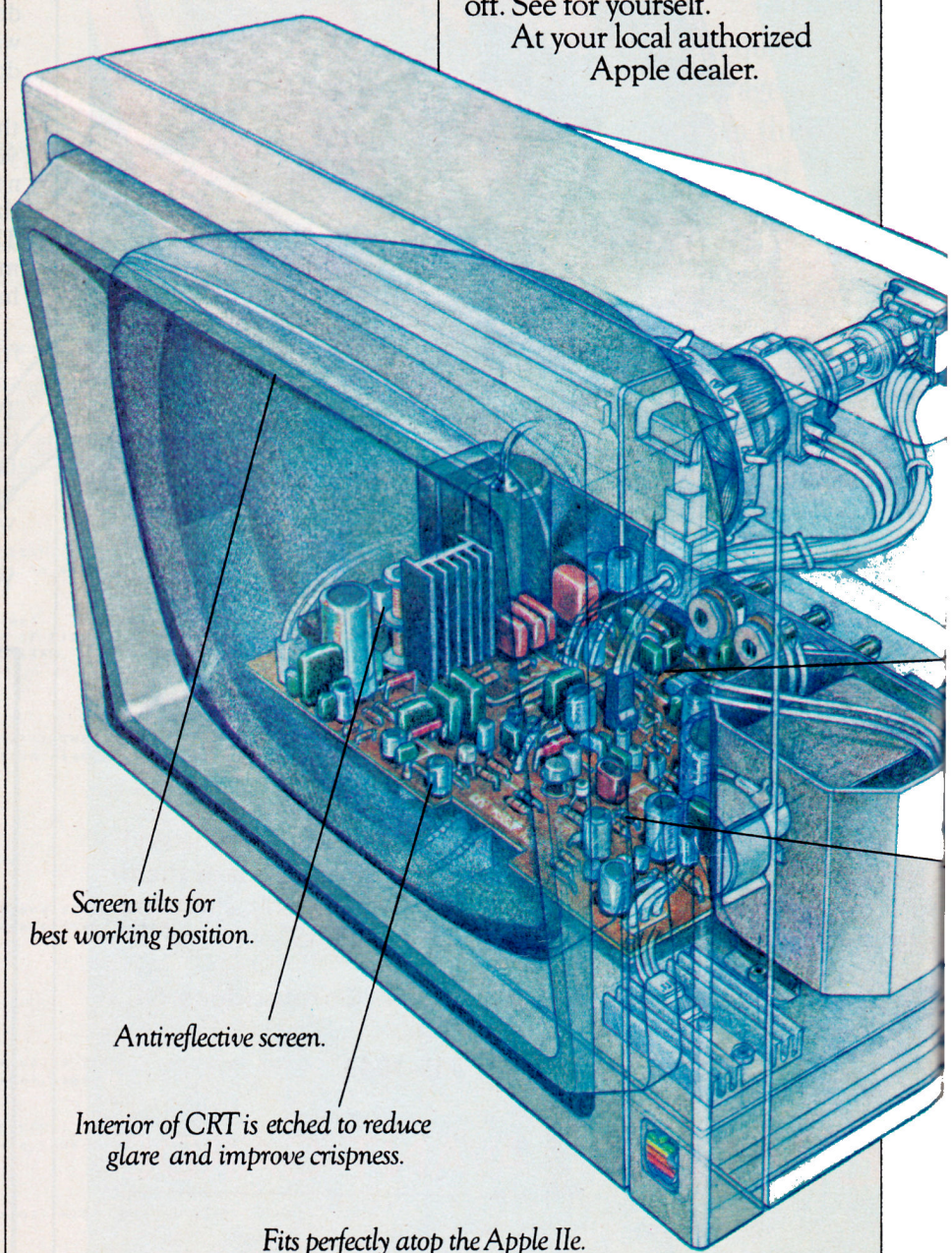

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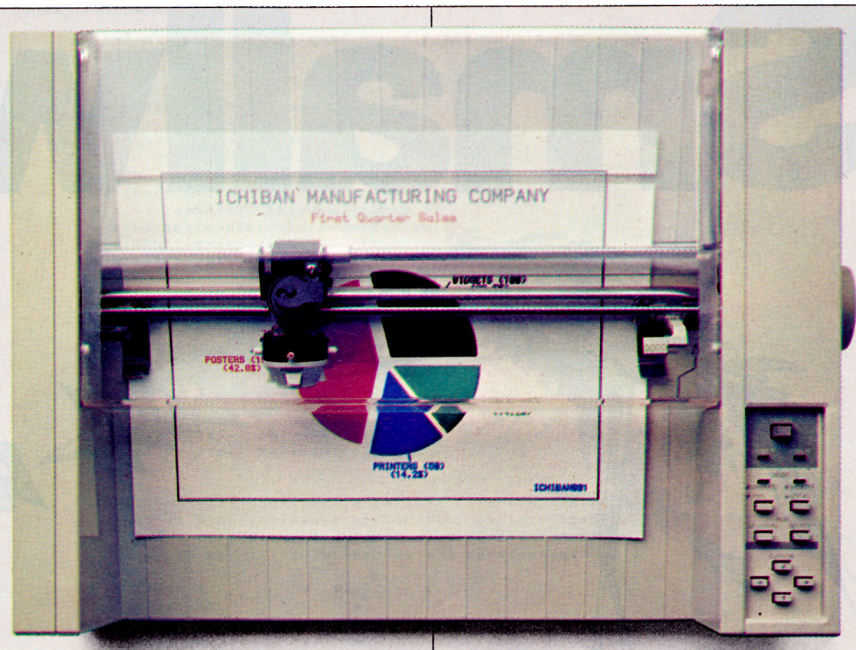

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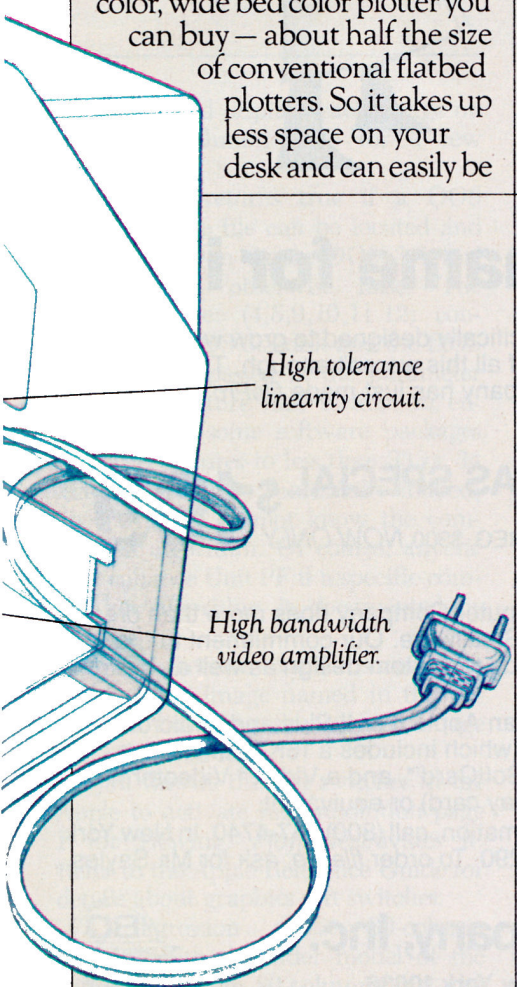

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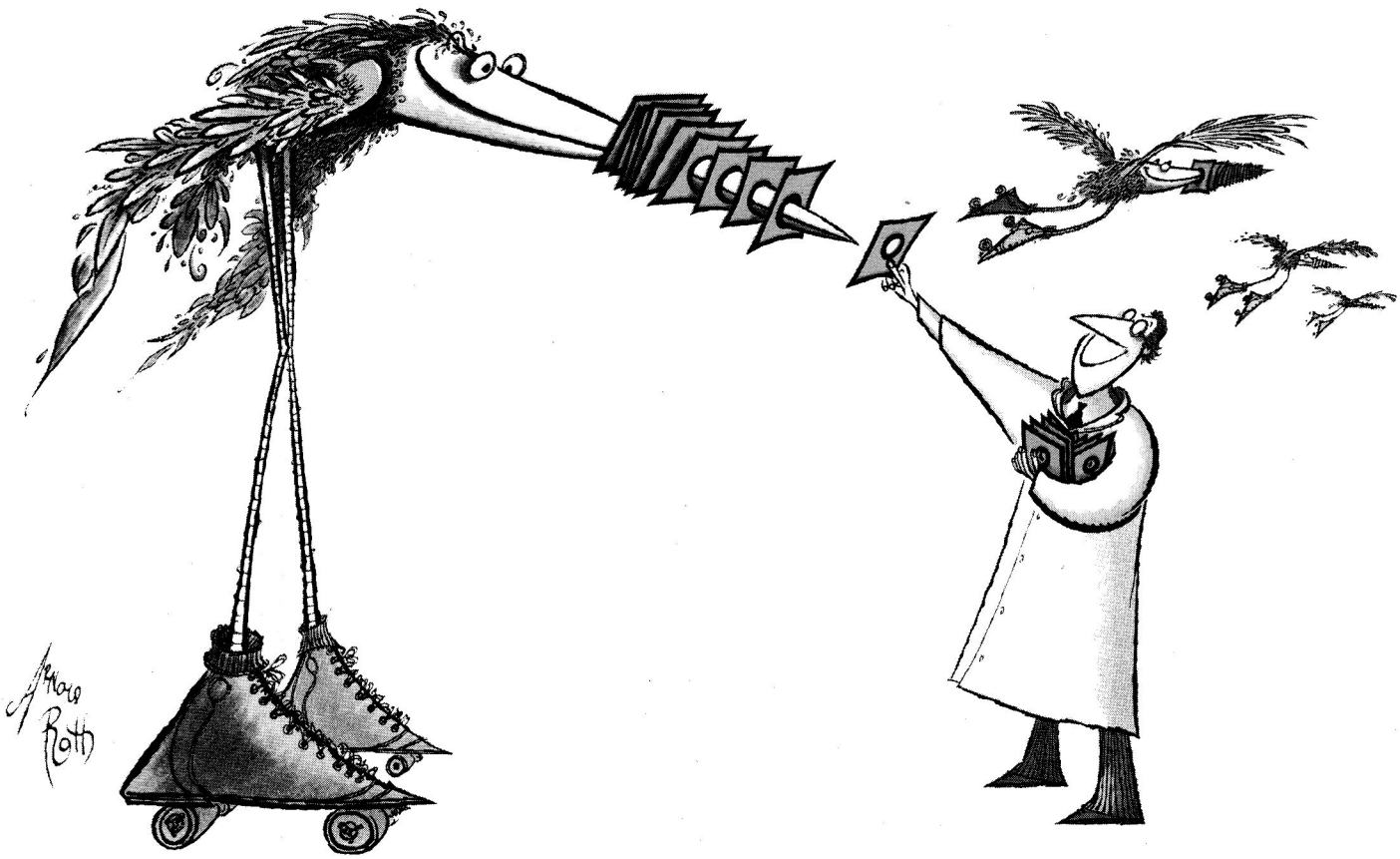

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available area in the current image file, otherwise false. The image's name is passed as a parameter.

Pfload is the complement of pfsave. It returns true if an image having the name passed in the parameter list can be located and overlaid onto the Apple's high-resolution area, otherwise false.

Pfdisplay cycles through the current image file and displays each image on the high-resolution page for a few seconds.

"The body of unit PF completes PF.TEXT. It writes the unit's name and version number on the screen and initializes some variables."

Pfdosload returns true if a DOS binary picture file can be located and loaded from an Apple DOS 3.3 formatted disk, otherwise false. The device number (4,5,9,10,11,12) containing the DOS 3.3 disk and the DOS filename are passed in the parameter list. DOS picture files written in encoded form (some software packages compress pictures to less than 33 or 34 sectors) cannot be successfully loaded, since Unit PF cannot know the compression algorithm. Of course, anyone may enhance Unit PF if a specific compression algorithm is documented or deduced.

Pfdelete returns true if it successfully removes the image named in the parameter list from the current image file, otherwise false.

Pfon throws the soft switches in the Apple to activate high-resolution page 1 for viewing. *Pfoff* deactivates it. Refer to the Apple Reference Guide for details about graphics soft switches.

A digression about 80-column boards: With the older model of the Videx Videoterm 80-column card, the screen will also have to be manually

Listing continued.

```
ELSE pfload:=(diskio(readrecord,findname(name)));
END;

PROCEDURE pfon;
{ display high resolution PAGE 1}
VAR
    throwswitch:INTEGER;
    m:memory;
BEGIN
pfresult:=0;
m.a:=hiresmode;  throwswitch:=m.v^;
m.a:=graphicmode;  throwswitch:=m.v^;
m.a:=fullscreengraphics;  throwswitch:=m.v^;
m.a:=shopage1;  throwswitch:=m.v^;
END;

PROCEDURE pfoff;
{ display text }
VAR
    throwswitch:INTEGER;
    m:memory;
BEGIN
pfresult:=0;
m.a:=shopage1;  throwswitch:=m.v^;
m.a:=textmode;  throwswitch:=m.v^;
END;

FUNCTION pfdosload((device:INTEGER;filename:STRING):BOOLEAN);
{ load an non-compressed binary FILE picture image created under
  dos 3.3 on a basic disk into high resolution PAGE 1
  refer TO pp. 128ff IN the dos 3.3 referencemanual }
CONST
    highbit          =  128;
    maxtrack         =   34;
    maxsector        =   15;
    deleted          =  255;
TYPE
    trackrange       = 0..maxtrack;
    sectorrange      = 0..maxsector;
    dostspair        = PACKED RECORD
        track        : byterange;
        sector       : byterange;
        END;
    dostslist        = PACKED ARRAY[1..33] OF dostspair;
    dosdirentry      = RECORD
        link         : dostspair;
        filetype     : byterange;
        name         : STRING[30];
        entrysize    : byterange;
        END;
    doscatrecord     = RECORD
        link         : dostspair;
        entry        : PACKED ARRAY[1..7] OF dosdirentry;
        END;
VAR
    foundpicture     :  BOOLEAN;
    buffer           :  pfblock;
    listlocation     :  dostspair;
    tslist           :  dostslist;
    cat              :  doscatrecord;

    PROCEDURE abortload (err:INTEGER);
    { exception EXIT }
    BEGIN pfresult:=err; pfdosload:=FALSE; EXIT(pfdosload) END;

    PROCEDURE strip (VAR c:CHAR);
    { turn high bit off -- dos keeps them on }
    BEGIN IF (ord(c))=highbit) THEN c:=chr(ord(c)-highbit) END;

    FUNCTION ts_TO_block (t:trackrange; s:sectorrange) : INTEGER;
    { translate dos track/sector coordinates into absolute pascal
      blocknumber }
    VAR
        offset           : 0..7; { blocks 0 - 7 per track }
    BEGIN
    CASE s { adjust FOR dos sector mapping } OF
      14,00: offset:=0;      12,13: offset:=1;
      10,11: offset:=2;      08,09: offset:=3;
      06,07: offset:=4;      04,05: offset:=5;
      02,03: offset:=6;      15,01: offset:=7;
      END{CASE};
    ts_TO_block:=(t * 8) + offset;
    END;

    FUNCTION bottomhalf (s:sectorrange) : BOOLEAN;
    { IF sector starts at offset 256 IN buffer return TRUE.  each
      512 byte pascal block contains two 256 byte dos sectors. }
    BEGIN bottomhalf:=(s IN [2,4,6,8,10,12,14,15]) END;

    PROCEDURE adjustbuffer;
    { move sector represented IN second half OF buffer TO first half
      OF buffer }
    BEGIN moveleft(buffer[256],buffer[0],256) END;

    PROCEDURE loadbuf (blocknumber:blockrange);
    { transfer a 512 byte block into the variable named buffer }
    BEGIN
    unitread(device,buffer[0],512,blocknumber,12);
    IF (ioresult<>0) THEN abortload (ioresult);
    END;

    FUNCTION searchcat :BOOLEAN;
    { locate a binary picture image on a dos catalog.  return
      TRUE IF found, otherwise FALSE. }
    LABEL
        100;
```

Listing continued.

Listing continued.

```
CONST
    dirtrack     =   17; { FOR standard dos 3.3 }
    dosnamelength=  30;
VAR
    endreached   : BOOLEAN;
    sectornumber: sectorrange;
    nameindex    : 0..7;
PROCEDURE abortsearch;
{ report TO caller that search has failed }
BEGIN searchcat:=FALSE; EXIT(searchcat) END;

FUNCTION checkfilekind(i:INTEGER) :BOOLEAN;
{ is FILE binary TYPE? }
CONST
    binarylocked  = 132;  binaryunlocked  = 4;
BEGIN
checkfilekind:=
  (cat.entry[i].filetype=binaryunlocked)OR
  (cat.entry[i].filetype=binarylocked)
END;

FUNCTION checklength(i:INTEGER) :BOOLEAN;
{ is FILE 33 OR 34 sectors long? -- length FOR an uncompressed
  dos picture image. }
BEGIN
checklength:=
    (cat.entry[i].entrysize=34)OR
    (cat.entry[i].entrysize=33)
END;

FUNCTION checklinks :BOOLEAN;
{ more catalog sectors? }
BEGIN checklinks:=((cat.link.track()0)OR(cat.link.sector()0))END;

FUNCTION checkname :INTEGER;
{ IF matches THEN return its relative index ELSE return 0 }
VAR
    n:STRING;
    index:INTEGER;
    foundmatch:BOOLEAN;

    PROCEDURE stripstring(VAR s:STRING);
    { turn off any high bits }
    VAR c:CHAR; i:INTEGER;
    BEGIN
    FOR i:=1 TO length(s) DO
        BEGIN c:=s[i]; strip(c); s[i]:=c END;
    END;

    PROCEDURE fattenfilename;
    { right fill the filename TO 30 characters }
    BEGIN
    WHILE(length(filename)(dosnamelength) DO
        filename:=concat(filename,' ');
    END;

BEGIN {checkname}
index:=7; foundmatch:=FALSE; fattenfilename;
REPEAT
    n:=cat.entry[index].name;
    stripstring(n);
    shiftstring(n);
    stripstring(filename);
    foundmatch:=(filename=n);
    IF(foundmatch=FALSE)THEN index:=index-1;
UNTIL ((index=0) OR (foundmatch=TRUE));
checkname:=index;
END;

FUNCTION checknotdeleted(i:INTEGER) :BOOLEAN;
{ has this FILE been deleted by dos? }
BEGIN
checknotdeleted:=(cat.entry[i].link.track()deleted);
END;

PROCEDURE loadcatsector;
{ assumes sector image has been previously READ into the variable
  called buffer }
CONST
    trackoffset     =   1;
VAR
    entrynumber     : 1..7;

    PROCEDURE loadsingleentry (index:INTEGER);
    { extract info about each entry from buffer }
    CONST
            eachentry       =  35;  { directory entry = 35 bytes }
            entrystart      =  11;  { offset hex b FOR entry 1   }

            {offsets relative TO each entry...}
            track   =   0;  filetype=   2;
            name    =   3;  count   =  33;
    VAR
            startindex:INTEGER;
    BEGIN
    startindex:=((index-1)*eachentry)+entrystart;
    cat.entry[index].link.track:=0;
    cat.entry[index].link.sector:=0;
    moveleft(buffer[startindex+track],
             cat.entry[index].link,2);
    cat.entry[index].filetype:=0;
    moveleft(buffer[startindex+filetype],
             cat.entry[index].filetype,1);
    cat.entry[index].name:=copy(lotsaspaces,1,dosnamelength);
    moveleft(buffer[startindex+name],
             cat.entry[index].name[1],dosnamelength);
    cat.entry[index].entrysize:=0;
```

Listing continued.

switched over by either moving the cable in the back of the Apple or by flipping the rear panel Videx switch if one has been installed, beside calling pfon and pfoff. Other 80-column boards may have their own idiosyncratic requirements. If the standard Apple screen is being used, nothing additional need be done.

Next comes a compiler directive to include the file shown in Listing 2, IMPLEMENT.TEXT. Generally, it is convenient to separate the interface and implementation texts in separate files. The interface part tends to double duty as a design document.

The body of unit PF completes PF.TEXT. It writes the unit's name and version number on the screen and initializes some variables.

PF Implementation

Listing 2 shows the contents of the file IMPLEMENT.TEXT. This is an include file needed during compilation of PF.TEXT, and contains the implementation of Unit PF's interface, along with support routines. This is the part of Unit PF which is invisible to a user. Explanation follows.

The CONST section lists the byte location of the various graphics soft switches.

The TYPE section defines image as an array of 8192 (0..8191) contiguous bytes. This reflects the size of the Apple's high-resolution screen. The TYPE trippletype (addr,valu,foto) is used to define the three-way variant record called memory. When a memory variable is referred to as an addr, its absolute location in RAM may be assigned. When a memory variable is referred to as a value, its word (two bytes) may be accessed. When a memory variable is referred to as a foto, its byte and the 8191 bytes following may be accessed. This versatile TYPE dubbed memory facilitates byte diddling.

The VAR section allocates lotsaspaces, screen, and bloxmoved. Lotsaspaces is a handy warehouse of spaces when strings need to be padded. Screen is the actual memory used as high-resolution page 1. Bloxmoved holds the result of the intrinsics BLOCKREAD and BLOCKWRITE when blocks of bytes are shifted to and from RAM and disk.

Procedure uppercase converts the lowercase character passed in its parameter list into a corresponding uppercase character. Although the ASCII definition of characters is universally used in the microcomputer world, this routine is independent of it.

Procedure shiftstring makes repeated calls to uppercase to translate any lowercase string members to corresponding uppercase members.

Function findblocknumber returns an integer which is the relative starting block of an image in an image file, based on the image's record number. For example, the third image (recnumber = 3) would return 35, since the storage of its pattern according to the algorithm expressed in the function begins at relative block 35.

Function diskio returns true if it successfully transfers an image from the high-resolution screen to disk file or vice versa depending on the command parameter (readrecord,writerecord), otherwise it returns false. Note how calls to the function findblocknumber are part of the arguments given to the intrinsics BLOCKREAD and BLOCKWRITE. Passing functions as parameters allows terse and lucid programming style.

Procedure zerocatalog uses the fast intrinsic FILLCHAR to initialize the PF catalog area (not to be confused with the Pascal disk directory). Filling with nulls effectively sets numerics to zero and strings to empty.

Procedure pfclose simply closes the image file and calls zerocatalog.

Function pfopen returns true if an image file specified by the filename parameter is successfully opened, otherwise false. Only one image file may be open at a time.

Function checksignature, a subfunction of function pfopen, returns true if the signature bytes in the first block of the file contain the expected value, otherwise false. Consequently, a file opened as an image file, but which in fact is not an image file, will be quickly recognized as an imposter. Unpleasant surprises are avoided.

Procedure reportstatus, a subprocedure of pfopen, manages the reporting of ioerrors and other exceptions by setting the global variable pfresult appropriately and cleanly

Listing continued.

```
            moveleft(buffer[startindex+count],
                     cat.entry[index].entrysize,1);
            endreached:=((cat.entry[index].link.track=0)AND
                         (cat.entry[index].link.sector=0)) OR
                         (sectornumber=1);
            END;


        BEGIN {loadcatsector}
        IF(bottomhalf(sectornumber)) THEN adjustbuffer;
        moveleft(buffer[trackoffset],cat.link,2);
        FOR entrynumber:=1 TO 7 DO loadsingleentry(entrynumber);
        END;

    BEGIN {searchcat}
    sectornumber:=maxsector;
    foundpicture:=FALSE;
    WHILE (foundpicture=FALSE) DO
        BEGIN
        loadbuf(ts_TO_block(dirtrack,sectornumber));
        loadcatsector;
        nameindex:=checkname;
        IF (nameindex)0) THEN
          IF (checknotdeleted(nameindex)) THEN
            IF (checklength(nameindex)) THEN
              IF (checkfilekind(nameindex)) THEN
                BEGIN
                foundpicture:=TRUE;
                listlocation.track:=cat.entry[nameindex].link.track;
                listlocation.sector:=cat.entry[nameindex].link.sector;
                GOTO 100;
                END;
        IF (NOT(checklinks)OR(endreached)) THEN abortsearch;
        sectornumber:=sectornumber-1;
        100:
        END;
    searchcat:=foundpicture;
    END;

    PROCEDURE loadpage1;
    { transfer image sector by sector from dos disk TO high
      resolution PAGE 1 area }
    VAR
        index       :0..8192;
        startmove   :INTEGER;
        i           :INTEGER;

        PROCEDURE gettracksectorlist;
        { READ IN dos sector containing t/s list AND transfer its
          contents TO the variable tslist }
        CONST
            offset  = 12;
        VAR
            startindex : INTEGER;
        BEGIN
        loadbuf(tstoblock(listlocation.track,listlocation.sector));
        IF(bottomhalf(listlocation.sector)) THEN adjustbuffer;
        moveleft(buffer[offset],tslist,sizeof(tslist));
        END;

        PROCEDURE transfer (start,index,amt:INTEGER);
        { transfer part OR all OF the buffer contents TO the
          appropriate part OF the high resolution PAGE 1 area }
        BEGIN moveleft(buffer[start],screen.f^[index],amt) END;

        PROCEDURE firstsector;
        { PUT all but the first four bytes on the high resolution
          PAGE 1 area }
        BEGIN transfer(4,0,252); index:=index+252 END;

        PROCEDURE lastsector;
        { PUT the last four bytes on the high resolution PAGE 1 area }
        BEGIN transfer(0,index,4) END;

        PROCEDURE middlesectors;
        { transfer a full sector TO the high resolution PAGE 1 area }
        BEGIN transfer(0,index,256); index:=index+256 END;

    BEGIN {loadpage1}
        index:=0;
        gettracksectorlist;
        FOR i:=1 TO 33 DO
          IF ((tslist[i].track()0)OR(tslist[i].sector()0)) THEN
            BEGIN
            loadbuf(tstoblock(tslist[i].track,tslist[i].sector));
            IF(bottomhalf(tslist[i].sector))THEN
               moveleft(buffer[256],buffer[0],256);
            IF(i=1) THEN firstsector
            ELSE IF(i=33) THEN lastsector
            ELSE middlesector;
            END;
        END;

        FUNCTION checkdevice :BOOLEAN;
        { check device parameter is correct }
        BEGIN checkdevice:=(device IN [4,5,9..12]) END;

    BEGIN {pfdosload}
    pfresult:=0;
    IF(checkdevice=FALSE) THEN abortload(132);
    shiftstring(filename);
    IF(searchcat) THEN loadpage1
    ELSE abortload(132);
    pfdosload:=TRUE;
    END;
```

Listing continued.

Listing continued.

```
FUNCTION pfdelete ((name:pfname):BOOLEAN);
BEGIN
pfresult:=0;
IF(findname(name)<>0) THEN
    pfdelete:=writecat(findname(name),'')
ELSE
    BEGIN
    pfresult:=131;
    pfdelete:=FALSE;
    END;
END;

PROCEDURE pfdisplay;
{ cycle thru all images IN the current FILE IN order }
BEGIN
{ this PROCEDURE has been left as the proverbial exercise FOR
  the reader TO complete. }
END;
```

Listing 3. UTILITY.TEXT unit.

```
                                (5s+)
                        PROGRAM picturefiler;
                        USES (5u pf code) pf;
CONST
        title=
        'Welcome to PICTURE FILER (c) 1983 J. Stephenson -- SELECT FROM MENU';
TYPE
        charset         = SET OF CHAR;
        singledigit     = 0..9;
VAR
        choice          : singledigit;
        endprogram      : BOOLEAN;
        spaces80        : STRING;
        digitset        : charset;

        PROCEDURE clearline(y:INTEGER);
        BEGIN GOTOXY(0,y); WRITE (spaces80); GOTOXY(0,y) END;

        PROCEDURE center (line:INTEGER; s:STRING);
        CONST xmax=79; ymax=23;
        VAR i:INTEGER;
        BEGIN
        IF(line<0)THEN line:=0 ELSE IF(line>ymax)THEN line:=ymax;
        i:=((xmax-length(s))DIV 2)+1;
        IF(i<0)THEN i:=0 ELSE IF(i>(xmax DIV 2))THEN i:=xmax DIV 2;
        clearline(line);
        GOTOXY(i,line);
        WRITE(s);
        END;

        PROCEDURE statusmessage;
        CONST
                timelimit       =2047;
                statusline      =   0;
        VAR
                s               : STRING;
                time            : INTEGER;
        BEGIN
        IF pfresult=0 THEN s:='Operation completed successfully.'
        ELSE IF pfresult=128 THEN s:='Invalid picture file.'
        ELSE IF pfresult=129 THEN s:='Cannot exceed image limit.'
        ELSE IF pfresult=130 THEN s:='Picture file is FULL.'
        ELSE IF pfresult=131 THEN s:='No such picture found.'
        ELSE IF pfresult=132 THEN s:='Unable to load DOS picture.'
        ELSE IF pfresult=133 THEN
         s:='Cannot read/write image to floppy -- possibly no room.'
        ELSE
            BEGIN
            str(pfresult,s);
            s:=concat('Pascal system I/O error #',s);
            END;
        center(statusline,s);
        FOR time:=0 TO timelimit DO BEGIN {pause} END;
        clearline(statusline);
        END;

        PROCEDURE uppercase (VAR ch:CHAR);
        BEGIN
        IF((ch>='a')AND(ch<='z')) THEN ch:=chr(ord(ch)-ord('a')+ord('A'))
        END;
        PROCEDURE shiftstring (VAR s:STRING);
        VAR
                i:INTEGER;
                c:CHAR;
        BEGIN
        i:=0;
        WHILE (i<length(s)) DO
                BEGIN i:=i+1; c:=s[i];uppercase(c); s[i]:=c END;
        END;

        PROCEDURE showmenu;
        CONST
                menutop         = 2;
                menubottom      = 7;
        VAR
                i               : INTEGER;
        BEGIN
        FOR i:=menutop TO menubottom DO clearline(i);
        center(menutop,'MENU');
        GOTOXY(0,menutop+2);WRITE('0- Create new file.');
        GOTOXY(27,menutop+2);WRITE('3- Load picture from disk.');
```

Listing continued.

exiting.

Function pfopen begins by calling the intrinsic RESET, followed by reading the pffile catalog data contained in the first three blocks of the file.

Function writecat returns true if a change in the pffile catalog is successfully written to disk, otherwise false. The image record number and the image name are passed in the parameter list.

Function pfcreate locks a new image file into the Pascal disk directory.

Procedure reportstatus, a subprocedure of function pfcreate, gracefully handles exception conditions that may arise during the creation process. Recall that function pfopen also contained a subprocedure called reportstatus. Name conflict is absent since each reportstatus is hidden from its namesake because they are nested within different functions.

Function pfcreate begins by initializing the signature, size and catalog. It determines if sufficient contiguous disk space is available by writing junk data (whatever happens to be in the high-resolution screen area) to the final blocks in the file. If successful, it then calls the intrinsic CLOSE with the lock parameter to make the file name a permanent entry in the Pascal disk directory. Finally it calls pfopen to get the file ready for storing images.

Function findname returns an integer corresponding to the record number of a named image in the current file. Zero is returned if it cannot be located. Perhaps it was never saved to the file.

Function pfsave returns true if the contents of the high-resolution area is successfully written to the image file, otherwise false.

Function findopenslot, a subfunction of function pfsave, returns a record number available in the current file, otherwise zero, using a simple looping search.

Function pfsave begins by calling function findname to determine if an image corrsponding to the name parameter already exists. If it does, the old image is updated without ceremony (the faint of heart may wish to modify this). True is returned. If it does not, it continues by calling its sub-

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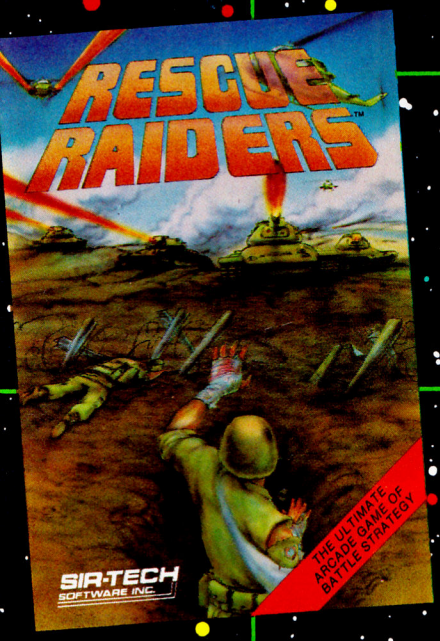

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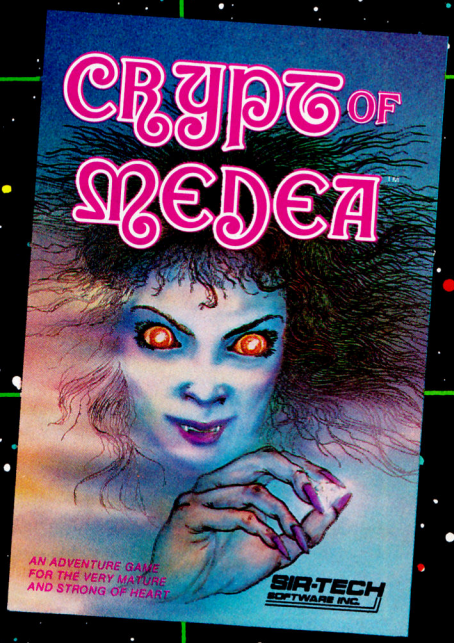

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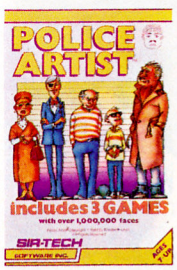

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Listing continued.

```
GOTOXY(54,menutop+2);WRITE('7- View.');
GOTOXY(0,menutop+3);WRITE('1- Open existing file.');
GOTOXY(27,menutop+3);WRITE('4- Load DOS picture.');
GOTOXY(54,menutop+3);WRITE('8- Quit.');
GOTOXY(0,menutop+4);WRITE('2- Save picture to disk.');
GOTOXY(27,menutop+4);WRITE('5- Display all pictures.');
GOTOXY(54,menutop+4);WRITE('9- Close picture file.');
GOTOXY(27,menutop+5);WRITE('6- Delete a picture.');
END;

PROCEDURE showcatalog;
CONST
        cattop          = 10;
        catbottom       = 22;
VAR
        i,j,k           : INTEGER;
BEGIN
FOR i:=cattop TO catbottom DO clearline(i);
center(cattop,'PICTURES IN CURRENT FILE');
FOR i:=1 TO pfcat.info.maxindex DO
        BEGIN
        GOTOXY(((i-1)MOD 3)*27,((i-1) DIV 3)+ cattop+2);
        IF(length(pfcat.info.name[i])(24) THEN
            WRITE(pfcat.info.name[i])
        ELSE WRITE(copy(pfcat.info.name[i],1,24));
        END;
END;
PROCEDURE showtitle;
BEGIN center (0,title) END;

FUNCTION select (ok:charset) : CHAR;
VAR ch:CHAR; c:PACKED ARRAY [0..1] OF CHAR;
BEGIN
REPEAT
    unitclear(2);
    unitread(2,c[0],1,0,0);
    ch:=c[0];

    uppercase(ch);
UNTIL (ch IN ok);
select:=ch;
END;

FUNCTION menuitem: singledigit;
BEGIN menuitem:=ord(select(digitset))-ord('0') END;

PROCEDURE initialize;
{ initialize PROGRAM variables }
BEGIN
endprogram:=FALSE;
digitset:=['0'..'9'];
{$r-}
spaces80[0]:=chr(80);
{$r+}
fillchar(spaces80[1],80,chr(32));
PAGE(output);
showmenu;
END;

PROCEDURE getstring (p:STRING; VAR s:STRING);
BEGIN clearline(0); WRITE(p,' '); READLN(s) END;

PROCEDURE cutto30 (VAR s:STRING);
BEGIN WHILE (length(s))30) DO delete(s,length(s),1) END;

PROCEDURE create;
VAR ch:CHAR; n:STRING;
BEGIN
getstring('NEW FILE NAME:',n);
IF(length(n)(1) THEN EXIT(create);
center(0,'Creating file for a half dozen pictures.');
IF NOT (pfcreate(n, 6)) THEN statusmessage;
END;

PROCEDURE open;
VAR n:STRING;
BEGIN
getstring('NAME OF FILE TO OPEN?',n);
IF(length(n)(1) THEN EXIT(open);
center(0,'Opening file.');
IF NOT(pfopen(n)) THEN statusmessage;
END;

PROCEDURE save;
VAR n:STRING;
BEGIN
getstring('SAVE UNDER WHAT NAME?',n);
IF(length(n)(1) THEN EXIT(save);
cutto30(n);
IF NOT(pfsave(n)) THEN statusmessage;
END;

PROCEDURE view;
VAR wait:CHAR;
BEGIN
center(0,'VIEW NOW ON -- Press (space) to continue');
pfon; wait:=select([chr(32),chr(13)]); pfoff
END;
PROCEDURE load;
VAR n:STRING;
BEGIN
getstring('LOAD WHICH PICTURE?',n);
IF(length(n)(1) THEN EXIT(load);
cutto30(n);
IF NOT(pfload(n)) THEN statusmessage ELSE view;
END;
```

Listing continued.

function findopenslot to seek unused space. If unused space is not available, it returns false. If unused space is available, it calls function diskio to save the contents of the high-resolution page and calls function writecat to update the associated image file catalog, and returns true.

Function pfload returns true if it successfully finds and loads an image corresponding to the name parameter, otherwise false. It is the complement of function pfsave.

Procedure pfon reads from the appropriate bank of soft switches to activate high-resolution page 1 for viewing. The variable m is first treated as an address (in the form m.a) and assigned a specific switch, then treated as a location (in the form m.v.↓) and its contents are read into the variable called throwswitch. The actual quantity assigned to throwswitch is ignored by unit PF (throwswitch is assigned whatever is randomly on the computer's bus). Its only purpose is to instigate activation of the high-resolution screen.

Procedure pfoff is the complement of pfon.

Function pfdosload returns true if a binary high-resolution file is successfully loaded from a DOS 3.3 disk, otherwise false. It is a lengthy implementation with many subprocedures and subfunctions. If space is at a premium and binary high-resolution files on DOS 3.3 disks are irrelevant to a programmer's target applications, this entire section can be replaced by a single line of code to perpetually return false. Hopefully, the programmer will be thoughtful enough to insert notice of this change into the unit initialization section to warn users.

The CONST, TYPE and VAR sections of function pfdosload reflect DOS 3.3 file and disk structure as defined in the DOS 3.3 manual, p. 128ff.

Procedure abortload gracefully records exception codes in the global variable pfresult and cleanly exits pfdosload.

Procedure strip turns the eighth bit of a character to off. DOS maintains characters with this eighth bit on, so this is necessary if comparisons of characters or strings are to work as

Listing continued.

```
        PROCEDURE dos;
        VAR n:STRING; device:INTEGER;
        BEGIN
        getstring
           ('NAME OF DOS BINARY FILE (file must be 33 or 34 sectors)?',n);
        IF(length(n)<1) THEN EXIT(dos);
        center(0,
        'where (A..F)?  A:S6,D1  B:S6,D2  C:S5,D1  D:S5,D2  E:S4,D1  F:S4,D2');
        CASE select(['A'..'F']) OF ( standard appleii configuration is... )
             'A':device:=4;        'B':device:=5;          'C':device:=11;
             'D':device:=12;       'E':device:=9;          'F':device:=10;
             END;
        center(0,'Search for / Loading DOS binary file.');
        IF NOT(pfdosload(device,n)) THEN statusmessage ELSE view;
        END;

        PROCEDURE displayall;
        BEGIN
        center(0,'Displaying all pictures in this file.');
        pfdisplay;
        END;

        PROCEDURE delete;
        VAR n:STRING;
        BEGIN
        getstring('DELETE WHICH PICTURE?',n);
        IF(length(n)<1) THEN EXIT(delete);
        cutto30(n);
        IF NOT(pfdelete(n)) THEN statusmessage;
        END;

        PROCEDURE quit;
        BEGIN endprogram:=TRUE END;

        PROCEDURE CLOSE;
        BEGIN pfclose; statusmessage  END;

        PROCEDURE terminate;
        BEGIN PAGE(output) END;

BEGIN
initialize;
REPEAT
    pfresult:=0;
    showtitle;
    choice:=menuitem;
    CASE choice OF
    0:create;          1:open;            2:save;
    3:load;            4:dos;             5:displayall;
    6:delete;          7:view;            8:quit;



     9:CLOSE;
     END {CASE menuitem};
     IF(choice IN [0,1,2,6,9]) THEN showcatalog;
UNTIL(endprogram);
terminate;
END.
```

desired.

Function tstoblock returns an integer which is the translation of a track and sector number into an absolute Pascal disk block number. The case construct allows the construction of a convenient translation table. The layout of this table was deduced from observations while executing a disk snooper.

Function bottomhalf returns true if the sector number passed in the parameter list is located in the second half of a Pascal disk block. DOS sectors are 256 bytes in size, while Pascal blocks are 512 bytes in size. There are two DOS sectors per Pascal block.

Procedure adjustbuffer shifts a sector represented in the second half of a Pascal block into the first half. It does this with the RAM buffer, not the actual disk block!

Procedure loadbuf reads a Pascal block into the variable space called buffer, which was allocated at the invocation of function pfdosload.

Function searchcat returns true if a DOS 3.3 binary file of appropriate size matches the filename parameter passed to function pfdosload, otherwise false. This entails search and analysis of the DOS catalog track. For structural details, refer to the DOS 3.3 manual. Explanation of function searchcat's subprocedures and subfunctions follows.

Procedure abortload gracefully exits function searchcat if an appropriate DOS binary file cannot be located.

Function checkfilekind returns true if a DOS catalog shows a file as binary, otherwise false.

Function checklength returns true if a DOS catalog shows a file as either 33 or 34 sectors, the proper length of an uncompressed DOS picture file, otherwise false.

Function checklinks returns true if more DOS catalog sectors are available to be read, otherwise false.

Function checkname returns the relative DOS catalog entry number if a name match is found, otherwise zero.

Procedure stripstring, a subfunction of function checkname, makes repeated calls to procedure strip to turn off eight bits that DOS has turned on.

Procedure fattenfilename, a subprocedure of function checkname, right fills the pfdosload parameter filename with blanks so it may be properly compared with DOS filenames.

Function checkname cycles through the information in a single DOS catalog sector searching for a name match.

Function checknotdated returns true if a DOS file is marked as not deleted or false if a DOS file is marked as deleted.

Procedure loadcatsector manages the reorganization of the raw DOS catalog sector byte pattern into the appropriate Pascal variables.

Procedure loadsingleentry, subprocedure of procedure loadcatsector, extracts information about a single DOS catalog entry and places that information into the appropriate variables.

Procedure loadcatsector captures the link to the next DOS catalog sector, then repeatedly calls loadsingleentry for each of the seven possible DOS catalog entries.

Function searchcat calls upon its subprocedures and subfunctions to systematically work its way through an entire DOS catalog track searching for a match. Note the use of the GOTO to jump out of a series of nested IF statements when a match is found. Perhaps this is a legitimate use of the often criticized GOTO control statement.

Procedure loadpage1 transfers the contents of DOS sectors comprising a binary picture directly into the high-resolution page memory. Explanation of loadpage1's subprocedures follows.

Procedure settracksectorlist extracts the relevant part of the DOS track/sector list depositing it into the tslist variable.

Procedure transfer concatenates all or part of the contents of the buffer variable to the high-resolution image.

Procedure firstsector discards the four housekeeping bytes DOS requires for binary files.

Procedure lastsector retrieves the fi-

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nal four bytes of the images, displaced because of the way DOS allocates the first sector.

Procedure middlesector simply concatenates a whole sector of picture information onto the high-resolution page.

Procedure loadpage1 uses the tslist variable as a guide to retrieve DOS sectors and transfer them in correct order to the high-resolution memory.

Function checkdevice returns true if the device parameter passed to function pfdosload is in the correct range, otherwise false.

Function pfdosload prepares the filename parameter by calling procedure shiftstring, instigates a DOS search, which, if successful, triggers a high-resolution memory load.

Function pfdelete returns true if the named image is successfully removed from the pffile catalog, otherwise false. It calls function findname to determine if the image is present. If present, it calls function writecat with a null string to effectively overwrite the image name.

Procedure pfdisplay is left to be completed by the reader. The necessary procedures and functions to implement a cyclical display of the contents of the current image file exist in the unit. All that is required is the correct looping logic. Try it!

The Utility Program

Listing 3 shows the contents of UTILITY.TEXT, a program which activates the routines of Unit PF under keyboard command.

Procedure showmenu straightforwardly displays ten user options.

Procedure showcatalog displays the contents of the Unit PF variable pfcat.

Function select returns a character pressed by the user among a set of legal characters.

Function menuitem returns a single digit based on which number key the user presses.

Procedure initialize sets up certain program variables.

Procedure getstring prompts the user with the message passed in the p parameter and returns the user's string response in the s parameter.

Procedure cutto30 chops off any string characters past 30.

Procedure create through procedure delete simply obtains parameter information from the user and passes it along to the appropriate routine in Unit PF.

Procedure quit and procedure terminate exit the program cleanly.

The utility program loops through menu selection, displaying image file catalog information when appropriate, until the user decides to quit. To transfer an image from one file to another, simply open the first (source) file and load the desired image, or load it from a DOS file. View it if you like, then close the file. Open the second (target) file. Now save the image, which is still undisturbed on the high-resolution page.

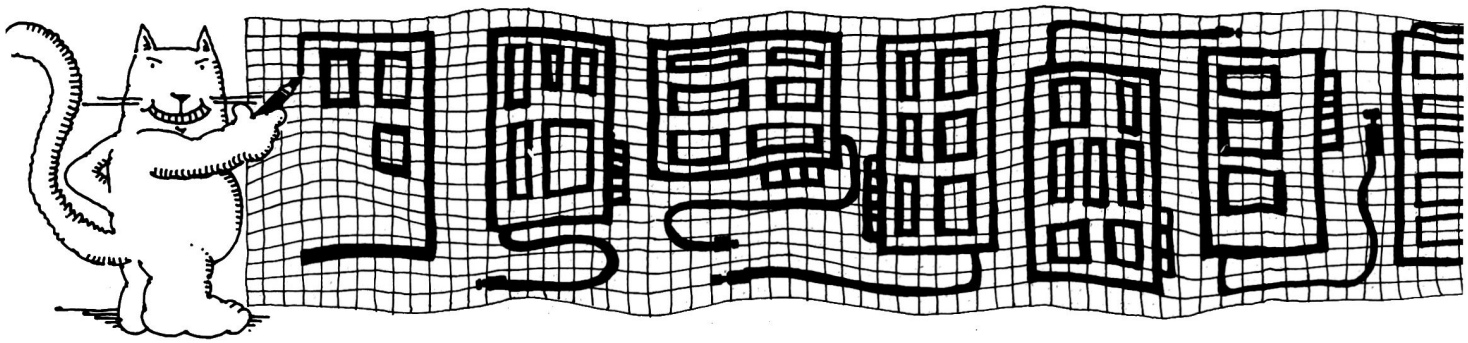
Installing PF

Unit PF has been written as a regular (not intrinsic) unit. This means that it must be linked with the calling program before the calling program can run. Type in the contents of PF.TEXT, IMPLEMENT.TEXT and UTILITY.TEXT. Compile PF.TEXT and UTILITY.TEXT. Summon the linker from the Pascal main command line by pressing L. The linker concatenates the code files generated by the compiler from both UTILITY. TEXT and PF.TEXT into another single code file of the programmer's choice, resolving procedure and function references in the process. Follow the instructions for operating the linker found starting near the bottom of p. 179 in the Apple Pascal 1.1 Operating System Reference Manual. The host file will be UTILITY.CODE.

The utility program is unique in that it makes use of all the functions and procedures available in Unit PF. Normally, an application program will only need to open an image file, load images, switch the hi-res screen on and off, and close the image file when processing is complete. The routines found in UTILITY.TEXT provide excellent examples of how these functions can be performed from user programs.

With the help of Unit PF, Apple Pascal programmers can store and retrieve pictures and charts as easily as text. Enjoy. ■

Circle 215 on Reader Service card.



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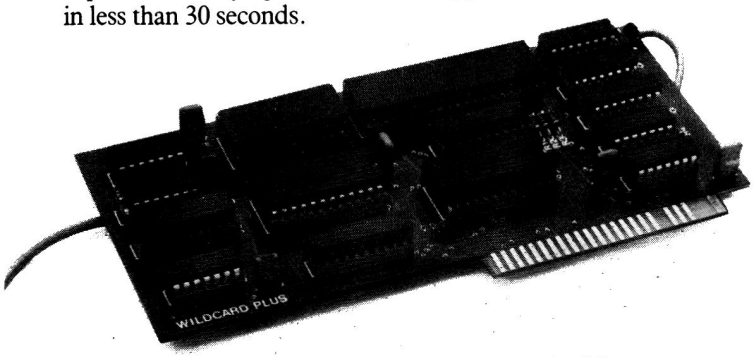

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A Light Touch

A light pen is one of the easiest ways to do graphics, and our reviewer finds the Gibson LPS II really shines.

by James A. Gupton, Jr.

If you were to closely examine a television screen, you would discover that the image is not static like a photograph, but refreshed 60 times each second. The image is composed of 525 horizontal lines, each varying in brightness along its length according to the needs of the total image. The even-numbered and odd-numbered lines alternate, interlacing to produce a complete image 30 times a second. These lines are, in turn, defined by one scanning electron beam. At any one instant, the only light on the screen is a circular dot the thickness of one horizontal line in diameter. It is the visual retention characteristics of the eye that holds the CRT image and "creates" a fully-illuminated screen.

The same image composition of 525 lines also applies to the computer monitor CRT. Thus, knowing the timing frequencies of both vertical and horizontal CRT displays, you can pinpoint a very precise location anywhere in the screen area. It is on this principle that Gibson Laboratories has developed the LPS II graphics light pen.

The LPS II Light Pen System

The Gibson Laboratories LPS II and its accompanying Pentrak software use CRT raster detection to establish the true X-Y coordinates of any position on the screen at which the light pen is pointed. When the scanning electron beam spot passes the position of the light pen, the pen relays a signal to the LPS II's card in the computer and sets up a timing sequence keyed to the electron beam's position.

Since the LPS II is a detector, not a generator, of light, the term "light pen" is actually inappropriate. The pen does not "draw" an image; it locates the coordinates for the Pentrak software to use in generating the artwork.

An initial calibration procedure must be performed to assure correct coordinates for your specific CRT monitor. There are two monitors that the LPS II simply will not work with: the Apple III and the Amdek Anti-glare. This incompatibility is due, in the first instance, to a green phosphor

You can write to the author of this review, James A. Gupton Jr., at 7416-G Pebblestone Drive, Charlotte, NC 28212.

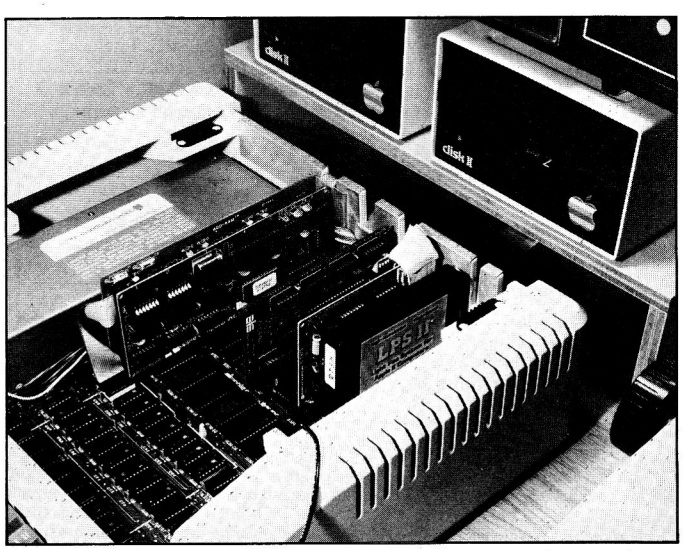

Photo 1. The LPS II card situated in slot 7 of the Apple.

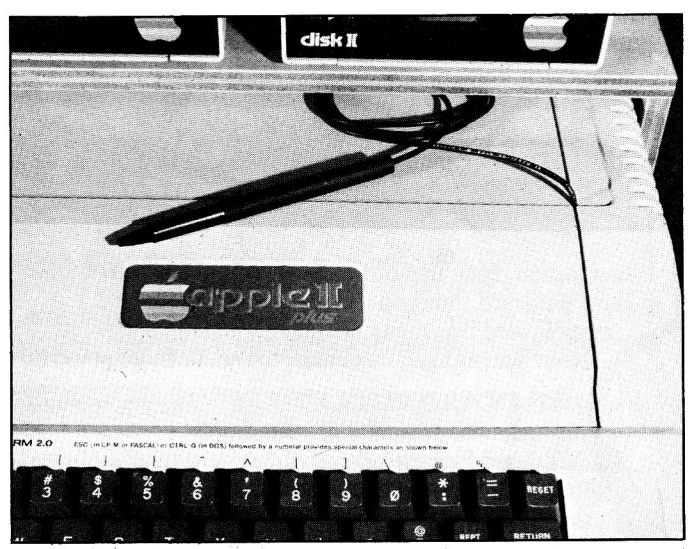

Photo 2. The author's light pen cable arrangement.



Photo 3. A creation of the Sketch program with mirror option.

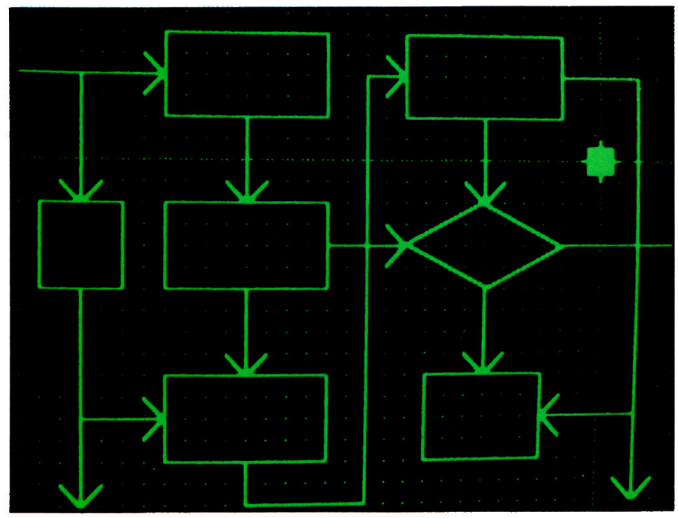

Photo 4. With Grid Draw you create pictures by connecting dots.

screen persistence greater than P4 and, in the second, to the black nylon mesh covering on the face of the CRT. With these two exceptions, the LPS II produces excellent results with all monitors.

Installation

Installation of the LPS II System takes just a few seconds; simply plug the card into the number 7 slot of any Apple II (see Photo 1) and run the light pen's cable under the top cover to exit just above the keyboard. Load the software, and you are ready to experience a new dimension in creative graphics.

You can also bring the cable out of the computer further up on the case, as shown in Photo 2. With more cable length to work with, it's easier to reach all parts of the monitor screen.

In some cases slot 7 may already be occupied. No problem—a simple modification to the LPS II circuit board and a short length of number 30 gauge insulated wire is all that's needed to enable the LPS II to function in any available slot. The instruction book fully details how to make this modification by cutting away a small portion of the exposed printed circuit, soldering the 30 gauge wire to the circuit board, and then running the wire to pin 8 of the 74LS51 chip at location C-13 on the Apple circuit board. Number 30 gauge wire (solid wire) is essential, since it must be inserted into the 74LS51's socket and the 74LS51 replaced. Larger size wire would make replacing the integrated circuit impossible.

Operation

The first item to appear on your monitor, assuming you have correctly installed the card, will be the Applications menu. If you have made an error, the screen will indicate so by stating CANNOT FIND LPS II LIGHT PEN. Recheck to make sure the card is correctly inserted into slot number 7, and run the Pentrak software again.

The Applications menu should now appear on the screen. Point the light pen at the spot to the left of the Calibrate program option. If the screen brightness level is correct, you should hear a beep or two within 2 or 3 seconds, the menu should disappear from the monitor, and Calibrate should appear. If not, no big deal—just turn up the monitor's brightness level and check to see that there are no bright reflections on the screen. Now try it again. See, it works! Proceed with the calibration operation, then run through each program in the menu to sample what is available here for your creative graphics education.

The Programs

Let's take a look at some of the

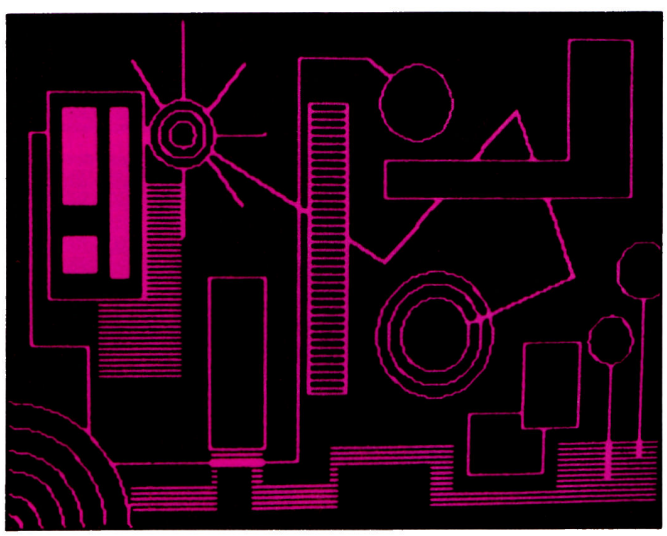

Photo 5. The "geometric" style of Geomed II.

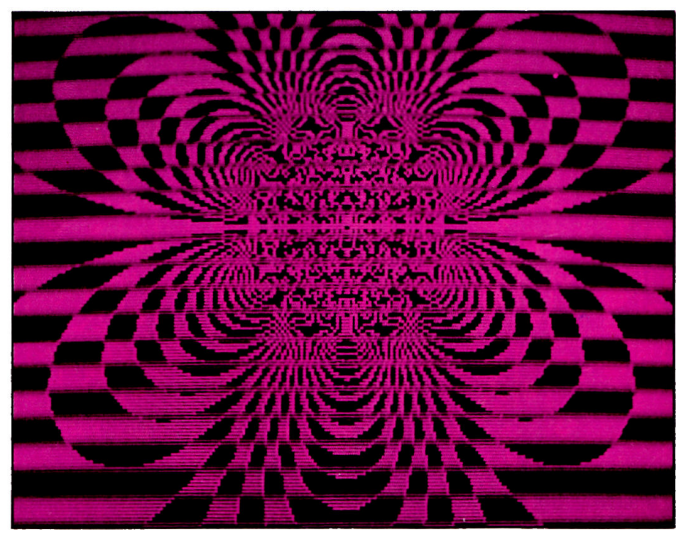

Photo 6. A full-screen animation frame produced by Opart.

"If you also point the light pen at Zoom, the selected frame is enlarged for easier visibility."

designs you can produce with the programs listed in the Applications menu. Photo 3 is a creation of Sketch and its mirror option. Notice that each half of the image is an exact reverse of the other. The image was drawn on the left side and the mirror option automatically drew in the right. There are three mirror options, plus a choice of black on white, white on black and colors for a color monitor.

Photo 4 shows a product of Grid Draw. As with the Sketch program, Grid Draw offers black on white, white on black and color. The monitor displays the dotted-line background and a white square (on the upper right side as the starting location). The white square can be placed at any initial point by pointing the light pen to the square and then moving it to the desired location. To draw, hold the light pen on the square until you hear the beep, then move the square with the light pen to the next point you wish to connect. Again the beep will sound and automatically a line will join the two points.

The Circles program is great for those who love to doodle circles. The program displays a blank screen with X-Y coordinate lines. A small square resides at the location where the vertical and horizontal lines cross. This square, as well as the X-Y lines, moves at the point of the light pen.

Locate the X-Y intersection where you want the center of your circle to be. Then, after the beep, move the black square to the outer edge of the circle. On the next beep the screen will automatically draw a circle to the points you designated. You can fill the entire screen area with circles of all sizes—even circles within circles.

Photo 5 illustrates the "geometric" style of artwork created with Geomed II. If music is your thing, the Music program will enable you to create your own and hear it too. The stanza bars are automatically displayed on the screen and you position the notes with the light pen. Once you have them the way you want, you can load the screen onto disk and save it. With many screens, you can build a composition.

Boxes is similar to Circles, but produces three-dimensional boxes based on the light pen's coordinates. You can type in a legend for each and center it within the box.

Opart offers full-screen animation with the most fantastic designs imaginable. Photo 6 is one "frame" of a constantly changing design produced by this program.

Jumping over Easyedit, we come to Animator, which I find one of the most enjoyable animation programs yet developed. The demonstration program features 20 frames of a stick character happily playing with his yo-yo while a bird flies ahead trying to catch an elusive insect (Photo 7). The animation is performed at a speed of 18 frames per second—just a trifle slower than the standard motion picture speed of 24 frames per second.

Changes to any frame are done by pointing the light pen at the large spot to the left of the desired frame. If you also point the light pen at Zoom, the selected frame is enlarged for easier visibility, as shown in Photo 8. As you make changes in a frame, the character on the line on top of the frame box automatically reflects what you have done.

Lastly we come to Pattern Editor and Penpainter, among the most colorful programs for creative graphics anywhere. You can use the stock patterns, or create your own patterns. Use the light pen to sketch a rough drawing, then, with Easyedit, clean up the drawing and fill in the outlines with patterns in color or just color alone. If you do not like a color or pattern, erase it and fill in with another. The creativity of these three programs alone is more than worth the cost of the LPS II System.

Mere words and black and white photographs do not adequately describe the versatility of the LPS II light pen. You must try it on your own. For additional information contact Gibson Laboratories. They are located at 23192-D Verdugo Drive, Laguna Hills, CA 92653. ■

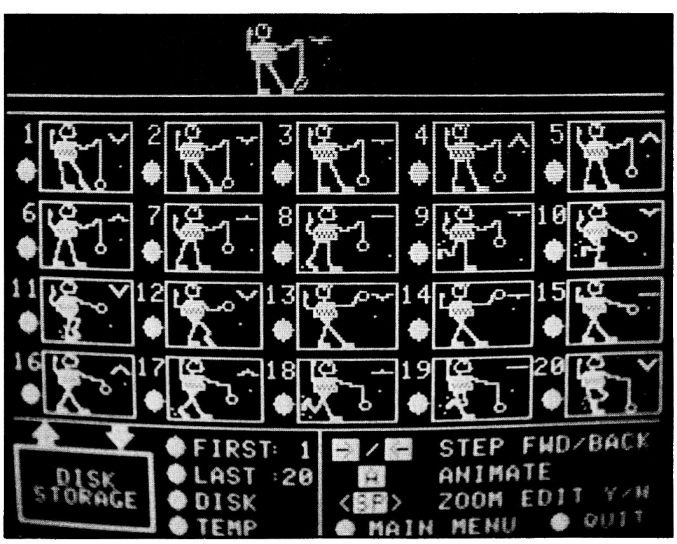

Photo 7. All 20 frames of the Animator demonstration program.

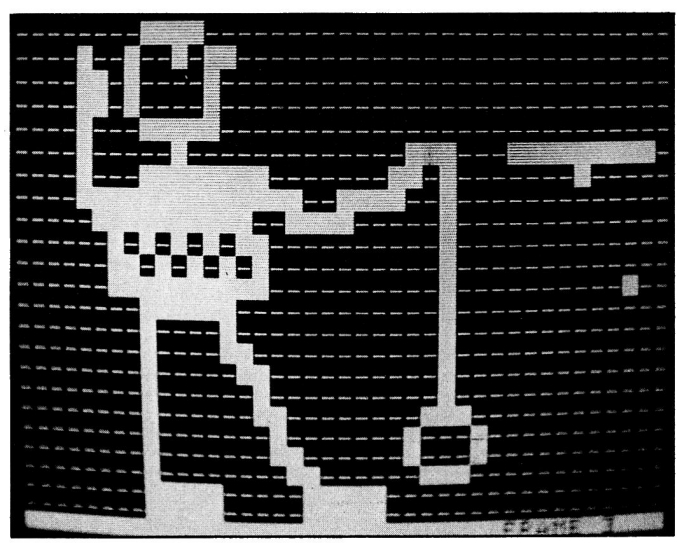

Photo 8. One frame of the Animator demo, "zoomed" for detailed changes.

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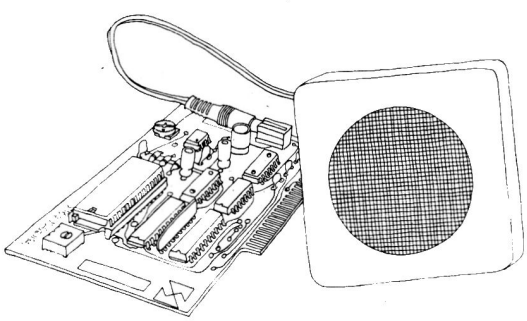
Software Compatibility

Not only can you add speech to the programs you write yourself, over 25 top educational and adventure software manufacturers are currently designing programs to be compatible with the ECHO][. Be watching for details.



Value

Each ECHO comes ready to use with a speaker and tutorial-style manual. The ECHO][, priced at $149.95, also comes with a variety of demonstration and utility programs. The new ECHO GP (General Purpose), priced at $199.95 is a stand-alone unit with its own on-board microprocessor; it will interface with any computer through the serial port. All ECHOs have a one year warranty.

Bells And Whistles

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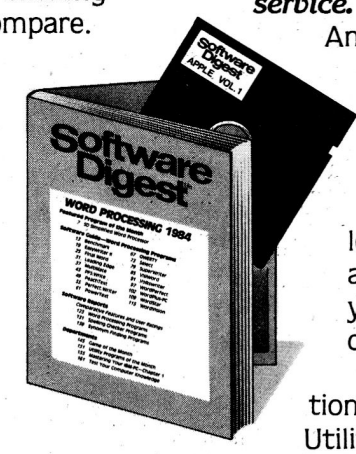

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Circle 290 on Reader Service card.

Educational Software For the Family



by Molly Watt

Much has been said and written about our children spending endless hours watching television, schools neglecting to teach basic skills and parents being too career-oriented to spend time with their children. But quietly, a revolution has taken place in millions of American homes—a revolution centered around the microcomputer.

The Apple may have started out as a business tool for the parent, but as families have become familiar with this powerful tool, its applications have skyrocketed. Soon there may be as much reading, writing and arithmetic at home as in the classroom. Considering other basic skills like developing problem solving strategies, debugging and revising, keyboarding, data entry and computer literacy, the Apple can help each family member acquire the tools needed to function in the high-tech eighties.

Theories of Educational Computing

Robert Taylor of Columbia Teacher's College in New York City cites three distinct philosophies of educational computing. In the first the Apple acts as a tutor, teaching skills using computer aided instruction, drill and practice and other electronic workbook programs. The second category conceives of the Apple as a dumb object to be "taught." Just as parents and teachers learn by teaching, a child who writes a program—whether in Logo, Basic or Pilot—learns much about a computer's capabilities.

The third category sees the Apple as a tool to help you accomplish a specific task, such as word processing, data management or accounting. I add a fourth category—the Apple as a toy. This is the application many educators decry when bemoaning the breakdown of family relationships. Well, enjoying games at home with family members and friends greatly reduces the stress of the workaday world. I changed my attitudes about game playing after learning that my ten-year-old friend, Shawn, made quite a study of game strategies and group cooperation while appearing, on the surface, to be mesmerized by games. Teaching strategy and group cooperation always should be important classroom goals.

Steve Matthias, an elementary school principal in Fort Wayne, Indiana, is the father of three. He began bringing his Apple home on the weekends to "do a little work," but before long his kids joined him at the keyboard. Thirteen-year-old Jody likes writing Basic programs. Ten-year-old Jason likes to play games, and Jamie, who likes drawing, uses Logo to create turtle graphics. They all use Bank Street Writer to prepare homework assignments. The Matthias family is one of thousands who seek stimulating, easy-to-use educational software.

I'm happy to announce a new wave of informal educational software for the home market, and many of these new programs may replace the more traditional computer aided instruction programs in future school purchase orders.

The New Hit Parade

The Learning Company has developed six software packets that are fun to use, teach problem solving, logic, mapping, and encourage creativity. Rocky's Boots is my favorite, an electronic tinkertoy for learning computer

Molly Watt is a former elementary school teacher and administrator. Now she is writing Teaching with Logo, *to be published in 1984 by Addison-Wesley, and she coordinates the Institute in Educational Computing at Keene State College, Keene, NH. You can write to her at Gregg Lake Road, Antrim, NH 03440.*

"The Apple may have started out as a business tool for the parent, but as families have become familiar with this powerful tool, its applications have skyrocketed."

science and logic gates while building video machines. Gertrude's Secrets and Puzzles teach attributes and Venn's diagrams while allowing a user to become a secret master. Bumble Games and Bumble Plot teach graphing and plotting by game playing. Juggle's Rainbow permits a pre-school child to use the computer to map positions and eventually build a rainbow in splendid color.

Xerox Education Publications/ Weekly Reader has released three packets to enable children to learn "readiness" skills. Stickybear Numbers, Stickybear ABC and Stickybear Bop let the child control sophisticated graphics and play with numbers, letters and an animated shooting gallery. Each packet includes a storybook, stickers and a poster.

The Children's Television Workshop and Apple Computer have co-released a series of interactive packets for the family. The programs avoid violence and sexism and assuage any fear a child may have. In the Mix and Match packet, the traditional game of Hangman becomes a new game called Raise the Flags. The user chooses from three lists of words: food, nature or a list of his/her own. Each successfully guessed letter raises a flag. The program displays the entire alphabet at the outset; as letters are guessed they disappear. A bird flies over each letter guessed, and nods "yes" or "no" to indicate if the guess was right or wrong. That's a nice touch. Other packets in this series include Ernie's Quiz, Instant Zoo and Spotlight.

Graphics Potential

New programs for the Apple easily enhance a child's self-expression in graphic art. Delta Drawing, produced by Spinnaker, allows even a four-year-old to draw pictures on the screen and save his/her pictures as a program. Because no programming knowledge is necessary, some teachers use Delta Drawing as the basis of their computer literacy program.

Magic Crayon, another excellent drawing program (produced by C & C Software, Wichita, Kansas), provides the young artist with an electronic crayon and clear instructions. By breaking down a drawing problem into individual procedures, the child develops fundamental programming skills.

If you enjoy a good mystery story or adventure game, watch for Tom Snyder's programs produced by Spinnaker. Snooper Troops contains interactive mystery stories in which the users drive around town investigating crimes. Debating and record keeping play key roles in unraveling the mysteries. In Search of the Most Amazing Thing follows a similar format; the users must locate an object in space. Figuring out how to drive the B-liner search vehicle—a cross between a dune buggy and a hot air balloon—posed a mammoth problem for me.

Disk Magazines

A notable event indeed for home enthusiasts is the advent of two computer disk magazines. Microzine, produced by Scholastic Wizware, offered four programs on its first disk. I had fun with the Haunted House mystery adventure story, and enjoyed an interview with Robert MacNaughton (star of the film "E.T.").

Window, produced by Window, Inc. of Watertown, Massachusetts, is more challenging than Microzine. Issue number 3 included an editorial on Logo music, methods to decipher codes and to calculate your favorite baseball team's statistics, software reviews and a Logo column.

The software I've described can provide hours of interactive pleasure. Each program showcases the computer's capabilities, is easy to use and clearly presented. Yet these programs represent only the tip of the iceberg. Watch for these and forthcoming software packages that are both educational and fun! ■

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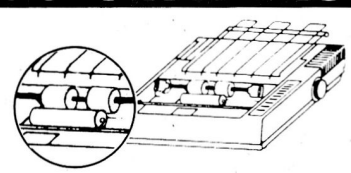

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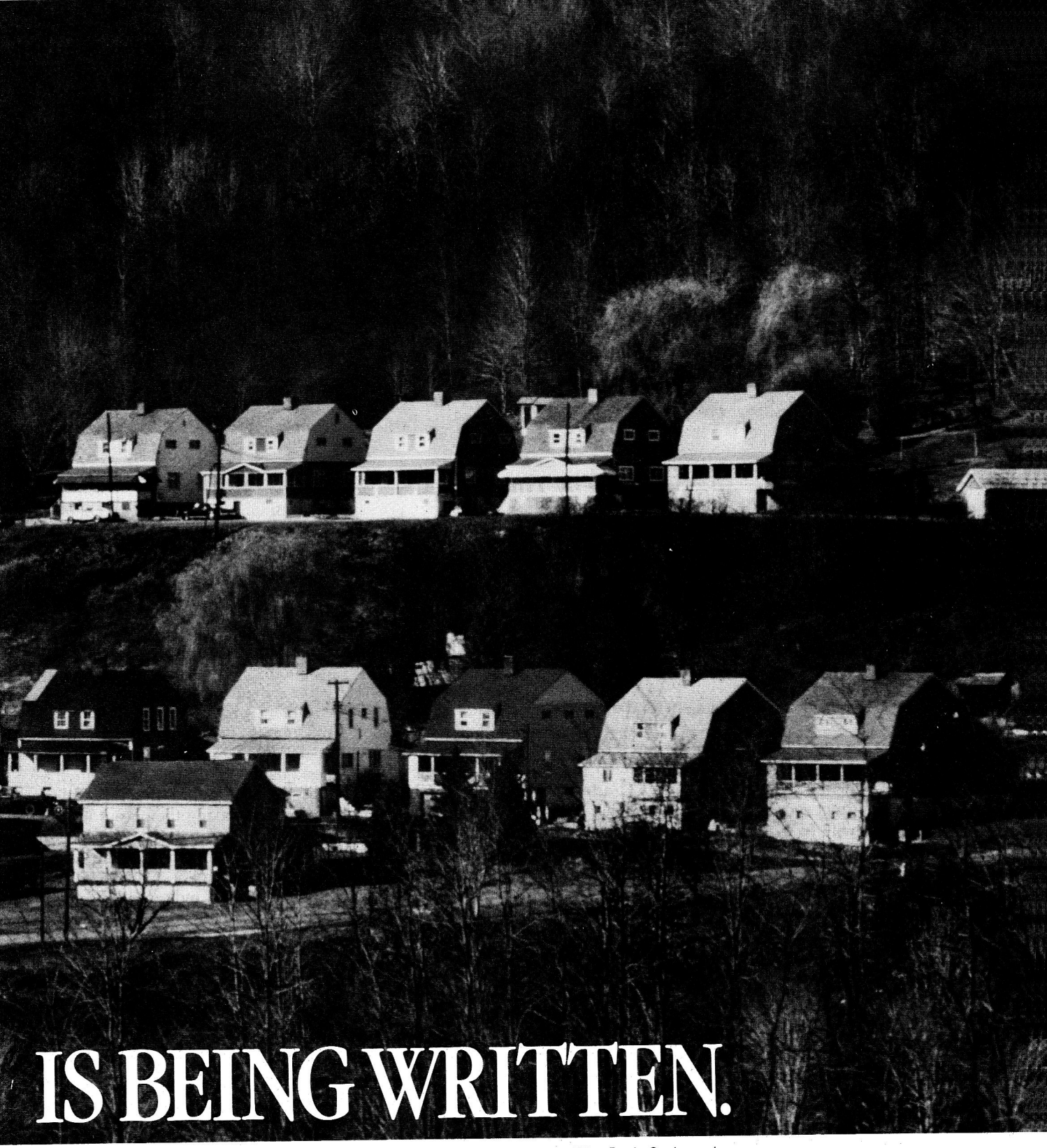

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Modulating

Here's how to buy or build that all-important RF modulator for your TV-turned-monitor.

by Tim Daniel

Choosing an Apple is only the first step in getting a start in computing. You'll find that there are plenty of other decisions to make: what kind of software to buy, whether you need one disk drive or two, what kind of monitor is best, and so forth. If your choice for a monitor is a TV set, then you face yet another decision: What kind of radio frequency (RF) modulator to buy.

Modulators are like miniature transmitters. They take your Apple's video output, a baseband signal, and convert it into a radio frequency signal that your television will recognize. Occasionally you may hear about a "friend of a friend" who forgot that a modulator was needed, hooked the Apple directly to a TV and found that it worked! It makes for a nice story, but if you try the same thing you're likely to be disappointed. With only one exception, it is safe to assume that you'll need some sort of modulator. (The exception is if you own a TV that has a separate input for baseband composite video signals. A few higher priced TV sets, like Panasonic's CT1320V 13-inch color model, include this.)

Modulators come in various forms and the one that your local computer store sells may not always be the best buy. But first look around home; you may already have a modulator. Video cassette recorders and many component video units are designed to take a composite video signal input and output RF, or you might be able to cannibalize a modulator from a defunct video game.

Another alternative is to build your own as described later in the article. Building instead of buying may save a few dollars and you'll gain some "I did it myself" satisfaction.

The Ready-Made Approach

Ready-made modulators come in two varieties. One puts out a signal on a VHF TV channel, the other works on a UHF channel. My experience doesn't find one type superior to the other, unless you have a TV set that is missing or has a poor UHF tuner. Whatever type you choose, make sure that the unit is FCC approved (it's required by law) and that it is designed to accept your Apple's NTSC composite video output.

As the price of a modulator goes up, features are added like a choice of output channels, built-in power supply, antenna switching and a provision for audio. Are these features worth the extra money? That depends. Frequency selection can be helpful if you want to avoid sharing a channel with a very strong broadcast signal. Built-in antenna switching is sometimes worthwhile if your set is used for more than computing.

A power supply will appeal to anyone who has owned a battery-powered modulator. On the other hand, the Apple's on-board video connector provides +12 volt and −5 volt connections for just that purpose. The audio option allows you to replace or supplement your Apple's built-in speaker. It means connecting the modulator to another part of your Apple (assuming it is compatible).

Installation Precautions

No matter what type of modulator you settle on, be sure that it is installed correctly. This means that when the modulator is driving the TV set the antenna *must* be disconnected. Remember, the modulator is a like a transmitter and, if you leave your antenna connected, a signal will be radiated. Your signal might make enemies of your neighbors, particularly if you're on a cable system.

Other problems associated with modulators include lack of brightness or downright weak signal. The brightness quandary can usually be cured by adjusting the appropriate control on your set, tweaking the output level on the modulator (if it is adjustable), or by changing the setting of the Apple's video level control.

Weak signals, indicated by snow or instability, can usually be traced to a poor connection between the modulator and TV, or a worn-out battery. By using a plug-in power supply and the proper type of cable between the modulator and set, this problem should disappear.

A third problem occurs when a set thinks it is displaying color, even though the Apple is outputting black and white. All but the earliest Apple IIs have color-killer circuitry, but some TVs still see color even when it is not there. The solution: Turn down the color level on the set when viewing text or black and white graphics.

If your TV picture goes into spasms every time the computer accesses a disk drive, then you're suffering from television interference (TVI). The computer and its related hardware unin-

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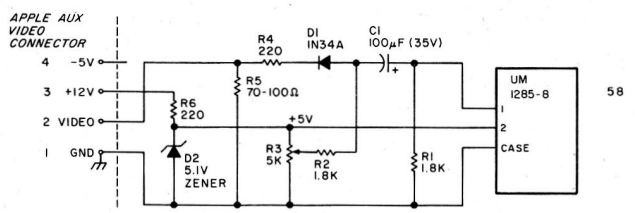

Figure. *Slightly modified, the schematic that accompanies the UM 1285-8 works well for interfacing the modulator with an Apple.*

tentionally generate radio frequency signals. Even though these signals may not be on a designated TV channel, they still may overload your TV set, resulting in the jitters or a herring-bone pattern.

Eliminating TVI is almost impossible, but you greatly reduce it by keeping the disk drives away from the set and using shielded cable between the modulator and TV. In some cases you can alleviate TVI by putting the modulator at the TV antenna terminals rather than by the computer.

The Home-Made Approach

Building your own modulator is a straightforward project—one that you should be able to complete in an evening with time left over to play your favorite computer game. The parts you need are as close as the nearest Radio Shack store and the only tools necessary are a soldering iron, a pair of

	Item	Radio Shack Number
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R4,R6	220 ohm resistor	271-1313
R5	70 to 100 ohm resistor (put three 220 ohm resistors in parallel)	271-1313
C1	100 uF, 35V electrolytic capacitor	271-1028
D1	1N34A germanium diode	276-1123
D2	5.1 volt zener diode	276-565
UM 1285-8 RF modulator		277-221
perforated board		276-1392
8-pin wire wrap socket		276-1988
hookup wire		

Table. *Parts list for the modulator project. Refer to the Figure.*

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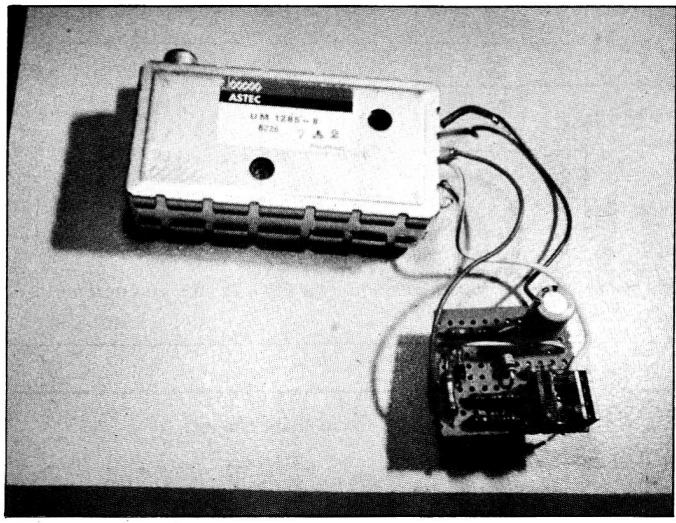

Photo 1. The metal-encased UM 1285-8 modulator and the 1 inch by 1 inch perforated board interface circuit are connected by three pieces of hookup wire. All components, except the trim pot, are located on one side of the board.

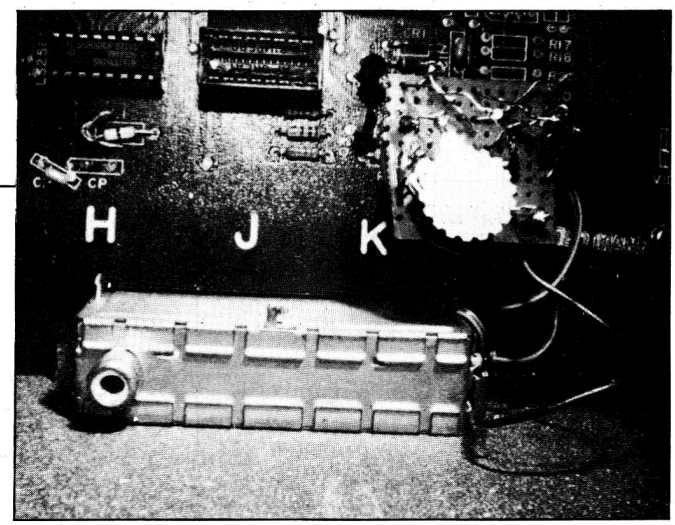

Photo 2. The eight-pin wire wrap socket makes an ideal mate for the Apple auxiliary connector. By putting the trim pot on the connection side of the interface board it is easily accessible. The modulator shown here is installed in a Franklin Ace 100. Installation in an Apple is almost identical.

pliers and some wire cutters. The secret to this project is that you really don't build a modulator from scratch. Instead, you concentrate your efforts on a simple interface circuit, just enough to make Radio Shack's UM 1285-8 module work with your Apple. The circuit described in the UM 1285-8 instruction sheet works as well as any, and all you really need is the video section, shown in the Figure.

Photo 1 shows the modulator before installation. The UM 1285-8 comes in a metal case and the interface circuit can be wired on a 1 inch by 1 inch piece of perforated board. The board plugs directly into the Apple's auxiliary video jack, located in the right rear of the machine. An eight-pin wire wrap socket, with four of the pins cut off, mates with the Apple connector. The UM 1285-8 works on either channel 3 or 4. For channel 3 ground the fourth lead.

The only thing special about the construction of the interface is the placement of the level control. By locating it on the bottom side of the board, it will be accessible when installed in your Apple, as shown in Photo 2. Leave enough wire between the interface board and the UM 1285-8 so the latter can be tucked out of the way in a corner of the computer.

The modulator gets its power from the Apple, so all you need to worry about is the cable between the TV and computer. Once all the pieces are in place, power up the computer and adjust the interface level control and the TV controls for the best picture. If you see anything, check to make sure the modulator is getting the proper voltage. There should be 5 volts on lead two. Another possible problem could be the incorrect installation of C1 or D1. Both are polarized components.

A complete parts list is shown in the table. If you have a well-stocked "junk box," about the only part you'll need to buy is the UM 1285-8, priced at $9.95. Even if you buy all the parts new, the total cost should be under $20, with some parts left over for your next project. ■

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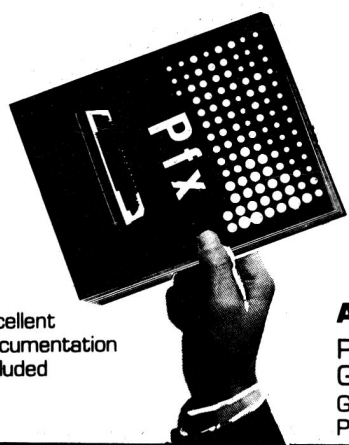

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Circle 295 on Reader Service card.

Converting CP/M Files to DOS

Try as they might, Apple users couldn't transfer CP/M files to DOS 3.3—until now. Learn how the other half lives with this invaluable utility.

by Raul Baragiola

In recent articles, R. Walker (Reference 1) and J. Matthews (Reference 2) have shown the means to transfer files between the formats of two operating systems for the Apple computer: the standard DOS 3.3 and the Pascal operating system. These file transfer programs are advantageous when, for instance, one wants to use the editor present in the Pascal system as an efficient way to edit Basic programs.

With the adaptation of Z-80 processor cards and the CP/M operating system to the Apple, the ability to transfer files becomes even more important. A program (APDOS) is included in the CP/M package to transfer text files from the DOS format to the CP/M format. One can then take a program written in Applesoft, put it into a text file, and transfer it to a CP/M disk. The program can then be run, after a (hopefully) small number of changes, in the more powerful Basics (MBasic and GBasic) supplied with the CP/M system.

There is no program in the CP/M package, however, for the inverse purpose—namely, the transfer of files from CP/M to DOS disks. Such a program would be useful not only to transfer Basic programs, but also other text files that can be easily edited on one of the excellent word processors available for CP/M systems (like WordStar, used to edit this article).

I present here a program to transfer data between CP/M and DOS disks. See Listing 1. This program was made possible by information I gathered while laboriously peeking into a CP/M disk to recover an accidentally-erased file. I will start by describing the format of the directory (catalog) on CP/M disks, since it is not given in the CP/M handbook. Then I will present a menu-driven program to read the file information in the directory, list a file to the screen, or transfer it to a DOS 3.3 text file.

1 extent	=	16 blocks (clusters)
1 Kbyte block	=	8 records
1 record	=	128 bytes

Table 1. CP/M file data units.

Block Position in Track (BP)	Starting Sector (SN)	Sector Sequence
1	0	0-6-C-3
2	9	9-F-E-5
3	B	B-2-8-7
4	D	D-4-A-1

Table 2. Block sector allocations in CP/M files.

Address correspondence to Raul A. Baragiola, Centro Atomico Bariloche, 8400 Bariloche, Argentina. Dr. Baragiola is a physicist with the Argentine Atomic Energy Commission and teaches experimental physics at the university level.

Disk Formats

The standard 5.25-inch floppy for the Apple II is formatted using double-density encoding, with in-

Byte	Name	Description
0	ET	Entry type—0 for active file, E5H (hexadecimal) for deleted file.
1–8	FN	File name—uppercase ASCII characters padded with trailing ASCII blanks (20H). High bit is zero.
9–11	FT	File type or extension—uppercase ASCII characters padded with trailing blanks. The high bit of these bytes is normally zero, but can be set to 1 with the STAT.COM program. If the high bit of byte 9 is 1, the file can only be read (R/O); if the high bit of byte 10 is 1, the file is a "system file" and therefore will not be listed by the DIR command.
12	EX	File extent—number of the 16K logical extent for this entry.
13–14		Set to zero.
15	RC	Record count—number of records in extent EX.
16–31		Disk allocation map—contains the list of logical block numbers where the extent EX of the file is stored in the disk. It is padded with trailing zeros.

Table 3. CP/M directory entry codes.

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Accounts Payable **1.** Daily Voucher Report **2.** Daily Credit Report **3.** Checks with Detailed stubs **4.** Check Register **5.** General Ledger Transfer Report **6.** Cash Requirements Report **7.** Transaction Register **8.** Open Voucher Report **9.** Aged Payables Report **10.** Detailed Vendor Activity Report **11.** Summary Vendor Account Report

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Listing 1.
CP/M to DOS file transfer program.

```
100  REM    CPM>AP,  VERSION 4

110  REM  - PROGRAM TO READ DATA FROM CPM DISK AND TRANSFER IT TO DOS 3.3

200  REM
INITIALIZE

210 RTS = 776:GIOB = 768:OUT = 825:MT = 15872: HIMEM: MT
220 D$ =  CHR$ (4):G$ =  CHR$ (7):BS$ =  CHR$ (8):S$ = " "
230  REM   SET DEFAULT SOURCE SLOT (6) & DRIVE (2)
240 SS = 6:SD = 2:SL% = SS:DR% = SD
250  PRINT D$;"BLOAD CPMSUBR.OBJ0"
300  REM
LIST OF SECTORS (POSITION, PAGE OF BLOCK)

310 M%(0,0) = 0:M%(0,1) = 6:M%(0,2) = 12:M%(0,3) = 3
320 M%(1,0) = 9:M%(1,1) = 15:M%(1,2) = 14:M%(1,3) = 5
330 M%(2,0) = 11:M%(2,1) = 2:M%(2,2) = 8:M%(2,3) = 7
340 M%(3,0) = 13:M%(3,1) = 4:M%(3,2) = 10:M%(3,3) = 1
350  REM   FILENAME N$, EXTENT X, RECORD COUNT R, BLOCK MAP B$
360  DIM N$(64),X(64),R(64),B$(64)
400  REM
- - - -    M E N U    - - - -

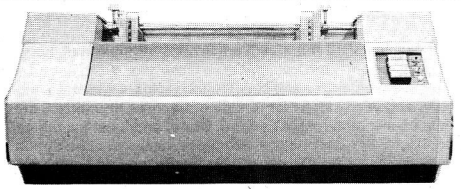
405  GOSUB 3240: PRINT : PRINT "O P T I O N S"
410  VTAB 4: HTAB 1
415  PRINT "< D > DIRECTORY": PRINT
420  PRINT "< R > RESET SLOT & DRIVE": PRINT
425  PRINT "< B > BLOCKMAP OF CP/M FILE": PRINT
430  PRINT "< L > LIST CP/M FILE": PRINT
435  PRINT "< C > COPY CP/M FILE": PRINT
440  PRINT "< Q > QUIT
445 T$ = "PRESS KEY FOR OPTION CHOSEN" + G$: GOSUB 3220: GET OPT$
450  IF OPT$ = "D" GOTO 500
455  IF OPT$ = "R" GOTO 600
460  IF OPT$ = "B" GOTO 700
465  IF OPT$ = "L" GOTO 800
470  IF OPT$ = "C" GOTO 800
```

Listing continued.

terleaved data and synchronization bits (References 3 and 4). The extraction of data from the magnetic patterns on the disk is performed by standard DOS 3.3, Pascal OS (POS) and CP/M in the same manner (and differently from older operating systems, like DOS 3.2). Changes in the way data and clock bits are encoded form one of the bases for the most successful software protection schemes.

As a result of the encoding, DOS 3.3, POS and CP/M divide each track of the disk into 16 sectors, each 256 bytes long; each track holds, therefore, 4096 bytes. For standard 5.25-inch disks with 35 tracks, the total amount of information that can be stored is 16 × 4096 bytes = 143360 bytes. You should read References 3 and 4 if you want more details on the separation of clock and data bits.

Circle 283 on Reader Service card.



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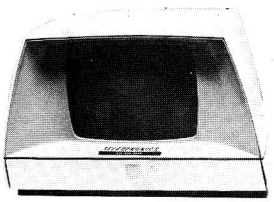

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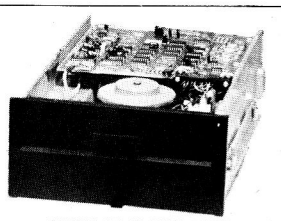

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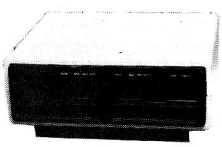

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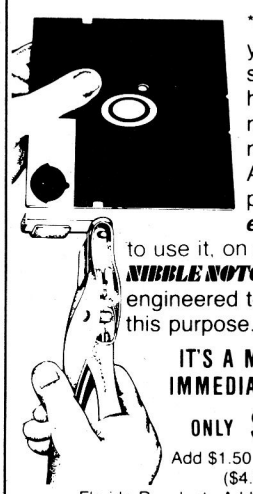

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Listing continued.

```
475  IF OPT$ = "Q" THEN  GOSUB 3240: END
480  I$ = "??": GOSUB 3220: FOR I = 1 TO 300: NEXT : GOTO 445
500  REM
```

DIRECTORY

```
503  REM      PRINT DIRECTORY IF ALREADY READ
506 PD = 1:  IF DI = (10 * SS + SD) THEN  GOTO 557
509  REM      GET DIRECTORY IF FIRST TIME
512 T$ = "READING DIRECTORY": GOSUB 3220
515 BU% = MT
518  FOR BLOCK = 0 TO 1: GOSUB 3020: NEXT BLOCK
521 S = 32:EN = BU% - S
524 N = 0: REM  FILE INDEX
527  FOR I = MT TO EN STEP S
530  IF  PEEK (I) <   > 0 THEN 551
533 N = N + 1:N$(N) = ""
536  FOR J = 1 TO 11:N$(N) = N$(N) +  CHR$ ( PEEK (I + J)): NEXT J
539  PRINT ".";
542 X(N) =  PEEK (I + 12):R(N) =  PEEK (I + 15)
545 B = 1 + R(N) / 8.01:B$(N) = ""
548  FOR J = 1 TO B:B$(N) = B$(N) +  STR$ ( PEEK (I + J + 15)) + S$: NEXT
     J
551  NEXT I
554 DI = 10 * SS + SD: REM   FLAG THAT DIRECTORY WAS READ
557  REM
```

PRINT DIRECTORY IF CALLED BY <D> COMMAND

```
560  IF PD = 0 THEN  RETURN
563  GOSUB 3240:KB = 0
566  PRINT "NAME          EX REC"
569  FOR I = 1 TO N
572  PRINT  LEFT$ (N$(I),8)" " RIGHT$ (N$(I),3)"  "X(I); SPC( 4 -  LEN ( STR$
     (R(I)));R(I)
575 KB = KB +  INT (R(I) / 8)
578  NEXT
581  PRINT : PRINT N;" FILES IN ";KB;" KBYTES  - ";126 - KB;" KBYTES FREE
     "
584  PRINT : PRINT "PRESS ANY KEY TO CONTINUE";
587  GET IN$:PD = 0: GOTO 405: REM   RESET PRINT DIRECTORY FLAG: BACK TO
     MENU
600  REM
```

RESET SLOT AND DRIVE

```
605  GOSUB 3240
610  VTAB 8: HTAB 1
615  PRINT "SOURCE SLOT: ";SS;: GET IN$
620 I =  VAL (IN$)
625  IF I = 0 THEN 640
630  IF I < 0 OR I > 7 THEN  PRINT : GOTO 610
635 SS = I: PRINT BS$;SS
640  PRINT : VTAB 10: HTAB 1
645  PRINT "SOURCE DRIVE: ";SD;: GET IN$
650 I =  VAL (IN$)
655  IF I = 0 THEN 670
660  IF I < 1 OR I > 2 THEN 640
665 SD = I: PRINT BS$;SD
670 SL% = SS:DR% = SD
675 DI = 0: REM    RESET DIRECTORY READ FLAG
680  GOTO 500: REM   READ DIRECTORY
700  REM
```

BLOCK MAP

```
705  REM    PRINTS BLOCK MAP OF A FILE IN CPM DISC IN DRIVE 2 - SLOT 6
710  IF DI <   > (10 * SS + SD) THEN  GOSUB 509: REM        GET DIRECTORY
715 T$ = "ENTER FILENAME: ": GOSUB 3220
720  INPUT "";SF$: IF SF$ = "" THEN 715
725  REM   FIND FILE NAME
730  GOSUB 1205: IF DE =  - 1 THEN 405
735 T$ = "BLOCK MAP OF FILE " + SF$ + " :  ": GOSUB 3220
740  PRINT B$(DE)
745  PRINT : PRINT "ANOTHER FILE (Y/N)?";
750  GET IN$: IF IN$ = "Y" THEN 715
755  GOTO 405
800  REM
```

COPY FILES

```
803  GOSUB 3240
806  VTAB 3: PRINT "*** CONVERT CP/M FILE TO TEXT ***"
809  IF OPT$ = "L" THEN 848
812  VTAB 12: HTAB 1: REM    **** DESTINATION SLOT - DS ****
815  PRINT "DESTINATION SLOT:  6";: GET IN$
818 DS =  VAL (IN$)
821  IF DS = 0 THEN DS = 6
824  IF DS < 1 OR DS > 7 THEN 812
827  PRINT BS$;DS
830  VTAB 14: HTAB 1: REM    **** DESTINATION DRIVE - DD ****
833  PRINT "DESTINATION DRIVE: 1";: GET IN$
836 DD =  VAL (IN$)
839  IF DD = 0 THEN DD = 1
842  IF DD < 1 OR DD > 2 THEN  PRINT : GOTO 830
845  PRINT BS$;DD
848  VTAB 15: GOSUB 3260: PRINT : REM   **** SOURCE FILE - SF ****
851  INPUT "SOURCE FILE: ";SF$: IF SF$ = "" THEN 405
854  IF OPT$ = "L" THEN 866
```

Listing c...

Among other things, the three operating systems differ in the way they assign disk space to hold the files, the directory, and the routines of the operating system. They also differ in the way they organize the information existing in each track.

CP/M maps the physical tracks and sectors in the software units shown in Table 1. Since there is a delay between reading a sector and readiness to read another, the operating systems do not read the sectors sequentially. In CP/M, each track can hold four blocks; the sectors for each block are allocated according to the sequence in Table 2.

Use of Space on the Disk

The first three tracks (0–2) of the disks are used by CP/M to hold the operating system (bootstrap, device handlers, utilities). This information is recorded by the COPY-S command.

Disk blocks start in track 3. The relationship between the block number (BN), track number (TN) and starting sector number (SN) is:

TN = 3 + INT(BN/4)
BP = MOD(BN,4)

and SN(BP) from Table 2. (The function MOD(A,B) gives the rest of the division of A by B.)

After subtracting the three tracks occupied by CP/M, there are left 32 tracks, or 128 1K-blocks, in a standard 35-track 5.25-inch disk. Blocks 0 and 1 (in track 3) hold the directory of the disk files. The remaining 126 blocks can be used to store files.

Structure of CP/M Directory Entries

For the purpose of the directory, each file is divided into segments called logical extents, of 16 Kbytes or 128 records in length. There is one directory entry for each extent. Each directory entry is 32 bytes long, coded as shown in Table 3.

The directory entry forms the first 32 bytes of the file control block (Reference 5, Interface Guide), except for byte 0 which is replaced by the code for the disk drive (0—default drive, 1—drive A:, 2—drive B:, ... 16—drive P:).

Since each of the two 1024-byte directory blocks can hold at most 32

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Listing continued.

```
857  VTAB 18: HTAB 1: REM   **** DESTINATION FILE - DF ****
860  INPUT "DESTINATION FILE: ";DF$
863  IF DF$ = "" THEN DF$ = SF$: VTAB 18: PRINT "DESTINATION FILE: ";DF$
866 T$ = "PRESS <RETURN> TO PROCEED; <ESC> TO END": GOSUB 3220
869  GET IN$: IF IN$ =  CHR$ (27) GOTO 405
872  IF IN$ <  > CHR$ (13) THEN 866
875  IF SD = DD THEN T$ = "INSERT THE SOURCE (CP/M) DISK - PRESS <RETURN>
     ": GOSUB 3220: INPUT "";IN$
878  IF DI <  > (10 * SS + SD) THEN  GOSUB 509: REM   GET DIRECTORY
881  FOR SX = 0 TO 6: REM     LOOP THROUGH FILE EXTENTS
884  REM  GET FILE NUMBER, IF NOT THERE, REASK FILE NAME
887  GOSUB 1205: IF DE = - 1 AND SX = 0 THEN 848
890  IF SS = DD AND SX > 0 THEN 1040: REM   ONLY 1 EXTENT IF ONLY 1 DRIVE
      PRESENT
893  IF DE > 0 THEN 905
896  IF OPT$ = "C" THEN 1040
899  GOTO 1045
900  REM

READ SOURCE

905  IF SX = 0 THEN T$ = "READING FILE": GOSUB 3220
910 BU% = MT
915 NL = 1: REM  GET BLOCK NUMBER FROM BLOCK MAP STRING B$
920  FOR I = 1 TO 1 + (R(DE) / 8.001)
925 A$ = "":BLOCK = 0
930  FOR L = NL TO  LEN (B$(DE))
935 T$ =  MID$ (B$(DE),L,1): IF T$ = " " THEN 950
940 A$ = A$ + T$
945  NEXT L
950 V =  LEN (A$)
955  FOR J = 0 TO V - 1
960 BLOCK = BLOCK + 10 ^ J *  VAL ( MID$ (A$,V - J,1)): NEXT J
965  GOSUB 3020: REM  READ BLOCK
970 NL = L + 1
975  NEXT I
980  IF SX > 0 THEN  PRINT : GOTO 1030
985  IF SD = DD THEN T$ = "INSERT DESTINATION (APPLE DOS) DISK - PRESS <R
     ETURN>": GOSUB 3220: INPUT "";IN$
990  IF OPT$ = "L" GOTO 1110
1000  REM

WRITE DESTINATION FILE

1005 T$ = "WRITING...": GOSUB 3220: PRINT
1010  PRINT D$;"OPEN ";DF$;",D";DD
1015  PRINT D$;"DELETE ";DF$
1020  PRINT D$;"OPEN ";DF$;",D";DD
1025  PRINT D$;"WRITE ";DF$
1030  CALL OUT
1035  NEXT SX
1040  PRINT : PRINT D$;"CLOSE ";DF$
1045 T$ = "DONE" + G$ + " - ANOTHER FILE (Y/N)": GOSUB 3220
1050  GET IN$: IF IN$ = "Y" THEN 848
1055  GOTO 405
1100  REM

LIST FILE

1110  GOSUB 3240: CALL OUT: NEXT SX: GOTO 1045
1200  REM

FIND FILE NAME

1205  REM       INPUT SOURCE FILE SF$, EXTENSION SX
1210  REM       OUTPUT DIRECTORY ENTRY DE OR ERROR ( DE = -1 )
1215  REM  TAKE OUT POINT, ADD SPACES
1220 NA$ = ""
1225  FOR I = 1 TO  LEN (SF$)
1230 A$ =  MID$ (SF$,I,1)
1235  IF A$ = "." AND I < 9 THEN  FOR J = 1 TO 9 - I:NA$ = NA$ + S$: NEXT
     J
1240  IF A$ <  > "." THEN NA$ = NA$ + A$
1245  NEXT I
1250 L =  LEN (NA$)
1255  IF L < 11 THEN  FOR J = 1 TO 11 - L:NA$ = NA$ + S$: NEXT J
1260  FOR I = 1 TO N
1265  IF N$(I) = NA$ AND X(I) = SX THEN DE = I: RETURN
1270  NEXT I
1275  IF SX > 0 THEN 1290
1280 T$ = "FILE NOT FOUND: PRESS <RETURN>" + G$: GOSUB 3220
1285  INPUT "";IN$
1290 DE =  - 1: RETURN
3000  REM

SUBROUTINES

3010  REM   *** READ A BLOCK ***
3020 TR% = 3 +  INT (BLOCK / 4)
3030 PT% = 4 * (3 + BLOCK / 4 - TR%): REM    PT%=MOD(BLOCK+12,4)
3040  CALL GIOB:IOB = 256 *  PEEK (73) +  PEEK (72)
3050  POKE IOB + 1,SL% * 16: POKE IOB + 2,DR%
3060  FOR IP = 0 TO 3
3070  POKE IOB + 4,TR%: POKE IOB + 5,M%(PT%,IP)
3080 BH% =  INT (BU% / 256):BL% = BU% - 256 * BH%
3090  POKE IOB + 8,BL%: POKE IOB + 9,BH%
3100  CALL RTS
3110 ER% =  PEEK (IOB + 13): IF ER% <  > 0 THEN 3160
3120  IF BU% > 32512 THEN  RETURN
3130 BU% = BU% + 256
```

Listing continued.

directory entries, the number of files that can be stored on a 5.25-inch Apple CP/M 2.0 disk is limited to 64 (versus 105 in Apple DOS and 77 in the Pascal operating system).

Program Description

The program presents a menu to the user, who then makes a choice by pressing a single key. The choices are the following:

- <D> Directory—displays the directory of the CP/M disk. Files are listed in their order of appearance in the CP/M directory, and once for each extent. The output is the program name, its length in records, and the used and free space on the disk. After the directory is read, a flag is set to so indicate. In this way you can output the directory without reading it again from the disk. If you change the disk, then you must reset the slot and drive (option R) to read the new directory.
- <R> Reset Slot and Drive— The initial (default) value is slot 6, drive 2. You should use this option if you want other values, or after changing disks.
- <B> Block map—displays the list of blocks (the block map) used by a given file. This information is useful if you want to see whether the file is stored in contiguous blocks and thus optimized for speed in disk access, or if it is fragmented over different parts of the disk. In the latter case you will find it convenient to make a copy of the relevant files onto an empty disk; this procedure will store the files in contiguous blocks.
- <L> List—lists the CP/M file chosen on the Apple screen. The program was made more general by writing it so you can choose from the normal 40-column video screen or

"The program presents a menu to the user, who then makes a choice by pressing a single key."

Listing continued.

```
3140  NEXT IP: RETURN
3150  REM   *** SIGNAL ERROR ***
3160  IF ER% = 16 THEN T$ = "WRITE ERROR"
3170  IF ER% = 64 THEN T$ = "DRIVE ERROR"
3180  IF ER% = 128 THEN T$ = "READ ERROR"
3190  GOSUB 3220: REM  PRINT ERROR MESSAGE
3200  POP : PRINT  CHR$ (7): FOR I = 1 TO 1000: NEXT : GOTO 405
3210  REM   PRINT MESSAGE
3220  VTAB 20: PRINT  CHR$ (13) + T$;: GOTO 3260
3230  REM   *** CLEAR APPLE & VIDEOTERM TEXT SCREENS ***
3240  PRINT  CHR$ (12): HOME : RETURN
3250  REM   *** CLEAR TO END OF SCREEN ***
3260  PRINT  CHR$ (11);: CALL  - 958: RETURN
60000 :
60010  REM    ********************************
60020  REM    **                              **
60030  REM    **   BY   RAUL A. BARAGIOLA     **
60040  REM    **  CENTRO ATOMICO BARILOCHE    **
60050  REM    **  8400 BARILOCHE, ARGENTINA   **
60060  REM    **      DATE 23-APR-1983        **
60070  REM    **                              **
60080  REM    ********************************
60090  REM
END
```

from an 80-column Videx Videoterm board. To adapt the program to another terminal, which does not use the same control characters as the Videoterm, you need only modify subroutines 3240 (clear screen and home cursor), and 3260 (clear from cursor to end of screen).

- <C> Copy—copies the CP/M file chosen to a DOS 3.3 text file. You can choose the name of the output file or retain the input CP/M file name by pressing return. Only characters with ASCII code larger than 31 and carriage return (ASCII 13) are output. This can be easily changed by the user (see below).
- <Q> Quit—clears the screen and stops the program.

Assembly Language Subroutines

In this program you will find two classic examples of the need to use assembly language. One is for input/output by interfacing to routines in the operating system. The other is to speed up a program segment that would take an unacceptably long time to execute in Basic. A description of the subroutines appears in Table 4.

Find these subroutines in Listing 2. You can enter the object code from the monitor and then save the routines with:

BSAVE CPMSUBR.OBJ0, A$0300, L$66

Hex	Decimal	Label	Description
0300	768	GIOB	Gets the address of the input/output control block and stores it in two zero-page locations for use by the RWTS subroutine in DOS (Reference 6) and the "read-a-block" subroutine (3020) in the main program.
0308	776	REATS	Reads a sector of the disk into a buffer. The slot, drive, track and sector number, and the address of the buffer are stored in the input/output control block by the "read-a-block" subroutine (3020) in the main program.
032F	815	OUT	Uses the monitor COUT routine (Reference 7) to write into the output device the contents of the 16K memory buffer ($3E00–$7DFF). The output is terminated when an end-of-file character (ASCII $1A or control-Z) is found. The high bit of each byte is set before output to indicate a normal character to DOS. Only characters with ASCII code larger or equal to $20 (ASCII space), and $0D (ASCII carriage return) are output. This can suppress formatting information present in a file written with a word processor like WordStar. If you want to output all bytes, just enter $01 in location $033D. (Byte 0 should not be written to a text file since it means end-of-file to DOS.)

Table 4. Description of assembly routines in Listing 2.

Final Remarks

The transfer program has been written with the user in mind. The information needed for operation is written on the screen, and input errors are trapped. When displaying a large directory or listing a file, you can normally freeze the screen by typing control-S and then any key to

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```
SOURCE FILE: CPMSUBR
0000:             1 *********************************
0000:             2 **                             **
0000:             3 **       CPM>DOS ASSEMBLY      **
0000:             4 **                             **
0000:             5 **          SUBROUTINES        **
0000:             6 **                             **
0000:             7 **       RAUL A. BARAGIOLA     **
0000:             8 **                             **
0000:             9 **   CENTRO ATOMICO BARILOCHE  **
0000:            10 **                             **
0000:            11 **        8400 BARILOCHE       **
0000:            12 **          ARGENTINA          **
0000:            13 **                             **
0000:            14 **            1982             **
0000:            15 **                             **
0000:            16 *********************************
0000:            17 *
0000:            18 * EQUATES
0000:            19 *
0000:            20 * INPUT/OUTPUT CONTROL BLOCK
0000:            21 *
0001:            22 IBSLOT  EQU  $01        ;SLOT NO.
0002:            23 IBDRVN  EQU  $02        ;DRIVE NO.
0003:            24 IBVOL   EQU  $03        ;VOLUME NO. 0=WILDCARD
000C:            25 IBCMD   EQU  $0C        ;COMMAND 0=NULL 1=READ 2=WRITE 4=FMT
000D:            26 IBSTAT  EQU  $0D        ;ERROR CODE
000F:            27 IOBPSN  EQU  $0F        ;PREVIOUS SLOT NO.
0010:            28 IOBPDN  EQU  $10        ;PREVIOUS DRIVE NO.
0000:            29 *
0000:            30 * ITS ADDRESS
0000:            31 *
0048:            32 IOB     EQU  $48
0049:            33 IOBH    EQU  $49
0000:            34 *
0000:            35 * DOS ENTRY-POINTS
0000:            36 *
03D9:            37 RWTS    EQU  $03D9      ;READ/WRITE TRACK SECTORR
03E3:            38 GETIOB  EQU  $03E3      ;GET I/O CONTROL BLOCK
0000:            39 *
----- NEXT OBJECT FILE NAME IS CPMSUBR.OBJ0
0300:            40         ORG  $0300
0300:            41 ************************************************************
0300:            42 * SUBROUTINE TO GET AND SAVE ADDRESS OF I/O CONTROL BLOCK *
0300:            43 ************************************************************
0300:20 E3 03    44 GIOB    JSR  GETIOB     ;GET ADDRESS OF I/O BLOCK
0303:84 48       45         STY  IOB
0305:85 49       46         STA  IOBH
0307:60          47         RTS
0308:            48 ***************************************
0308:            49 * SUBROUTINE TO READ SECTOR FROM DISK  *
0308:            50 ***************************************
0308:A0 03       51 READTS  LDY  #IBVOL
030A:A9 00       52         LDA  #00        ;SET FOR ANY VOLUME
030C:91 48       53         STA  (IOB),Y
030E:A0 0C       54         LDY  #IBCMD
0310:A9 01       55         LDA  #01        ;READ COMMAND
0312:91 48       56         STA  (IOB),Y
0314:20 E3 03    57         JSR  GETIOB
0317:20 D9 03    58         JSR  RWTS
031A:            59 *
031A:            60 * DONE, CHECK FOR ERROR,
031A:            61 * UPDATE SLOT AND DRIVE
031A:            62 * AND CLEAR IOB ADDRESS
031A:            63 *
031A:A0 0D       64         LDY  #IBSTAT
031C:B1 48       65         LDA  (IOB),Y
031E:B0 04       66         BCS  ERROR      ;ERROR IF CARRY SET
0320:A9 00       67         LDA  #00
0322:91 48       68         STA  (IOB),Y    ;0 IF NO ERROR
0324:A0 01       69 ERROR   LDY  #IBSLOT
0326:B1 48       70         LDA  (IOB),Y
0328:A0 0F       71         LDY  #IOBPSN
032A:91 48       72         STA  (IOB),Y
032C:A0 02       73         LDY  #IBDRVN
032E:B1 48       74         LDA  (IOB),Y
0330:A0 10       75         LDY  #IOBPDN
0332:91 48       76         STA  (IOB),Y
0334:A9 00       77         LDA  #00
0336:85 48       78         STA  IOB
0338:60          79         RTS
0339:            80 *********************************
0339:            81 * SUBROUTINE TO DUMP CHARACHTERS *
0339:            82 * IN MEMORY TO OUTPUT CHANNEL    *
0339:            83 *********************************
FDED:            84 COUT    EQU  $FDED
0339:AD 00 3E    85 OUT     LDA  $3E00      ;BUFFER FROM $3E00 TO $7DFF
033C:C9 1A       86         CMP  #$1A       ;IS IT EOF (CNTL/Z)?
033E:F0 1C       87         BEQ  END        ;IF YES, END
0340:C9 0D       88         CMP  #$0D       ;NO, IS IT CR ?
0342:F0 04       89         BEQ  PRINT      ;IF YES, PRINT
0344:C9 20       90         CMP  #$20       ;?ASCII
0346:90 05       91         BCC  NEXT       ;NO,SKIP
0348:09 80       92 PRINT   ORA  #$80       ;SET HIGH BIT
034A:20 ED FD    93         JSR  COUT       ;OUTPUT CHARACTER
034D:EE 3A 03    94 NEXT    INC  OUT+1      ;INCREMENT ADDRESS
0350:D0 E7       95         BNE  OUT
0352:EE 3B 03    96         INC  OUT+2
0355:AD 3B 03    97         LDA  OUT+2
0358:C9 7E       98         CMP  #$7E       ;DON'T GO TOO FAR
035A:30 DD       99         BMI  OUT        ;OUTPUT NEXT CHARACTER
035C:A9 3E      100 END     LDA  #$3E       ;RESET BUFFER ADDRESS
035E:8D 3B 03   101         STA  OUT+2
0361:A9 00      102         LDA  #00
0363:8D 3A 03   103         STA  OUT+1
0366:60         104         RTS
*** SUCCESSFUL ASSEMBLY: NO ERRORS
```

Listing 2.
Assembly language subroutines to accompany Listing 1.

continue output.

When the program prompts you for the source file name, you can type return to go back to the menu. Then, after the file name is given, the program will read the directory only if it has not done so before.

The programs have a lot of comments to give you sufficient information to modify them to suit your needs. For instance, you may wish to include an option to output to a printer, or increase the number of extents that can be transferred with a single-drive system, or accept all ASCII codes from a CP/M text file and translate control characters, used to format printing, to suit your particular printer.

The information and methods given here can also help you develop other useful programs—for instance, to form a master catalog of CP/M disks or to recover deleted files. For the latter purpose you can easily use the assembly language routines to write to disk by doing POKE IOB + 10,2. This makes the RWTS subroutine in DOS write a sector to disk. ■

"The programs have a lot of comments to give you sufficient information to modify them to suit your needs."

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Apple EPROM Emulator

This inexpensive hardware project will save you time and aggravation when you do your next dedicated controller project.

by Douglas Ortman

There must be some of the old KIM-1 alumni out there who occasionally get the urge to go back to the hardware tinkering days and build something from scratch. Computer technology has progressed at an incredible pace since those KIMs were released, and today's Apple offers us a whole new world of computing. The software and hardware manufacturers who support Apple have added much to its capability. But for this Apple user, all that capability does not take away the delight of "getting back to basics" and building some hardware. Maybe you have some applications that would be better suited for a small dedicated controller computer, freeing your Apple for the bigger tasks.

Building a dedicated controller is not a difficult task. Many small but powerful boards are on the market for just that purpose. One of the simplest is sold by John Bell Engineering. It contains a 6502 microprocessor, a 6522 VIA for I/O, 1K of RAM and an EPROM socket, along with the other components necessary to run it. That's about as simple as you can get for a small price. Bell even offers the PC board separately, so if your budget is really strained you can put together the hardware for your controller very inexpensively.

However, the next phase of development of your controller, writing and debugging the software, could have a few bumps in store for you. One of the most dreaded tasks, for me at least, is the seemingly endless loop of burning an EPROM for that controller, trying it out, making changes when it crashes, and erasing it only to try again and again.

Here's a solution to that dreaded loop—an Apple peripheral for use as a development system for your controller. It lets you write the target software in the 2K block of memory space at $C800–CFFF of Apple's memory map. This space is reserved for dedicated routines in PROM for use by peripheral cards, but your Apple doesn't care if you use it for RAM. You even get a bonus 2K RAM when you add this board to your system.

Figure 1 shows the block diagram of the board, which can be built on a prototyping card compatible with the Apple bus. The heart of the board is the 2K RAM. The data lines connect to Apple's bus through a bidirectional bus transceiver and to the target system's data bus through gates and the emulate socket. The emulate socket makes the board appear to the target system like a 2716 EPROM; a 24-pin DIP jumper cable accomplishes this. The bus transceiver is enabled when the 2K block at $C800 is addressed by Apple. Direction is determined by Apple's R/W line.

The RAM is addressed from one of two places, as determined by the three data selector gates. Through the mode switch, you select whether the RAM is addressed by the master system (Apple) or the target, via the emulate socket.

Circuit Details

The Apple data bus is buffered into the board through U4 (See Figure 2), an octal transceiver—74LS245. The chip select, $\overline{CS}$, is derived from the $\overline{I/O\ STROBE}$ line, pin 20 on the Apple peripheral bus. Apple has conveniently provided this line as a strobe for any address within the 2K block of $C800–CFFF. Data direction through U4 is determined by a modified R/W signal from Apple. R/W is gated with the derived 02 clock in U10 to give the $\overline{DIR}$ signal for U4.

Since Apple does some tricky manipulation with 6502 clock signals to achieve its unique display technique, the 02 clock does not exist on the peripheral bus. Their 00 clock does not quite conform to what MOS Technology had in mind. The *Apple Reference Manual* says it is the same, but the 00 clock is slightly different from 02. Several articles detail this problem with

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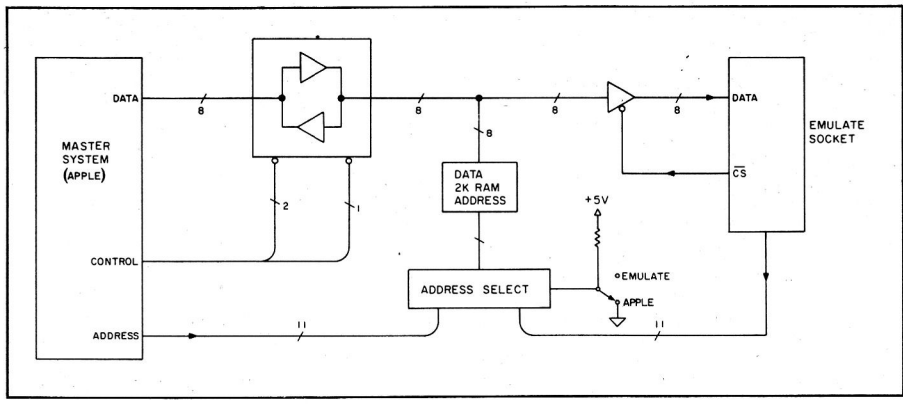

Figure 1.
Apple EPROM emulator board.

respect to interfacing 6500 family peripheral chips to Apple (see Bibliography).

The circuit using U11 merely delays the rising edge of 00 by roughly 140 ns to allow a little more time for the address lines to become stable before the rising edge of 02. The resultant signal is nearly an accurate 02. In tests, the board worked without the U11 circuit. Since you won't be dealing with any 6500-family peripherals on this board that require the accurate 02 clock, you may be able to use the 00 clock directly into the gate at U10, pin 5. However, for reliability I recommend that you include the delay circuit.

On the board side of the data bus transceiver, the bus is wired to the four 2114L RAM chips, U5–U8, and to the emulate socket through U12–74LS244. U12 is a non-inverting buffer, enabled

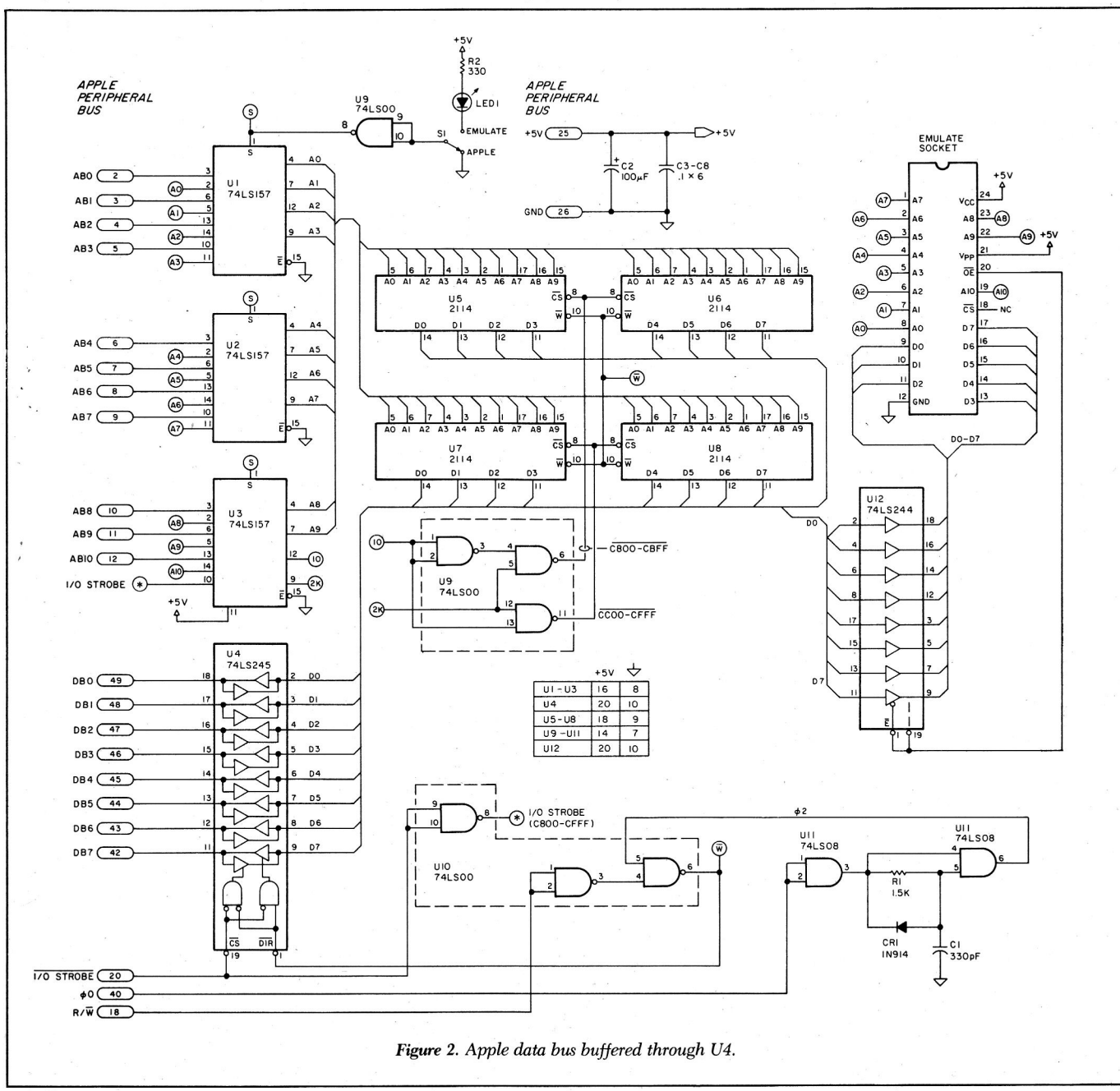

Figure 2. Apple data bus buffered through U4.

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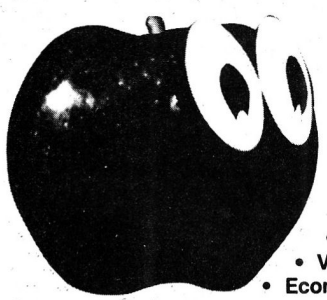

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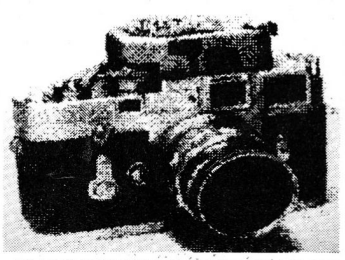

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Figure 3.
Parts list.

U1–U3	74LS157
U4	74LS245
U5–U8	2114L 1K × 4 static RAM
U9–U10	74LS00
U11	74LS08
U12	74LS244
C1	330 pF ceramic disk
C2	100 mfd electrolytic/16V
C3–C8	0.1 mfd ceramic disk
R1	330 ohm, ¼W
R2	1.5k ohm, ¼W
CR1	1N4148 or 1N914
LED1	any small red LED
S1	miniature toggle switch, SPDT
MISC	Apple prototyping card, Vector 4609 or equiv.
	IC sockets
	wire

by the $\overline{OE}$ of the target system when the target's microprocessor addresses the EPROM socket on its board. When that occurs, the RAM data appears to the target like an EPROM.

The chip selects for the RAM chips are derived by gating the 2K select ($\overline{I/O\ STROBE}$) with A10 to provide a separate 1K select for each pair of 2114s ($C800–CBFF/U5–U6 and $CC00–CFFF/U7–U8).

RAM address lines are selected by U1–U3 data selectors 74LS157. The data selectors are toggled by a switch, S1, which determines whether Apple's address lines or the target system's address lines connect to RAM.

The RAM R/W input is handled exclusively by Apple, since the target system needs to read data only from RAM.

Construction

Assembly of the emulator board is pretty straightforward. Just follow the schematic in Figure 2, checking off each connection as you hook it up. Those yellow or green highlighting pens work well for keeping track of what you have done.

The parts (see Figure 3) are all readily available from the hobby suppliers whose ads appear throughout this magazine, or from original equipment manufacturers. You could substitute two Intel 8216 chips for U4 but you'd need to make some obvious pin changes. To conserve power for other peripherals, do not substitute 7400 series for the LS. Likewise, be sure you get L version 2114 RAM chips. C3–C8 are 0.1 mfd ceramic disk type for power bypassing. They should be spread around on the board by putting one between every other IC package. C2 is a tantalum or aluminum electrolytic. C1 can be a ceramic disk or silver mica. S1 can be any type of small switch; a miniature toggle type is a good choice.

Operation

When you have the board all wired up, check it over once more for obvious shorts or wiring errors, then insert the ICs in their respective sockets. Be sure to align pin 1 properly on each IC. Plug the board into any blank peripheral slot. *Never plug in or remove peripheral boards with power on!*

Another note of caution here—some of your system's other peripheral cards may contain an EPROM using the same $C800–CFFF address space. To avoid memory conflicts, remove those boards before using the emulator. The Apple disk controller is no problem. It has an on-board ROM for booting DOS, but it resides below $C800, dependent on the slot. Some printer interface cards utilize the $C800 block, so be careful.

Now turn on your Apple and it should function normally. Boot up your assembler or go into the monitor and with the mode switch, S1, in the master position, you should be able to write to, then read from any address in $C800–CFFF. If all is well there, enter your target system software in that block. Your assembler should be able to deal with the address differences between $C800 and the actual address of the EPROM socket on the target system.

In the case of the JBE board I mentioned earlier, that 2K block is $F800–FFFF to accommodate the 6502 reset, IRQ, and NMI vectors, which reside at the top of the memory map. Some assemblers may not be able to assemble the object code directly at $C800 so as not to potentially overwrite DOS. In that case, have your assembler place the object code safely down in Apple RAM and use the monitor block move (M) function to transfer the code just before you are ready to try it out.

When you are ready to test your program on the target controller, be certain that it does reside between $C800–CFFF in Apple and the RST vector at $CFFC–CFFD ($FFFC–FFFD to the target system) points to the start of your program. Switch the emulator board mode switch to emulate position, reset the target's microprocessor, and start debugging. If you need to make some changes, just switch back to Apple, make the changes with the monitor, and try again. Once the target software meets your requirements, program a 2716 EPROM for the target and it will be ready to stand alone.

This EPROM emulator board, along with an EPROM programmer, can turn your Apple into a powerful development system for assembly or machine language programs. It should save you a great deal of time in getting your dedicated controller projects up and running by eliminating the need to burn a new EPROM every time you need to make a change in the code. ■

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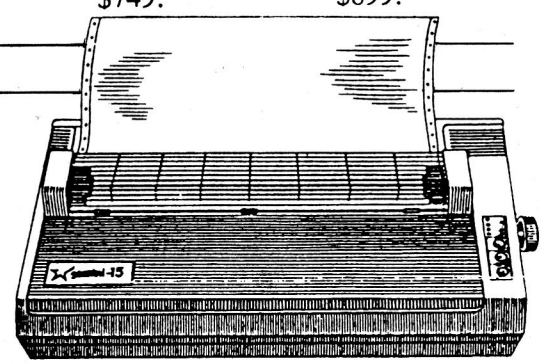

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Yours is really a two-part problem: (1) to select the right equipment; and (2) to find a reputable dealer (mail order or otherwise).

The best no-risk way to evaluate a product is to talk a friend who already has one into bringing it over to see how it works. If that isn't possible, try writing to the product's manufacturer. Make a comparative feature list; it's often the features products lack that are crucial to your particular applications. When you've narrowed it down to a few products, call the manufacturers and ask them specific questions. If their answers sound "fishy," rephrase them to be sure you heard them properly.

To find a reputable dealer, ask fellow computer owners for the names of companies they have dealt with. You, as a consumer, generally have a choice of full service versus lower prices. Sometimes you get lucky enough to find both, or at least a good balance. Make sure you understand what the dealer will and won't do in case you experience any problems.

If you live in an unusually isolated area with no nearby computer owners to answer your questions, help is on the way! Once you have your modem, you will be just a simple modem call or electronic message away from a whole country of people who may have experienced the same problems.

I need help in accessing WordStar files in a CP/M system using an Apple with a Micromodem II, so that I'll end up with Apple text files. Any suggestions?

Modems are the great equalizer—we all look the same over the phone. Don't worry about incompatible disk formats or different operating systems. First of all, you'll need a modem and software for the CP/M system that can send the WordStar files you want over the phone line. And you'll need a terminal program on the Apple that can "capture" what's coming in over the phone line and save it to disk.

Besides letting you exchange files with otherwise incompatible microcomputer systems, the modem also lets you send ASCII files to specially equipped typesetting services to save them the trouble and you the expense of re-keyboarding the same data. Special typesetting commands either can be inserted by you beforehand or can be added by the typographer to the raw ASCII file after they receive it.

These two types of file transfers require both computers to be on-line at the same time. Through electronic mail or store-and-forward message systems, you may send moderate size documents when convenient for you, and the recipient may receive it at a time convenient to him/her.

Do I need a special program to operate a modem?

Depending on the modem, you may not *need* a program to operate it, but it'll help you get a lot more out of it. Most modems let you use the Apple as a "dumb" terminal, that is, operating it directly from the keyboard without any software. Table 1 shows how easy it is to use just the built-in "terminal mode" of the Hayes Micromodem II.

A good terminal program lets you "capture" (or save) material scrolling past your screen in a buffer, so you can later edit it, save it to disk or send it to your printer. You will hear this often referred to as "downloading." A terminal program should also let you "upload" (or send a previously created text file) to the distant computer.

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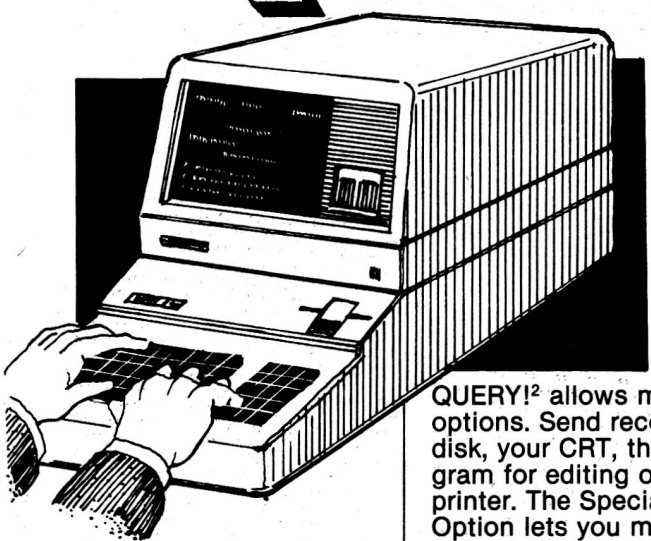

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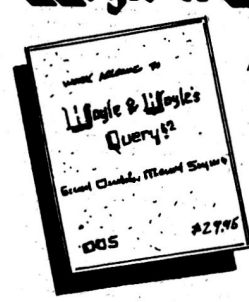

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```
Making your first call with your modem is actually quite simple:

    ] IN#3                              (or your modem's slot #)

    ] CTRL-A                            (gets modem's attention)

    MICROMODEM II:?                          (modem's response)

      CTRL-F                          (puts modem into full duplex
                                       and into its terminal mode)

    MICROMODEM II:BEGIN TERM                 (modem's response)

      CTRL-A                            (gets modem's attention)

    MICROMODEM II:?                          (modem's response)

      CTRL-Q                           (starts modem dialing)

    MICROMODEM II:DIALING:                   (modem's response)

    1-213-516-9432  (and a RETURN)      (or whatever number
                                         you want to call)

    MICROMODEM II:AWAIT CARR.                (modem's response)

    MICROMODEM II:CONN.                      (modem's response)

    WELCOME TO SYSTEM XYZ                        (greeting from
    PLEASE LOG ON:                               "host" system)
    >
                          .
                          .
                          .
                  (proceed with your call)
                          .
                          .
                          .

When you're all done with your call:

      CTRL-A                            (gets modem's attention)

    MICROMODEM II:?                          (modem's response)

      CTRL-Z                                    (hang up phone)

    MICROMODEM II:HUNG UP                    (modem's response)
```

Table 1.
A typical session using the built-in "terminal mode" of the Hayes Micromodem II, the SSM Modemcard, or the Novation AppleCat II (if it has the optional firmware or the DCH Mirror ROM).

How can I make my printer or 80-column board and the modem work at the same time?

Try giving an IN# command to your modem and a PR# command to your printer, followed by the same control character commands as in Table 1. Just note that the on-screen prompts ("MICROMODEM II:?") probably will not be visible on your screen. Follow the same sequence you normally do, being careful not to dial too fast. (You can watch the Microcoupler's off-hook light pulse while you dial, to be sure it has finished each digit before you type in the next one.) Once you're connected to the other system, everything should appear on your printer (or 80-column board).

If you have both a line-oriented printer (as most dot-matrix printers are) and an interface card which doesn't display simultaneously on the screen, you may have trouble answering the questions. If the system asks "What is your name?" and then waits on the same line for your answer, your printer may not display the question until after you've answered it and hit RETURN. Thus, you'll have to know what questions you'll be asked and in what order!

Is there software that lets me bypass the buffer in my terminal program and dump the input directly to my printer?

When you take data into the buffer, you can save it to disk, edit it later, or duplicate it without photocopying. The procedure in the previous answer will do your bidding without any software. If it works with your printer, great! If not, see the following question for a possible explanation.

Why do I lose data when my printer is running?

Many line-oriented printers lose data when used concurrently with a modem because they hold incoming characters in their buffer until they get the RETURN. They then print the whole line at once, losing the first few characters of the next line coming in over the modem. To remedy this, you could increase the printer's buffer size, get an interface card or separate device to buffer data going to your printer, tell the distant system to insert enough NULLS after each RETURN it sends, or get a good communications or terminal program.

Why would DATACAPTURE work flawlessly no matter which mainframe I am linked to, whereas ASCII PRO cannot link up with the IBM?

Many software companies probably get questions like "Why doesn't your XYZ program work with system ABC?" If problems persist after carefully checking the documentation, ask the software vendor if they've noticed such a problem, and could they suggest possible solutions. Also, check any control characters the IBM host system sends you and any consequences those characters might have to your software.

How can I use Sprint or MCI with my modem?

On the SSM Modemcard or the Novation AppleCat II, make sure your modem is set for tone dialing (not pulse), and then dial the local access number for Sprint, MCI or any other long distance service. After the local number, you must allow time for the service to answer and provide their own dial tone before inputting your identification number, area code and the phone number you want. Either insert enough pause characters or, if available, a character to make your modem wait for another dial tone (such as the "+" on the DCH Mirror ROM).

With a pulse dialing system like the Micromodem, you can input the IN#, CTRL-A and CTRL-F on the keyboard. Then pick up a phone connected to the same line and help it with the tones yourself. When you finish dialing and hear the phone ringing at the other end, just hit CTRL-A, CTRL-Q and then RETURN (which will fool it into thinking it dialed itself, sending it looking for the carrier). Be sure to hang up the telephone handset (your modem will keep the line open); having an extension off the hook adds extra line resistance, preventing a clean connection. ■

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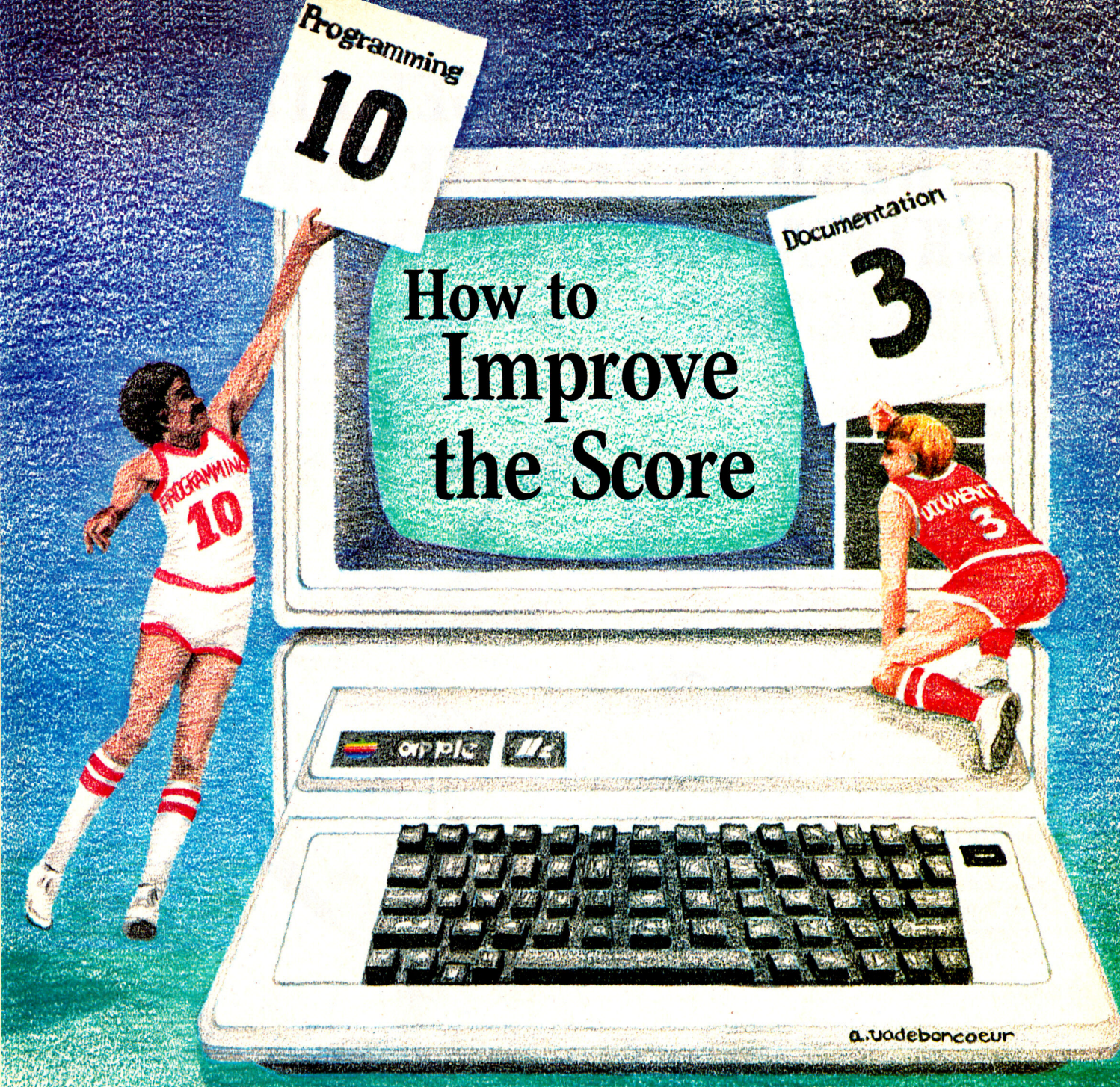

How to Improve the Score

Take the time to write good docs for your software customers—you'll both be winners.

by Ann Baldridge

When Coach Jim Everroad first wrote the set of instructions for the exercises that became his best-selling *How to Flatten Your Stomach*, he gave them to his wife to perform. Well, she never made it through the first exercise because she couldn't figure out what she was supposed to do. A physical education teacher, Everroad had flattened his own problem paunch. So he simply wrote down what he'd done, using scientific names for the various bones and muscles involved, which he thought would be enough. It wasn't.

You see, another gym teacher—a friend with the same background as Everroad—couldn't do them either.

What do you suppose Everroad did next? What would you have done? Blame Mrs. Everroad and his friend for not trying hard enough? Or, rewrite the instructions to make them clearer? As you might guess, that's what Coach Everroad did—over and over and over. He published the book only after ten strangers in a row did all the exercises and got results without calling him for help.

Ann Baldridge wrote the original documentation for Sublogic's Music Maker and for The Business Papers Set to be published by Solutions Softworks. She recently completed an audio cassette course on using the Apple III computer. Write her at PO Box 72289, Roselle, IL 60172.

Resources

What if you don't wish to write a user manual or operator's guide or simply don't have the hours available for the best job possible? Try a little-used alternative. Get a professional to write the manual. Not necessarily another professional programmer. In fact you should be wary of someone who's written manuals for mainframe software and who regards a personal computer as a toy. S/he'll not be as able to respect your program's power or the person using it enough to do the best job.

The person you choose should be given time to thoroughly understand your program, all its ramifications and all (well, almost all) the possible mistakes people might make. He or she should be willing to go though the debugging procedures just listed.

It may be the person you select will have written little if any computer documentation. He or she may be someone who can explain things well in writing or who has written instructions for something else. Of course, you do have the right to ask for writing samples. If you feel yours is a major software breakthrough, have two or three people write a brief sample and evaluate the results. You'll have to decide if you'll pay a flat fee or on a royalty basis. It may be a combination.

Now, you'll find that good writers cost money. They won't be "free," as you might mistakenly count yourself. But you can use the freed-up time to write another program. More important, most personal computer software marketers willing to maintain only their present level of documentation will watch their sales slow to a trickle within a year. As yours rise all the way to the top.

Here are some books that will help you improve your writing. I'm assuming that you already have a good dictionary, an up-to-date thesaurus, and your high school or college grammar book.

The Elements of Style, Third Edition, by William Strunk and E. B. White. A $1.95 paperback published in 1979 by Macmillan Publishing Company. Don't be put off by its small size. It's *the* basic writing reference work for every professional.

The Careful Writer, by Theodore Bernstein. Published in paperback in 1977 by Atheneum Press, this invaluable guide to how words should be used belongs in every writer's library. How come? It was written by the former Assistant Managing Editor of *The New York Times*.

Tips and Hints for Writing (or Rewriting) Articles for The Mother Earth News. Absolutely one of the best-written, all-around guides for popular writing available. Pick up a copy of *Mother Earth News* and find out how to get one.

How To Write Like a Pro, by Barry Tarshis. A hardcover published by New American Library in 1982. Subtitled "The Techniques of Writing Nonfiction for Magazines, Newspapers, Technical Journals, and more," this book shows you how to keep the "reader's needs and expectations vividly in mind." I hope it'll appear in paperback soon. ■

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By now, you've probably guessed what this anecdote is doing in a computer magazine. I'm afraid it doesn't reflect how most hardware manufacturers and software publishers treat the guides that go with their products. With glaringly rare exception, most of them never bother to find out if anyone else understands what they write. They should.

Here's Why

Today's group of desktop-computer buyers is entirely changed from what it was just a few years ago. The new breed knows very little about computers, programming, peripherals or using them. They don't want to become expert and shouldn't have to. They include few, if any, "hardware hackers" or "programming nuts."

As a whole lot of people have pointed out, you don't need to be an automotive engineer in order to drive a car. You can focus on where you're going and how you're going to get there. If you need help, you get out your well-written, lavishly illustrated Owner's Manual and look something up. Or you refer to a whole network of meticulously prepared roadmaps and guide books. If your car quits, you take your car to the local mechanic, who fixes it for you.

In the same way, the buyer of a computer program wants to use it right away by perusing a well-put-together manual or viewing a very clear set of screen instructions. He wants to focus on the *job*—build a mailing list, track inventory figures, write a letter, get the billing out, plan the future of his company, defeat the alien hordes. He doesn't need the added burden of decoding an impossibly written set of instructions.

Most people realize they can't be facile in two or three highly technical skills at the same time—designing hardware or programming computers and writing clear, understandable English. In fact, a good writer for computers is almost never a good writer for people. As an example, just look at any manual for a new printer. I have yet to see one that makes any kind of sense to a non-technical person even though I've been "around" and written for and about several computers.

Many software companies solve the problem by hiring writing specialists. You've probably seen the help wanted ads for what are sometimes called "technical writers." But, if you're just starting out, you can't afford to pay someone a salary to write your material. Unless you're blessed with an unusually talented spouse or child, you'll likely have to do it yourself. Here, then, is an overview to help you write more effective user manuals and/or other instructions for your software:

Writing the Words: Preliminaries

Before you even start the manual and while you're creating the program—composing the flowchart, coding the information, keying it in, debugging—keep a notebook nearby. Record ideas about what a first-time user *needs to know* as they come to you. If your program is complicated, start with a different page for each section or category.

"They don't want to become expert and shouldn't have to."

Next, decide which parts will be in the program—and, therefore, on the screen—and which in the written user manual. Ideally, you should do both. Write the user prompts and explanations into the software, then duplicate the instructions in a different order in the manual. Of course, include an index. Hard as this sounds, it can be done. For example, VersaForm, an exceptionally well-done database, provides a thick, completely consumer-oriented set of written instructions. Some buyers find they rarely need it, however, because the series of programs contains excellent on-screen tutorials.

Make sure to include HELP screens showing your special uses for various keys and for quickie solutions to typical problems. This is mandatory on such software as graphics utilities, word and text processors, accounting packages, and databases. Some publishers of these complex programs provide a

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handy chart. You should include one or the other or both. Notice, incidentally, even the Snack Attack game spots the move keys in the lower right corner of the screen.

Getting It Into Black and White

Figure out who's most likely to buy your program. Who did you write it for? Visualize that one person. Let's say it's a general ledger accounting package. Is it written for an accountant to use with clients? Or, will it help a small business owner with an important part of his daily work? The accountant won't need long, technical explanations of procedures and what kind of data to enter when. She will, however, wish to know such things as exactly how you define your terms and how to format reports.

On the other hand, the small business owner might need a tutorial section leading him through each step in addition to the above information. He could be just starting a business and need help in setting up accounts and so on. If your program could be used by either one, consider dividing the manual into two or three sections. Or use a special layout in which one column outlines what the professional needs and the second column—relating to the same topic—details more information for the novice.

Make sure to start by listing just what equipment's required. Then, detail how to get your program up and running, what it can do (and what it *can't*), and exactly how to get those results. This is where you'll refer to your notes. Put it into simple, easy to understand steps. Pretend you're holding the person's hand and leading him through it. No, you don't have to sound like a Dick and Jane reader. But it's better to err on the side of simplicity than on the side of too much technical material and computer jargon. Use few, if any, computer terms (unless it's a program to be used in a computer application such as a DOS fixer).

Divide the instructions into logical groups and put only one step on each line. Be generous with comments and reminders about why these steps and sequences are important and how they help. If you must, as a last resort, include some highly technical terms, be sure to define them clearly, and give an example or two.

Include a lot of illustrations—pictures, photographs, drawings, schematics, whatever. Make sure to label them clearly. Most useful ones show "how the screen looks" at a certain stage, or what a typical printout contains, or which keys have what functions. Think of the kinds of information your one person will use the most and when he'll need them. Do exactly that!

Use analogies to teach whenever possible. In case you've forgotten how your high school English teacher defined an analogy, I've put the latest definition here. An analogy relates a familiar thing point by point to an unfamiliar thing. For example, compar-

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"Don't coach and don't correct. If you see him headed for a disaster, let him crash."

ing software to cars and their manuals, as we did earlier in this article, is a teaching analogy.

Be positive throughout, too. A manual filled with "WARNING!!!" and/or "CAUTION!!!" markers can frighten a computer rookie. A flashing screen—or words—along with "appropriate" sound effects (such as the typical "raspberry" noise) is completely unacceptable in a professionally done program. If you've done your programming correctly, these won't be needed.

Select a typical situation or application and use that throughout, if possible. If you need to explain other, different uses, put a complete example into an appendix. Or set it off visually from the text with a box or put it on a separate page.

Now, put the whole thing aside for a week. Then use it with your program as if you were a brand new computer user and yours was the first program you'd bought. Edit and make things clearer. If any wordings "jog" something in your head, pay attention. Reread and rewrite again. Cut out the words you don't need and add those you do. Show, don't tell. Professional writers frequently read their material aloud at this point. You may be surprised what you'll discover.

And check it thoroughly for the basic errors. I shouldn't have to mention those kinds and, until a couple of weeks ago, wouldn't have thought it necessary. But I came across a manual and screen presentation with glaring mistakes in spelling, grammar, punctuation, and, would you believe, computer terminology. The publisher's trying to get over a thousand bucks for it, too. Unbelievable.

The next step, then, is to type it up and print it out. Include everything that will be in your finished version: Table of Contents, Index, Appendices, Illustrations pasted up just as you'd like. Do it over 'til you get it right!

Error Checking

All done? Nope. You've just begun. The key to producing really readable manuals is to debug them, too. Just like Jim Everroad did, find at least five people who might actually buy your program. Preferably, they'll have little or no computer expertise, unless, of course, that's who it's for. Give each one a copy of your manual and the program. As payment, offer to trade a free copy of the final version for their help.

Sit each person in turn down in front of the computer and watch him go through the thing. Make notes on a copy of the documentation. And, *bite your tongue.* Don't coach and don't correct. If you see him headed for a disaster, let him crash. Answer questions only as a last resort. Notice any time he

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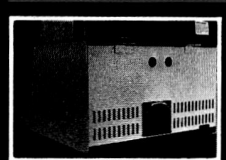

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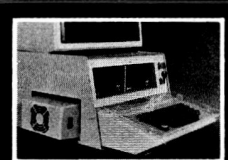

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"Keep in mind that your main purpose is to sell more programs by helping each buyer use his program effectively."

hesitates. See how long it takes him to respond appropriately. Not everyone will be able to breeze through with equal ease, of course, but you're looking for major stumbling blocks and mistakes.

What you want to find out is, "Could someone use this completely on his own without an interpreter at his side? Have I made that possible?" Simply observe and write.

Ask yourself if the mistakes happened because of a programming error, poor screen presentation, confusing instructions, or all of the above. Never allow yourself to blame the user. Focus on, "What happened? What didn't? How come?" instead of "Why didn't that dummy try harder? It's his responsibility to understand what I put down." Make corrections and repeat the procedure with the next person.

If you can't take the time to sit through this critical but long process, then do this: Give each test user the package and have him make notes in the margins or on specially keyed notepaper. Keep yourself open for phone calls if something's truly dense. You'll want to follow up with a complete telephone discussion, even if a frustrated user doesn't call you first.

Now, ask each person how you can improve it. Don't ask for criticisms. Many people will be reluctant to say anything negative—especially if most of your program, screen presentation, and manual are average or above already. Besides, if they're friends or acquaintances or colleagues, they may not want to hurt your feelings. But almost everyone likes to give advice—to help you make it better. If several folks suggest the same improvements, you'll get a leg up on your competitors if you make them.

Keep in mind that your main purpose is to sell more programs by helping each buyer use his program effectively. Your main purpose is not to dazzle with your brilliance, or baffle him by using heady terms, or lay a guilt trip, or make your customer feel uncomfortable. You want, after all, for him to say to a friend, "Hey! I got my money's worth from these guys!" It won't hurt your business at all if he feels better about his computer and himself each time he finishes something with your name on it.

Now, I realize that this takes time. Don't try to do it overnight or as an afterthought as most publishers appear to do. In fact, you may want to take as long to write and debug the documentation as the program itself. We all know that there's no such thing as a perfect program that arrives out of the blue bug-free. Well, you've probably figured out that there's no such thing as a *perfect user manual* first crack out of the text-editor. You can and should improve both as much as you can. You expect at least that much from the programs you buy. Your customers deserve the same. Besides, your future sales depend on it. Let's get all those user manuals to a score of 10. ■

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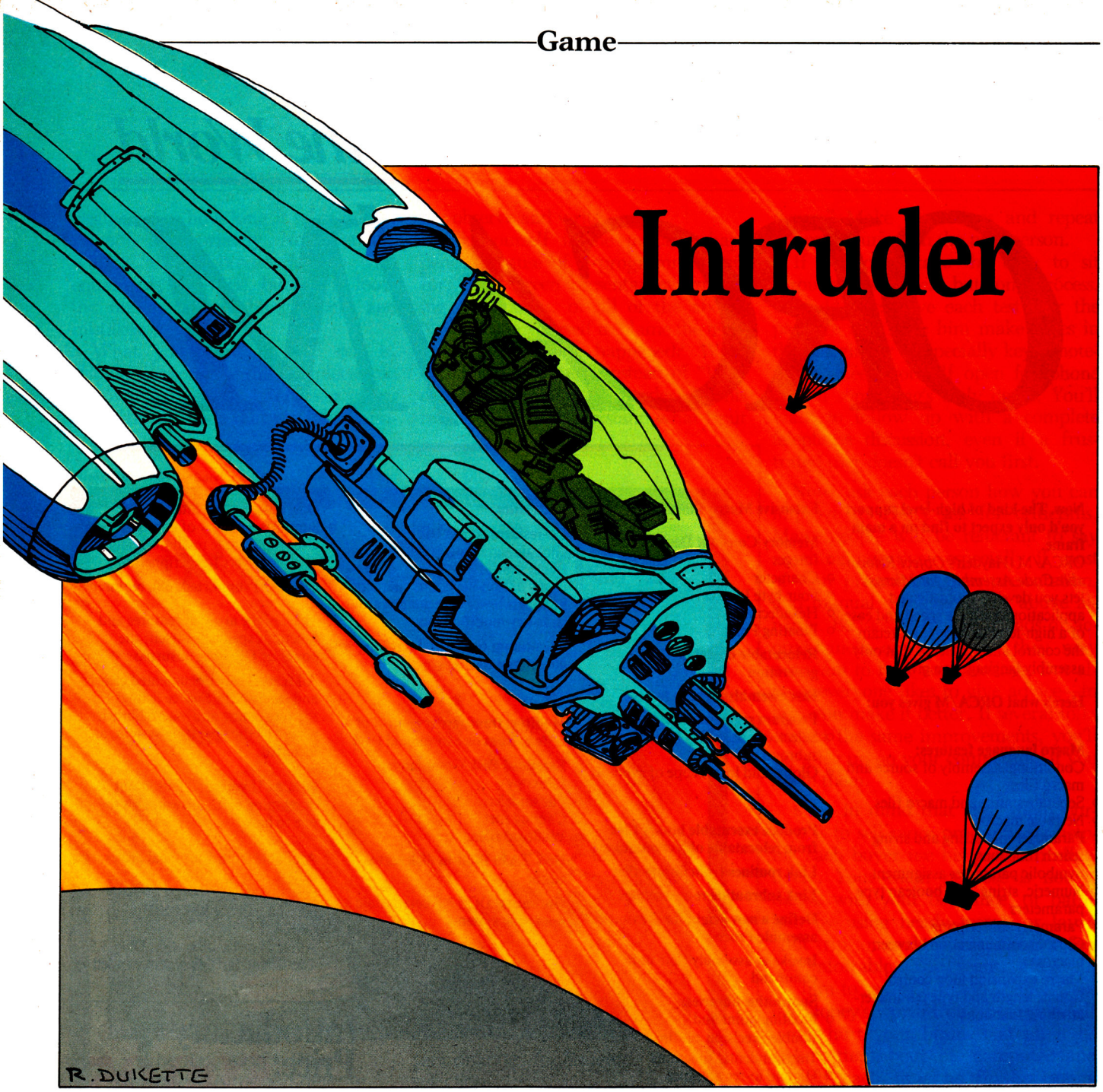

by Alan Fullmer

You are seated comfortably in the cockpit of your sabre-nosed fighter. You have been patrolling all day and have seen nothing. Confident that all is well, you begin to land. And then you see it . . . a missile. No, it's an enemy balloon! Quick, pop it! Oh no, there are more falling! How long can you hold out?

This is Intruder, a hi-res action game written in Applesoft. Yes, we all know that Applesoft is not famous for making action games, but *this* game is fast and fun to play.

The controls of your aircraft are the two paddles. (A joystick also works great.) Paddle 0 controls speed; paddle 1 controls angle and therefore altitude. If you climb too fast without enough speed, your plane will stall. Then there's an ominous clicking and you lose altitude sharply. To correct, either increase speed or drop the nose of the plane. Stalling the plane can be useful because it allows you to back up and hit a balloon you may have missed. Dont' go too fast while pursuing a balloon or you may actually skip over it.

The Program

Intruder uses no special graphic techniques, only standard commands such as DRAW and HPLOT. If you wish, you may change line 20 to read: 20 Q = 9 + E:X = X + Q. This will keep the plane at a constant speed and make stalling impossible. A line-by-line description of the program appears in Table 1. The variables are described in Table 2. Have fun! ■

You can write to Alan Fullmer at 11114 Whisper Meadow, San Antonio, TX 78230.

Line(s)	Description
2, 8, 10, 12	Set variables, et al.
4, 6	Poke shape table into memory.
20	Calculates speed from PDL(0). The angle (E) is then added so you will go faster while descending than while climbing.
30	Checks for stall.
32	Means plane has stalled. Click speaker and increase Y by six.
34–38	Check if plane has gone beyond screen borders.
40	Erases plane.
50	Draws plane.
55	Checks to see if plane has crashed.
60	Moves balloon down and checks whether or not it has reached ground. If so, it then goes to explosion sequence.
70	Erases balloon.
80	Draws balloon.
90	Checks for collision between plane and balloon.
100	Calculates angle of plane (E) from PDL(1).
110	If stall has occurred, then return to start of loop. This is done so the plane will not gain altitude in a stall.
120	Increases or decreases altitude (Y) according to angle (E).
400–450	Draw random landscape.
500–560	A balloon has been hit. Balloon rapidly increases in size and its rate of descent accelerates. Score is increased and printed and you return to main loop.
1000–1090	Title sequence.
2000–2060	Crash sequence in which a series of red lines is drawn from the object to random positions on screen.
2070–2080	Asks if player wants to play another game.
2090–2100	High score is calculated; game is restarted.

Table 1. Line-by-line description of the Intruder program.

Variable(s)	Description
SC	Player's score.
HS	High score.
X, Y	Actual horizontal and vertical coordinates of plane.
X1, Y1	Old horizontal and vertical coordinates of plane, for erasing.
SK	Speed of balloon's fall; increases after each hit.
DX, DY	Actual horizontal and vertical coordinates of balloon.
OX, OY	Old horizontal and vertical coordinates of balloon, for erasing.
Q	Horizontal speed of plane.
E	Vertical speed of plane.
E1	Old E, used for erasing plane.

Table 2. Intruder variables.

Program listing. Intruder.

```
1  GOSUB 1000: REM   INTRODUCTION
2  HOME : VTAB 23: PRINT "SCORE:0";: HTAB 20: PRINT "HIGH SCORE:0":HS = 0
3 TRSE;TRJEHJ NEW GF;
4  FOR I = 24576 TO 24582: READ A: POKE I,A: NEXT : POKE 232,0: POKE 233,9
     6
6  DATA  1,0,4,0,53,39,0
8 Y = 80:Y1 = Y:X1 = 10:Y1 = 10: SCALE= 2: ROT= 0
10  HGR :SK = 1: GOSUB 400
12 X = 10:DX = 139:DY = 2:OX = DX
15  REM  ** START OF LOOP **
20 Q =  PDL (0) / 20 + E:X = X + Q
30  IF Q > 2 THEN AZ = 0: GOTO 34
32 AZ = 100:WQ =  PEEK ( - 16336):Y = Y + 6
34  IF X < 3 THEN X = 276
36  IF X > 276 THEN X = 3
38  IF Y < 10 THEN Y = 10
40  HCOLOR= 0: HPLOT X1 - 2,Y1 TO X1 + 2,Y1 + E1
50  HCOLOR= 3: HPLOT X - 2,Y TO X + 2,Y + E:X1 = X:Y1 = Y:E1 = E
55  IF Y > 150 THEN 2000
```

Listing continued.

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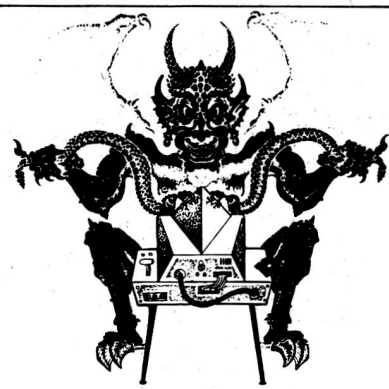

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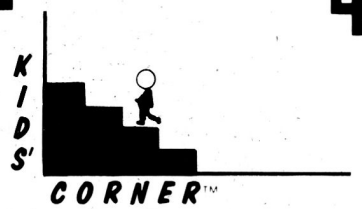

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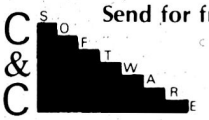

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Listing continued.

```
60 DY = DY + SK: IF DY > 152 THEN X1 = DX:Y1 = 152: GOTO 2000
70  HCOLOR= 0: DRAW 1 AT OX,OY
80  HCOLOR= 3: DRAW 1 AT DX,DY:OY = DY
90  IF  ABS ((X + 2) - DX) < 5 AND  ABS ((Y + E) - (DY + 2)) < 4 THEN 500
100 E =  PDL (1) / 20 - 6
110  IF AZ = 100 THEN 20
120 Y = Y + E: GOTO 20
400  HCOLOR= 3: REM  * LANDSCAPE *
410  HPLOT 0,150
420  FOR YT = 3 TO 279 STEP 3
430 V = ( RND (1) * 5) - 2
440  HPLOT  TO YT,(152 + V): NEXT
450  RETURN
500  HCOLOR= 0: DRAW 1 AT OX,OY
510  FOR TR = 2 TO 10: SCALE= TR - 1: HCOLOR= 0: DRAW 1 AT DX,DY
520  HCOLOR= 3: SCALE= TR: DRAW 1 AT DX,DY:WQ =  PEEK ( - 16336): NEXT
530 SC = SC + 10: HCOLOR= 0: DRAW 1 AT DX,DY:DX =  RND (1) * 250:DY = 2
540  SCALE= 2:OX = DX
550  VTAB 23: PRINT "SCORE:";SC:SK = SK + .25
560  GOTO 20
1000  HOME : VTAB 24
1010  HTAB 14: PRINT "INTRUDER"
1020  FOR X = 1 TO 12: PRINT
1030  FOR C = 1 TO 100: NEXT : NEXT
1040  POKE 34,11
1050  VTAB 24: HTAB 10: PRINT "BY: ALAN FULLMER"
1060  FOR X = 1 TO 10: PRINT
1070  FOR C = 1 TO 100: NEXT : NEXT
1080  FOR X = 1 TO 1000: NEXT
1090  TEXT : RETURN
2000  FOR V = 1 TO 50
2010  HCOLOR= 2
2020 X = ( RND (1) * 130) + 130
2030 Y = ( RND (1) * 80) + 80
2040  HPLOT X1,Y1 TO X,Y
2050 RE =  PEEK ( - 16336)
2060  NEXT
2070  VTAB 22: INPUT "PLAY AGAIN(Y/N) ?";A$
2080  IF A$ = "N" THEN  END
2090  HOME : VTAB 23: PRINT "SCORE:0  ";
2100  IF HS > SC THEN  HTAB 20: PRINT "HIGH SCORE:";HS: GOTO 3
2110 HS = SC: HTAB 20: PRINT "HIGH SCORE:";HS: GOTO 3
```

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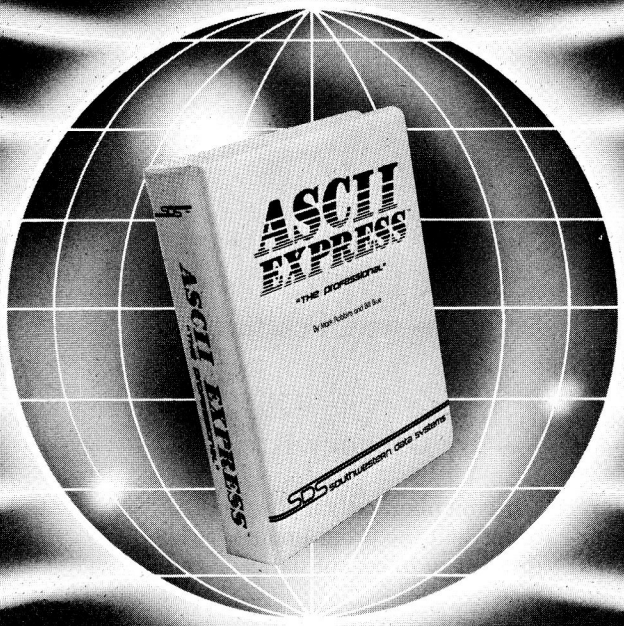

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Circle 250 on Reader Service card.

Better Inventory Control

Find out how to keep track of your stock the easy way—with Peachtree's help.

by Gregory R. Glau

Today, many business people buy database systems to handle their inventory requirements, rather than plain old inventory systems. A database system can thoroughly analyze items in its files, but must be formatted to your file organization, field lengths and record sizes. A good inventory system, however, can fulfill your needs right out of the box.

The Peachtree Inventory program, part of their Series 40 Accounting package, requires Microsoft Basic and the Microsoft "Softcard," and comes with two system disks and a sample data disk. You must copy these disks, add to them CP/M and MBasic (per instructions) and only then construct your programs. Don't use the originals.

The 86-page manual comprises four sections: an overview of the 13 programs; a breakdown of each program's operation; details on field length and program reports; and sample reports, plus a primer on error messages and system start-up. Unfortunately, there's no index, and explanations of reports aren't buttressed with accompanying samples—those are found elsewhere. Peachtree should have done better.

Before running the system, you must first configure the system to your Apple. That's not easy, as you see in Table 1.

Let your printer manual be your guide. Peachtree also asks if the "clear screen code" for your terminal is 027042. It *is* if you're using an Apple, so why ask at all if the program is "Apple ready"?

Remember, only if your codes are in order will the program create a blank disk ready to accept data.

Getting Underway

Once you're through the muck, place your program disk in Drive A and the data disk in Drive B. Every item's first three numbers indicate its department. You then add up to ten numbers for the item number itself. The combination of the two—department number plus item number—makes up your actual inventory number. Because you may use *any* character as part of your inventory number, you can use the inventory numbers you're using now by just adding them to the department-code number.

The system permits up to 20 characters for an item's description, and provides "unit of measure" space for items that sell by the dozen, pound or square foot. For these items, totals for units sold and number in stock are carried out two decimal places.

But beware: Each item's eight characters for a vendor ID number and eight numbers for a vendor's identification may prove insufficient, and you're allowed only one supplier for each item. This limits those who buy from more than one wholesaler.

Cost pricing can be handled two ways. The first is what you'd expect—a standard cost amount. But you can also instruct the program to *average* the costs for a particular item, an invaluable feature for those dealing with ever-fluctuating prices.

The system keeps three retail prices for each item. However, the program cannot go through a department's items (or your total inventory) and raise or lower all prices by a certain percent. This three-price system could best be used interfaced with an invoicing system.

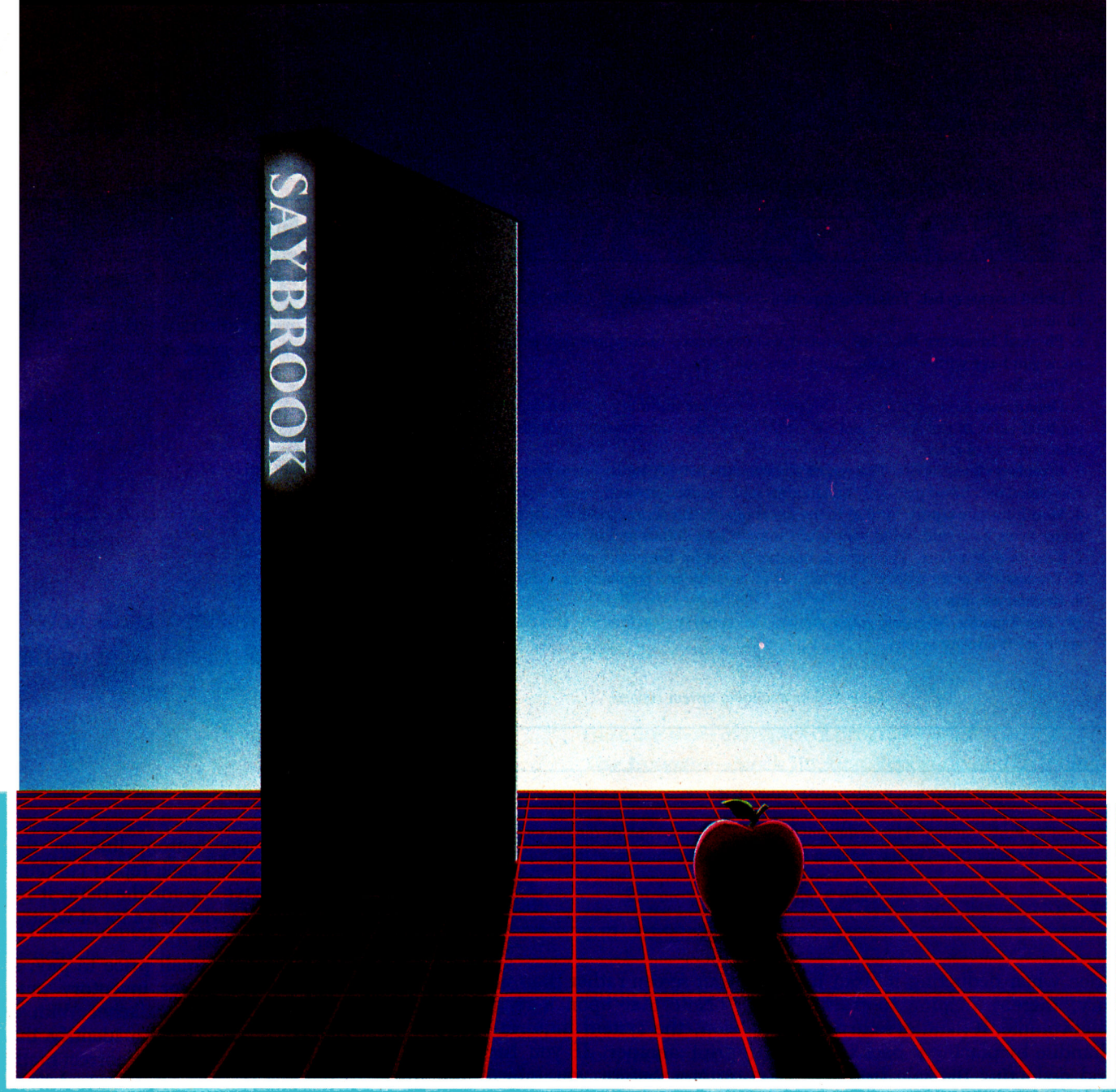
The system does print a reorder summary, a list of items at or below minimum stock level. You're allowed eleven digits for a reorder level, meaning you could register up to 99 *billion* items (or ounces or whatever units you wish). Why not include more room for a supplier's part number and less for this area?

The Peachtree Inventory program stores a reorder quantity for you; when the item appears on the report, it prints how many you should reorder. The system records how long an item has been on the reorder summary. It also totals your "period to date" sales (a month, or any period you wish) and concurrent costs, and tracks yearly sales volume and cost totals, too.

Though you can't determine the actual "balance on hand" figures, a comment space blazes a strong audit trail, allowing you to label an item as "miscounted" or "freight damaged," for example.

The system asks an item's selling

Address correspondence to Gregory R. Glau, P.O. Box 1627, Prescott, AZ 86302.



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- **Cost.** $1,550 suggested retail price, includes the Saybrook 68000 co-processor with 128K RAM on-board; the UCSD p-System (Version IV) with Pascal, FORTRAN-77, and BASIC *compilers*. In addition, Applesoft-compatible, 68000 BASIC is included. CP/M 68K optional. UNIX available soon.

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TOP OF FORM CODE 012
"This is the common form feed character for most printers. If your printer does not use this code, change it to '000' and the system will process Top of Form internally."

Table 1. An example of part of the configurtion program that requires some research.

1. **Detail inventory list.** This is a complete listing of the inventory file, with all information for all items.
2. **Physical Inventory list.** This prints a worksheet used to compare that actual number of items you have with what your Apple says you have.
3. **Price list.**
4. **Department summary report.** This prints a one-line summary for each department showing total value of the department's inventory and other information, including year-to-date sales and cost of sales.
5. **Inventory status report.** This report gives you the activity for the items since the last period was closed out, based primarily on amounts sold, balance on hand, returns, adjustments, etc.
6. **Month-to-date report.** Similar to the status report, this concentrates on the numbers—how many items were sold, what your profit margin is in dollars and in percent, etc.
7. **Year-to-date report.** The same as number 6, but for the yearly totals.
8. **Transaction entry report.** This outlines all activity and transactions.
9. **Reorder summary.**
10. **The Examine-Inventory status report.** This report prints the data about a single item as you'd see it on your screen.

Table 2. The available system reports.

"End of rank reached. This error will appear when the rank of the current key does not match the rank (type) of the previous key during sequential processing."

Table 3. Explanation of Error 102.

price when deducting it from inventory, thereby helping to track total sales volume. It handles returned merchandise by placing it back into stock and deducting the sale from the period-to-date and year-to-date sales figures.

Unfortunately, the system does not track purchase orders. While the reorder summary shows what you need and when you ordered it, there's no way to trace any specific purchase order number. This is a significant weakness.

Another weakness: Data in the system may be displayed *only* with complete item numbers; there are no "partial-match" or "wild-card" search provisions in the program.

Reporting As Ordered

Table 2 outlines the Peachtree system's crack reports. They can focus on just one particular department or the entire inventory, and two of the reports (the Transaction Entry and the Detail Inventory List) can "print" to your screen rather than your printer.

Note that upon a report's conclusion, the system inquires whether to print another. If you turn off your printer before you inform the program, it will hang. It *must* print something like the following before you regain control of the program:

END OF INVENTORY PRICE LIST

And when you complete an inventory session, you exit to MBasic rather than CP/M.

Your Apple can handle 700 inventory items per data disk, but the Peachtree Inventory cannot search more than one disk at a time for its reports. Don't worry. Categorizing disks by department (or location or type) and structuring them accordingly will streamline your inventory control.

Printouts contain many extras—some necessary, some not. For instance, the physical worksheet, used to compare physically counted totals to those your Apple claims you should have in stock, includes a comment line for additional data. Plus, each detailed report goes so far as showing you from which inventory field each item came.

But the price list, for example, prints information superfluous to those at the front sales counter or billing department. Along with the prices come the number of an item you had in stock when the price list was printed, and the supplier's name and part number. Why?

"The system records how long an item has been on the reorder summary."

Perhaps the bottom line on the amount of detail each report contains is: If you have use for the data, it's a blessing; otherwise, it's a lot of wasted paper and printer time.

Still, that's a small price to pay; a database system, for inventory purposes, is one big headache. With a database you'd have to identify the proper data, perform the correct math with it, and format printouts to deliver the information properly. That's a lot of work.

The appendices do list error messages—however foggy—as seen in Table 3.

In short, don't expect much help from the manual. The error-trapping, however, is outstanding; we could *not* make the program crash. It won't even accept a month "13" or a day "32" in the date field. It *will* take an "11" or "17" for the year, so the program can take you into the next century.

If you're in the market for a ready-to-go inventory program, take a look at this one. The Peachtree Inventory system requires 64K, two disk drives, a 132-column printer and a Microsoft "Softcard" with CP/M and MBasic. It's available for $400 from Peachtree Software, Inc., 3445 Peachtree Road N.E., Atlanta, GA 30326. ■

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AppleMusic—Beepin' the Blues



Hey, they're displaying our song!

—by Jim Menick—

My master program for music generation plays music in three chromatic octaves using the Apple keyboard as the "piano" keys. The program's straightforward structure and language can be used, with various tinkerings, as a basis for any kind of computer music and sound effects. Once you understand this simple master program, you'll see dozens of ways to experiment with it.

When you run the master program, the letters from A to K on the keyboard correspond to a C to C scale in ascending order from left to right. The sharps and flats, the "black keys," are in the same place they would be on a piano. For instance, the W right above and between A and S on the Apple keyboard (or above and between C and D on our imaginary piano) will play the tone C#. The same applies to the Apple keyboard's E, T, Y, and U, representing the piano's D#, F#, G#, and A# respectively.

If you hit a key that isn't part of the imaginary piano keyboard, nothing will happen, unless that key happens to be 1, 2 or 3. These numbers control the octave—1 being the lowest, 3 the highest. To change octaves, hit one of these keys before "playing." Needless to say, the top C in octave 1 is identical to the bottom C in octave 2, and likewise for the top and bottom of 2 and 3.

Always bear in mind that each sound generated by the speaker comprises two aspects—frequency and duration. A change in either results in a corresponding change in the sound. Frequency and duration are the only important variables; you must limit their values between 1 and 255, and insert them as the second half of the POKE statements in lines 510 and 520 (frequency and duration respectively).

Strike Up the Band

The full program is simple. Line 10 sets up the machine routine to generate sound—I can't explain how, but this is an essential constant statement that must appear in any modification. Line 20 sets the variable O at 2; I chose to default at the middle octave. Line 30 sets D, the variable for duration. A duration of 100 to my ear sounded just right.

Line 40 gets the input from the keyboard. Line 50 sets X at 0; X is the variable for the sound's frequency. This line and line 500 limit your input, setting up a default so that you'll get sound only when you hit a key programmed for sound. Line 60 sets the

Drop a note to the author, Jim Menick, at 15 Casparian Road, Peekskill, NY 10566.

```
5  HOME
10  FOR Z = 770 TO 790: READ D: POKE
     Z,D: NEXT : DATA   173,48,19
     2,136,208,5,206,1,3,240,9,20
     2 ,208,245,174,0,3,76,2,3,96

20 O = 2: REM  DEFAULT AT MIDDLE
     OCTAVE
30 D = 100: REM  DURATION
40  GET C$
50 X = 0: REM  TO CLEAR VALUE OF
     X
60  IF C$ = "1" OR C$ = "2" OR C$
      = "3" THEN O =  VAL (C$): REM
      SET OCTAVE VARIABLE
70  ON O GOTO 80,220,360
80  IF C$ = "A" THEN X = 192
90  IF C$ = "W" THEN X = 180
100  IF C$ = "S" THEN X = 171
110  IF C$ = "E" THEN X = 161
120  IF C$ = "D" THEN X = 153
130  IF C$ = "F" THEN X = 144
140  IF C$ = "T" THEN X = 136
150  IF C$ = "G" THEN X = 129
160  IF C$ = "Y" THEN X = 122
170  IF C$ = "H" THEN X = 115
180  IF C$ = "U" THEN X = 108
190  IF C$ = "J" THEN X = 102
200  IF C$ = "K" THEN X = 96
210  GOTO 500
220  IF C$ = "A" THEN X = 96
230  IF C$ = "W" THEN X = 91
240  IF C$ = "S" THEN X = 86
250  IF C$ = "E" THEN X = 81
260  IF C$ = "D" THEN X = 76
270  IF C$ = "F" THEN X = 72
280  IF C$ = "T" THEN X = 68
290  IF C$ = "G" THEN X = 64
300  IF C$ = "Y" THEN X = 60

310  IF C$ = "H" THEN X = 57
320  IF C$ = "U" THEN X = 54
330  IF C$ = "J" THEN X = 50
340  IF C$ = "K" THEN X = 47
350  GOTO 500
360  IF C$ = "A" THEN X = 47
370  IF C$ = "W" THEN X = 45
380  IF C$ = "S" THEN X = 42
390  IF C$ = "E" THEN X = 40
400  IF C$ = "D" THEN X = 37
410  IF C$ = "F" THEN X = 35
420  IF C$ = "T" THEN X = 33
430  IF C$ = "G" THEN X = 31
440  IF C$ = "Y" THEN X = 29
450  IF C$ = "H" THEN X = 27
460  IF C$ = "U" THEN X = 26
470  IF C$ = "J" THEN X = 24
480  IF C$ = "K" THEN X = 23
490  GOTO 500
500  IF X = 0 THEN 40: REM  THIS
     SENDS YOU BACK SOUNDLESS IF
     WRONG KEY IS HIT
510  POKE 768,X
520  POKE 769,D
530  CALL 770
540  GOTO 40
```

Listing 1. The master music generation program listing.

octave, O, and lines 70–490 supply data for the value of X, the frequency of the particular note. Lines 510–530 send out the actual sound signal in two halves, frequency and duration, then a CALL to the routine set up in line 10. Line 540 sends the program back for the next note.

Because the program is so simple, you can generate virtually any kind of sound imaginable. First, you can lengthen or shorten a sound's duration by adjusting the value of D in line 30 (remember, you're limited to values between 1 and 255). The following modifications create an echo effect:

```
Del 30,30
45 D=40: REM TO RESET D FOR EACH
NOTE
505 FOR D=D TO 5 STEP -5
535 NEXT D
```

Similar changes will yield all kinds of strange sounds. You conceivably could turn the "piano" into a synthesizer, if you're willing to invest the time experimenting.

You can make cosmetic changes that display output on the monitor. For instance, you could print the name of the note as you play it by changing all the

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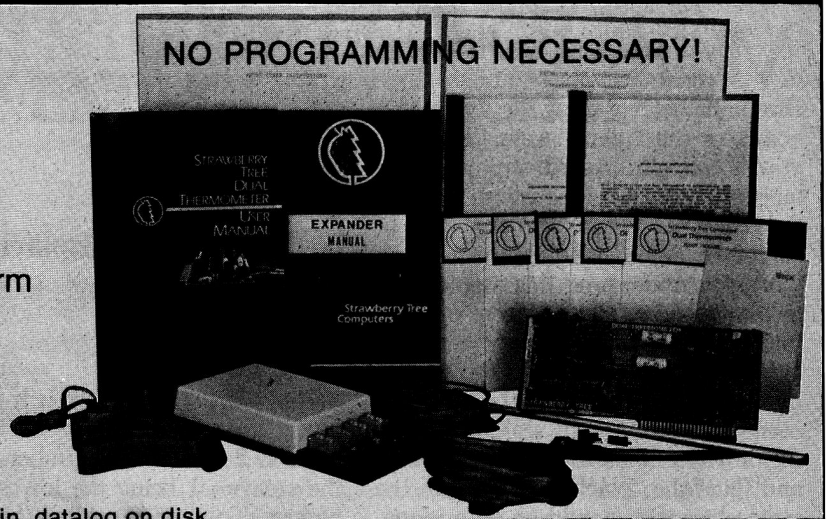

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data lines like so:

80 IF C$ = "A" THEN X = 192: PRINT "C"
90 IF C$ = "W" THEN X = 192: PRINT "C#"

You could even set up a graphics response if you were so inclined.

Then again, you could forget about the keyboard altogether by dropping all keyboard-related parts of the program and substitute other sources of X and D (frequency and duration). Listing 2 functions just like the master program, with the exception of new lines 40 and 50, which set random values for X and D. Running this 7-liner provides truly wacko musical entertainment. You also could set D as a constant in this variation. D = 25 gives you a nice, zippy sequence. The D = 50 setting produces the computer noises of a '50s science fiction film. D = 255 evokes the "Phantom of the Opera."

Going Up, Going Down

Listings 3 and 4 closely resemble the random music program in Listing 2. The only differences in Listing 3 are in line 30, which gives ranges of X starting at the lowest frequency; line 255, going to the highest, 1; line 40, which sets a constant duration; and line 80, which completes the loop begun in line 30. This program gives you steadily ascending tones. In Listing 4, line 30 is inverted into a "going down" riff; the addition of line 90 makes it a continuous loop. It's a nice touch of science fiction.

You also can establish specific frequency values to replay specific tunes (we're back to regular music now). For this variation I ran the master program, sat down with a program printout in one hand and pecked out the notes with the other. When I got the notes the way I wanted them, I wrote down the X value from the master program until I had a complete sequence of correct notes. Then I totalled the

```
10  HOME
30  FOR Z = 770 TO 790: READ D: POKE
    Z,D: NEXT : DATA   173,48,19
    2,136,208,5,206,1,3,240,9,20
    2 ,208,245,174,0,3,76,2,3,96

40 X =  INT ( RND (1) * 255) + 1
50 D =  INT ( RND (1) * 255) + 1
60  POKE 768,X
70  POKE 769,D
80  CALL 770
90  GOTO 40
```

Listing 2. The "random notes" program.

```
10  HOME
20  FOR Z = 770 TO 790: READ D: POKE
    Z,D: NEXT : DATA   173,48,19
    2,136,208,5,206,1,3,240,9,20
    2 ,208,245,174,0,3,76,2,3,96

30  FOR X = 255 TO 1 STEP  - 1
40 D = 5
50  POKE 768,X
60  POKE 769,D
70  CALL 770
80  NEXT
```

Listing 3. The "going up" program.

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notes (12 as in Listing 5) and inserted that number as the Y limit in line 30, and then preset the frequency data with the READ/DATA statement in lines 40 and 100. This can be a bit time consuming, but you could apply this procedure for any song you choose.

"You could even set up a graphics response if you were so inclined."

You also may create data for replay by adding to the master program a storage routine that recalls a sequence of values for X as you play the keyboard. Then you could WRITE that file of values when you're finished. To replay the song, set up a routine to READ back the song's file. Beware: You must create arrays and keep track of the notes played so that your files run true and your array dimensions don't become overloaded. Also, make sure you hit the right notes in the first place—unless you build a failsafe mechanism to block the recording of musical errors as they happen. With a bit of sophisticated tinkering the master program could adapt to such a recording operation.

Once you understand the master program the possibilities are limitless, both for music and for sound effects. These spinoff programs barely scratch the surface, and exemplify the kinds of things you can do if you set your mind to it. ■

```
10  HOME
20  FOR Z = 770 TO 790: READ D: POKE
     Z,D: NEXT : DATA   173,48,19
     2,136,208,5,206,1,3,240,9,20
     2 ,208,245,174,0,3,76,2,3,96

30  FOR X = 1 TO 50
40 D = 5
50  POKE 768,X
60  POKE 769,D
70  CALL 770
80  NEXT
90  GOTO 30
```

Listing 4. The "going down" program.

```
10  HOME
20  FOR Z = 770 TO 790: READ D: POKE
     Z,D: NEXT : DATA   173,48,19
     2,136,208,5,206,1,3,240,9,20
     2 ,208,245,174,0,3,76,2,3,96

30  FOR Y = 1 TO 12
40  READ X
50 D = 100
60  POKE 768,X
70  POKE 769,D
80  CALL 770
90  NEXT
100  DATA     76,72,76,86,96,86,7
     6,64,72,76,86,72
```

Listing 5. The "replay" program.

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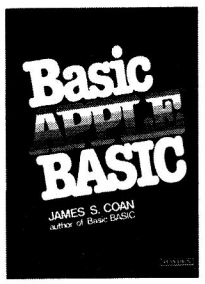

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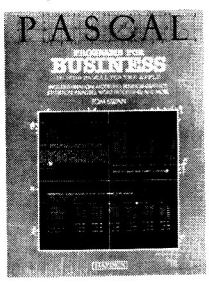

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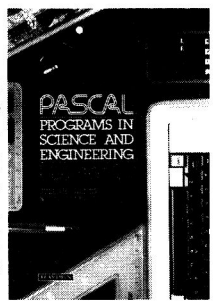

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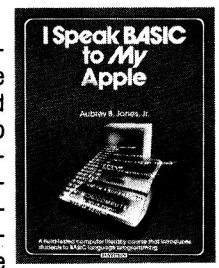

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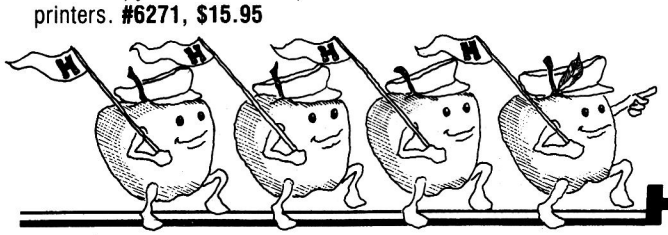

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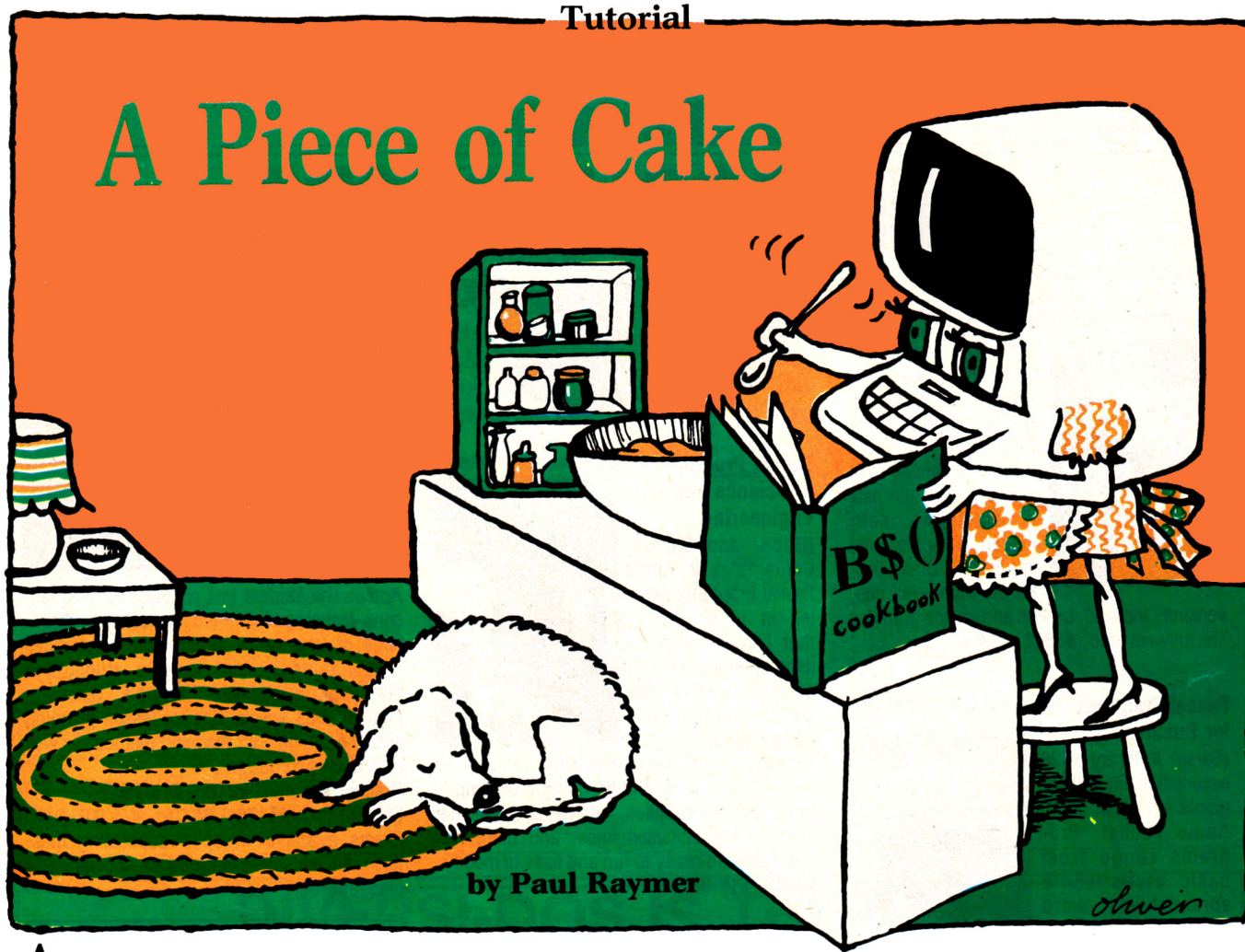
A Piece of Cake



by Paul Raymer

All of us who have run a good program written by another person must have marveled, or at least wondered, how they get all the ideas to do all that terrific stuff!

It's a piece of cake, really.

Start with a simple idea, and if it works just add a little more—just a bit at a time—and when you run out of steam, memory or time, you'll have a full-blown, dyed-in-the-wool, really honest-to-God program all your own! My Birthday Cake program may give you an idea how to build a program starting with a very simple routine and, by spending a little time, making a fun thing out of it.

Birthday Cake, The Basic Program

Have a look at Listing 1. Note that the author's usual neatness in having all lines numbered by 10 is not evident in this case. Bear with me on this and use these line numbers or you'll blow the whole deal.

Lines 100–120 introduce the author and display all that remains of the Latin he was taught so many years ago at John Adams High School.

Lines 150–160 read the DATA statements that will appear later—somewhere. Because the actual location of a DATA statement in a program is never too important, I usually stick them at the end of the listing just to get them out of the way. You may stick them wherever you wish.

Lines 214–240 put the B$ array to work. Using the random bit it makes sure that each datum (datum?—that must be the singular of data!) is only used once.

Line 320 picks a vertical line to work on and prints whatever B$(R) is—thirty-nine times! Obviously, this program is not for the faint of heart as the screen fills with a myriad of alpha and non-numeric symbols.

Line 330 is vital to this process. Well, vital may be a bit strong; relatively important may be more like it. By assigning a new value to B$(R) we ensure that it will not be used again. Ever. Line 230 sees to that.

Many of those new to Apple computers may wonder why the letters JOSH were used. Old timers know that $3F4 (1012) normally contains $45, since it is the power-up byte. Former TRS-80 owners can see the answer on page 157 of *The Applesoft Tutorial*, which corresponds to the index of the original TRS-80 Level II manual, but those of you who know why Nevada is called the Silver State will recognize the name as belonging to the clever youngster who wrote the Apple program for one-year-olds, Josh's Toy Box.

Line 340 is a time delay, quite short, to make this mini-program do something.

Line 580 wraps up the whole thing.

Line 590 holds our long-lost DATA. Note that it starts out strangely. The period really belongs there! We don't need it just yet, but we will—later.

This, such as it is, is a program. It may give you all sorts of ideas for other things to do—like watching TV, drinking, leaving town or selling your computer. It gave me the idea for Birthday Cake, Part Two.

You can write to Paul Raymer about his recipe at the Baking Dept., Paul's Electric Computer, 3464 Townhouse Drive, Las Vegas, NV 89121.

Birthday Cake, Part Two

Now check out Listing 2. Most everything we've used before will continue to be used as we move along with our Birthday Cake. Let's start to make additions.

Line 180 is an input line requesting a name; you can see how this program rapidly becomes personalized. Asking a person's name in a program is not necessarily good programming, but it surely is good salesmanship. Who is going to complain about a program that makes him/her the hero/heroine?

Line 190 determines the age of the player, and then retains that age in a secondary form. Note that both variables, AGE and YR, retain the value. More on that later.

"Asking a person's name in a program is not necessarily good programming, but it surely is good salesmanship."

Line 200. Now it's later. If the age is more than 38, YR becomes 1. There are three reasons for this. (1) The Apple screen has a problem with images wider than 40 and so (allowing for margins) 38 is about it for screen display. (2) How many people over the age of 12 do you think will be reading this column? (3) I forget the third reason.

Now the REM statement in 170 takes on some meaning, since we know whose birthday cake we are making.

Line 250 really puts your typing skills to the test. Between the "(" and the ")" and the shift key and all—you'll be sorry you didn't take Typing 101 when you had a chance in junior high school. I am. What we are doing here is building a string using whatever B$(R) happens to be at the time. There is a word for it in my *Applesoft Manual*—concatenation—but I was always a little bashful about looking on page 21 and seeing what it was, since I was raised so strictly as a youngster.

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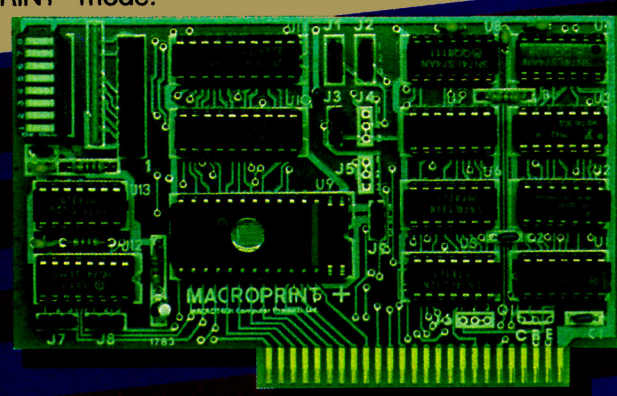

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Line 260 looks almost the same as line 250, but not quite. If you can't see the difference in the two lines, this is a good time to sell your Apple and buy a VIC-20 or Bic or a Trac II.

Line 270 is different still. All of these do similar things, but in a slightly different manner. With great restraint the author will not refer to the soaps and various shenanigans that take place on TV in the daylight hours.

Lines 280–310 create a temporary string (P$) that will be used later in the program in a most ingenious manner. Most programmers choose variable names that suggest the things the variables represent, such as YR for "year" or B$( ) for "birthday". I used P$ for the temporary string because I developed this part of the program on a Friday, which is payday, and I knew my check would only last a very short time. Hints like this will always be found in my programs!

Line 320 is a *change* line! You really don't have to make any big decisions; Woz and Jobs did that for you a long time ago in California. You just have to type the lines in, and zap, the old one will be gone. Line 320 has a handy centering routine in it, then prints the P$ thing we have been waiting for. Then—like the black widow spider does to her mate, zaps P$ so that it is just a "". P$ is no more. Sigh.

Lines 360–390 print a bunch of lines using INVERSE and CHR$(32). This makes white boxes on the screen somehow. Hopefully, a NORMAL will follow soon.

Lines 410–430 look along V-line 3 for ASCII 174 and finding it, change it to ASCII 106. To find out what those numbers are type PRINT CHR$(174), CHR$(106); or look in the marvelous Computer Station *Programmer's Handbook*, which is loaded with information like that; or wait until the program runs.

Line 530 adds the birthday girl's name to the greeting and centers it on the cake—unless N$ is a boy. In that case it adds the birthday boy's name to the greeting and centers it on the cake.

Now run the program, and see what a little enhancement can do. Then,

```
50  REM  LISTING #1
100  TEXT : HOME : CLEAR
110  REM

%%%%%%%%%%%%%%%%%%
%                  %
% HAPPY BIRTHDAY %
%                  %
%%%%%%%%%%%%%%%%%%


120  REM

         PAUL RAYMER
         3464 TOWNHOUSE DR
         LAS VEGAS NV 89121

130  REM
I/XXIX/MCMLXXX

150  DIM B$(15)
160  FOR A = 1 TO 15: READ B$(A):
      NEXT A
170  REM


===============
WHOSE BIRTHDAY?
===============

210  FOR X = 1 TO 15
220 R =  INT (15 *  RND (1)) + 1
230  IF B$(R) = "JOSH" THEN 220
240  REM


================
AGE FIGGER-OUTER
================

320  VTAB R: HTAB 1: FOR A = 1 TO
     39: PRINT B$(R);: NEXT A
330 B$(R) = "JOSH"
340  FOR ZZZ = 1 TO 100: NEXT ZZZ

350  NEXT X
400  REM


=============
LIGHT CANDLES
=============

520  REM


=============
DECORATE CAKE
=============

580  NORMAL : VTAB 23: HTAB 1: END

590  DATA  .,H,A,P,P,Y,*,B,I,R,T,
     H,D,A,Y
```

Listing 1. Your Basic Birthday Cake.

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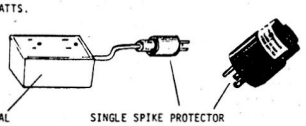

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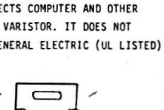

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```
50  REM  LISTING #2
180  INPUT "NAME? ";N$
190  INPUT "AGE? ";AGE:YR = AGE: HOME

200  IF AGE > 38 THEN YR = 1
250  IF YR < 11 THEN B$(R) = B$(R
     ) + B$(R) + B$(R) +  CHR$ (3
     2): GOTO 280
260  IF YR < 14 THEN B$(R) = B$(R
     ) + B$(R) +  CHR$ (32): GOTO
     280
270  IF YR < 20 THEN B$(R) = B$(R
     ) +  CHR$ (32)
280  FOR Y = 1 TO YR
300 P$ = P$ + B$(R)
310  NEXT Y
320  VTAB R + 2: HTAB 1 + (41 -  LEN
     (P$)) / 2: PRINT P$:P$ = ""
360  INVERSE : FOR X = 1 TO 39
370  FOR Y = 18 TO 22 STEP 4
380  VTAB Y: HTAB X: PRINT  CHR$
     (32);
390  NEXT Y: NEXT X
410  FOR X = 1280 TO 1319
420  IF  PEEK (X) = 174 THEN  POKE
     X,106
430  NEXT X
530  VTAB 20: HTAB 13 - ( LEN (N$
     )) / 2: PRINT "HAPPY BIRTHDA
     Y ";N$;
```

Listing 2. Birthday Cake, Part Two.

```
50  REM  LISTING#3
440  IF YR > 19 THEN 490
450  FOR X = 1024 TO 1999
460  IF  PEEK (X) = 170 OR  PEEK
     (X) > 192 THEN  POKE X,32
470  NEXT X
480  GOTO 530
490  FOR X = 1024 TO 1999
500  IF  PEEK (X) = 170 OR  PEEK
     (X) > 192 THEN  POKE X,201
510  NEXT X
```

Listing 3. Birthday Cake, Part Three.

```
50  REM  LISTING #4
370  FOR Y = 18 TO 22
380  VTAB Y: HTAB X: PRINT  CHR$
     (47);
540  VTAB 20: HTAB 3: PRINT AGE;:
      HTAB 36: PRINT AGE
550  FOR X = 1 TO AGE: VTAB 1: HTAB
     20: PRINT X: FOR ZZZ = 1 TO
     300: NEXT ZZZ: NEXT X
570  VTAB 1: HTAB 1: CALL  - 868
```

Listing 4. Birthday Cake, Part Four.

after running the program for several days, you may wish to go on to...

Birthday Cake, Part Three

The program we have run so far is so much fun and so filled with drama, adventure and romance, it's hard to imagine what more delights could be added. But more there are. See Listing 3.

Line 440 changes the format for those folks who are more than 19 years old. No subtle innuendos are made toward our seniors—their contributions toward the sundial, abacus, hourglass and the railroad watch cannot be disputed—but we are now in the Miraculous LXXX's and old ways must make room for the new.

Lines 450–480 perform a novel function. PEEK (X) allows the computer to look at the screen and if certain things are there (like 170's or numbers bigger than 192) they are changed into

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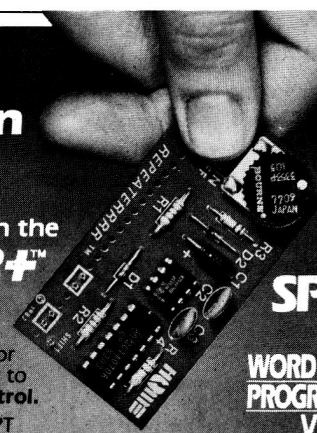

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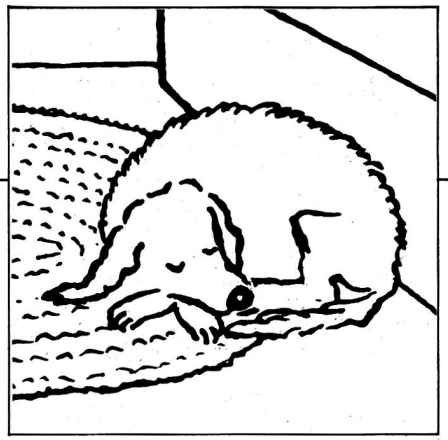

32's. Then the program goes to 530—to avoid stepping all over the routine in lines 490–510 which is reserved for the old-timers.

Lines 490–510 inspect the same area, only instead of changing (poking) things into 32's, it changes them into 201's. Probably has something to do with gerrymandering (the study of old age).

Run the program now and see how, by just a few simple (but devilishly clever) lines, the results change considerably.

Many of you will no doubt consider this program now at its zenith and wish to move on to minor things such as exploring black holes; looking for spelling errors in other magazines; determining mean, median and average prices of WordStar according to mail order discount ads in computer magazines; or memorizing page 149 of the *Apple II Reference Manual*. Others, with word processing programs, may wish to use the global replacement feature and change the word "zenith" to "nadir."

Those of you who have realized it's too late to watch TV, have no homework or reports to do this evening, or are too grouchy to go dating, may wish to try the final enhancement. . .

Birthday Cake, Part Four

You guessed it! Find Listing 4.

Line 370 is changed slightly, reducing the step to 1. This means that Y will no longer be skipping about every fourth time, but will do something every time. Finally.

Line 380 changes dramatically. Up until now only CHR$ (32) has been printed. I just looked on reference page 18 of the *Programmer's Handbook* and was startled to find that ASCII is no more than a space! Wow! That just isn't good enough for an elaborate program such as this. The value is therefore changed to CHR$ (47). Someday I'll check to see what *that* is.

Line 540 prints the birthday person's age at two locations on screen. We have selected VTAB 20, and because of the semicolon after the variable AGE, the HTAB 36 will be on the same line as the HTAB 3.

Line 550 sets up a counting routine on top of the screen and delays the count with the ZZZ for next loop thing. Variables on most Apples (using Applesoft) use only the first two letters (ZZ), but for visual impact one can take

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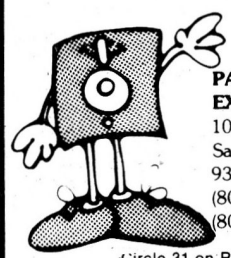

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liberties in naming variables, as I have done in this case. Use of ZZZZZ would have been a bit much, however.

Line 570 uses CALL-868 to clear the line from the cursor, allowing the author one more chance to show off before the program ends. Most professional programmers and a limited number of malcontents may wish to use CALL-936 instead. That is, of course, their option—provided that they have purchased this magazine and did not borrow it at a library or copy this program in a computer store, supermarket or bus station.

Birthday Cake, Part Five

Last but not least, Listing 5.

Line 140 requires the addition of BUZZ = -16336. Those of you with an Apple may recognize this buzzword as one that can make noises later on.

Line 290 makes noises.

Line 380 changes. It makes noises and prints things and more. I wish I really understood some of the stuff I write when I look at it the next morning. Does anyone else have that problem?

Line 420 also changes. It does the same thing it did before, but makes a fuss while doing it.

Line 460 changes. Same thing as above. Note that the values of A change slightly. This is as close to music as I can get since, in frustration, I set fire to my Alf Music Board instruction manual.

```
50  REM  LISTING #5
140 BUZZ =  - 16336
290  FOR A = 1 TO 3:BEEP =  PEEK
     (BUZZ): NEXT A
380  VTAB Y: HTAB X: PRINT  CHR$
     (47);:BEEP =  PEEK (BUZZ)
420  IF  PEEK (X) = 174 THEN  POKE
     X,106: FOR A = 1 TO 2:BEEP =
      PEEK (BUZZ): NEXT A
460  IF  PEEK (X) = 170 OR  PEEK
     (X) > 192 THEN  POKE X,32: FOR
     A = 1 TO 7:BEEP =  PEEK (BUZ
     Z): NEXT A
500  IF  PEEK (X) = 170 OR  PEEK
     (X) > 192 THEN  POKE X,201: FOR
     A = 1 TO 7:BEEP =  PEEK (BUZ
     Z): NEXT A
550  FOR X = 1 TO AGE: FOR A = 1 TO
     3:BEEP =  PEEK (BUZZ): NEXT
     A: VTAB 1: HTAB 20: PRINT X:
      FOR ZZZ = 1 TO 300: NEXT ZZ
     Z: NEXT X
560  PRINT  CHR$ (7); CHR$ (7); CHR$
     (7)
```

Listing 5. Birthday Cake, Part Five.

Line 500 changes. Only the value of the noise changes, and not too much for the better.

Lines 550–560 are added to provide a final flourish in a wonderfully mundane program. The actions are all quite simple and if everything is typed in just as listed, no major malfunctions should occur.

By the way, in line 500 you may want to change the value from 201 to 161 for a different look. That's the nice thing about enhancements—once you get into it there is always *one more*!

The final enhancement is over. You may wish to cancel all engagements for the next several days, order a bucket of chicken or a couple of pizzas and a few six-packs or quarts (liters) of milk (soft drinks), and run Birthday Cake for what may become a diminishing number of friends.

(P.S.)

I wish to thank both of the folks who were kind enough to write and tell me they enjoyed my articles, programs, sense of humor and approach to life, liberty and the pursuit of happiness.

To the hundreds of others who wrote—same to *you*, buddy!

The Paul's Electric Computer Award for Semi-Excellence goes this month to Ellis R. McDaniels of Williamsville, NY for the highest score and most exciting word display for the Scanner program (*inCider*, January issue). The display was GUY.FOX.FUN.HUM.SEX.RUN.GEM.FIX.. (Sorry we cannot publish the rest of the list!)

Bonus Award of the Month: For the folks who asked to see the program I described in the "New Careers" article in the March issue of *inCider*. . . send me a stamped envelope and nine cents in coins or stamps and I'll send you the listing. It *isn't* worth it, but if you send five bucks, I'll forward the program on disk.

Help Wanted Notice: If you write to tell me there are bugs in my programs, that you need help, money, instructions, gambling advice—please enclose a self-addressed stamped envelope. Things haven't been going too well at the crap tables lately and. . . ■

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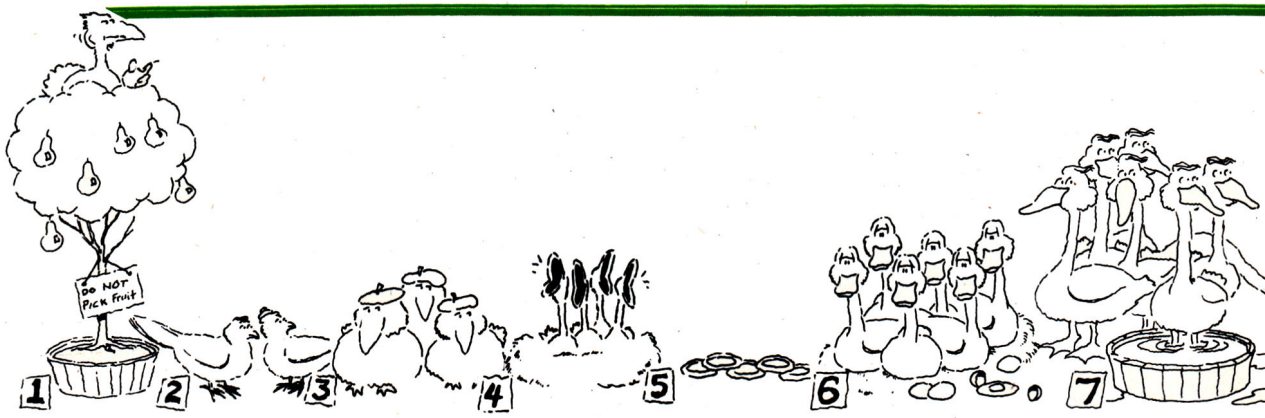

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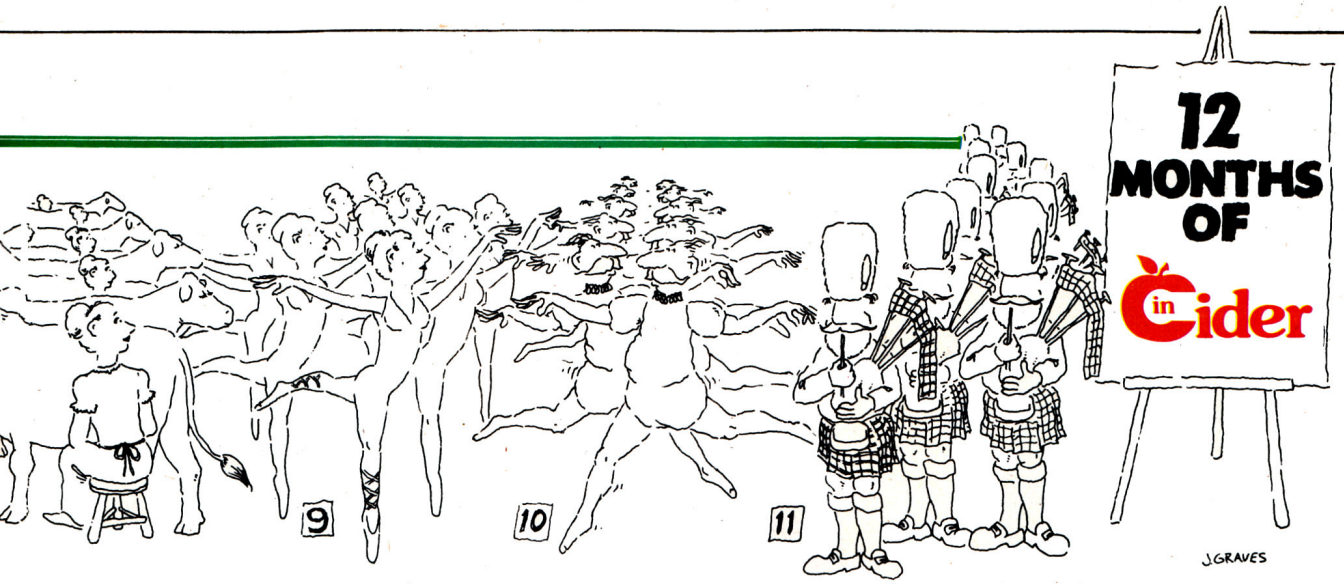

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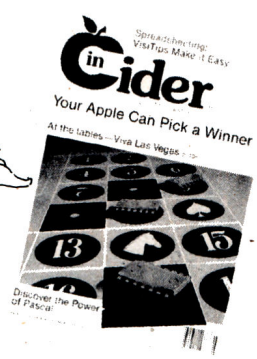

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by Chris Faigle

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Write to Chris Faigle at 3001 River Hills Terrace, Midlothian, VA 23113.

```
20  TEXT : HOME
30  DIM CODES(255)
40  PRINT : INPUT "STARTING ADDRESS? (DECIMA
    L ONLY) ";STAR
50  IF STAR < 256 OR STAR > 1023 AND STAR <
    5392 OR STAR > 40959 THEN 40
60  PRINT : INPUT "LENGTH? (DECIMAL ONLY) ";
    LNGTH
70  IF LNGTH < 1 OR LNGTH > 40959 THEN 60
80  PRINT : INPUT "NEXT ADDRESS? (DECIMAL ON
    LY) ";N
90  IF N < 256 OR N > 1023 AND N < 5392 OR N
    > 40959 THEN 80
100 HOME : PRINT : PRINT "START: "STAR" (DE
    CIMAL)": PRINT
110 PRINT "LENGTH: "LNGTH" (DECIMAL)": PRINT

120 PRINT "NEW ADDRESS: "N" (DECIMAL)"
130 VTAB 15: PRINT "CURRENT ADDRESS: ": PRINT

140 PRINT "NEW ADDRESS: "
150 COUNT = 0
160 FOR X = 0 TO 255
170 READ CODES(X)
180 NEXT X
190 X =  PEEK (COUNT + STAR)
200 VTAB 15: HTAB 18: PRINT COUNT + STAR
210 VTAB 17: HTAB 15: PRINT COUNT + N
220 IF X = 76 OR X = 108 OR X = 32 THEN 290

230 IF CODES(X) = 1 THEN  POKE N + COUNT,X
240 IF CODES(X) = 2 THEN Y =  PEEK (STAR +
    COUNT + 1): POKE N + COUNT,X: POKE N +
    COUNT + 1,Y
250 IF CODES(X) = 3 THEN Y =  PEEK (COUNT +
    STAR + 1):Z =  PEEK (COUNT + STAR + 2):
     POKE N + COUNT,X: POKE N + COUNT + 1,Y
    : POKE N + COUNT + 2,Z
260 COUNT = COUNT + CODES(X)
270 IF COUNT >  = LNGTH THEN  VTAB 21: PRINT
    "**** FINISHED ****": END
280 GOTO 190
290 REM  CODE WAS A JSR OR JMP
300 REM  NEXT SECTION DETERMINES WHETHER OR
     NOT THE ADDRES SPECIFIED WAS IN
310 REM  THE LIMITS OF THE START & START+LN
    GTH LOCATIONS
320 REM  IF IT WAS, THEN CANGE TO NEW ADDRE
    SSES
330 REM  BY ADDING THE (NEW LOCATION-OLD LO
    CATION)
340 Y =  PEEK (STAR + COUNT + 1)
350 Z =  PEEK (STAR + COUNT + 2)
360 A = Z * 256 + Y
370 IF A > LNGTH + STAR OR A < STAR THEN 40
    0
380 A = A + N - STAR
390 Z =  INT (A / 256):Y = A - (Z * 256)
400 REM  POKE VALUES INTO NEW LOCATION
410 POKE COUNT + N,X: POKE COUNT + 1 + N,Y:
     POKE COUNT + 2 + N,Z
420 GOTO 260
430 DATA 1,2,1,1,1,2,2,1,1,2,1,1,1,3,3,1
440 DATA 2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
450 DATA  3,2,1,1,2,2,2,1,1,2,1,1,3,3,3,1
460 DATA  2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
470 DATA  1,2,1,1,1,2,2,1,1,2,1,1,3,3,3,1
480 DATA  2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
490 DATA  1,2,1,1,1,2,2,1,1,2,1,1,3,3,3,1
500 DATA  2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
510 DATA  1,2,1,1,2,2,2,1,1,1,1,1,3,3,3,1
520 DATA  2,2,1,1,2,2,2,1,1,3,1,1,1,3,1,1
530 DATA  2,2,2,1,2,2,2,1,1,2,1,1,3,3,3,1
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560 DATA  2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
570 DATA  2,2,1,1,2,2,2,1,1,2,1,1,3,3,3,1
580 DATA  2,2,1,1,1,2,2,1,1,3,1,1,1,3,3,1
```

Program listing. Binary File Renumberer.

Disk Space— The Final Frontier

We invite you to explore sectors beyond the innermost reaches of inhabited space.

by Bob Brownhill

I always had assumed that when a disk generates a DISK FULL error it really *was* full. A few months ago, I picked up *Beneath Apple DOS* (a fine book by Don Worth and Peter Lechner) and learned that I can increase program storage on my disks by approximately 11%!

A newly initialized DOS 3.3 disk has 560 sectors. Since 48 sectors go toward DOS and 16 go toward the catalog, that leaves 496 sectors for programs. Track 17 sector 0 (called VTOC for Volume Table of Contents) determines whether sectors are free or used (see the Figure); this is the sector you modify to make more free space.

```
                                  VTOC  of  a  just-initialized  DOS  3.3  disk
---------------------------------------
          TRACK 11 (17 DEC) SECTOR 00                    BYTE   PURPOSE
00:04 11 0F 03 00 00 FE 00 00 00 00 00 00 00 00 00   01-02  Address of first
10:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00          Catalog sector.
20:00 00 00 00 00 00 00 7A 00 00 00 00 00 00 00 00   34     Number of Tracks.
30:13 01 00 00 23 10 00 01 00 00 00 00 00 00 00 00   38-39  Map of Track 0
40:00 00 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00          sectors (now used)
50:FF FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00   3C-3D  Map of Track 1
60:FF FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00          sectors (now used)
70:FF FF 00 00 FF FF 00 00 FF FF 00 00 00 00 00 00   7C-7D  Map of Track 17
80:3F FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00          sectors (now used)
90:FF FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00   C0-C1  Map of Track 34
A0:FF FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00          sectors (now free)
B0:FF FF 00 00 FF FF 00 00 FF FF 00 00 FF FF 00 00
C0:FF FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00     Example Sector Map
D0:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   BYTES:    3F        FF
E0:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   Binary 00111111  11111111
F0:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  Sectors FEDCBA98  76543210
                                                  Since 0= used and 1= free,
                                                  only sectors F and E are used.

     To use track 35, I increased byte 34 (52 dec) by 1, and put FF's in bytes
C4 and C5 (196 and 197 dec) to make track 35 all free sectors.

     To remove DOS I put FF's into bytes 3C,3D,40, and 41 (60,61,64,65 dec) to
make tracks 1 and 2 all free sectors.

     To free certain catalog sectors I calculate the new sector map for track
17 (see program) and poke it into bytes 7C and 7D (124 and 125 dec).
```

Figure. The VTOC of a just-initialized DOS 3.3 disk.

The Secret

Since older disk drives only can read 35 tracks (0-34), DOS 3.3 doesn't use track 35. But since most disk drives can use this track, I wrote a routine that initializes a disk (including track 35) and modifies its VTOC to use track 35 as free space (see Listing 1). This yields 16 extra sectors for program storage!

To make the program "Copya" copy a disk that uses Track 35, type in the following program and run it (don't bother to save it). It will create a text file called "Copya 35." Now copy the

```
10 D$ =  CHR$ (4): PRINT
20  PRINT D$;"OPEN COPYA 35": PRINT
     D$;"DELETE COPYA 35"
30  PRINT D$;"OPEN COPYA 35": PRINT
     D$;"WRITE COPYA 35"
40  PRINT "LOAD COPYA": PRINT "BLO
     AD COPY.OBJ0"
50  PRINT "70": REM  PREVENT RELOA
     DING OF COPY.OBJ0
55  PRINT "POKE-16642,36": REM  MA
     KE DOS INIT TRACK 35
60  PRINT "POKE770,36": REM  MAKE
     COPYA READ TRACK 35
65  PRINT "POKE 863,36": REM  MAE
     COPYA WRITE TRACK 35
70  PRINT "RUN"
75  PRINT  CHR$ (4);"CLOSE": END
```

Listing 1. The routine that modifies COPYA to copy track 35.

You can write to Bob Brownhill at 64 Maverick Road, Woodstock, NY 12498.

"Rather than let track 0 be a total waste, I wrote a routine to let you put a boot-up message on sector 1."

```
100  REM  *** DISK SPACE EXPANDER
      ***
110  REM  *** BY BOB BROWNHILL  *
     **
113  PRINT : PRINT  CHR$ (4);"MON
      C,I,O"
115  TEXT : HOME : POKE 47092,1
120  POKE 47083,0: POKE 47091,0:B
     UF = 16384: POKE 47088,0: POKE
     47089,64
130  POKE 768,32: POKE 769,227: POKE
     770,3: POKE 771,76: POKE 772
     ,217: POKE 773,3: REM  ROUTI
     NE TO READ/WRITE SECTORS
140  HTAB 10: PRINT "EXPAND DISK
     SPACE": HTAB 10: PRINT "====
     ==========": PRINT : PRINT
     "BY BOB BROWNHILL"
150  VTAB 8: PRINT "1. INITIALIZE
      DISK (INCLUDING TRACK 35) 2
     . REMOVE DOS FROM DISK
                3. MAKE BOOT-UP M
     ESSAGE ON DOS-LESS DISK4. FR
     EE UNUSED CATALOG SECTORS"
155  PRINT "5. EXIT"
160  PRINT : PRINT "ENTER CHOICE
     ( )"; CHR$ (8); CHR$ (8);: GET
     A$:A =  VAL (A$): IF A < 1 OR
     A > 5 THEN  RUN
170  HOME : ON A GOTO 190,300,400
     ,500
180  END
190  PRINT "THIS OPTION WILL NOW
     TRY TO INITIALIZE": PRINT : PRIN
     "AN ENTIRE DISK, INCLUDING T
     RACK 35,": PRINT : PRINT "WH
     ICH IS NORMALLY NOT USED. IF
      THIS": PRINT
200  PRINT "TAKES MORE THAN 1 MIN
     UTE, YOUR DISK": PRINT : PRINT
     "DRIVE PROBABLY CANNOT READ
     TRACK 35 AND": PRINT : PRINT
     "YOU SHOULD NOT USE THIS OPT
     ION."
210  GOSUB 800:V = 13: GOSUB 850
230  POKE  - 16642,36: REM  TELL
     DOS TO INIT 36 TRACKS
240  PRINT : PRINT  CHR$ (4);"INI
     T HELLO": PRINT  CHR$ (4);"D
     ELETE HELLO"
245  POKE 47083,0: POKE 47091,0: POKE
     47088,0: POKE 47089,64
250  POKE 47084,17: POKE 47085,0:
      POKE 47092,1: CALL 768: REM
       READ VTOC
260  POKE BUF + 52,36: POKE BUF +
     196,255: POKE BUF + 197,255:
      REM  FREE TRACK 35
270  POKE 47092,2: CALL 768: REM
      WRITE VTOC
290  PRINT : INPUT "DONE. IT WORK
     ED FINE. PRESS RETURN";A$: RUN

300  PRINT "THIS OPTION WILL REMO
     VE DOS FROM A DISK.": PRINT
     "TO USE A DOS-LESS DISK YOU
     MUST FIRST": PRINT : PRINT "
     BOOT UP A DISK WITH DOS ON I
     T."
310  GOSUB 800:V = 9: GOSUB 850
330  POKE 47084,17: POKE 47085,0:
      CALL 768: REM  READ VTOC
340  POKE BUF + 60,255: POKE BUF +
     61,255: POKE BUF + 64,255: POKE
     BUF + 65,255: REM  FREE TRAC
     KS 1&2
350  POKE 47092,2: CALL 768: REM
      WRITE VTOC
360  GOTO 490
400  PRINT "THIS OPTION WILL ALLO
     W YOU TO TYPE A": PRINT : PRINT
     "MESSAGE OF UP TO 237 CHARAC
     TERS. THIS": PRINT : PRINT "
     MESSAGE WILL BE PUT ON TRACK
     0, SECTOR1": PRINT
410  PRINT "OF YOUR DOS-LESS DISK
      SO THAT IT WILL BE": PRINT
     "SHOWN EVERY TIME YOU TRY TO
      BOOT THE": PRINT : PRINT "D
     ISK."
420  GOSUB 800:V = 15: GOSUB 850
460  HOME : HTAB 14: PRINT "TYPE
     MESSAGE": HTAB 40: INPUT M$
462  IF  LEN (M$) > 237 THEN  PRINT
     : PRINT "TOO LONG!": FOR I =
     1 TO 2000: NEXT I: GOTO 460
465  IF  LEN (M$) < 237 THEN M$ =
     M$ + " ": GOTO 465
470  FOR I = 0 TO 18: READ A: POKE
     BUF + I,A: NEXT I: FOR I = 1
     9 TO 255: POKE BUF + I,128 +
      ASC ( MID$ (M$,I - 18,1)): NEXT
     I: REM  SET UP SECTOR
480  POKE 47092,2: POKE 47084,0: POKE
     47085,1: CALL 768: REM  WRIT
     E SECTOR
490  PRINT : INPUT "DONE! PRESS R
     ETURN";A$: RUN
500  PRINT "THIS OPTION TURNS 1-1
     4 OF THE CATALOG": PRINT : PRINT
     "SECTORS INTO FREE SPACE. NO
     RMAL": PRINT : PRINT "DOS HA
     S ROOM FOR 105 FILENAMES. TH
     E MORE"
510  PRINT "SECTORS YOU FREE, THE
      LESS ROOM FOR": PRINT : PRINT
     "FILENAMES YOU HAVE.": PRINT
     : PRINT "ENTER NUMBER OF CAT
     ALOG SECTORS TO FREE  (1-14)
      ";
520  INPUT N: IF N < 1 OR N > 14 THEN
      HOME : GOTO 500
530  PRINT : PRINT "THAT LEAVES R
     OOM FOR ";7 * (15 - N);" FIL
     ENAMES."
540  GOSUB 800:V = 16: GOSUB 850
550  FOR I = 0 TO 7: IF N >  = I AND
     I > 0 THEN B1 = B1 + (2 ^ I)

555  IF N - 8 >  = I AND I < 7 THEN
     B2 = B2 + (2 ^ I)
558  NEXT I: REM  COMPUTE VTOC PO
     KES
560  POKE 47084,17: FOR I = 1 TO
     N: POKE 47085,I: CALL 768: IF
      PEEK (BUF + 11) > 0 THEN 57
     0: REM  CHECK FOR EXISTING F
     ILES
565  NEXT I: GOTO 580
570  PRINT : INPUT "FILES EXIST O
     N ONE OF THE SECTORS!!      A
     BORTING ATTEMPT. PRESS RETUR
     N";A$: RUN
580  POKE 47085,0: CALL 768: POKE
     BUF + 125,B1: POKE BUF + 124
     ,B2: POKE 47092,2: CALL 768:
      REM  CHANGE VTOC
590  POKE 47092,1: POKE 48085,N +
     1: CALL 768: POKE LO + 2,0: POKE
     LO + 3,0: POKE 47092,2: CALL
     768: REM  MAKE CATALOG END
600  GOTO 490
800  VTAB 22: PRINT "SHALL I PROC
     EED (Y/N)? ( )"; CHR$ (8); CHR$
     (8);: GET B$: PRINT B$;")"
810  IF B$ = "N" THEN  RUN
820  IF B$ = "Y" THEN  RETURN
830  GOTO 800
850  VTAB V: PRINT "INSERT DISK T
     O DO THIS TO AND PRESS  P": GET
     A$: PRINT A$: IF A$ <  > "P"
      THEN 850
860  RETURN
9999  DATA  173,232,192,162,18,23
     2,189,0,183,32,237,253,224,2
     55,208,245,76,3,224
```

Listing 2. The disk space expander program listing.

files "Copya" and "Copy.obj0" from the system master to the disk with "Copya 35" on it. Now you are done. Whenever you insert this disk and type EXEC COPYA 35, this file will load "Copya" and modify it so that it will copy Track 35.

DOS reserves room for 105 filenames on track 17 (15 sectors of 7 filenames each). Since it is highly unlikely that you'll ever have that many files on one disk, you can use some of these sectors for free space. For example, if you free six of these sectors, you still have room for 63 filenames; if you free ten sectors you have room for 35 filenames (don't worry—my program won't free sectors with filenames on them). Using this option gives a disk from 1 to 14 more free sectors, but be sure you leave enough room for *all* your filenames. Trying to save more files than the catalog can hold generates a DISK FULL error.

I have found it unnecessary to keep DOS on most disks, since I can boot up any other disk with DOS before using them. DOS normally occupies tracks 0, 1, and 2 but the routine I have written makes tracks 1 and 2 free sectors, giving a disk 32 more free sectors!

Unfortunately, track 0 cannot be used for program storage because DOS uses a 00 as its marker for the end of a file's track-sector list. Rather than let track 0 be a total waste, I wrote a routine to let you put a boot-up message on sector 1. Now, instead of booting up gibberish after tracks 1 and 2 are written over, a DOS-less disk will boot up a message. The message can be your name, a list of programs on the disk, or instructions telling the user to boot up another disk with DOS before using the disk.

Caution: This program can do undesirable things to your disks if incorrectly typed in. I suggest you double-check your typing and use the program on a blank disk first, to make sure all options work correctly. The program also could damage your disk if you press RESET while it's writing to disk.

Use the FID program to see how many free sectors you're gaining. If you use all my sector-freeing options your disk will have up to 554 sectors for program storage—58 more than when you started! ■

Friendlier Functions

Try this routine to make programs with user-defined functions easier to use.

by Chuck Baldwin

Upon examination of the large collection of software available for the Apple II, you will find that user-defined functions are frequently employed. In all cases it is necessary to actually write a program line in order to define the function. In most cases the process of writing a new program line is an easy job for someone with a working knowledge of the program as well as the Apple II. However, for the user unversed in the structure and operation of the program or the computer, the entry of a function can be quite time consuming.

The following Applesoft routine makes programs that employ user-defined functions easier to use. Also, the routine may be of interest to those who like to tinker with the Apple II.

What the Program Does

Simply put, the routine allows an input string to define the function. However, since user-defined strings do not directly define a function by the Apple, a technique of program manipulation is employed. This consists of placing two subroutines before the DEF FN statement to enable the string to define the function. The first subroutine finds the address in memory where the function is to be defined, and the second subroutine inserts the string into memory. In addition, as the string is inserted into memory, the computer pays special attention to the numeric functions (sgn, int, sin, cos, . . .) and the arithmetic operators (+, −, *, /, ^) in order for the function to be defined properly.

How the Routine Works

The operation of the routine is not too difficult to follow, except for a few structures that the reader may not recognize. On line 155 the function is entered as a string by the user. The subroutine on line 160 finds and resets FN F(X), while the subroutine on line 165 inserts the string into memory. When processing reaches line 170, the string is correctly inserted into memory and the function is defined. A closer look at the two subroutines will reveal how this is done.

The subroutine called on line 160 begins on line 205 and ends on line 265. The value of the variable M is set to the lowest memory address available to a program (LOMEM), which is 2048 in this case. The program memory is then searched, starting at M, for the key character DEF (ASCII code 184). Once the position of DEF is found, the value of M is reset to the first memory address after the =. Finally, the program line is cleared of anything previously held in memory.

As a note, the colons after the = character denote the memory address where the function will be defined and also clear the previous function out to the end of the line. This is denoted in program memory by the null or control-@ character, and does not affect the defining of the function in any way.

The subroutine called on line 165 begins on line 270 and ends on line 385. On line 285, the variable L is set to the length of the user-defined string, and the variables I and C are counters that denote the positions where program execution is occurring along the user-defined string and the user-defined function, respectively. Line 290 defines a single character and a three-character string from the input string.

Lines 295 through 310 check the three-character string with the numeric functions in the data stack. If a numeric function is found within the input string, the value of T is set to the token value of that numeric function and then poked into a single memory location. Lines 315 through 335 check the single character string with the arithmetic operators. If an arithmetic operator is found, the value of the token is reset and then poked into an appropriate memory location. If no numeric function or arithmetic operator is found, the token is set to the ASCII value of the single character string and poked into memory.

In short, the subroutine steps across the input string, examining single and three-character strings, and pokes the appropriate ASCII code into program memory for the correct definition of the function. The data stack contains the most-used numeric functions, but any function could be pushed into the stack and checked for by the subroutine.

Problems with the Routine

In implementing the routine I have found a few "grey areas" that you should be aware of. First, the input string is not checked for proper syntax,

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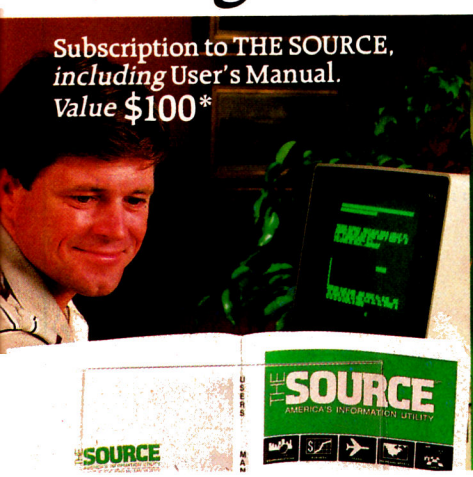

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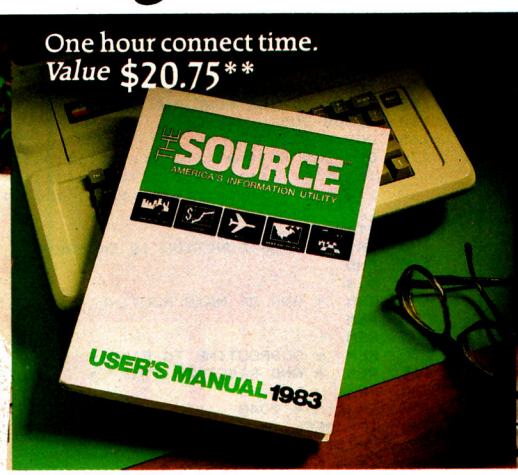

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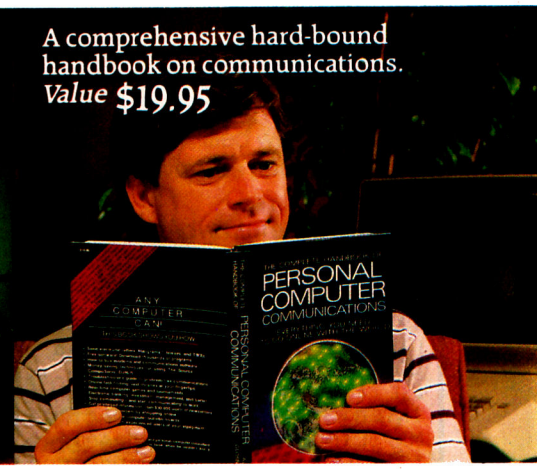

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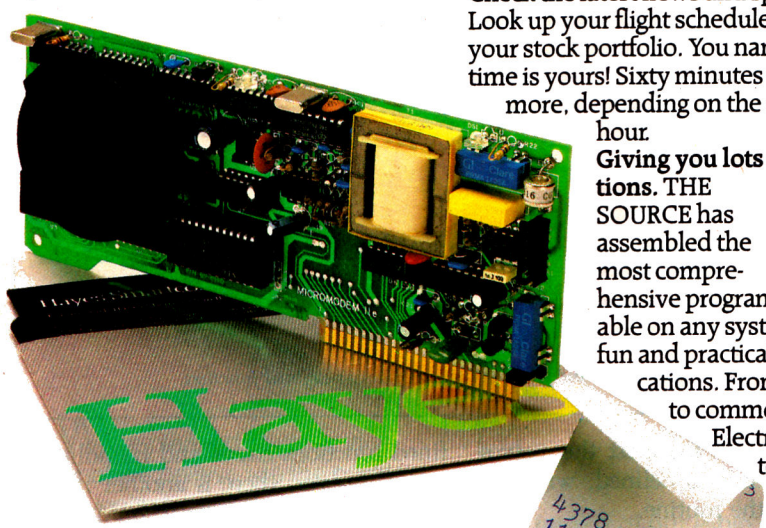

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```
100  REM  **********************
105  REM  *  INPUT OF A USER-  *
110  REM  *  DEFINED FUNCTION  *
115  REM  *         BY         *
120  REM  *  DANNY KUSNIERZ &  *
125  REM  *    CHUCK BALDWIN   *
130  REM  **********************
135  REM
140  REM  +START OF MAIN ROUTINE+
145  REM
150  TEXT : HOME : VTAB 3
155  INPUT "ENTER FUNCTION :";A$
160  GOSUB 205
165  GOSUB 270
170  DEF  FN F(X) = ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     ::::::::
175  VTAB 12
180  PRINT "YOUR FUNCTION IS ENTERED"
185  END
190  REM
195  REM  + END OF MAIN ROUTINE +
200  REM
205  REM
210  REM  * SUBROUTINE TO FIND *
215  REM  * AND RESET FN F(X)  *
220  REM
225 I = 0:M = 2048
230  IF  PEEK (M + I) = 184 THEN  GOTO 240
235 I = I + 1: GOTO 230
240 M = M + I + 7:J = 0
245  IF  PEEK (M + J) <  > 0 THEN  POKE (M + J),58:J = J + 1: GOTO 245
250  RETURN
255  REM
260  REM  * END OF SUBROUTINE *
265  REM
270  REM
275  REM  *   SUBROUTINE TO     *
280  REM  *TOKENIZE INPUT STRING*
285  REM
290 L =  LEN (A$):I = 1:C = 0
295 C$ =  MID$ (A$,I,1):T$ =  MID$ (A$,I,3)
300  RESTORE
305  READ R$,T: IF R$ = "END" THEN  GOTO 320
310  IF T$ = R$ THEN I = I + 2: GOTO 350
315  GOTO 305
320  IF C$ = "+" THEN T = 200: GOTO 350
325  IF C$ = "-" THEN T = 201: GOTO 350
330  IF C$ = "*" THEN T = 202: GOTO 350
335  IF C$ = "/" THEN T = 203: GOTO 350
340  IF C$ = "^" THEN T = 204: GOTO 350
345 T =  ASC (C$)
350  POKE (M + C),T
355 C = C + 1:I = I + 1
360  IF I <  = L THEN  GOTO 295
365  RETURN
370  DATA  LOG,220,EXP,221,COS,222,SIN,223,TAN,224,ATN,225,SQR,218,ABS,212
     ,INT,211,SGN,210,END,0
375  REM
380  REM  * END OF SUBROUTINE *
385  REM
```

Program listing. *Routine for direct input of a user-defined function.*

so errors will not manifest themselves until the function is defined, which is at the end of the routine.

Second, the value of M on line 225 should be set to LOMEM or the location in memory where the search for the character DEF is to begin. LOMEM can be found by typing the following:

```
] NEW
] ? PEEK (106) * 256 + PEEK (105)
```

Third, since this routine will be used as a subroutine in a larger program, care should be exercised in subsequent use of the data stack. Additional data can be input by files or the stack pointer can be reset if a problem with data input occurs.

Overview

As was mentioned earlier, the prime motivation for developing this routine was to make programs with user-defined functions easier and friendlier t use. However, there is another impo tant consideration. The technique th allows a program to actually modify i self is an algorithm that serious App users should be familiar with. The may be applications where this tec nique would make a program perfor much better than normally expected.

Because existing language stat ments are so broad, I don't expect th technique to be used extensively. would recommend that Apple pr grammers reading this article consid altering program memory if existir language statements cannot perfor the functions of a program properl Just remember that modifications program memory by this technique a done by the program, so the operatic of the computer must be taken into a count for an executable machine-lan uage program to be generated. ■

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Determining Decimal Equivalents

by Patricia Higgins

Convert Hex is a short Applesoft program that converts hexadecimal numbers to their decimal equivalents. It's handy to determine the decimal equivalents of addresses, locations of shape tables, and memory locations for peeks and pokes.

Although there are several other conversion programs, including some machine language subroutines, I use mine for quick results or when I need the equivalents of lots of numbers. ■

Write to Patricia Higgins, Route 1 Box 491-R, Lyman, SC 29365.

```
10  TEXT : HOME
20  VTAB 24: PRINT "           (PRESS '/' TO END)";
30  VTAB 10: HTAB 4: INPUT "ENTER HEX NUMBER: $";N$
35  IF  LEN (N$) < 1 THEN  RUN
40 EX = 0:T = 0
50  FOR L =  LEN (N$) TO 1 STEP  - 1
60 P$ =  MID$ (N$,L,1)
70  GOSUB 120
80  NEXT L
90  VTAB 12: HTAB 4: PRINT "DECIMAL EQUIVALENT = ";T
100  VTAB 22: PRINT "      PRESS ANY KEY TO CONTINUE..
     .";: GET K$
105  IF K$ =  CHR$ (47) THEN  HOME : END
110  HOME : GOTO 20
120  IF P$ =  CHR$ (47) THEN  HOME : END
130  IF  ASC (P$) > 64 AND  ASC (P$) < 71 THEN P =  ASC
     (P$) - 55:Z = P * 16 ^ EX: GOTO 290
190  IF  ASC (P$) > 47 AND  ASC (P$) < 58 THEN P =  ASC
     (P$) - 48:Z = P * 16 ^ EX: GOTO 290
200  VTAB 20: PRINT " SORRY - THAT'S NOT A VALID HEX N
     UMBER!": POP : GOTO 100
290 T = Z + T:EX = EX + 1
300  RETURN
```

Program listing. Convert Hex.

How About a Date?

by M. Max McKee

Yes, and right away!

How ridiculous it is to type ##/##/## every time you need a new date entry. Consider those typing time-wasters:

1. The slashes are always in the same places.
2. The year stays the same for 365 days.
3. The month stays the same for 28–31 days.

With that in mind, a date-using program should provide a routine which changes only what needs to be changed (usually the two center digits). At the same time, changing the month or year should at most involve a couple of extra keystrokes.

Also, a program should accept only valid digits. No 13th month. No 31st of April. No 29th of February, except in leap year, of course! To polish it off, the date automatically should be saved to and retrieved from a disk file every time you access the date subroutine.

So, if you want a date, you've got it!

The series of short subroutines shown in the listing cover each of the above requirements, but are arranged so that you can use all or just parts of the features:

Statements 200–204 print the date (stored in Y$).
Statements 205–269 handle the date input.
Statements 275–299 disk read/write the date.
Statements 20–30 and 5000–5200 run the subroutines.

The small but complete program

M. Max McKee is the president of Pear Software. Write to him at 407 Terrace, Ashland, OR 97520.

supplied in the listing will demonstrate how TODAY'S DATE might be included in an opening menu. To set up your own flow, be sure to include all statements between 200 and 299 and refer to the following list of GOSUBs to develop your own program.

GOSUB 200 prints the date (##/##/##).
GOSUB 210 handles all date input.
GOSUB 275 disk reads the date.
GOSUB 285 disk writes the date.
GOSUB 298 closes the disk file.

If you wish to eliminate only the disk access, remove statements 20–27, 275–299, and 5140.

When you first RUN the complete program, the disk will be accessed to read the last date entered. Since no such file yet exists, the ONERR at statement 22 will present ##/##/## after the words TODAY'S DATE. Pressing T will position the cursor over the first number sign. (The cursor will appear over the third # whenever the string Y$ [date] has a value.)

Note that you cannot enter invalid dates and that you aren't allowed to type slashes or other non-numeric characters. When the line contains the desired date, just press RETURN and Y$ will be saved to a disk file called, imaginatively enough, "Date".

Pressing T positions the cursor over the first digit of the middle pair of numbers. If that number is 19, for example, just press 2, then 0, then RETURN. Your date will be accurately changed and stored to disk.

If you typed in 07/31/83 and you wish to advance that date one day, just press the left arrow once to move the cursor from the 3 back to the 7. Type 8 (the cursor will skip over the slash to the 3), then type 0, then type 1 and press RETURN. Once again the entire entry will be updated—and with a minimum of keystrokes!

Want a date? You've got one . . . right away! ■

Program listing. *The How About a Date program.*

```
0  REM DATE SUBROUTINE
20 D$ =  CHR$ (4)
22  ONERR  GOTO 27
25  GOSUB 275
27  GOSUB 298
30  GOTO 5000
200  REM SCREEN PRINT DATE
202 DV = 3: IF  NOT  VAL (Y$) THEN
     Y$ = "##/##/##":DV = 0
203  VTAB V: CALL  - 875: HTAB 1:
      PRINT TI$;Y$
204  RETURN
205  REM VALUE CHECK
207 TY$ = Y$: GOSUB 265: RETURN
210  REM DATE INPUT
211  GOSUB 205:IV = 0
212  VTAB V: HTAB H + DV:CH = DV:
     TY$ = "":DV = 0: IF CH THEN
     TY$ =  LEFT$ (Y$,CH)
213  GET DD$: IF DD$ =  CHR$ (27)
      THEN  CALL 54915: GOTO 5000

214  IF CH < 0 THEN CH = 0
215  IF DD$ < "0" THEN  IF DD$ <
      >  CHR$ (8) AND DD$ <  >  CHR$
     (13) AND DD$ <  >  CHR$ (21)
      THEN DD$ = "A"
216  IF DD$ > "9" THEN  PRINT  CHR$
     (7);: GOTO 213
217  IF  ASC (DD$) = 13 THEN  PRINT
     :Y$ = TY$ +  MID$ (Y$,CH + 1
     ,8): ON  NOT LV OR  NOT MV GOTO
     210: GOSUB 205: ON LV = 2 AND
     MV = 29 GOSUB 256: ON IV GOTO
     210: RETURN
218  IF  ASC (DD$) = 8 AND CH =  <
     1 THEN TY$ = "": HTAB H: PRINT
      LEFT$ (Y$,1): GOTO 212
219  IF  ASC (DD$) = 8 THEN TY$ =
      LEFT$ (TY$,CH - 1):DD$ =  MID$
     (Y$,CH,1): HTAB H + CH - 1: PRINT
     DD$;: HTAB H + CH - 1:CH = C
     H - 1:DD$ =  CHR$ (8): ON CH
      = 2 OR CH = 5 GOTO 219: GOTO
     213
220  IF  ASC (DD$) = 21 THEN DD$ =
      MID$ (Y$,CH + 1,1)
221  IF CH = 8 THEN 224
222  PRINT DD$;:TY$ = TY$ + DD$: GOSUB
     230: IF IV THEN 213
223  IF  LEN (TY$) = 2 OR  LEN (T
     Y$) = 5 THEN TY$ = TY$ + "/"
     : PRINT "/";:CH = CH + 1
224 CH = CH + 1: IF CH = 9 THEN  HTAB
     H + 9:CH = 8
225  GOTO 213
230 IV = 0
231  GOSUB 265: IF LV > 12 THEN  POP
     : GOTO 210
232  ON LV GOTO 234,236,234,238,2
     34,238,234,234,238,234,238,2
     34
233  RETURN
234  IF MV > 31 THEN 250
235  RETURN
236  IF MV > 28 GOTO 255
237  RETURN
238  IF MV > 30 THEN 250
239  RETURN
250 CH = CH - 1:IV = 1: HTAB H +
     CH: IF CH < 1 THEN TY$ = "":
      RETURN
251 TY$ =  LEFT$ (TY$,CH)
252  RETURN
255  IF MV <  > 29 THEN 250

256  IF  INT (RV / 4) = RV / 4 THEN
      RETURN
257 CH = CH - 3: GOTO 250
265  REM DATE VALUES
267 LV =  VAL (TY$):MV =  VAL ( MID$
     (TY$,4,2)):RV =  VAL ( MID$
     (TY$,7,2))
269  RETURN
275  REM READ DATE
277  PRINT D$;"OPEN DATE": PRINT
     D$;"READ DATE": INPUT Y$: RETURN
```

Listing continued.

Listing continued.

```
285  REM SAVE DATE
286  GOSUB 200
287  PRINT D$;"OPEN DATE": PRINT
     D$;"WRITE DATE": PRINT Y$
298  PRINT D$;"CLOSE"
299  RETURN
5000  REM MAIN
5005 TI$ = "<T> TODAY'S DATE: ":V
      = 6:H =  LEN (TI$) + 1
5010  HOME : VTAB 3: HTAB 16: PRINT
     " M E N U"
5020  GOSUB 200: VTAB 8: PRINT "<
      > OTHER SELECTION": VTAB 10
     : PRINT "< > OTHER SELECTION
     ": VTAB 12: PRINT "<Q> QUIT.
     "
5050  VTAB 16: HTAB 14: INVERSE :
      PRINT " MAKE SELECTION ";:
      NORMAL : GET CH$: PRINT CH$

5055  IF CH$ = "T" THEN 5100
5060  IF CH$ = "Q" THEN 5200
5070  GOTO 5050
5100  REM PHONE SEQUENCE
5130  GOSUB 210
5140  GOSUB 285
5150  GOTO 5050
5200  TEXT : HOME : END
6000  REM VARIABLE NAMES
6010  REM
6020  REM CH =CURRENT HORIZONTAL
6030  REM CH$=CHOICE (GET CHAR.)
6040  REM  D$=CTRL-D
6050  REM DD$=DATE DIGIT (GET)
6060  REM DV =DATE VALUE
6070  REM  H =HORIZONTAL
6080  REM IV =ILLEGAL VALUE FLAG
6090  REM LV =LEFT VALUE OF DATE
6100  REM MV =MID. VALUE OF DATE
6110  REM RV =RIGHT VAL. OF DATE
6120  REM TI$=TITLE ON DATE LINE
6130  REM TY$=TEMPORARY Y$
6140  REM  V =VERTICAL
6150  REM  Y$=DATE (MO/DAY/YEAR)

6200  REM OTHER INFO
6210  REM CHR$(8) = LEFT ARROW
6220  REM CHR$(21)= RIGHT ARROW
6230  REM CHR$(13)= RETURN KEY
6240  REM CHR$(27)= ESC KEY
6260  REM CALL54915=CLEAR STACK
6270  REM CALL -875=CLEAR LINE
```

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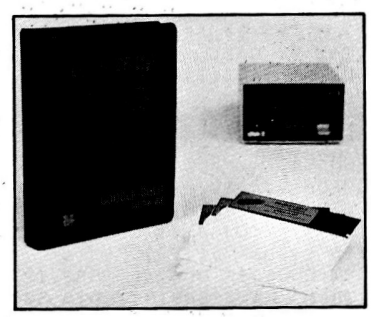

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Applesoft Lazarus

by Edward T. Macke

You must be familiar with this Apple user nightmare: You have just spent an hour or more typing in an Applesoft program. You've tested the program and corrected your typos. Finally everything is working properly, so you prepare to move on to your next program. You enter a NEW command to clear out the existing program, and only then you remember that you haven't saved it! What can you do? Retype the program? Pray for a miracle? Write your Congressman?

If you've chosen option two, your prayers have been answered. It turns out that a miracle is *not* necessary to bring your program back, since the NEW command doesn't destroy your program. Instead, it writes an "End-of-Program" marker at the beginning of the program, and sets an "End-of-Program" pointer (located at $69–$6A) to point to that marker. The machine

```
10    REM
15    REM LAZARUS CREATOR
20    REM
50    ADR = 768
100   FOR I = 1 TO 54: READ
      A: POKE ADR,A:ADR =
      ADR + 1: NEXT
200   PRINT  CHR$ (4)"BSAVE
      LAZARUS,A$300,L$36"
500   DATA 216,165,103,164
510   DATA 104,133,094,132
520   DATA 095,160,001,152
530   DATA 145,094,160,004
540   DATA 200,177,094,208
550   DATA 251,200,152,024
560   DATA 101,094,133,094
570   DATA 144,002,230,095
580   DATA 160,001,177,094
590   DATA 208,232,169,003
600   DATA 024,101,094,133
610   DATA 105,165,095,105
620   DATA 000,133,106,076
630   DATA 242,212
```

Listing 1. Lazarus Creator.

You can write to Edward T. Macke at 5460 Walsh St., St. Louis, MO 63109.

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```
*********************************
;
; Applesoft LAZARUS program
; Written by Ed Macke
; 26 March 1983
;
; Will resurrect a program
; destroyed by a 'NEW' command
;
; To use:
; just 'BRUN LAZARUS'
;
*********************************
;
; Labels
;
INDEX   EQU $5E
TXTTAB  EQU $67
VARTAB  EQU $69
LINKSET EQU $D4F2
;
*********************************
;
        ORG $300
;
; Store start of program
; in index location
;
        CLD
        LDA TXTTAB
        LDY TXTTAB+1
        STA INDEX
        STY INDEX+1
;
; Undo 'End-of-Program' marker
; set by 'NEW' command
;
        LDY #1
        TYA
        STA (INDEX),Y
;
; Find end of this Applesoft line
;
L.1     LDY #4
L.2     INY
        LDA (INDEX),Y
        BNE L.2
;
; Update index to point
; to next Applesoft line
;
        INY
        TYA
        CLC
        ADC INDEX
        STA INDEX
        BCC L.3
        INC INDEX+1
;
; Check if at end
; of Applesoft program
;
L.3     LDY #1
        LDA (INDEX),Y
        BNE L.1
;
; If at end, then save address
; of end of program
; as 'End-of-Program' pointer
;
        LDA #3
        CLC
        ADC INDEX
        STA VARTAB
        LDA INDEX+1
        ADC #0
        STA VARTAB+1
;
; Return to Applesoft
;
        JMP LINKSET
;
*********************************
; End of LAZARUS Program
*********************************
```

Figure 1. Applesoft Lazarus program.

language program in Figure 1 undoes both these actions, restoring your program to its original form.

If you're comfortable with hex notation and the system monitor, you can enter this Lazarus program by going to the monitor (type CALL -151<RETURN>), and then typing:

```
300:D8 A5 67 A4 68 85 5E 84<RETURN>
308:5F A0 01 98 91 5E A0 04<RETURN>
310:C8 B1 5E D0 FB C8 98 18<RETURN>
318:65 5E 85 5E 90 02 E6 5F<RETURN>
320:A0 01 B1 5E D0 E8 A9 03<RETURN>
328:18 65 5E 85 69 A5 5F 69<RETURN>
330:00 85 6A 4C F2 D4<RETURN>
```

Next, type 300.335<RETURN> and check the resulting list to verify that you've typed the above code correctly. Retype any lines which do not match. Then return to Applesoft (3DOG<RETURN>), and type:

```
BSAVE LAZARUS,A$300,L$36<RETURN>
```

Alternately, you could use the following Applesoft program to obtain a working copy of the Lazarus program as shown in Listing 1.

As a final check that you have a working copy of Lazarus, load an Applesoft program from disk and type NEW<RETURN>, then BRUN LAZARUS and list the program, making sure all lines have been recovered.

By the way, Lazarus also will recover programs lost via the FP command, provided the program was stored at the usual location in memory ($800). If you're unsure where the program was stored, you still have nothing to lose by trying Lazarus. ■

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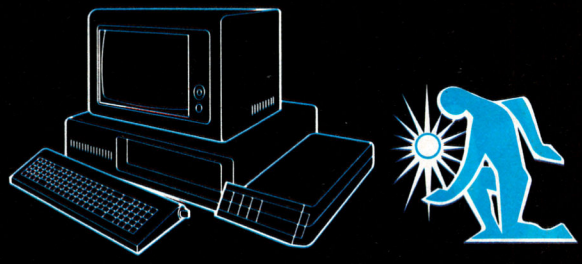

PROMETHEUS

by Dan Bishop

Color Code Combo: An Instructional Game

In my previous two columns, I have dealt with the design of educational programs. The emphasis for both articles was drill and practice, or tutorial, programs. The format for these programs is the same as for a written quiz. The only difference lies in the variety of response and immediate feedback that the computer can provide.

The quiz program is simple to write and easy to mold around any given subject area. However, I believe that educational games and simulations ultimately will be of more value in helping the computer achieve its potential in the classroom. These programs require more imagination and more programming skill, but the results make the effort worthwhile.

In many cases, such programs provide learning experiences that can be obtained in no other way. Furthermore, games and simulations are more interesting to the students. This alone increases their effectiveness.

Color Code Combo

Listing 1 is the code for a game program designed to expand the player's deductive ability. Called Color Code Combo, it first appeared in an article I wrote for the February, 1982, edition of *Microcomputing* magazine. The listing is reproduced here with that magazine's permission.

Color Code Combo is based on Mastermind, a peg board game patented by Invicta Plastics Ltd. of Leicester, England. In the original game, two players are required. One devises a code consisting of colored pegs in a certain sequence. The other must deduce this code sequence by making a series of guesses. After each guess, the code maker makes two responses: how many colors are correct, and how many of the correct colors are in the proper place. Only these two numbers are revealed, never the specific pegs that are correct. The code breaker must deduce the code, within a certain number of guesses, from the code maker's pattern of responses.

Color Code Combo can be played with or without a color monitor. If color is available, the player may choose graphics mode, in which graphics blocks are displayed in color on the screen. Otherwise, text mode, in which single letters are used to represent each peg (R for red, B for blue, etc.), is the only option. The letter codes for the colors appear at the bottom of the screen for reference.

At the start of each game, the player specifies how many colors (three to eight) the computer should use in the code, how long the coded sequence should be (three to eight "pegs") and how many guesses are allowed (four to twelve). The computer then randomly generates a coded sequence of the specified length. Of course, since the colors are randomly selected, a code may consist of all one color, even though you might have specified seven.

After each guess, the program asks if the player wishes to redo the guess (press X), have the guess evaluated (press E), or switch to the other mode, text or graphics (press S).

When the player requests evaluation, the computer displays the number of correctly chosen colors and the number of correctly placed colors, if the player is using text mode. In graphics mode, it displays a row of white and red blocks next to the guess. Each white block represents a correct color that is improperly placed, and each red block represents a correct color that is properly placed. (There is no correlation between the position of a block in the evaluation column and the position of the correctly placed color in the sequence.) Each guess and each evaluation remains on the screen for future reference.

Please note that the evaluations displayed in the two modes are slightly different. For example, in a sequence of seven pegs, if the player has four colors correct and two of these are in the proper position, the text mode response will be 2 and 4, while the graphics mode will display two red blocks and two white blocks.

Color Code Combo becomes a real challenge for an adult if eight colors and eight positions are used! On the other hand, a three color/three position game is suitable for preschoolers, once they understand how to play. With any level of difficulty between these two extremes possible, this game can sharpen anyone's deductive abilities.

About the Program

Take a look at Listing 1. First, the program dimensions three arrays. Since up to twelve guesses are allowed, and since the player can

You can write to Dan Bishop at Custom Comp, PO Box 429, Buena Vista, CO 81211.

Program listing. Color Code Combo.

```
1  REM  COLOR   DEV. FOR APPLE
2  REM   CODE   BY D. BISHOP
3  REM    COMBO    CUSTOM COMP, B
     OX 429
4  REM             BUENA VISTA, C
     O 81211
10  DIM X$(12),CP(12),CC(12)
20  GOTO 1000
29  REM  DELAY LOOP SUBROUTINE
30  FOR I = 1 TO 5000: NEXT : RETURN

39  REM  FLASHING COLOR DOT
40 ZC =  SCRN( H,2 * V)
50  IF ZB = 5 THEN ZB = ZC: GOTO
     70
60 ZB = 5
70  COLOR= ZB: PLOT H,2 * V
80  FOR I = 1 TO 15
90 A = 0:A =  PEEK ( - 16384): POKE
     - 16368,0
100  IF A < 128 THEN 130
110 A$ =  CHR$ (A - 128)
120 I = 15:F1 = 1
130  NEXT I
140  IF F1 <  > 1 THEN 50
150 F1 = 0: RETURN
199  REM  OPTIONS LISTING SUBROUT
     INE
200  HTAB 1: VTAB 23: PRINT "PRES
     S <X> TO CHANGE GUESS; <E> T
     O GRADE;";
210  HTAB 10: VTAB 24: PRINT "PRE
     SS <S> TO SWITCH MODES.";
220  GET A$: RETURN
999  REM  MAIN PROGRAM LISTING
1000  TEXT : HOME : VTAB 10: PRINT
     "**  COLOR  **": PRINT "**
     CODE   **": PRINT "**  COMBO
       **": PRINT
1010  PRINT "<C> 1981 BY D. BISHO
     P"
1020  PRINT "            CUSTOM C
     OMP": GOSUB 30

1030  FOR I = 1 TO 12:X$(I) = "":
     CP(I) = 0:CC(I) = 0: NEXT I
1040  PRINT : PRINT : PRINT "HOW
     MANY COLORS DO YOU ": INPUT
     "WANT TO WORK WITH (3-8)  ";
     C
1050  IF C < 3 OR C > 8 THEN 1000

1060  PRINT : INPUT "HOW LARGE A
     TABLEAU (3-8)  ";T
1070  IF T < 3 OR T > 8 THEN 1000
1080  PRINT : INPUT "HOW MANY GUE
     SSES WILL YOU NEED  (4-12)";
     G
1090  IF G < 4 OR G > 12 THEN 100
     0
1100  PRINT : PRINT "WHICH MODE:
     ";: POKE 50,127: PRINT "C";:
      POKE 50,255: PRINT "OLOR, O
     R ";: POKE 50,127: PRINT "A"
     ;: POKE 50,255: PRINT "LPHAB
     ET?";: GET A$
1110 S = 1: IF A$ = "C" THEN S =
     2: GOTO 1130
1120  IF A$ <  > "A" THEN 1100
1129  REM  RANDOM PROBLEM GENERAT
     OR
1130  DATA  R,B,G,Y,O,W,P,A
1140  FOR I = 1 TO 8: READ A$(I):
     NEXT
1150  RESTORE
1160 R$ = "": FOR I = 1 TO T:R$ =
     R$ + A$( INT ( RND (1) * C +
     1)): NEXT
1199  REM  SET UP DISPLAY
1200  GOSUB 6000: IF S = 1 THEN 1
     220
1210  GOSUB 4000
1219  REM  OBTAIN PLAYERS GUESS
1220  FOR K = 1 TO G
1230 G$ = ""
1240  FOR L = 1 TO T
1250 ZZ = 120 + 40 * K + 2 * L:V =
```

Listing continued.

switch back and forth between text mode and color graphics mode, each guess must be saved in memory. The array named X$ handles this job. The number of correctly chosen colors and the number of those correctly placed are stored in the CC and CP arrays, respectively.

The main program begins at line 1000. Lines 1000–1020 present the title display, and line 1030 initializes the three arrays to zero or a null string. The player then chooses the number of colors allowed in the coded sequence. This value is kept in the variable C.

Lines 1060–1070 ask for the length of the coded sequence and 1080–1090 prompt for the maximum number of guesses. Finally, lines 1100–1120 send a prompt for the player to enter C or A to specify color graphics or alphabet representations of the colors. The variable S is set to one for text display and two for graphics.

Remember, at any time a guess has been entered, but before it has been evaluated, the player may switch modes. This is particularly useful when using a large number of colors that may be difficult to distinguish on some monitors. You can switch to text display to verify the identity of a given block in the graphics display, and then switch back again.

Lines 1130–1160 generate the random code. This is done by reading all eight-letter representations into the A$ array and then, with only the first C elements, selecting at random a sequence of T letters. The code is stored as R$.

The Play

To begin the game, the program sets up the display. Subroutine 6000 provides the bottom four lines, the letter representations for the colors. This subroutine also sets up the text display if S equals one. If S equals two, specifying a graphics display, subroutines 4000, 5000 and 5200 are called.

With the display finished, the program waits for the player to enter a guess. Lines 1220–1310 accept this guess as G$ and display it, one character or colored block at a time in its ap-

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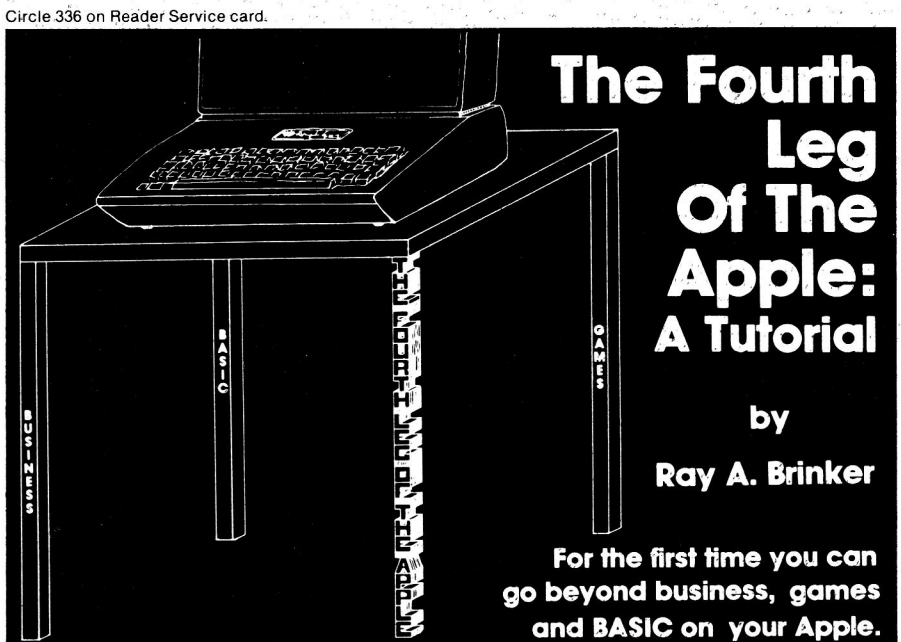

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propriate position in the sequence. Most of the math calculates the appropriate HTAB or VTAB values for text display (as H or V) or the appropriate X and Y positions to plot a specific graphics block.

Now a prompt at the bottom of the screen (from subroutine 200) invites the player to enter either S to switch modes, E to evaluate the guess, or X to repeat the guess before evaluation, so the player can make changes.

Subroutine 1500 evaluates the guess. The first step is to determine the number of exact matches (color and position) and record this as CP(K), this being the K'th guess. Lines 1510–1530 carry out this task with the MID$ function on G$ and R$.

The second step, a more difficult one, requires determining the number of correct colors. The step 1 technique can't be used here, because it would yield repeat counts for repeat colors. For example, if the guess had only one R, yet the code sequence had three, as the MID$ function compared the R with each of the positions in the sequence, the result would come out 3.

To alleviate this problem, the code sequence is temporarily stored in RT$. Then, as each comparison is made between G$ and R$, when a color match is made, R$ is changed by substituting a blank space for that position in the code. Then the MID$ function for G$ is stepped up to the next position in the guess sequence so the process can repeat. Each successive position in G$ is thus compared with all positions in R$, and every time a match is found the substitution procedure takes place.

Lines 1380–1400 display the results of the evaluation on the screen. In text mode # OUT OF # appears alongside the guess. The first number is the number of correctly *placed* colors and the second is the number of correctly *chosen* colors (which must always be the same or larger than the first).

In graphics mode, the results appear as a series of red blocks and a series of white blocks alongside the guess. As mentioned before, the red blocks correspond to the number of

Listing continued.

```
      INT (ZZ / 40):H =  INT (ZZ -
     40 * V)
 1260  IF S = 1 THEN  HTAB H: VTAB
     V: GET A$: PRINT A$;: GOTO 1
     280
 1270  IF S = 2 THEN ZC = 0: HTAB
     39: VTAB 24:X = H:Y = 2 * V:
      GOSUB 40: GOSUB 5000
 1280 G$ = G$ + A$
 1290 X$(K) = G$
 1300 A$ = "":A = 0
 1310  NEXT L
 1320  GOSUB 200
 1330  IF A$ = "S" AND S = 1 THEN
      GOSUB 4000: GOSUB 5200: GOTO
     1320
 1340  IF A$ = "S" THEN S = 1: GOSUB
     7000: GOTO 1320
 1350  IF A$ = "X" THEN 1230
 1360  IF A$ <  > "E" THEN 1320
 1370  GOSUB 1500
 1380  IF S = 1 THEN  VTAB V: HTAB
     26: PRINT CP(K);" OUT OF ";C
     C(K): GOTO 1410
 1390 Y = 2 * V:X = 22: COLOR= 1: IF
     CP(K) <  > 0 THEN  FOR J = 1
      TO CP(K): PLOT X,Y:X = X +
     2: NEXT J
 1400  IF CC(K) <  > 0 AND CC(K) <
      > CP(K) THEN  COLOR= 15: FOR
     J = 1 TO CC(K) - CP(K): PLOT
     X,Y:X = X + 2: NEXT J
 1410  IF CP(K) = T THEN 3000
 1420  NEXT K
 1430  GOTO 3010
 1499  REM  EVALUATION SUBROUTINE
 1500 RT$ = R$:G$ =  LEFT$ (G$,T)
 1510  FOR I = 1 TO T
 1520  IF  MID$ (G$,I,1) =  MID$ (
     R$,I,1) THEN CP(K) = CP(K) +
     1
 1530  NEXT
 1540 J = 0:CC(K) = 0
 1550  FOR I = 1 TO T
 1560 J = J + 1
 1570  IF  MID$ (G$,I,1) <  >  MID$
     (R$,J,1) THEN 1600
 1580 CC(K) = CC(K) + 1: IF J = 1 THEN
     R$ = " " +  RIGHT$ (R$,T - 1
     ): GOTO 1610
 1590  IF J = T THEN R$ =  LEFT$ (
     R$,T - 1) + " ": GOTO 1610
 1595 R$ =  LEFT$ (R$,J - 1) + " "
      +  RIGHT$ (R$,T - J): GOTO
     1610
 1600  IF J < T THEN 1560
 1610 J = 0
 1620  NEXT I
 1630 R$ = RT$: RETURN
 2999  REM  CONCLUDING RESPONSES
 3000  GOSUB 3080: HTAB 1: VTAB 23
     : PRINT "THAT'S IT!!  CONGRA
     TULATIONS.": FOR I = 1 TO 3:
      CALL 64484: NEXT : GOTO 304
     0
 3010  GOSUB 3080: FOR I = 1 TO 50
     :A =  PEEK ( - 16336): NEXT
     : HTAB 1: VTAB 23: PRINT "SO
     RRY... THE ANSWER WAS: "R$
 3020  GOSUB 3060
 3030  HTAB 1: VTAB 24
 3040  PRINT "PRESS ANY KEY TO CON
     TINUE.          ";: GET A$
 3050  GOTO 1000
 3060  IF S = 1 THEN  HTAB 2: VTAB
     19: FOR I = 1 TO T:A$ =  MID$
     (R$,I,1): PRINT A$;" ";: NEXT
     I: RETURN
 3070 X = 2:Y = 10 + 2 * G: FOR I =
     1 TO T:A$ =  MID$ (R$,I,1): GOSUB
     5000:X = X + 2: NEXT I: RETURN

 3080  HTAB 1: VTAB 23: PRINT "

           ";: RETURN : REM  39
     BLANKS
 4000 S = 2: GR
 4010  COLOR= 1: PLOT 0,39: COLOR=
     2: PLOT 5,39
 4020  COLOR= 4: PLOT 10,39: COLOR=
     13: PLOT 15,39
 4030  COLOR= 9: PLOT 20,39: COLOR=
     15: PLOT 25,39
 4040  COLOR= 11: PLOT 30,39: COLOR=
```

Listing continued.

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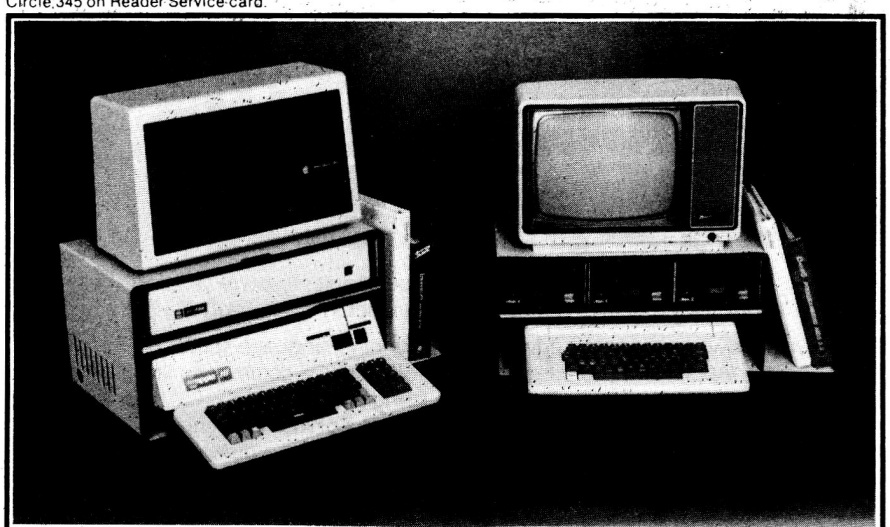

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Listing continued.

```
      7: PLOT 35,39
 4050  IF C <  > 8 THEN  COLOR= 0:
       HLIN (5 * (C - 1) + 1),39 AT
       39
 4060 X = 2:Y = 8
 4070  COLOR= 5: VLIN 0,35 AT 19
 4080  HLIN 0,39 AT 8 + 2 * G
 4090  FOR I = 1 TO 2 * T STEP 2: PLOT
       1 + I,1: PLOT 1 + I,2: PLOT
       21 + I,1: PLOT 21 + I,2: NEXT
       I
 4100  IF K = 0 THEN  RETURN
 4110  FOR I = 1 TO K
 4120  FOR J = 1 TO T
 4130 A$ =  MID$ (X$(I),J,1)
 4140  GOSUB 5000
 4150 X = X + 2: NEXT J
 4160 Y = Y + 2
 4170 X = 2: NEXT I
 4180  GOSUB 5200
 4190  RETURN
 5000  IF A$ = "R" THEN  COLOR= 1:
       PLOT X,Y: RETURN
 5010  IF A$ = "B" THEN  COLOR= 2:
       PLOT X,Y: RETURN
 5020  IF A$ = "G" THEN  COLOR= 4:
       PLOT X,Y: RETURN
 5030  IF A$ = "Y" THEN  COLOR= 13
       : PLOT X,Y: RETURN
 5040  IF A$ = "O" THEN  COLOR= 9:
       PLOT X,Y: RETURN
 5050  IF A$ = "W" THEN  COLOR= 15
       : PLOT X,Y: RETURN
 5060  IF A$ = "P" THEN  COLOR= 11
       : PLOT X,Y: RETURN
 5070  IF A$ = "A" THEN  COLOR= 7:
       PLOT X,Y: RETURN
 5080  COLOR= 0: PLOT X,Y: RETURN

 5200  IF K = 1 THEN  RETURN
 5210 Y = 6
 5220  FOR II = 1 TO K - 1
 5230 X = 22: COLOR= 1:Y = Y + 2
 5240  IF CP(II) <  > 0 THEN  FOR
       J = 1 TO CP(II): PLOT X,Y:X =
       X + 2: NEXT J
 5250  IF CC(II) = 0 OR CC(II) = C
       P(II) THEN 5280
 5260  COLOR= 15
 5270  FOR J = 1 TO CC(II) - CP(II
       ): PLOT X,Y:X = X + 2: NEXT
       J
 5280  NEXT II
 5290  RETURN
 6000  HOME : TEXT : VTAB 21: HTAB
       1: FOR I = 1 TO 8: PRINT A$(
       I);"    ";: NEXT
 6010  PRINT "RED  BLUE GRN  YLW
       ORNG WHT  PINK AQUA"
 6020  FOR I = 1 TO 16: HTAB 20: VTAB
       I: PRINT "*****";: NEXT
 6030  HTAB 1: VTAB 17: PRINT "***
       **************************
       *********": REM  40 STARS
 6040  HTAB 24: VTAB 1: PRINT "COR
       RECT  CORRECT";: HTAB 24: VTAB
       2: PRINT "PLACEMENT  COLORS"
       ;
 6050  FOR I = 1 TO G: HTAB 20: VTAB
       I + 3: PRINT " "I"  ";: NEXT
 6060  HTAB 1: VTAB 1: FOR I = 1 TO
       T: PRINT " *";: NEXT I
 6070  IF C <  > 8 THEN  VTAB 21: HTAB
       (5 * C + 1): FOR I = 1 TO 8 -
       C: PRINT "    ";: NEXT
 6080  IF C <  > 8 THEN  HTAB (5 *
       C + 1): VTAB 22: FOR I = 1 TO
       8 - C: PRINT "    ";: NEXT

 6090  RETURN
 7000 S = 1
 7010  TEXT : HOME
 7020  GOSUB 6000
 7030 H = 0:V = 4
 7040  FOR I = 1 TO K
 7050  FOR J = 1 TO T
 7060 H = H + 2: HTAB H: VTAB V: PRINT
       MID$ (X$(I),J,1);
 7070  NEXT J
 7080 H = 0:V = V + 1: NEXT I
 7090 V = 4
 7100  IF K <  > 1 THEN  FOR I = 1
       TO K - 1: VTAB V: HTAB 26: PRINT
       CP(I);"  OUT OF  ";CC(I);:V =
       V + 1: NEXT I
 7110  RETURN
```

correctly placed colors, just as did the first number in the text evaluation. The white blocks, however, correspond to the number of correctly chosen colors that are *not* in the right position. So the total number of correctly chosen colors (the second number in the text evaluation) is actually the sum of the red and white blocks displayed in the graphics evaluation scheme.

Thinking Ahead

In next month's column, I'll present a subroutine that provides a simple way to set up a variety of menu displays or, for that matter, any type of message you might want to display on the screen. The subroutine allows you to select backgrounds that are black, white or hatched (using any displayable character), with the menu properly centered on the screen and, if desired, surrounded by a box. The lines of the message may be left-justified within the box or each line centered separately. Once this subroutine is in your program, all you'll need to do, besides issuing the appropriate subroutine calls, is define each line of your message or menu as an element in a data list.

I have provided this description somewhat prematurely to encourage you to program this project on your own between now and December's issue. Then you can compare your approach with mine—"learn by doing," so to speak. Homework, no less! ■

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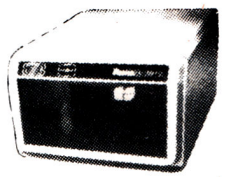

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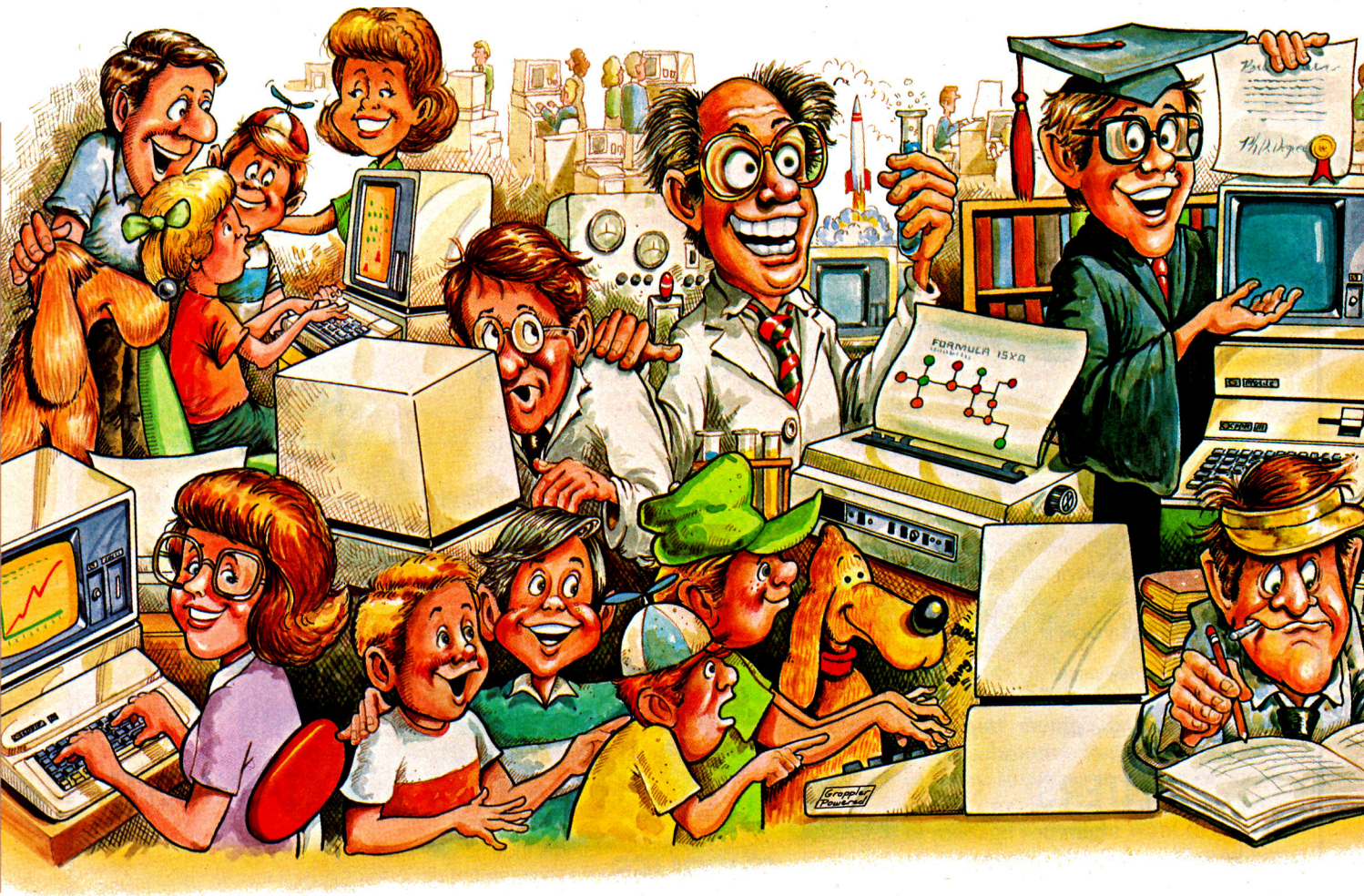

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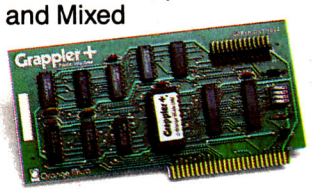

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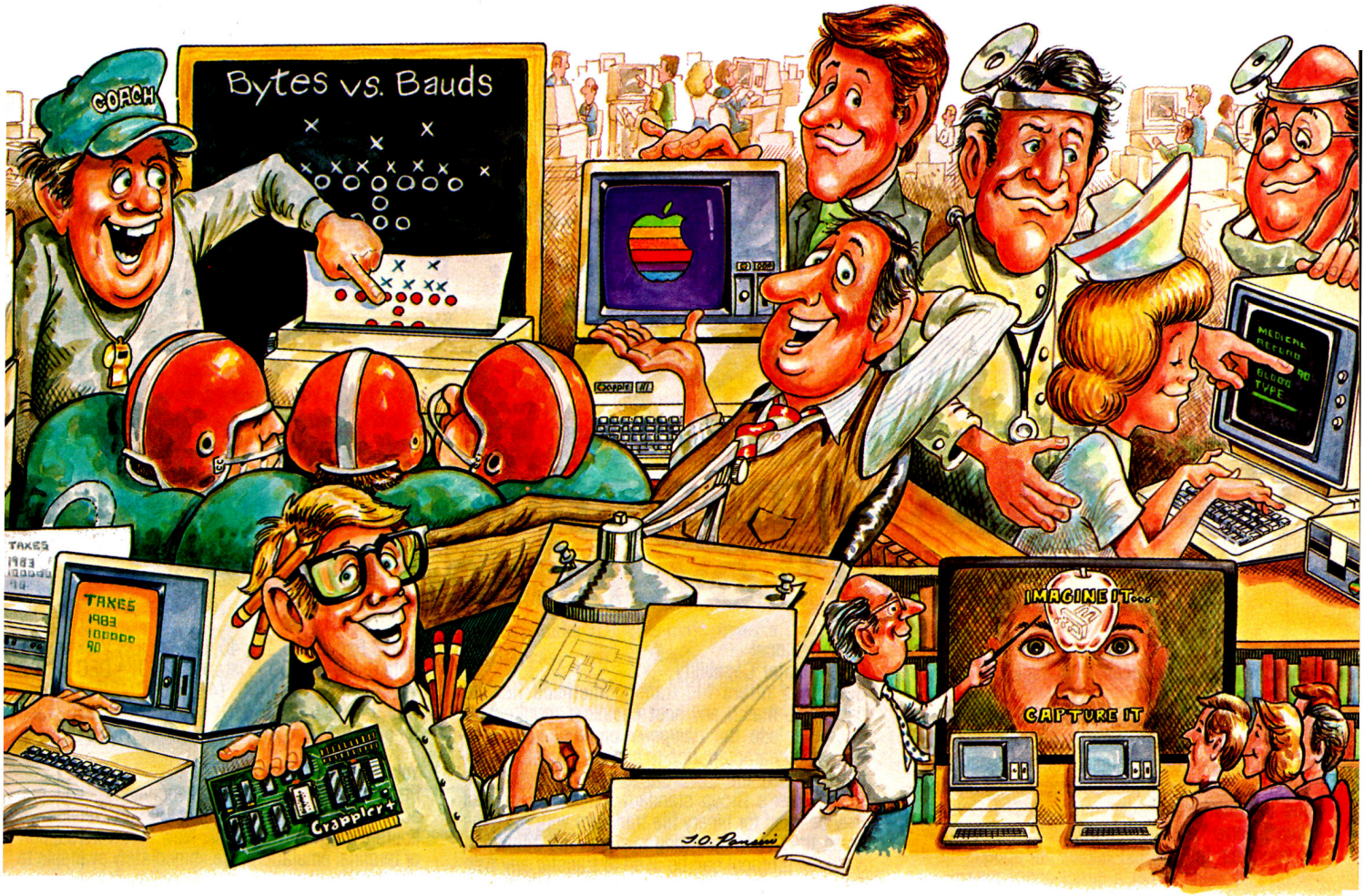

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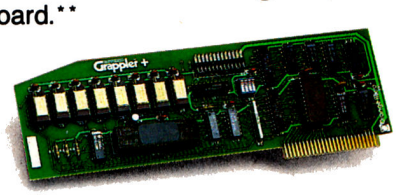

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Bent on Business

by Gregory R. Glau

Quick and Easy Past-Due Notes

So you bought your business a microcomputer to monitor your accounting, payroll and inventory, but didn't invest in a full-blown word processor. Any businessperson has customers who *owe money*; wouldn't it be nice if your microcomputer could send them a few past-due notes? What if it could do that almost automatically? Would it help collections? Cash flow? Of course it would—and that's the point of the Basic program I present.

First, enter your company name and address. If you have more than one business the program will work for them all without changes. Second, when you enter your city, state and zip, the name and address becomes a default value.

For customers who live in the same city as your business, pressing <RETURN> will apply the default value for the city, state and zip to that customer.

Your business name safely entered, the program then goes to the customer section, with space for up to 50 past-due notices. The program asks for the customer's name, address, city, state, zip (enter manually, or use the default value by pressing <RETURN>), and the amount they owe you.

After you enter this data, the program asks about the next customer. When you answer END for the customer's name, you're sent to the printing section of the program. There you may print the letters, or stop.

So your basic flow looks like the Figure.

Lines 100–235 tell what the program does, and let you stop if you wish.

Lines 240–410 let you enter the information about your business name and address, and the date.

Lines 420–520 display your business information and allow you to start over, if you've made a mistake.

```
C$.................Your company name
A$.................Your company address
S$.................Your City / State / Zip
E$.................The date of the letter
Q..................Input to continue the program
C..................Counter
Customer information is stored in single-dimension arrays:
N$(X)..............Customer's name
M$(X)..............Customer's address
O$(X)..............Customer's City / State / Zip
B(X)...............The past-due amount they owe you
X..................counter for the array:
   N$(1) is customer # 1
   N$(2) is customer # 2 and so on.
```

Table 1. Variables used in the program.

Write to Gregory R. Glau, PO Box 1627, Prescott, AZ 86302.

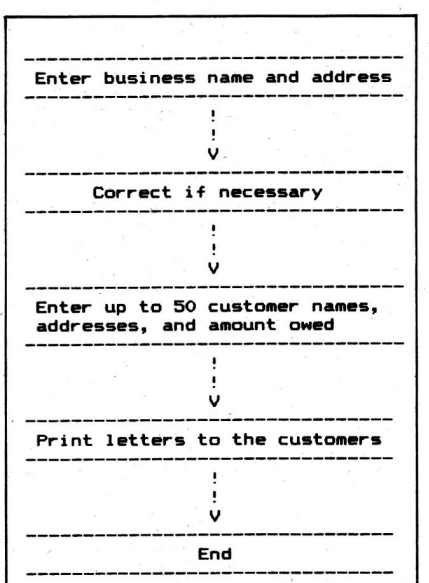

Figure. Flowchart.

```
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    508 MILLER ROAD
    PRESCOTT AZ 86301


                    11/15/83



    MR. AND MRS. WALTER WEBB
    461 CANYON SPRINGS DRIVE
    PRESCOTT AZ 86301

DEAR CUSTOMER:

AS OF TODAY, OUR RECORDS SHOW YOUR ACCOUNT BALANCE IS $ 107.65.

AND, AS YOU KNOW, IT IS NOW PAST DUE.

UNFORTUNATELY, GLAU GAS EQUIPMENT COMPANY
IS A SMALL BUSINESS, AND WE SIMPLY CANNOT AFFORD TO CARRY
PAST-DUE AMOUNTS. WE WISH WE COULD, BUT WE'RE SURE
YOU UNDERSTAND OUR POSITION.

THEREFORE, WE MUST ASK FOR IMMEDIATE PAYMENT OF THIS ACCOUNT.
OTHERWISE, WE CANNOT KEEP THE ACCOUNT OPEN.


                                    SINCERELY,

                                    ------------------------

                                    CREDIT MANAGER
```

Table 2. A sample letter produced by the program.

Listing. Here is the program listing for quick and easy past-due notes.

```
100  HOME
110  VTAB 5
120  GOSUB 11000: PRINT : PRINT
130  PRINT "THIS PROGRAM WILL PRINT PAST-DUE"
140  PRINT "NOTES. IT WILL HANDLE UP TO 50 AT"
150  PRINT "ONE TIME."
160  PRINT
170  GOSUB 11000
180  PRINT
190  PRINT "ANSWER 1 TO CONTINUE...2 TO STOP NOW:"
200  PRINT
210  INPUT Q
220  IF Q = 1 THEN 240
230  IF Q = 2 THEN  PRINT "END OF PROGRAM": END
235  GOTO 100
240  HOME : VTAB 5
250  GOSUB 11000: PRINT
257  PRINT
260  PRINT "PLEASE ENTER YOUR COMPANY'S NAME:"
270  PRINT
280  INPUT C$
290  IF  LEN (C$) > 80 THEN 240
300  PRINT
310  PRINT "PLEASE ENTER YOUR MAILING ADDRESS:"
320  INPUT A$
330  PRINT
340  PRINT "PLEASE ENTER YOUR CITY-STATE-ZIP"
345  PRINT
350  PRINT "(THIS WILL BE A 'DEFAULT'"
355  PRINT "CITY/STATE/ZIP FOR YOUR CUSTOMERS)"
360  PRINT
370  INPUT S$
380  PRINT
390  PRINT "PLEASE ENTER TODAY'S DATE"
395  PRINT " -- LIKE MM/DD/YY --"
400  PRINT
```

Listing continued.

Lines 700–705 dimension the single-dimension arrays N$, M$, O$, and B, used to store information about your customer. N$(1) is the name of the first customer you enter, M$(1) is his address, and so on.

Lines 900–930 set up a loop allowing you to enter up to 50 names and other information. X is the variable used to count inside the arrays.

Lines 10000–10210 form the subroutine that lets you enter customer data. If you enter END for a name, you're sent to the printing section. Otherwise, the program will continue requesting more customer information until all 50 slots are filled.

"The program is completely self-prompting."

Lines 11000–11030 print an inverse line across the screen, with PAST-DUE-NOTE inside it.

Finally, lines 15000–16020 are the printing area of the program. The program will let you quit from here, too, although it double-checks to make sure you didn't press the wrong key. Once you instruct the program to print, it prints letters to as many customers as you've entered information for, then stops.

The program expects your printer to be in slot #1; if it is in another slot, change line 15230 to reflect the proper slot.

The program is completely self-prompting; anyone can follow it and enter the data.

Once you have a customer's name and other information in the system, you cannot correct it. So if you make an error, you waste a piece of paper. All you need is a list with names and addresses of your debtors and you're ready to go. If you have more than 50 names and amounts, RUN the program as many times as necessary.

While you won't get a complete

Listing continued.

```
410  INPUT E$
420  HOME : PRINT
430  GOSUB 11000: PRINT
440  PRINT "HERE ARE YOUR ENTRIES. PLEASE ANSWER"
450  PRINT "1 TO GO ON SO YOU CAN ENTER YOUR"
460  PRINT "CUSTOMER'S NAMES, ETC., OR 2 TO START"
470  PRINT "OVER WITH YOUR NAME (IF YOU MADE A"
480  PRINT "MISTAKE):"
490  PRINT
500  PRINT C$
510  PRINT A$
520  PRINT S$
525  PRINT
530  PRINT "TODAY'S DATE IS ";E$
540  PRINT
550  GOSUB 11000: PRINT
560  PRINT "1 TO ENTER CUSTOMER DATA..."
570  PRINT "2 TO START OVER..."
580  PRINT
585  INPUT Q
590  IF Q = 1 THEN 620
600  IF Q = 2 THEN 100
610  GOTO 420
620  REM : NAME, ETC. IS OKAY.
700  DIM N$(51): DIM M$(51): DIM O$(51)
705  DIM B(51)
710  REM  ^^^ TO MAKE ROOM FOR UP TO 50 ENTRIES AT ONE TIME
720  HOME : GOSUB 11000: PRINT
730  PRINT "NOW, YOU CAN ENTER UP TO 50"
740  PRINT "CUSTOMER NAMES AND ADDRESSES,"
750  PRINT "AND WHAT THEY OWE YOU, AND THEN"
760  PRINT "PRINT PAST-DUE NOTES TO THEM ALL."
770  PRINT
780  PRINT
790  PRINT "ANSWER ";: INVERSE : PRINT "END";
792  NORMAL
795  PRINT " FOR THE NAME WHEN YOU'RE"
800  PRINT "READY TO PRINT."
810  PRINT
820  PRINT "ANSWER 1 TO CONTINUE,"
830  PRINT "ANSWER 2 TO STOP NOW:"
840  PRINT
850  INPUT Q
860  IF Q = 1 THEN 900
870  IF Q = 2 THEN  PRINT "END OF PROGRAM": END
880  GOTO 720
900  REM  WE WANT TO ENTER NAMES AND AMOUNTS NOW
910  FOR X = 1 TO 50
915  IF X = 50 THEN 15000
920  GOSUB 10000
930  NEXT X
10000  HOME
10010  PRINT "...ANSWER ";: INVERSE : PRINT "END";: NORMAL
10012  PRINT " WHEN YOU'RE DONE..."
10013  PRINT
10015  INVERSE : PRINT "         ENTRY # ";X;"      ";: NORMAL : PRINT
10016  PRINT
10020  PRINT "ENTER YOUR CUSTOMER'S NAME:"
10025  PRINT
10030  INPUT N$(X)
10035  IF N$(X) = "END" THEN 15000
10040  PRINT
10050  PRINT "ENTER THEIR STREET ADDRESS:"
10060  PRINT
```

Listing continued.

Basic education with this program, it will help your business, and you can alter it to meet your needs.

You also may want to save customer information on disk, so you'd know who you wrote and when, by designing a text file to accept the information from variables N$(X), M$(X), O$(X), B(X), and E$.

Let this program write a few notes for you. Remember that regular 8½″ × 11″ paper is 66 lines long, so you can experiment with other messages and still use the basic program. If you do add material, you can change the number of spaces at the end of the letter in line 15720. It reads:

```
15720 FOR C = 1 TO 23: PRINT" ": NEXT C
```

This line will print 23 blank spaces following "Credit Manager." If you wish to add 5 text lines in the body of the letter (around line 15600 on), changing the 23 in line 15720 to 18 will set your printer at the proper spot for your next letter.

Once you have the program saved on disk, you can have the program send thank-you notes, sales letters or whatever, just by changing a few lines. And of course, if you put the program to work just as it is now, it's bound to collect some extra cash. ■

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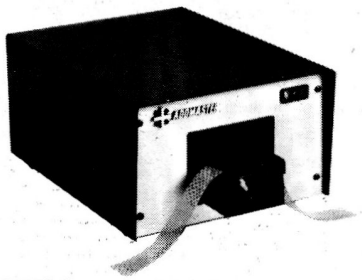

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Listing continued.

```
10070  INPUT M$(X)
10080  PRINT
10090  PRINT "ENTER HIS CITY-STATE-ZIP"
10095  PRINT
10100  PRINT "...THE CITY/STATE/ZIP YOU ENTERED"
10104  PRINT "FOR YOUR COMPANY IS THE 'DEFAULT'"
10106  PRINT "ENTRY - IF YOUR CUSTOMER HAS THE SAME"
10108  PRINT "CITY/STATE/ZIP, JUST PRESS <RETURN>..."
10110  PRINT
10120  INPUT O$(X)
10124  REM  THE NEXT LINE LETS YOU ENTER A DEFAULT FOR THE CITY/STATE/ZIP
10125  IF O$(X) = "" THEN O$(X) = S$
10130  PRINT
10150  PRINT "ENTER THE PAST-DUE AMOUNT:": PRINT
10160  INPUT B(X)
10170  RETURN
10200  REM  ALL ENTRIES HAVE BEEN MADE
10210  REM  GOTO PRINTING SECTION AT LINE 15000
11000  REM  THIS WILL PRINT A LINE ACROSS THE DISPLAY
11005  INVERSE
11010  PRINT "              PAST-DUE-NOTES
11020  NORMAL
11030  RETURN
15000  REM  ASK ABOUT PRINTING
15010  HOME : VTAB 5: GOSUB 11000
15020  PRINT
15030  PRINT "THIS SECTION WILL PRINT NOTES"
15040  PRINT "TO YOUR CUSTOMERS."
15050  PRINT
15060  FLASH : PRINT "TURN ON YOUR PRINTER": NORMAL : PRINT
15070  PRINT "ENTER 1 TO PRINT, 2 TO STOP NOW:"
15090  INPUT Q
15100  IF Q = 1 THEN 15200
15110  IF Q = 2 THEN 15130
15120  GOTO 15000
15130  PRINT : FLASH : PRINT "ARE YOU SURE YOU WANT TO"
15140  PRINT "STOP NOW, WITHOUT PRINTING ANYTHING?": NORMAL
15150  PRINT
15160  PRINT "ANSWER 1 TO PRINT, 2 TO STOP NOW:"
15175  PRINT
15180  INPUT Q
15190  IF Q = 1 THEN 15000
15195  IF Q = 2 THEN  PRINT "END OF PROGRAM": END
15197  GOTO 15000
15200  REM  PRINTING SECTION
15210  HOME
15220 D$ =  CHR$ (4)
15230  PRINT D$;"PR#1"
15235  PRINT "": REM  THERE IS A CONTROL-I 8ON BETWEEN
15236  REM  THE QUOTATION MARKS SO YOU GET A FULL 80-COLUMN PRINTOUT
15330  FOR X = 1 TO 50
15340  IF N$(X) = "END" THEN 16000
15400  REM  THERE ARE 66 LINES TO THE PAGE
15410  FOR C = 1 TO 5: PRINT " ": NEXT
15420  PRINT  TAB( 5)C$
15430  PRINT  TAB( 5)A$
15440  PRINT  TAB( 5)S$
15450  PRINT " ": PRINT " "
15460  PRINT  TAB( 20)E$
15470  FOR C = 1 TO 3: PRINT " ": NEXT
15472  PRINT  TAB( 5)N$(X)
15474  PRINT  TAB( 5)M$(X)
15476  PRINT  TAB( 5)O$(X)
15480  PRINT " "
15485  REM  18 LINES
15500  PRINT "DEAR CUSTOMER;"
15510  PRINT " "
15520  PRINT "AS OF TODAY, OUR RECORDS SHOW YOUR ACCOUNT BALANCE IS $ ";
15530  PRINT B(X);
15540  PRINT "."
15550  PRINT " "
15560  PRINT "AND, AS YOU KNOW, IT IS NOW PAST DUE."
15570  PRINT " "
15590  PRINT "UNFORTUNATELY, ";
15600  PRINT C$
15610  PRINT "IS A SMALL BUSINESS, AND WE SIMPLY CANNOT AFFORD TO CARRY"
15620  PRINT "PAST-DUE AMOUNTS. WE WISH WE COULD, BUT WE'RE SURE"
15630  PRINT "YOU UNDERSTAND OUR POSITION."
15640  PRINT " "
15650  PRINT "THEREFORE, WE MUST ASK FOR IMMEDIATE PAYMENT OF THIS ACCOUNT
      ."
15660  PRINT "OTHERWISE, WE CANNOT KEEP THE ACCOUNT OPEN."
15680  FOR C = 1 TO 4: PRINT " ": NEXT C
15682  PRINT " "
15685  PRINT  TAB( 35)"SINCERELY,"
15687  FOR C = 1 TO 3: PRINT " ": NEXT
15690  PRINT  TAB( 30)"-------------------------"
15695  PRINT " "
15700  PRINT  TAB( 35)"CREDIT MANAGER"
15710  REM  43 LINES WERE USED
15720  FOR C = 1 TO 23: PRINT " ": NEXT C
15800  NEXT X
16000 D$ =  CHR$ (4)
16010  PRINT D$;"PR#0"
16020  PRINT "END OF PROGRAM": END
```

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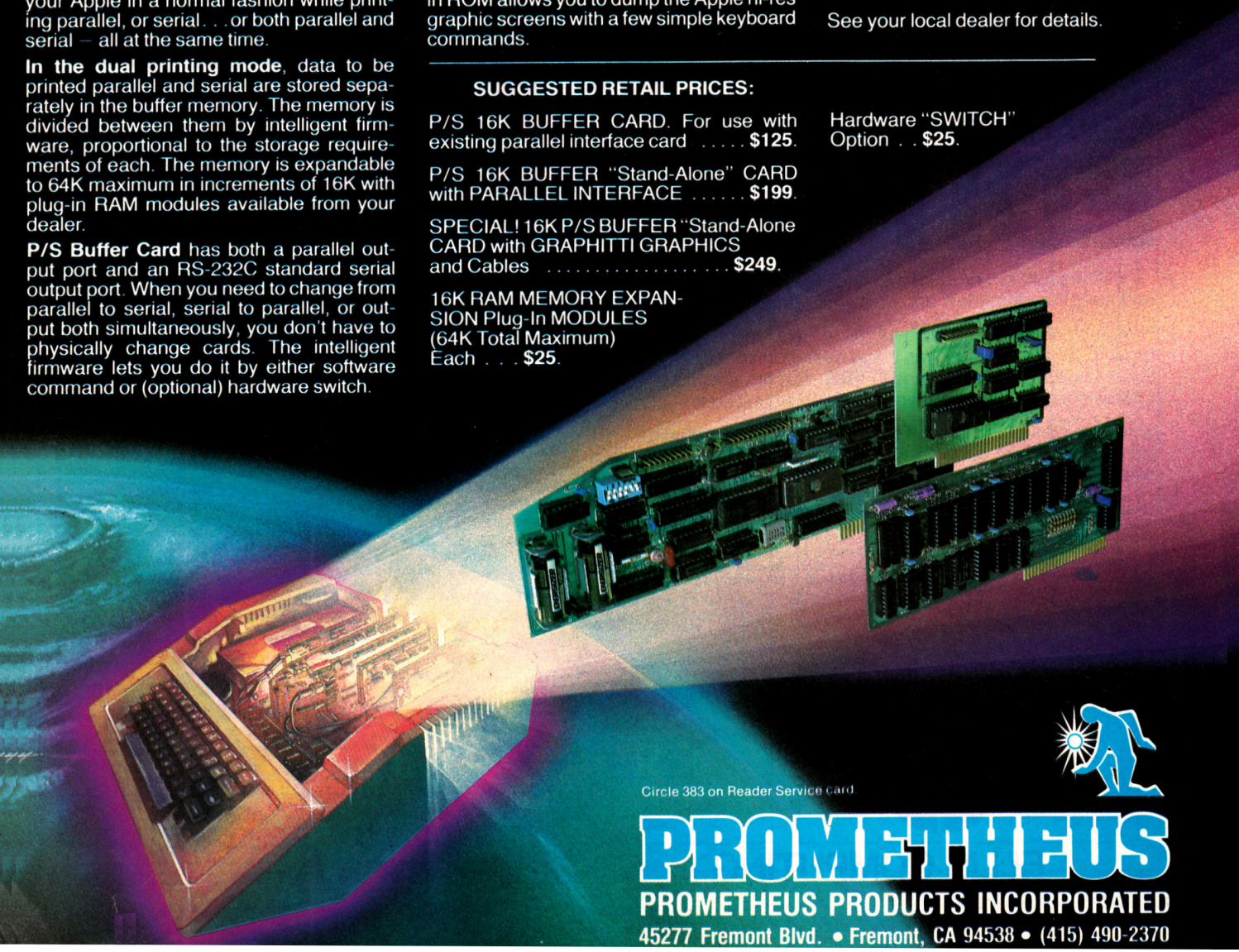

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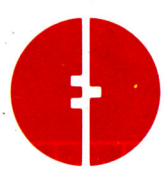

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The Assembly Advantage

by Randy Hyde

6502 Indirect Addressing Modes

The 6502 indexed addressing modes, discussed in last month's column, are useful for implementing small arrays and for accessing elements of strings in known locations. For large arrays, and for arrays and strings whose address is not known at assembly time, the 6502 *indirect indexed* addressing modes are required.

So far you've met three basic types of addressing modes on the 6502 microprocessor: the immediate, the absolute, and the indexed. (For our purposes, the relative addressing mode, used by the branches, is identical to the absolute mode.) An addressing mode specifies where in memory data to be accessed is located. For example, the *immediate* mode tells the 6502 that the data is to be found *immediately after the instruction's opcode byte*. The *absolute* mode, rather than providing the data itself, follows the instruction opcode with the *address of the data* in memory.

The 6502 *indirect* addressing mode is a logical extension of this sequence. Rather than following the instruction opcode with the data to be accessed or the address of the data, it is followed with the *address of the address of the data*. Figure 1 pictures how the various addressing modes function; Figure 2 is a closer view of the indirect mode.

The indexed addressing modes on the 6502 add the contents of the X or Y register to the absolute address that

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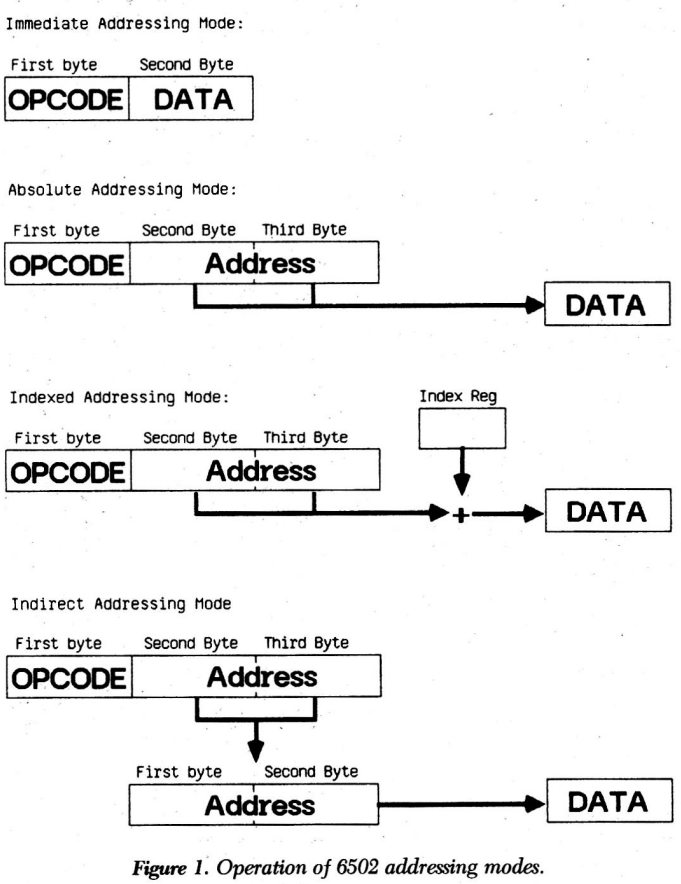

Figure 1. Operation of 6502 addressing modes.

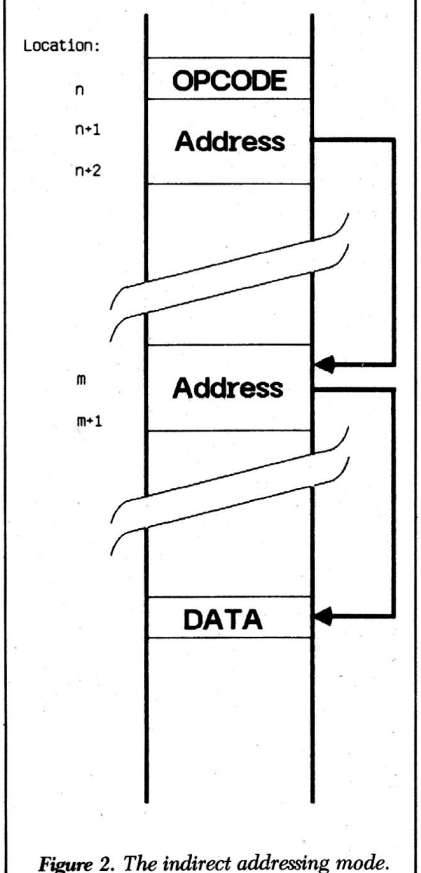

Figure 2. The indirect addressing mode.

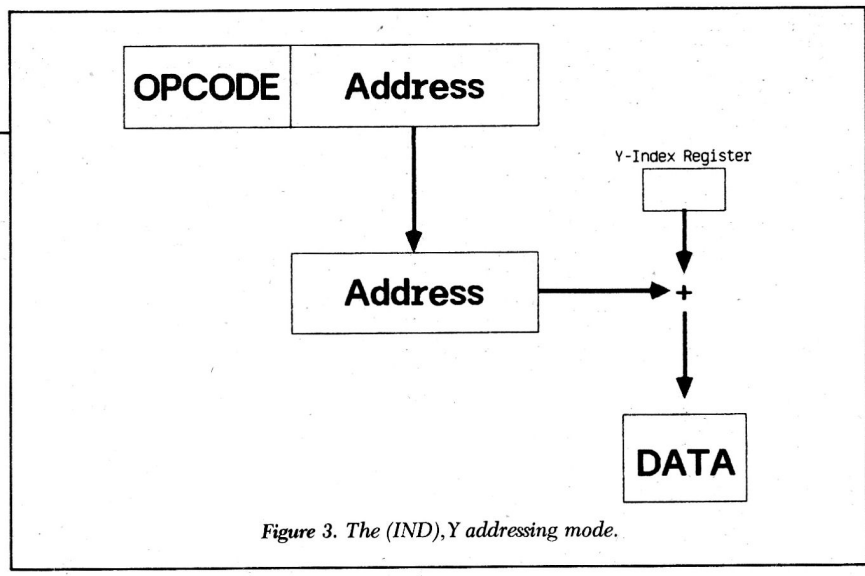

Figure 3. The (IND),Y addressing mode.

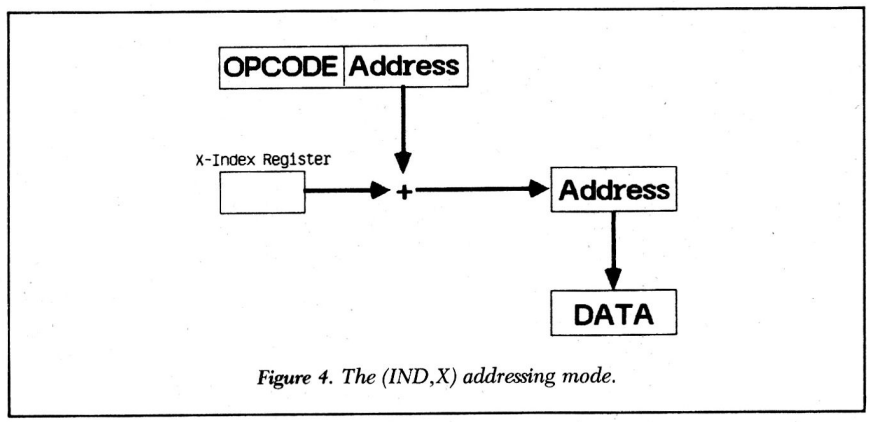

Figure 4. The (IND,X) addressing mode.

follows the instruction opcode to obtain the *effective address*. By applying this same technique to the indirect addressing modes you come up with the *indirect, indexed* mode. When using this mode, the value in the Y register is added to the value pointed at by the byte following the instruction opcode. This sum provides the *true effective address* for the instruction. See Figure 3.

A second form of indirect addressing—*indexed, indirect*—is also available. Here the contents of the X index register are added to the address immediately following the instruction opcode to obtain the address of the address of the data you're interested in. The operation of the indexed, indirect mode is shown in Figure 4.

Nasty Reality #1:
The Indirect Jump Instruction

There's only one problem with the 6502's indirect addressing modes: They can only be used with the JMP instruction. You can't load, add, subtract, or do anything else with them in their pure form.

The syntax for the indirect JMP instruction is:

JMP (ADRS)

where ADRS is the address of a two-byte pointer containing the address where you want to jump. ADRS must point at the low-order byte of the new address, and location ADRS+1 must contain the high-order byte.

There is a nasty little bug in the 6502 chip that can get you into a lot of trouble if you're unaware. The two-byte address pointed at by ADRS *must* be totally contained within a single page of memory. If ADRS holds the value xxFF (where xx is any single-byte value), then the 6502 fetches the low-order byte from location xxFF (as you'd expect) and the high-order byte from location xx00. Note that you really wanted the high-order byte fetched from location yy00, where yy = xx + 1.

Since the purpose of this month's column is to discuss implementing arrays, I will leave the discussion of the JMP indirect instruction for later. Right now let's worry about implementing large arrays with the indirect, indexed addressing modes.

Nasty Reality #2:
The Zero Page Addressing Mode

Unfortunately, I must introduce yet another 6502 addressing mode before continuing the discussion of the indirect mode. In reality, the indirect mode isn't just a combination of two modes (indirect and indexed), but rather *three* modes: indirect, indexed, and *zero page*.

The 64K address space of the 6502 is divided into 256 groups of 256 bytes each. Each block of 256 bytes is called a *page*, and the pages are numbered sequentially. Page zero is the first page of memory (addresses $0000–$00FF), page one is the second page (addresses $0100–$01FF), etc. The zero page addressing mode gets its name from the fact that it only allows you to access the first 256 bytes in the 64K address range, i.e., page zero.

There are two advantages to the zero page mode (compared to the absolute mode): An instruction using the zero page mode is one byte shorter and one microsecond faster than the equivalent instruction using the absolute mode. There are also two big disadvantages: You can only access the first 256 bytes of memory in the 6502's address space, and page zero is prime real estate—everyone else wants to use it too. In particular, DOS, ANIX, Basic, the Apple monitor, Pascal, CP/M (actually the BIOS drivers), SPEED/ASM, and many other programs that your SPEED/ASM program must co-exist with, all use some zero page memory. If you use the same location as SPEED/ASM or DOS, you can make the system crash. So use page zero only when you have to, and make sure you're not using any zero page locations occupied by a coresident system. Typically locations $50–$6F are available when operating SPEED/ASM under Apple DOS.

Declaring a zero page variable is

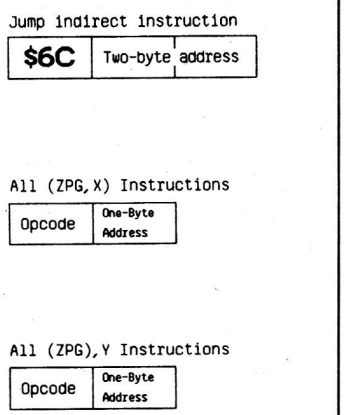

Figure 5. Indirect instruction formats.

done quite a bit differently than declaring normal SPEED/ASM variables. Rather than using the DFS or ADR pseudo-opcode to reserve space for the zero page variable, you must use the EPZ, "equate to page zero," pseudo-upcode. The syntax for EPZ is:

<varname> EPZ <address>

To explain, <address> is the actual address in memory where the variable is to be stored. Since this is a zero page variable, you must make sure that <address> is in the range $00–$FF, or LISA will signal an error when you attempt to assemble the program. Since SPEED/ASM variables (and 6502 pointers for that matter) require two bytes, make sure that both locations <address> and <address> + 1 in page zero are open, because both will be used by the SPEED/ASM routines and the indirect addressing modes.

Once you've "equated" a symbol to a zero page address using the EPZ pseudo-opcode, you can treat that label exactly like any other SPEED/ASM integer variable. To initialize a variable declared in page zero, you could use the LOAD or MOVE SPEED/ASM routine. To access it you could use any valid 6502 instruction (that works with the absolute addressing mode), or any of the SPEED/ASM integer functions like MUL, DIV, PRTINT, etc. When using a pure 6502 instruction, you will usually notice

```
STRPTR    EPZ   $50
;
          JSR   LOAD              ;Copy address of STRING
          ADR   STRING,STRPTR     ; into STRPTR
;
          LDY   #0
PRTLOOP   LDA   (STRPTR),Y
          BEQ   PRTDONE
          JSR   PUTC
          INY
          JMP   PRTLOOP
;
PRTDONE:
```

Listing 1a.

```
          LDY   #0
PRTLOOP   LDA   STRING,Y
          BEQ   PRTDONE
          JSR   PUTC
          INY
          JMP   PRTLOOP
;
PRTDONE:
```

Listing 1b.

```
          JSR   LOAD
          ADR   STRING1,STRPTR
          JMP   PRTIT
          .     .
          .     .
          .     .
          JSR   LOAD
          ADR   STRING2,STRPTR
          JMP   PRTIT
          .     .
          .     .
          .     .
          JSR   LOAD
          ADR   STRING3,STRPTR
          JMP   PRTIT
          .     .
          .     .
          .     .
PRTIT     LDY   #0
PRTLOOP   LDA   (STRPTR),Y
          BEQ   PRTDONE
          JSR   PUTC
          INY
          JMP   PRTLOOP
;
PRTDONE:
```

Listing 2.

that only two bytes of object code (instead of the normal three) are emitted. This is because the high-order byte of zero is implied by the use of the zero page addressing mode.

Back to the Indirect Addressing Modes

Before I digressed to a discussion of the zero page addressing mode, I mentioned that the indirect, indexed, and the indexed, indirect modes are actually combinations of three modes: indirect, indexed and zero page. All indirect instructions (except jump indirect) are two bytes long. The first byte is the 6502 opcode and the second byte is the zero page address of the pointer to the memory location you're interested in. See Figure 5.

Note that the program sequences in Listings 1a and 1b perform equivalent functions. Also note that in the case of the indirect, indexed-by-Y mode you are still limited to 256 bytes due to the Y index register's 8-bit limitation. So why use the indirect addressing mode? It doesn't appear to provide any additional features; in fact, it makes a somewhat complex process (indexed addressing) even more complex.

Its beauty lies in the fact that the pointer can be changed *under program control*. For example, the Listing 1a program segment (using the indexed mode) is forever limited to printing the string STRING. Listing 1b can be changed to print any string

```
;    Assume SPEED/ASM variable "I" contains the
;    index into the byte array "B".
;
          CLC
          LDA   I
          ADC   #B
          STA   ARRAYPTR
          LDA   I+1
          ADC   /B
          STA   ARRAYPTR+1
;
          LDY   #0
          LDA   (ARRAYPTR),Y      ;Loads B[I] into accumulator.
```

Listing 3.

by simply changing the LOAD instruction before the print loop. For example, consider the code in Listing 2. One of three different strings will be printed, depending upon the value loaded into STRPTR.

While this example certainly justifies the existence of the indirect, indexed-by-Y mode, it still doesn't show how to access more than 256 bytes using the indirect mode. And that's the whole purpose of this month's column—to describe how to access elements of an array containing more than 256 bytes.

The secret to accessing large blocks of data using the indirect addressing mode is to modify the two-byte pointer instead of the Y register. By setting the Y register to zero (which makes the indirect, indexed-by-Y mode behave *exactly* like a true indirect addressing mode) and then incrementing the two-byte zero page pointer, you can access up to 64K of data (the amount of memory accessible with a two-byte pointer). If that's not enough memory, you're using the wrong microprocessor!

To access an element of a byte array that contains more that 256 elements, the address of the desired element can be computed by the formula:

<adrs> = <base address> + <index>

where <base address> is the address of element zero of the array and <index> is the number of the desired array element. This calculation can be performed using the 6502 code in Listing 3.

When accessing elements of an integer array, don't forget that each element requires two bytes, so the index value must be multiplied by two before adding it to the base address. The quickest way to double the index is to shift it one position to the left. This is accomplished with the code in Listing 4.

The ASL instruction shifts the data in memory location I to the left one position. A zero is shifted into the low-order bit position, and the data in bit number seven is shifted into the carry flag. The ROL (rotate left) instruction shifts the high-order byte of I. The difference between the two instructions is that the contents of the carry flag (i.e., the bit shifted out of bit seven of the low-order byte) is shifted into the low-order bit of location I + 1.

In many cases it won't matter if you double the value of I. Sometimes you will reload it anyway. But in some instances, particularly if I is the index variable of a FOR loop or some other control variable, you can't leave the value doubled. To undouble a value (divide it by two) the LSR (logical shift right) and ROR (rotate right) instructions are used after the calculation to restore the value of I. *Note that the high-order byte of I is shifted to the right before the low-order byte.* This is exactly opposite to when the shift left function is used to double the value. I'll talk more about the shift instructions in a future column; for now, just duplicate these instructions verbatim.

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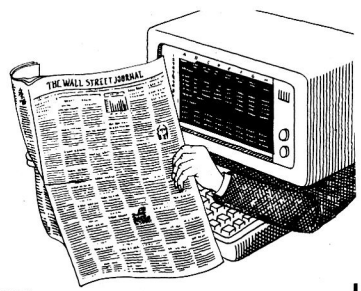

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```
        ASL   I              ;Multiply the index by two
        ROL   I+1            ; before adding it to the base address.
        CLC
        LDA   I
        ADC   BASE
        STA   ARRAYPTR
        LDA   I+1
        ADC   BASE+1
        STA   ARRAYPTR+1
;
        LDY   #0
        LDA   (ARRAYPTR),Y   ;Get L.O. byte of array element.
        STA   J              ;Save L.O. byte.
        INY
        LDA   (ARRAYPTR),Y   ;Get H.O. byte of array element.
        STA   J+1            ;Save H.O. byte.
;
        LSR   I+1            ;Divide the index by two to
        ROR   I              ;set it to its original value.
```

Listing 4.

Multi-Dimensional Arrays

Handling one-dimensional arrays is easy. The formula:

<adrs> = <base address> + (<index> *<element size>)

(where <element size> is the number of bytes required by each array element) is completely adequate. Multiple-dimension arrays are a little more difficult and a lot more time consuming.

For a two-dimensional array, the formula becomes:

<adrs> = BA + (NDX1 + NDX2*SIZE1)*WS

where BA is the base address of the array dimensioned as ARRAY[SIZE1, SIZE2] and accessed as ARRAY[NDX1, NDX2], and each element occupies WS bytes. The multiplication by WS is easy, assuming a character or integer array. Shift to the left if integer, and ignore the multiplication by WS if character. The other multiplication (NDX2*SIZE1), however, cannot be handled with a simple shift in most cases. This one requires a real multiply, and multiplies are very slow.

Three-dimensional arrays are even worse—two multiplies are required. The formula for calculating the address of an element of a three-dimensional array is:

<adrs> = BA + (NDX1 + (NDX2 + (NDX3*SIZE2))*SIZE1)*WS

If you need to use higher-dimensioned arrays, consider using a high level language capable of supporting your data structure needs.

Speeding Things Up

Normally when you access array elements you go for adjacent elements rather than random locations within the array. Once you've calculated the address of an element, obtaining the addresses of adjacent elements is easy. If you want to access the *next* location, simply add WS to the current address. If you want to access the *previous* location, subtract WS from the current address.

When dealing with byte (character) arrays, all you need do is increment or decrement the address by one. While you *could* use the ADC instruction sequence to add one to the pointer, there is a tricky way to add one quickly to a two-byte integer value. The code to accomplish this is:

```
        INC   VAR
        BNE   >0
        INC   VAR+1
^0:
```

where VAR is the name of the pointer (or any SPEED/ASM or two-byte integer value) you wish to increment.

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How does it work? Well, the first increment instruction adds one to the low-order byte of the variable. Now, the only time overflow occurs when incrementing by one is with the value $FF because then you wind up with $00. This is the *only* time you wind up with zero, and likewise it's the only time the 6502 zero flag is set after the increment. Whenever overflow occurs, you must add one to the high-order byte of the variable, so the BNE instruction skips the INC VAR+1 instruction. If the Z flag is set, then the 6502 drops through and increments the high-order byte.

The sequence above only works for character or single-byte arrays. When dealing with an integer array you need the code:

```
CLC
LDA   VAR
ADC   #2
STA   VAR
BCC   >0
INC   VAR+1
^0:
```

I could have incremented VAR twice, but this code is faster and shorter. Incidentally, the trick here is to recognize that only the carry gets added to VAR+1, so rather than perform the explicit addition, I only incremented VAR+1 whenever there was a carry out of the low-order byte. This trick can be used when adding any 8-bit value to a 16-bit integer variable.

The Indexed-by-X, Indirect Addressing Mode

The indexed-by-X, indirect addressing mode on the 6502 is severely handicapped by the requirement of zero page. The way this mode works is, the X register is added to the zero page address that follows the instruction opcode. Then this sum points at the low-order byte of a pointer that points to the data to be accessed. This addressing mode lets you set up a table (or array, if you will) of pointers, and index into this array of pointers to find the data. Unfortunately, this mode presupposes lots of zero page at your disposal. Since this is probably not the case, the indexed-by-X, indirect addressing mode isn't very useful.

There is one exception, however. If you load the X register with zero, then the indexed-by-X, indirect mode degenerates to a pure indirect addressing mode. Since this is usually what you're interested in when accessing an element of a multi-dimensional array, the indexed-by-X, indirect addressing mode may prove useful on occasion. ■

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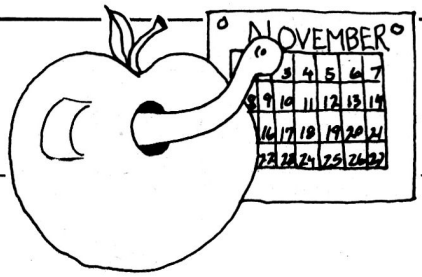

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Wichita, KS 67208
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PO Box 639
Silver Spring, MD 20901
(301) 589-8142

November 9–11
Using Technology in Math Education
Philadephia, PA
contact:
National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091
(703) 620-9840

November 10–12
Colorado Springs Regional Math Conference
Colorado Springs, CO
contact:
NCTM Convention Dept.
1906 Association Drive
Reston, VA 22091
(703) 620-9840

November 11–13
1983 Philadelphia Area Computer Show
Philadelphia, PA
contact:
Mike Tankle
(215) 745-4914

November 17–19
5th Annual Northeast Computer Show and Software Exposition
Boston, MA
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Northeast Expositions
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(617) 739-2000 (in MA)

November 28–December 2
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National Computer Graphics Assoc.
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Washington, DC 22036
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December 12–14
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Arlington, VA
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Atlanta, GA 30332
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Computer Networking Symposium
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January 20–24
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Dallas, TX
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January 31–February 3
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If you are organizing, or otherwise know of, an event important to Apple users, and would like it listed in the **inCider** *Calendar, please drop us a line at* ***Pine Street, Peterborough, NH 03458****. Include the name of the event, the date, the location, and the name of a contact for further information.* —*the editors*

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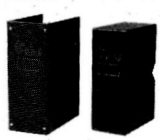

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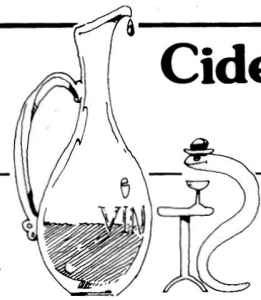

Cider Vinegar

Remark Reminder Made Easy, May

When I saw "Remark Reminder Made Easy" by David Schroeder in the May, 1983 issue of *inCider*, my first response was to key the Remark Extraction program into the Apple IIe at work to help keep better track of our programs. At first all seemed to work, but then a flaw in the listing caught my eye.

Listing 1a included here shows the line numbers reported by the program as listed in the magazine. Listing 1b shows the correct line numbers reported when lines 86 and 87 are deleted, or at least replaced by NOPs. I had to make a crash study of 6502 assembly language to find the flaw and offer my observations to help anyone who has had similar problems recover with less effort.

Bruce Dagel
617 Orange St.
Muscatine, IA 52761

Control Character Maze, July Hints 'n' Techniques

We have a correction and a few additions to make to the Control Character Maze Chart on pages 154 and 155 in July's Hints 'n' Techniques. Under the Apple Monitor Code column, control-D is listed as the character that displays the contents of the 6502 registers. This is incorrect; it should be control-E. Also in this column, control-M should be shown as producing a Return. In the Applesoft column, you should pencil in that control-J produces a Line Feed. If you have any additions to

```
00000 - ESTIMATE
00919 - BREAK UP A$ TO FIT 40 COLUMNS
01090 -  CENTER STRING A$
00890 -  RETURNS TO X/T
00909 - TT=0, MILL; TT=1, SAW; TT=11, ROUGH GROOVE; TT=12, FIN. GROOVE
01680 - 89 = "Y"
01839 -  MM-200 ENTRY
01719 -  EA,EB OR CINTIMATIC ENTRY
03439 -  LEBLOND ENTRY
07359 -  NEW MACHINE
08919 -  QUIT
55499 - OPERATION REPORT
50060 - DA$ date                PR$  programmer's name
50061 - CN$ customer's name     PN$  part number (P/N)
50062 - CN  cut number          SIze tool size (diameter)
50063 - OP  operation number    MT   machine type pointer
50064 - TN  tool number         TT   tool type pointer
50065 - RAp tool rapid time     TRav cut length & rapid distance
50066 - Z   formatting input    ZS   decimal point location
50067 - Z$  variable formatted for printing
50068 - T   rapid traverse rate for the machine in use
50069 - TL  tool's cut I. D. letter ASCII code
50071 - RC  rapid traverse approach/retract constant
50075 - I,J,K  are general purpose variables.
50076 - A$,B$  are general purpose strings.
50077 - TT$()  tool text for disk file or tool list
50400 - INdex  number of indexes or degrees to index
50403 - CUt    time taken to make all cuts for 1 area
50404 - LOde   is the load/unload time (LOAD is a BASIC keyword)
50480 - SUm(0) is the accumulator for oper. machining time.
50481 - SUm(1) is the accumulator for oper. rapid traverse time.
50483 - SUm(3) is the accumulator for oper. number of indexes.
50484 - SUm(4) is the accumulator for oper. index time.
50865 -  ****************************************
50866 -  ****************************************
50867 -  ***                                  ***
50868 -  ***         SCHMARJE TOOL CO.        ***
50869 -  ***       ESTIMATE PROGRAM           ***
50870 -  ***      APPLE II VERSION 1.00       ***
50871 -  ***        COPYRIGHT 1983            ***
50872 -  ***     WRITTEN MARCH 11, 1983       ***
50873 -  ***         BY BRUCE DAGEL           ***
50874 -  ***   LAST CHANGE APRIL 15, 1983     ***
50875 -  ***                                  ***
50876 -  ****************************************
50877 -  ****************************************
```

Listing 1a. Listing reported by Remark Extraction as published.

the Control Character Chart, let us know about them. We want the chart to be as comprehensive as possible.

—the editors

Undeleter, July Hints 'n' Techniques

Malcolm Cox's Undeleter program on page 147 in the Hints 'n' Techniques column of the July issue has a severe flaw. Undeleter does not restore the marking of the file's sectors to indicate that they are again in use. Thus, when something new is saved to the disk, DOS may overwrite the sectors used by the "restored" file because it sees the sectors as unallocated storage space.

The solution to this problem is to, upon exiting Undeleter, immediately load the "restored" file into memory (DOS can read the file if nothing has been saved on top of it) and then save it to the disk again.

Rudie W. Slaughter, III
5341 Essex Court #51
Alexandria, VA 22311

Poking Perfection Part III, June

I found an error on page 122 in A.E. Doughty's "Poking Perfection Part III" in the June *inCider*. He states that a value of 35 results in a color combination of light blue (top) and dark blue (bottom). I think if he checks his math, he will find the correct value is (light blue = 7) + ((dark blue = 2)*16) = 39. The value of 35 results in purple (top) and dark blue (bottom) or (purple = 3) + ((dark blue = 2)* 16) = 35.

Mike Van Winkle
802 Barry #903
Corpus Christi, TX 78411

```
00000 - ESTIMATE
00999 - BREAK UP A$ TO FIT 40 COLUMNS
01090 -  CENTER STRING A$
01530 -  RETURNS TO X/T
01549 - TT=0, MILL; TT=1, SAW; TT=11, ROUGH GROOVE; TT=12, FIN. GROOVE
01680 - S9 = "Y"
01999 -  MM-200 ENTRY
02999 -  EA,EB OR CINTIMATIC ENTRY
05999 -  LEBLOND ENTRY
07999 -  NEW MACHINE
08999 -  QUIT
55499 - OPERATION REPORT
63500 - DA$ date                PR$  programmer's name
63501 - CN$ customer's name     PN$  part number (P/N)
63502 - CN  cut number          SIze tool size (diameter)
63503 - OP  operation number    MT   machine type pointer
63504 - TN  tool number         TT   tool type pointer
63505 - RAp tool rapid time     TRav cut length & rapid distance
63506 - Z   formatting input    ZS   decimal point location
63507 - Z$  variable formatted for printing
63508 - T   rapid traverse rate for the machine in use
63509 - TL  tool's cut I. D. letter ASCII code
63511 - RC  rapid traverse approach/retract constant
63515 - I,J,K  are general purpose variables.
63516 - A$,B$  are general purpose strings.
63517 - TT$()  tool text for disk file or tool list
63520 - INdex  number of indexes or degrees to index
63523 - CUt    time taken to make all cuts for 1 area
63524 - LOde   is the load/unload time (LOAD is a BASIC keyword)
63600 - SUm(0) is the accumulator for oper. machining time.
63601 - SUm(1) is the accumulator for oper. rapid traverse time.
63603 - SUm(3) is the accumulator for oper. number of indexes.
63604 - SUm(4) is the accumulator for oper. index time.
63985 -  ****************************************
63986 -  ****************************************
63987 -  ***                                  ***
63988 -  ***        SCHMARJE TOOL CO.         ***
63989 -  ***        ESTIMATE PROGRAM          ***
63990 -  ***      APPLE II VERSION 1.00       ***
63991 -  ***        COPYRIGHT 1983            ***
63992 -  ***     WRITTEN MARCH 11, 1983       ***
63993 -  ***          BY BRUCE DAGEL          ***
63994 -  ***   LAST CHANGE APRIL 15, 1983     ***
63995 -  ***                                  ***
63996 -  ****************************************
63997 -  ****************************************
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Listing 1b. Listing reported with Remark Extraction corrected.

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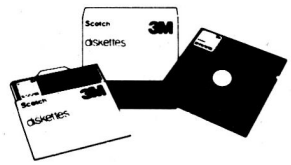

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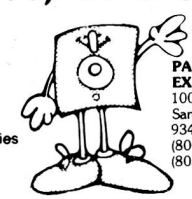

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Software Reviews

Golfsoft Statistician

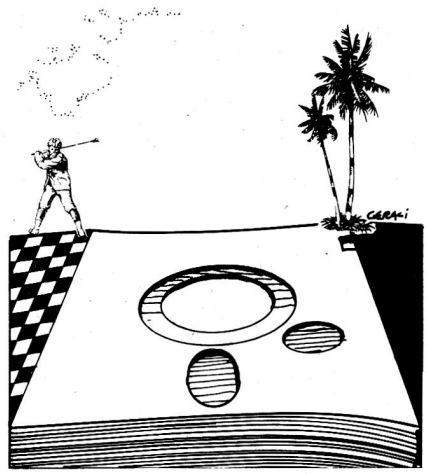
Golfsoft Statistician, written by Dave Haberle, a three year veteran of the PGA tour, is a program that gives you a wonderful opportunity to analyze your golf game in depth. Perhaps, with a certain club, you tend to deflect the surface slightly, causing the shot to slice. Perhaps you are using a club in certain situations that will not deliver the power you require. Golfsoft Statistician can help you spot these errors, omissions and bad habits and can help you correct them.

Golfsoft Statistician relies on your own initiative. While you're out on the links, you must make notes of your performance on each swing. On a scale of one to nine, you must first rate the feel of the shot (with one representing a hard feel and nine signifying a dead feel). Next, note initial deflection—how far off target the ball is just after it has been stroked. The range the program will accept is from 20 yards left to 20 yards right.

Then you must note how far off target the ball was when it came to rest. You must take note of the trajectory (low or high) of the ball and the distance the ball travels compared to the desired distance (the range is from −20 to +20 yards). You then make an overall judgment about the shot, from poor to excellent.

The next major step is to bring all this carefully accumulated data back home to your Apple. When you boot Golfsoft Statistician, the main program menu appears on the monitor. Select item 1 to input the data on your round. The program prompts direct you to enter your initials and then the date the game was played. Next, you input the data you collected during your game. Enter your hole-by-hole score; then the program queries you on each stroke, collecting your data on feel, direction, final direction, distance, trajectory and the overall quality of the stroke.

When you complete data entry, a 24-section report analyzing your game is produced. You may opt to see



the report on the video monitor or you may choose to have a permanent printed record.

What do the reports tell you? Parts 1 through 3 show how often the feel of your shots seem hard, dead or comfortable. Reports 4 to 6 examine the direction of the ball's flight immediately after it is stroked. They show how many of your shots start off to the left, the right or dead on target. If you find, for example, that you are sending the shots slightly to the right with certain clubs, you may want to examine your grip, stance or clubhead angle.

Parts 7 to 9 detail the final direction the ball takes. These statistics may provide important clues that reveal a defect in your stance or grip. In parts 10 to 12 your trajectory is analyzed. You may learn you are topping the ball with certain clubs or swinging under it with others. Parts 13 to 15 deal with ball distance when using scoring clubs—your pitching wedge, sand wedge and putter. You may learn that you are putting with a good eye for the line, but with too much or too little muscle.

In the sections on confidence (16 to 18), the reports evaluate how frequently the golfer expresses satisfaction or dissatisfaction with his performance. You can see from the stats which clubs you are most confident with. Reports 19 through 21 analyze the shots that start and stay in one direction, from the first impact of the club to the moment the ball comes to rest.

Sections 22 to 24 discuss shots that start straight but then curve off to the right or left.

It may take several games and a lot of study to discover what has gone wrong with your game. The data culled from one bad game, after all, may not be typical of your game.

The software itself is not overly elegant. There are no graphics. A minor drawback is found in the data collection process. If you hit the return key inadvertently, some of the text lines on the screen do not clear when the next prompt appears. The permanent inclusion of these lines makes the screen confusing and can lead to errors in the input of data.

The program disk is accompanied by two booklets explaining how the data is to be collected, processed and interpreted; a reference card on how to collect data; and a worksheet you can photocopy and use on the course. Haberle's commentary in one of the booklets is lively and illuminating; his explanations and interpretations of the stats greatly enhance the value of the program.

Golfsoft Statistician is made by Golfsoft Inc. of 10333 Balsam Lane, Eden Prairie, MN 55344. The list price for the system is $34.95. A printer that can display 80 columns is helpful, but you can read the reports, one section at a time, on your monitor. ■

Brian Murphy
Fairfield, CT

The Arcade Machine

The Arcade Machine is an interesting program that provides real insight into the design of commercial arcade games.

With this menu driven program, you can design aliens, laser bases, or even the background of a shoot 'em-up game. You can give your aliens animated movement like the little apples in Apple Panic or have them mutate into other creatures as in Space Eggs.

Anytime you boot AM it automatically loads a Space Invader-like game.

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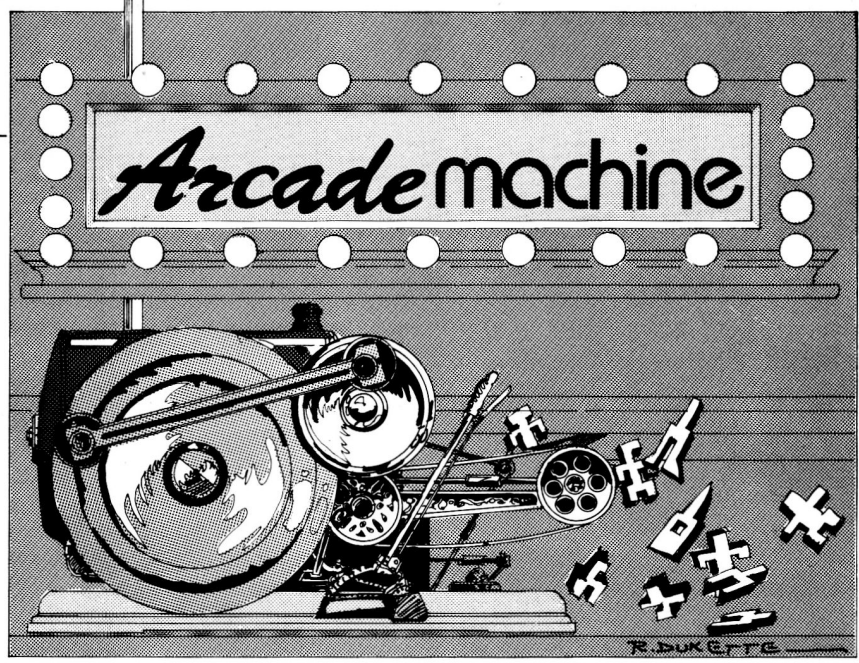


By entering a subprogram through one of the menus, you can make changes to the game. Then you can exit the subprogram and enter the game playing mode by pressing the return button repeatedly. You can make changes, then play the game to see if you like what you've done. Of course, you don't have to use their test game, but when learning about the program's possibilities, it helps.

The programming feat that the AM software package represents is astounding. You won't be able to design a game like Choplifter, but with the AM, you have control over such things as the movement of stars, regular or smart bombs, type of explosions, missiles, sound effects, color, barriers and even bouncing bombs.

Probably the most difficult part of AM to master is the design of the paths for the aliens to follow. There are many possibilities and the documentation could be clearer in this area. In fact, the documentation is the weakest part of this package. Fortunately, you can easily discover many of your answers through experimentation. But in complex operations such as path design, which may include such options as delays, bombing instructions, and alien attack formation coordination, at least one complete example should be given.

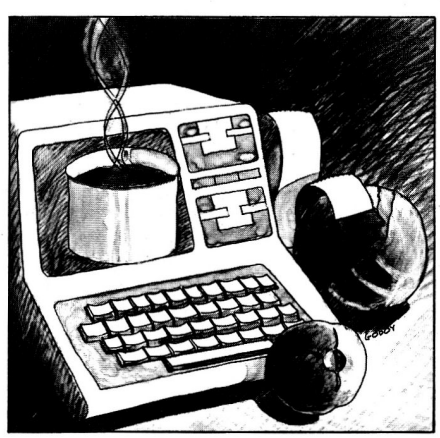
After you finish your game masterpiece, you can design a title page with your name on it. And then AM produces a separate, copy-protected disk that you can give away or maybe even sell.

AM comes with grid sheets to help with shape and path design, a disk and documentation. If only for the opportunity to expand your thinking in the graphic and game design area, The Arcade Machine is worth a look. It is manufactured by Broderbund Software, 1938 4th St., San Rafael, CA 94901. Price is $59.95. ■

Robert Pritchett
Columbus, OH

Micro Cookbook

Micro Cookbook is a $40 software package that finds recipes for your next meal using the odds and ends in an understocked refrigerator and cupboard. It can also eliminate before-meal trips to the supermarket, find a recipe for that perishable bargain that is beginning to spoil or show you how to combine this week's supermarket specials into a recipe.



Micro Cookbook includes two disks (a software disk and a recipe disk with 154 recipes that use a total of 165 popular ingredients), a 25-page user's guide and three loose sheets: a thank you note, a list of recipes and a list of ingredients.

To use the program, boot the software disk, remove it from drive number 1, insert the recipe disk and push any key on the keyboard. A menu appears. Select an option by typing its number, and then push return.

My favorite option is number 3, Select Recipe by Ingredients and/or Classifications. In this option, for example, when you type in eggs and cheese, the cookbook responds that 45 recipes use eggs only, 19 use cheese only and five use both eggs and cheese. By typing control-C, the cookbook reveals the five egg and cheese recipes: chicken parmesan, veal parmesan, stuffed cabbage, zucchini quiche and chops milanaise.

Like most good cookbooks, Micro Cookbook includes a glossary that defines cooking terms. Ingredient preparation and combination techniques, tables of ingredient fat, carbohyrate and protein content and additional reference material such as food storage guidelines are also included.

You may add new recipes and modify old ones. Although the software disk is not copyable (a back-up copy is available for $12 from the manufacturer), the recipe disk can be copied. You can use recipes from your own library of cookbooks, in which case you need enter only the ingredients, omitting the cooking instructions to save typing time. For cooking instructions, you can refer to the source of the recipe (i.e., the page and name of a specific cookbook, or the page number of a loose leaf binder where a clipped recipe is stored).

Micro Cookbook works with an Apple II Plus with 48K or more of memory, ROM Applesoft and DOS 3.3. It also comes in a IIe version. It can be ordered from Virtual Combinetics, PO Box 755, Rockport, MA 01966. ■

Steve Goldman
Cherry Hill, NJ

The Game Show

The Game Show is a form of electronic flash card that is dressed up with sound effects and hi-res color graphics. It is designed for the quick and easy creation of reviews and quizzes that will entertain the student while engaging his/her competitive instincts.

In the quiz mode the program displays the set of a TV game show—a moderator conducts the quiz and two other figures play the role of the partners in this Password-style game.

Teachers can use the quizzes as reviews for classroom College Bowl competitions and as formal quizzes. Drawing from a user-created data base, clues are given by the animated partners to their respective users. Your job is to guess the right answer based on those clues. The more clues needed, the lower your score. The user scoring the highest point total wins. This element of competition heightens the excitement of the review and keeps the children's interest high.

The graphics for the quiz portion of the program are lively and creative; they are effective in capturing the imagination of younger children. Children will be especially entertained by the way the figures appear to talk on screen and by the antics of their partners when they are on the winning side.

The Game Show is easy to use. In either the one player mode or two player game, the kids will have no problems following the prompts with a minimum of help from a teacher. Even younger students approaching the Apple II computer for the first time are unlikely to be confused.

Game Show's simplicity is a two way street: Teachers will find that creating sets of questions is simple. You first select the Add or Create Subjects option from the main program menu. This will access a versatile program routine allowing you to format blank disks to accept data for the game, record new questions, edit previously entered data and delete material as desired.

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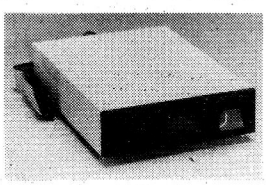

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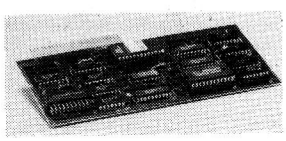

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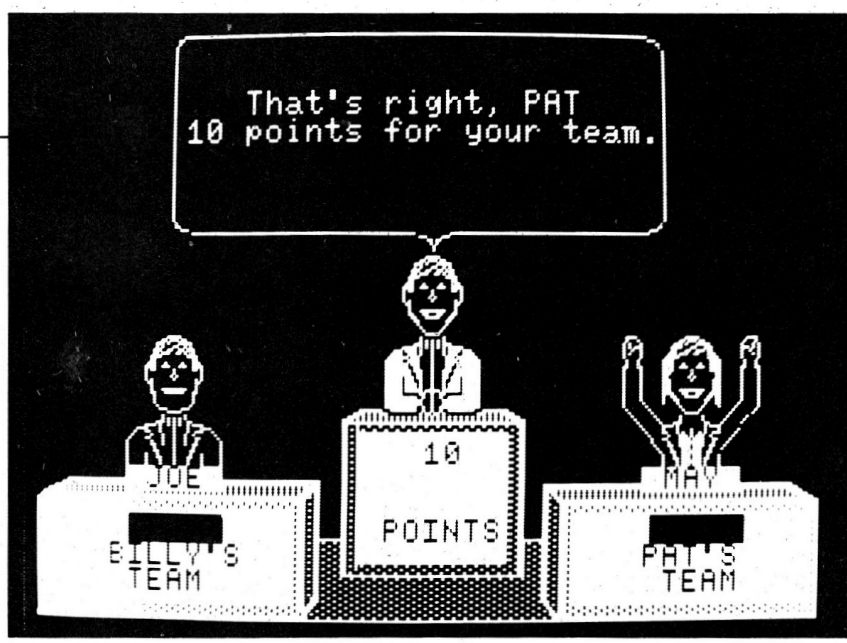

In creating quizzes you first enter the correct answer, then a series of brief clues. For example, if the desired answer is Abraham Lincoln, you enter his name as the answer and then as many as ten short clues. Acceptable clues could be key words or phrases such as 16th President, railsplitter, Gettysburg Address or Great Emancipator. Once you have entered your clues and answers, you may then store all related materials under an appropriate subject heading such as Civil War or U.S. History. Using blank disks you can create and store an infinite number of quizzes on a wide range of subjects. This capability can be invaluable in a classroom setting, with the teacher able to create a library of quizzes as permanent or as changeable as needed.

The Game Show has a limited application in such topic areas as algebra and mathematics; but in subjects such as the sciences, vocabulary and social studies, its applications are almost unlimited.

The cost of adding Game Show to your electronic classroom, or as a home study aid, is $39.95. The manufacturer is Computer Advanced Ideas of 4442A Walnut St., Suite 341, Berkeley, CA 94709. ■

Brian Murphy
Fairfield, CT

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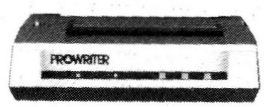

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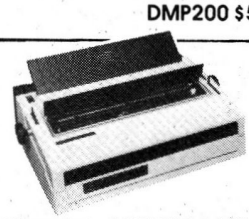

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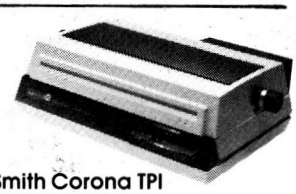

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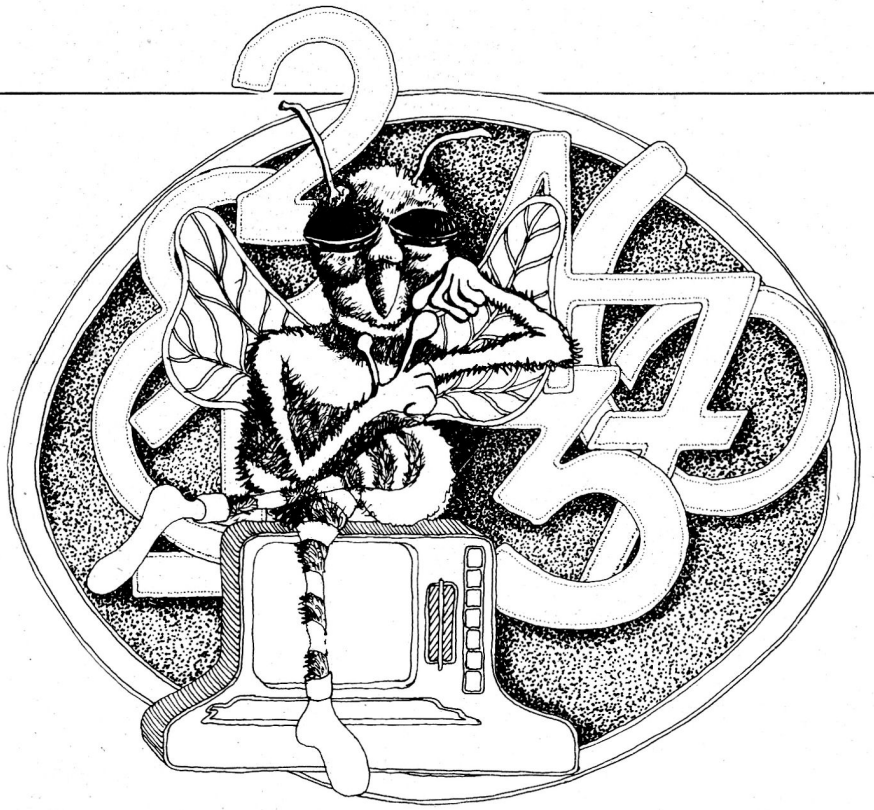

Counting Bee

Counting Bee is a Computer Assisted Instructional package designed to help children ages five to eight develop quantitative thinking concepts.

It consists of eight learning modules that can be grouped into three general categories: counting activities, measuring/comparing quantities and simple arithmetic operations. The order of presentation of these modules is from concrete to abstract concepts. However, if desired, the teacher may rearrange this sequence. The number of modules in a given lesson may be controlled by the teacher, and the teacher can select the number of trials within each module.

Good features of the package include quality high-resolution graphics, extensive use of lively sound effects, a unique corrective feedback technique that erases wrong responses instantly before students can fixate on incorrect information, and simple three-key (space bar, return, escape) operation of all modules. In addition, teachers or parents can access student progress information in order to plan future lessons. And students may stop at any time during a lesson and return to the stopping point later.

One problem with the package is that the disk must be "personalized" for each student. In other words, the teacher configures the disk with the options deemed appropriate for Johnny, and when Johnny finishes his lesson, the teacher must reconfigure the disk for Janie. A one-time configuration for a class of 30 different students would be much simpler for the teacher to accomplish, and it would make the collection of class performance statistics much easier.

In summary, this is a very attractive and easy to use package. I believe that younger students will be excited about using it. However, it would be extremely difficult to use with large classes of students because of the amount of teacher mediation necessary and the fact that only one student at a time may use the package.

Counting Bee is manufactured by Edu-Ware Services Inc., Box 22222, Agoura, CA 91301. Price is $29.95. ■

Michael Waugh
Athens, GA

Ultra Hi-Res Graphics

One of the nicest things about owning an Apple and an Epson MX-80 FT is that whatever you want to do, someone, somewhere, has probably written exactly the program you need!

For my dissertation, which has to do with loudspeakers and room acoustics, I needed graphs—about a hundred of them. The Apple hi-res screen adequately displays loudspeaker polar response charts, but the resolution offered by screen dump programs falls far short of what I needed for publication. See Figure 1. Without Apple video color —in this case, orange on white—it was very difficult to read the graphs.

I knew that while the Apple was capable of a resolution of 192 dots by 150 or so, the Epson was capable of much finer resolution: at least 900 by 900! The problem was how to access the dot graphics of the Epson.

I spent a week trying to solve the problem in Basic. The Epson, unfortunately, has its quirks; and trying to access Epson dot graphics with the Apple's seven-bit word length is difficult. True, I could have bought a special interface board that controlled the eighth bit, but I hated to spend money to buy a replacement for something I already owned that worked perfectly. Further, did you ever reflect on the fact that storing a 900 by 900 matrix requires more than 100K of memory, exclusive of program length?

But eventually, and unexpectedly, something toggled a bit of information in the back of my mind. Hadn't a company called Computer Stations Inc. written a program for the IDS series of printers that did exactly what I was trying to do? The program arrived a week later.

The program, Ultra Hi-Res Graphics, is a sleeper that has never received the attention it deserves. It works with most Epson printers and virtually any parallel interface; it is written in machine code and is ac-

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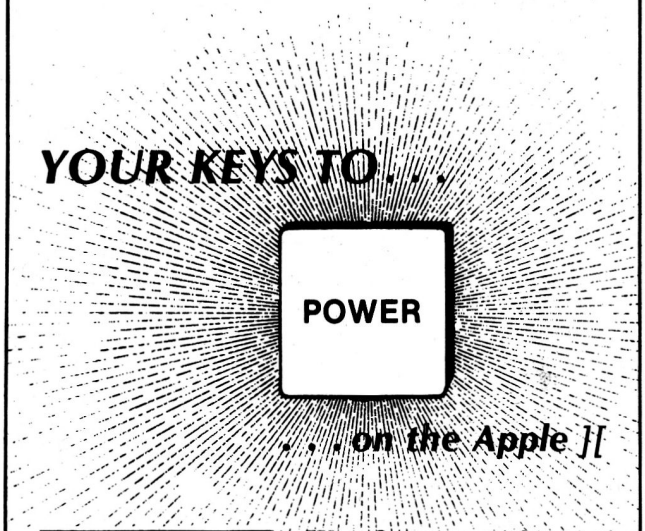

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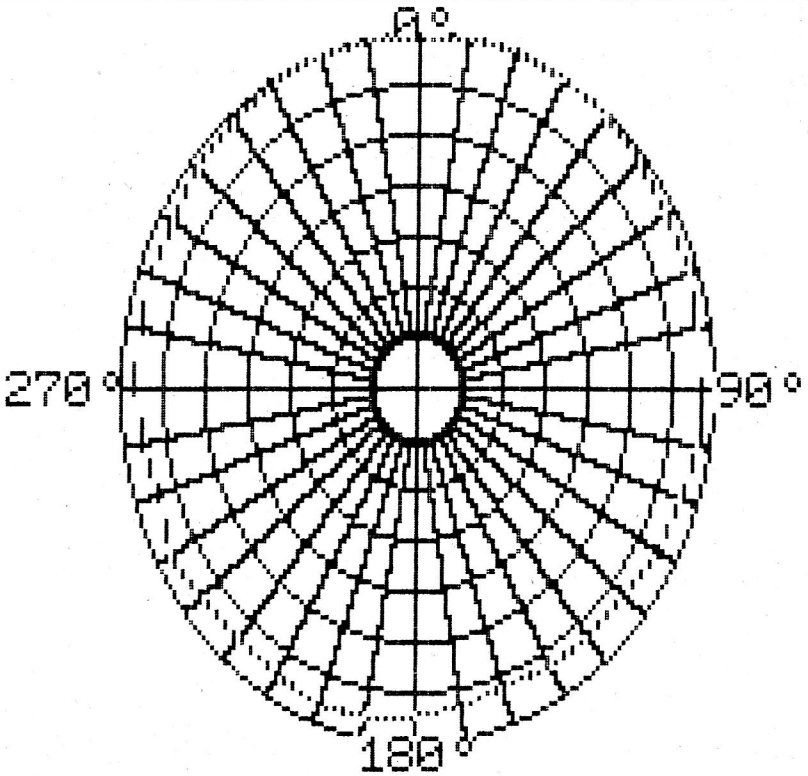

Figure 1. Polar response graph.

cessed through commands that precisely mimic Apple hi-res graphic commands!

Ultra Hi-Res Graphics is very easy to use when you consider what it does. It is not, however, particularly easy to use in an absolute sense. Instead of printing error messages, it beeps; there is no hint of what is causing the error. No doubt the use of an ampersand jump to machine code from Basic makes it difficult to include comprehensive error messages without revising Applesoft. But it is a good idea, I think, to develop and debug programs for Ultra Hi-Res on the Apple video display and then convert them for the Epson.

And although Ultra Hi-Res Graphics is remarkably fast when compared to my efforts in Basic, a typical graph like the one shown in Figure 2 takes slightly more than 11

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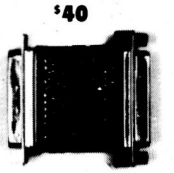

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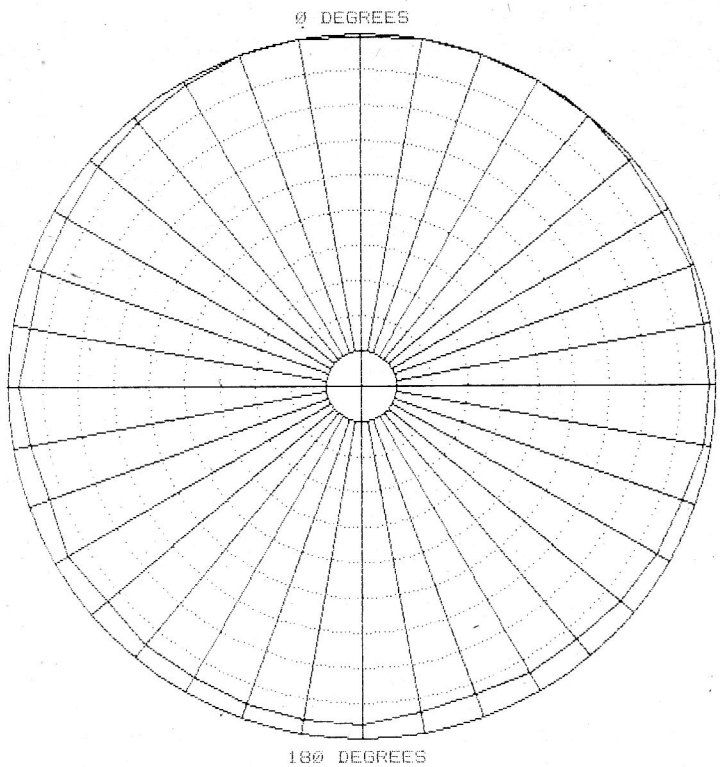

Figure 2. Polar response graph using Ultra Hi- Res graphics.

minutes to complete—a long time if you are trying to isolate and eliminate program bugs one at a time. To obtain the huge amount of storage space necessary, Ultra Hi-Res uses disk space as virtual memory. Although the process is completely transparent to the user, the continual disk access tends to consume a good deal of time.

Unaccountably, while the Epson is capable of 120 by 144 dots per square inch resolution, Ultra Hi-Res is limited to 120 by 72 dots per square inch resolution. On the positive side, however, pictures can be produced to a full page in size, provided the limits of disk memory are not exceeded. I suspect that the program either stores only the position of dots actually printed or the specified line vectors.

When called, Ultra Hi-Res seems, at first, to do absolutely nothing but spin the disk for several minutes before it begins to print. If you don't put in a few trace statements to tell you where you are in the program, you risk losing your sanity. And if you run out of disk or program memory, Ultra Hi-Res will not tell you; it begins silently to either omit dots, print extra dots, garble your picture, or some combination of the three!

Quibbles aside, this program is invaluable. Once my graph program was up and running, I put my program/data disk on one disk drive and the hi-res graphics scratch disk on the other. I toggled between them by issuing a CATALOG, D1 or CATALOG, D2 whenever I wanted to switch from one drive to the other. Using this method, I was able to let the program run overnight and gather my printouts in the morning.

Ultra Hi-Res Graphics is one of the most useful programs ever written for the Epson and Apple. It is worth much more than $49.95. It is available from Computer Station, 11610 Page Service Drive, St. Louis, MO 63141. ■

Herb Rand
Sweet Briar, VA

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Crisis Mountain



The scenario is deep inside a supposedly inactive volcano; terrorists have planted bombs that are quickly ticking away. In Crisis Mountain, your job is to defuse them before it is too late.

There are nine levels of play composed of two different danger-laden scenes. In each level bombs and supplies are put in random places, so the game is different every time you play it.

You control a man who searches for loot and supplies and tries to defuse bombs. Along the way you encounter a variety of obstacles. You must jump over tumbling rocks and debris, while avoiding bubbling lava pits. Each time you are hit by a rock your strength decreases. You have the ability to heal yourself and regain your strength, but the process is very slow.

There are three different ways to get killed: by having all of your strength depleted, by falling into a lava pit, or by being bitten by Bertram the Bat—a strange radioactive creature.

There are some interesting twists to this program. When you are killed you sprout wings, become an angel and fly to the top of the screen. The sound effects are mostly composed of squeaks and ticks, but the animation more than makes up for this slight flaw.

You render a bomb inactive by digging it up. This can be accomplished by hand or by using a shovel (four times faster). Using a shovel can be tricky; every time you are hit by a rock while carrying the shovel, it spins off to another part of the screen.

After all of the bombs are excavated, the time left on the bombs is accumulated and you enter a bonus run. During the bonus run, you try to gather up all the loot and supplies left. The bonus run ends when your time expires, when you are struck by a boulder or when you are killed. For every second spent during your bonus run, ten points is added to your score.

Overall, Crisis Mountain is an exciting game for all ages. It is manufactured by Synergistic Software, 830 N. Riverside Drive, Suite 210, Renton, WA 98055. Price is $34.95.■

Jim Witham
Mont Vernon, NH

Printographer

If you own a fancy printer with graphics capability, you know that dumping your artwork or charts from the Apple's high-resolution screen to paper is not easy. A special interface card or a special program is needed, and sometimes the job becomes so difficult it's not worth doing.

Not so, once you discover The Printographer. This utility does it all. The package is easy to use and as flexible as any Apple program I've encountered. And it will work with just about any graphics printer.

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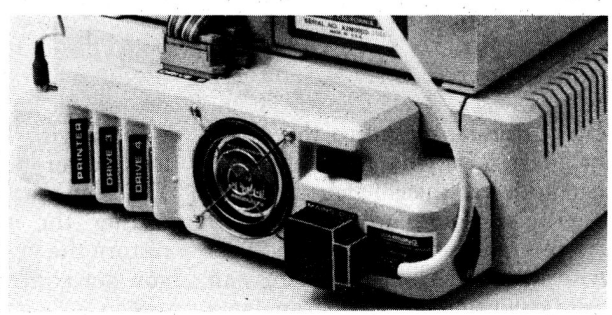

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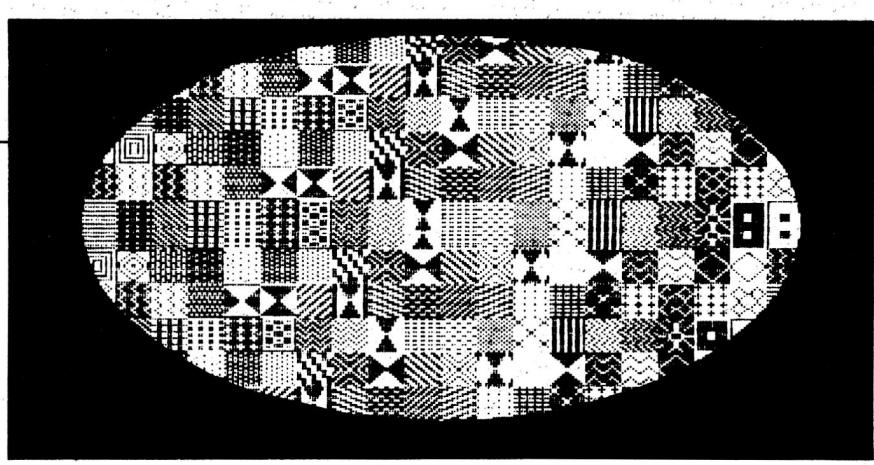

The cost is $49.95.

Some of the nice features of this program include the ease of cropping and magnifying the picture, printing out pictures from your own Applesoft or Integer Basic program, conserving disk space by compressing the picture when you save it and making full-color printouts with the IDS Prism printer.

Problems with the program include its inability to work directly with Pascal, Logo, Pilot or CP/M; the need to purchase SDS' The Correspondent or an equivalent in order to dump the picture in the middle of text from a word processor; and the hassle of loading a program from disk.

The first time you boot The Printographer you are asked a few questions about your printer and interface. Relax; the program seems to cover just about every possible combination from Anadex to Xerox. If you don't see yours listed, and if nothing seems to work, you are welcome to give SDS a call for help. Some printers, including the Apple dot matrix and daisywheel, have been added to the configuration list recently and more are added often. The manual even tells you how to write your own driver. You can easily reconfigure the program later as needed. Just quit the program and run Configure.

I had no trouble making the program work with a Qume Sprint 5 and a CCS 7710A interface, with a Qume Sprint 9 and a Microbuffer II interface, and with an IDS 445G and an Apple parallel interface. But it would not work with an Epson MX-80 and the Epson APL interface, without the Graftrax ROMs.

You can make three back-up copies of The Printographer with the built-in copy program (but not with COPYA on your system master). This is a single drive program and did not work with my cheap Apple-compatible drives. After using Lobo, Rana (Siemens), Datadrive (TEAC), Apple (Alps) and Shugart drives, I have learned to expect these little surprises in some programs.

You will know that The Printographer is an up-to-date program when you see that it takes advantage of the new cursor keys on the Apple IIe, as well as the standard I-J-K-M keys on the II or II Plus. These keys are used to grab a top (T) or bottom (B) corner of the screen and to crop the picture to make it smaller. It wasn't immediately clear, but I soon discovered you can crop the sides of the picture as well as the top and bottom. I found this especially useful when a few extra dots appeared on an otherwise white line at a margin. The margins generally look better with straight dark lines. You can crop with giant boots by hitting the escape key first, or restore the original by hitting O. If you get confused, hit ? for a help screen.

After you finish cropping, you can magnify the picture when it is printed out (from 1 to 99 times, but usually only up to about 3 as that fills up a standard page width). I wish the magnification could be done in fractions as well as integer amounts.

With The Printographer, the user selects either left, centered or right justified margins. There are some problems with the right justified mode; the end of the line does not always print properly. It disappears at times, and with some printers, it wraps around to the next line. I confess I couldn't figure out the plotter planner picture, which might have helped me if there had been some explanation. I would prefer being able to fine tune the indentation, but it looks like this step might require a bit of experimentation with your particular setup.

I should add that another choice in cropping is to have the program make a diamond or cameo shape of your picture. Perhaps you will never use this, but it is a cute feature. Can't you see a digitized picture of your sweetheart here?

You can make the printout either normal or inverse, horizontal or vertical. You may find that the picture is slightly distorted if you print horizontally, though.

A control-C returns to the first menu at all times. Although these commands are generally convenient, perhaps Pascal enthusiasts are used to hitting escape to exit and control-C to confirm. The menus are the modern "Visi" style—you hit escape to move the inverse marker to the next text and return to make a selection. The control-C will stop the printing, in case you find you made a mistake.

The documentation for The Printographer is improved from SDS' earlier efforts. It is clear for beginner and advanced alike. Although it lacks an index, it is organized well enough to use as both a tutorial and a reference book. I particularly appreciated the trouble shooting page that includes suggestions on getting the most out of a number of printers.

In summary, don't overlook this program if you have a printer with the capability of dumping Apple's high-resolution screen. It is slightly more expensive than Zoom Graphix or the Image Printer, but it will work with just about any printer and does practically everything the others do and more. Full-color business graphics with the Prism

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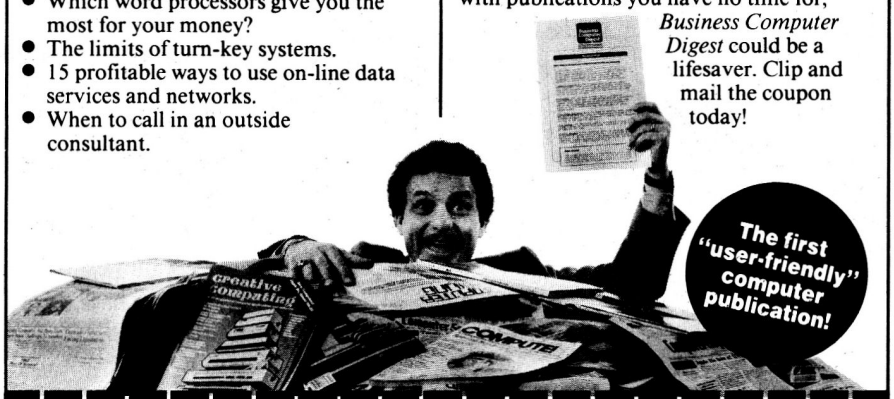

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Ultra Function Plot

If I'd had Ultra Function Plot when I was taking geometry in high school, I would have received straight A's. But unfortunately, I didn't have a home computer with graphics software to help me explore the mysteries of numbers and the plotting of their functions.

Applications of Ultra Function Plot include business, psychology, statistics, linguistics, biology/ecology, mathematics, and any other disciplines that can be expressed in equation form. The plots are in high-resolution graphics with full color, up to five plots on the screen; and the areas under the curves can be colored in. Also, the graphs can be labelled horizontally and vertically.

Anxious to explore Ultra Function Plot, I booted up the front side of the disk. The program led me by the hand as I defined a function to plot. I plotted $Y = 1$, which took 25 seconds to draw. Next I tried $Y = COS(X)$, which took 29 seconds. $Y = X^2$ took 38 seconds, and the combined function $Y = 1 + COS(X) + X^2$ required 57 seconds to plot.

I tried to draw a circle with $X^2 + Y^2 = 1$ but was told I couldn't plot an equation in this form. I checked the manual and learned that X had to be on the right side of the equation, Y on the left side. I tried again in the form $Y = SQR(1 - X^2)$. It plotted only the top half of the circle. I got the bottom half by plotting $Y = -SQR(1 - X^2)$.

I became somewhat familiar with the operation of the program in 30 minutes, and I decided to explore some of the enhanced capabilities by using the post plotting menu. I selected $Y = SIN(3*X) - COS(2*X)$ as my function, with X going from −6 to 6 (radians) and Y going from −3 to 3. There was some space between each point so I selected "more points plotted" and had 200 additional points added to the graph. Next, I used the integration function to shade the area under the curve. Then I labelled the graph horizontally and vertically.

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Other post plotting capabilities include listing a table of values, solving for either X or Y, listing all the functions plotted and finding the asymptotes of the curve. An especially useful routine is plotting two functions on the graph and replotting their intersection with a blown up scale to accurately determine the intersection point.

The program comes on one protected disk with no backups. The manual does not say what the disk replacement policy is so I called Avant-Garde Creations in Eugene, OR. They told me they have a free 30-day replacement and a $5.00 charge after 30 days.

Ultra Function Plot will run on the Apple II computer with 48K and Applesoft in ROM. Only one disk drive is needed. It is from Avant-Garde Creations, P.O. Box 30160, Eugene, OR 97403. Cost is $59.95. ■

Larry Strong
Layton, UT

The Data Reporter

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The Data Reporter is one program with several modules. Some modules load in from disk as needed. The first part is the required setup section, which I will discuss later. The main part is what technically amounts to a file manager. With it you can construct a data file with labelled fields and records and save and retrieve your data.

The report generator section is a sort of document processor; you can create text such as a form letter. Also, there is a plotting section that allows you to view a dot, bar, line or pie chart.

You can use The Data Reporter for maintaining a small mailing list, merging the names and addresses into a form letter, and viewing plots of some of your numeric data. Only as much data as will fit into the memory of your machine can be handled by The Data Reporter—except for searches and sorts. That limited me to about 300 names (with other information) on one list.

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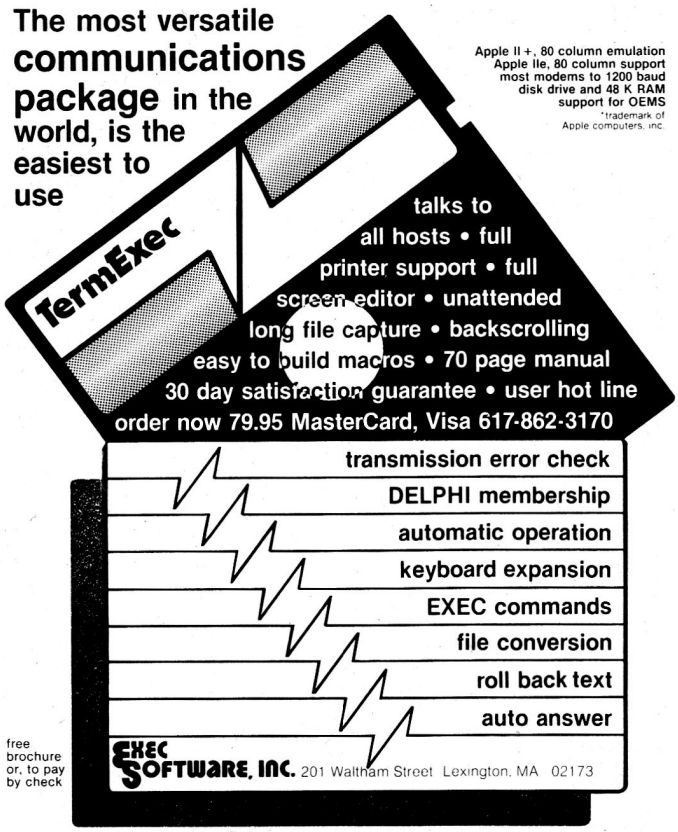

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There is room for 22,180 characters on line; divide that by your record length to determine the maximum records per file. Even if you have a 64K machine, the program does not seem to use the extra memory. Perhaps there is a way of relocating DOS, although the manual does not mention it.

You can have 35 fields per record. Each field occupies one line on the screen, eight per screen; but you can have more than one screen. The prompt for each field must begin on the left end of the line. If you've used the full screen formatting of PFS:File, DB Master or even CCA-DMS, all this would seem confining. But you can have more than one application program per data disk, unlike PFS or DB Master.

You can browse from one screen to another within a record by hitting /, but there is no indication on the first screen that a second screen or more is behind the first one.

Data entry is straightforward. As you enter data, the program will tab to the next field when the field is full, which might be an unwelcome treat. If you make an error, you must hit escape to quit or finish the whole record and then edit it; there is no way to back up to an incorrect field. Once you edit, you can't see the contents of the field until you enter the number of the field you wish to change.

The program allows either an alphanumeric, numeric or monetary field. Most of the time you will want the alphanumeric field. Don't try to enter a comma in a monetary field, because that truncates the rest. If you enter a dollar sign it will be ignored, as one is placed at the start of each monetary field. Totals, arithmetic, or plotting functions are not available with alphanumeric fields.

Searching is fast because everything is usually in memory at once. The Search menu asks if you want the results to display, print, total, delete, edit, save to a new file or search on multiple files. It then asks you how many fields you want to search and which fields to search. You may search up to ten levels. If you wish to delete something, it asks how many, which is a bit cryptic. Selecting "special function" allows you to display totals, global edit or reformat data files. There is also a "quick list" function that works on keys you can preset in your file.

Sorts, up to three fields, can be performed as long as the data is on one disk drive. Try to set up your program so you never have to sort or merge any files.

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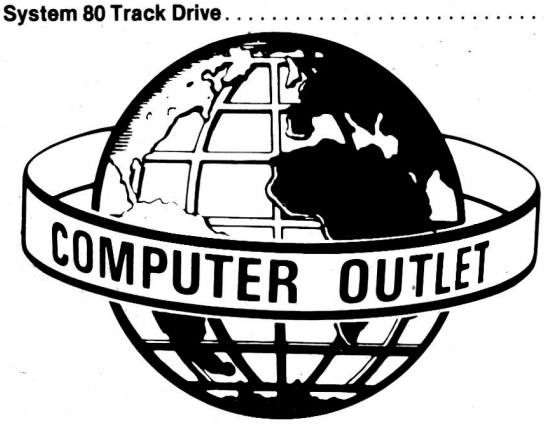

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The report generator is an oddball line editor. With it you can enter lower case text on a 40-column screen, which wraps around up to 132 characters. The escape key serves as the shift key and lock. It will take you a while to get used to the large number of control characters that are in two separate modes: the Command mode and the Edit mode.

In the Command mode you can add, delete, find a line, get text, insert a line, list text, indent, print, remove text, save text or set tabs. In the Edit mode, there are commands for beginning, center line, delete character, edit line, insert field, insert character, justify, command, end of line, printer character, quit line, argument, subtotal, tab, zap word or go back to the Command mode.

The arrows move the cursor and the return key accepts a line. To get back to the menu, you have to hit control-B-Reset and hit control-X to quit.

The plotter module is fast and satisfies typical business graph needs. No shading is offered, and the x and y axis labels are always 0-10. You can add another label to each axis as well. The auto-scaling did not always work for me. Again, this section is menu-driven, so it does not take long to master. Although some statistical calculation is possible (standard deviation, correlation coefficients), I wonder if it could be used for serious scientific work.

There is another problem in using this program in a business. There is no password protection. I suppose you could build it in, but if not, you might be reluctant to commit valuable information to a disk that others can read or modify at will. Since the data files are stored in binary form, you will not be able to access them easily with another word processor. At least they are easily backed up onto another disk.

In the setup module, you enter when you boot the master disk, answer questions about your printer, hardware, and paper size, and define your file. Here it helps to have it down on paper first. You need to lay out the report as well as the entry screens at this time. You can make changes later, and reformat your data. Not all database programs allow you to do this.

It is possible to change parts of the program if you are an experienced Basic programmer. An appendix in the manual lists a good deal of information about the program internals and some suggested program modifications. I did not try them. Some of the subroutines are of the ampersand variety and do the work of processing data smoothly.

"It is possible to change parts of the program if you are an experienced Basic programmer."

When I tried to plot some non-numeric data by mistake, the program crashed. Also it hung up when I tried to print a plot, forgetting that I had taken out the printer interface. The error trapping is not as good as I would wish. The manual suggests you look up the error number in the Applesoft or DOS manual.

I particularly appreciated the appearance of the mailing labels The Data Reporter generates. The fields are properly spaced with just one blank space apart. When I tried to do that with PFS I ended up with an added space between the first and last name; and with DB Master, I got a lot of spaces filling up the length of the field.

In summary, The Data Reporter is an office tool you may want to look at if your requirements are limited to a small amount of data which needs much reworking. It would be barely adequate for form letters, for instance. The plotting module might be useful for certain business graphs. If you like to tinker in Basic you can modify parts of the program, and you can reformat your files.

It is manufactured by Synergistic Software, 830 N. Riverside Drive, Suite 201, Renton, WA 98055. Price is $220. ■

Eric Eldred
Derry, NH

***Editor's note:** A new version of The Data Reporter, Version 3.0, has recently been released by Synergistic. According to the manufacturer, Version 3.0 has 15 new features.*

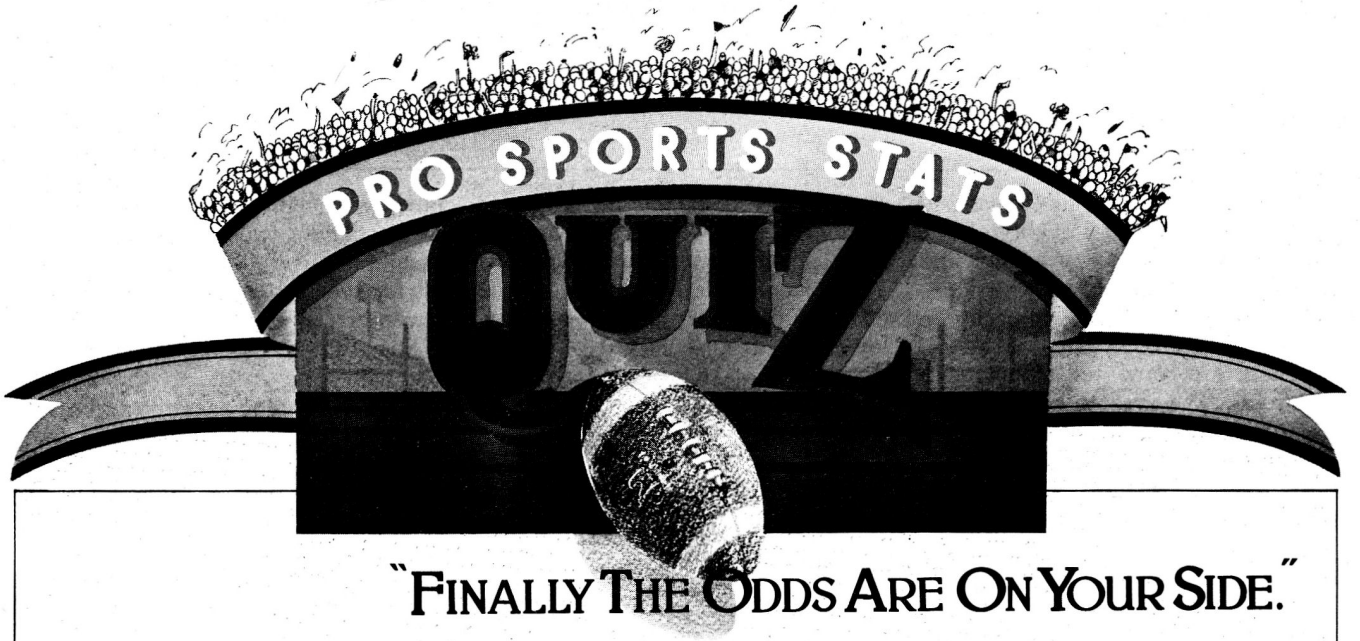
The Artist

The Artist, from Sierra On-Line Systems, is a versatile color graphics program that operates in eight menu-selected modes. It comes with both an original of the program disk and a backup—a real plus—and runs with either one or two drives and a paddle or joystick. The documentation, in the form of a tutorial, is occasionally poorly organized, but otherwise adequate.

In the Single Paddle Draw mode you draw with an arrow-shaped cursor controlled by the paddle or joystick. Drawing speed may be varied from a slow rate of 1 to an extremely fast rate of 9. Eight hi-res colors are available, as well as a selection of five brush widths.

Drawing with paddles is usually clumsy, but not here. This drawing mode is simple to use, and I was quite surprised at the cursor's responsiveness. This is not the accuracy of individual bit toggling that is possible through most keyboard draw modes. But the slowest drawing speed and the thinnest brush width do provide for highly exacting work. Coupled with the Artist's editing capabilities, Single Paddle Draw is a very useful mode. The second drawing mode, Double Paddle Draw, has very little use other than for drawing straight lines.

21 Color Fill is the mode for filling in enclosed areas with color—21 colors, in fact—a rich selection. If the area is not totally enclosed, the color spills out into the area adjacent to the break.



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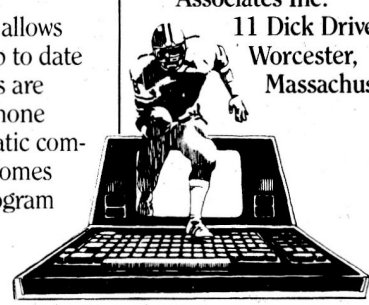

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Some of the colors, like silver and gold, don't possess the quality of hue I'd expect. I believe the monitor and the way the Apple hi-res screen displays color mixes are primarily to blame for this minor fault.

There are some restrictions with color fill. The area to receive color must be black. Also, once you've saved the picture to disk, no other color fills are possible on that picture. (The same holds true for drawing after exiting the Color Fill mode.) The documentation suggests, somewhat belatedly, that all original pictures be saved to disk before color fill, just in case the final result is not satisfactory. This hint should appear at the start of the color fill tutorial, to avoid the frustration of destroying perfectly good pictures.

Zoom Lens is your access to editing pictures. By moving a flashing rectangular outline about the hi-res screen, you designate an area for editing. Then, when you press the spacebar, the screen divides in half. The upper portion is a copy of the contents of the rectangle, and the lower part is an enlarged version of the same to make for easier editing.

"Shape Viewer mode allows you to move an entire shape around the screen with the paddles."

I found the keyboard controls for editing extremely accurate and easy-to-use. The keyboard control in the 21-color mode enables you to use all 21 colors, instead of the basic six. You can also invert the main screen to change black to white or orange to blue, as well as cancel any enlargement changes you've already made. L-shift and R-shift swap odd bit colors for even bit colors by shifting the screen in a corresponding direction.

Shape table drawing is also possible with The Artist, in the Shape Maker mode. You identify and save your shape, and also indicate the shape's point-of-origin, which specifies where the shape will be redrawn when called from the shape table. After a shape has been inserted into a table, you can choose to redefine it, view any shape in the table, make a new shape, save the table, or access a different table.

Shape Viewer mode allows you to move an entire shape around the screen with the paddles, and to plot the shape at any screen location. There is a Hi-Speed Byte routine, as well as opportunity to examine the shape using different colors, rotations, and scales—a very handy utility.

Add Text is the mode for combining text with a picture. It is the only module in The Artist that is not compatible with the Apple IIe.

Font Editor mode easily manipulates character sets. With it you can modify the built-in one, and create new ones. Select an individual character and edit it into, say, a space creature. Then define a progression of these forms and save them to disk. When you call your new character set into action you have an animation sequence. This form of animation, though not quick, is easily understandable and is usable by even the novice.

There are other graphics application products whose animation modules are far more sophisticated than The Artist. It is not "professional," as emblazoned on the front cover. Yet, for $79.95, I consider Sierra On-Line's graphics application system, in both presentation and capabilities, a top product for the novice and intermediate user.

For further information contact Sierra On-Line at 36575 Mudge Ranch Road, Coarsegold, CA 93614. ■

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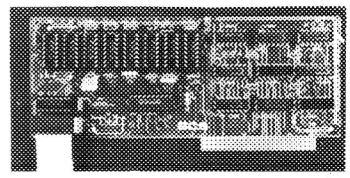

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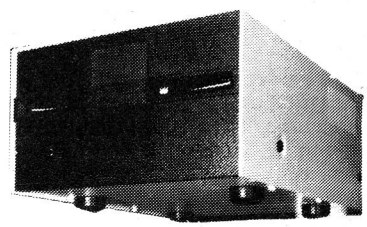

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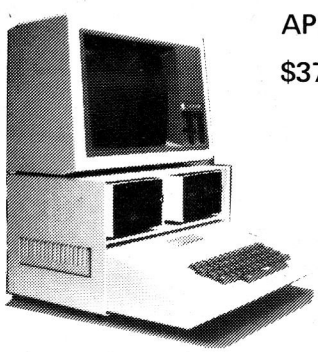

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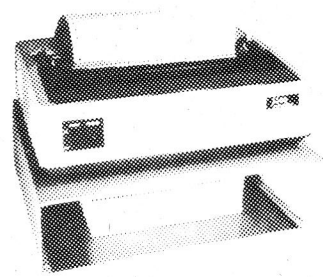

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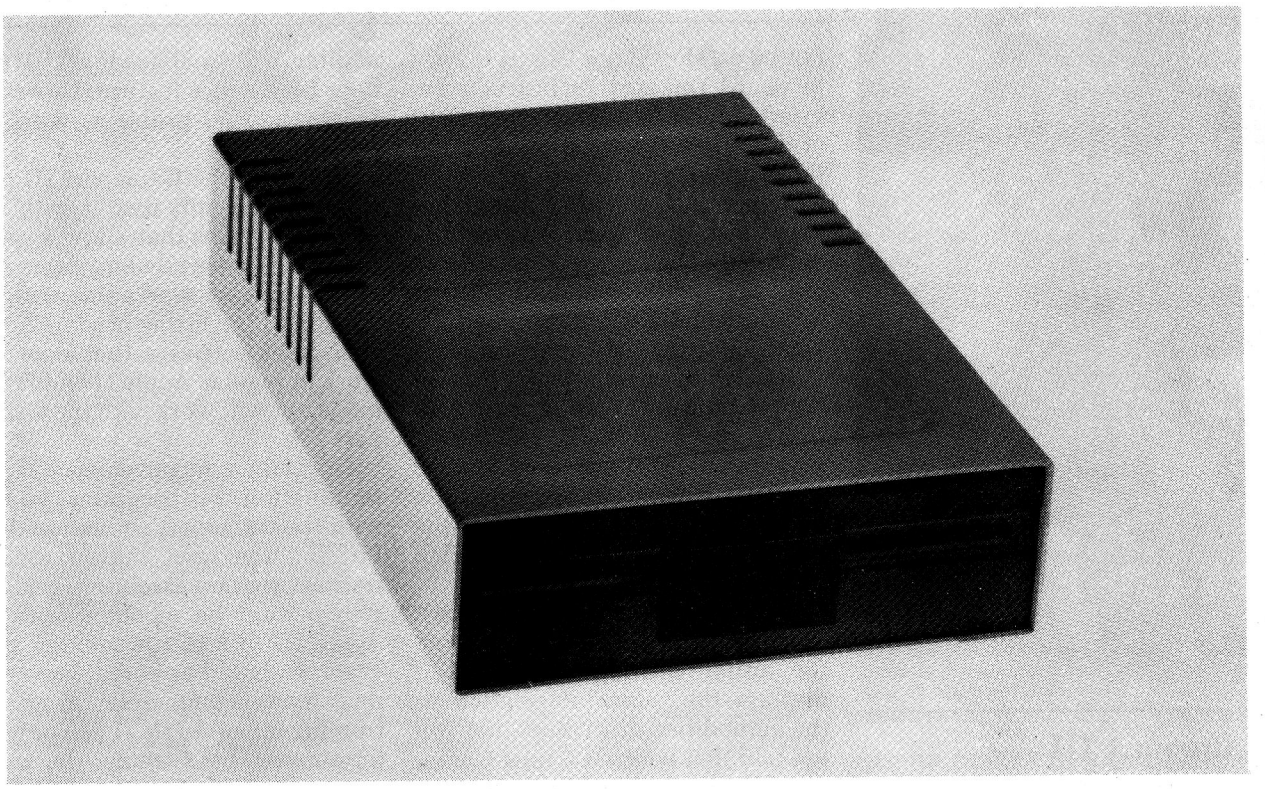

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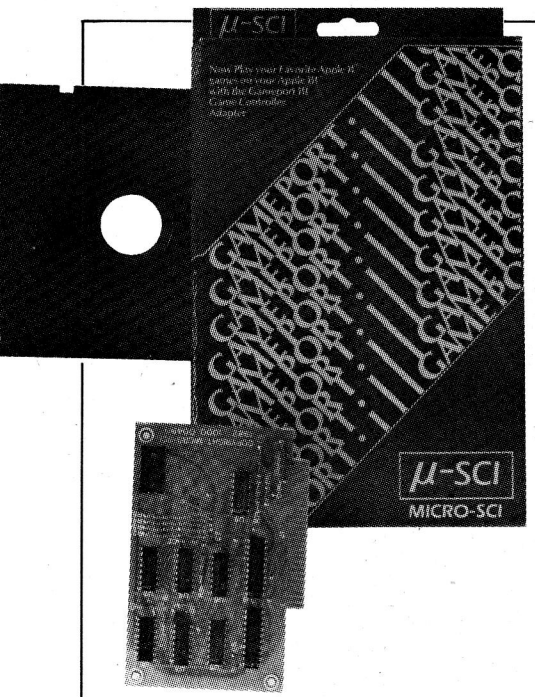

Gameport III

Gameport III is a circuit board that plugs into any slot of the Apple III and accepts game controllers (i.e., paddles, joysticks and game port extenders) equipped with 16-pin plugs. With the Gameport III in place and using a modified Apple II emulation mode, you can now run Apple II software requiring a game controller that previously would not work on the Apple III. Gameport III greatly expands the capabilities of the III's Apple II emulation mode.

The Gameport III package includes a write-protected disk, three pages of instructions, and the Gameport III itself—a small circuit board mounted with an Apple II game I/O socket, nine microchips and several other electronic devices.

The installation process begins with modification of an Apple II emulation disk. This is accomplished by first booting the Gameport III modification disk in the Apple III's built-in disk drive. (The instructions provide no hint as to what this disk does or how it does it, and as far as I can tell, the disk cannot be cataloged nor can its drivers be read.) You are then instructed to insert a non-write-protected copy of the Apple II emulation disk (not the original) and to press return. In a few seconds, you are notified that your disk has been successfully modified. The instructions indicate that the modified emulation disk is to be used only when running software requiring the Gameport III.

Hardware installation is a snap. Simply plug an Apple II game controller (be it joystick, paddles or whatever) into the socket provided on the Gameport board and then insert the board into any slot of the Apple III. A diagram is provided to help ensure proper installation.

To use the Gameport III, just boot the modified emulation disk in the usual manner. The screen displays the same information as the unmodified disk except that you are told that your III is now Gameport III compatible. You then insert your game disk into the built-in drive and press return. While your Apple II disk is booting, you must press button 1 on your game controller to activate the Gameport III. Nothing happens at this point to let you know that you have successfully activated the board. Some audible or visual feedback would have been a nice feature. However, I have had no problems with the procedure.

How does the Gameport III perform? I have only used it with Apple II programs that allow a game controller, since all of my other Apple II software works fine without it. Table 1 is a listing of some Apple II joystick software that does not work in regular Apple II emulation mode but will work with the Gameport III.

One minor inconvenience is the termination of programs booted with the Gameport emulation disk. Pressing the reset button usually freezes program execution, and the system must be rebooted with an Apple III disk to run another program. It should be noted, however, that many commercial programs running on an Apple II can only be terminated by turning the computer off and rebooting to change programs.

In short, I can safely say that the games written for the Apple II can be used on the Apple III with Gameport III.

Gameport III is manufactured by Micro-Sci, 2158 South Hathaway St., Santa Ana, CA 92705. Price is $74.95. ■

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Table 1. Apple II Joystick programs that work properly using the Gameport III.

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In Remote mode, the modem will automatically answer your phone; if a modem is initiating the call, connection is automatic. The remote user can then catalog your disks, load and list programs, and write to your disks.

In the Program mode, you can write programs (for an Apple DOS, Apple Pascal or CP/M environment) that use firmware routines in the modem to control its functions. Unfortunately, the manual fails to document this capability.

The system software was designed to work with a number of different hardware configurations. For example, Transend assumes the modem card is in slot #5, but Apple's standard modem slot is #2.

The software includes data capture ability, so all or part of a communications session can be kept in RAM for later printing and/or saving to disk. Up to 62 blocks of 256 characters each can be temporarily stored. The program also can send displayed text directly to your printer. The capture buffer is useful for editing and transmitting files. A verified file transfer protocol is available for error checking files sent between Apples.

Transend 2 displays normal 40-column text with inverse characters for uppercase or lowercase. Some 80-column cards are supported. Most printers, both serial and parallel, work without modification.

Membership offers to The Source and The Dialog knowledge index will save you money if you're just getting started. These are popular services, and worth investigation.

Overall, I'd say the Transpak 2 is just about as complete a package as you can get. The cost, around $450, is competitive. The value of the package depends on whether you plan to use the information services and whether you feel Transend is the support program for you. I recommend that you have the program demonstrated to you at the store, or at least examine the user manual carefully to see if a menu driven program like this is right for you.

My main complaint was a problem I experienced using the program with my Apple IIe and 80-column card. According to SSM, this problem has been solved in the newest release.

You can purchase Transpak 2 from SSM Microcomputer Products Inc., 2190 Paragon Drive, San Jose, CA 95131. ■

George Guild
Nashua, NH

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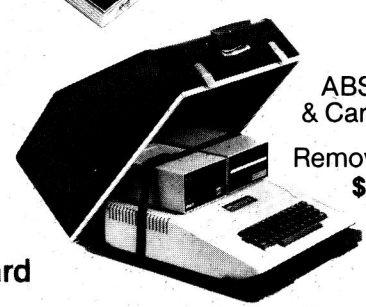

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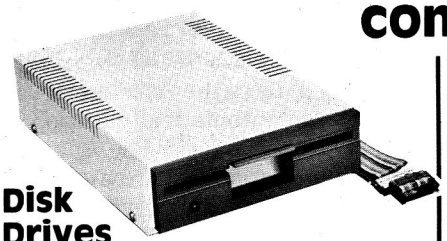

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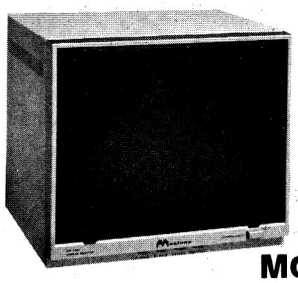

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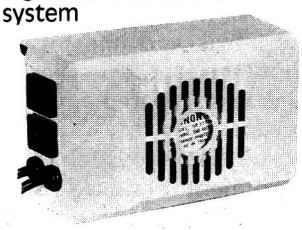

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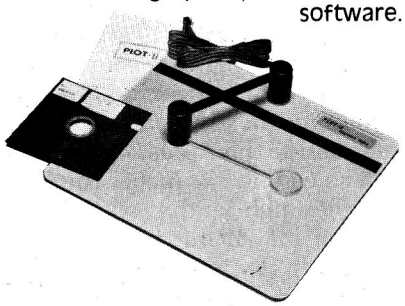

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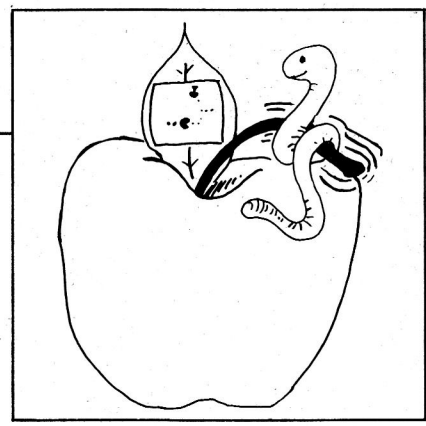

Editor's Note: SSM has recently changed its name to Transend Corporation. According to the company, the Transend Software now assumes the modem card is in slot 2.

Apple Joystick II

From its high-impact casing to its stress resistant interface cable, the Apple Joystick II is exactly the type of device you would expect from the folks at Apple: durable and well-designed.

The cable is a true cable, not a ribbon connector, and it is reinforced at three places: the point where the cable exits the joystick, the point where the cable exits the interface plug and a point 4½ inches from the interface plug. This last reinforcement is a moulded hard rubber stress protector which is made to slide down into the second slot from the right on the backplate of your Apple. It even has a little grounding clip to attach to the RF shielding plate, if your Apple is so equipped. This stress protector eliminates *all* stress on the interface plug inside the Apple.

The case is 3¼ inches square by 2 inches high, and its square shape is ideal for all but the smallest of hands. It fits in your hand and is neither too bulky nor too small.

There are two firing buttons, each ½ inch square, located on the top of the case. The buttons are smooth, precise and easy on the thumb; and they are located close enough together so they can both be pressed easily with one thumb. They also emit a soft click on both the downward and upward motion. This is of small significance, but it is a little annoying when you are playing Alien Rain at 3:00 a.m. —you just cannot play quietly! On the other hand, these clicks give you audible feedback on every press.

The joystick itself offers full 360 degree cursor control. It has self-centering springs that center the stick in its case; and on the bottom of the case, there are four small plastic screws (one for each spring) that allow you to disable the springs completely or in any combination. This is vital if you are using the joystick in conjunction with a graphics design program. And the screws can be turned with your thumbnail. Forget about looking for a screwdriver. On the underside of the case there are two thumbscrews that adjust the centering for the screen. These adjustments, one for the x-axis and one for the y-axis, allow the center position of the joystick to be located anywhere on the screen.

The Apple Joystick II is a quality instrument designed for years of use. As long as you don't mind buttons that click, it is the best joystick on the market. Apple Computer is located at 20525 Mariani Ave., Cupertino, CA 95014. Price is $59.95. ■

Jeff Moyer
Keezletown, VA

Accelerator II

How fast is fast? If you've spent much of your life making calculations with pencil and paper, a pocket calculator seems fast; and if you're using an Apple II to do spreadsheet work, payrolls and checkbook management, then your computer seems miraculously fast.

The day will come, however, when you'll wish that the Apple would work a little faster. The Accelerator II, from Titan Technologies, accomplishes the goal of reduced processing time in a very interesting way—by installing a computer inside your computer.

The Accelerator II is a plug-in card that will interface with Apple slots 1–7. The card is built around an improved 6502 central processing unit similar to the CPU on the Apple II motherboard but substantially faster (the Apple II CPU is rated at 1 MHz; the Accelerator's CPU is rated at 3.6 MHz). The board also carries 64K of RAM (including a built in language card), enough free memory for most business applications. The memory is organized for faster storage and retrieval.

Here's how the card works: When you plug in the Accelerator, programs are automatically loaded into the card's memory. The Apple RAM memory and CPU are used to control the video display while the card is active. The Apple's electronics are not completely bypassed; switches on the card, which you preset and forget, allow you to use other interface cards, disk controllers, modems, printer interfaces and so on. If additional memory is needed, you can make use of a regular language card to store data files, but the program itself must be stored in the Accelerator II memory.

How well does the Accelerator work? To answer that question, I loaned an Accelerator to a businessman who makes extensive use of his Apple II.

Don is the treasurer of a company in the travel industry that does a gross business of over $50 million annually. Every dollar of that business finds its way, sooner or later, into the calculations he performs on his Apple II. He runs VisiCalc about 50 percent of the time he uses his Apple. Fifteen percent of his computing time is dedicated to doublechecking his IBM mainframe-based check management program using an Apple software package called Disk O Check. All in all, most of his workday finds him seated at his Apple II. For someone like Don, computing speed is critical to productivity and profits.

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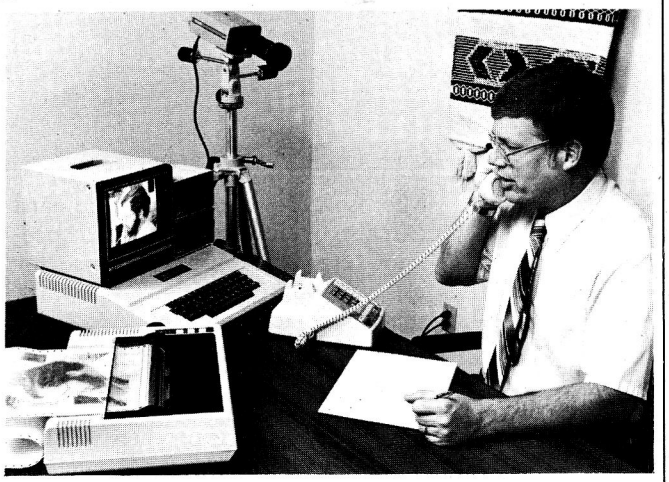

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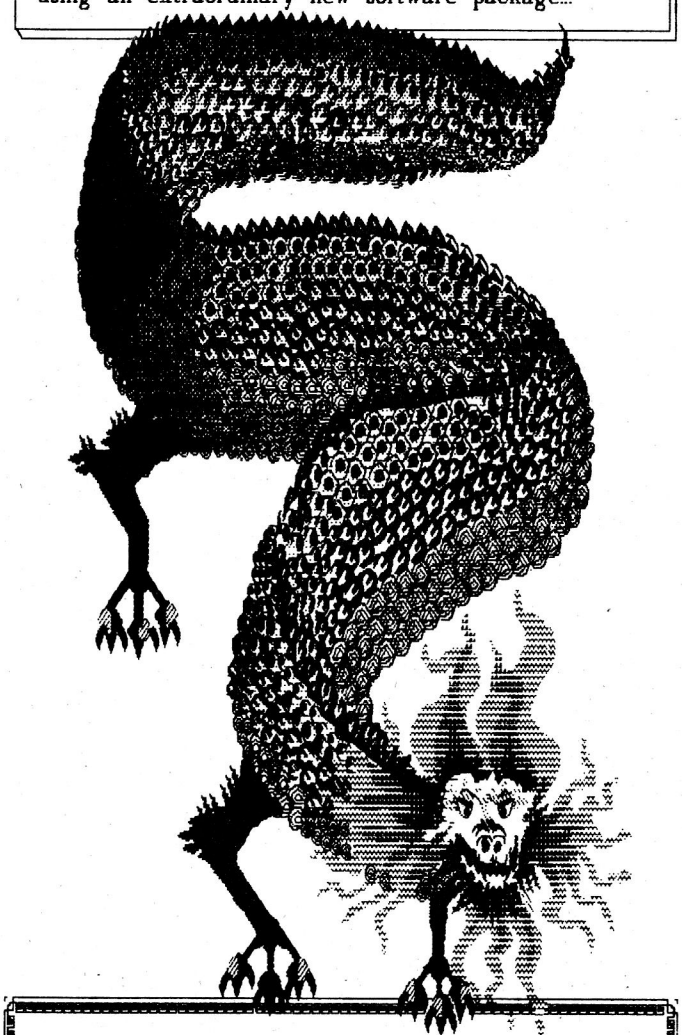

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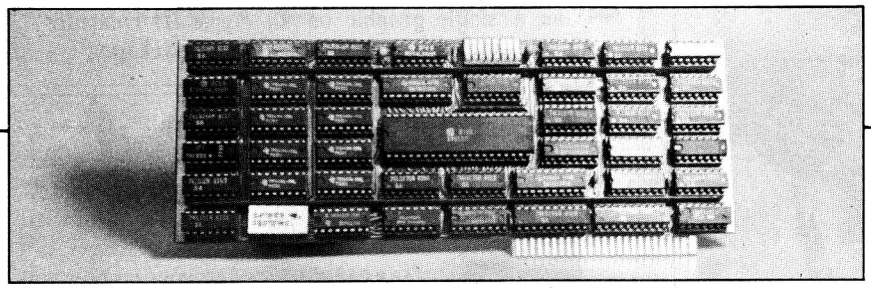

The Accelerator II from Titan Technologies.

Don fell instantly in love with the Accelerator. The long and tedious periods spent waiting for Disk O Check to compute during its check register procedure were cut in half. He discovered similar savings in computation time with VisiCalc, PFS and Information Master.

Don did, however, have two minor criticisms. One was that the Accelerator did not speed up the time it takes to load programs from disk. Apple disk drives work at their own speed and the Accelerator has to slow down for them. If the main time delay in running your favorite program is disk access, there's not much the Accelerator can do.

Another criticism was that some of his programs required the use of a pre-boot disk, which is provided with the card. Unfortunately, not all programs are written the same with regards to language; and in some cases, the Accelerator II has to be preconfigured to load Applesoft into its language card. That's the function of the pre-boot disk. The disk also configures the card to accept programs that run from a language card in slot 0. Pascal and Integer Basic are two examples mentioned in the Accelerator manual. The pre-boot disk also disables the Accelerator for use with direct memory access devices like the Microsoft Z-80 Softcard. The card can also be slowed down by the pre-boot to normal Apple II speed for use with entertainment software, such as arcade games.

There are scores of programs which, speeded up by the Accelerator II, will make your computing time more productive. Examples that spring to mind include VisiCalc versions 193 to 208, Mathemagic, Accounting Plus, the BPI accounting series, Invoice Factory, The General Manager and the N-Squared Market Illustrator.

The Accelerator II for the Apple II and II Plus comes ready to install with manual and pre-boot disk for a list price of $599 from Titan Technologies, 3990 Varsity Drive, Ann Arbor, MI 48104. ■

Brian Murphy
Fairfield, CT

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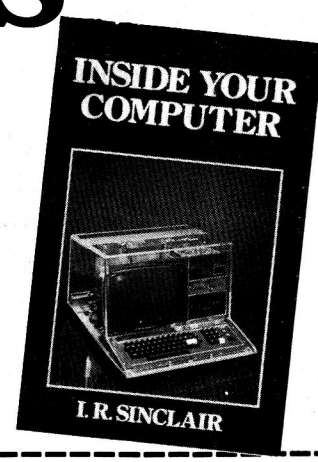

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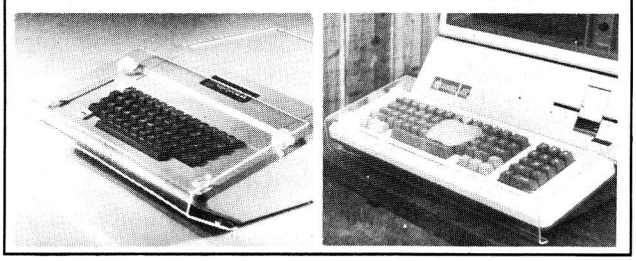

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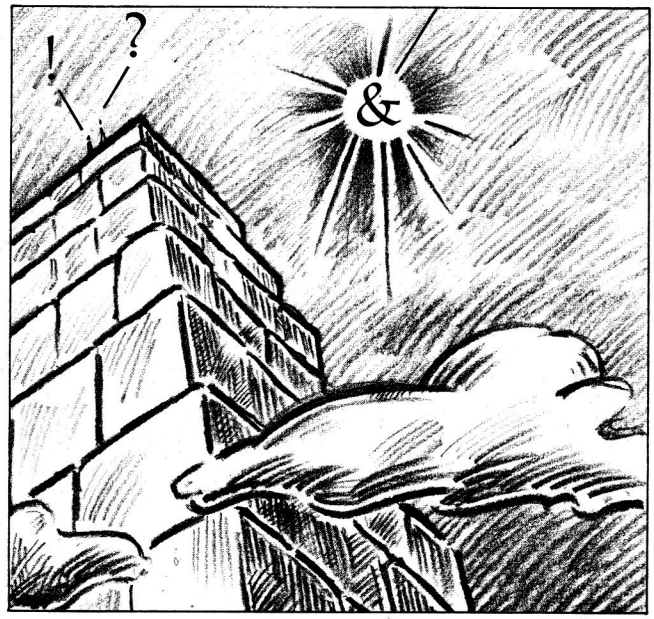

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Book Reviews

Apple Machine Language

by Don Inman and Kurt Inman

Reston Publishing Company Inc.
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$12.95

If you have no prior knowledge of 6502 assembly language, then this should be your first book. The first thing I noticed was the statement on the cover that with it you can learn machine language quickly and easily. As I flipped through the pages I saw that the book is indeed geared toward the novice.

The first chapter briefly reviews the major functions of Applesoft Basic, particularly the PEEK and POKE commands. A Basic program is presented that allows the user to enter assembly code to the monitor and run machine-language programs without having to learn about the monitor. Using this "Basic Operating System," the programmer can see results without even knowing the difference between decimal, hex and binary number systems. This is the subject of chapter 3, which also introduces the accumulator and instruction code format. The Basic Operating System is also used in subsequent chapters for discussing lo-res graphics and sounds.

After each chapter, a few self-test questions are presented, with answers of course! Throughout the text, stick figures and diagrams break up the monotony and reinforce important points. These are almost too simple in places—definitely for novices.

By Chapter 8, the user has learned about the various registers, commands and forward and backward branching. A table in each chapter provides a quick reference on the commands covered and their functions, addressing modes and opcodes. There is a full listing of 6502 instruction codes as an appendix (with one error for the LDX command).

The Basic Operating System is left behind now, and the monitor used for entering and running programs. Multiple-precision and negative numbers and a chapter on using the mini-assembler and addressing modes bring the book to a conclusion. The author mentions that the mini-assembler is not available for the Apple II Plus.

All in all, this book is a fine introduction to the basics of 6502 assembly language. Now I can pick up more traditional presentations on the subject and understand what they are saying! ■

Mark A. Butler
Roseburg, OR

6502 Systems Programming

by Thomas G. Windeknecht

Little, Brown & Company
34 Beacon St.
Boston, MA 02108
Softcover, $14.95

Written as an outgrowth of a university course, this book appears intended for assembly-language novices and experts alike. Though primarily designed for use as a textbook, it is an excellent vehicle for self-instruction.

Immediately obvious to the reader is the rather novel use of a non-standard assembly language, named Brevity by its author. Its advantages are repeatedly seen in the many examples of systems programs, running the gamut from tape I/O and printer control programs to a complete software development system.

Brevity is designed for efficient assembly-language programming on 6502 systems with little memory and only tape storage. The language is easy to learn, with features such as one-character mathematical opcodes, one-character addressing mode syntax, and statements no longer than eight characters.

This book offers a thorough treatment of assembler and assembly-language design. The reader moves quickly from the development of a set of elementary subroutines to a monitor program and a text editor, as well as the Brevity assembler and disassembler. While the reader must supply a few subroutines and addresses to run Brevity on a particular computer, the author has marketed a complete Apple II implementation for the meek of heart. ■

Peter Vogel
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by Alfred Glossbrenner

St. Martin's Press
New York, NY 10020
Softcover, $14.95

Have you been fascinated with the idea of using a modem with your Apple? You may have heard about the endless goodies on the other end of the phone line. But unitl now there hasn't been any decent book explaining how to go about making the connection, and detailing what it is you can expect once you finish dialing.

This past summer, three good introductions appeared. Since telecommunication is a rapidly expanding and changing field, you can expect even more books and revised editions to hit the newsstands soon. Don't

wait for something better, though—I wish I had read any one of these books before I started accumulating big phone bills! Even though I've been using my modem for a couple of years, I learned quite a lot from each of these books.

Each book assumes you are a rank amateur and gives an overall perspective on the subject. They list and define all the jargon you are likely to encounter, and then describe exactly how to connect your computer to the phone lines, with the hardware and programs you will need. Each book also shows what you should expect when you are connected to the time-sharing utilities and offers helpful suggestions on coping with them. However, none of the books delves deeply enough into the less popular Baudot standard, or input devices designed for the handicapped.

Knight's book is the cheapest and most elementary, Shapiro's is the sharpest for the Apple user, and Glossbrenner's is the most encyclopedic. They're all quite good, but...

Since my philosophy is, "Don't do it if it isn't fun," I looked for evidence that the authors had captured some of the excitement and compelling interest that moved the early modem users to make the system work. Curiously, I didn't find much fun. Also, these books are just too fascinated with technical considerations to communicate much of the real potential for technology to extend the human spirit.

Knight, who owns a TRS-80 Model III and was only 16 years old when he wrote this book, shows you step-by-step how to set up your hardware and software. That part is pretty elementary and is reasonably accurate, even though it is slanted heavily toward Radio Shack. He does give you an indirect picture of the amusement you can get from your new hobby, for instance by typing into the CB simulator on CompuServe.

His book has 33 photographs and 19 cartoons or line drawings, which is quite a lot for a computer book. The photos, however, add nothing to the text, being mostly the happy family around the Model I type. Most of the information goes little beyond the CompuServe handouts, or adopts the all too prevalent "gee-whiz" tone.

Knight has made a few minor mistakes. Figure 3-7 (p. 40) shows not the Source's Chat mode, but a screen from CompuServe. Baud does not technically mean bits per second, although for practical purposes that is nitpicking. Downloading software to your computer is not something to look into the crystal ball for; in fact, the Telephone Software Connection has been doing that for years. Finally, the menus reproduced from the Source and CompuServe are copyrighted by their respective owners, who should be given credit.

Knight treats us to a gratuitous chapter on so-called piracy which is completely one-sided. A new user would expect an intelligent discussion

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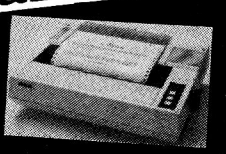

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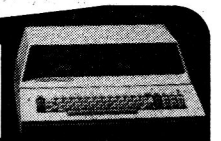

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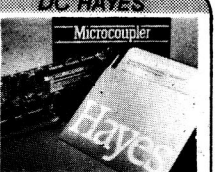

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of what legel thickets he might get into with his modem, but that is entirely lacking here.

More significantly, I missed mention of the wealth of public domain software available from CP/M bulletin boards. Only Glossbrenner pays this subject its due. Knight does not discuss graphics, nor the Prestel, Telidon, or other emerging protocols for videotex, and ignores the Dow Jones Information Service and other business-oriented utilities.

Here is where Shapiro and Glossbrenner shine. There really are businesses that use and depend on modems and the timesharing systems. With either of these two books you can easily get a system going too. If you have an Apple, you can simply follow Shapiro's suggestions exactly. His route is helpful and painless. If you must communicate with less popular systems, Glossbrenner's might be more useful, especially as a reference, though you might need a good dealer to explain some details that apply only to your particular hardware.

Neil Shapiro comes with impeccable credentials: electronics editor of *Popular Mechanics* magazine, and president and SYSOP of the Micro-Net Apple Users' Group (MAUG) on CompuServe.

I found little to complain about in his book. It is curious that the cover photo shows an RS232-C serial ribbon cable and a DB25 connector. Since neither is really discussed in the book, nor mentioned in the index, maybe they should have pictured an RJ11 modular phone plug with some sort of direct connect modem instead.

In the first chapters, Shapiro explains what a modem is and covers such arcane details as parity, baud rates, duplex, and the complete installation instructions for the Micromodem II and the Apple II. He explains what a terminal is and the difference between smart and dumb. Using ASCII Express Professional from Southwestern Data Systems as an example, Shapiro details the features of the best terminal programs.

To get you going with your first phone call, Shapiro wisely uses a local bulletin board using the PMS protocol, showing you how to log on, read messages, store your responses and gracefully exit. An appendix with the telephone numbers and help files on the most popular bulletin board systems is very useful. Knight has a similar listing, but for the most up-to-date phone listing you should try calling Bill Blue's PMS at the number given in the books.

The chapters on the Source and CompuServe tend to be similar in

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each of the books. The menus and some of the command details may have changed slightly (so don't set up your macro files for automatic logon until you practice manually first), but each book has little hints or nuggets of information that didn't find their way into the manuals. I especially appreciated Shapiro's explanation of how to save files on the timesharing systems. They should have hired him to write their manuals.

There are some warnings in the books about the deficiencies of the present systems. For example, Shapiro cautions that the Participate conferencing utility on the Source is very, very slow. I got stuck in it once for more than an hour, hopelessly lost.

Another helpful hint is to use a database to organize all the text files you will collect if you capture and download as the books advise. Glossbrenner even furnishes The Electronic Universe Survival Kit, which includes a suggestion to get a cheap manual address book so you can remember all those ID codes.

In fact, Glossbrenner's book is full of what he calls Online Tips, which are little boxes of very helpful information, such as "if you buy a 1200 baud modem, be sure it is Bell 212A compatible.

There are only two problems with his book. First, it is aimed more at the IBM PC and business user than the Apple hobbyist. Shapiro's book is useful if you mainly call public bulletin board systems. Secondly, it is so detailed that inevitably some parts are out of date. The Source menus and commands keep changing arbitrarily, and the section on the *New York Times* Information Service will be of little interest to the personal computer user as that service unfortunately has become a dedicated contract utility rather than a public one.

Glossbrenner, a computer consultant, has compiled a great deal of information into a very organized reference. Some parts, such as the appendix, "Secrets of Using Telenet and Tymnet," can probably be found nowhere else. He even has a directory of the electronic mailbox IDs of many people active in telecommunications.

Here's one tip the books overlooked. You can get for $10 a really good smart terminal program called DATACOMM written by Hayes Microcomputer Co. in Apple Pascal and donated by them to the International Apple Core. See your local Apple users group for details. With one of these books, a used Hayes Micromodem II ($175–$200), and DATACOMM, you will have an excellent start on an engrossing hobby. ■

Eric Eldred
Derry, NH

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Microcomputer Graphics

by Roy E. Myers
Addison-Wesley Micro Books
Reading, MA 01867
Paperback, $11.95

Apple Graphics and Arcade Game Design

by Jeffrey Stanton
The Book Publishing Co.
156 Drakes Lane
Summertown, TN 38483
Paperback, $19.95

Two recently published books cover concepts of graphic design appropriate for all computers, and include examples and techniques specific to Apple computers. *Microcomputer Graphics* introduces the basics of graphics programming in clear, logical steps. *Apple Graphics and Arcade Game Design* follows up with animation for games.

Microcomputer Graphics

Microcomputer Graphics by Roy E. Myers begins with nine short but impressive graphics programs to whet your appetite. Curves, moving shapes and a variety of animation techniques abound.

Myers has written a clear, gradual presentation that effectively teaches graphics on the Apple computer. Most of the examples are no more than a dozen lines long, encouraging even the laziest programmer to enter them into the computer to see the results. All examples are written in Basic so that any Apple programmer should have no trouble following them.

Myers' book provides a thorough grounding in how Apple graphics are structured and how they are used in Basic programs. The internals of the Apple computer are laid open for investigation—how the various graphics pages are organized, and how to find your way around in them. The Apple graphics commands TEXT, GR, HGR, HCOLOR and HPLOT are all explained with examples. Myers takes care to show how additional graphics features, not available through the normal Apple commands, may be accessed with pokes to the right memory location. He also explains bit pattern graphics and how to generate and use shape tables.

After presenting the basics, Myers discusses two- and three-dimensional graphics with matrix transformations, homogenous coordinates and analytic geometry. The book explains matrix functions with a complete set of simple programs that show the effects of each. The discussion of coordinate systems and transformations appropriate for three dimensions provides a solid basis for rotating and moving three-dimensional objects, and then projecting them onto a two-dimensional display. In another chapter he gives a variety of techniques for eliminating lines, such as those on the back of objects that should not appear.

The how-to graphics discussion ends with a short chapter on animation—hardly enough for any real insights into this complicated subject that could be the topic of an entire book.

Microcomputer Graphics explains the mysteries of programming graphics on the Apple and is for anyone who is at least moderately proficient in Basic programming. The mathematics of two- and three-dimensional displays are valid for any computer, but the method of translating the concepts into actual displays on the screen is specific to the Apple.

All examples in the book are available from the author on disk for $15—a bargain for those who don't want to type them all in.

Apple Graphics and Arcade Game Design

In *Apple Graphics and Arcade Game Design*, Jeffrey Stanton unfor-

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tunately tries to introduce, in only 25 pages, a subject that *Microcomputer Graphics* explains thoroughly in 100 pages.

Stanton in Chapter 2 proclaims "It is my intent in this chapter to teach you the fundamentals of assembly language programming..." (!) This proclaimed goal is unattainable.

The following chapters present workable techniques for using Applesoft hi-res routines, raster graphics shape tables, bit mapped graphics and many other routines needed to program arcade type games in assembly language on the Apple. There is a wealth of detail on paddle routines, calculating collisions, as well as steering and moving objects around the screen.

This should be the book to explain animation on the Apple. Not so. The explanations of the techniques are confusing. Examples are complete, but there are too many concepts in each one to follow easily. The several long hundred line programs also discourage this practical method of learning.

The book is a good example of well-documented arcade programs on the Apple. It is a bad example of a book designed to teach how to program graphics.

Although the basic techniques would work on almost any computer with bit mapped graphics display (like the Atari in some of its graphics modes), it would take a great deal of work to transfer the concepts to any computer other than the Apple.

As with Myers' book, the examples in Stanton's book are available on disk for $15, plus $1.50 for handling from The Book Co. The time required to enter the lengthy examples and the likelihood of making typing errors easily justify the cost of the disk.

Wading through *Apple Graphics and Arcade Game Design* is difficult, but it does have its rewards. The advertising blurb proclaims that *Apple Graphics* is, "The only book to explain how to design arcade games from start to finish..." This is true. But before you tackle this book, you really should read Myers' book, and you should have some 6502 assembly language programming under your belt.

For a good, solid introduction to graphics display theory and specific programming techniques on the Apple, you cannot go wrong with *Microcomputer Graphics* by Roy E. Myers. If you want to extend your knowledge into animation and games, you'll also need *Apple Graphics and Arcade Game Design* by Jeffrey Stanton. These two books take the mystery out of computer graphics and show you how to make frivolous little aliens scoot across the screen, or add a practical display to your business application. ■

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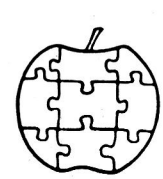
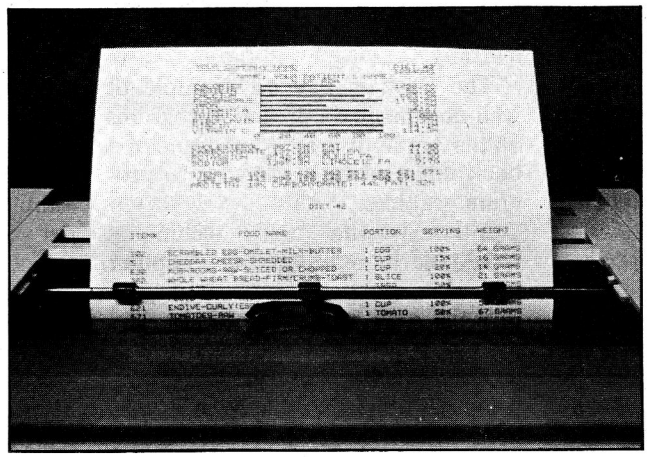


New Software

edited by Joan Witham

Nutritionist II

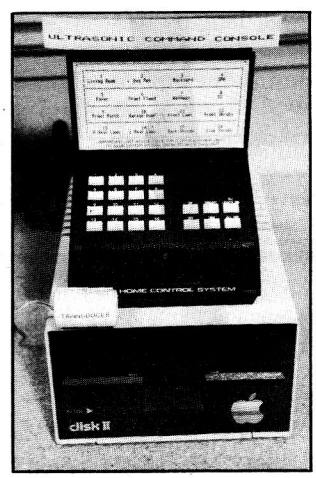
N-Squared Computing, 5318 Forest Ridge Road, Silverton, OR 97381, has announced the Nutritionist II, an interactive graphics diet analysis program. Nutritionist II includes a program disk, user manual, USDA Reference Source, index and database disk with 730 foods, all for $295. Dieticians, hospitals, educational systems and homemakers can use this program to display nutritive analyses of foods and diets, identify deficiencies and determine optimum foods for a naturally-balanced diet. Reader Service number is 440.



Nutritionist II diet analysis program.

Query!2 Update

Query!2, a general database management system, is now available with an added feature to select screen hold (on/off), so that records with more than 22 fields will no longer scroll off the screen. Another new feature is Printer, with options such as printing labels (1–4 per page) and selecting which records to print. The new sort alphabetizes faster and the Help menus are completely updated. Query!2 is available for $29.95 from Hoyle and Hoyle Software Inc., 716 S. Elam Ave., Greensboro, NC 27403. Older copies may be updated for $3. Reader Service number is 441.



Home Controller.

Amper-Magic Update

Amper-Magic, a program that adds new commands to Applesoft, has a new Command Library disk, Volume Two, that offers you 27 more commands, including a complete and flexible Print Using command. Volume Two lists at $35. For further information, contact Anthro-Digital Inc., PO Box 1385, Pittsfield, MA 01202. Reader Service number is 442.

Handweaver's Design Tool

Navette, a sophisticated pattern design tool for handweavers, allows the user to easily create warp and weft drawdowns that can be stored on disk and combined to produce new patterns. The price is $39.95 from Opcode Software, 1909½ Vine St., Berkeley, CA 94709. Reader Service number is 443.

Home Controller

The Home Controller enables the Apple II or IIe to create schedules (daily, weekly or monthly) to remotely control any electrical device plugged into a BSR module. The standard Pascal program controls up to 50 events and costs $40. The advanced version controls up to 100 events and costs $55; You supply your own hardware. For further information, contact Infeld Software, 2422 Alvin St., Suite 100, Mountain View, CA 94043. Reader Service number is 444.

Pentapus

Speed and intelligence will defeat the devilish mutant army so you can meet the dreaded Pentapus and return home from your outer space journey. Pentapus retails for $29.95 for the Apple II, II Plus or IIe. Contact TurningPoint Software Inc., 11A Main St., Watertown, MA 02172. Reader Service number is 445.

SRA's Library Plan

SRA has announced a new plan to make its educational courseware, Thinkware, available at cost savings. It offers a lower-cost way to keep up-to-date with new products. For further information on the library plan, schools can contact SRA, 155 North Wacker Drive, Chicago, IL 60606. Reader Service number is 446.

Daisy Professional Statistical Package

Now available for the Apple II Plus and IIe is a new and enhanced version of Rainbow Computing's Statistics with Daisy. Daisy Professional performs over 50 statistical functions for business planners, scientists, government analysts, researchers, educators and students. The cost is $2000. For further information, contact RCI Marketing, 9719 Reseda Blvd., Northridge, CA 91324. Reader Service number is 448.

Physics Lab Interfaces

Cross Educational Software offers three packages, Heat, Light and Sound, that are used to perform experiments in the physics lab. Each includes a kit of parts that plug into the Ap-

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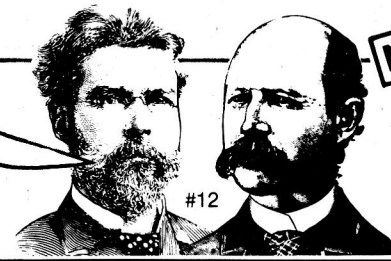

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SHAPE EDITOR: Keyboard-draw shapes for animation in your programs. Create **Proportionally-Spaced Typefaces** with special characters. Six fonts included. Listable Applesoft demos show you how to animate graphics and create professional Charts and Graphs.

BYTE-ZAP: Rewrite any byte on a disk for repair or alteration. Load entire sectors on the screen for inspection. **Hex/Dec/Ascii** displays and input. Educational instructions include experiments for making trick file names, restoring deleted files, changing DOS, etc.

MORE: Useful music, text and hi-res tricks for your programs. Clear educational documentation.

(**$29.50**: Includes Peeks/Pokes Chart & Tip Book #5)

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26 NEW FONTS for use with Apple Mechanic programs. Many sizes of fully-editable characters.

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ALPHA PLOT
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by BERT KERSEY and JACK CASSIDY

DRAW IN HI-RES on both pages using keyboard OR paddles/joystick. View lines before plotting. Use mixed-colors and Reverse (background opposite) plotting. Fast hi-res circles, boxes and ellipses; filled or outlined.

Compress HI-Res Images to 1/3 Disk-Space. Superimpose hi-res pages 1 and 2 or re-locate any rectangular image area anywhere on either hi-res page.

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DOS BOSS
DISK COMMAND EDITOR
by BERT KERSEY and JACK CASSIDY

RENAME DOS COMMANDS and Error Messages. "Catalog" can be "Cat"; "Syntax Error" can be "Oops" or *anything*. **Protect your programs**—An unauthorized Save-attempt can produce a "Not Copyable" message, or *any* message you want. Also List-Prevention and one-key program-execution from catalog.

Customize DOS. Change the Disk Volume heading to your message or title. Omit or alter catalog file codes. Fascinating documentation, tips and experiments.

ANYONE using your disks (booted or not) will be formatting DOS the way YOU designed it.

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TIP DISK #1
by BERT KERSEY

100 LISTABLE PROGRAMS from Beagle Bros Tip Books 1-4. Make your Apple do things it's never done! All 100 programs are changeable for experimentation. Includes Apple COMMAND CHART with all Applesoft, Integer Basic & DOS Commands and Descriptions!

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LIST FORMATTER prints each program statement on a new line. Loops indented with printer Page Breaks. A great Applesoft program de-bugger! Also...

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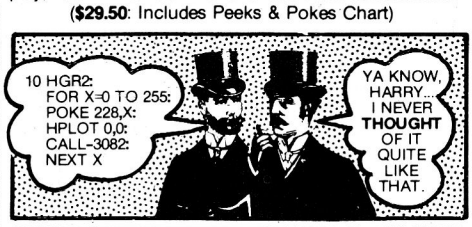

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RENAME ANY APPLESOFT COMMAND or Error Message to any word, for program clarification or encryption. Plus add optional NEW COMMANDS—

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Also— GOTO or GOSUB may precede variables (as in "GOSUB FIX" or "GOTO 4+X". Escape-mode indicated by special ESC CURSOR. Replace Apple's awkward Graphics Screen Switch pokes with one-word commands. Change ctrl-G Beep to any tone. INVERSE REM STATEMENTS too! All GPLE® compatible.

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Excellent Reviews— (see Jan-83 *Softalk*, page 148). BEAGLE MENU too: Description under "Typefaces".

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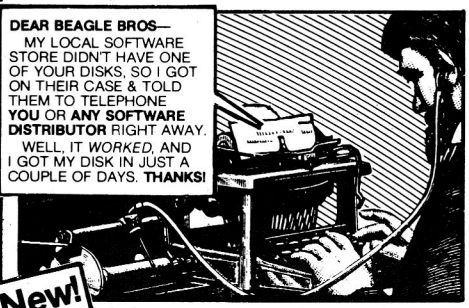

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ple's game port. The cost is $60 each. These are part of a series of 114 physics programs (12 disks) for Apple computers. Contact Cross Educational Software, 1802 N. Trenton St., PO Box 1536, Ruston, LA 71270. Reader Service number is 449.

Golf League Statistics

This fully-automated system will manage, analyze and print records for an industrial or school league with up to 20 teams and 50 players. Some features are player standings, course records, equitable stroke adjustment. It is available for $139.95 from Disk Depot, 731 W. Colorado Ave., Colorado Springs, CO 80905. Reader Service number is 455.

Pro Football Stats

Eastern Computer Consulting Associates Inc., 11 Dick Drive, Worcester, MA 01609, has developed a database and operating program, Pro Football Stats, that shows the complete history of every professional football game since 1970. It will analyze how any team performed against the spread under whatever criteria you choose. The cost is $495. Reader Service number is 447.

Personal Inventory

Personal Inventory organizes your books, magazines and personal items. The quick search can use a partial spelling to find any reference. It is available for $59.95 from 8th Dimension Enterprises, PO Box 62366, Sunnyvale, CA 94088. Reader Service number is 454.

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Index Card File

Make your files more efficient and easier to reference with Index Card File from United Software Associates, 38A West Oakland Ave., Oakland, NJ 07436. It offers easy installation and immediate use for $49.95. Reader Service number is 457.

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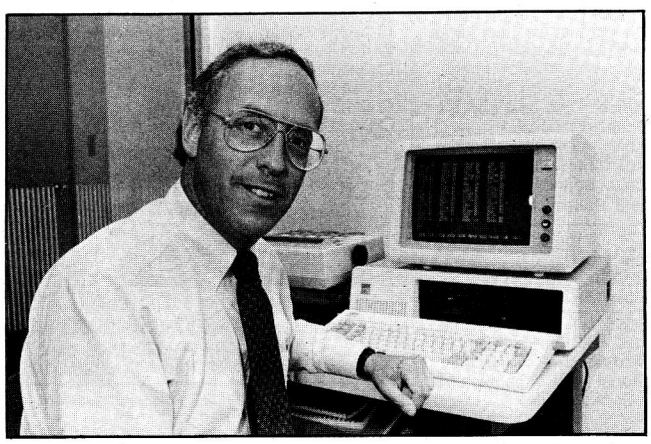
Lorac Software, 48 Baker Road, Livingston, NJ 07039. Reader Service number is 458.

The Pharmacist's Assistant

The Pharmacist's Assis-



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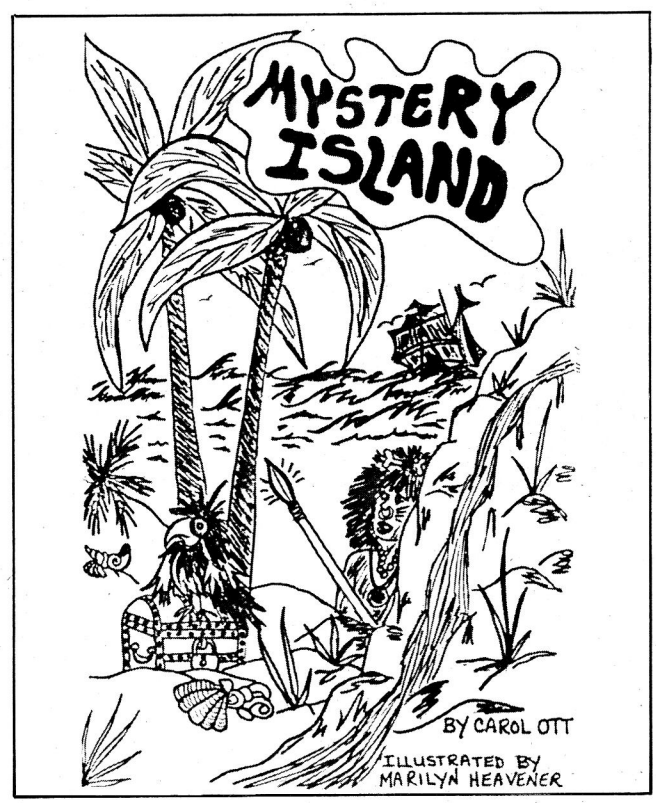

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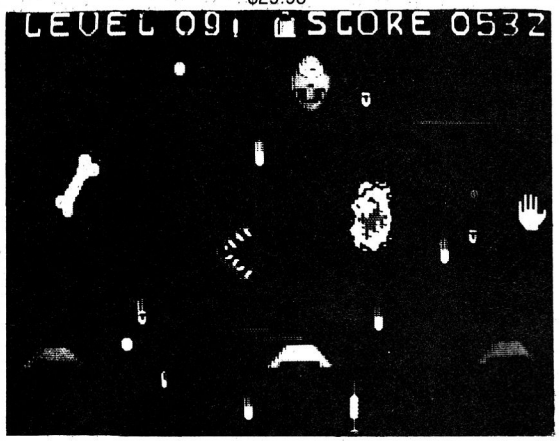

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Custom Ware is a mini-authoring series to help teachers create and edit their own CAI lessons. Nine programs offered are classifying, choosing, matching, finding, naming, completing, sequencing, spelling and editing. The first series includes lessons for levels three through six, covering reading and language arts skills. Cost is $69.99 each for the creation disk and one level disk. Contact Random House, 7307 South Yale Ave., Suite 103, Tulsa, OK 74136. Reader Service number is 450.

Two Teaching Utilities

UTIL is a utility program with applications for the computer science or computer math teacher. Features include restoring a file, protecting disks from copiers, rebuilding disks or fixing sector counts and more. The cost is $29.95.

Sorting Techniques I can be used in a programming course to show five different sorting routines. Full documentation lists all algorithms, and an explanation of each sort is included. The cost is $24.95. Both programs may be obtained from Microcomputer Workshops, 225 Westchester Ave., Port Chester, NY 10573. Reader Service number is 452.

AgDisk Budgeting Extension Module

Managers of agricultural operations can shorten budgeting and review procedures with the AgDisk Budgeting Extension Module, which is used with the AgDisk Farm Accounting Package. It permits budgeting based upon the previous year's data, then prints graphs and tabulated reports. The program costs $150 from Harris Technical Systems Inc., 624 Peach St., Lincoln, NE 68508. Reader Service number is 453.

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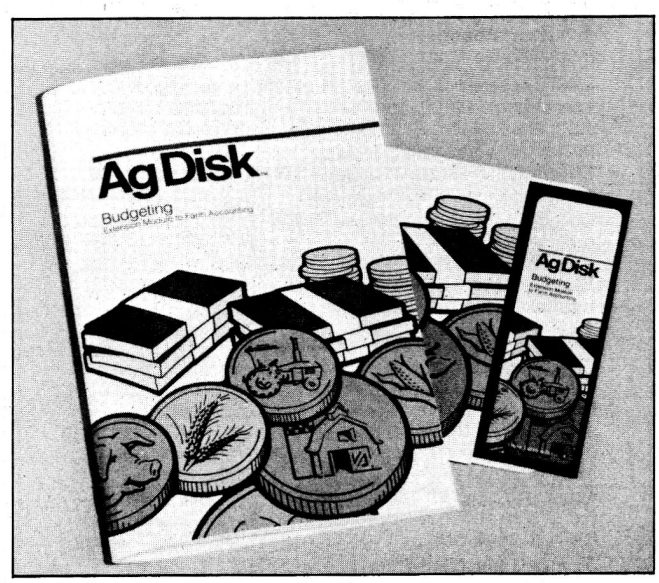
The Graphics Magician's improved version has three animation editors and a high-resolution picture/object builder to store hundreds of multi-colored pictures on one disk. The automatic color-fill paintbrush routine does shading and fills in detail drawings with over 100 colors. Retail price is $59.95. Contact Penguin Software, 830 4th Ave., Geneva, IL 60134. Reader Service number is 451.



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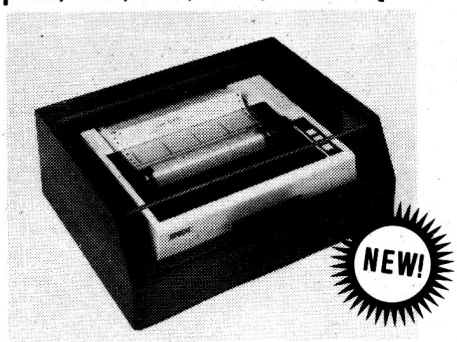

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APPLE MACHINE LANGUAGE—by Don Inman and Kurt Inman. APPLE MACHINE LANGUAGE builds upon your previous knowledge of BASIC, and teaches you the machine language in small, easy, completely illustrated steps. Following this guide, you will be able to write machine language programs directly, using the Apple System Monitor. Each new program is thoroughly presented in functional blocks, with sketches of how each step will actually appear on the video screen. Soon you will be entering and executing your own machine language programs, with predictable results! BK 1248 $14.95

THE BOOK OF APPLE SOFTWARE—edited by Jeffrey Stanton, Robert P. Wells, Ph.D., and Sandra Rochowansky. Are you bewildered by the thousands of Apple II programs on the market? Here is the advice you need, with descriptions, ratings, and evaluations of over 500 of the most popular programs for the Apple II. You'll find reviews of business, education, game, and utility programs, and advice on hardware options and software vendors. BK1265 $19.95.

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IIe Introductory Videotape

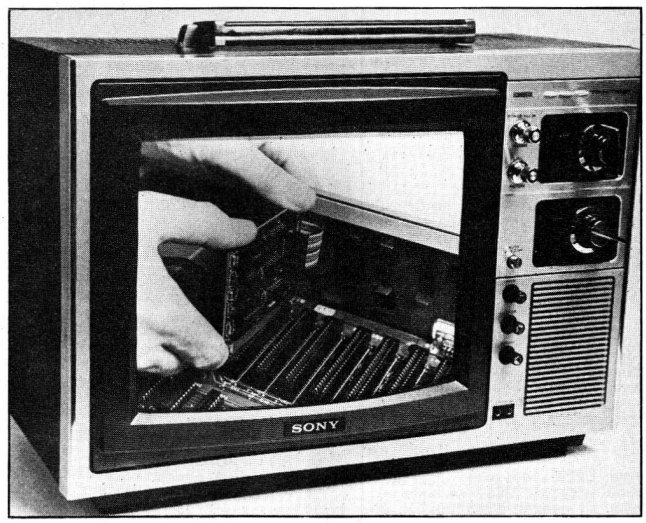
A half-hour videotape, "Introduction to the Apple IIe: Getting Started," is now available to computer newcomers. It covers unpacking and setup, installation of peripherals, disk care, and a demonstration of several types of software including word processing, electronic spreadsheet, database management, computer-generated music and a computer game. Price is $60 from Lewis Video Productions, 601 West End Ave., New York, NY 10024. Reader Service number is 466.

Instagraphic CRT Imager

With the Kodak Instagraphic CRT imaging outfit, users can instantly produce high-quality color photographs of static 12- or 13-inch color screen displays. The imaging outfit includes the cone, camera (with close-up lens attached), color print film, cable release, gelatin filter, owner's manual and other extra accessories. Adapter brackets for your own 35mm SLR camera are also included. The outfit cost is $190. Contact Eastman Kodak Co., 343 State St., Rochester, NY 14650 for further information. Reader Service number is 479.

Memory Correct III Electronic Typewriter

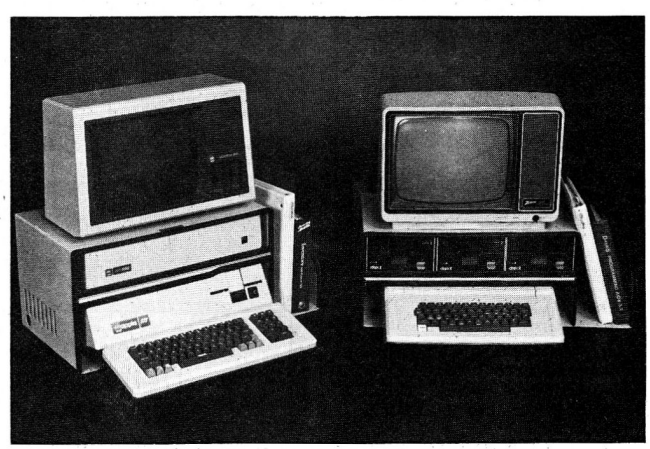
Smith-Corona has expanded its line of portable electronic typewriters with the Memory Correct II Messenger that can serve as a letter-quality computer printer by plugging its optional Messenger Module into a computer. It is equipped with both RS-232 serial and Centronics parallel outlets. Suggested retail price for the electronic typewriter is $599, with an additional $179 for the Messenger Module. For further information, contact Smith-Corona, 65 Locust Ave., New Canaan, CT 06840. Reader Service number is 474.



A new videotape, "Introduction to the Apple IIe: Getting Started."



The complete Kodak Instagraphic CRT imaging outfit.



The Pro-Tech security stand.

Music Master Interface Card

Using Apple keyboard commands and the Music Master interface card, you can play preprogrammed music, create custom music programs, develop and compose music, add special sound effects and designate melody, tempo, chord and rhythm. Music Master comes with detailed instructions, keyboard coding labels and two mini stereo speakers with audio cables for $199.95 from OPCS Inc., 23801 Calabasas Road, Suite 2050, Calabasas, CA 91302. Reader Service number is 476.

Pro-Tech Security Stand

Segull Enterprises provides security for the Apple II with the Pro-Tech II ($155), and the Pro-Tech III ($165) for the Apple III. Each stand features a rear locking system made of 16-gauge steel and is color coordinated to the Apple. For further information, contact Segull Enterprises, 88 West Britannia St., Taunton, MA 02780. Reader Service number is 473.

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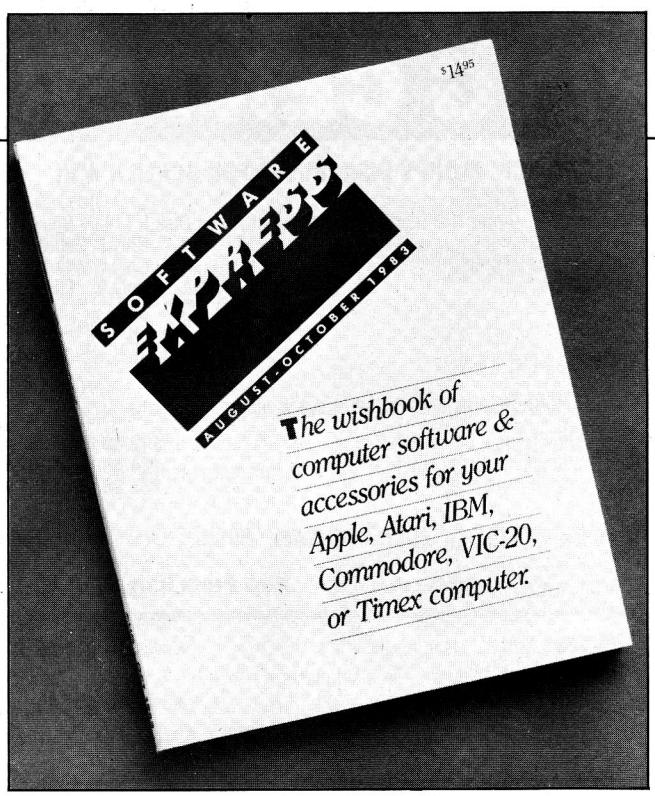


SKU's Software Express.

Software Express

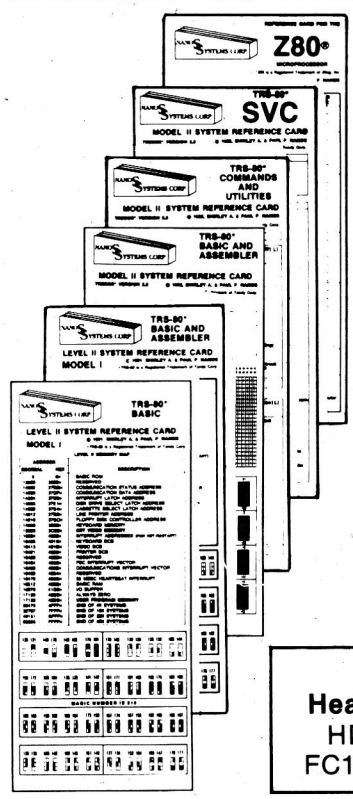
SKU's *Software Express* is a 300-page guide containing descriptions of more than 800 software programs and peripheral accessories for personal computers. The guide is organized for easy reference and features vendor coupons good toward the purchase of software and/or accessories. Software Express is sold through computer stores for $14.95. Reader Service number is 462.

Voicemail Electronic Mail

Telephone Software Connection, PO Box 6548, Torrance, CA 90504, brings you Voicemail at a month-to-month subscription rate of $25 for setup plus $25 monthly fee. Additional costs are 30–40 cents per minute, evenings. Voicemail brings the features and convenience of electronic mail to normal spoken messages, entered or retrieved via a toll-free call. Reader Service number is 472.

Rainbo-256 RGB Card

The Rainbo-256 is a high-resolution RGB card designed to interface Apple II Plus and IIe computers with Electrohome, Taxan and other similarly inter-



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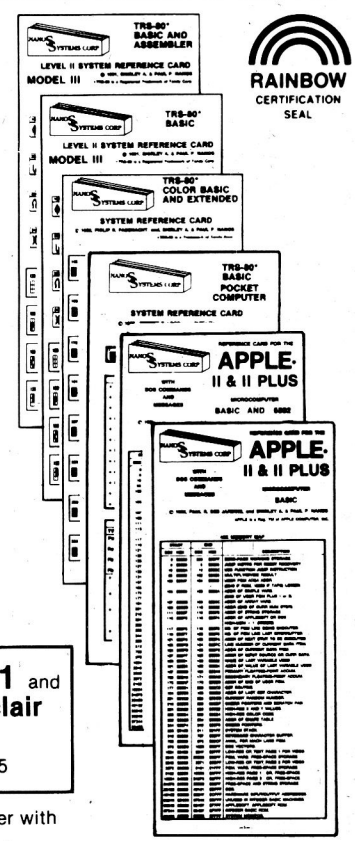

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faced color video monitors; the monitor must be specified to order the correct interconnector. The Rainbo-256 is programmable and eliminates color smearing. The cost is $279 from Microtek Inc., 4750 Viewridge Ave., San Diego, CA 92123. Reader Service number is 475.

Hard Disk

A removable 5-megabyte hard disk is now available for the Apple II or IIe from Digital Electronics Systems Inc., 107 Euclid Ave., Birmingham, AL 35213. The 70-millisecond average access device uses a 100-millimeter disk and Whitney technology. The hard disk also provides a convenient medium of exchange between Apples and Digital Electronics Systems' 68000-based computer. The $1295 price includes the hard disk, controller, manual and software. Reader Service number is 480.

Info-Mate Modem

A microprocessor-based Bell 212A-type modem, designed to fit beneath a standard telephone, has been introduced by Cermetek Microelectronics Inc. After you plug it into your computer, telephone line and a power outlet, it automatically adapts to your communications parameters. Features are auto-dial, auto-answer, auto-speed select and auto or manual selection of pulse or tone dialing. The Info-Mate 212A is priced at $595 from Cermetek Microelectronics, 1308 Borregas Ave., Sunnyvale, CA 94089. Reader Service number is 465.



The Info-Mate 212A auto-answer modem.

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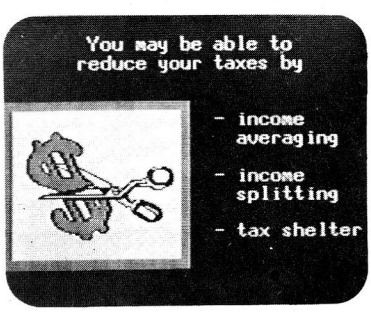

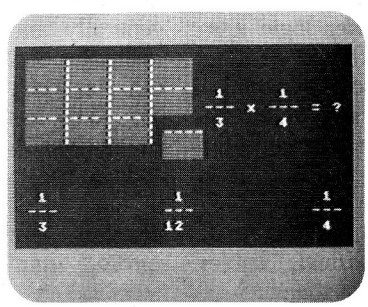

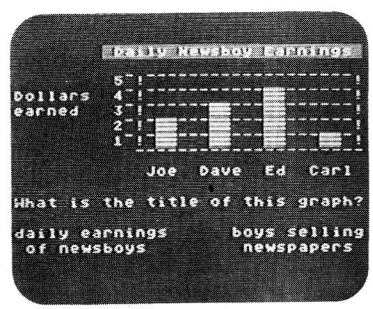

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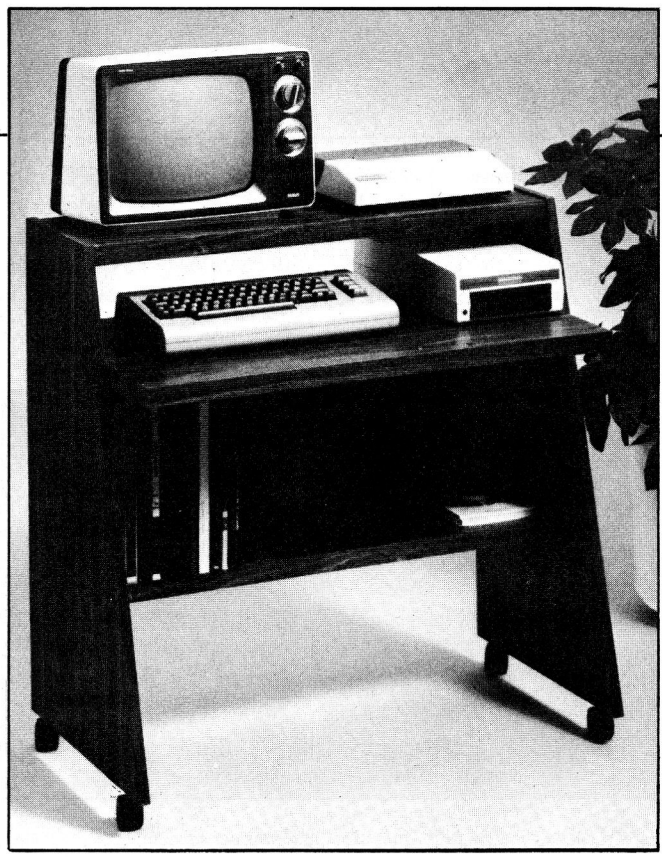


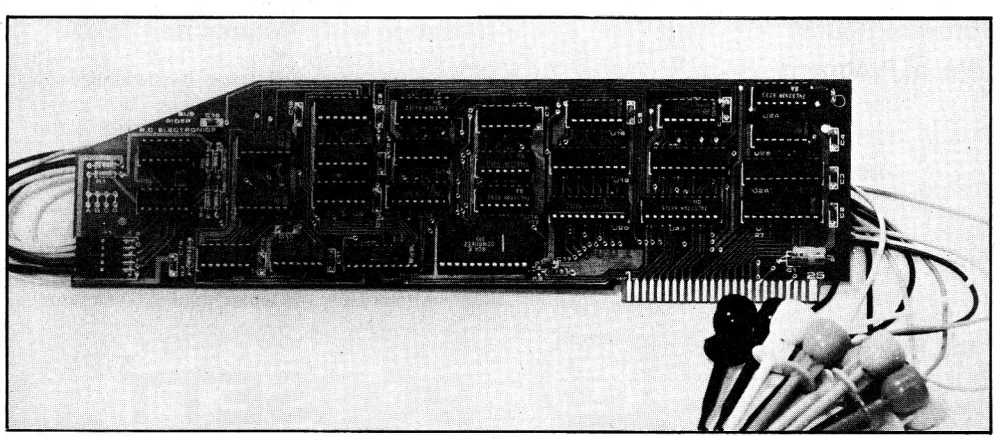
The Model CT-100 computer table.

CT-100 Computer Table

The Model CT-100 computer table, which retails for $69.95, has a full-width platform above the desk surface for a monitor, disk drive and printer. A storage shelf below the work surface holds manuals, software and accessories. Contact Bush Industries, 312 Fair Oak St., Little Valley, NY 14755 for further information. Reader Service number is 477.

Busrider Logic Analyzer

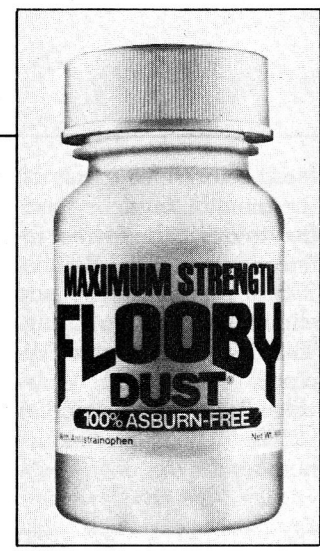
The Busrider logic analyzer is a tool for developing hardware boards and interface software, or for debugging assembly code for the Apple computer. It is available for $395, which includes the circuit card, reference manual, cables for external inputs and software. For more information, contact R.C. Electronics Inc., 5386 Hollister Ave., Suite D, Santa Barbara, CA 93111. Reader Service number is 469.



The Busrider logic analyzer.

Flooby Dust

Flooby Dust, when applied in measured amounts to hardware, software, programs or operators, will debug any computer-connected operation. Flooby dust is carefully packaged in a tamper-proof bottle to keep it out of the hands of children and the inept. For further information, contact Ron Wallace, Wallace Micro-Mart Inc., 2619 N. University, Peoria, IL 61604.



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DX-1 Sound Processing System

Real sound can now be entered, saved, processed, sequenced, played and generally modified under computer control using the DX-1 sound processing system. The basic system includes the DX-1 printed circuit board, an operation manual and a software program capable of recording, manipulating and sequencing sound along with 22 pre-recorded sounds. Cost is $239. Contact Decillionix, PO Box 70985, Sunnyvale, CA 940 86 for further information. Reader Service number is 460.

The Operator Modem

The Operator by Timecor is a totally self-contained modem complete with documentation and start-up software programs on disk. Main features include 110/300 baud, full and half duplex, auto answer and disconnect, and rotary and Touch Tone compatibility. It can be obtained for $159.95 from Timecor, Four Longfellow Place, Boston, MA 02114. Reader Service number is 478.

Analog Input Boards

The DT2832 series are plug-in analog input boards for the Apple II, II Plus and IIe personal computers. The DT2832, at $695, includes a 12-bit A/D converter system along with a programmable timer containing a real-time clock and two auxiliary clocks.

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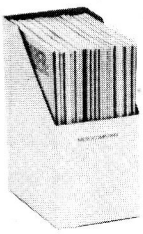

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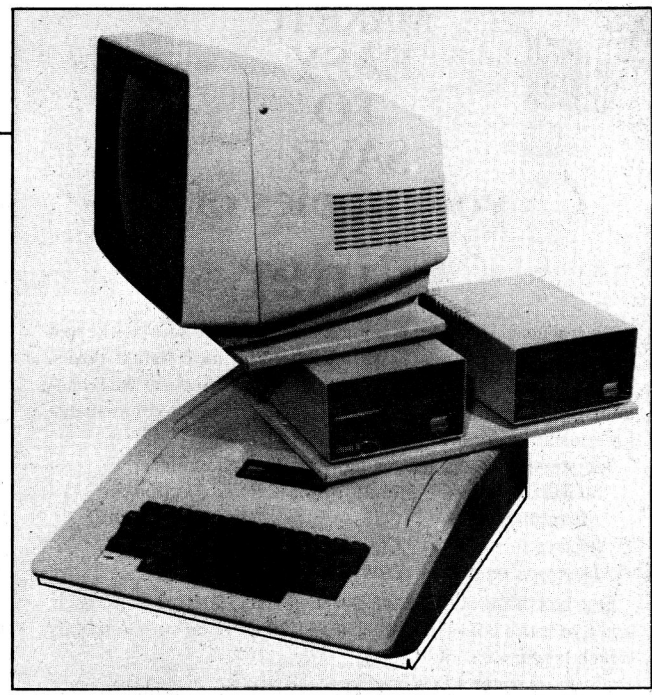
Omni-Lock Security Shelf

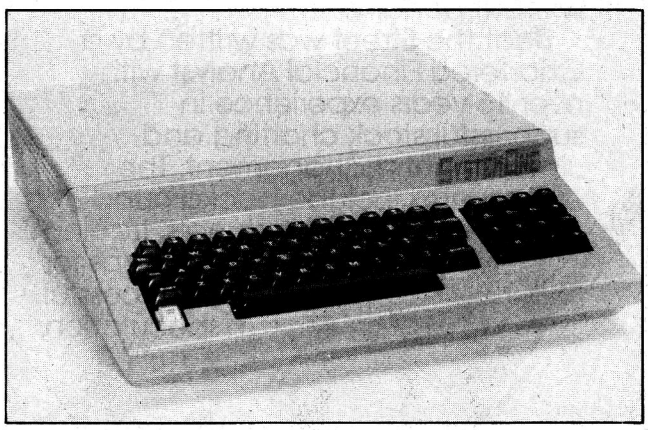
Omni-Lock is a security shelf system designed for the Apple II or III. It provides total lock-down of keyboards, dual disk drives and monitors through a single lock on the shelf spindle. Omni-Lock shelves swivel 360 degrees for complete access to internal cards and peripherals. One key unlocks all. Prices range from $339 to $419, depending upon the model. For further information, contact Micro-Metrics Inc., 908 South Claremont St., San Mateo, CA 94401. Reader Service number is 468.



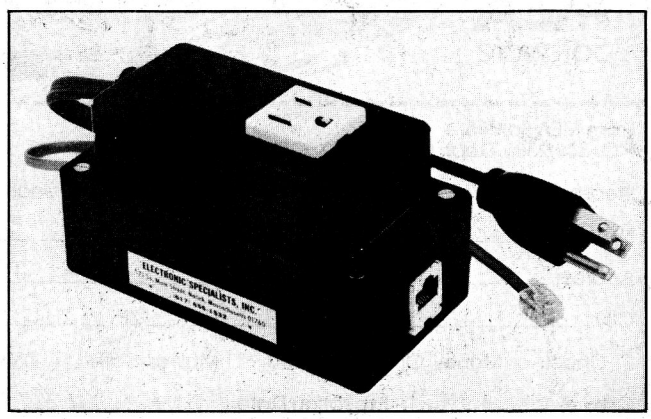
The Omni-Lock security shelf system.

System One Computer

System One, a new Z-80/6502-based personal computer that supports both the CP/M 2.2 and Apple DOS operating systems, has been introduced by Extra Computer Corp., 68 Dorman St., San Francisco, CA 94124. It comes with 64K RAM, 8K of system ROM, seven Apple-compatible peripheral slots, 80-column board, low/high resolution graphics and both NTSC and rf modulated video outputs powered by a 110/220 V power supply. Upper- and lowercase operation is featured, along with a number key pad. It is available for $795. Reader Service number is 470.



The System One Z-80/6502 personal computer.



Kleen Line modem protection.

Just Wood Roll-Top Furniture

Roll-top computer centers are available in two different sizes at prices from $399 to $673, depending upon size and wood desired. Contact Just Wood Inc., 6511 E. State Road 46, Bloomington, IN 47401. Reader Service number is 463.

Kleen Line Modem Protection

Kleen Line protection is now available for modems with standard four-pin and eight-pin connectors. Intended to suppress damaging telephone and power line spikes caused by lightning, spherics or phone office switch gear, the Kleen Line Security Model PDS-11/SUP provides simple, trouble-free hook-up for $81.95. Contact Electronic Specialists Inc., 171 South Main St., Natick, MA 01760 for further information. Reader Service number is 464.

Print-It! Graphics Printer Card

A software-independent, color-graphics printer card called Print-It! has been announced by Texprint Inc. for the Apple II, II Plus, IIe and Apple look-alikes. The device incorporates a chip that fits under the CPU. It allows the user to interrupt any program and print the screen display just by pressing a button. Price is $299. For more information, contact Texprint Inc., 8 Blanchard Road, Burlington, MA 01803. Reader Service number is 461.



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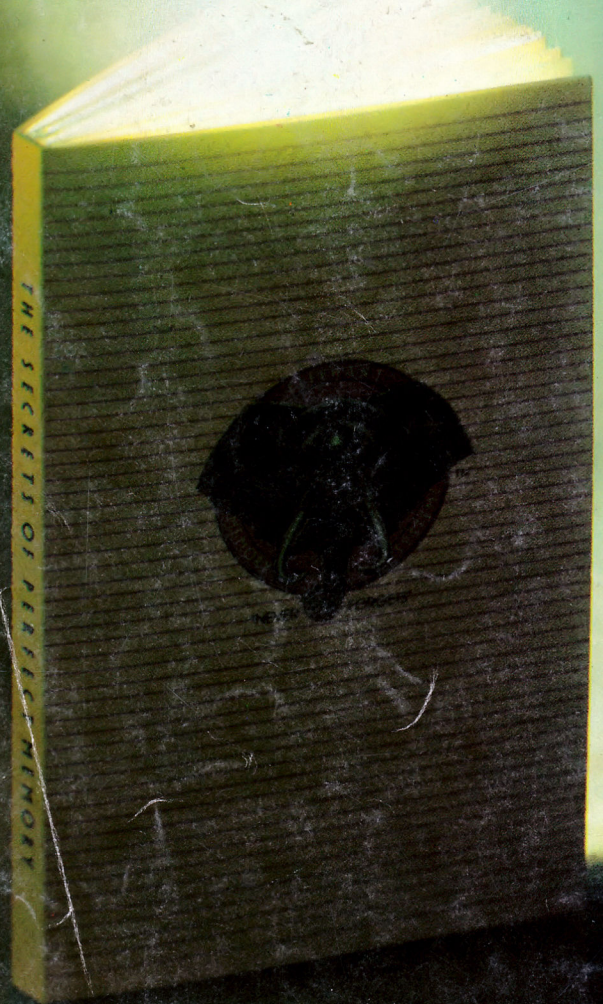

Circle 3 on Reader Service card.