October 1985
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Editors' Choice:
'Extra K' from Beagle Bros

inCider

The Apple II Journal

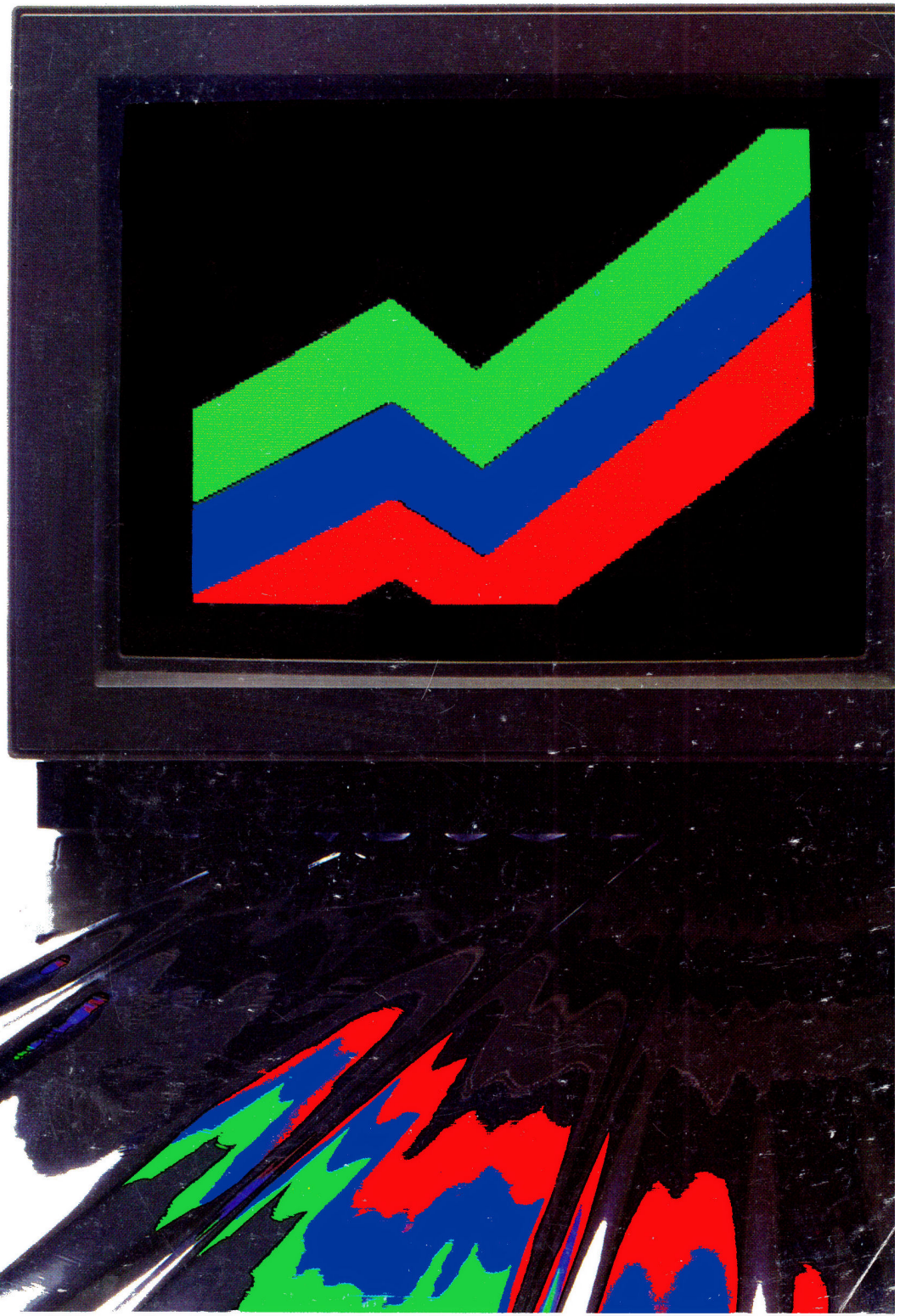
RGB MONITORS:

Best of the Brightest

How to Write Great Game Programs

Your First Lesson in Assembly from Roger Wagner

Reviews of Mouse Calc, The Juki 6000, and more



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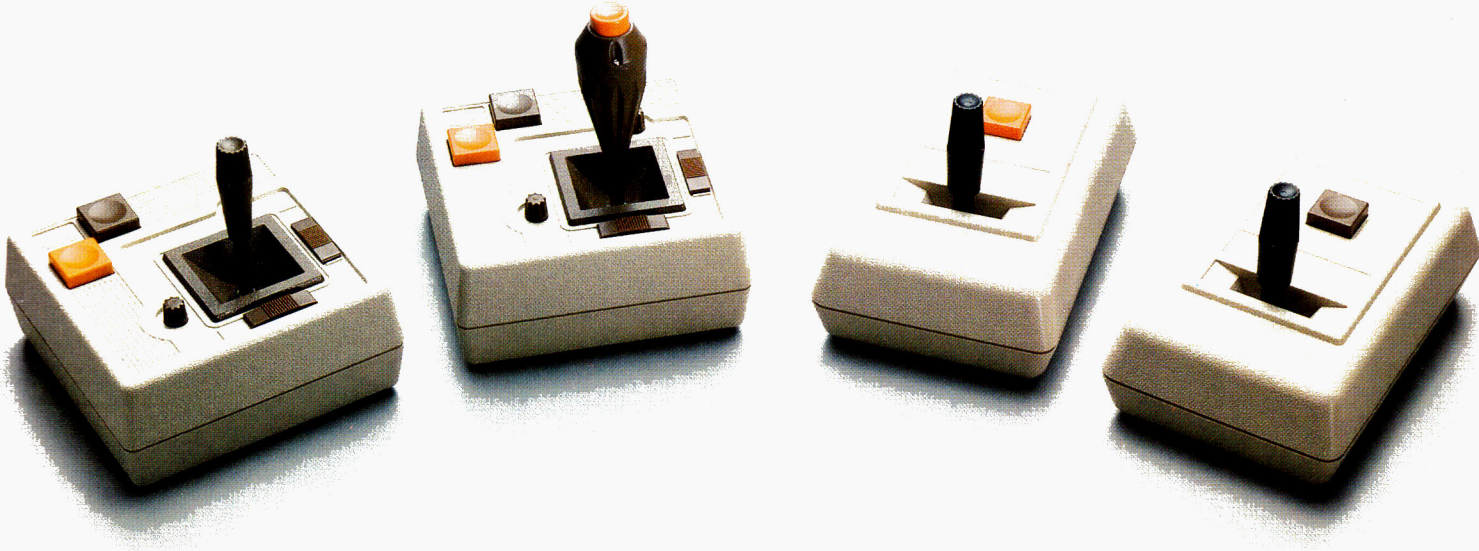

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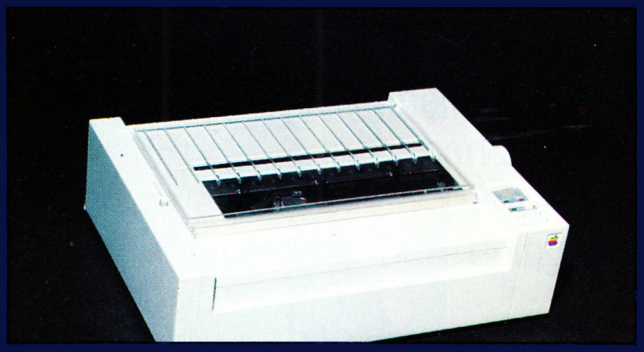
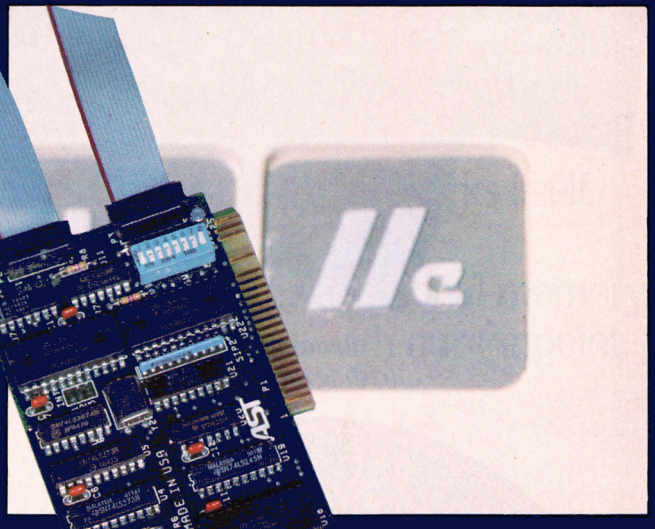


Printer serial port

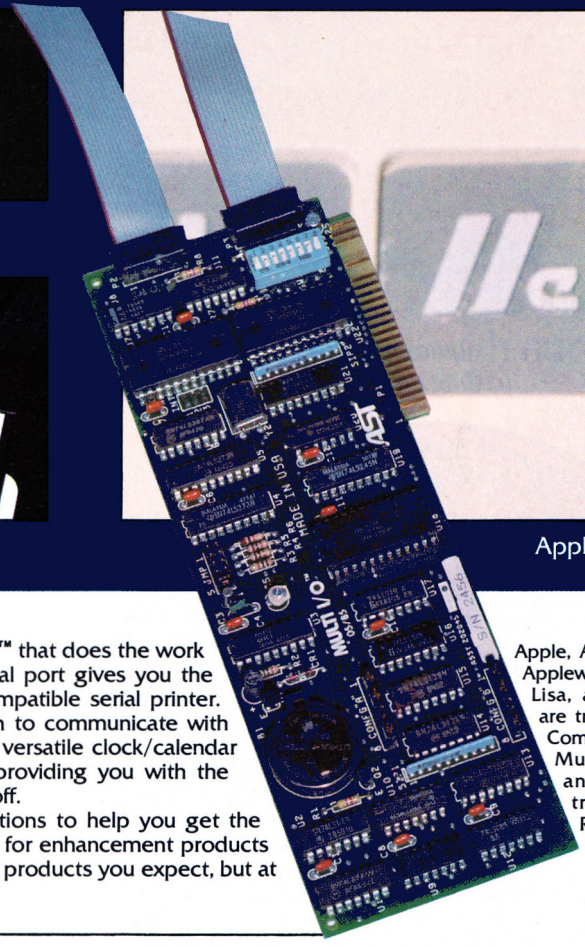
Modem serial port

Clock/Calendar

Software Utilities



Apple IIe compatible



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You'll see that Pinpoint does more than give AppleWorks a handful of accessories.

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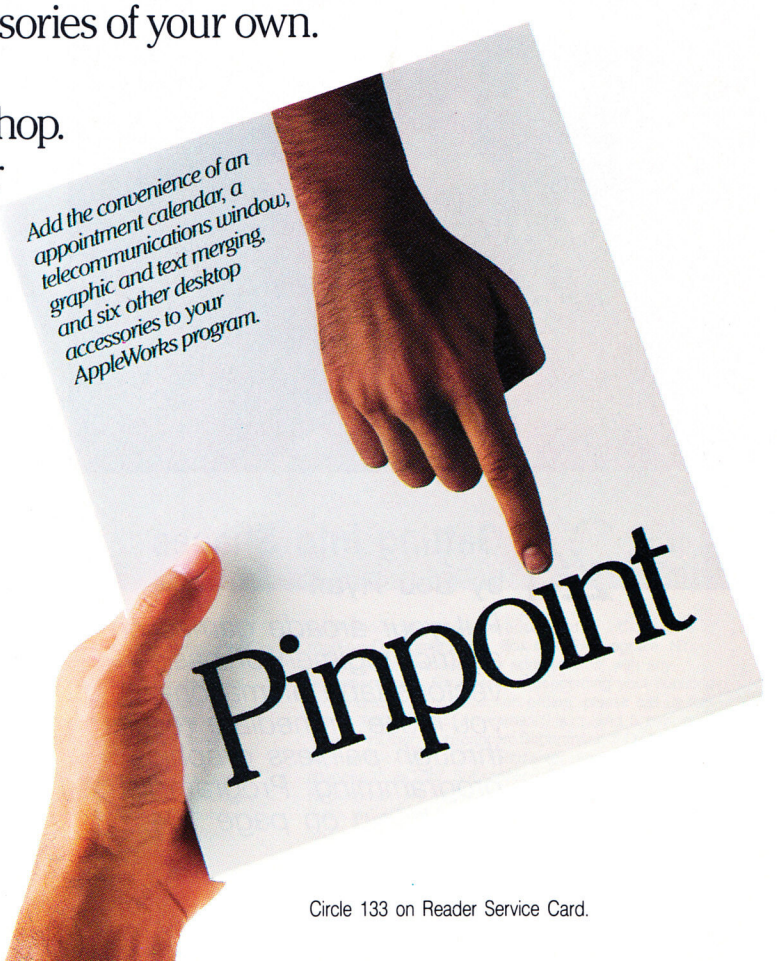

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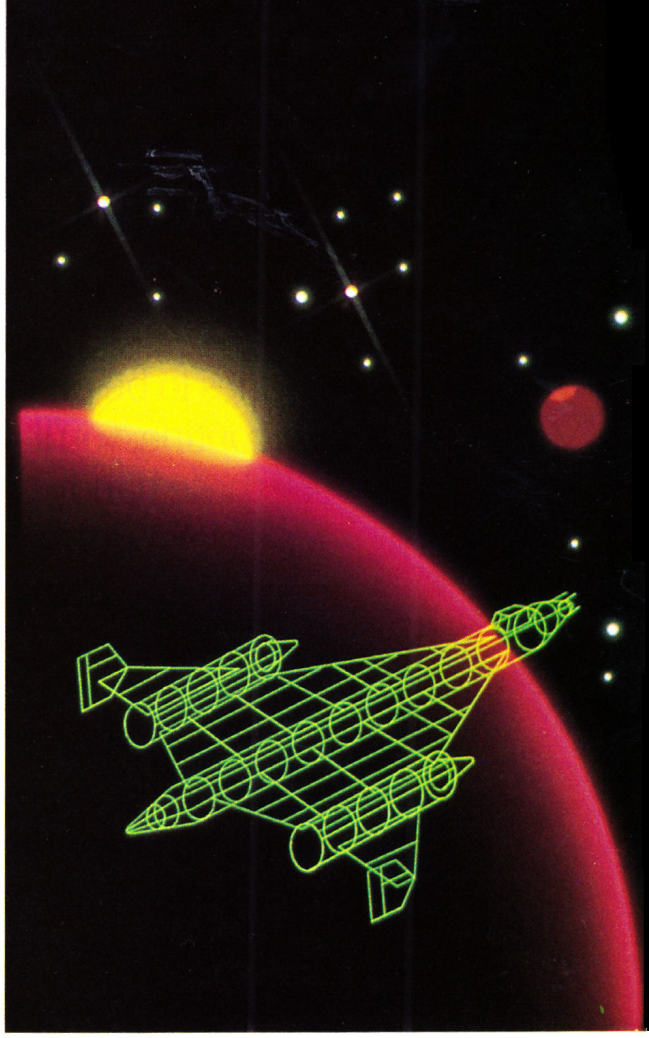

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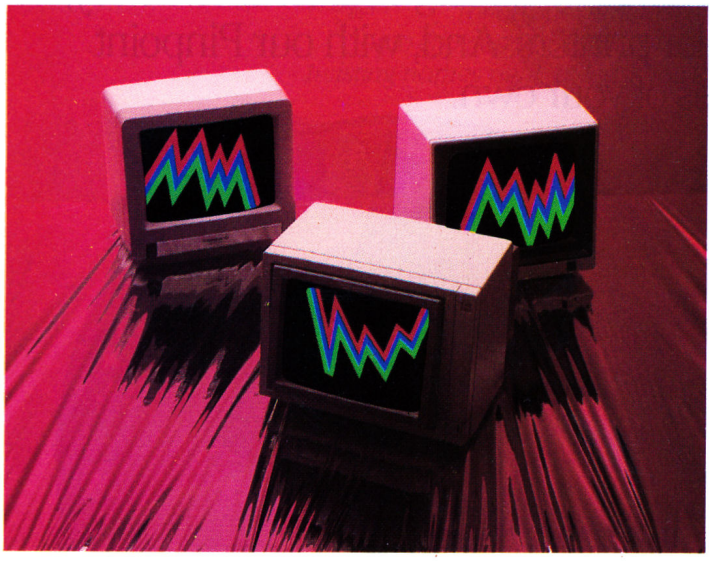

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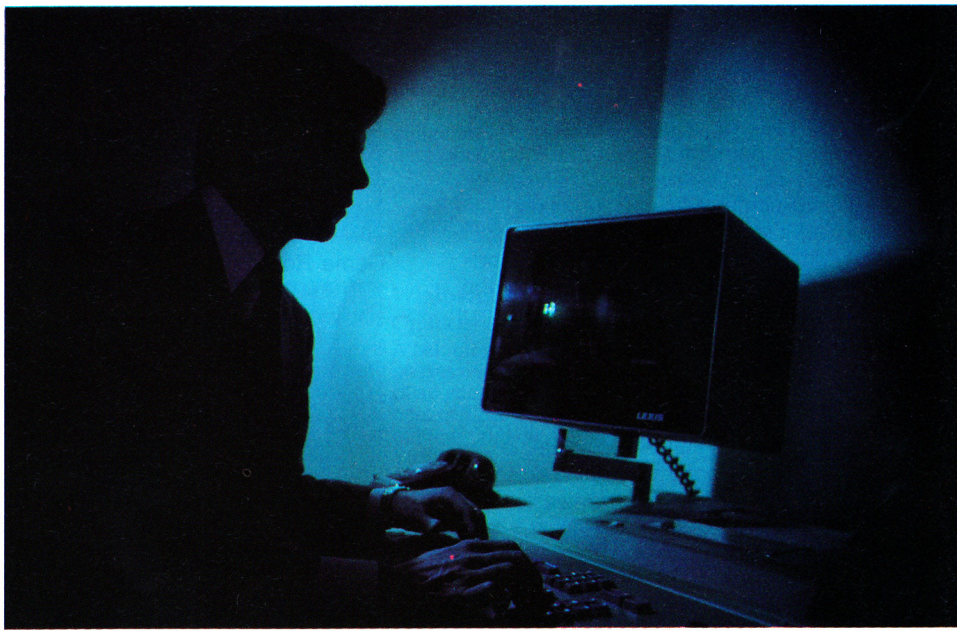

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EDITORIAL

Old Wine in New Bottles

by Susan Gubernat

Yes, we're reversing the cliché—new wine in old bottles—to assure you that what you're holding is indeed your October *inCider*, full of the practical computing information and timely, objective product analyses you've come to expect from us.

Yet, it's a redesigned *inCider*.

With the mixture of trepidation and pride one feels after an image-altering haircut (or beard-shearing, so I'm told), we present our new persona.

From our point of view, the redesign is a culmination and a literally graphic embodiment of some of the changes and reaffirmations we've made in response to your criticisms and suggestions over the last few months.

To effect this, we've had veteran freelancers—like Bill O'Brien—arise phoenix-like from the ashes of their old columns. Now they'll preen in the spotlight of in-depth feature reviews of products you're considering adding to your repertoire—last month, hard-disk drives; this month, RGB monitors.

Meanwhile, we'll continue to give you the information you need to develop programming expertise, including ready-to-type-in programs in columns and feature articles, like this month's series on game design, in a new format we hope you'll find even more readable and easy to use.

You'll also notice that we've kept what's vintage at *inCider*, but changed some labels: For example, Cider Press has become News Line; The Game Reserve now appears as Game Room.

In an ongoing commitment to tutorials, we added Pascal Primer in August, as you'll recall, and debuting this month, in response to your requests, Right of Assembly (page 68), a new tutorial by that Merlin of assemblers, Roger Wagner.

Before going any further, I'll direct you to this month's BackTalk BBS poll (page 81). Please take the time to let us know what you think about our new look as it strikes you right from the start. Register your votes immediately via modem when you call (603) 924-9801. And thanks.

MacContest

It's time to take note of some of the least memorable moments in microcomputer publishing history. This month I'll draw your attention to the sterling prose of my eminent colleague at *MacWorld*, David Bunnell. In his August editorial, he remarks, "Let's be honest; the Apple II is a dog."

Have you ever noticed how often Macfanatics find it necessary to dump on the II? It seems a defensive, quibbling posture, unworthy of us all.

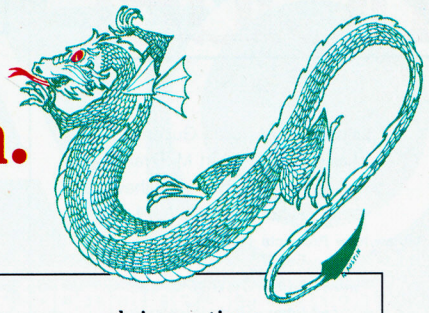
We could ignore such tactics, of course—or raise the ante. Surely those of us in the Apple II world can do better when it comes to describing the Mac.

So I'll tear a page from John Dvorak's *InfoWorld* columns featuring new meanings for the acronym IBM as supplied by his readers (as in Imperialism by Marketing and Irresponsibly Behaved Multinational), and ask you to help me come up with three-word (as opposed to four-letter) descriptions of the other Apple. (Of course, "Mac" didn't start its life as an acronym, but we won't hold that against it.)

To get you started: How about Most Architectonically Cute, Mainly Advertising Clout, Mutually Assured Commercialism, and Market-Adaptable Computer? Send your suggestions to me, and I'll publish some of the best ones here.

And thanks to Bunnell and Dvorak for kicking this off in my head: proof that computer journalists are good for something. ■

Big Game Hunting? Try Baggin' Our Dragon.



It's the biggest game in town

Our dragon, of course, is Wizardry—that unique series of computer recreation programs designed for Apple users who are seeking the ultimate "big game" challenge.

Since its debut, Wizardry has been the best-selling computer game of its kind.

For a very good reason:

Because Wizardry is more than just a game, more than a diabolically clever maze.

Wizardry is a complex world of variety and depth. A world of richness and pleasure.

Packed with suspense, full of surprises, Wizardry is enchanting—a compelling diversion that turns your leisure time into prime time.

Wizardry is powerful and sophisticated. A simple command system, 3D maze displays and superb programming provide you with month after month of involvement and satisfaction.

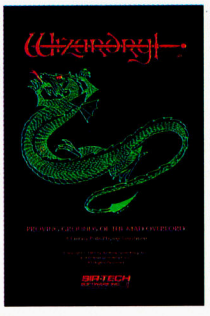
Four years old and still growing, the game is already recognized by critics and game lovers as a classic.

Simply stated, Wizardry is the finest fantasy role-playing computer game you can buy.

Set your sights on the best. Track down Wizardry—the biggest game in town.

Enter the World of Wizardry®

A Classic Encounter

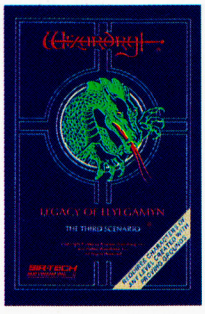


Proving Grounds of the Mad Overlord

The First Scenario

Unlike any other game you have ever played. A fascinating 10-level maze full of monsters, sorcery, traps and treasures. As you gain skills, the characters you create grow stronger, richer, wiser and better able to survive. The final goal is elusive. Your experience . . . unforgettable.

Twice voted "All Time Most Popular Computer Program" —Softalk Readers

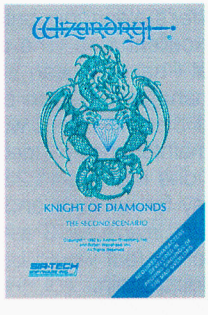


Legacy of Llylgamyn

The Third Scenario

A spellbinder that advances the classic traditions of Wizardry. Find the great dragon L'kbreth and save the people of Llylgamyn. Includes full screen maze display and Windo-Wizardry, the revolutionary pop-up window graphics system. Requires brave adventurers of any level developed in PROVING GROUNDS.

". . . A Landmark in Graphics Advancement" and "The Best Yet" —Softalk

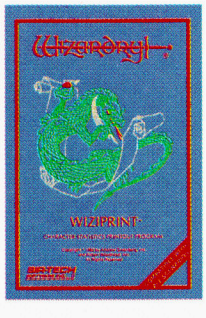


Knight of Diamonds

The Second Scenario

This classic journey should only be attempted with those Wizardry heroes who have attained the 13th level of ability in PROVING GROUNDS. Their challenge—and yours—to adventure through a six-level maze and become the Knight of Diamonds. First-rate fantasy!

Awarded "Best Adventure Game for the Home Computer"
—Game Mfrs. Association of America



Wiziprint

Character Statistics Printout

A helpful utility program that prints the possessions, attributes and known spells of all your Wizardry characters. Quick, neat and easy-to-read. For use with 80-column printers. Compatible with all Wizardry scenarios. A real timesaver!

"Wiziprint is a very handy utility disk for ardent Wizardry players"
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Razzle Dazzle

I am a subscriber and an avid *inCider* reader, and have been since I got my Apple //e. I look forward to your software and hardware reviews the most, and I respect your reviewers' opinions. Regarding the review of Dazzle Draw, however, in the June 1985 issue, I have an important update.

Dazzle Draw is not fully compatible with the Apple Extended 80-column Color Card. (I have this card hooked up to the Model 100 RGB monitor.) Broderbund Software says, "We are working on a version that should support the RGB card and monitor, [but] we cannot guarantee the exact date or [that] the problem will be corrected totally." The problems encountered are fairly substantial:

1) The initial menu screen (any text screen) doesn't appear. A series of apparently random lo-res graphics takes its place.
2) Text on the drawing screen is illegible. You simply can't read it without considerable eyestrain.
3) Solid painting and drawing doesn't yield solid colors. Traces of other colors often appear along the perimeter of your drawing.

In all other respects, I agree with Cynthia Field's review. The program is really good. In fact, the program is so good that I have decided to keep it, despite its problems. I just wanted to let other readers know about these difficulties, so that they can decide for themselves.

Robert Jackson
923 South Alfred Street
Alexandria, VA 22314

Rotten Apples?

As a concerned computer hobbyist. I am writing to you about a company called TG Products. More than a year ago, I purchased one of its joysticks for my Apple II Plus, because of comments others have made about the high quality of this peripheral. About six months later, it broke. I returned it to TG Products in Plano, Texas, for repair. It wasn't under warranty, so I offered to pay for fixing it. Since then, despite three letters, I have not heard from the company, nor have I gotten my joystick back, repaired or otherwise. My letters have not been returned, so the address must be good.

As a leading publisher in the computer field, you must have as much interest in removing the rotten apples from the business as its customers do.

Ralph J. Hamilton
18057 East Berry Avenue
Aurora, CO 80015

T.G. Products (formerly Personal Peripherals) has changed its address. Contact the company at 2201 South Mobberly Street, Longview, TX 75607, (214) 758-8874. T.G. Products customers should send damaged joysticks and a check or money order for $7.50 to the attention of Linda Toler. —eds.

Busy BBS's

I think *inCider*'s electronic bulletin board is an excellent idea. The only problem is that I haven't been able to call it. (I did manage to get on once, only to be told that the board would be down for maintenance.) I tried calling the board one night at 11:23 p.m., and it was busy for an hour and ten minutes. I set my alarm for 3 a.m., in hope that no other fool would be calling then—no luck again.

I'm sure you have a popular board, but what are the chances of putting a time limit on calls? Most of the boards to which I belong limit members to 20 minutes. It's not fair to have someone sign on and tie up the board for hours at a time, downloading everything in sight. Twenty minutes is plenty of time to download a program or two, leave some mail, and check out messages. (You may already have such a policy—

I haven't been able to find out.) Perhaps adding a second line could alleviate the problem.

At any rate, keep the magazine coming—you're doing an excellent job.

Raymond P. Stickler
3 West Oak Street
New Baden, IL 62265

We've been pleased with the favorable response to our BBS. We are considering a 30- or 40-minute time limit for callers, and we're investigating adding a second line. —eds.

Resetting and Rebooting Advice

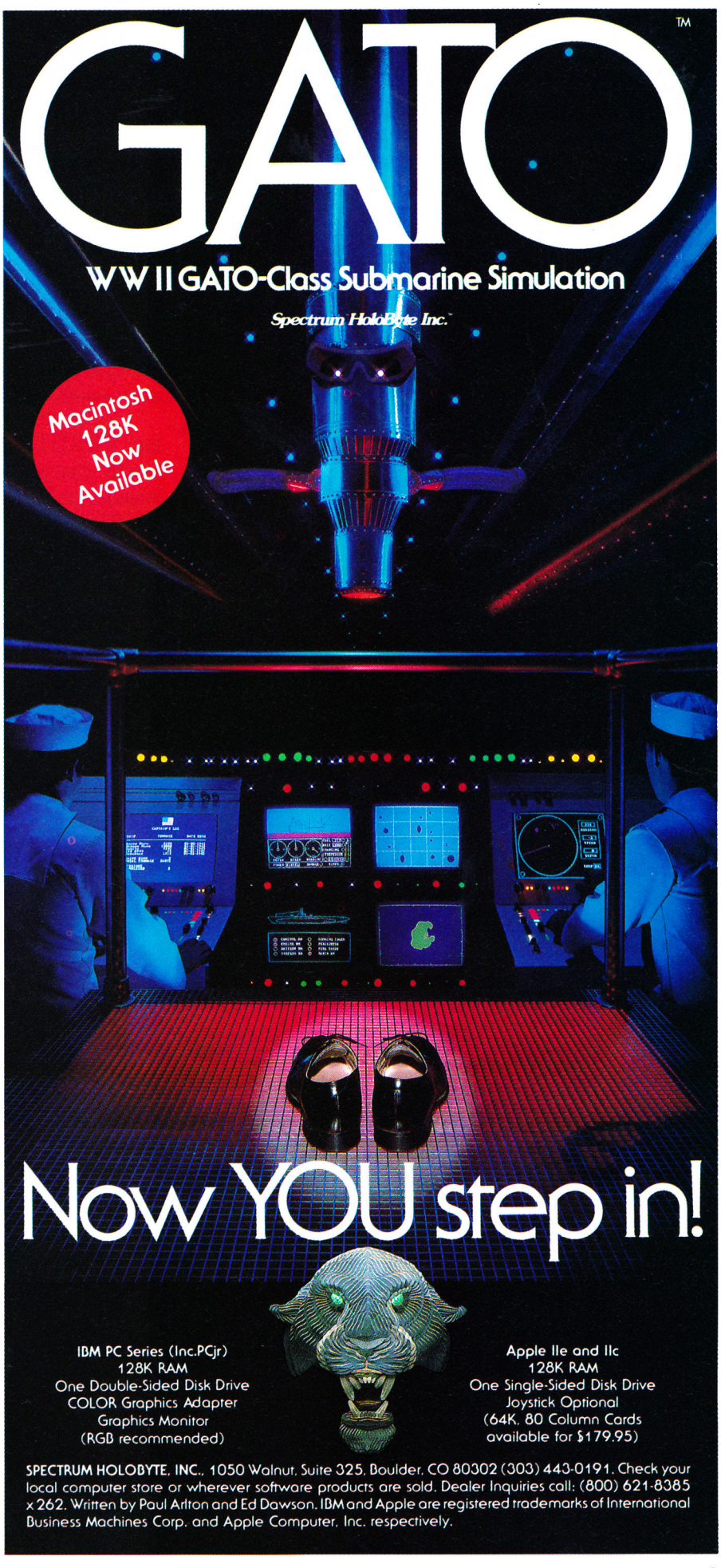
I found the "Reset and Reboot" letter in the April 1985 issue of *inCider* misleading. I'm afraid many of your readers may take its advice, then find themselves wondering if their computers are malfunctioning.

In his article "Capturing Big Game Screens" (*inCider*, November 1984, p. 62), Kerry Lanz very clearly explained that without purchasing additional hardware specifically designed to dump screens, you can dump only about 50 percent of them. You cannot capture a screen by pressing control/open-apple/reset. That's like switching your Apple off and on—using this method to boot a disk disturbs the memory locations of the hi-res image. You will capture the image you wanted, but invariably, it will have lines through it. The amount of distortion depends on how long you hold down the open-apple key.

It's important for your readers to pay attention to this technical point, so that if they do use this method to boot screen-saver programs, and they do experience distortion of captured screens, they'll know that their Apples don't need to visit the nearest repair dealer.

Janet M. Calvert
47 Oakland Avenue
Bloomfield, NJ 07003

Continued on p. 13.



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What every Apple II+ and IIe user should ask before buying the "Sider" 10 MB hard disk:

When a company offers a superior quality 10 megabyte Winchester hard disk for only $695, it's bound to raise a few eyebrows...and a lot of questions. The fact is, you're probably already wondering "Can I really get a 10 megabyte hard disk that's *reliable* for only $695?" The answer is: ABSOLUTELY...when you choose the Sider from First Class Peripherals.

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What's so great about the Sider?

For starters, the Sider lets you boot your ***Apple II+*** or ***IIe*** directly off the hard disk—unlike some other Winchester subsystems. Rebooting is also trouble-free. And the disk is partitionable, allowing you to allocate space to four operating systems on the same disk. The Sider supports: Apple DOS 3.3; Pro DOS™; Apple Pascal; and CP/M®

What's more, a small "footprint" lets you incorporate the compact Sider into your existing computer set-up with ease.

In addition, with the Sider, you not only pay far less for the subsystem, you also save money on installation. Because, unlike other 10 MB systems that require the purchase of expensive "extras," the Sider is *plug and play*. Everything you need is provided, including cables, host adaptor, installation software and manual.

What makes it so reliable?

To start, the Sider is manufactured, and sold exclusively, by First Class Peripherals, an innovative computer company which is backed by Xebec. The computer industry's leading manufacturer of disk controllers, Xebec has over a decade of experience serving customers like IBM, Toshiba, Texas Instruments and Hewlett Packard. It's this kind of expertise that helps assure the Sider's performance.

Special design features further enhance reliability. The Sider's controller is the field-proven, industry standard Xebec S1410A. And Xebec's 3200 drive tester, the toughest in the industry, ensures that the Sider will operate reliably. One more assurance of the $695 Sider's quality: it's UL Approved and FCC Class B rated.

But why is it only $695?

You pay less for the Sider than for other 10 MB hard disks simply because you're paying for the superior quality components inside the unit, not for a lot of retail overhead costs. Since First Class Peripherals sells direct, you avoid dealer and distribution expenses, and pay only for the product.

What about a guarantee?

Like many experienced Apple users, you may be reluctant to buy a hard disk priced at only $695 without fi· ·eing for yourself how it performs. T why First Class Peripherals offers you a reassuring, money-back guarantee that eliminates any risk on your part. Simply order the Sider and use it for 15 days. Then, if you're not entirely satisfied, return it and receive a full refund—no questions asked.

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To receive the Sider 10 megabyte Winchester hard disk subsystem for only $695, simply order using the coupon below. For faster service, order by phone and charge to your VISA, MasterCard or American Express. (You can also call us if you have any questions or technical concerns about the Sider. We'll see you get the help you need.) Call toll-free:

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In Canada, call 1-800-227-7792
Extention 242

☐ Yes, please send me the Sider, including half-height 10 megabyte Winchester hard disk drive, Apple adaptor board, cable, complete installation software and documentation.

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Continued from p. 9.

Save Your $ense

In your April issue (p. 85), there was a review of Dollars and $ense by Paul DiBara. The review was little more than a synopsis of the sales hype on the back of the box. Recently, I bought this program and ran into some major difficulties with the checkbook-balancing portion of the program.

After several days of pulling out my hair and looking for my errors in data entry or program use, I called the discount-software store where I purchased the program. The salesman who had previously claimed to have used the program, and had recommended it highly, now admitted it had been some time since he had had any "hands-on" experience with it. He suggested I call the manufacturer in California, naturally at my expense.

Monogram's technical support was very helpful. The representative said the company had had "a little trouble" with older versions of the program, which would not balance properly. He agreed to replace the disks upon their return.

The reviewer should have explained a weakness in the documentation: you can't alter highlighted budgets. The manual points that out, but gives the impression that this restriction is etched in stone. To alter a budgeted item that has been highlighted, you must go back and remove all entered transactions in that particular account. The program only highlights accounts when you've made all transactions. The book doesn't explain how they become highlighted or how to alter them once they are. In fact, the manual states that you can't alter them at all once they are highlighted.

My point is that Paul DiBara's review lacked practical information about the program—such as a description of the problems users have run into. A good reviewer should use the program and check with representatives of the manufacturer on the problems they have experienced to date. Apple user groups are also excellent sources of this information.

A. Frank Ross
14216 Village View Drive
Tampa, FL 33624

In the Dollars and $ense review heading in your April issue, the following statement appears: "Financial management, Apple //c, or //e with 128K." I recently purchased Dollars and $ense, and I'm having a great deal of difficulty getting started with it. My Apple //e has only 64K. Do I need 128K in order to run this program?

Wilson Cranford
Candy Lane
Cummaquid, MA 02637

Yes, you do. The programming in Dollars and $ense requires 128K of RAM; the package cannot run on a machine with only 64K. —eds.

I give Paul DiBara's review of Dollars and $ense just two stars. How far did he take it through its paces? I purchased Dollars and $ense for our IBMs at work to encourage my staff to use them. It was such a success, I purchased it for my home computer, an Apple //e. What a flop.

The graphs (a big feature of the product) will not print with an Imagewriter without going through horrible gyrations. I could understand it if I were using hybrid products, but there is no excuse for it not working on an "all-Apple system."

Let's hope that Monogram improves its products for Apple II's. It will be interesting to see if Monogram takes the initiative to move ahead when so many software developers have not.

James S. Linville
10432 Melissa Hill Road
Richmond, VA 23236

inCider *welcomes readers' comments regarding articles, letters, or other topics of interest. We reserve the right to edit letters for clarity, style, and space. Please address your correspondence to Letters,* inCider, *80 Pine Street, Peterborough, NH 03458.*

Corrections

In "Hard-Driving Disks" in the September 1985 *inCider*, the key was inadvertently omitted from the hard-disk comparison chart (pp. 26–27). Areas shaded in salmon denote which features apply to the particular disk systems named at the left of the table.

The price of Dave Winfield's Batter Up! was listed incorrectly in August's New Software (p. 80). The game is available from Avant-Garde for $39.95.

[SEE PREVIOUS PAGE]

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NEWS LINE

by Cynthia K. Carr, *inCider* staff

The Sky's the Limit

If you always wanted to fly your own plane, MicroProse is ready to make your dream come true. Along with Cessna Aircraft Company, the simulation-software firm is sponsoring a "Learn to Fly" contest—in which you can earn your pilot's wings.

"We thought it was time to offer [people] as close to the real thing of flying as we can get," says Paula Myers, public-relations manager for MicroProse.

With the discovery-flight coupon (available with MicroProse packages) and $20, you can sit in the pilot's seat with an instructor and fly around the air strip. You can then sign up for your pilot's license and the MicroProse drawing.

The grand-prize winner will receive the chance to qualify through a certificate and license to pilot his or her own aircraft. Second prize, a solo package, will be awarded to three winners. For third prizes, MicroProse and Cessna will give away 20 introductory flights if winners present a discovery-flight coupon.

The contest, which runs from September 1985 until January 1986, is also open to MicroProse dealers and distributors. Winners will be announced in February 1986. For details, contact MicroProse Software at 120 Lakefront Drive, Hunt Valley, MD 21030, (301) 667-1151.

VDTs and Baby, Too

Headaches, eyestrain, and even psychological problems have been blamed on video-display terminal use (see The Cider Press, April 1985, p. 13). But researchers at Mount Sinai Hospital's medical school plan to conduct a four-year study to determine the effects of VDTs on 10,000 pregnant workers.

According to *The Wall Street Journal*, researchers intend to see if the low levels of nonionizing radiation from VDTs are associated with miscarriages and birth defects. Currently, many scientists say the radiation levels are too low to harm biological tissue.

The survey, costing $200,000 each year, will be conducted by volunteers from the Service Employees International Union.

Computer Crime

Whodunit? Computer crime is on the rise, and the accusatory finger points at company workers—not outside forces, as some TV shows and movies would have you believe.

Computer crime encompasses using the office computer for personal gain, copying information for private use, accessing company files without permission, and playing games on company time.

Austin Weber, editor of *COMP-U-FAX*, says that although "it's hard to put a dollar figure on crime," the industry reports losses totaling $125 million to $250 million each year because of computer abuses.

Twenty-one percent of those responding to a *COMP-U-FAX* survey of Data Processing Management Association (DPMA) members indicate that most abuses were committed by company employees: programmers, systems analysts, machine operators, and data-entry clerks. According to the survey, their MO's were: ignorance of proper professional conduct (27 percent), misguided playfulness (26 percent), personal gain (25 percent), and maliciousness or revenge (22 percent).

INSIDE OUT

•Not so fast. . . Computer-law specialist Jonathan Joseph, of Rosen, Wachtell & Gilbert in San Francisco, says Stephen Jobs' 11 percent holding of Apple stock provides significant protection against a hostile buyout. He says, however, that an unfriendly takeover "would not be impossible," and Apple should be wary of corporate raiders.

•Off to market. . . John Sculley promises more marketing programs for the //e and //c in 1985. He refuses to "arbitrarily restrict" them to education and home markets.

•Climbing the charts. . . AppleWorks made Apple Computer the sixth largest software publisher last year, according to Future Computing, Inc.

•Downturn. . . InfoCorp reports a steady erosion of Apple's market share in retail channels. The California-based research firm notes that in May 1984 Apple won 47 percent of the market, as opposed to IBM's 31 percent. By May 1985, Apple's share had slipped to 39 percent, while IBM remained at 31 percent. "The slack is being taken up by Compaq, Hewlett-Packard, AT&T, KayPro, and lots of little guys," a company spokesperson says.

—Wendy Lea McKibbin
***inCider* staff**

Weber says most employees don't know they're abusing computer time, so many companies are fighting crime through awareness campaigns.

Music Makers

Technology stands still for no musician. And that's why Roland, an electronic-musical-instrument design company, has been sponsoring a series of seminars on the latest in electronic-music technology.

Interest in the marriage between computer and music stems from a technological standard called MIDI (Musical Instrument Digital Interface) information. According to Nancy Kewin, director of communications and education, electronic-music technology "makes music more tangible, more accessible for people."

The company recently concluded an 11-city tour of its one-day seminars that "educate people in the various applications of computer music," Kewin says. While the seminars explored electronic music in recording, composition, performance, computers and music software, and audio-visual production, Kewin says future seminars will stress hands-on workshops and specialized training sessions.

Those interested in the seminars or a textbook and audiotape package of the Electronic Music Seminar materials should send $49.95 to RolandCorp US, 7200 Dominion Circle, Los Angeles, CA 90040.

We're always looking for news of the Apple world. If you're making news, send your press releases and photographs to News Line, inCider, 80 Pine Street, Peterborough, NH 03458.

CALENDAR

October 4
FIFTH ANNUAL COMPUTER CONFERENCE FOR EDUCATORS
Indianapolis, IN
contact:
Carol Vodde
ICE Conference '85
1200 South Barr Street
Fort Wayne, IN 46802
(219) 425-7602

October 5–8
SYMPOSIUM OF SMALL COMPUTERS IN THE ARTS
Philadelphia, PA
contact:
Symposium
P.O. Box 1954
Philadelphia, PA 19105

October 7–10
USING MICROCOMPUTERS IN GOVERNMENT
Denver, CO
contact:
Conference Manager
U.S. Professional Development Institute
1620 Elton Road
Silver Spring, MD 20903
(301) 445-4400

October 10–12
COMPUTERS AND CHILDREN: WHAT LIES AHEAD
Ann Arbor, MI
contact:
Laura Skidmore
Center for Human Growth and Development
300 North Ingalls Building, 10th Floor
The University of Michigan
Ann Arbor, MI 48109
(313) 763-3717

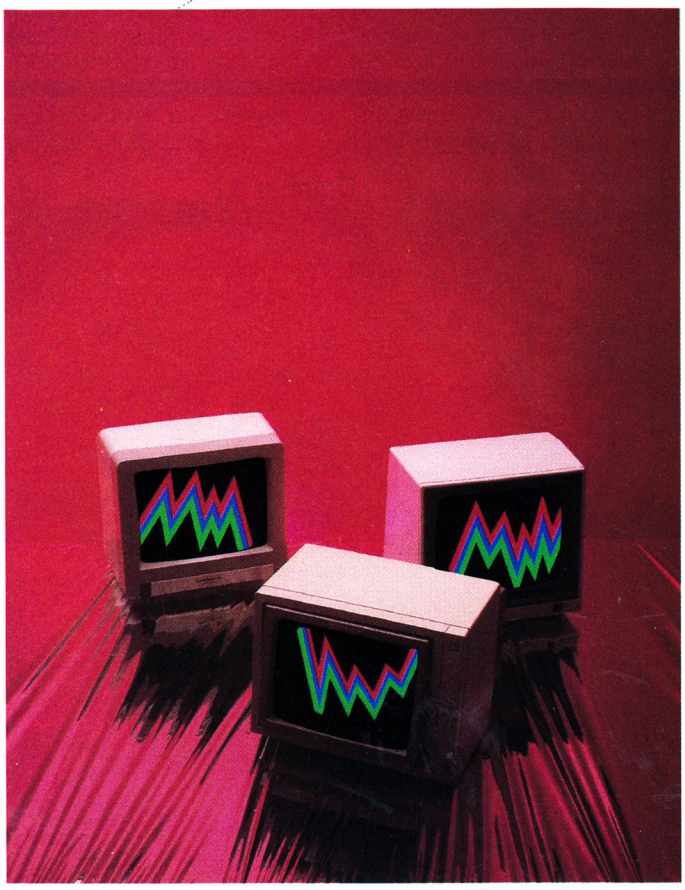
October 12
COMPUTER EXPO '85
Cranford, NJ
contact:
Union County College
1033 Springfield Avenue
Cranford, NJ 07016
(201) 276-2600

October 28–29
PACIFIC NORTHWEST COMPUTER GRAPHICS CONFERENCE
Eugene, OR
contact:
Paul Katz
Conference Manager
University of Oregon
Continuation Center
Atrium Building, Suite 333
99 West 10th Avenue
Eugene, OR 97401
(800) 228-6891
(800) 524-2404, in Oregon

Screen Tests

You **can** *judge an RGB monitor by its color—and by its brightness, resolution, dot pitch, and more.*

by Bill O'Brien



Sociologists may deliberate about the number of hours we spend in front of the computer screen, but for us, all that matters is how well we see the images flashing before our eyes.

If you've ever tried to destroy 3000 aliens on a monochrome monitor, you already know it's no fun. An RGB color monitor, however, enhances your Apple's graphics applications. You're given more options in word processing—black letters on a green screen, for example. For business use, RGB color enhances your tables, charts, and figures. In education applications, sharp color captures children's attention and encourages interaction.

Rather than accept a premixed (composite) color signal, standard on Apple II computers, an RGB monitor is fed separate red, green, and blue signals along with the information needed to organize those colors into a usable display of eight colors. The colors are brilliant, and 80-column text displays are as sharp as those found on any better-quality monochrome monitor.

Prehistoric Times

Originally, RGB monitors were quite expensive—$800 to $1000 for one of moderately good quality. Today, you can buy a decent RGB monitor for $500 to $600. Apple has its own 80-column, 64K-expansion, and RGB-display-board combination. Many RGB monitor manufacturers make Apple-compatible RGB interface boards. The barriers to bright colors

and crisp text displays have fallen, which is a good reason to see what's available.

Setting the Standards

But you'll soon find yourself up to your keyboard in RGB monitors. To help you decide, I reviewed seven monitors (see the **Table**) in three screen sizes: 9, 12, and 13 inches. Some of the monitors are specifically designed to use Apple's standard digital approach to RGB displays. Others, catering to the IBM PC market, can't be plugged directly into an Apple RGB display module, because they use a different connector. In addition, the required synchronization signals aren't the same as those generated by the Apple. To surmount this little problem, I borrowed a Mappler RGB converter from Video-7; this device makes Apple-originated signals compatible with IBM-oriented monitors.

Some manufacturers offer a third mating option—a nondescript connector capable of handling a variety of RGB inputs. In those cases, the connecting cable determined the monitor's compatibility.

For this review, Video-7 also supplied the RGB-interface modules that process the Apple's raw video. While its Apple //e model is identical to Apple's RGB combination board (both cards have a Video-7 copyright), Video-7 also has an RGB interface for the Apple //c. The Mappler works with the //c module, but because the Mappler is an unenclosed PC board designed for connection inside the //e's back panel, Video-7 doesn't recommend it for the transportable //c.

Under Scrutiny

To uphold truth in testing, I adjusted each monitor to yield the same brightness and contrast. Using International Apple Core's Disk #45—a public-domain copy of the game Defender—I performed subjective tests and submitted each monitor to a gruelling half hour of shoot-'em-up action, complete with multicolor laser blasts and explosions.

The objective and subjective results should indicate the quality of RGB monitors. Watch out for resolution, however. In double-hi-res mode, the Apple can display 560 by 192 dots. Typically, most monitors handle a screen resolution of 640 by 240 dots. You might be tempted by the "more is better" philosophy, but a monitor with resolution as good as that your computer provides is more than adequate. It's usually a waste to spend more money just because a monitor has a higher resolution.

Also compare dot pitch, the size of each dot on the screen: the smaller the number (usually in hundredths of millimeters), the better.

The Line-up

Apple

When you turn on Apple's Color 100 you hear a sound that might accompany the start-up of a dynamo. Inside, a motor operates a tilt screen which

Apple Color 100

you can position up or down to a maximum of approximately 30 degrees from horizontal, to offset glare from poor room lighting. (Of course, it was one of the heaviest monitors in the group because of the extras.)

Visually, it's accurate. Reds are red, blues are blue. But its color display isn't outstanding. Although I held it as the standard by which to judge the other monitors (as intangible as that may sound), the images lacked vitality, especially the yellows. For text work, you can select from among four default character colors from the RGB-interface board (the Video-7 board allows green, amber, blue, or white) or choose green from a switch on the monitor.

The Apple logo is a driving reason to buy the Color 100. While most dealers service the merchandise they sell, Apple products have traditionally enjoyed a quicker turn-around time for repairs. Also, the Color 100 is directly compatible with standard Apple RGB interfaces, alleviating the expense of a Mappler.

Princeton Graphic Systems

Princeton Graphic Systems has made quite a name for itself in the IBM world as a supplier of quality—yet cost-conscious—video displays. The SR-12 is a super hi-res display designed for a special add-on video board to the IBM PC. It doesn't seem compatible with the Apple II, though, despite the Mappler's attempt to sort the correct signals.

The HX-12 is a 12-inch display using an IBM standard connector. The Mappler solved the rewiring problems to the Apple, and the monitor worked superbly. The colors were rich and vibrant; black backgrounds were, indeed, black.

PGS's HX-9 is a chip off the HX-12's block, but scaled down to a 9-inch diagonal display. It surprised me. I anticipated cramped video and major concessions to 80-column text readability. I was wrong. "Crisp" and "intense" immediately came to mind. The monitor handles text either through the interface-card options or a switch selected from the monitor as green or amber.

Clarity made the HX-9 my favorite. Its tilt/angle adjustable stand didn't detract from its utility, either. The only problem I encountered was an annoying whine from a transformer, but it stopped five minutes later.

Princeton Graphic also shipped a PGS-80 card, which offers plug-compatible connectors for its monitors and eliminates the extra expense of the Mappler. The card's major drawback is its lack of memory expansion.

I almost did a disservice to Princeton Graphic, however, by basing the review on screen shots using its card. While the PGS-80 card produces pale, muted colors on its monitors, the Video-7 board/Mappler translated the Apple color into a striking royal blue on both Princeton Graphic monitors. Princeton's card produced a shade only slightly more intense than sky blue.

Princeton Graphic added a puzzle: The HX-9 has an Apple-IBM switch on the back, and you can correctly cable it without a Mappler. Instinct normally dictates that you set the switch to "Apple." Doing so, however, distorts and muddies the color values, degrading the visual impact.

In the "IBM" position, without the Mappler, there is a small difference in some color values, but they

Princeton Graphic Systems HX-12

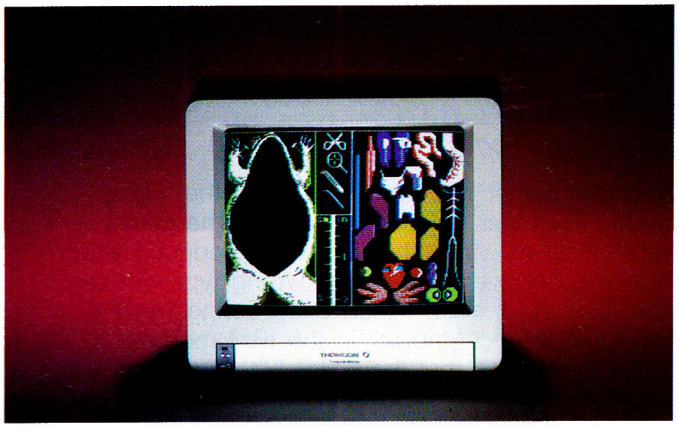
Table. Comparison chart for seven RGB color monitors.

Monitor	Manufacturer	Price	Screen Size
Color 100	Apple	$599	12″
HX-12	Princeton Graphic	$695	12″
ZVM-135	Zenith	$599	13″
Color 500	Amdek	$525	13″
HX-9	Princeton Graphic	$650	9″
CV36432SI	Thomson	$499	14″
SC-200	Sakata	$599	13″

are still vibrant. If you do forego the Mappler, keep the switch in the "IBM" position anyway. My only serious complaint with the HX-9 was its comparatively high price.

Thomson

If you've never heard of Thomson before, you're not alone. This new French company enters the



Thomson CV36432SI

American monitor market with 15 monochrome, composite color, and RGB monitors. The CV36432SI, from Thomson's professional series, is an IBM-based monitor that works fine with the Mappler. Although the review model sported an audio input, it had no composite-video input line. That's an odd arrangement, but no one says you absolutely must have composite video.

For fairness' sake, the review model was an advanced-release, pre-production model, which may account for some oddities in the brightness and contrast controls. After I adjusted the controls, things coalesced into a new degree of light or dark. Thomson probably used the wrong variable resistors for the brightness and contrast controls in only the preproduction model.

Actually, it's not a bad monitor. When everything was in place, the result was a very pleasing display that fell a hair short of Zenith's ZVM-135 in color quality. This monitor is no slouch, and its downranged pricing makes it very attractive.

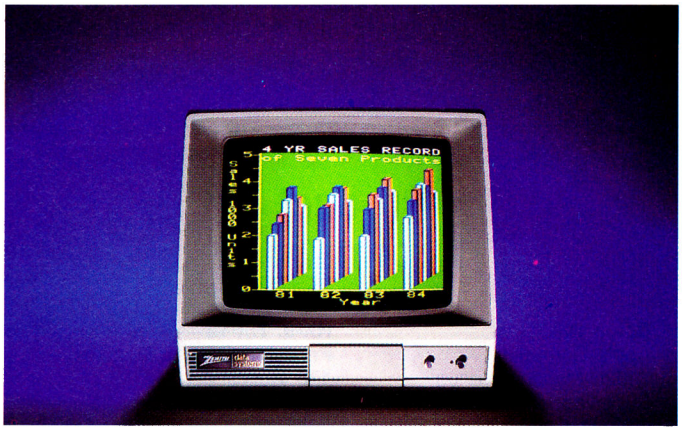
Zenith

Zenith isn't just a television manufacturer. It was one of the first suppliers of 12-inch green-phosphor monitors for the II Plus. (Though inexpensive, they were terrible.)

I almost reached for my sunglasses when I flipped on the Zenith ZVM-135 and powered up the Apple. The 13-inch screen came alive with color. Subjectively, it earned a slight edge over the HX-9. For straight text, you can select between green and white characters.

The connector on the back of the ZVM-135 is a nonstandard 25-pin. Zenith has made provision for quite a few different computer brands, including Apple. The correct cable is a ZVM-135-3, and there are no additional switches to set.

Unfortunately, the monitor was shipped with an IBM cable that required a Mappler to make it Apple-



Zenith ZVM-135

□ *Blue indicates which special features accompany monitor.*

Video Characteristics				Special Features				Interface Characteristics			
Lines	Char. per Line	Resolution	Dot Pitch	Anti-Glare	Composite Video	Sound	Tilt Screen	Apple	IBM	Other	Cable Supplied
25	80	see note*	.38mm	■			■	■			■
25	80	690 × 240	.31mm	■					■		■
25	80	640 × 480	.43mm		■	■		■			■
25	80	560 × 240	.51mm		■	■		■			■
25	80	640 × 200	.28mm	■			■	■			■
25	80	560 × 240	.43mm	■		■			■		■
25	80	640 × 240	.39mm								

*Apple states resolution in scan lines. The Color 100 has a 600-line resolution at the center, 416 at the corners.

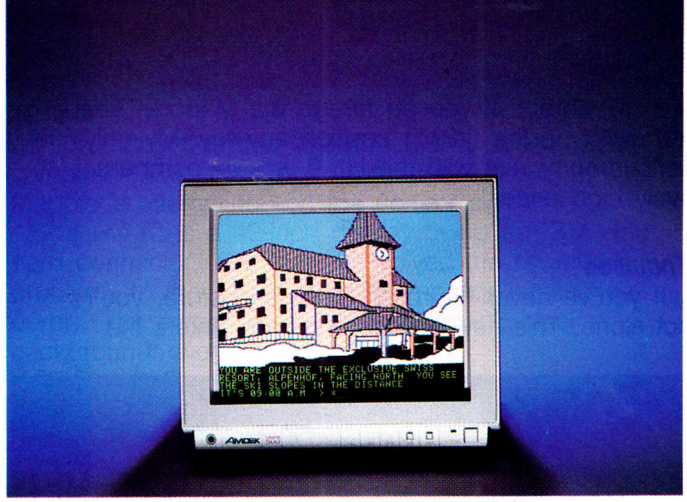
compatible. It would have been interesting to try what Zenith considers the correct cable to see if the color varied.

If you ever tire of your Apple and desire additional entertainment, the ZVM-135 is compatible with your VCR's composite video (via a rear slide switch) and will also accept an audio input, amplify it, and let you listen from a built-in speaker. Zenith includes an audio-output line if you prefer not to use the Apple speaker.

Amdek

Amdek is an old friend. I've been using the Color I composite monitor on my VCR, and the Color II RGB monitor was my only choice when I needed a quality RGB color monitor for another computer. So, I was more than eager to see the Color 500, which is from a new series of monitors that are both Apple- and IBM-compatible. I should have tempered my eagerness.

A quick look at the comparison chart reveals that the Color 500's horizontal resolution is slightly lower than that of most of the other monitors tested. But that's not the problem. The monitor's resolution is well within the capabilities of the Apple's resolution.



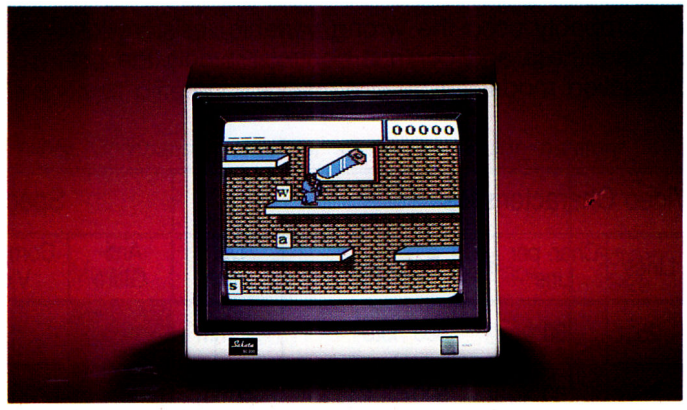
Amdek Color 500

What did bother me were the colors; they were muddy. Red was a forlorn magenta. The colors were closer to what other monitors produced when their switches were set for the wrong type of interface. (For the record, I tried direct-connect in the Apple mode and Mappler in the IBM mode.)

The problem is that the Color 500 is packed with features. It touts an RGB input, a separate line for composite video, and additional lines for audio and video signals from your VCR. (You can select RGB/Composite through a rear panel switch, while VCR can be punched up from the front, no matter which of the other two modes you're in.) The composite and VCR modes produce brilliant colors. And there's the surprising audio punch from its internal speaker. If you need the versatility, the RGB let-down might be tolerable.

Sakata

The Sakata 200's interface is IBM standard, requires the Mappler, and has a 13-inch screen, but that's about it. There's nothing outstanding about the monitor.



Sakata SC-200

The timid colors don't help the Sakata 200. Nor does the lack of a contrast control make the less-than-black background more than marginally tolerable. Overall, it's a lower-quality monitor—though its price hardly reflects that—and I can't recommend it.

Heartless I'm not. I talked to Sakata representatives, and they, too, recognize the monitor's shortcomings. A new model, the SC-150, is scheduled for August release. It promises a black-matrix tube

Product Information

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(408) 996-1010
$599
Reader Service Number 313

Color 500
Amdek
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Elk Grove Village, IL 60007
(312) 595-6890
$525
Reader Service Number 314

CV36432SI
Thomson
330 Washington Street
Suite 509
Marina del Rey, CA 90292
(213) 821-2995
$499
Reader Service Number 315

HX-9, HX-12
Princeton Graphic Systems
170 Wall Street
Princeton, NJ 08660
(609) 683-1660
$650, $695
Reader Service Number 316

SC-200
Sakata
651 Bonnie Lane
Elk Grove Village, IL 60007
(312) 593-3211 in Illinois
(800) 323-6647 outside Illinois
$599
Reader Service Number 317

ZVM-135
Zenith
1000 Milwaukee Avenue
Glenview, IL 60025
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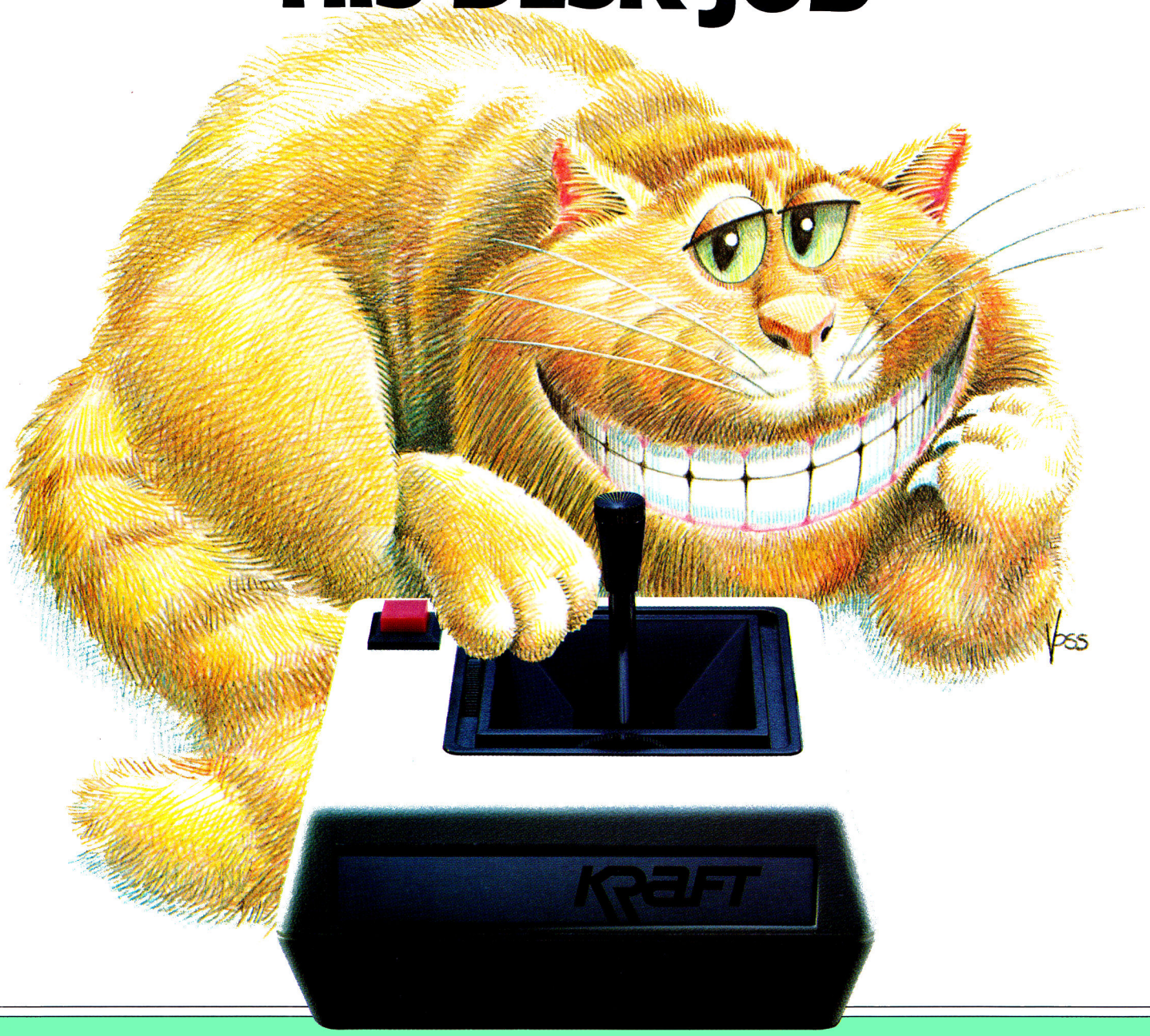

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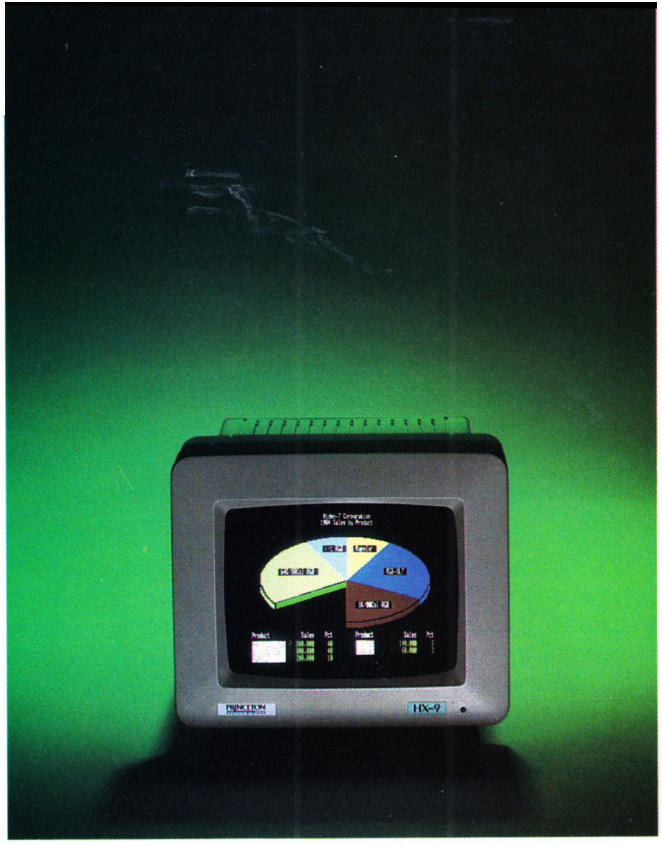
and composite/sound capability at $90 less than the SC-200. The dot pitch will increase to .42mm on the SC-150, but you might want to look at it first.

And the Winner Is. . .

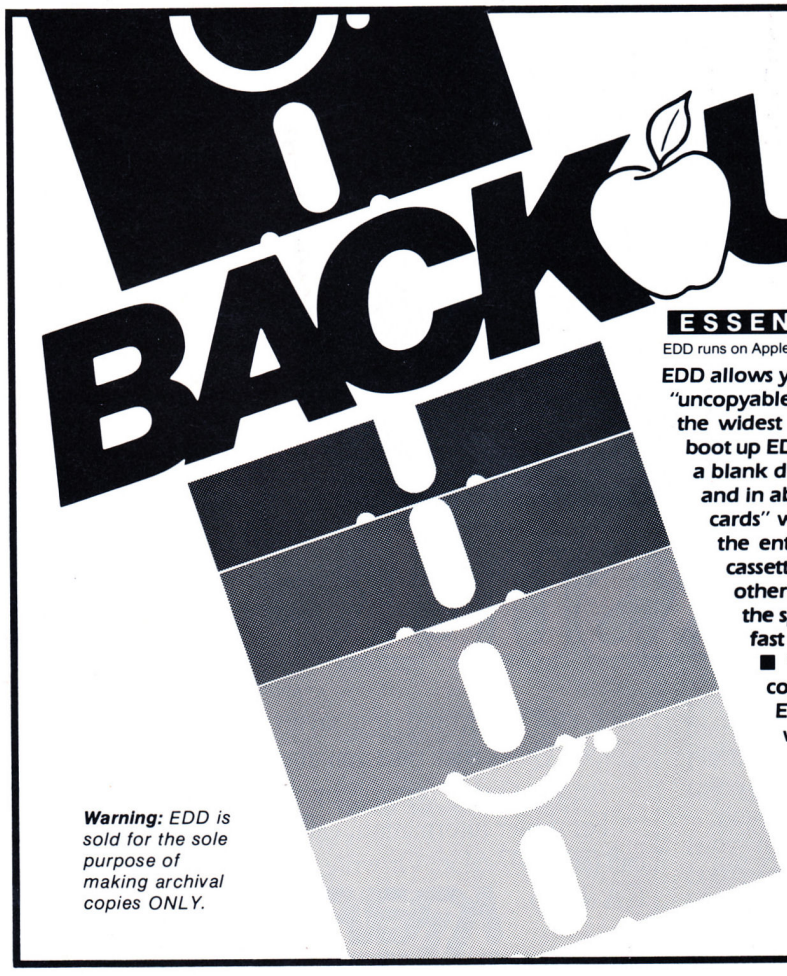
When I started this comparative review, I convinced myself there was no way to select a clear-cut "best" RGB monitor—or even attempt to establish a hierarchy, for that matter. I was wrong. If you can afford the $650 price tag, Princeton Graphic's HX-9 is an outstanding choice. It beats the rest by a wide margin. Ranking a solid second on the list is Zenith's ZVM-135. But if you want to save $100—and sacrifice a bit of color vibrancy (but add an additional 1 inch of diagonal viewing area)—seriously consider Thomson's CV36432SI. (By press time, Thomson promises a shorter model designation.)

Your individual needs will dictate the monitor you choose, but consult the comparison chart before you open your wallet.■

Write to Bill O'Brien at P.O. Box 1010A, Fort Lee, NJ 07024.



Princeton Graphic Systems HX-9



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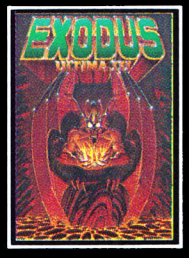

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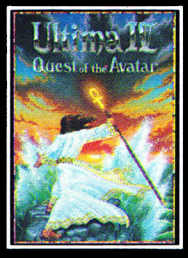

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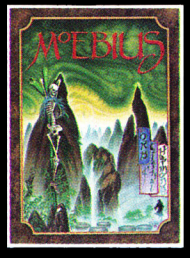

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GETTING INTO SHAPES

Add life to your Applesoft arcade games with basic vector-shape animation.

by Bob Ryan, *inCider* Technical Editor

I've never met a programmer who hasn't dreamed of writing the ultimate arcade game on his or her Apple. But I have met precious few who've demonstrated much understanding of Apple graphics beyond HPLOT and HCOLOR. Like "The Wall" in a marathon (that physical and psychological point in a race that can break the best runners), graphics animation seems to be a barrier breached by few programmers. Listening to them, you'd think that the only way to produce arcade animation is to use assembly language. I intend to show that arcade-style animation is well within the reach of all but novice Applesoft programmers.

You can choose from many animation methods on the Apple. The simplest is to HPLOT an object, erase it (HPLOT the object in the same location with HCOLOR set to black), and then plot it again in a different location. This method of animation is easy, but slow. Far superior is the use of shapes in animation. Shapes are discrete images you can move around on the hi-res screen. They can be drawn and erased much faster than images created with HPLOTs.

You can use two types of shape animation on Apple computers—vector-shape animation and bit-mapped (or block) animation. Bit-mapped shapes are snapshots of a part of the Apple hi-res screen. You store them in memory and move them to a particular location on the hi-res screen as needed. Although faster than vector graphics, bit-mapped graphics aren't supported directly by any Applesoft commands—they can only be used via assembly language.

Vector shapes are stored, naturally enough, in vector-shape tables. Vector shapes consist of a series of plotting instructions that Applesoft's DRAW and XDRAW commands use to create the shape on the screen. For the programmer interested in arcade-style animation, but lacking the time to devote to the study of Apple assembly language, vector graphics are the best and easiest solution.

Creating Shapes

Before you can learn how to use shapes in a game or in any other program, you must first create the shapes you want to use and put them into a shape table. Many utilities, both commercial and public-domain, do most of this work for you (see the sidebar on page 28). For the purposes of this discussion, I've converted a shape table into a BASIC program, TABLE.CREATOR (**Listing 1**, p. 104), by using the PEEK to POKE utility published in the September issue of *inCider*, page 71. When run, SHAPE.CREATOR POKEs a shape table into memory and then saves the table as a binary file called DEMO.SHAPES.

Once you have the shape table on disk, just follow along as I show you how to manipulate the shapes and make a simple arcade game. Then you can use these principles in other graphics-animation applications.

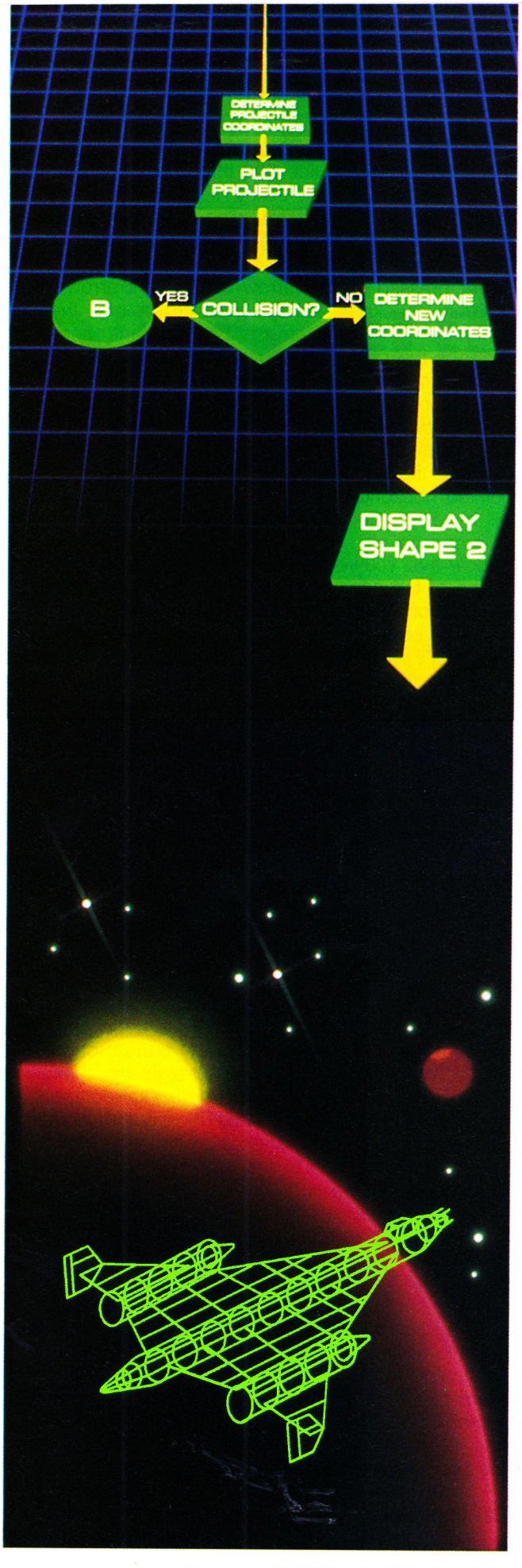
Memory Maneuverings

Before your program can use a shape table, it has to transfer the table from disk to memory. With DEMO.SHAPES, the shape table created with the program TABLE.CREATOR, you accomplish this as follows. First type in:

```
10 PRINT CHR$(4)"BLOAD DEMO.SHAPES,A36865"
```

To keep the shape table from being clobbered by your Applesoft program or its variables, you should protect it by putting HIMEM (the highest address that Applesoft can access) below your shape table. Type in:

```
20 HIMEM:36864
```



Now, to protect the Apple high-resolution graphics screen, you should type in:

```
30 LOMEM:16384
```

What the last two statements do is ensure that your shape table will not be overwritten and that Applesoft will store the contents of your variables above hi-res screen 1. (The program doesn't use screen 2.) What these statements *don't do* is ensure that your program won't spill over into the hi-res area. This isn't a problem with the demonstration program that accompanies this article, but it could be if you go on to write a large arcade game. To totally protect the hi-res area of memory, you should load large graphics programs above the hi-res screens. For an explanation of this and other memory-management matters, see "Memory Management" in the Fudge It! column of the June 1984 issue of *inCider*, page 17.

When the shapes are safely in memory, you have to tell Applesoft where to find them. You must POKE the starting address of the shape table into locations 232–233. The following statements tell Applesoft that the shape table begins at the address used in the last BLOAD command—in this case, 36865.

If you're using DOS 3.3, type in:

```
40 POKE 232,PEEK(43634)
```

and

```
50 POKE 233,PEEK(43635)
```

When using ProDOS, type in:

```
40 POKE 232,PEEK(48825)
```

and

```
50 POKE 233,PEEK(48826)
```

Now, let's see what the shapes in DEMO.SHAPES look like. Type in:

```
60 HGR:SCALE = 1
70 HCOLOR = 3
```

```
80 FOR X = 1 TO 14
90 DRAW X AT 50,50
100 FOR Y = 1 TO 2000:NEXT Y
110 XDRAW X AT 50,50
120 NEXT X
```

This little program displays a shape on the screen, erases it, and then displays the next shape in the table. The program illustrates some basic principles concerning shapes. First, you refer to shapes with a numeral or a numeric variable. DEMO.SHAPES contains 14 shapes, numbered 1 to 14. To use any other number in accessing this table will result in an "Illegal Quantity" error. The shapes themselves consist of UFOs, cannon barrels, projectiles, and some miscellaneous flying machines. I won't use all of them in my demonstration game, but you can use any or all of the shapes in DEMO.SHAPES in your own programs.

Next, note that the XDRAW command erases a shape. What the XDRAW command literally does is to draw the shape using the complement of the color currently being displayed at the coordinates given in the XDRAW command. Since black is the complement of white, XDRAW's effect is to erase the shapes.

Finally, note the use of a delay loop in line 100. You have to be careful that what you draw remains on the screen for a reasonable length of time.

Do the Locomotion

Now, let's move a shape. Type in the following:

```
80 FOR Y = 1 TO 140 STEP 5
90 DRAW 1 AT 140,Y
100 XDRAW 1 AT 140,Y
110 NEXT
120 END
```

This program causes shape 1 to "drop" from the top of the screen. You can change the rate of descent by changing the STEP value. You can move the shape horizontally by varying the x-coordinate instead of the y-coordinate. You can get it to move diagonally by varying both coordinates. Use this program to experiment with some of the other shapes in the table. I've incorporated this program, exemplifying the cardinal points of graphics animation, as the central routine in the demonstration program that accompanies this article.

Keyboard Control

Arcade games aren't passive endeavors. They require the active participation of the player. When you design an arcade game, you have to supply some means to let the player control the action.

In my demonstration game, CHICKEN.LITTLE (**Listing 2**, pp. 104–105), the player is cast in the role of the defender of the Earth. Alien UFOs are dropping out of the sky, and the player must destroy them before they touch down. The player gets a cannon to fight off the UFOs. The cannon barrel swivels back and forth under the control of the right- and left-arrow keys. There are actually five different shapes for the cannon (shapes 2, 3, 4, 11, and 12 in the shape table), each showing the barrel at a different angle. The program changes the cannon shape based upon input from the player. Here's how I handle player input and use it to control the cannon shape.

After initialization, the program loops through a routine beginning in line 500 that checks to see if the player has pressed a key. If so, the routine determines which key was pressed and returns. The program then checks to see if the key that was pressed was meaningful (lines 1000–1090). If the player pressed the left arrow or the right arrow, the program checks to see if it needs to change the cannon shape. For example, if the current cannon shape is the center one (with the barrel straight up and down), and the player presses the left-arrow key, the program changes the cannon shape to the shape that has a barrel pointed slightly to the left. If the left-arrow key is pressed again, the program changes the cannon shape so that the barrel is pointed horizontally left. Another left-arrow keypress will have no effect—the cannon is as far to the left as it can go.

Now that you've seen how the player controls the shape of the cannon (how, in effect, he or she aims the cannon), let's see how the player fires the cannon and how the program plots the trajectory of the shell.

Fire Away

The last component of the keypress routine is line 1080, which checks to see if the player hit the space bar. The space bar initiates cannon shots. When the player hits the space bar, the program jumps to line 2000.

In lines 2000–2040, the program determines where the cannon is pointing by determining which of the five cannon shapes is now appearing on the screen. It then sends program control to the appropriate shooting subroutine. If, for example, the cannon is aiming straight up (that is, the current cannon shape, stored in the variable P, is 2), the program jumps to the routine in lines 2100–2140, which plots the shell's trajectory. The trajectory is under the control of an equation that reflects the current cannon shape. With the barrel pointing straight up, the equation (line 2110) keeps the horizontal component of the shell plot constant while varying the vertical component so that the shell is plotted from the mouth of the cannon to the top of the screen. In all of the shell-plotting subroutines—there is one for each barrel shape—one line (line 2120 in this instance) checks to see if the shell intersects the UFO, scoring a hit. Hit detection is pretty simple. The program compares x and y coordinates of the UFO and the shell. If the coordinates of both are fairly close (within ten, in this case) the shell is considered to have hit the UFO.

Should the player fail to hit the target, the program plots the shell's movement to the edge of the screen under the control of the shell-plotting equation. If, on the other hand, the player scores a hit, the program jumps to a scoring routine at line 4000.

Get the Points

Like all arcade games, the object of my demonstration game is for the player to rack up as many

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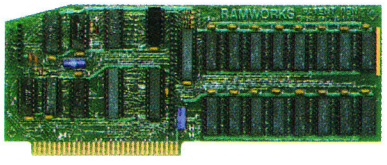

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points as possible. Nothing motivates a game player more than seeing his or her score mount up in the course of the action. You can handle arcade-game scoring in many ways. I decided to add a scoring mechanism that not only adds points for hits, but also varies the points for hits based upon how quickly the player destroys the UFO. Hitting the UFO before it drops very far results in more points than if the player gets the UFO just before it hits the ground.

The scoring routine (starting in line 4000) first erases the UFO and the shell. It then computes a score for the hit. The routine determines the score by subtracting the target's vertical coordinate (which increases as it drops, from 140. Line 4020 displays the player's total score at the bottom left-hand corner of the screen. Then the program loops back to the start of the UFO-drop routine and repeats the sequence of falling UFOs, keyboard input, and shot plotting.

Nothing Is Forever

Life doesn't go on forever, and neither do arcade games. When you design a game, you must specify some "end" condition—some combination of events that concludes the game. I spent a lot of time thinking about how to detect when a UFO landed—needless thinking, as it turned out. Quite simply, my game ends when the FOR. . .NEXT loop that controls the descent of the UFO completes its control function without interruption (the only cause of interruption being the collision of the UFO and a shell).

As a parting shot, I included a routine at line 5000 that "explodes" the cannon after a UFO landing. The program jumps to this routine from line 280, the line immediately following the NEXT statement of the UFO control loop. Any game you design probably won't have such a simple ending condition. I just got lucky.

Touch It Up

That's all there is to CHICKEN.LITTLE. It is not the be-all and end-all of arcade games, but it's not meant to be. It contains most of the elements and demonstrates many of the problems encountered in animation programming in general and arcade games in particular. If you're an intermediate Applesoft programmer, you should now be able to write your own animation programs or modify my program to suit your tastes. You should be aware that many techniques, such as page-flipping and collision-counting, will increase the apparent speed of the shapes. Welcome to the never-ending world of Apple graphics.■

Listings 1 and 2 are on pages 104 and 105.

Shape-Creation Software

Vector shapes are not difficult to use, but they can be very difficult to create. Basically, there are two methods of shape creation—you can use a shape-editing program, or you can produce shapes by hand.

The latter technique is described in the *Applesoft BASIC Programming Reference Manual* (Apple product #A2L0006), commonly known as the "green" manual. This method involves graphing your shapes on paper and converting the dots on the paper into plotting vectors. You then translate these vectors into machine-language bytes so that Applesoft shape commands (DRAW, XDRAW, etc.) can use them to re-create your shapes on the hi-res screen. Finally, you incorporate the bytes into a table, construct an index, and, using the monitor, type the table into memory. You can then save the table to disk. All in all, this procedure is troublesome enough to make you give up graphics programming forever.

Luckily, a number of commercial and public-domain programs are available to assist graphics programmers. These programs normally consist of a number of modules, including a shape editor and a shape-table creator. Most shape editors give you a magnified grid on which to compose your shapes; shape-table creators put the shapes you've drawn into a shape table, complete with index.

The first shape utility I ever used was Apple Mechanic by Beagle Bros. This package contains, in addition to shape utilities, a hi-res character editor and a number of different hi-res type fonts. Apple Mechanic is a very good shape utility at a bargain price.

You can find another efficient shape utility in Pixit, a graphics package from Baudville. One of Pixit's strengths is its excellent tutorial on graphics animation. I recommend it to students of all ages.

The most respected name in Apple graphics is Penguin Software, and naturally it offers several utilities that deal with shapes. The Complete Graphics System, for instance, provides a very capable vector-shape editor in addition to a drawing program, a hi-res character generator, and a 3-D graphics system. The Complete Graphics System encompasses the breadth of Apple graphics.

The Graphics Magician is another Penguin offering that handles shape creation. Unlike the programs mentioned above, the Graphics Magician works primarily with bit-mapped graphics. You can use one of its sections, however, to create super vector shapes.

Of course, if you can get by with minimal documentation and user-friendliness, you can also obtain a fairly good shape editor from any Apple public-domain software library. (See the list of public-domain shape utilities in the product information box on page 30.) Whatever shape editor you decide on, you can be thankful that the days of manual shape creation are gone forever.□ **—R.R.**

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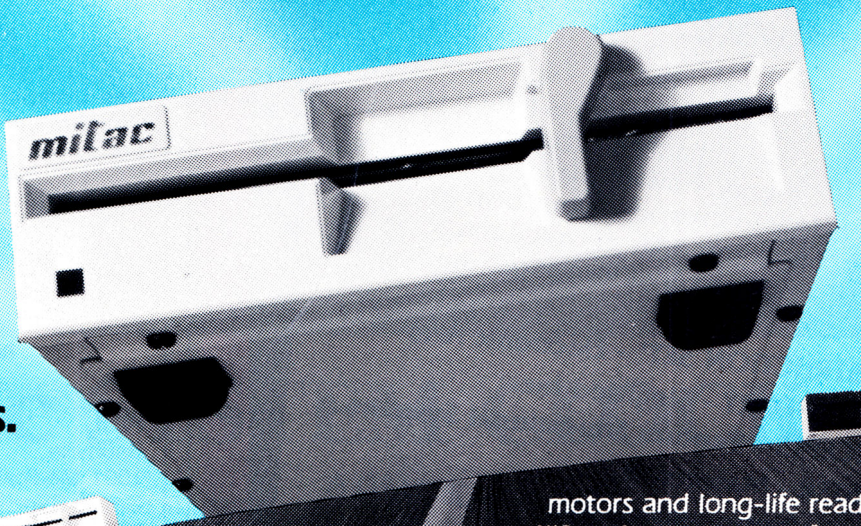

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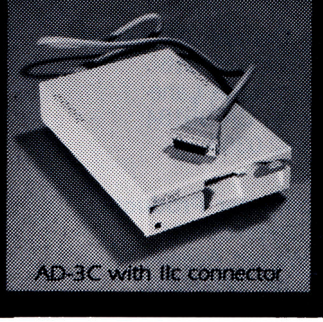
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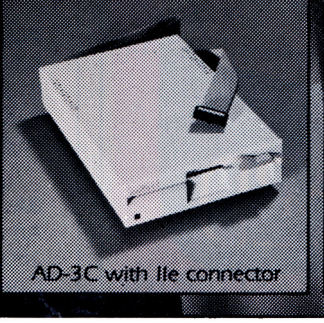
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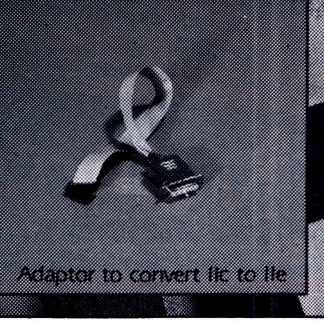
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The Graphics Magician
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$79.95, The Complete Graphics System
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Pixit
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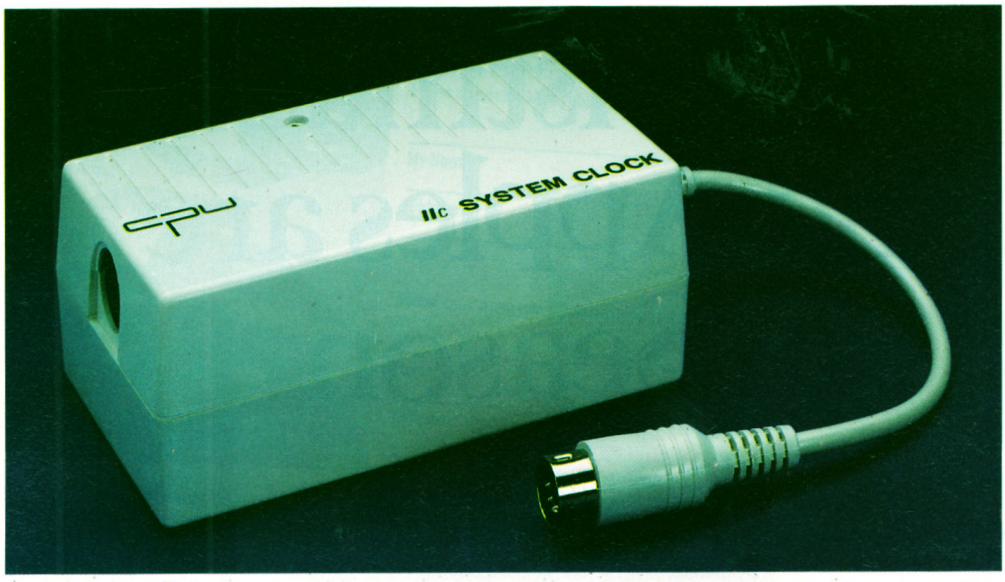

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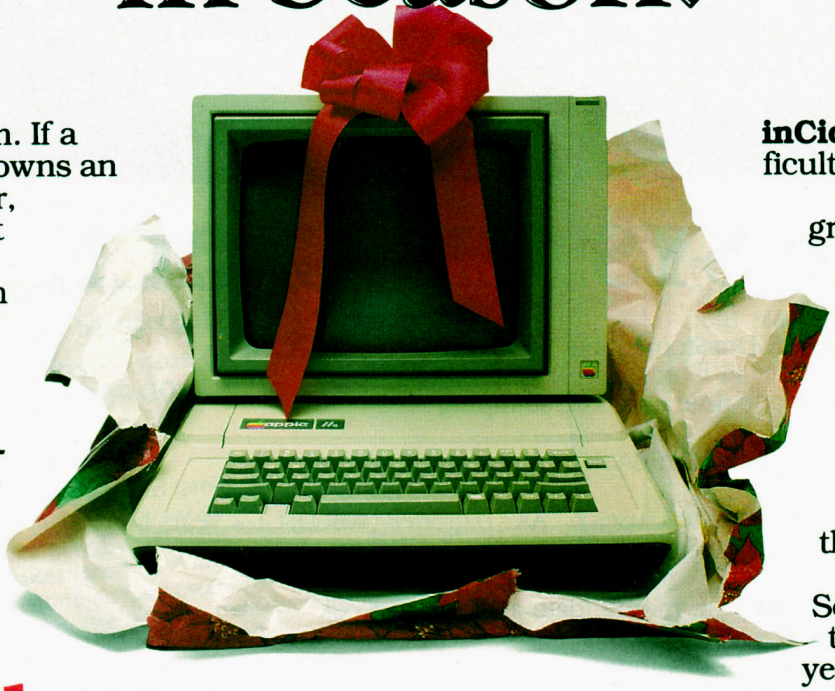

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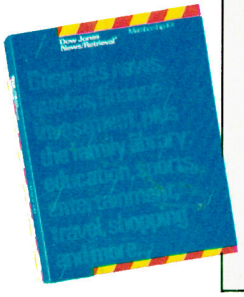

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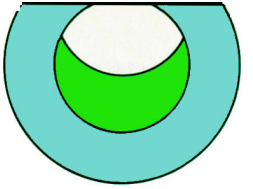
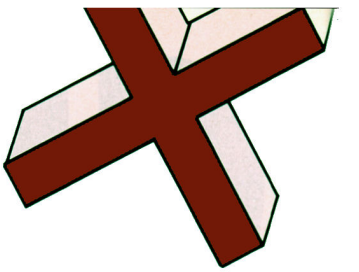




MASTER OF THE GAME

Even in tic-tac-toe, the computer that fails to remember the past is doomed to repeat it.

by R.A. Dousette

Although your computer can't "think," it can at least simulate learning. My computerized Pascal tic-tac-toe program, based on Donald Michie's MENACE (see the sidebar), helps your Apple improve its game playing by referring to previous games—won, tied, and lost.

As with Michie's version, my computerized MENACE always has the first move. Even with this restriction, more than 300 game plays are possible. As **Figure 1** illustrates, each tic-tac-toe position is logically equivalent to seven others. Rotating position 1 90, 180, and 270 degrees produces positions 2, 3, and 4, respectively, with positions 5–8 being their mirror images. Thus, a good move for position 1, when appropriately rotated, reflected, or both, is also a good move for the other seven positions. Likewise, a bad move for position 1 is equally disastrous for the other seven positions.

As the computer encounters each position, it compares that position to the ones stored in memory. If the current pattern matches one in memory, the program plays that old pattern. If the current pattern is new, the computer adds it to its memory.

A three-part record represents each pattern: A three-by-three array contains Xs, Os, and blanks that stand for their respective positions on the playing field; a three-by-three array of integers contains the results of prior plays of this pattern; and a pointer shows the next pattern in the list.

Three linked lists—consisting of patterns the computer encounters before the third, fifth, and seventh

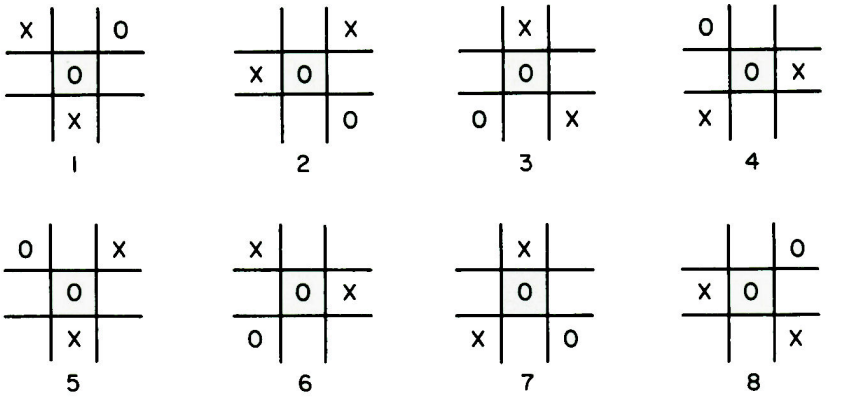
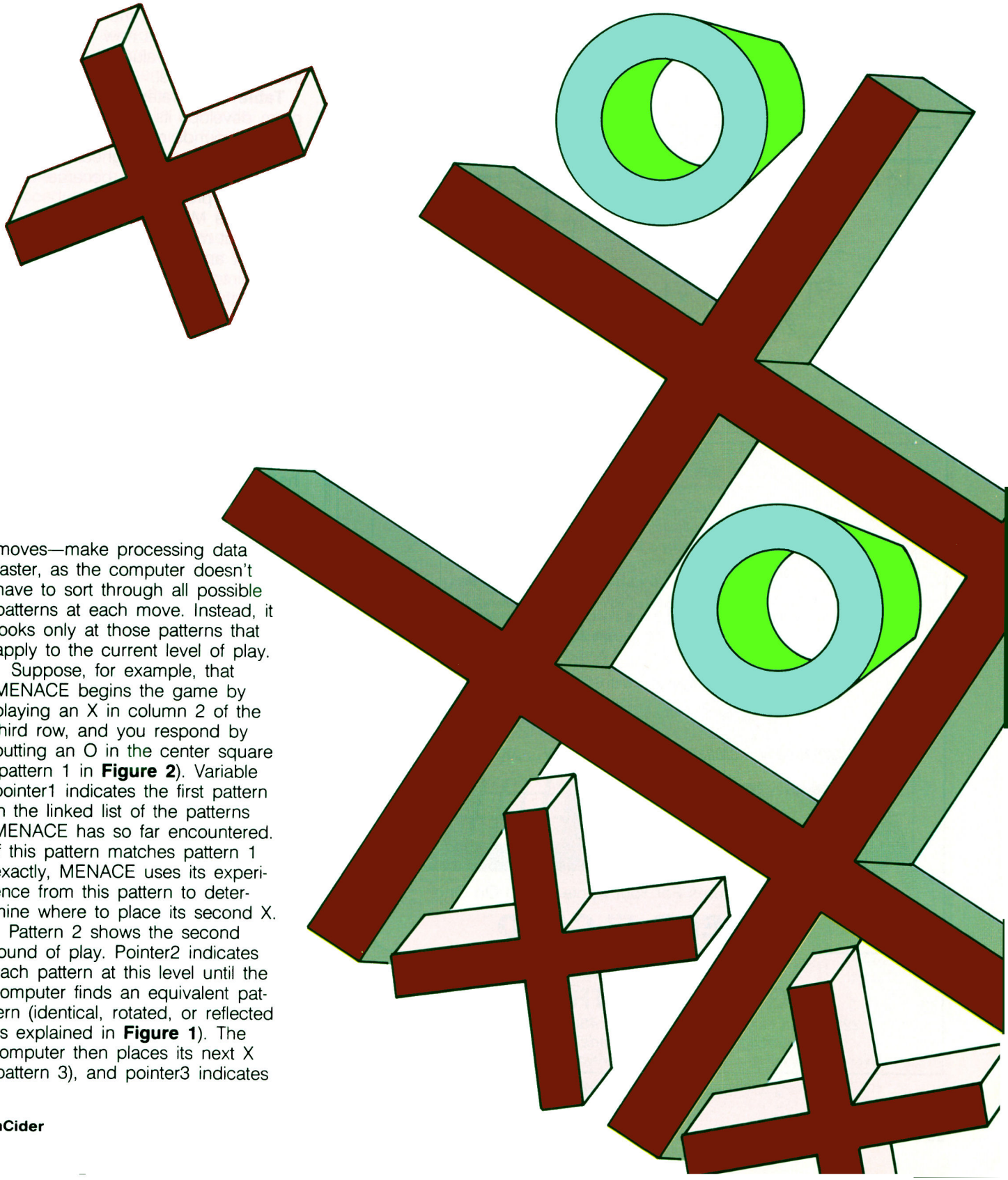


Figure 1. Eight equivalent tic-tac-toe positions.

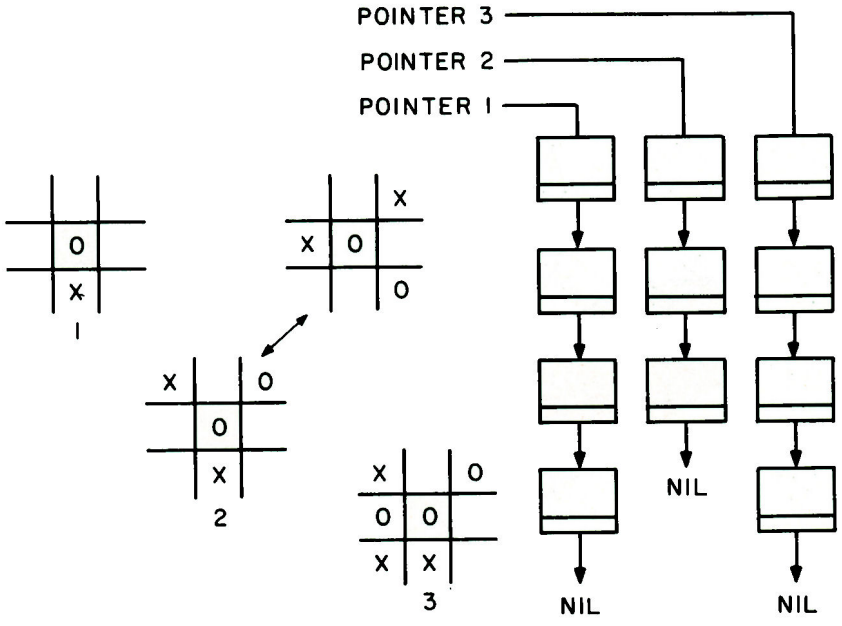


moves—make processing data faster, as the computer doesn't have to sort through all possible patterns at each move. Instead, it looks only at those patterns that apply to the current level of play.

Suppose, for example, that MENACE begins the game by playing an X in column 2 of the third row, and you respond by putting an O in the center square (pattern 1 in **Figure 2**). Variable pointer1 indicates the first pattern in the linked list of the patterns MENACE has so far encountered. If this pattern matches pattern 1 exactly, MENACE uses its experience from this pattern to determine where to place its second X.

Pattern 2 shows the second round of play. Pointer2 indicates each pattern at this level until the computer finds an equivalent pattern (identical, rotated, or reflected as explained in **Figure 1**). The computer then places its next X (pattern 3), and pointer3 indicates

Figure 2. How MENACE chooses a move.



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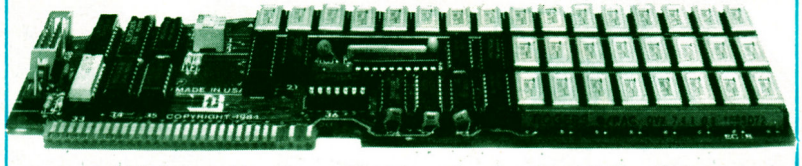

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the list of patterns at this level. If the program doesn't find a pattern that matches pattern 3 (that is, the pointer to the next pattern has the value nil), it realizes this is a new pattern. The program updates the pointer in the fourth pattern to indicate this new pattern, and gives it the value nil to signal the end of the list.

Table 1 illustrates how the program develops its ability. In the first two rounds of 25 games each, my wins outweighed my draws, but the games became somewhat predictable.

Because MENACE chose the move that made it competent in the least amount of time, it quickly settled into a pattern of always playing the first move in the center. To avoid MENACE's possible forced win, I usually responded by playing one of the corners. This resulted in one of two sequences of play leading to a draw.

If MENACE played the corner or side as its first move instead, I had a wider choice of advantageous responses. Consequently, by the fourth round, MENACE had refined its ability to such an extent that I won only one of the 25 games.

In the fifth round, I adopted a riskier strategy. In response to the computer's center play, I placed an O in row 1, column 2. It's a chancy move because a skillful opponent can force a win from this position; the advantage arose from placing MENACE in an unfamiliar and initially confusing situation. The computer quickly learned what was happening (it increased its patterns at all levels) and once again began to win. I saw the handwriting on the wall.

In the eighth round I played irrationally. I figured that if, for example, I didn't block two Xs in a row, MENACE might not choose the correct response and would, instead, throw the game into new, unexplored territory where I might have a chance to pick up a few morsels. This strategy shift temporarily restored my wins, but the trend was definitely downward.

The Listing

The **Program listing** (beginning on page 106) has uppercase code that is commented out because it slows down program execution. This code, however, provides an interesting view into the inner workings of the program. To activate the code, remove the comment symbols at the beginning of the uppercase code and recompile the code.

Columns 41 through 80 display the name of each procedure (see **Table 2** for a description of the procedures) as you enter it, the level of play, the pattern from the list being compared to the current pattern, the rotation and/or reflection of the pattern from the list, and whether or not the pattern matches the current position. The display also shows the relative weights assigned to the possible moves, the row and column of the move generated from the pattern in memory, and the row and column to which this move is rotated and reflected to become a play in the current game.

Conclusion

Watching MENACE in action reveals both the strength and weakness of this method of simulating learning. The program is responsive to good play, but MENACE can settle into a pattern in which it will play in pursuit of a draw while passing up obvious wins—exactly what you would expect from a program capable of looking only at past experiences.

MENACE eventually becomes a competent opponent, but an unimaginative one. You can, however, experiment with the program. Chapter 8, "A Matchbox Game-Learning Machine," of Martin Gardner's *The Unexpected Hanging and Other Mathematical Diversions* (Simon and Schuster) may give you some tips on how to produce an aggressive opponent. ■

The Program listing begins on p. 106.

Write to R.A. Dousette at 2509 Johnston Street, Apt. 13-4, Lafayette, LA 70503.

Table 1. A demonstration of program play.

Round	Wins	Losses	Draws	New Patterns Encountered Move 3	Move 5	Move 7
1	21	0	4	6	14	9
2	17	0	8	7	19	14
3	6	0	19	7	19	14
4	1	0	24	7	19	14
5	9	6	10	8	23	21
6	0	10	15	8	23	23
7	1	16	8	8	23	23
8	13	9	3	8	28	28
9	6	16	3	8	33	35

Table 2. Procedures for MENACE.

MAIN ROUTINE

Initboard
Shows the game count and the number of wins, losses, and draws; clears the array that stores the history of the game; and fills the tic-tac-toe board with blanks.

Tictactoe
Generates the computer's initial move at move 1, and then calls function won to see the status of the game. If the game is still in progress, the procedure calls itself two moves higher. If the game is over, the variable status is given the value lose, draw, or win.

Update
Updates the experience to include the results of the most recent game.

Done
Uses a Boolean value that returns the value true if you indicate no more games.

MOVES

Applemove
Generates the Apple's play. At move 1, the computer randomly plays in either the upper left-hand corner, the center position, or the second column of the first row. The array firstmove[i], which represents the value of each of these plays, initially equals four (each move has four chances in 12 of being chosen). As the moves result in wins, losses, and draws, their relative weights change in favor of those moves that result in wins and draws. At moves 3, 5, and 7, the pointer variable srchptr is set at the beginning of the appropriate linked list. At move 9, applemove plays the final blank space.

Humanmove
Examines the playing board to find the first blank space in the board after the computer's move, and displays a plus sign there for your move. The left- and right-arrow keys move the plus sign, and the return key or the space bar places your move in a position.

Nextblank
A subprocedure that finds the row and column coordinate of the next blank space.

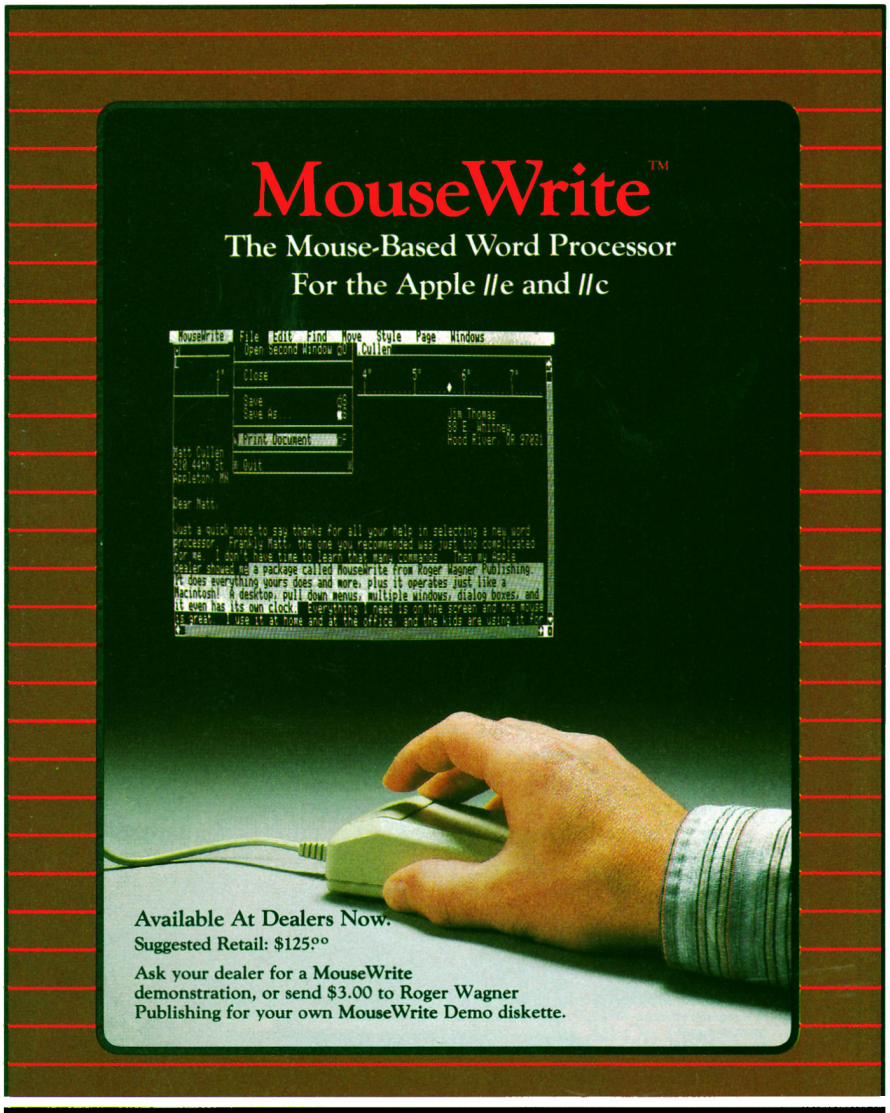
Lastblank
A subprocedure that finds the row and column coordinate of the last blank space.

PATTERNS

Searchpattern
Searches the linked list for a match and randomly generates the computer's move. A "repeat. . .until" loop compares the game position to the one to which srchptr is pointing, and, if the position doesn't match, updates srchptr to point to the next position in the list. This continues until the program finds a match or the list is exhausted.

Newpattern
Adds a new pattern to the end of the appropriate linked list if searchpattern doesn't find a match. It also prints the value of memavail, a built-in function that shows how much memory remains to contain later patterns.

Genmove
Totals the weights of the possible moves and generates a random number to select the row and column of



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the move from the pattern matching the game board. It then rotates the move to match the game board, and reflects it if mirror = true. It also updates the array history to record the pattern used and the row and column chosen.

Match
Returns a Boolean value (true/not true) to indicate if the game board matches the position being examined. If it does, the function also returns values for rotate (how many times the pattern must be rotated 90 degrees to the right to match the game board) and mirror (if the pattern has to be reflected to get a match).

Matchbox Gaming

Around 1960, a scientist named Donald Michie developed a "machine" that played tic-tac-toe. It began as a completely ignorant player, then learned from experience until it became a competent opponent. Called MENACE (Matchbox Educable Naughts And Crosses Engine), this machine stored its experiences in 300 matchboxes containing colored beads with various tic-tac-toe positions drawn on the outside.

Each matchbox represented a different pattern MENACE was likely to encounter. To reduce the number of possible patterns, Michie restricted the games to ones in which MENACE played first. Thus, MENACE made the first, third, fifth, seventh, and ninth moves of the game. The pattern for the first move was just a blank playing field, and no matchboxes were necessary for the ninth move, because MENACE simply played the last empty position.

Each matchbox had a color assigned to every possible move. The number of beads of a given color in the matchbox represented the value of that color's move in the game. Initially, each move for a pattern had the same number of beads assigned to it—three of each color represented the value of the third move, two of each color the fifth move, and one of each color the seventh move.

Michie generated a move for MENACE by selecting the matchbox for the current position, shaking it, then randomly drawing a bead from the matchbox. The color of the bead determined the move MENACE chose. At the end of each game, Michie examined the matchboxes used in that game. If MENACE lost the game, Michie discarded the bead drawn from the box. For a drawn game, he returned the bead to the box and added an extra bead of the same color. And if MENACE won the game, Michie not only returned the bead, he also added three more of the same color. Thus, after being used several times, a matchbox held beads for the winning moves or draws, while beads that led to losses were discarded.□ **—R.A.D.**

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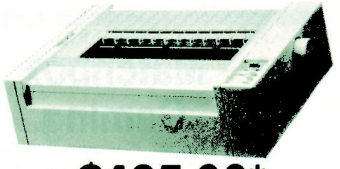

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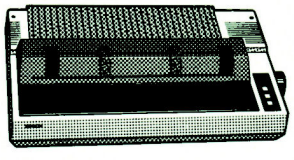

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ENTURE

by James L. Muller

You may enjoy commercial adventure games, but haven't found one with all the special features you'd like. Then why not write your own? You'll achieve a sense of accomplishment as you exercise your creativity and develop your programming skills.

I'll present the major concepts behind adventure-game programming to enable you to write a game. Although my ideas won't represent an exhaustive study of the subject, they will provide a good starting point for those who already have a moderate knowledge of Applesoft BASIC. (The concepts apply equally well to Pascal.)

You should write a generalized program with as much reusable code as possible, so you can create new games simply by initializing the variables differently. Before you write the actual code, though, you should design the program focusing on the details—identifying rooms, handling movement, interpreting commands, and so on—rather than on the overall structure to control the program.

Room Identification

The most fundamental concept in adventure games is a set of "rooms," which need not necessarily imply different physical locations: Two rooms can represent the same location, with a change having been made in one of them. (I'll discuss this in more detail later.)

Many beginners use different sections of code to represent various rooms (for example, lines 100–190 for the entrance, lines 200–290 for the next room, and so on), and each section uses a set of IF (or ON X GOTO) statements to control movement. With this method, you must retype the same statements for each room (changing only the GOTO destinations). This wastes memory and severely limits the input vocabulary the game recognizes. A better way to program this is to use a single, simple instruction loop that lets various sections of code represent different possible actions according to player input, rather than the actual rooms.

Number rooms sequentially, beginning with one (for internal identification only, since the player never sees the numbers). The rooms need not connect sequentially. Next, store this information in an integer variable, RM%. (See the accompanying **Table** for a description of the variables described in this article.)

You can put all other room properties, such as names and descriptions, into arrays NM$( ) and DE$( ), respectively. Then, by using the room-number variable as a subscript (the value within the parentheses), you can obtain the properties of the current room. For example, if you want the name of the current room printed after every move, end your instruction loop with the statement:

```
PRINT "YOU ARE IN THE ";
  NM$(RM%);" ROOM."
```

If your game has more than 11 rooms, you must declare these arrays explicitly—DIM NM$(50) for 50 rooms, for example—since Applesoft automatically dimensions undeclared arrays to a range of zero to ten.

Movement

When a player types in a command to move in a certain direction, the command interpreter (called a *parser*) calls a subroutine (**Listing 1**) to handle this movement. (All listings are on page 110.) As the player moves from one room to another, this subroutine changes the value of RM%. (Later, I'll describe in more detail how the parser works.)

The player's destination—the new value of RM%—depends on the direction in which he or she wants to move, the variable stored in the string OJ$, and his or her present location, the current value of RM%. (The variable named OJ$ stands for object. This choice of name will make more sense when you look at the parser.) Thus, you should declare a two-dimensional array, the "next-room" array—DIM NR% (4,50), for example. The values in the NR% array are the destination-room numbers. The first index represents the direction code, D%—0, 1, 2, 3, and 4 for no passage, north, south, east, and west, respectively—and the second, the current-room number.

The value of OJ$ determines the value D% will be, as the following code exemplifies:

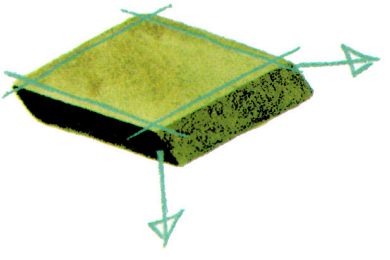

Table. Variable descriptions.

Variable	Type	Description
RM%	Integer	Current room number
OJ$	String	Object (returned by parser)
NM$(RM$)	Array	Room name
DE$(RM$)	Array	Room description
NR%(D%,RM%)	Array	New-room value
D%	Integer	Direction code (1–4)
LR%	Integer	Previous room
OB$(*n*)	Array	Object name
OL%(*n*)	Array	Object location
CO$	String	Input command string
VB$	String	Desired action

n is the number of rooms and objects you choose.

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```
OJ$ = LEFT$(OJ$,1): IF OJ$ = "N"
   THEN D% = 1: IF OJ$ = "S"
   THEN D% = 2: IF OJ$ = "E"
   THEN D$ = 3: IF OJ$ = "W"
   THEN D% = 4
```

Then, assuming NR%(D%,RM%) doesn't equal zero, the code for the location of the new room is:

```
RM% = NR%(D%,RM%)
```

The LEFT$ function above truncates (cuts off) all characters after the first, so the computer understands any direction that begins with N to be NORTH. You can test for NORTH as well as N if you prefer.

The program should check that a move is "legal" (Does a passageway exist in that direction? Does a locked gate prevent entrance?) and you should insert the appropriate lines using IF. . .THEN statements just before the final statement that assigns the new-room value.

Special values in the NR% array can trigger special actions—zero for "no passage," for example. A value greater than 1000 can indicate an obstacle, making the program branch to an obstacle-handling subroutine (see **Listing 2**). Inside this subroutine, values from 1001–1050 can represent a locked gate; when a player unlocks the gate, 1000 is subtracted from that value and the result shows where the passage leads. Similarly, values from 2001–2050 can indicate a magic spell; and values 3001–3050, some other obstacle. This is one place where nonreusable code might make programming easier.

Another variable, LR%, remembers the number of the room just left. You should assign the value of LR% with LR% = RM% after the obstacle check approves the move to the new room, but before the value of RM% changes. So, if the player supplies the appropriate command to return to the room he or she just left (BACK, for example), the program checks that at least one passage leads to that room (simply searches the four directions), then moves in that direction.

An Example

Suppose a player is in room 20, from which N, S, E, and W lead to rooms 15, 4, 10, and no-

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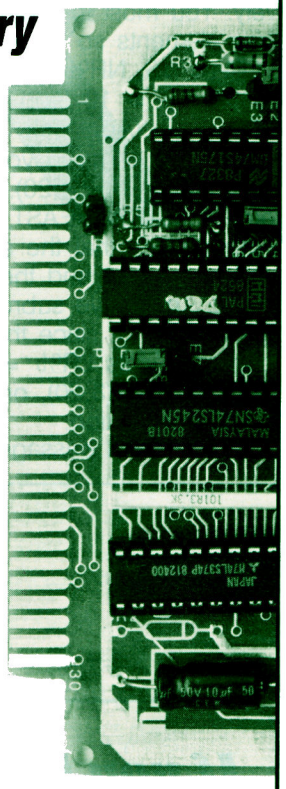

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where (a wall, perhaps), respectively. You must initialize these array elements so that NR%(1,20) = 15, NR%(2,20) = 4, NR%(3,20) = 10, and NR%(4,20) = 0. (Applesoft initializes all variables to zero, so you don't have to set NR%(4,20).) At the command MOVE EAST, the parser determines that the action desired is a move and the direction is east. The move subroutine sets D% = 3, and, since there is no obstacle, it sets LR% = 20 and RM% = NR%(3,20), or 10—the new room location.

If you want a passage to open up after a player says a magic word, or if another room property changes due to an action other than movement, you could treat the room as two separate rooms—but they must appear similar to the player. The appropriate subroutine must change RM% when the conditions are fulfilled. In most cases, however, it's just as easy to have the nonmove subroutine change the pertinent room property, thus making the two similar rooms unnecessary. Either way, it will probably be easier to program room-dependent, nonmove actions with nonreusable code.

Tips

The only actual work involved is initializing suitable values for the NR% array. You should map out the set of rooms and all the passages carefully to make sure a player can enter and exit each one. The main objective shouldn't be in an inaccessible room! Listing the NR% array in columns, with direction across the top and room number increasing down the side makes programming more convenient. Then, when you eventually write the program, you have complete freedom over where each passage leads: Going west from room A to room B doesn't require that going east gets you back again, or even that a return route exists. You should make most passages reversible, though, so the player doesn't become frustrated by being unable to explore or second-guess his or her decisions.

I limited this game to 50 rooms and four directions, but the only real limitation is computer memory. Including up and down would make the NR% array 50 percent larger. If your game needs many rooms and memory is a problem, defining only half the rooms is one solution. Then reinitializing the pertinent variables at a critical point can make the second set of rooms available. The biggest demand on memory will probably be the string variables holding the room descriptions, so reducing the number of rooms accessible at a time will do the most to save memory.

Managing Objects

Objects in adventure games usually contribute to the score and frequently affect the player's options. (Note: This is not the same "object" used in the move subroutine.) First assign each object (I used 20) an identification number—again for internal identification only. Then, define two arrays—DIM OB$(20) and DIM OL%(20)—to hold the object names and locations, respectively.

Special values for OL% or for the OL% array can represent specific conditions, such as zero for a nonexistent object or 100 for an

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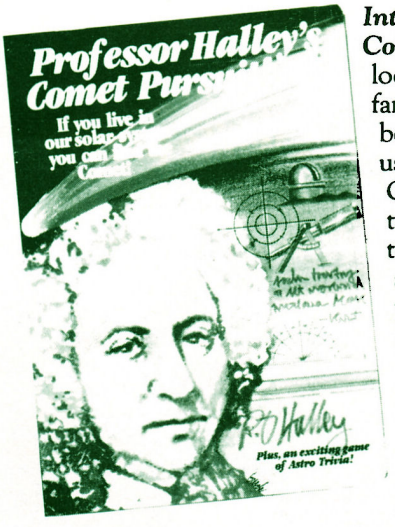

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object in a player's possession. When a player wants to list his or her possessions, the appropriate subroutine searches the list of objects and prints the name of any whose location is 100. An inventory subroutine could be:

```
PRINT "YOU ARE CURRENTLY
  HOLDING:": FOR I = 1 TO 20:
  IF OL%(20) = 100 THEN PRINT
  OB$(I): NEXT I
```

When a player wants to pick up an item, the appropriate subroutine searches the object list until it finds one with both the appropriate name and room, then changes that object's room number to 100. **Listing 3** shows a drop subroutine.

The Parser

What effect does the parser—that subroutine which interprets natural-language, multiple-word commands for the computer—have on the playing experience? Why use text input, anyway? Words are wonderful hooks to the imagination; they provide color, depth, and texture to adventure games.

The parser converts a player's commands into operations on the game's variables, usually by calling a different subroutine to handle each possible operation the game can perform. Its vocabulary generally includes more words than the number of subroutines. You must choose words that fit the style of the game—you don't use force-fields in a magic forest or magic spells in space combat—and those a player is likely to use. Since he or she must use a word the parser recognizes, the program should include an on-line help screen that lists many or all of the usable words.

The parser in **Listing 4** recognizes two-word commands—a verb and an object, even if the second word is not an object grammatically. When a player types in a command, the computer uses INPUT to read the command into string variable CO$. The parser then scans CO$ looking for a blank by using the code:

```
FOR I = 1 TO LEN(CO$): IF
  MID$(CO$,I,1) = " " THEN J = I:
  NEXT I
```

It considers everything before the blank a verb and everything after it an object. The LEFT$ and RIGHT$ functions, along with the value of J found, transfer the verb and object into string variables VB$ and OJ$ (the OJ$ used in the move subroutine). If the first blank occurs at the end of the string or if there is no blank, OJ$ must be set to "".

Next, the parser runs through a set of IF statements to compare the verb with possible abbreviations. Choose abbreviations carefully: You don't want the game to ask EAT WHAT? every time a player types an E to move east.

Typically, the code to signify that NORTH or N means MOVE NORTH is:

```
IF VB$ = "NORTH" OR VB$ = "N"
  THEN VB$ = "MOVE": OJ$ =
  "NORTH"
```

Enter this as one line of code, so the IF statement controls both the VB$ and OJ$ assignments.

Next, the parser runs down a list of IF statements looking for a match to VB$, and calls the appropriate subroutine. The parser never looks at OJ$. Since each action may expect something different, and not all subroutines even use an object (RUN, for example), each called subroutine must interpret the object. If a subroutine requires an object (such as DROP SHOVEL) and OJ$ is empty, the program can call another subroutine that asks for the object, such as:

```
PRINT VB$;" WHAT OR WHERE?":
  INPUT OJ$: RETURN
```

The move subroutine (**Listing 1**) and the drop subroutine (**Listing 3**) are examples of the use of OJ$.

It isn't too difficult to write a parser that will recognize four words. As with most programming, improving the parser comes from thinking about the subject matter (in this case, English) rather than the programming language. First, consider how a player might phrase any command. Then, write a program that separates the input string into its component words.

The trick to interpreting the words rests with the possible actions. Except in the case of ab-

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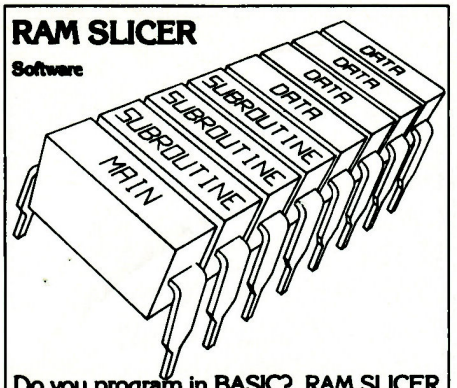

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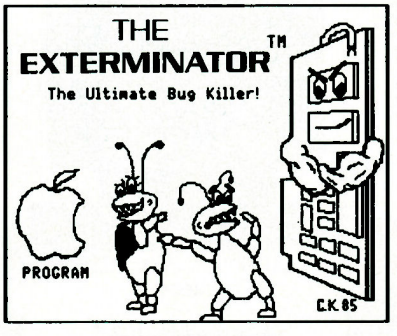

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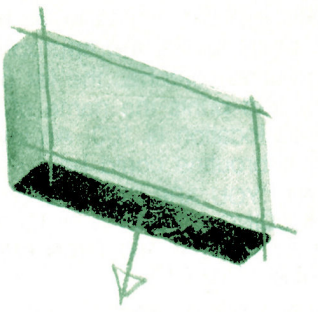

breviations (N, S, E, W), the first word will probably be the verb that determines what subroutine is called and the second word will be an object, as mentioned earlier. For most possible actions, the third word will be a preposition, and the last one another object—THROW SPEAR AT DRAGON, OPEN LOCK WITH KEY, GIVE MONEY TO BARTENDER. As a fail-safe, you can have any input command that neither the parser nor a called subroutine recognizes trigger the output message "Please rephrase and try again."

Final Notes

A control structure (the basic input/command loop) acts as the main program. (**Listing 5** is an example.) Initialize the arrays by reading values from a disk file if speed isn't a problem or by putting them into initialization subroutines if memory space isn't a problem. If memory is short, you can put these initialization subroutines into a separate program that chains into the main program.

Finally, you can incorporate many other ideas into your game, such as mazes, which are different every time you play the game (have part of the NR% array be generated randomly according to some rules to guarantee you can reach all parts), or monsters that move from room to room. Use your imagination; come up with a new twist. Your game will be more fun to write, play, and show to others when you know how it works yourself. ■

Listings 1-5 are on p. 110.

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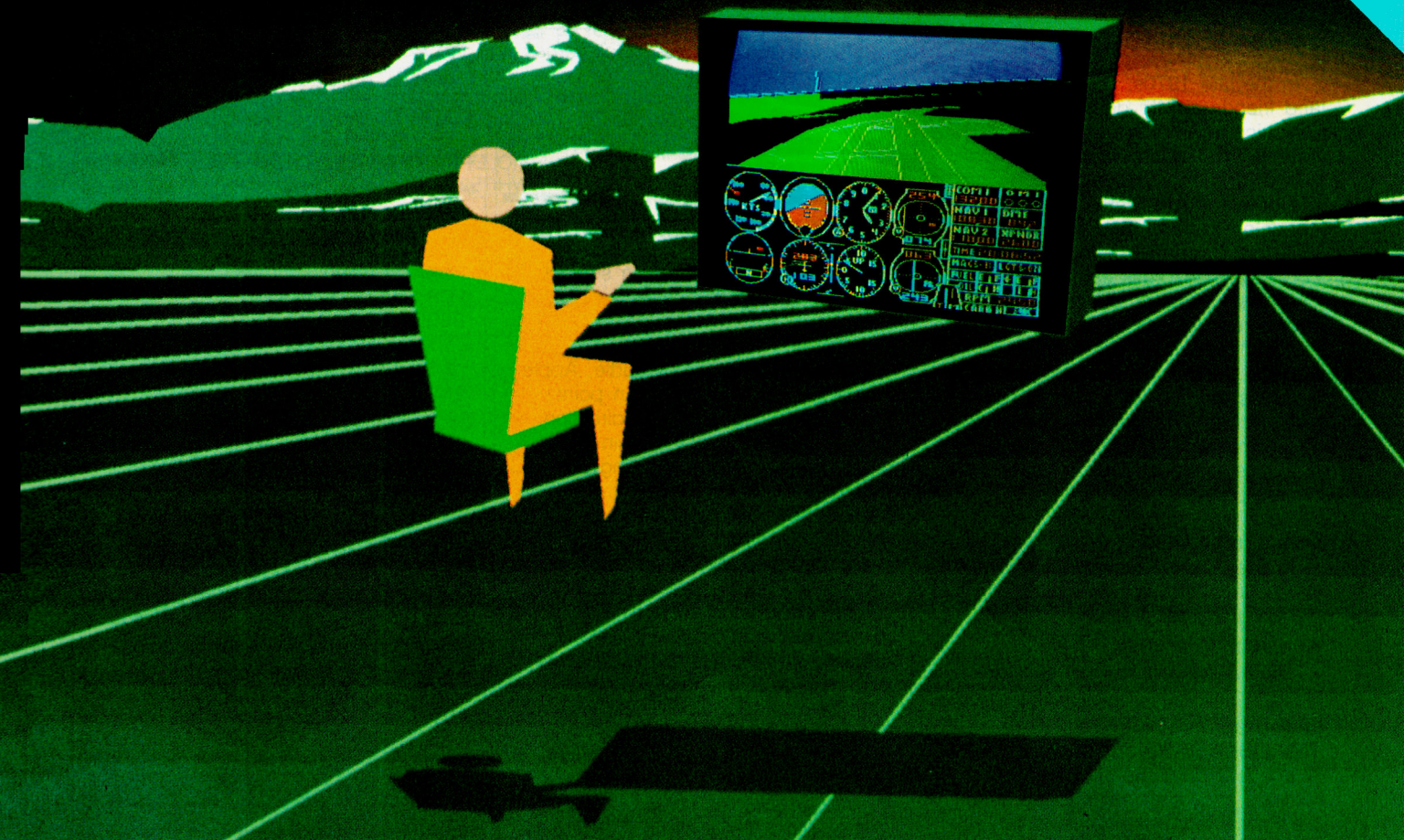

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Pascal's Turtle

Discover the fun of Apple Pascal's Turtle Graphics.

by Tom Swan

In the late 1970s, Seymour Papert and friends at MIT designed Turtle Graphics to help teach coordinate geometry. The "turtle," a squatty robot with a tail pen you could pull up or put down, moved across a piece of paper on the floor and drew pictures. With this surprisingly simple idea, you could easily express complicated graphics algorithms and create sophisticated designs by using "turtle motions"—positioning the turtle, rotating it to various angles, and sending it across the floor or across a computer screen. This month, I'll examine Apple Pascal's version of Turtle Graphics, and also look at procedures, functions, and loops.

Using Turtle Graphics

To use Apple Pascal's Turtle Graphics routines, add a USES clause to the program declaration:

```
PROGRAM MyDrawings;
  USES TurtleGraphics;
```

USES tells Pascal to look for the TurtleGraphics unit in the SYSTEM.LIBRARY file on your boot disk. A *unit* is a precompiled collection of routines and other items that extend the Pascal language. Other units in SYSTEM.LIBRARY are AppleStuff, ChainStuff, and Transcend. You can also write your own units, a subject I'll cover later in this series.

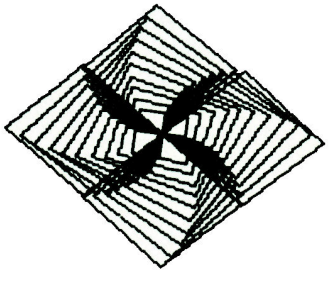

Figure 2. Program Boxes produces intricate designs such as this one using only a few simple Turtle Graphics commands. This pattern was produced with a Step of nine.

Figure 1. Use these color names with the PENCOLOR and FILLSCREEN commands.

NONE	WHITE	BLACK	REVERSE	RADAR
BLACK1	GREEN	VIOLET	WHITE1	BLACK2
ORANGE	BLUE	WHITE2		

The Turtle

Unlike Papert's original turtle, Apple Pascal's is invisible. You can point this imaginary turtle in any direction, then send it walking a certain distance. If you select a drawing color beforehand, the turtle leaves a trail—a line on the graphics display—as it moves.

You can also tell the turtle to go directly to a specific location on the screen, designated by a pixel or pel (picture element) coordinate. Apple graphics numbers horizontal pixels from zero to 279 and vertical pixels from zero to 191. Coordinate (0,0) designates the lower-left corner and (279,191) the upper-right corner.

The command InitTurtle turns on the Apple graphics screen, erases it, and positions the turtle in the center of the display facing right. **Tables 1-4** list other TurtleGraphics commands, and **Figure 1** and **Table 5** list a few associated values.

Drawing Boxes

To draw a box, move the turtle a certain distance, turn it 90 degrees, and repeat these steps four times. By specifying only distances and angles, rather than exact pixel coordinates, you can use the same program to draw a box anywhere on the screen. For example, in the following program, the turtle moves 50 pixels in the direction it is currently pointing, turns 90 degrees, and repeats the process until the box is drawn:

```
PenColor( Blue );
FOR Side := 1 TO 4 DO
BEGIN
  Move( 50 );
  Turn( 90 )
END;
```

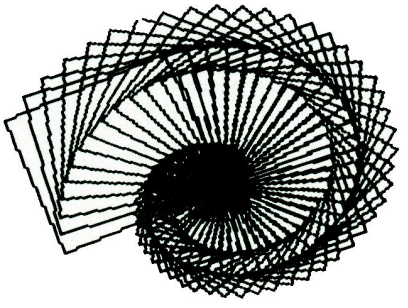

Figure 3. As shown here, Boxes is not limited to one design. A Step of 91 made this drawing.

PenColor selects one of the several drawing colors **Figure 1** lists.

FOR Loops

FOR loops always count by single units (here, integers using variable I), and can count either up:

```
FOR I := 1 TO 10 DO
  WRITELN( I );
```

or down:

```
FOR I := 10 DOWNTO 1 DO
  WRITELN( I );
```

As the box example showed, you can surround multiple statements by BEGIN and END. These two key

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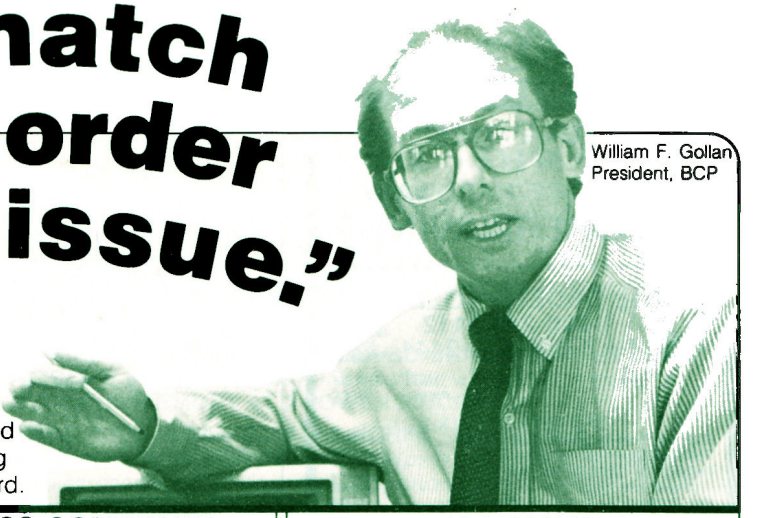

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Table 1. General Turtle Graphics commands for initializing the display and selecting drawing colors.

Command	Description
FILLSCREEN(COLOR)	Fills entire display (or inside boundaries defined by VIEWPORT) with this color. **Figure 1** lists available colors.
GRAFMODE	Switches from text to graphics without disturbing either display.
INITTURTLE	Turns on and erases the graphics display. Positions turtle facing right (0 degrees) at screen center.
PENCOLOR(COLOR)	Next turtle movement will leave a trail of this color.
TEXTMODE	Switches from graphics to text without disturbing either display.
VIEWPORT(LEFT, RIGHT, BOTTOM, TOP)	Sets boundaries of active graphics display. Lines drawn out of bounds are invisible.

Table 2. Turtle Graphics commands to move the turtle.

Command	Description
MOVE(DISTANCE)	Moves turtle the specified distance along its current angle, leaving a trail in the current PENCOLOR or no trail if the color is NONE.
MOVETO(X, Y)	Sends the turtle directly to screen coordinate (X,Y), leaving a trail in the current PENCOLOR.
TURN(DEGREES)	Turns the turtle from its current heading the number of degrees designated. Negative values turn the turtle clockwise, positive values counterclockwise.
TURNTO(ANGLE)	Turns the turtle to the specified angle. Angles may be any integer value, but are limited by Pascal to −359 to +359 degrees. Zero degrees faces right.

Table 3. Turtle Graphics functions that return values.

Command	Description
TURTLEANG : integer;	Returns the current heading, 0 to 359 degrees, of the turtle.
TURTLEX, TURTLEY : integer;	Returns current X (TURTLEX) or Y (TURTLEY) coordinate of the turtle position.
SCREENBIT(X, Y) : Boolean;	Returns FALSE if the pixel at coordinate (X,Y) is colored BLACK. Returns TRUE if the position is set to some visible color.

Table 4. Turtle Graphics text and pattern-drawing commands.

Command	Description
CHARTYPE(MODE)	Sets drawing mode for WCHAR and WSTRING. **Table 5** lists available modes.
DRAWBLOCK(SOURCE, ROWSIZE, XSKIP, YSKIP, WIDTH, HEIGHT, XSCREEN, YSCREEN, MODE)	Transfers bits in SOURCE directly to screen. Used to draw animated figures and other complex patterns with a single command.
WCHAR(CH)	Writes the character CH at the current turtle position. After writing, the turtle is positioned seven pixels to the right.
WSTRING(S)	Writes the string S at the current turtle position. Calls WCHAR for each character in the string.

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words form a compound statement, which the FOR loop treats as a unit. With a single-statement FOR loop, as in the counting examples above, BEGIN and END are unnecessary.

Procedure Box

So you can use your box-drawing program several times, store it in a *procedure*—a named collection of statements and other declarations, similar to a subroutine in BASIC. Wherever you want to draw a box in your program, just write Box to call the procedure. You must define the procedure, however, before you use it the first time.

Listing 1 draws a 50-unit square blue box. (Don't enter the reference line numbers or colons.) The procedure beginning at line 2 resembles a complete program, but starts with the key word PROCEDURE, and ends with a semicolon at line 11.

Procedures can have their own constant, type, and variable declarations. In **Listing 1**, procedure Box declares a local integer variable, Side. Because Side is declared inside the procedure, it doesn't exist anywhere else in the program—its scope is limited to the procedure in which it is declared.

Step to It

It's easy to add motion to Turtle Graphics programs. A few minor changes to the box procedure produces intricate displays like those in **Figures 2** and **3**.

First, replace the literal value 50 with the integer variable Distance, because not all boxes are 50 pixels square (**Listing 2**, lines 1–2). Next, use another FOR loop to vary the Distance variable from 10 to 150 (lines 23–27). The turtle turns Step degrees to the right (negative Steps) or left (positive Steps) after it draws each box. (The program lets you enter values for Step in line 18.) Changing the distance at the same time produces the patterns.

REPEAT Loops

Listing 2 also demonstrates a second kind of Pascal loop, REPEAT. . . UNTIL, which begins at line 16 with the key word REPEAT and ends at line 31 with the key word UNTIL and an expression. The program executes the remaining statements repeatedly until

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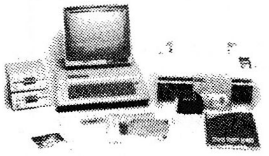

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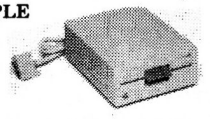

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Table 5. Use these mode numbers with CHARTYPE and DRAWBLOCK to tell Turtle Graphics how to display characters and bit patterns. PB is the pattern bit; SB is the screen bit at drawing position. Each mode sets screen bits according to a Boolean expression.

Mode	Expression	Mode	Expression
0	FALSE	8	PB AND SB
1	NOT (PB OR SB)	9	PB = SB
2	PB AND (NOT SB)	10	PB
3	NOT SB	11	PB OR (NOT SB)
4	(NOT PB) AND SB	12	SB
5	NOT PB	13	(NOT PB) OR SB
6	PB XOR SB	14	PB OR SB
7	NOT (PB AND SB)	15	TRUE

Step equals zero—the expression Step = 0 is true.

Unlike the FOR loop, which automatically increases or decreases a variable by one each time through the loop, the REPEAT. . .UNTIL loop requires that you increment/decrement the variable yourself. The program below shows this by using a REPEAT loop to count to ten:

```
I := 0;
REPEAT
  I := I + 1;
  WRITELN( I )
UNTIL I = 10;
```

If you forget to include a variable counter, the loop will never end. (You can often break out of such a loop, by the way, by typing control-P or pressing the escape key and then control-P. Try it several times before giving up and hitting control-reset.)

Functions

A *function* is a procedure that returns a value. You write functions similar to procedures, but, because a function returns a value, you must always use its name in an expression.

Listing 3, a demonstration of one way to draw circles, shows an example of a Pascal function. Function Radians (lines 10–14) returns a real number equal to a certain angle converted to radians. (There are 2π radians in a circle.) You must express angles as radians because that's what Pascal's SIN and COS functions expect.

SIN and COS are two of several transcendental functions not normally available in Apple Pascal. To include them in the program, add USES Transcend to the program declaration (lines 1–2) in addition to TurtleGraphics.

Parameters

Function Radians in **Listing 3** has a single parameter, angle, declared inside parentheses after the function name in line 10. The function uses this *formal parameter* as it does any other variable. By passing an actual value to the function's formal parameter, you can give the function a value to act upon. The equation below, for example, sets a real-number variable R equal to the number of radians in 45 degrees:

```
R := Radians( 45 );
```

Procedures may also have parameters (lines 16–28). Here, procedure DrawCircle has a single parameter, Radius, which defines the size of the circle.

WHILE Loops

Inside the DrawCircle procedure is the third and final kind of loop state-

Listing 1. Basic box program.

```
 0: PROGRAM BlueBox; USES TurtleGraphics;
 1:
 2: PROCEDURE Box;
 3: VAR
 4:   Side : integer;
 5: BEGIN
 6:   FOR Side := 1 TO 4 DO
 7:   BEGIN
 8:     Move( 50 );
 9:     Turn( 90 )
10:   END
11: END;
12:
13: BEGIN
14:   InitTurtle;
15:   PenColor( Blue );
16:   Box;
17:   readln;
18:   TextMode
19: END.
```

ment available in Pascal, the WHILE loop. This loop is similar to a REPEAT. . .UNTIL loop except that the program tests its condition before the loop begins.

The following example counts to ten using a WHILE loop:

```
I := 0;
WHILE I < 10 DO
BEGIN
  I := I + 1;
  WRITELN( I )
END;
```

As in FOR loops, BEGIN and END statements must surround multiple statements, forming a single compound statement. The program executes all statements between BEGIN and END while some condition, here I < 10, remains true. If you replace I := 0 with I := 20, the WHILE loop would never execute. This contrasts with the REPEAT. . . UNTIL loop, which always executes at least once.

When you run **Listing 3**, try a radius of 50 and a step size of 18. Since the program draws a circle as a many-sided polygon, the best step

Listing 2. Creating patterns with boxes.

```
 0: PROGRAM Boxes; USES TurtleGraphics;
 1: VAR
 2:   Distance, Step : integer;
 3:
 4: PROCEDURE Box;
 5: VAR
 6:   Side : integer;
 7: BEGIN
 8:   FOR Side := 1 TO 4 DO
 9:   BEGIN
10:     Move( Distance );
11:     Turn( 90 )
12:   END
13: END;
14:
15: BEGIN
16:   REPEAT
17:     write( 'Step? (0 to quit) ' );
18:     readln( Step );
19:     IF Step <> 0 THEN
20:     BEGIN
21:       InitTurtle;
22:       PenColor( White );
23:       FOR Distance := 10 TO 150 DO
24:       BEGIN
25:         Box;
26:         Turn( Step )
27:       END;
28:       readln;
29:       TextMode
30:     END
31:   UNTIL Step = 0
32: END.
```


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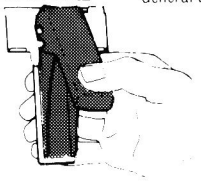

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Pascal News

This month, I'm going to start including news of interesting Apple Pascal products. What I look at will be totally arbitrary, and I don't intend to do complete reviews. Please write directly to suppliers for more information and accurate prices.

If you use any products you think would interest other Apple Pascal owners, drop me a line. If you are selling a product, I'll try to mention it if it's related to Pascal, but no promises.

Listing 3. Drawing circles.

```
 0: PROGRAM Circles;
 1: USES
 2:   TurtleGraphics, Transcend;
 3: CONST
 4:   pi          = 3.141593;
 5:   Xcenter     = 140;
 6:   Ycenter     = 96;
 7: VAR
 8:   radius, stepsize : integer;
 9:
10: FUNCTION Radians( angle : integer ) : real;
11: (* Return angle as radians *)
12: BEGIN
13:   Radians := ( abs( angle mod 360 ) * pi / 180 )
14: END; (* Radians *)
15:
16: PROCEDURE DrawCircle( Radius : integer );
17: VAR
18:   angle : integer;
19: BEGIN
20:   pencolor( none );
21:   angle := 0;
22:   WHILE angle <= 360 DO
23:   BEGIN
24:     moveto( round( radius * cos( radians( angle ) )) + Xcenter,
25:             round( radius * sin( radians( angle ) )) + Ycenter );
26:     pencolor( white );
27:     angle := angle + stepsize
28:   END;
29:   pencolor( none )
30: END; (* DrawCircle *)
31:
32: BEGIN
33:   REPEAT
34:     writeln;
35:     write( 'Radius? (0 to quit) ' );
36:     readln( radius );
37:     IF radius > 0 THEN
38:     BEGIN
39:       write( 'Step size (1 . . 45)? ' );
40:       readln( stepsize );
41:       IF ( stepsize >= 1 ) AND ( stepsize <= 45 ) THEN
42:       BEGIN
43:         initturtle;
44:         DrawCircle( radius );
45:         readln;
46:         TextMode
47:       END
48:     END
49:   UNTIL radius = 0
50: END.
```

● USUS is the UCSD Pascal System User's Society. Write to the USUS secretary at P.O. Box 1148, La Jolla, CA 92038 for membership information. USUS publishes a thick newsletter (somewhat erratically in the past, but with better frequency of late). The society also maintains an impressive software library. You can even get the source code to an early version of UCSD Pascal, upon which Apple Pascal was based.

● Any German readers out there? My book *Pascal Programs for Games and Graphics* was recently translated into German by Pandabooks, Bismarckstr. 67, D-1000, Berlin 12. I can't read it; maybe you can.

● Finally, take a look at Kyan Pascal, by Kyan Software, 1850 Union Street, Suite 183, San Francisco, CA 94123. Company owner Tom Eckmann tells me that a new version of Kyan Pascal will be available by the time you read this. The new compiler fixes several bugs, supports 80-column displays, and recognizes Apple //e keyboard keys. Owners of earlier versions can upgrade for free.

Kyan Pascal runs under ProDOS—not the Apple Pascal operating system—but compiles to 6502 machine language instead of p-code, as does Apple Pascal. (ProDOS is supplied on the Kyan disk.) The 108-page Kyan manual could use a rewrite, but seems to be complete and easy to follow. At $69.95, this is a well-done product that deserves a serious look from Apple owners interested in Pascal programming. My guess is you'll be hearing more about Kyan in the future.

And Finally. . .

This month I introduced Pascal Turtle Graphics, and showed you how to use procedures, functions, and three loops—FOR, REPEAT. . .UNTIL, and WHILE. There's a lot more to Turtle Graphics than would fit in this one column—and Pascal graphics is a subject I'll return to again and again. ■

Tom Swan is the author of several computer books, including Pascal Programs for Business, Pascal Programs for Games and Graphics, *and* Pascal Programs for Data Base Management, *published by Hayden Book Company. Address correspondence to Tom at P.O. Box 206, Lititz, PA 17543. Please enclose a self-addressed, stamped envelope if you want a personal reply.*

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The Apple Clinic is a forum for discussing Apple II hardware and related subjects. If you have questions or answers, or want to make a statement, write to Jim Sather, Apple Clinic, inCider, *80 Pine Street, Peterborough, NH 03458.*

VisiTrend/Plot Revisited

Your May 1985 column contained a letter from a reader who had problems using VisiTrend/Plot with an Epson MX-100 printer. I also have an Apple II Plus with an MX-100 and have been successfully printing VisiTrend/Plot-generated graphs since 1981. The most effective solution I've found is to save the graph to disk as a binary file using the PIX SAVE option, then exit VisiTrend/Plot and run Data Transforms' Graftrix program. This program gives me three magnifications, optional cropping of the graph from the top and bottom, and normal or inverse printing.

The Graphtrix disk contains an all-purpose utility screen-dump program you can copy to any disk and call in an Applesoft program—a feature I've used extensively. The program primarily centers around adding embedded graphics to Apple Writer, but I cannot comment on this since I don't use Apple Writer.

The Graphtrix program seems more flexible and probably more economical than a hardware solution.

Eugene Shively
Albany, IN

It certainly is more economical than buying new hardware, but I still find "picture-taking" printer interface cards an attractive way to get printer dumps generated by any *software* anytime.

William Bull's letter resulted in a number of responses from people suggesting that VisiTrend/Plot graphics dumps are best attained by saving the image to disk, then using a separate utility to dump the disk file to printer. Another satisfied Graphtrix user is J.E. Yamauchi. Robert E. Townsend uses Zoom Grafix by Phoenix Software to generate his dumps after saving via PIX SAVE. An additional graphics dumping utility, Roger Wagner Publishing's Printographer, has a variety of capabilities.

James C. Yule chipped in that printer interface cards with on-board graphics-dumping firmware, such as the Grappler from Orange Micro, make it much easier to get graphics dumps. He saves his VisiTrend/Plot pictures using PIX SAVE, then uses built-in Grappler features to get his printer dumps. Yule also writes that PFS:graph is perhaps superior to VisiTrend/Plot because it has driver routines for Epson printers and Grappler interface cards. While glancing through my own Grappler Plus manual, however, I noticed a patch that makes VisiTrend/Plot work with the Grappler Plus (see the accompanying ***Figure****). I recommend that you use a protection-busting copy program to back up your VisiTrend/Plot disk and make the patch to the duplicate disk. It's never safe to attempt to patch your master copy of any program.*

CP/M or Z-80?

Please tell me the difference between a CP/M card and a Z-80 card.

Randy Leary
Meriden, CT

Figure. The VisiPlot patch for the Grappler Plus interface (reprinted with permission of Orange Micro).

A) With DOS 3.3 operating, catalog your VisiPlot or VisiTrend/Plot disk. If your disk contains the file VISIPLOT.DRIVER, proceed to step C.
B) If your disk does *not* contain VISIPLOT.DRIVER, type "RENAME SILENTYPE.D, VISIPLOT.DRIVER" and press the return key.
C) Enter the following Applesoft program:

```
 5 A$ = "VISIPLOT.DRIVER"
 6 B$ = "SILENTYPE.D"
 7 C$ = ","
10 DATA 169,137,32,237,253,169,199,32,237,253,169,141,32,237,
        253,96
20 D$ = CHR$(4)
30 PRINT D$;"BLOAD";A$
40 PRINT D$;"RENAME";A$;C$;B$
50 FOR A = 39129 TO 39144
60 READ B
70 POKE A,B
80 NEXT
90 PRINT D$;"BSAVE";A$;",A$98C3,L$81"
```

D) Double-check the program for typing errors, then type RUN.
E) When the program stops running, your disk is configured for use with the Grappler Plus. Now boot the disk and print away.

They're the same. CP/M (control program for microcomputers) is a program—more specifically, a standardized operating system available for several microprocessors descended from the Intel 8080, including the Z-80. There is no version of CP/M written for the 6502 or 65C02, the microprocessors Apple II computers use. As a result, the basic Apple II cannot run any of the multitude of available CP/M-based programs. Instead, you must install a peripheral or auxiliary slot card containing a microprocessor that will run CP/M. The Z-80 card is by far the most popular processor card for Apples, and several versions are available. Since the reason for installing a Z-80 card in an Apple is to run CP/M, you'll often hear a Z-80 card referred to as a CP/M card.

More sophisticated Z-80 cards, such as the Microsoft Softcard, come packaged with software that includes a CP/M master disk with standard CP/M utilities. Cheaper versions often come with no software, leaving you to your own devices for obtaining general-purpose CP/M utilities disks to go along with any CP/M-based software you decide to purchase.

80-Column Display Mapping

I have an Apple 80-column text card. I'd like to be able to POKE in and read out the values of the characters on screen in the 80-column mode. I can do this in 40-column mode using memory locations 1024–2039 ($400–$7F7), but in the 80-column mode, these memory locations represent every other column. What are the memory locations for the missing columns?

Nur Touba
Mound, MN

They are the same, Nur, except they are in auxiliary-card memory. If the columns are numbered 0–79, then the even columns are mapped into auxiliary-card RAM, and the odd columns are mapped into motherboard RAM. For example, the map locations for the top line of text are $400 auxiliary, $400 motherboard, $401 auxiliary, $401 motherboard, $402 auxiliary, and so on. Double-resolution hi-res graphics is mapped similarly, but in seven-dot groups. The first seven-dot group at the top left of the screen is mapped at $2000 auxiliary, the next at $2000 motherboard, then $2001 auxiliary, $2001 motherboard, and so on.

To access the 80-column memory map, set the 80STORE soft switch (POKE –16383,0 or STA $C001). From that point, the PAGE1/PAGE2 soft switch alternates MPU access between motherboard and auxiliary-card memory in the $400–$7FF range. If the HIRES and 80STORE soft switches are both set, then PAGE1/PAGE2 selects between motherboard and auxiliary-card access in both the $400–$7FF and $2000–$3FFF ranges. See the accompanying ***Program listing*** *for an illustrative BASIC program that transfers the character at the top left 80-column text position (column 0) to the adjacent position (column 1).*

Voltage Regulators Overseas

In the April 1985 Apple Clinic, Oliver Hui presented three alternatives for using 110-volt Apples in countries with 240 volts, 50 cycles as standard household supply. I would just like to add a few words on this subject.

In many cases, it may not be enough simply to add a transformer. Overvoltages and undervoltages of high magnitude (20 to 25 percent) from the standard 220/240 volts are common to developing countries. Without an automatic voltage regulator between the supply line and the 240/110-volt transformer, system burnout is possible because of too low or too high a supply voltage. Motorized devices such as drive motors and cooling fans are especially sensitive to low voltages. A 220/240-volt voltage regulator can smooth 240 volts ±25

Program listing. Direct mapping of Apple //e and //c 80-column text.

```
10 STR80 = -16383 : MBD = -16300 : AUX = -16299
20 POKE STR80,0 : POKE AUX,0 : ASKII = PEEK (1024)
30 POKE MBD,0 : POKE 1024,ASKII
40 GOTO 40 : REM PREVENT SCROLL
```


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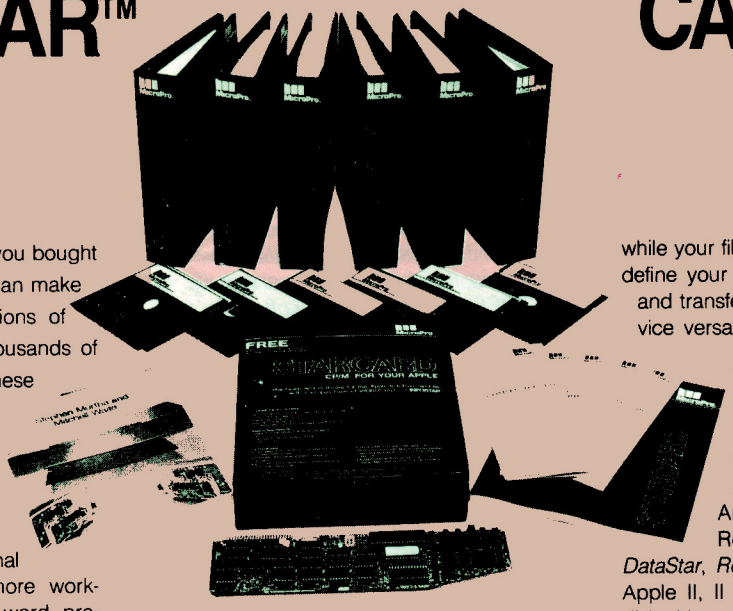

You made a wise choice when you bought your Apple computer. Now, you can make another smart buy—join the millions of happy users who are running thousands of CP/M programs. Hundreds of these programs are public domain. . .FREE of charge to you!

The Software

WordStar is a truly professional word processing system with more work-saving features than any other word processing software. It takes the time and drudgery out of revising and retyping! Features like column move and horizontal scrolling make tabular formats simple. And as your needs grow, *WordStar* will grow along with you:

Mailmerge. . .makes mailing labels and form letters quick and easy; *SpellStar*. . .allows for easy spelling checking and eliminates laborious proofreading. *StarIndex*. . .creates a table of contents and an alphabetical index.

WordStar comes complete with an easy-to-understand user's manual, training guide, reference card, and keytop labels.

InfoStar, made up of both *DataStar* and *ReportStar*, is one of the most advanced data base management systems available for the Apple. *InfoStar* doesn't expect you to write in code, it simply asks you what you want to do by listing a number of choices—all in plain English! *InfoStar* can turn your Apple into an order entry system, electronic filing system, or an information report writer. Plus, it works together with *WordStar* and *CalcStar* (the electronic spreadsheet program) so you can create complete business reports!

The Hardware

StarCard is a printed circuit board with Z-80B microprocessor. It runs at 6MHz (3 times faster than the Apple microprocessor) and has its own 64K of RAM. *StarCard* does not use the Apple's memory for program execution.

StarCard works only in the Apple II, II Plus, and IIe (pre-installed for the Apple //e or II Plus). *StarCard* will also use the Apple's graphics ability to produce a 70-column screen if you don't have an 80-column card.

You *must* have an 80-column card to use *DataStar* or *ReportStar*. *WordStar*, however, can run in 70. We will be happy to supply you with an 80-column card for only $39.95, shipping included. Please ask for it.

Run Apple DOS or CP/M

If you boot with an Apple DOS disk, your Apple will run under Apple DOS. If you boot with the *StarCard*'s CP/M disk, your Apple will run under CP/M. You don't have to remove the *StarCard*. . .you can also use the 64K RAM on the *StarCard* as a disk drive when you're using Apple DOS. Since the normal Apple drives are only 141K, this capability furnishes you with approximately half of a disk drive.

Full CP/M System

StarCard uses the standard CP/M 2.2 and has all the usual CP/M utilities.

SYSGEN and FORMAT have been combined into a special utility called COPYFRMT to make them easier to use.

The CP/M utility MOVCPM is contained in the INSTALL utility. Use the Apple RAM as a printer buffer so you can continue working while your file is being printed! You can even define your own functions for different keys and transfer Apple DOS files to CP/M. . .or vice versa.

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percent at its input to 240 volts ±10 percent at its output. The output of the regulator is then connected to a 240/110-volt transformer.

You were right in suggesting that transformers are available overseas. An alternative, however, for those who don't have the patience to hunt around or who are going abroad on a short visit is to buy the transformer and the matching voltage regulators of different capacities in the United States from Computers Plus Company, 2303 North 44th Street, Phoenix, AZ 85008, (602) 955-1404.

Vasant L. Abhyanker
President
Computers Plus Company
Phoenix, AZ

Thanks for the tip, Vasant. It certainly is possible that large voltage variations can occur in many locations and that a line regulator is necessary. Experienced travelers know they cannot take stable power and other dependable utilities for granted in all parts of the world. I would make sure I was aware of the dire possibilities, but wouldn't purchase a line-voltage regulator until I had a good reason to suspect I needed one.

Taxan RGB Interface

I'm having trouble displaying Apple //e double hi-res graphics on my Taxan Vision III Model 410 RGB monitor. I've tried the Taxan 410-80, 410-08, and 410-64 interface cards with no luck. Taxan customer service informed me I need the 410-64 card, but it supports double hi-res in only two colors—black and the color selected on the interface card. The card does work with my Beagle Bros Diskquik software. Is there any way to generate double hi-res graphics with 16 colors on the Taxan RGB Vision III Model 410?

George A. Kerekes
Baton Rouge, LA

I showed your letter to the technical-support group at Video-7, the company that designed the Taxan RGB cards as well as Amdek, Princeton Graphics, Sakata, Panasonic, Apple, and Sony cards. Apparently the Taxan 410-64 is an older design that doesn't support double-resolution hi-res except in monochrome graphics. Off the top of his head, my contact at Video-7 named the Amdek, Apple, and Sony cards as examples of RGB cards that do support 140-point double-resolution hi-res graphics in 16 colors.

The cards Video-7 sells under its own name also support double hi-res colors. These cards—the V-color //e for the Apple //e auxiliary slot, V-color //c for the Apple //c, and V-color 7 for the Apple II or //e slot 7—all produce displays of the quality of the V-color //c reviewed in inCider *(December 1984, p. 150). The V-color //e also includes the 64K RAM and 80-column functions.*

Expandable RGB Interface

I own an enhanced Apple //e with an Amdek Color II Plus monitor. I'm trying to upgrade to 128K and beyond, but am told that my Amdek RGB card is not expandable. After numerous phone calls and visits to my local Apple dealer, I turn to your column and sage advice on how I can best accomplish my task.

Frank C. Gavin
Ft. Leavenworth, KS

One option is to keep your RGB card and find a peripheral-slot RAM card that meets your expansion needs, perhaps a Titan Technologies' 192K Neptune board (for the //e only). Another option is to purchase an auxiliary card that combines the RGB interface and high-capacity RAM-expansion functions. Applied Engineering's RAMWORKS card is expandable to 1 megabyte and has optional RGB interface. Also, Checkmate Technology is developing an RGB/RAM card that's expandable to 512K. The company hasn't even named it yet, but it should be released by the time this issue hits the stands.

I'm sure you can find other options if you shop around. The expansion RAM card business is competitive, and there are many products from which to choose.

More RGB

I currently own an Apple II Plus equipped with one disk drive, 16K RAM card, Epson MX-80 printer, and Super Fan. I recently acquired a Sylvania RGB monitor/receiver, model RAD139SL. Although I now feed my output through a modulator to the TV input, I'd like to start using the RGB capability of the monitor for 80-column resolution. If possible, please

Continued on p. 66.

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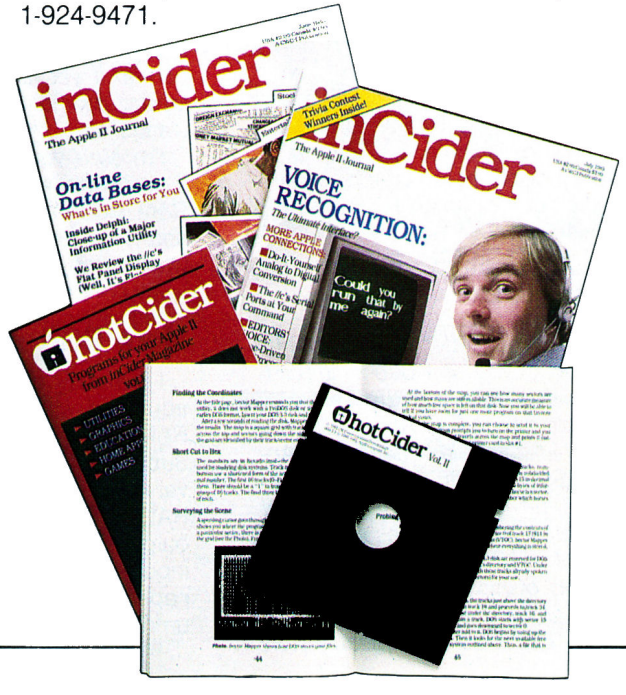

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Continued from p. 63

provide information on an RGB interface and 80-column card compatible with this monitor.

In addition, I'm considering increasing my computer's memory by an additional 64K. What is the best method of accomplishing this? Is it possible to implement all of this with one card?

Paul R. Childers
Upland, CA

I think you should take a serious look at the new Checkmate Technology slot 0 RAM/RGB card I mentioned in my response to the previous letter. I know of no other card that combines the RGB and RAM-expansion functions for Apple II Plus owners.

Another Checkmate Technology product I'd like to point out to Apple Clinic readers is the MultiView 80/160 text-display card, reviewed in inCider *(July 1985, p. 78). This card solves Leonard Rosenthol's problem of running AppleWorks on a Franklin (or Apple II, Basis, and so on; see the March 1985 Apple Clinic). With the preboot disk Checkmate promises to have ready by October, you can have AppleWorks up and using the Checkmate or other RAM-expansion card. As noted in the review, the preboot disk also supports ProDOS Apple Writer and various spreadsheets on Apple II compatibles. Be aware, though, that the MultiView/AppleWorks combination will only result in a 10K working space for AppleWorks on a 64K Apple II or compatible. You'll need RAM expansion of some sort to get more work space for AppleWorks.*

50 Hz a Problem?

I'm taking my 120-volt, 60-Hz Apple //e to the Netherlands, where household power is 220 volts, 50 Hz. I know I can get a transformer to step down the voltage, but will the 50-Hz frequency affect my disk drive and printer?

Gary Hammond
Victorville, CA

A DC motor turns the disks, and disk-head and printer-mechanism positioning is via computer-controlled stepper motors, so the line frequency should not affect disk-drive or printer operation. This is typical of most printers, but not true of most motorized typewriters. When I lived in Japan, all my computer peripherals worked great on 50 Hz, but my 60-Hz typewriter didn't work worth beans. ■

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Beneath Applesoft: The First Step

Unravel the mysteries of assembly-language programming.

by Roger Wagner

Welcome to the first installment of Right of Assembly, *inCider*'s newest column, dedicated to helping you learn about assembly- and machine-language programming. This skill can bring out the power in your Apple, and, best of all, it's surprisingly easy to learn.

Each month, I'll examine various machine-language commands and present working examples of what those commands can do. If you're new to the subject, you'll find each column teaches you things you can use immediately in your own programs—often even within Applesoft programs. And, if you already program in machine language, you'll discover new tricks of the trade. In either case, I'm sure you'll find Right of Assembly a valuable reference you'll want to keep around as an ever-growing resource.

A World of Languages

You create a program by putting possible commands in a certain meaningful order to tell the computer how to do a certain task. *Programming* itself describes the process of telling your computer what you want it to do. In fact, this is the real power of the computer as a modern device: You can tell it how to help you solve problems that are unique to your life—on your own terms and at your convenience.

Programming a computer isn't as hard as you might think. The only requirement is a language with which you can communicate with your computer, since the computer doesn't understand English directly. (See "Digital Dialects: A Guide to Apple Languages," August 1985, p. 14.) But it's not always necessary to use BASIC, Pascal, or another formal computer language. Some of the most successful commercial programs for the computer are just well-disguised programming languages. As an example, consider the classic spreadsheet program. It's always fun to hear someone say, "Oh, I don't program. I just use programs like the Acme Spreadsheet." With a little thought, you realize that using a spreadsheet is a lot like programming; it's just a different method of programming. You create a set of numbers, variables, and equations the computer uses in a predictable order. Some of the more advanced spreadsheet programs have enhancements like search and sort functions, condition testing (IF. . . THEN), and more.

How It Really Works

Lesson 1 in machine-language programming starts with Wagner's Paradox:

"Everything complex can be broken down into simple elements (and nothing is as simple as it seems)."

Although you may sometimes feel that life is an endless case of discovering the fine print, it's true that most things in life are quite simple when you consider the fundamentals that make them up. The computer is an excellent example.

Even though the engineering required to build a computer is awe-inspiring, the underlying principle of its operation is almost trivial. The heart of your Apple is the 6502 microprocessor (65C02 in the //c and enhanced //e). The other important ingredient is the computer's "memory"—thousands of locations (called *bytes*) where the computer stores simple numbers.

A microprocessor scans memory, one location at a time, and performs one of about 50 general operations, depending on the number it finds in a particular memory location. The number 27 in a certain location, for instance, may tell the microprocessor to add numbers; a 32 may indicate subtraction.

Obviously, the more memory a computer has available, the greater the number of instructions (and the more information to work on) it can hold. The 6502 in an Apple can directly address about 64,000 memory locations, 64K. There are ways of putting more memory into the computer, but the 6502 still talks to only 64K at a given time. (Even though there are actually 65,536 locations in the computer, the number is traditionally rounded to an even 64,000. "K" is used as an abbreviation for thousand, for the really lazy.)

BASIC Versus Machine Language

Machine language consists of numbers in memory on which the microprocessor can act directly, without any translation. Machine-language programming in its literal sense is the process of placing those numbers in memory, one at a time, to create a program the computer can carry out. Assembly language, as you'll see in upcoming months, is a very close relative of machine language.

BASIC is a "high-level language." One way of looking at this term is to consider that the 100 or so BASIC commands (like PRINT) are closer to English than those of the more simplistic low-level languages, like machine language. What it really means, though, is that, transparent to the user, a new command has been created from the 50 fundamental machine-language commands, to perform some fairly complex task. An interesting analogy might be to consider that the basic 26 letters of the alphabet create all the words you know.

In its "native" mode—the 6502 and some memory—the computer doesn't automatically understand words like PRINT or RUN. When you type in RUN to start an Applesoft program, you are actually triggering in the computer a machine-language program that acts as a middleman between the lines of BASIC you typed in and those 50 commands the 6502 understands.

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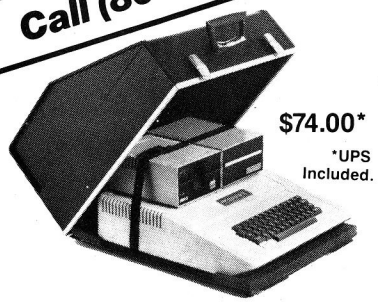

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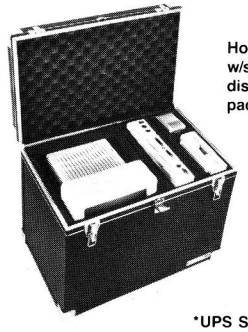

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RIGHT OF ASSEMBLY

Table. The effects of certain CALLs.

Address to CALL	Effect
64538	Moves cursor up
64614	Moves cursor down
64528	Moves cursor left
64500	Moves cursor right
64780	Waits for a keypress
64858	Waits for a return keypress
64668	Clears to end of line from cursor
64578	Clears to bottom of screen from cursor
62436	Shows Hi-Res Page 1
62450	Clears Hi-Res screen to black (without showing it in TEXT, but it does destroy the current Hi-Res page setting for HPLOTS, and so on)
62454	Clears Hi-Res screen to last color plotted
54915	Clears Applesoft stack of pending FOR. . .NEXT and GOSUB counters and any other lingering problems

When your program says PRINT "HELLO", this intermediate program looks up the word PRINT in a list of commands, then executes a short machine-language program to do what you think of as the actual PRINT command.

It turns out that Applesoft really is machine language—each time a statement in your Applesoft program is executed, the computer carries out a short machine-language program (or, more properly, a *subroutine*). The main reason Applesoft runs more slowly than a pure machine-language program is the time the Applesoft interpreter (that middleman we were talking about) takes to decide which routine to execute for each command in the various lines of BASIC as the program is running.

Maps, Addresses, and Calls to Mom

If you know how to write even a simple program in Applesoft BASIC, you're well on your way to knowing how to write a program in machine language. As a matter of fact, BASIC was originally designed as a teaching tool to help people learn how to program in machine language.

In BASIC, a line number identifies a place in your program. For example, to jump to a given routine you might use the statement GOSUB 1000. In machine language, it's the *location* that's important, and each location is identified with an *address*. (Computer people just love to start counting with zero, so the addresses of those locations are numbered 0, 1, 2, and so on, up to 65,535.) Just like a street address, each address of a memory location lets you find only one spot in the computer to look at or in which to store a number.

You can make a useful diagram of the various memory locations in your Apple and the functions of the different parts of memory. In upcoming lessons, you can use this *memory map* as you explore the Apple. For now, though, it's enough just to understand that for a machine-language program, the *location* of a value in the computer is as important as the line numbers in a BASIC program.

If you've ever used a CALL statement in Applesoft, you've already used the machine-language equivalent of BASIC's GOSUB command. For example, CALL 32768 from BASIC tells the computer to start running a machine-language program at memory location 32768. As long as a machine-language program is in that location and the routine eventually ends with the machine-language equivalent of RETURN, program control will return to your Applesoft program when the routine is finished.

Using Applesoft's CALL command to access short machine-language routines (ones that either already exist in the computer or that you have written yourself) is probably one of the best ways to start using machine-language programming techniques in your own programs. The **Table**

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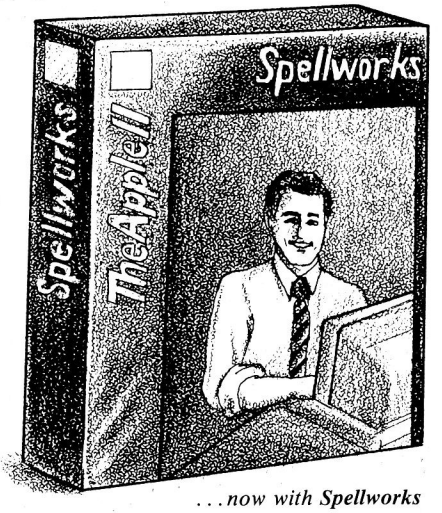

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shows a short list of some of the machine-language routines you can CALL right from Applesoft BASIC.

To see how you can use these CALLs, consider some short examples. **Listing 1** shows how you can draw on the hi-res screen without displaying the screen. After the program draws the lines, it switches the display to the Hi-Res mode (page flipping), and the lines appear instantly. The command HGR usually clears the screen to black. By using the Hi-Res CALLs listed in the **Table**, however, you can start your program with a white screen (**Listing 2**).

Another trick you can add to an Applesoft program to make CALLs more understandable is to set Applesoft variables equal to the address you want to CALL—that is, make the names of the variables a clue to the function of the routine itself (**Listing 3**). The main caution with naming routines is to remember that Applesoft uses only the first two letters of the name. This means you can't use one routine called MOVEUP and another called MOVEDOWN, for example. Also, Applesoft key words are not legal variable names; you can't create a variable called PRINT, for instance. You can set a variable equal to MOM, though, and then you'll be able to say you call MOM often.

PEEKs and POKEs

The commands POKE and PEEK are two other Applesoft links to the world of machine language (see line 20 of **Listing 1**). A machine-language program often uses the contents of a particular memory location in the computer to store a meaningful value or to look at a location to see the action the program should take.

In Applesoft, POKE puts a number value (always in the range of zero to 255) into a particular memory location (in the range of zero to 65535). Many Applesoft routines (including the one at line 25 of **Listing 1**) use location 230 as a reference to drawing on Hi-Res page 1 or page 2. You usually set this location when you do an HGR or HGR2 from Applesoft.

Since **Listing 1** is "fooling" Applesoft into later clearing the Hi-Res page, you must put the value 32 in location 230 if you want page 1 to clear properly. If you wanted to clear Hi-Res page 2, you would store a 64 in location 230.

Sometimes a machine-language routine alters memory locations as it op-

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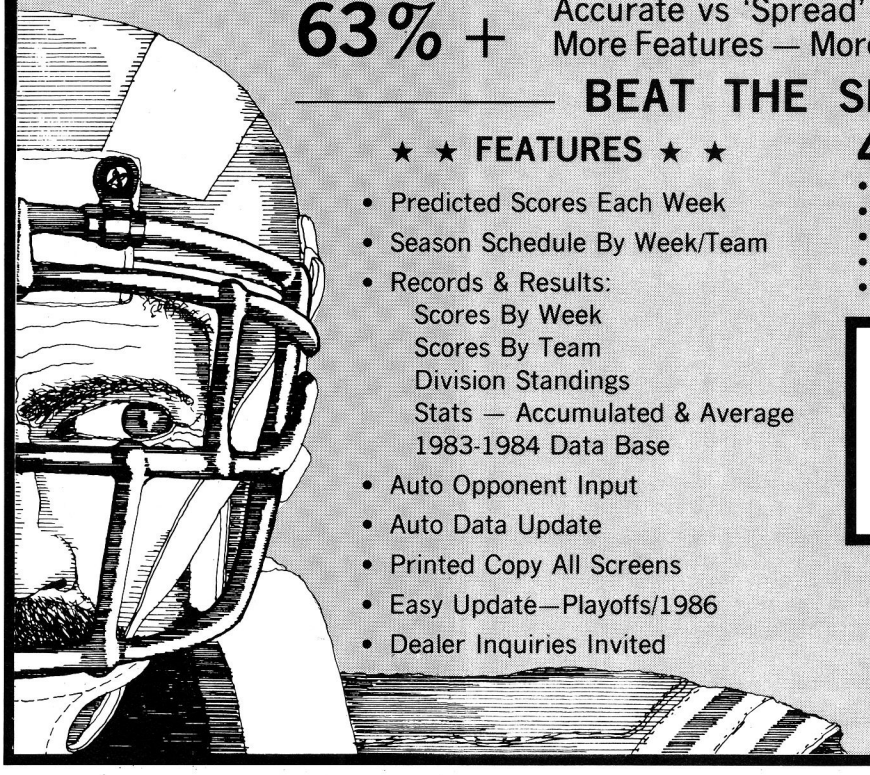

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RIGHT OF ASSEMBLY

Listing 1. Hi-res trickery.

```
10 HOME
15 PRINT "WELCOME TO HI-RES
   TRICKERY"
20 POKE 230,32: REM SET HI-RES
   PAGE '1'
25 CALL 62450 : REM CLEAR HI-RES
   SCREEN TO BLACK
30 REM DRAW A FRAME
35 HCOLOR = 3: REM SET HCOLOR TO
   WHITE
40 HPLOT 0,0 TO 279,0 TO 279,159 TO
   0,159 TO 0,0
45 REM DRAW A SHAPE
50 HPLOT 140,80: REM STARTING POINT
55 FOR I=1 TO 100
60 X = RND(1)*279
65 Y = RND(1)*159
70 HPLOT TO X,Y
75 NEXT I
80 REM SWITCH TO HI-RES SCREEN
85 CALL 62436 : REM SHOW HI-RES
   PAGE 1
```

Listing 2. HGR in color.

```
10 HOME
15 PRINT "WHITE HGR DEMO"
20 POKE 230,32: REM SET HI-RES
   PAGE '1'
25 HCOLOR = 3 : REM SET HCOLOR
   TO WHITE
30 HPLOT 0,0 : REM PLOT IT ONCE
35 CALL 62454: REM CLEAR SCREEN
   TO WHITE
40 CALL 62436: REM SHOW HI-RES
   PAGE 1
45 POKE 230,32: REM RESTORE PAGE
   SETTING
```

Listing 3. CALLing them by name.

```
10 UP=64538: DOWN=64614:
   LEFT=64528:RIGHT=64500
20 HOME
30 HTAB 20:VTAB 12:REM CENTER
   CURSOR
40 GET A$
50 IF A$="U" THEN CALL UP
55 IF A$="D" THEN CALL DOWN
60 IF A$="L" THEN CALL LEFT
65 IF A$="R" THEN CALL RIGHT
70 IF A$="Q" THEN END
75 GOTO 40
```

erates. The clear-screen routine stores the value zero in a large block of memory used to determine the contents of a given memory location in the Apple.

If you added the line:

```
90 PRINT PEEK(230)
```

to **Listing 2**, you would discover that location 230 changes after the program performs CALL 62436. Being aware of this is valuable, since the contents of location 230 are important to other Hi-Res commands, such as HPLOT. If you use CALL 62436 in your Applesoft programs, be sure to restore location 230 with a POKE 230,32 to keep things working properly.

Until We Meet Again. . .

The important thing this month is to understand that your Apple computer contains many levels of "programs." You're familiar with Applesoft BASIC, but, ultimately, the computer actually runs a series of number values stored in memory, called a machine-language program.

Your computer calls a machine-language program by jumping to a given address, rather than a line number as in BASIC. Most machine-language routines are like BASIC subroutines, and eventually return control to the point from which the computer called them. This means you can use them as you would BASIC subroutines from within an Applesoft program to enhance the programs you're writing.

You can use the Applesoft commands POKE and PEEK to alter the contents of memory and to examine any given memory location to see what's already there. You may want to go back to programs you've seen in magazines or on your local user-group program disks to look for POKEs, PEEKs, and CALLs to see how you can use them in many different Applesoft programs.

In upcoming issues, you'll learn more about machine-language programs and how to create them yourself. Best of all, you'll gain an insight into the way your computer really works.■

Roger Wagner is the author of Assembly Line: the Book *and is president of Roger Wagner Publishing, the publisher of Merlin and Merlin Pro assemblers. Write to Roger at Roger Wagner Publishing, 10761 Woodside Avenue, Suite E, P.O. Box 582, Santee, CA 92071.*

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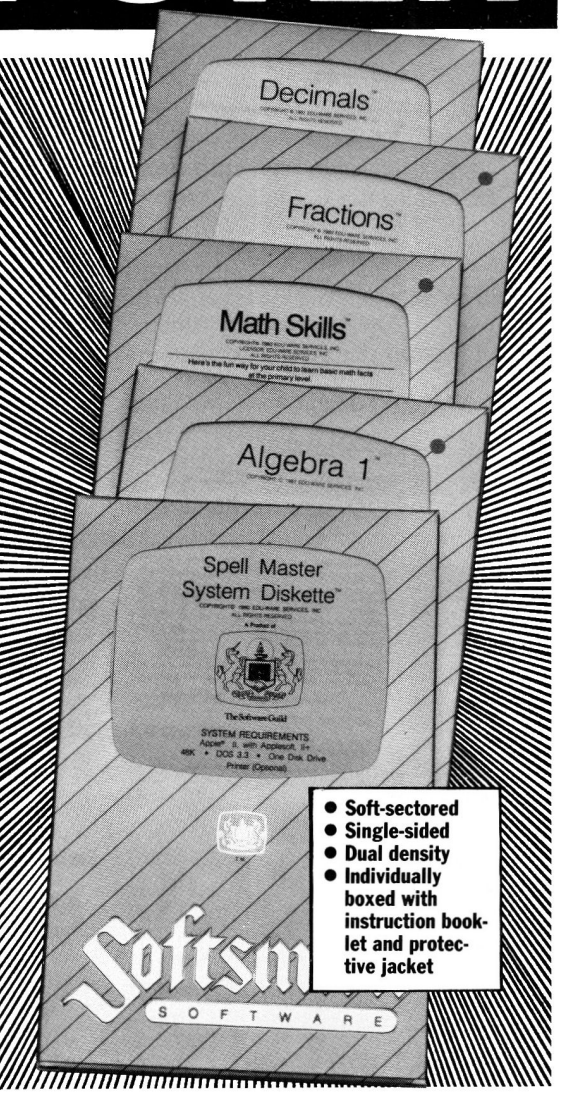

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THE FINAL FRONTIER. Item H-640-63542-32. Pilot an advanced version of the original NASA shuttle. Object: liftoff, rendezvous, approach and final docking with an orbiting space station. Radar systems will help you, but your piloting skills are vital to success! Requires: Apple® II, II+, IIe; 48K; Applesoft; DOS 3.3; 1 disk drive; joystick (optional).

ACEY-DUECY. Item H-640-63542-29. A fast-moving card game. Can make you a billionaire or a pauper in just a single play. Compete with the computer or with your friends. Play odds or intuition. Requires: Apple® II, II+, IIe; 1 disk drive; DOS 3.3.

CONGLOMERATES COLLIDE. Item H-640-63542-30. Manipulate cash, stock, subsidiary companies to survive and prevail in the tough corporate world. Requires: Apple® II with Applesoft, II+, IIe; 48K; 1 disk drive; DOS 3.3; color monitor optional.

MAX-COMMAND. Item H-640-63542-34. Military buildup is taking place between your home country and another major power. Your mission: military defeat of enemy. Requires: Apple® II with Applesoft, II+, IIe; 48K; 1 disk drive; DOS 3.3.

SPACE CONQUERORS. Item H-640-63542-38. You are landing on another planet. Your instruments indicate it is much like the earth. You choose to land, but will face unknown obstacles! Requires: Apple® II with Applesoft, II+, IIe; 48K; DOS 3.3; 1 disk drive; color monitor preferable.

THE PRISONER. Item H-640-63542-39. You ARE the prisoner! With only your intelligence, you must repel the brainwashing of the authorities who are trying to break you down. Can you escape, or will you always be "The Prisoner"? Requires: Apple® II with Applesoft, II+, IIe; 48K; 1 disk drive; DOS 3.3.

LUNAR PINBALL. Item H-640-63542-47. Ding, ring, bing, the ball's in play! All the excitement of planetary pinball in zero gravity playing field. All the sounds of real pinball. Lights blink as score adds up. Add: ten flippers and force field shields! Nothing on earth quite like this! Requires: Apple® II with Applesoft, II+, IIe; 48K RAM; DOS 3.3; 1 disk drive, game paddle.

ASTRO-ATTACK. Item H-640-63542-40. Control rocket ship! Climb, dive, drop bombs! Watch out for ground defenders aiming laser cannons at you! Adjustable difficulty level. Requires: Apple® II, II+, IIe; 48K RAM; DOS 3.3; 1 disk drive.

MIDNIGHT MALADY. Item H-640-63542-35. You're a member of a small medieval village. You wake in the morning with a wound in your arm and hear about a werewolf, and you must find an antidote before full moon rises tonight. Requires: Apple® II, II+, IIe; 48K RAM; 1 disk drive; DOS 3.3.

GUARDIAN. Item H-640-63542-43. Year 2112. The sacred "Emerald of Syrinx" is in your care. Because it is so valuable, many would kill you for it. You must protect yourself, the emerald, and get safely through the 6 levels of the Dungeons of Kailyn! Requires: Apple® II, II+, IIe; 48K RAM; Applesoft; DOS 3.3; 1 disk drive; joystick (optional).

RUSSKI DUCK. Item H-640-63542-37. Secret MX missile plans are in enemy hands. You're a special agent and have intercepted a message that reads, "get the duck and leave at midnight." You assume plans are secreted in a duck decoy. You must find them and return them to CIA, avoiding booby traps along the way that can be deadly. Requires: Apple® II, II+, IIe; 48K RAM; DOS 3.3; 1 disk drive.

CREATURE VENTURE. Item H-640-63542-31. You've inherited your rich uncle's mansion. To receive inheritance, you must rid the mansion of horrible creatures that possess it...and find the buried treasure. Requires: Apple® II, II+, IIe; 48K; DOS 3.3; 1 disk drive; Applesoft ROM.

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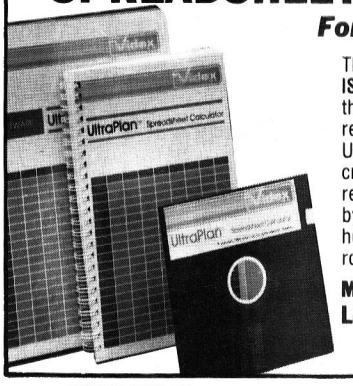

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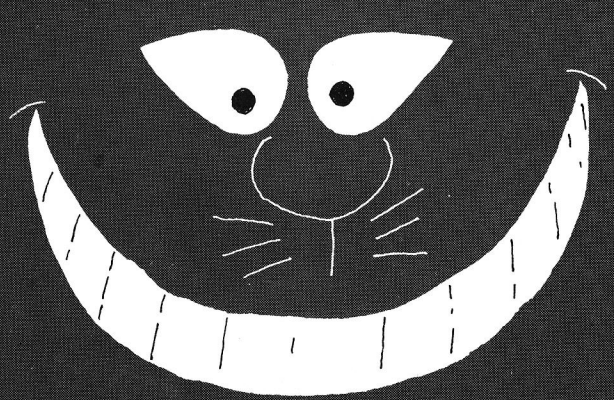

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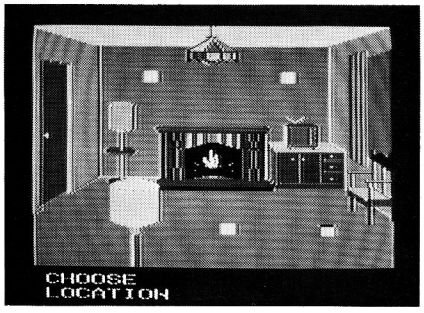

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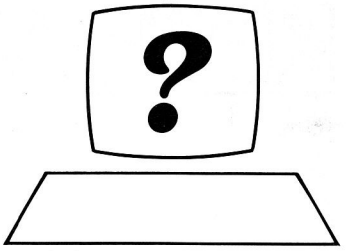


The New *inCider*: Take a Closer Look

Take a look at us now. From cover to cover, *inCider* sports a new look. We changed to reflect the sleek, fast-paced world of our computer culture. Notice the clean page design, the new columns and departments, the use of photographs and illustrations.

Redesigning a magazine doesn't happen overnight. Donna Wohlfarth, *inCider*'s art director, spent one month analyzing the magazine and changing its format to reflect the growing sophistication of computer technology.

"I started with a philosophy of stark simplicity, so I began by stripping the book," Wohlfarth notes. "I then added only what was needed for readability and page identity. You'll notice a great deal more white space. The end result is an appealing departure from what most technically oriented computer magazines are doing."

Change is never easy, but variety is the spice of life. This month, BackTalk wants your opinion about our redesign. It's your chance to tell us what you think about the new *inCider*. Dial (603) 924-9801 with your modem and answer the survey on our bulletin-board system. (You can still participate in the survey even if you don't have a modem. Simply complete the following questionnaire and mail it to BackTalk, *inCider*, 80 Pine Street, Peterborough, NH 03458.)

Please send your responses—by mail or modem—before October 14, 1985. The results will appear in the December issue. ■

Mail your responses to: BackTalk
inCider
80 Pine Street
Peterborough, NH 03458

1) Did the new look of the magazine affect your purchase?
   a) Yes
   b) No
2) When comparing *inCider*'s new cover look to the old one:
   a) I didn't notice any changes
   b) I thought the magazine looked more professional
   c) I liked the old look better
3) I find the table of contents:
   a) confusing
   b) helpful in locating articles
   c) attractive in design
4) Do you think the artwork (photos and illustrations):
   a) enhances the articles
   b) detracts from the product
   c) has no effect on my reading
5) For illustration purposes in the review section, do you prefer:
   a) screen shots
   b) manufacturer product shots
   c) illustrations
6) The new typeface:
   a) is easy to read
   b) is difficult to read
   c) doesn't affect readability
7) Overall, do you think *inCider* looks:
   a) stark
   b) clean and professional
   c) cluttered
8) Compared to the old *inCider*, I find the new *inCider*. . .

inCider's Ratings

Superlative ★★★★
Above average ★★★
Good ★★
Not recommended ★
Stay away ☆

Juki Model 6000

Juki Office Machine
23844 Hawthorne Boulevard, Suite 101
Torrance, CA 90503

Letter-quality printer
Any Apple II
$300

★★

If, as Shakespeare said, "they stumble that run fast," the Juki 6000 letter-quality printer should provide years of particularly reliable service. The Juki 6000 is a Centronics parallel or RS-232C serial daisy-wheel machine, and it's compatible with all Apple II computers. It runs more slowly than any other printer I've seen, and its manual reads like an algebra textbook, but it does have some redeeming qualities—excellent letter-quality type and a relatively low price.

The Juki lacks a built-in buffer, which would have been a nice feature. A buffer would compensate for the printer's slow speed, allowing you to print a page without tying up the computer. The tiny Juki is only useful for printing short documents (one or two pages). At ten characters per second (the Juki's maximum speed), printing three full pages of text can take up to 20 minutes. Because of this limitation, I wouldn't recommend the Juki for business applications. It's practical only for the home user who already has a dot-matrix printer and needs just an occasional letter-quality document.

The daisy wheel has a standard American character set, with 100 numbers, letters, and punctuation marks. The wheel is flimsy and doesn't look as if it would fare well with prolonged periods of full operation. The carriage can accept paper up to 12 inches wide; maximum line length is 9 inches, preventing the use of extra-wide paper.

In addition, the Juki uses a friction-feed paper-draw system, with no provision for installing a tractor feed; you can't print more than one page at a time. I guess my tractor-fed, correspondence-quality, 100-character-per-second dot-matrix printer has spoiled me.

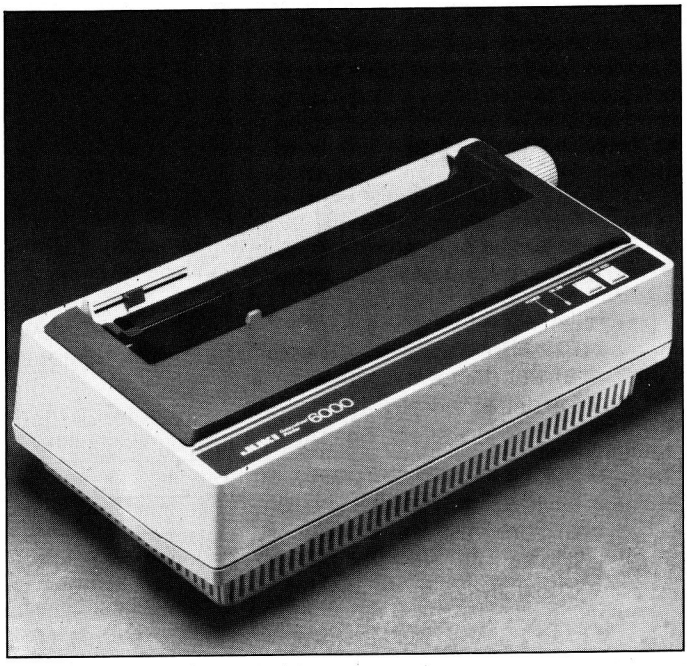
The Juki is flexible in terms of number of characters per line—90 if you choose ten characters per inch, 108 if you adjust the pitch to 12 cpi. You can easily turn this feature on and off with control characters.

The 6000's ribbon—either a one-time fabric or a multiple-strike film ribbon—comes in a convenient cartridge. The ribbon system is right on top of the print head, so changing ribbons in the middle of a printing cycle is easy.

The Juki's capacity for printing copies is poor—only an original and one copy are possible. This factor limits your production, especially if you need documents printed in triplicate.

At 6 kilograms, the Juki is light and easy to handle. It's one of the more compact letter-quality printers I've seen—just 41 by 22.9 by 13.8 centimeters, ideal for a small work space.

The little Juki 6000 turns out letter quality at a low price.



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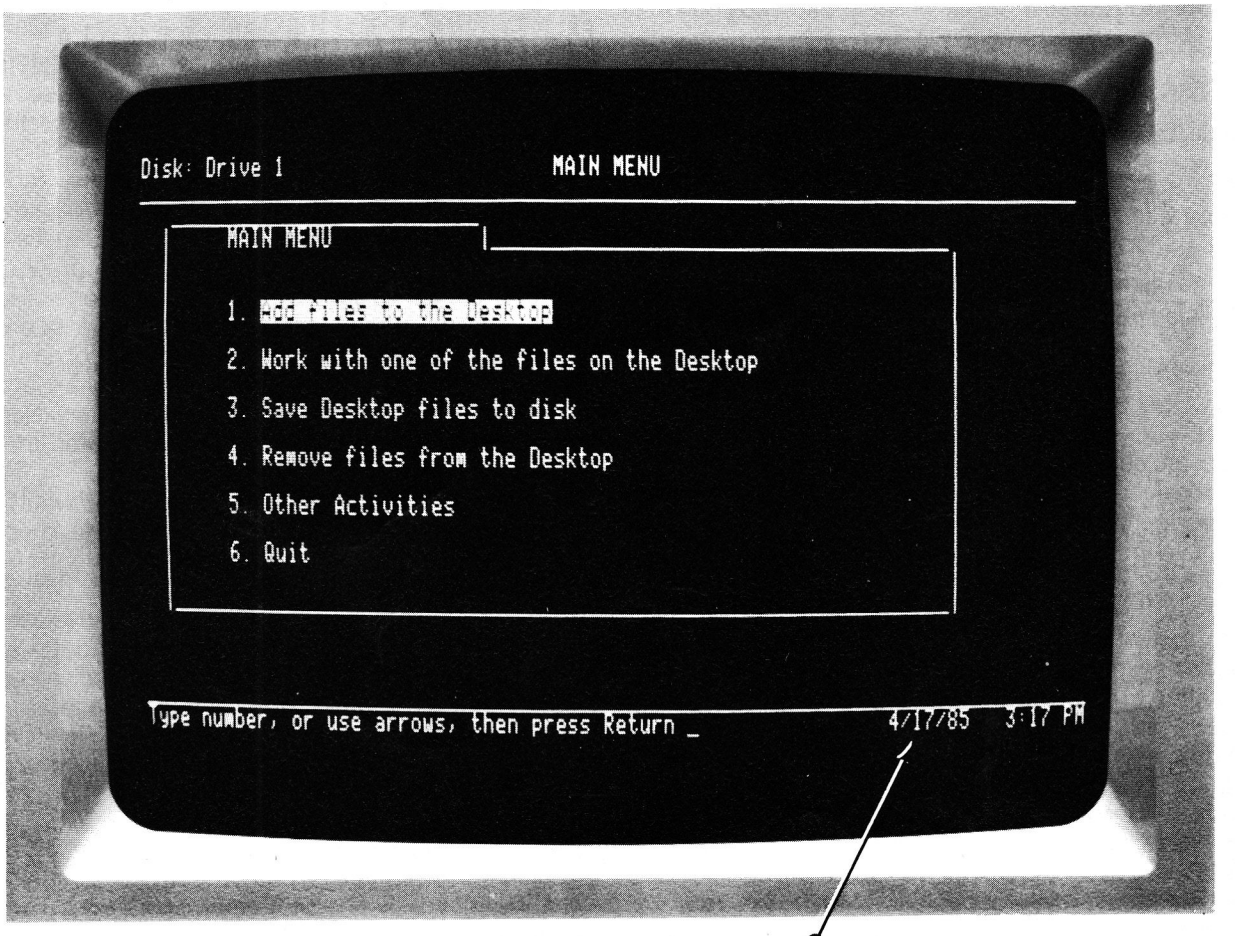

Just Look Right Here

Only the Timemaster H.O. displays the date and time on the Appleworks screen.* If you don't have a Timemaster H.O., you'll just get the help key reminder. The Timemaster H.O. will also automatically time and date stamp your files on disk. And don't forget, the Timemaster H.O. has all the features of all the competition combined, including year, leap year (not just in PRO-DOS), month, date, day, hours, minutes, seconds and milliseconds. The Timemaster H.O. is compatible with PRO-DOS, DOS 3.3, PASCAL and CP/M. And the Timemaster H.O. automatically emulates all other clock cards so you won't have any compatibility problems because the Timemaster H.O. works with ANY program that reads ANY clock.

In fact, you could put ALL the competitive cards in every slot in your Apple and you still wouldn't have all the features of the Timemaster H.O.

The Timemaster H.O. comes with a ton of fun and useful software. It has an easy to read yet detailed manual, a 20 year auto-recharging battery and a 3 year no hassle warranty.

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The Juki 6000 is an inexpensive printer with outstanding type quality. It's unusually quiet, even with no built-in sound insulation, but it will never win any awards for speed. All in all, though—*if* you're not looking for a high-production printer—the Juki 6000 is a sure-footed winner.■

Joseph J. Lazzaro
Revere, MA

ProImage

Interactive Arts
2715 Porter Street
Soquel, CA 95073

Animation design
Any Apple II, 64K
$69.95

★★

Shape tables, machine language, decimal-to-hex conversion—the details of program animation can be sheer drudgery. The right software can take care of the more laborious tasks of your animation project, but ProImage is one package that leaves you with a great deal of the work. ProImage lets you create smooth, professional-looking animation with images you design with the program or borrow from another source. There are so many steps in this process, and so much Applesoft programming to fiddle with, however, that only dedicated animators will be likely to persevere long enough to see their work on the screen. For those who do, however, the results are worth the effort.

At least three techniques let you animate an image on a cathode-ray tube. The first method, and the most time-consuming, is to draw an image, erase it, then redraw it elsewhere. Another way is to use the XOR (exclusive or) drawing mode, which redraws the image over itself. It's slow, but it permits drawing over complex backgrounds. ProImage employs a third method, pre-shifted images: You draw an image, save it, shift it to a new location, and save it again under a different name. You repeat the process until you've drawn an entire series of pre-shifted images over one another in sequence to create the illusion of movement. Animation produced by pre-shifted images is smooth and fast.

I tested the ProDOS version of ProImage (DOS 3.3 is also available). The package contains one disk and an 81-page typewritten manual in a three-ring binder. Booting the disk takes you to the main menu, where you can choose from PIXED (the pixel editor), TABLE (to arrange into the proper display sequence images you've already shifted and saved), CONFIGURATION (the type and number of disk drives you're using and your printer-card slot), DEMO (a self-running illustration of ProImage animation), and BASIC, which exits the program.

Editing Pixels

PIXED is somewhat limited as a graphics editor, and it's hardly what I'd call user-friendly. The screen is blank, except for the command line (PLCBSUZFEQVHRTJKKIM) and the status line (X = 1 Y = 1 HB = 38 VB = 190 S = 1) at the bottom. The letters in the command line denote specific functions (see the accompanying **Table**). The status line displays the x and y coordinates of your current screen position, the horizontal and vertical block dimensions, and the current step size for cursor movement.

Despite its lengthy command list, PIXED lacks several vital features. For example, you can't draw circles and curves except by plotting them one pixel at a time, and you can't rotate or change the size of your image. One way around the latter problem is to create your graphics with another program and save it as a standard 33- or 34-sector binary file. (Make sure you add .PIC to the file name so that ProImage will recognize it as a picture.)

If you've drawn an automobile, and you want to begin one of your programs by making the image travel across the screen, use the PIXED file command to load and display the picture. Next, create a block slightly wider than the image, and move the image into the block with the V command and the arrow keys. Be sure to leave the leftmost (vertical) columns of pixels blank. Now save the image as AUTO1. Move the image two pixels to the right and save it as AUTO2. Continue shifting and saving until you reach the right edge of the block. As these images are drawn over one another, the blank pixels erase the leftmost portion of the previous image, and the automobile appears to move from left to right.

Computer Cartoons

Arranging the images in their proper order requires ProImage's TABLE program. Once you load it into memory, the program displays the appropriate image directory so that you can determine the order of presentation. When you're satisfied with the arrangement, press the return key to build the shape table. The program then prompts you for a table name. If your ProDOS data disk has the prefix /DATA, enter /DATA/TABLES/AUTO. With the DOS 3.3 version, simply type AUTO.

After you've constructed an image table, you can incorporate it into any program. ProImage supplies two programs to illustrate this procedure—BASKEL (Basic Skeleton), an Applesoft file that loads the shape table, and IMGASSY (Image Assembly), a binary file that does the drawing. The manual includes a tutorial showing the program lines you must modify to move a sample image across the screen. The tutorial (and the rest of the manual) is so riddled with typographical errors, however, that trying to understand it is quite frustrating. When I finally got

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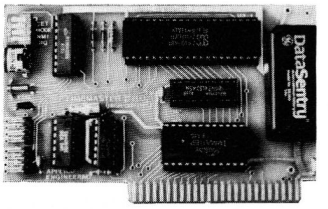

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	YES	YES	YES	YES	YES	YES	YES	YES
BRAND A	NO	NO	YES	NO	NO	NO	NO	NO
BRAND C	NO	NO	NO	NO	NO	NO	NO	NO
BRAND M	NO	NO	NO	NO	NO	NO	NO	NO
BRANDP	YES	YES	NO	YES	NO	NO	NO	NO
BRAND S	NO	NO	NO	YES	NO	NO	NO	NO
BRAND T	YES	NO	NO	NO	NO	NO	YES	NO

Full emulation of all other clocks. Yes, we emulate Brand A, Brand T, Brand P, Brand C, Brand S and Brand M too. It's easy for the H.O. to emulate other clocks, we just drop off features. That's why the H.O. can emulate others, but none of the others emulate us. The Timemaster II H.O. will automatically emulate the correct clock card for the software you're using. Of course most programs will use the Timemaster II H.O. in its native mode, but it's comforting to know that you won't have to worry about compatibility problems. You can also give the H.O. a simple command to tell it which clock to emulate. This is great for writing programs for those poor unfortunates who bought some other clock card.

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Our BSR X-10 interface option for the H.O. allows you to remotely control up to 16 lights and electrical appliances through your BSR X-X-10 home control system in your home or office. You're already wired because a BSR system sends its signals over regular 120 volt wiring. That means you can control any electrical device in your home or office without additional wiring.

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SUP'RTERM	MORE	NO	NO	NO	NO	NO	YES	YES
WIZARD 80	MORE	NO	NO	NO	YES	NO	YES	YES
VISION 80	MORE	YES	NO	NO	YES	NO	NO	NO
OMNIVISION	MORE	NO	NO	NO	NO	NO	YES	YES
VIEWMAX 80	MORE	YES	NO	NO	YES	NO	NO	YES
SMARTERM	MORE	YES	NO	NO	NO	YES	YES	NO
VIDEOTERM	MORE	NO	YES	NO	YES	YES	NO	YES

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Articles set off by quotation marks are published complete with type-in program listings.

Table. ProImage commands.

Command Letter	Function
P	Plots a point at the current cursor location
C	Lets you select any one of eight standard Apple hi-res colors
B	Sets the size of the block or image window
S	Changes the cursor-movement step size
U	"Unplots" a point at the cursor
Z	Erases the line from the last plotted point to the cursor
F	Takes you to the filer menu where you can save or load shapes and pictures, catalog, or execute any ProDOS command
E	Erases the screen and restores block and step defaults
Q	Exits PIXED
V	Lets you move the image around the screen with the J, K, I, and M keys
H	Takes you to help screens listing these commands
R	Toggles between full and split-screen graphics
T	Activates the text mode so that you can write on your graphics with standard ASCII characters

things straightened out, the image I created did move smoothly and rapidly across the screen, so the system does work.

ProImage provides an interesting, though somewhat limited, introduction to computer animation techniques. For programmers motivated enough to make the effort, this might be the place to start. If you don't want to spend a lot of time with Applesoft, however, I'd advise you to stay away.■

Wayne Sassano
Wethersfield, CT

Mouse Calc

International Solutions
910 West Maude Avenue
Sunnyvale, CA 94086

Spreadsheet
Apple //c or //e, 128K
$149

★★★★

A new French connection is infiltrating the United States—a wave of Mac-like software beginning with Mouse Calc, a smoothly integrated spreadsheet and graphics program.

Mouse Calc, the creation of 23-year-old French programmer Luc Barthelet, is reported to be to the //c what the original VisiCalc was to the Apple II. When you experience (a word not chosen lightly) Mouse Calc, you will see how far spreadsheets have come in less than ten years.

Many fine features distinguish Mouse Calc from other members of the Apple II calc family, yet the basics have not been overlooked. Mouse Calc performs all the routine spreadsheet functions. In fact, Mouse Calc can do almost anything VisiCalc Advanced can do. It even protects and hides formulas and merges spreadsheets.

The most frequently used mathematical and logical functions are built in. The more esoteric accounting functions (net present value and internal rate of return), however, are not preprogrammed for you.

I found it ironic that even when translated, this French-born program uses English in a common-sense way that some American-made software does not. For example, you don't "replicate"—you "copy" and "paste."

The most obvious distinction between Mouse Calc and other spreadsheet programs, however, is the appearance of its screen. The others present you with a rather static grid of cells. What you do with those cells is determined by how persistently you studied the program manual. If you don't remember their multifarious commands, you get beeped, and you get discouraged. You pray for something like Mouse Calc to come along.

Sure, It's a Spreadsheet

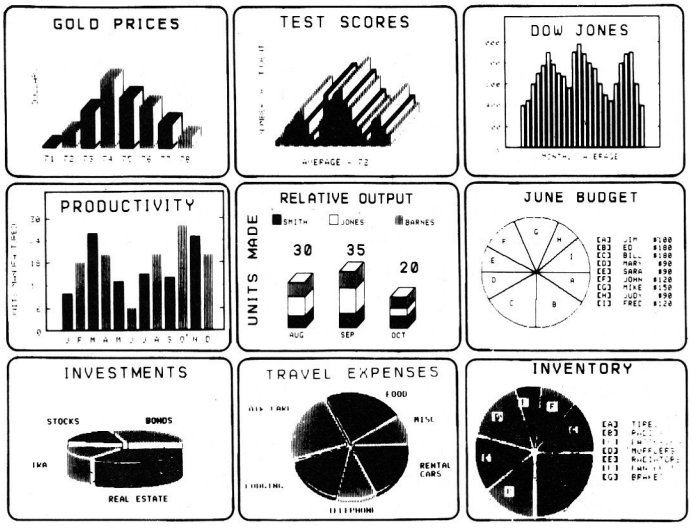
Sure, Mouse Calc has a grid of cells. It also has columns, rows, and a cursor. It wouldn't be a spreadsheet without those. But Mouse Calc is as much "mouse" as it is "calc." The program takes full advantage of this unique input device, so you don't have to use arrow keys or the GoTo function to move around the spreadsheet. Move the mouse instead.

You don't have to memorize a single command, because the masthead above the spreadsheet grid is your menu. Here your main options are logically presented; File, Edit, Print, Function, Format, Graph, Calculate, Link, and Info commands are included. To access any sub-options, move the on-screen pointer to the main option and click the mouse button. A pull-down menu unrolls before you. Move the mouse to your selection, click again, and you're center-justifying, for example, without even trying.

Mouse Calc's pull-down menus offer nearly 100 options. Without a doubt, this system beats even the best-conceived mnemonic command structure. You'll never need to CTRL or slash anything again.

The promotional material with the package claims that having Mouse Calc is "like having a Macintosh

AlphaChart!



Don't pay more for less! The pictures shown above are examples of charts created with AlphaChart!, perhaps the most powerful and friendly Apple II chart program on the market. Within seconds, keyboard-entered data can be converted into picture-perfect pie or bar charts, in 26 user-selectable styles, automatically scaled and labelled, and in color or black and white. And if you want to customize your charts by adding extra artwork or text, or display them in a slide show, AlphaChart! comes with these valuable extras.....

A **slide projector,** for orchestrating automated, stand-alone screen presentations of a series of charts, timed and sequenced by the user. This program alone is worth the cost of the disk. It can be used with any graphics files created with any program.

A **graphics editor,** for alteration and embellishment of charts. Besides standard point-by-point sketching, built-in structures permit push-button creation of cirlces, rectangles, lines, shape-table shapes, and exotic woven plaid patterns. If you wish to add clarifying text to the charts, you may type on the screen in several different letter font styles. For the artist, the graphics editor can also be used to sketch any imaginable scene from scratch.

A **shape table editor,** for creating special shapes for your charts. These shapes can also be used for animation in your programs! A sample animation program shows how to do it.

AlphaChart! includes a screen-dump program for printing your charts on paper. AlphaChart! is more! Just read what these people have to say about it...

"I noticed the advertisements for Spectral Graphics' AlphaChart! program and figured that, with a money-back guarantee, I would try it. Boy, am I glad I did! This is a fantastic program. You can master its many varied capabilities in less time that it would take to describe them. I would recommend it to everyone, even if you have absolutely no need for a graphing program. It's just fun to play with." **S.A. Smith, San Bernadino, Calif... letter to SOFTALK, June, 1984, page 14.**

"The software does much more than the advertisement suggests. Without question, this is among the best buys in software that I have ever come across, and certainly among the best written. It is extraordinarily easy to use, very well thought out, and priced to kill your competition (which I wish you every success in doing)." **Anthony J. Scriffignano, North Caldwell, New Jersey.**

"I have long been distressed by the lack of software available in the scientific academic community. At last there is a simple yet robust graphics program applicable for our purposes: AlphaChart!, by Spectral Graphics Software. Business folks and scientists alike will really appreciate how user-friendly it is; I was able to produce my first three-dimensional, multi-colored, labeled bar graph within five minutes of booting the disk–without reading my documentation. I would have had to pay a scientific illustrator much more than the whole program costs just to produce that one graph....you can't do without this gem." **John B. Iverson, Richmond, Indiana...letter to SOFTALK, April, 1984, page 23.**

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in your Apple II." The truth is even better than that. Apple II users have something Mac owners don't have—color. And with Mouse Calc, you have double-hi-res color.

Turning any part of your spreadsheet into crisply colored bar or line charts is as simple as highlighting the chosen data, opening a window (vertical or horizontal), and selecting the Graph option. With a click of the mouse button, you can instantly make your bar charts three-dimensional for a pleasing, professional effect.

What do you pay for all this? Aside from the monetary cost of $149, you pay another price—memory usage. Mouse Calc comes on one program disk (back-up and sample file disks are also included). The main program, including graphics utilities, loads in one shot, leaving 42K remaining from an initial 128K.

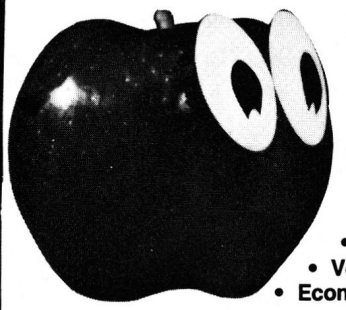
For most personal-computing uses, that amount of memory should suffice. For instance, I was able to track one month's income and expenses for five rental properties I own. My spreadsheet used about 110 cells, 21 of which held formulas. Using an additional 2K of memory, I also prepared a 3-D bar graph showing eight parameters for my five houses (40 bars in eight different colors).

Business users should be aware that completely filling 2171, or about 1/7, of the available cells exhausts the computer's memory. Still, when you consider that VisiCalc Advanced leaves you only 69K of working memory and doesn't offer the ease of use or color graphics Mouse Calc provides, you may conclude, as I have, that the extra 27K Mouse Calc costs you is memory well spent.

Printing with Mouse Calc

Printing your work is easy as un, deux, trois. From the pull-down Print menu, you can choose to print the spreadsheet only, the graph only, the spreadsheet and graph, or the whole screen display. When printing a spreadsheet, you have sufficient formatting capabilities, including page length and width. You can also program your printer for condensed or other typestyles.

Mouse Calc remembers the top-left and bottom-right limits of your spreadsheet, so you don't have to be sure the cursor is on cell A1 before you print. If you want to print only part of your work, however, you can easily change the default settings. Since Mouse Calc can read and write DIF files, you can convert from VisiCalc or AppleWorks without losing data.



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The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

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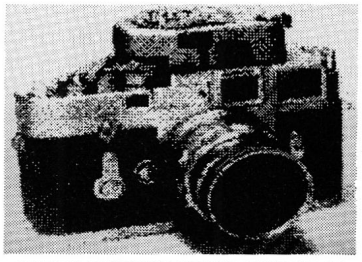

HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
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Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 RCA 1500 Series Camera w/6:1 zoom lens Price: $399.90/Combination Price: $729.95

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— Picture Scanner: An applications tool for processing video images for display on the Hi-Res screen. A variety of dithering algorithms are provided, for compressing the digitized image into the Hi-Res screen and simulating grey scales. Price: $39.95

— Superscan: Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Includes print routines for Anadex 9500 or 9501; Epson MX-80GFT and MX-100; and IDS 460 Paper Tiger*. Written for The Micro Works by Magna Soft. Price: $99.95

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International Solutions, the American marketing firm for Version Soft, promises a soon-to-be-released word processor called Mouse Word, purported to integrate with Mouse Calc, and Mouse Budget, for tracking personal finances. *(At press time, International Solutions claimed to be shipping Mouse Word and Mouse Budget, and to be creating Mouse Desk.—eds.)*

As with any other program in its first release, this version of Mouse Calc did have a few problems. The program disk didn't load consistently in my //e and //c. Sometimes the screen froze when I tried to use the elevators or copy and paste. According to a very supportive spokesman at International Solutions, some master disks may have been X-rayed in transit. When I switched to the back-up disk, I had no further problems.

Other minor annoyances can't be blamed on the medium. For example, you should be able to label the axes of graphs with descriptive words. On my rental-property graph, for example, I numbered the bars 1 through 5. And, if you discover a mistake while printing, you should be able to stop the printing process by pressing the escape key.

These are fairly tepid criticisms, however. Mouse Calc for the Apple //c and //e is the crème de la crème.■

Cynthia E. Field
Wakefield, RI

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REVIEWS

The good-looking Cari Portable Powered Work Station.

Constructed of tough, water-repellent cordura nylon, the Cari case is well prepared for rigorous travel. Measuring 20 by 13 by 6 inches, it easily fits under airline seats.

A high-density foam support system protects the internal elements of this portable power supply. The unit provides ample room for toting the //c power-transformer cube, a modem, a printer-interface cable, or other small items, along with your computer, flat-panel display, and buffer box. The weight of all that equipment adds up, however—you won't want to tote the Cari around for long when it's full.

Power Hitter

Velcro straps hold the Cari's rechargeable power source, a sealed lead-acid gel cell; you can remove the power source from the Cari case for desktop use. Two short cables with DIN connectors, one male and one female, extend from the front panel of the gel cell. This panel also houses the on-off switch and piezo buzzer, which indicates low power. Since the power cell, which contains a 5-amp fuse, is sealed, you'll have to contact Discwasher or an authorized service center when the battery needs repairs.

One of the DIN connectors goes into the //c's power socket. The transformer-cube power jack matches the remaining DIN connector of the battery. The transformer cube fits inside the Cari case so that you can recharge the cell while traveling. Discwasher advises you to leave the //c power switch in the "on" position at all times and use only the battery power switch for turn-on, turn-off chores because the //c drains electricity—even when the computer's switch is off.

Extending Life Expectancy

According to Discwasher, the battery's life expectancy is 400 to 500 recharge cycles (if drained low enough to activate the low-voltage alarm). As power is depleted, the low-voltage alarm will sound when you access the disk drive. If the warning sounds steadily, you have about ten minutes of power left, so save your work and recharge the unit. If you regularly recharge the battery before it runs down to alarm levels, you can extend its life expectancy to more than 1000 charges. Going from the low-voltage warning to a full charge takes 12 to 16 hours. You can leave the battery on recharge indefinitely, since you can't overcharge it. The //c transformer cube serves as the power source for recharging.

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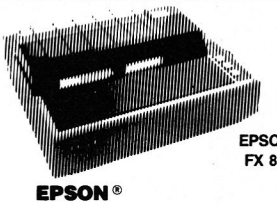

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Fully charged, the battery provides power for the //c and an LCD flat-panel display for up to seven hours. In practical use, five to six hours is more realistic. Extensive use of a disk drive and peripherals that depend on the computer for electric current (such as a modem) consumes power hungrily. Applications not requiring much disk access, such as word processing, yield better power "mileage."

The Cari battery also doubles as an ideal uninterruptable power supply (UPS) for everyday use. In UPS applications, the //c transformer cube furnishes a constant charging current for the Cari battery, which supplies juice to the //c. In a power failure, your supply is good for up to seven hours. More importantly, you won't lose data after a sudden power cut-off.

Get Up and Go

While the Cari makes a good tote for your gear, I wouldn't call it the world's most comfortable work set-up. You may not mind computing directly from the Cari, but I prefer a desktop or traditional work surface. The Cari obliges with an extension cord that lets you remove the computer and flat-panel display while the other components remain securely packed.

If you travel frequently with your computer, or if you're just looking for an uninterruptable power supply that doubles as a mobile computing unit, the Cari Portable Powered Work Station is worth your consideration.■

Tom Benford
Bricktown, NJ

MW-100 C-Print Interface

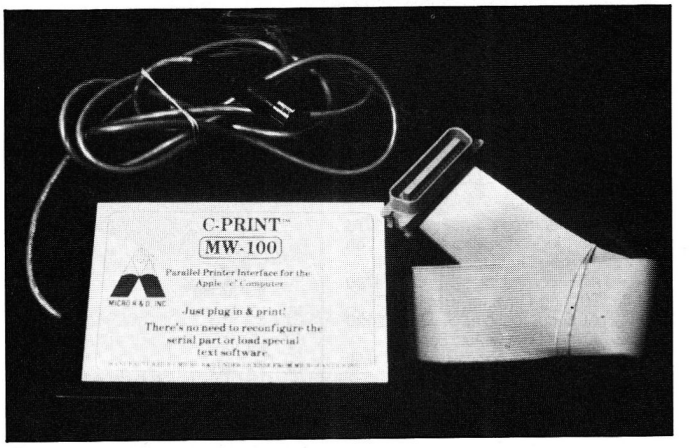
Micro-W Distributing
1342B Route 23
Butler, NJ 07405

Printer interface
Apple //c
$99.95

★★★★

Are you in the market for an economical parallel printer for your Apple //c? For your text-processing needs, you'll want to check out the MW-100 C-Print interface. There are no special hook-ups or configurations to worry about, since this compact unit plugs directly into the //c's printer port and emulates an Apple Imagewriter in text mode.

The MW-100 C-Print includes a 5-foot serial cable with a DIN connector that plugs into the //c. The interface module itself (a black plastic case containing the necessary support and translation circuitry) is connected to the other end of the serial cable. A flat-ribbon cable with a Centronics-type parallel connector extends from the opposite end of the module box. The ribbon cable and the module box increase



MW-100 C-Print, a serial-to-parallel interface for the //c.

the length of the unit to slightly less than 7 feet, a comfortable distance for most printer installations.

The interface gets its 5-volt power supply from pin 18 of the printer's 36-pin connector. If pin 18 doesn't carry this voltage, you can get a separate power supply from Micro-W for $9.95. You can also use any of the popular video-game or calculator AC power adapters that have 3½-millimeter (⅛-inch) phone plugs and can provide 9 volts at 100 mA or better. I used a Star SG-15 printer for testing purposes. This supplied the necessary 5 volts at pin 18.

If you want to use a separate power supply, you must change the position of the power jumper inside the C-Print. To do this, remove the four screws that hold the module housing together, and move the jumper cap over to the J2 side of the three-pin contact. This minor modification is necessary only for Epson, BMC, and other printers that don't supply 5 volts at pin 18, or whenever you want to use an external power source.

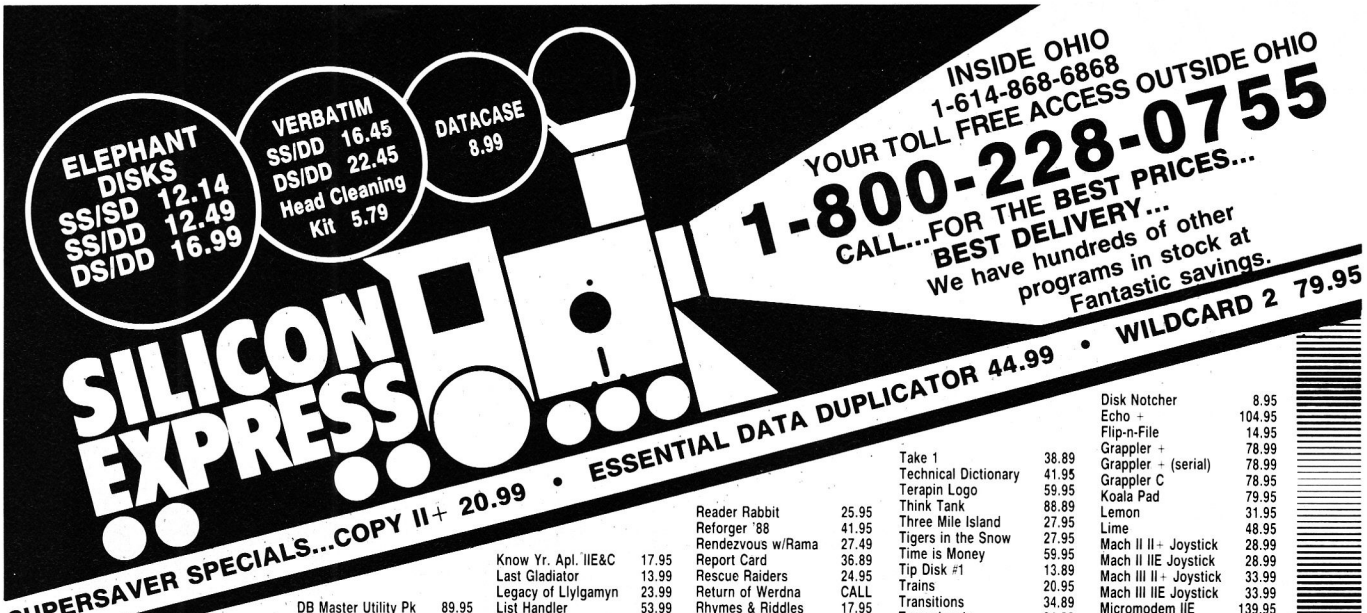
The MW-100 C-Print uses the standard printer default (PR#1) and transmits data at 9600 baud with standard DTR handshaking, which eliminates data loss. The C-Print is intended primarily for text applications, however, and may not function properly (or at all) for certain graphics applications.

There are no optional settings or switches with which to contend, since the interface emulates Imagewriter's text mode. To use C-Print, plug one end into the //c and the other end into the printer.

The documentation lists a couple of short printer test programs that let you verify proper operation of the interface. The C-Print worked perfectly during testing with word-processing software and for listing BASIC programs. As expected, I encountered some problems when trying to access graphics features. (Micro-W plans to market an intelligent graphics interface, the C-Print+, which will emulate the Imagewriter's graphics capabilities.)

If you use your printer mainly for text processing, the C-Print is a well-designed, economical interface that should serve your purposes admirably.■

Tom Benford
Bricktown, NJ



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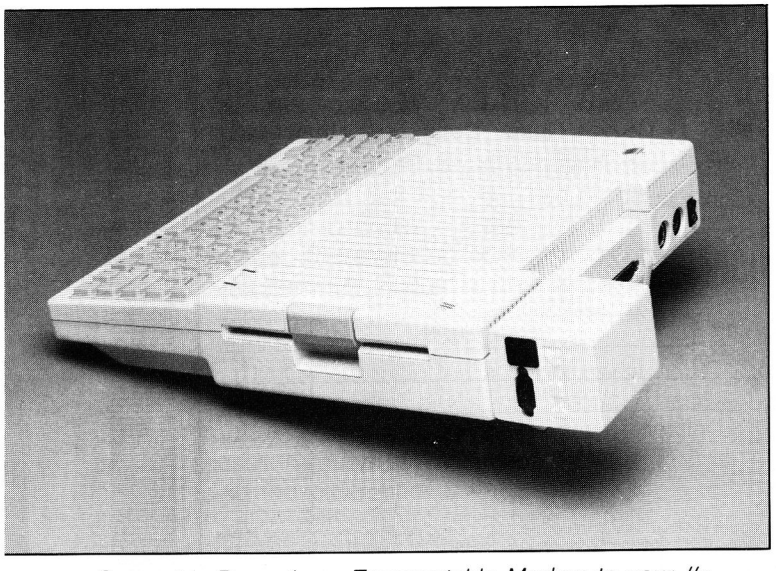
NEW PRODUCTS

edited by Paul Statt

Easy Modem

The **ProModem 300C** uses CMOS technology to drive an intelligent data communications device from the gameport of your //c. The microprocessor provides auto-redial on busy signals, a call-waiting bridge, and a choice between rotary and touch-tone dialing. The ProModem 300C package includes ProCom-A, a ProDOS communication program, but is also command-compatible with the Hayes Smartmodem 300 and most other communications software. The price is only $199 from Prometheus Products, 4545 Cushing Parkway, Fremont, CA 94538, (415) 490-2370. For more information circle number 350 on the Reader Service card.



Connect a Prometheus Transportable Modem to your //c.

Survival School

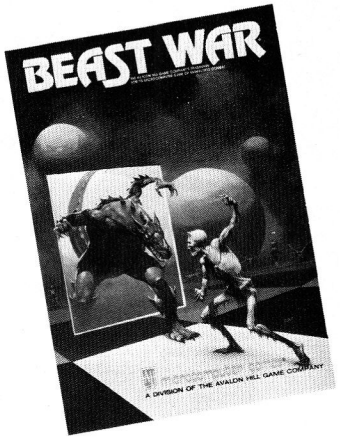
Your plane took a dive into the Sierra Nevadas. You salvage some bread, a warm jacket, and a topographic map from the wreck. **Wilderness: A Survival Adventure**, is the story of your trek to the ranger station on a nearby peak for aid. You'll need to learn real navigation skill and survival techniques. The program and illustrated fieldbook borrow heavily from the USAF Survival School manual. Further survival adventures are planned. A color monitor is not necessary but it helps. Wilderness retails for $50, from Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403, (415) 571-7171. For more information circle number 362 on the Reader Service card.

Quick Pascal

Instant Pascal teaches you the basics of the language without the wait. Instant Pascal is an interpretive language—that means you see program operation at once, without waiting for your Apple to compile the code. Learning is easier when you interact immediately with your program; you won't miss the speed an interpreter sacrifices to a compiler, unless you're writing commercial software. Instant Pascal sells for $140, but schools pay less for packages, from Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014, (408) 996-1010. For more information circle number 480 on the Reader Service card.

Bar and Code

SymbTrak prints and reads bar code with the Apple //e. The system includes a hand-held scanning wand, ROM-based software, a tutorial disk, and complete instructions on applying bar-code technology to your business. You can use either ProDOS or DOS 3.3. The symbol-printing software lets you mix text and bar codes when you use certain printers. The price for a standard SymbTrak unit starts at $495, from Advanced Business Technology, 1180 Coleman Avenue, San Jose, CA 95110, (408) 275-9880. For more information circle number 369 on the Reader Service card.



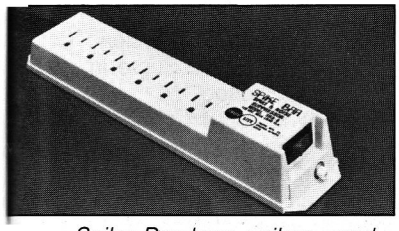
May the Best Beast Win

Beast War combines arcade combat and strategic skills in a single game. Constant conflict—and consuming bloodshed—among the warring tribes in the distant galaxy of Alaxis has led the leaders to develop a violent alternative to battle—the Beast War. You—George Steinbrenner long ago and far away—coach a team of semi-intelligent beasts who compete in proxy tournaments for control of Alaxis. Adventure and action for $25, from Avalon Hill, 4517 Hartford Road, Baltimore, MD 21214, (301) 254-9200. For more information circle number 360 on the Reader Service card.

Product descriptions contained in this section are based on information supplied to us by the respective manufacturers. These announcements are provided solely as a service to our readers and do not constitute endorsement by inCider *of any given product.*

Subliminal Simulation

Silent Service, **Gunship**, and **Aerojet** are three exciting new simulations from MicroProse. Silent Service puts you at the bridge of a submarine in the Pacific in WWII. You'll pilot an AH-64 Apache attack helicopter in Gunship, while Aerojet seats you in the cockpit of a BDJ-5 sport jet. All three simulations sport superb graphics, intelligent, useful manuals, and always the thrill of the real thing. Each voyage costs $34.95 from MicroProse, 120 Lakefront Drive, Hunt Valley, MD 21030, (301) 667-1151. For more information circle number 374 on the Reader Service card.



Spike Bar bars spikes—and surges.

Last Spike

The **Spike Bar** turns a single electrical source into a fully protective spike- and noise-protection device with six outlets. A 6-foot long power line, lighted on/off switch, test lamp, and a 15-amp circuit breaker complete the package. $49.95 from TrippLite, 500 North Orleans, Chicago, IL 60610, (312) 329-1777. For more information circle number 364 on the Reader Service card.

On Track

McBall lets you "drag" your mouse without jamming your finger down on a button. Besides its drag button, the low-cost trackball has a click button that duplicates the mouse's other function. McBall uses less desk space than the everyday mouse. Its unique design gives the handicapped easy Apple access, too. The McBall is available for $89.95 from Interfirm Systems, 110 Pioneer Way, Building H, Mountain View, CA 94041, (415) 964-4464. For more information circle number 351 on the Reader Service card.

It's a Date

Time-Trax for the Apple //c makes good one of the little computer's few failings—lack of an internal clock. Time-Trax includes time-management software that streamlines your schedule. The clock plugs into the //c through its printer or modem port. The //c System Clock is ProDOS-compatible and works with AppleWorks or other ProDOS volumes for automatic time- and date-stamping of files. The Time-Trax sells for $119.95, the //c System Clock for $129.95 from Creative Peripherals Unlimited, 1606 South Clementine, Anaheim, CA 92802, (714) 535-1155. For more information circle number 375 on the Reader Service card.

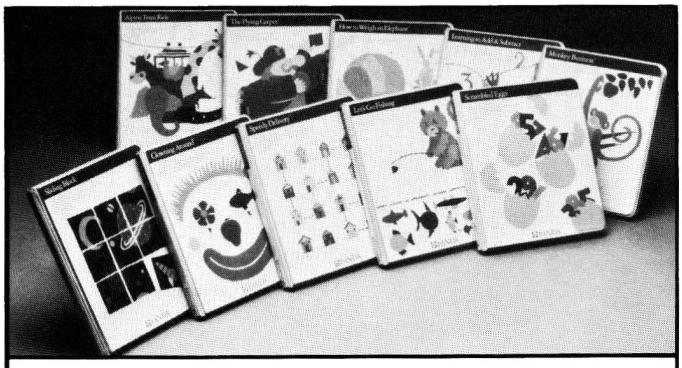
McBall is as handy as a mouse.

Oceanic Utilities

The Cape Cod Convertible rewrites your BASIC code from its Applesoft origin into CP/M, MS-DOS, or PC-DOS. Conversions to True BASIC, TRS-DOS, and Mac BASIC are in the works. In addition to line-by-line conversion, The Cape Cod Convertible makes program analysis and debugging possible for programmers of limited experience. You can also accomplish mass conversions—a boon for developers. A one-way trip costs $150, a round-trip ticket $225, from Cape Cod Software, P.O. Box 654, Eastham, MA 02651, (617) 255-9537. For more information circle number 363 on the Reader Service card.

Local Mail

The **Bank Street Mailer** is a complete correspondence system that includes a mailing-list data base, a letter-writing program, and full mail-merge capability. It's compatible with the Bank Street Writer, Filer, and Speller. Envelopes and mailing labels are easy to print, and if you write only rarely, the built-in word processor will have all the power you need. An on-screen calculator is available too. Homes, schools, and small businesses will all want the Bank Street Mailer, for $69.95, from Broderbund Software, 17 Paul Drive, San Rafael, CA 94903, (415) 479-1170. For more information circle number 368 on the Reader Service card.



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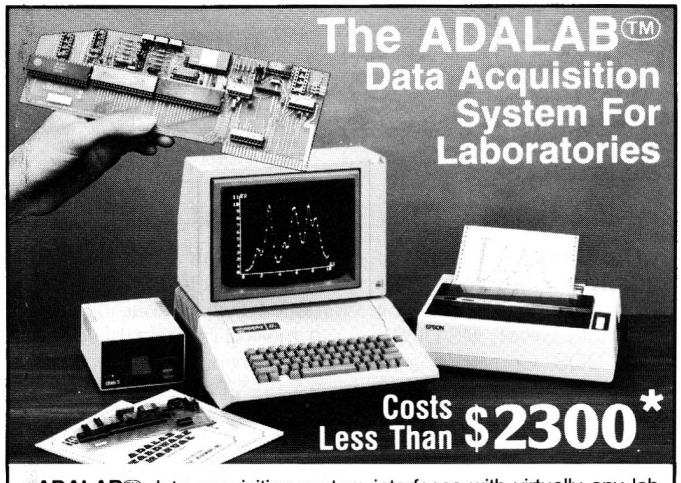

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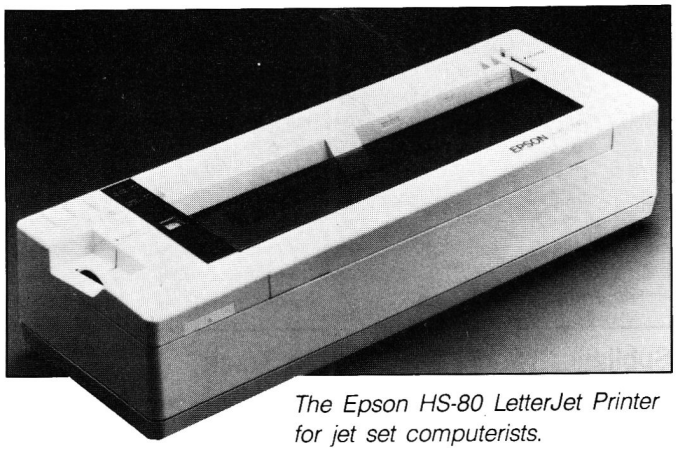

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Epson manufactures a low-priced portable ink-jet printer, the **HS-80 LetterJet**. The LetterJet races at 160 characters per second in the draft mode and approaches letter quality at 32 unidirectional cps. Nonimpact ink-jet printing technology ensures crisp, professional-looking documents without the drone and vibration caused by impact dot-matrix printers. The tiny LetterJet measures 13.7 by 4.8 by 3.2 inches and uses built-in rechargeable nicad batteries for easy traveling. The four-pound HS-80 LetterJet comes with a one-year warranty for $449 from Epson America Computer Products, 2780 Lomita Boulevard, Torrance, CA 90505, (213) 539-9140. For more information circle number 355 on the Reader Service card.

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Let's Talk operates your Apple while you're away and serves as a sophisticated answering machine and information center. You can set up a micro version of Dialog or CompuServe in your office, school, or home. What goes on-line is up to you. Let's Talk provides electronic mail—your correspondents can thumb through your catalogs or place an order. They can send files to you or receive messages with simple key commands. The password option keeps your mail a secret. Let's Talk sells for $125 from Russ Systems, 320 Dufour, Santa Cruz, CA 95060, (408) 427-1540. If you have a modem, your //e or //c can bring you a free demonstration at (408) 427-0310. For more information circle number 365 on the Reader Service card.

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The Epson **FX-85** and **FX-185** dot-matrix printers offer a choice to business-people who want print-speed for drafts as well as quality for letters. The new printers create 9 by 9 dot-matrix characters, feature logic-seeking bidirectional printing, and make 96 ASCII and 11 international character sets. Horizontal and vertical tabulation are standard. All kinds of characters are possible, as are accurate graphics. The FX-85 sells for $499, the 136-column FX-185 for $699 from Epson America Computer Products, 2780 Lomita Boulevard, Torrance, CA 90505, (213) 539-9140. For more information circle number 353 on the Reader Service card.

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Epson FX printers can produce near letter-quality work with **LetterWriter**. The NLQ mode offers four times the resolution of standard printing for finer character printing and no visible dots. You enter the enhanced mode simply by tapping the printer panel buttons. In Apple mode the FX printer will accept graphics and control codes for //c software like MousePaint. The LetterWriter replacement ROMs for FX-80 and FX-100 printers sell for $79.95 from Dresselhaus Computer Products, 837 East Alosta Avenue, Glendora, CA 91740, (818) 914-5831. For more information circle number 352 on the Reader Service card.

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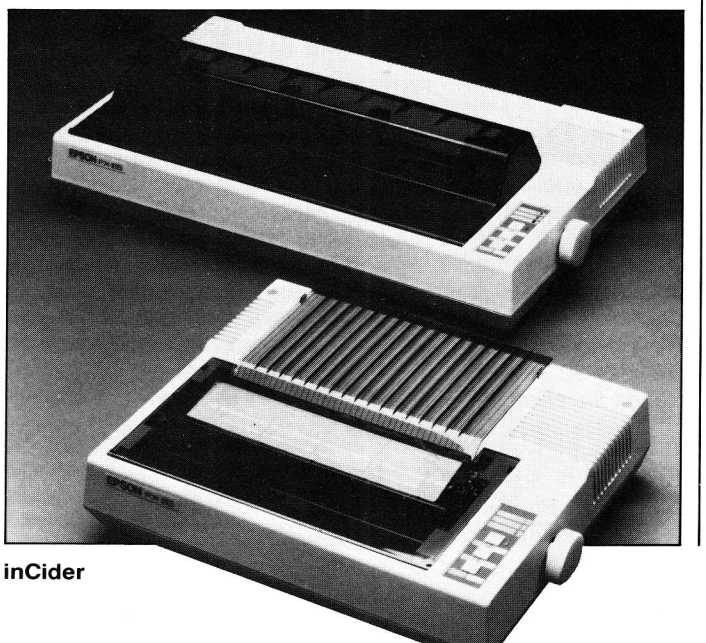

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MouseFont adds 12 94-character typesets to the five that came with MousePaint. MouseFont's Font and Icon Editor lets you design and install custom typefaces, if you don't find your favorite among "Midget," the world's smallest typeface, "Down," for sideways labelling, "Icons," for pictures, and more. Eighty fancy fonts dress up graphics. All MouseFont fonts are accessible from MousePaint's fonts menu. MouseFont retails for $34.95 from Ahware, 805 Luz Court, Danville, CA 94526, (415) 837-7346. For more information circle number 375 on the Reader Service card.

Product Updates

—Mouse Systems has dropped the price of the A+ Mouse from $150 to $99.

—You can now play The Learning Company's popular preschool game, Reader Rabbit, on Koala's Muppet Learning Keys.

—Mockingboard users can take advantage of a new Speech Development System ($39.95), Foreign Language Rule Tables ($24.95), and a Developer's Toolkit ($29.95).

—Terrapin offers Enhanced Logo 3.0, a version of its language that runs on both 64K and 128K machines. Updates for versions 1.3 and 2.0 are available.

—FingerPrint Plus ($149) provides 30 new commands for existing FingerPrint hardware.

—Five-dollar rebates go to buyers of Screenplay and Brown Bag Software, such as Asylum, Professional Blackjack, Caesar's Guide to Gaming, Trivia Arcade, and The Brown Bag Integrated Word Processor and Database.

—Broderbund responds to heavy demand with the Print Shop Graphics Library, Disk Two—200 images and pictures for $24.95.

—Newsroom newspeople will be clipping from Springboard's Clip Art Collection, Volume I ($29.95).

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BEGINNER'S PAGE

The purpose of this page is to help beginners type in and enjoy the programs *inCider* publishes. You must have an Apple II, II Plus, //e, or //c with one disk drive and either DOS 3.3 or ProDOS, and a blank, 5¼-inch disk.

CREATING A BASIC PROGRAMS DISK

Before you begin, you must prepare a disk on which to save your programs. This process is called *formatting*. Follow the specific instructions below for your computer-operating system combination. In addition, ProDOS requires you to copy two files to create a start-up disk.

ProDOS, version 1.0.2—Apple //c

1) Put your System Utilities disk into the internal drive, and turn on your computer.
2) When the main System Utilities menu appears, type 6 and hit the return key.
3) At each of the next two menus, type 1 and hit the return key.
4) Accept the default volume name by pressing the return key.
5) Remove the System Utilities disk and insert the blank, unformatted disk. Then press the return key.
6) When the message "Formatting. . . Done!" appears, hit the escape key.

Now copy PRODOS and BASIC.SYSTEM onto your formatted disk.

7) Type 1 and hit the return key. (Do this three times.)
8) Remove your programs disk and insert the System Utilities disk. Then type S and hit the return key.
9) Press the down-arrow key until PRODOS is highlighted. Then hit the right-arrow key.
10) Hit the down-arrow key until the brackets surround the words BASIC.SYSTEM. Hit the right-arrow key, then the return key.
11) When prompted, remove the System Utilities disk (the source disk) and insert your programs disk (the destination disk). Then hit the return key.
12) Switch disks twice more when prompted, and press the return key each time. The message "Copying PRODOS. . . Done!" will appear, followed by "Copying BASIC.SYSTEM. . . ."
13) Switch disks twice more when prompted, and press the return key each time.
14) When copying is done, label the disk "*inCider* programs disk #1."

Note: You can avoid disk swapping if you have an external drive. See page 20 of the *System Utilities Manual* for that method.

ProDOS, version 1.0.1—Apple //e or II Plus with 64K RAM

1) Insert the ProDOS User's Disk into drive 1 and turn on your computer.
2) At the first menu, hit the F key. At each of the next two menus tap the V and F keys, respectively. Press the return key twice.
3) Remove the User's Disk, insert a blank, unformatted disk, and hit the return key.
4) When formatting is complete, hit the escape key twice.

You now have to copy PRODOS and BASIC.SYSTEM onto your formatted disk.

5) At the Filer menu, hit the F key, then the C key.
6) Type PRODOS; then type /BLANK00/PRODOS, hitting the return key each time.
7) Remove your formatted programs disk (the destination disk), insert the User's Disk (the source disk), and hit the return key.
8) At the prompt, switch disks and hit the return key.

Note: On a two-drive system, drive 2 spins before the prompt appears. To use drives in the copying process, see page 80 of the *ProDOS User's Manual*.

9) When "Copy Complete" appears, type BASIC.SYSTEM and /BLANK00/BASIC .SYSTEM, hitting the return key after each.
10) Switch disks twice more, and hit the return key each time.
11) When copying is complete, label the disk "*inCider* programs disk #1."

DOS 3.3—Apple II Series

1) Insert the System Master disk into drive 1 and turn on your computer.
2) At the Applesoft prompt], type NEW, then 10 HOME; hit the return key after each.
3) Remove the System Master disk, insert a blank, unformatted disk, and type INIT HELLO. Then press the return key.
4) When the cursor appears, label the disk "*inCider* programs disk #1."

TYPING IN PROGRAMS

Follow these general guidelines to type in **Applesoft BASIC programs**:

- Put your programs disk into drive 1 (the internal drive on the //c) and turn on your computer. When the Applesoft prompt] appears, type NEW (to clear memory) and press the return key.
- Type the line number and the rest of the line exactly as they appear in the magazine. Lines longer than the width of the screen display automatically jump to the next line. Once you have entered the entire program line, hit the return key. Do this for each line.
- Save the program to disk—even before you run it—so you won't accidentally lose it. Type SAVE *file name* (file name is the program's name) and press the return key.
- Now type RUN. A syntax error indicates a typing error. The simplest way to correct it is to retype the entire line. The computer automatically replaces the old line with the new one.
- Save the error-free program.

Many programs in *inCider* use **machine-language routines** and **shape tables**, which consist of hexadecimal RAM addresses followed by the hex code (E500—A9 04 30 65 FA 8C 1B 09, for example). To type them in, follow the guidelines below:

- Turn on your computer with your programs disk in drive 1. When the Applesoft prompt] appears, type CALL -151 (use a minus sign) and hit the return key. An *, the monitor prompt, replaces the].
- Type in the first address of the program (the first four characters in the listing), followed by a colon (*not* the minus sign) and the hex numbers. See the example below:

```
E500:A9 04 30 65 FA 8C AB 09
```

Then hit the return key.

- For subsequent lines, just type a colon and the hex bytes, and press the return key.
- To check your typing before you save the listing, type in the starting address and hit the return key twice. This displays the first line. Additional lines appear each time you press the return key. To change a line, just retype it using the address and a colon.
- When the listing is correct, type 3D0G and hit the return key. Type BSAVE *file name*,Aa,Ll (a is the starting address, l the length). A $ should precede hex values. The address and length parameters are always published with the program.

Now you can type in *inCider*'s programs. Consult your manual for more detailed information.■

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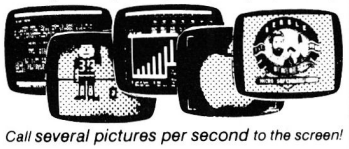

Call several pictures per second to the screen!

```
10 PRINT CHR$(21): COLOR=2:
   FOR X=0 TO 39 STEP 2: FOR Y=1
   TO 47 STEP 2: Z=Z=0: PLOT
   X+Z,Y: NEXT Y,X
20 POKE 37,255
```

GOSUB 94

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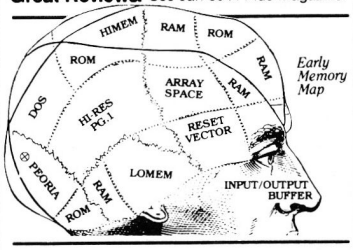

Early Memory Map

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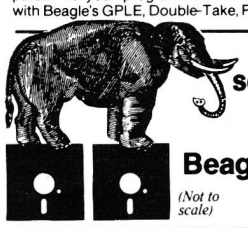

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```
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1 FOR X=1 TO 15
2 S=PEEK(49200+00000): NEXT
3 N=INT(RND(1)*5)+48
4 POKE 2075,N: POKE 2081,100-N
5 VTAB 9: LIST 1-2: GOTO 1
```

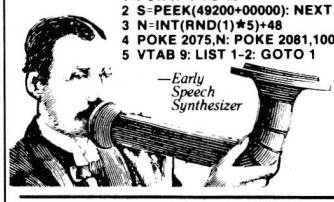

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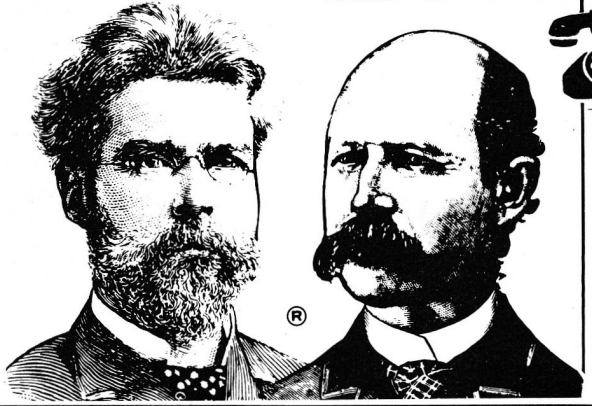

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Getting into Shapes

Listings 1 and 2. Text on p. 24.

Listing 1. TABLE.CREATOR.

```
10 REM THIS PROGRAM CREATES DEMO.SHAPES
20 FOR N = 0 TO 1441: READ P: POKE 36865 + N,P: NEXT
30 DATA 14,0,30,0,63,1,114,1,165,1,216,1,123,2,30,3,81,3,132,
   3,67,4,118,4,169,4,220,4,63,5,9,9,9,9,9,9,13,9,9,9,9,17,27,27,
   27,27,27,59,27,27,27,27,27,19,9,9,9,9,9,9
40 DATA 13,9,9,9,9,17,27,27,27,27,27,63,31,27,27,27,27,19,9,9,
   9,9,9,45,41,13,9,9,9,17,27,27,27,27,63,27,59,31,27,27,27,
   19,9,9,9,9,45,9,9,41,13,9,9,17,27,27,27,63,27,27
50 DATA 27,59,31,27,27,19,9,9,9,45,9,9,9,9,41,13,9,17,27,27,63,
   27,27,27,27,27,59,31,27,19,9,45,45,9,9,9,9,9,9,41,45,21,27,
   27,63,27,27,27,27,27,59,31,27,19,9,9,9,45,9,9
60 DATA 9,9,41,13,9,17,27,27,27,63,27,27,27,59,31,27,27,19,9,
   9,9,9,45,9,9,41,13,9,9,17,27,27,27,27,63,27,59,31,27,27,27,
   19,9,9,9,9,9,45,41,13,9,9,9,17,27,27,27,27,27,63
70 DATA 31,27,27,27,27,19,9,9,9,9,9,9,13,9,9,9,9,17,27,27,27,
   27,27,59,27,27,27,27,27,19,9,9,9,9,9,9,13,9,9,9,9,17,27,27,27,
   27,27,59,27,27,27,27,27,19,9,9,9,9,9,9
80 DATA 9,9,9,9,9,17,27,27,27,27,27,27,27,27,27,27,27,27,19,0,9,9,
   9,9,17,27,27,27,27,19,9,41,45,13,17,27,59,63,31,19,9,41,45,
   13,17,27,59,63,31,19,9,41,45,13,17,27,59,63,31,19,9
90 DATA 41,45,13,17,27,59,63,31,19,0,9,9,9,9,17,27,27,27,27,27,
   19,9,9,9,45,53,63,63,27,27,19,9,9,41,45,21,59,63,31,27,19,9,
   9,45,45,17,27,63,63,27,19,9,41,45,13,17,27,59,63,31,19
100 DATA 0,9,9,9,9,17,27,27,27,27,19,45,45,9,9,17,27,27,27,63,
   55,41,45,13,9,17,27,27,59,63,23,9,45,45,9,17,27,27,63,63,
   19,9,41,45,13,17,27,59,63,31,19,0,9,9,9,9,9,9,9,9
110 DATA 17,27,27,27,27,27,27,27,27,19,9,9,9,9,9,9,9,17,27,
   27,27,27,27,27,27,27,19,13,9,9,9,9,9,9,9,17,27,27,27,27,27,
   27,27,27,55,41,13,9,9,9,9,9,9,17,27,27,27,27,27
120 DATA 27,27,63,19,9,41,13,9,9,9,9,9,17,27,27,27,27,27,27,63,
   31,19,9,41,41,13,9,9,9,9,17,27,27,27,27,27,63,27,31,19,9,41,
   9,41,13,9,41,45,17,59,31,63,27,63,27,27,31,19,9,41
130 DATA 45,45,45,45,45,45,53,27,27,27,27,27,27,27,63,19,41,
   13,9,9,9,9,9,9,17,27,27,27,27,27,27,27,27,55,0,9,9,9,9,9,
   9,9,9,17,27,27,27,27,27,27,27,19,9,9,9,9,9,9,9
140 DATA 9,17,27,27,27,27,27,27,27,27,27,19,9,9,9,9,9,9,9,9,17,27,
   27,27,27,27,27,27,27,19,9,9,9,9,9,9,9,9,17,27,27,27,27,27,27,
   27,27,19,9,9,9,9,9,9,9,9,17,27,27,27,27
150 DATA 27,27,27,27,19,9,9,9,9,9,9,9,17,63,63,27,27,27,27,
   27,27,19,9,9,9,9,9,9,41,45,21,27,63,63,27,27,27,27,27,19,9,
   9,9,9,9,41,45,13,17,27,27,63,63,27,27,27,27,19,9
160 DATA 9,45,9,41,45,13,9,17,27,27,27,63,63,63,63,31,19,0,9,
   9,9,9,17,27,27,27,27,19,9,9,9,9,17,27,27,27,27,19,9,9,9,9,17,
   27,27,27,27,19,9,9,9,9,9,17,27,59,31,27,19,9,41
170 DATA 45,9,17,27,59,31,27,19,0,9,9,9,9,17,27,27,27,27,19,
   9,9,9,9,17,27,27,27,27,19,9,9,9,9,17,27,27,27,27,19,9,9,9,
   9,17,27,27,59,31,19,9,9,45,13,17,27,27,59,31,19,0
180 DATA 45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,
   45,53,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,
   55,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,53,
   63,63,63
190 DATA 63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,55,
   45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,45,53,
   63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,55,
   45,45,45,45,45,45
200 DATA 45,45,45,45,45,45,45,45,45,45,45,53,63,63,63,
   63,63,63,63,63,63,63,63,63,63,63,63,63,63,63,55,45,45,45,
   45,45,45,45,45,45,45,45,45,45,45,45,45,45,53,63,63,63,
   63,63,63,63,63,63
210 DATA 63,63,63,63,63,63,63,63,63,55,0,9,9,9,9,17,27,27,27,
   27,19,9,9,9,9,17,27,27,27,27,27,19,9,9,13,9,17,27,27,31,31,19,
   9,13,9,13,17,27,27,31,31,19,9,9,13,9,17,27,27,27,27
220 DATA 19,0,9,9,9,9,9,17,27,27,27,27,19,9,9,9,9,9,17,63,63,27,
   27,19,9,9,41,45,53,63,63,63,27,19,9,41,45,45,53,63,63,63,
   31,19,9,41,45,13,17,27,59,63,31,19,0,9,9,9,9,9,17,27,27
230 DATA 27,27,19,9,9,9,9,9,17,27,27,27,63,55,45,45,13,9,17,27,
   27,63,63,55,45,45,45,13,17,27,59,63,63,55,9,41,45,13,17,27,
   59,63,31,19,0,9,9,9,9,9,9,9,17,27,27,27,27,27,19,9,9
240 DATA 41,13,13,9,21,27,27,27,27,27,27,27,19,9,41,9,9,9,13,17,
   27,27,31,27,59,27,19,9,9,41,45,13,9,17,27,27,59,63,31,27,19,
   41,9,41,45,13,9,17,27,27,59,63,31,27,19,9,9,13,9,41,9
250 DATA 21,27,59,27,27,27,31,19,9,9,9,13,9,9,17,27,27,27,27,
   27,27,19,0,9,9,41,9,9,9,17,31,27,27,27,63,27,19,9,13,9,9,9,
   9,17,27,27,27,27,27,59,19,41,13,9,9,41,13,17,27,27
260 DATA 31,27,27,27,19,9,9,9,9,41,45,17,27,27,27,27,27,27,19,
   9,41,45,9,9,9,17,27,31,27,27,27,27,19,41,9,9,9,9,41,17,27,27,
   27,27,27,59,23,9,9,9,9,45,9,49,27,27,27,27,27,27
270 DATA 19,0
280 PRINT CHR$ (4)"BSAVE DEMO.SHAPES,A36865,L1442"
```

Listing 2. CHICKEN.LITTLE.

```
10  PRINT CHR$ (4);"BLOAD DEMO.SHAPES,A36865"
20  HIMEM: 36864
30  LOMEM: 16384
40  POKE 232, PEEK (43634) : REM USING PRODOS - 40
    POKE 232, PEEK(48825)
50  POKE 233, PEEK (43635) : REM USING PRODOS - 50
    POKE 233, PEEK(48826)
60  HOME
70  HGR : SCALE = 1
80  HCOLOR = 3
90  FOR X = 0 TO 279 STEP 30
100  DRAW 9 AT X,150
110  NEXT
120  DRAW 9 AT 120,140
130 X = 135
140 Y = 130
150 P = 2
160  DRAW P AT X,Y
200 XX = INT ( RND (1) * 270): IF XX < 15 OR XX > 265
    THEN 200
210  FOR YY = 0 TO 140 STEP 15
220  DRAW 1 AT XX,YY
230 KB = 0:F = FRE (0)
240  GOTO 500
250  GOSUB 1000
260  XDRAW 1 AT XX,YY
270  NEXT
280  GOTO 5000
500 K = PEEK (49152)
510  IF K > 127 THEN KB = K - 128: POKE 49168,0:
    GOTO 250
520 KB = 0: GOTO 250
1000  IF KB = 8 AND P = 11 THEN XDRAW P AT X,Y:P = 3:
    DRAW P AT X,Y: RETURN
1010  IF KB = 8 AND P = 3 THEN XDRAW P AT X,Y:P = 2:
    DRAW P AT X,Y: RETURN
1020  IF KB = 8 AND P = 2 THEN XDRAW P AT X,Y:P = 4:
    DRAW P AT X,Y: RETURN
1030  IF KB = 8 AND P = 4 THEN XDRAW P AT X,Y:P = 12:
    DRAW P AT X,Y: RETURN
1040  IF KB = 21 AND P = 12 THEN XDRAW P AT X,Y:P =
    4: DRAW P AT X,Y: RETURN
1050  IF KB = 21 AND P = 4 THEN XDRAW P AT X,Y:P = 2:
    DRAW P AT X,Y: RETURN
1060  IF KB = 21 AND P = 2 THEN XDRAW P AT X,Y:P = 3:
    DRAW P AT X,Y: RETURN
1070  IF KB = 21 AND P = 3 THEN XDRAW P AT X,Y:P =
    11: DRAW P AT X,Y: RETURN
1080  IF KB = 32 THEN GOSUB 2000: RETURN
1090  RETURN
2000  IF P = 2 THEN 2100
2010  IF P = 3 THEN 2200
2020  IF P = 4 THEN 2300
2030  IF P = 11 THEN 2400
2040  IF P = 12 THEN 2500
2100  FOR SY = 120 TO 0 STEP - 20
2110  DRAW 10 AT 135,SY
2120 Z1 = ABS (XX - 135):Z2 = ABS (SY - YY): IF Z1 < 10
    AND Z2 < 10 THEN XDRAW 10 AT 135,SY: GOTO 4000
2130  XDRAW 10 AT 135,SY
2140  NEXT : RETURN
2200 T = 1
2210  FOR SY = 115 TO 0 STEP - 20
2220  DRAW 10 AT 140 * T,SY
2230  Z1 = ABS (140 * T - XX):Z2 = ABS (SY - YY):
    IF Z1 < 10 AND Z2 < 10 THEN XDRAW 10 AT 140 *
    T,SY: GOTO 4000
```

Listing continued.

Listing continued.

```
2240  XDRAW 10 AT 140 * T,SY
2250 T = T * 1.1
2260  NEXT : RETURN
2300  FOR SY = 120 TO 0 STEP - 20
2310  DRAW 10 AT (SY * 1.1),SY
2320 Z1 = ABS (SY * 1.1 - XX):Z2 = ABS (SY - YY):
     IF Z1 < 10 AND Z2 < 10 THEN XDRAW 10 AT SY *
     1.1,SY: GOTO 4000
2330  XDRAW 10 AT (SY * 1.1),SY
2340  NEXT : RETURN
2400  FOR SX = 145 TO 270 STEP 20
2410  DRAW 10 AT SX,120
2420 Z1 = ABS (SX - XX):Z2 = ABS (120 - YY):
     IF Z1 < 10 AND Z2 < 10 THEN XDRAW 10 AT SX,120:
     GOTO 4000
2430  XDRAW 10 AT SX,120
2440  NEXT : RETURN
2500  FOR SX = 125 TO 0 STEP - 20
2510  DRAW 10 AT SX,120
2520 Z1 = ABS (SX - XX):Z2 = ABS (120 - YY):
     IF Z1 < 10 AND Z2 < 10 THEN XDRAW 10 AT SX,120:
     GOTO 4000
2530  XDRAW 10 AT SX,120
2540  NEXT : RETURN
4000  XDRAW 1 AT XX,YY
4010 SC = SC + 140 - YY
4020  VTAB 22: PRINT "SCORE: ";SC
4030  FOR QQ = 1 TO 200: NEXT
4040  POP : POP : GOTO 200
5000  DRAW 13 AT X,Y
5010  FOR QQ = 1 TO 300: NEXT
5020  DRAW 14 AT X,Y
5030  FOR QQ = 1 TO 300: NEXT
5040  VTAB 22: PRINT "YOUR FINAL SCORE IS: ";SC
```

End of listing.

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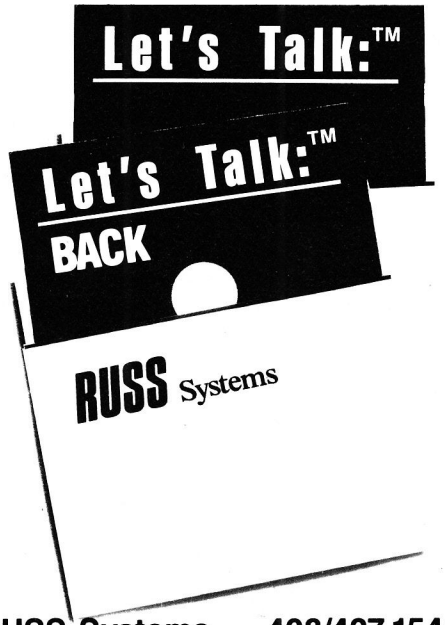

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Master of the Game

Program listing. Text on p. 34.

Program listing. *MENACE.*

```
program menace;
(* A program to play tic-tac-toe. This program begins completely
   ignorant of the game and uses matchbox learning to improve its
   play from observation of its experience. *)

uses applestuff;

type
  chrset = set of char;        (* Acceptable keyboard responses *)
  gameboard = array[1..3,1..3] of char; (* Tic-tac-toe board. *)
  gamestatus = (play,win,lose,draw);
  (* Status at various points in game *)
  ptrnptr = ^pattern;
  memory = record        (* Stores one move of the game *)
             ptrnplay:ptrnptr;
             (* Points to the pattern encountered *)
             move:array[1..2] of 1..3
             (* in play. Row and column played. *)
           end;
  pattern = record        (* Pattern stored in the linked list. *)
              position:gameboard;
              (* Game board pattern. Weights of *)
              weight:packed array[1..3,1..3] of integer;
              (* each move in the *)
              nxtptrn:ptrnptr     (* pattern. Pointer to the next *)
            end;        (* pattern. *)

var
  valid:chrset;        (* Set of acceptable keystrokes for getkey. *)
  status:gamestatus;        (* Stores game status. *)
  pointer1,pointer2,pointer3:ptrnptr; (* Pointers to the three lists. *)
  patterncount:packed array[1..3] of 0..255; (* Counts patterns
  stored. *)
  board:gameboard;        (* Stores current game position. *)
  firstplay:integer;        (* Stores the first play. *)
  firstmove:array[1..3] of integer;
  (* Weights assigned to first moves. *)
  history:array[1..3] of memory;
  (* Patterns and moves of current game. *)
  games,wins,losses,draws:integer;

procedure initmenace;
  (* Initialize values and output screen before *)
var        (* the first game begins. *)
  i,j:integer;
begin (* initmenace *)
  randomize;
  games: = 0;
  wins: = 0;
  losses: = 0;
  draws: = 0;
  for i: = 1 to 3 do begin
    patterncount[i]: = 0;
    firstmove[i]: = 4
  end;
  pointer1: = nil;
  (* Pointers to the three linked lists. Initially *)
  pointer2: = nil;        (* the three lists are empty. *)
  pointer3: = nil;
  page(output);
  writeln('Watchit! Here comes MENACE!');
  gotoxy(15,10);write('Board');
  gotoxy(15,11);write(' ! ! '); (* Place the game board on the crt. *)
  gotoxy(15,12);write('-----');
  gotoxy(15,13);write(' ! ! ');
  gotoxy(15,14);write('-----');
  gotoxy(15,15);write(' ! ! ');

(* GOTOXY(44,10);WRITE('Pattern                    Rotate/Reflect');
   GOTOXY(45,11);WRITE(' ! !                                ! ! ');
   GOTOXY(45,12);WRITE('-----                               ----- ');
   GOTOXY(45,13);WRITE(' ! !                                ! ! ');
   GOTOXY(45,14);WRITE('-----                               ----- ');
   GOTOXY(45,15);WRITE(' ! !                                ! ! '); *)

  gotoxy(5,20);write('Patterns, level 3:',patterncount[1]:3);
  gotoxy(5,21);write('Patterns, level 5:',patterncount[2]:3);
  gotoxy(5,22);write('Patterns, level 7:',patterncount[3]:3);
  gotoxy(5,23);write('Remaining memory: ',memavail:5)
end; (* initmenace *)

procedure writemove(row,col:integer;ch:char);
(* Write the character in the *)
begin (* writemove *)        (* row and column of the crt display. *)
  gotoxy(13 + 2*col,9 + 2*row);write(ch);
  board[row,col]: = ch
end; (* writemove *)

procedure initboard;
(* Initialize values at the beginning of each game. *)
var
  i,j:integer;
begin  (* initboard *)
  games: = games + 1;
  gotoxy(5,5);write('Game number:      ',games:3);
  gotoxy(5,6);write('Wins:             ',wins:3);
  gotoxy(5,7);write('Losses:           ',losses:3);
  gotoxy(5,8);write('Draws:            ',draws:3);
  status: = play;
  for i: = 1 to 3 do begin
    history[i].ptrnplay: = nil;
    for j: = 1 to 3 do begin
      board[i,j]: = ' ';
      writemove(i,j,' ')
    end
  end
end; (* initboard *)

function rndchoice(maxval:integer):integer;
(* Generate a random integer *)
var temp,rand:integer;
begin (* rndchoice *)                (* between 1 and maxval. *)
  temp: = (32767 div maxval) + 1;
  repeat
    rand: = random div temp
  until rand < maxval;
  rndchoice: = rand + 1
end; (* rndchoice *)

function getkey(valid:chrset):char;
(* Read a character contained in the *)
var            (* set valid from the keyboard. *)
  ch:char;
begin (* getkey *)
  repeat
    if keypress then read(keyboard,ch)
  until ch in valid;
  getkey: = ch
end; (* getkey *)

(* Delay loop to slow up the column 41 to 80 display.
   For a slow display, change the loop to FOR I: = 1 TO 250 DO *)
(*
PROCEDURE WAIT;
VAR
  I:INTEGER;
BEGIN
  FOR I: = 1 TO 5 DO
END;
*)

function won:boolean;  (* returns true if any column, row or
diagonal *)
var                    (* is filled with identical non-blank characters. *)
  i:integer;
  temp,wontest:boolean;
begin (* won *)
```

Listing continued.

Listing continued.

```
(* GOTOXY(40,0);WRITE('ENTERING WON.          .');
   WAIT; *)
  wontest: = false;
  for i: = 1 to 3 do begin      (* Test each row. *)
    temp: = (board[i,1] = board[i,2]) and (board[i,2] = board[i,3]);
    wontest: = wontest or ((board[i,1] < > ' ') and temp)
  end;
  for i: = 1 to 3 do begin      (* Test each column. *)
    temp: = (board[1,i] = board[2,i]) and (board[2,i] = board[3,i]);
    wontest: = wontest or ((board[1,i] < > ' ') and temp)
  end;
  (* Test the diagonals. *)
  temp: = (board[1,1] = board[2,2]) and (board[2,2] = board[3,3]);
  wontest: = wontest or ((board[2,2] < > ' ') and temp);
  temp: = (board[1,3] = board[2,2]) and (board[2,2] = board[3,1]);
  won: = wontest or ((board[2,2] < > ' ') and temp)
end; (* won *)

function done:boolean; (* Interrogates user for end of game. *)
var
  valid:set of char;
  answer:char;
begin (* done *)
  gotoxy(10,17);writeln('Press space to continue,          ');
  gotoxy(10,18);writeln('press Q to quit.          ');
  valid: = [' ','q','Q'];
  answer: = getkey(valid);
  if answer < > ' ' then done: = true else done: = false;
  gotoxy(10,17);writeln('                          ');
  gotoxy(10,18);writeln('                          ');
end; (* done *)

(*
PROCEDURE WRITEB(FLAG:BOOLEAN);
BEGIN
  IF FLAG THEN WRITE('True. ')
  ELSE WRITE('False.');
END;
*)

procedure searchpattern(var srchptr:ptrnptr;level:integer);
var      (* Search the list indicated by srchptr for a match. *)
  rotate:0..3;    (* Number of 90 degree rotations of the pattern. *)
  tempch:char;
  lastptr:ptrnptr;
  mirror,finished,temp:boolean;
function match(aboard:gameboard;var rotate:integer;var mirror:boolean):boolean;
var      (* Rotate and reflect the pattern in memory to see *)
  i,j:integer;          (* if it matches the current position. *)
begin

(* GOTOXY(40,0);WRITE('ENTERING MATCH.          ');
   WAIT; *)

  mirror: = false;

(* IF (rotate = 0) and (not mirror) THEN
     FOR i: = 1 TO 3 DO
       FOR j: = 1 TO 3 DO BEGIN
         GOTOXY(43 + 2*j,9 + 2*i);WRITE(aboard[i,j]);
       END;
  GOTOXY(40,6);WRITE('Rotated ',90*rotate:3,' degrees. Image: ');
  WRITEB(mirror);GOTOXY(40,7);WRITE('Match: '); *)

  temp: = true;
  for i: = 1 to 3 do      (* Compare pattern in memory to current
  position. *)
    for j: = 1 to 3 do (* BEGIN *)
      temp: = temp and (board[i,j] = aboard[i,j]);

    (* GOTOXY(62 + 2*j,9 + 2*i);WRITE(aboard[i,j])
    END;
  GOTOXY(47,7);WRITEB(temp);
  WAIT; *)

  if not temp then begin
    mirror: = true;
    temp: = true;
    for i: = 1 to 3 do      (* Compare reflected pattern to current
    position. *)
      for j: = 1 to 3 do (* BEGIN *)
        temp: = temp and (board[i,j] = aboard[i,4 - j]);

      (* GOTOXY(62 + 2*j,9 + 2*i);WRITE(aboard[i,4 - j])
      END *)

  end;

(* GOTOXY(69,6);WRITEB(mirror);
   GOTOXY(40,7);WRITE('Match: ');WRITEB(temp);
   WAIT; *)

  if not temp and (rotate < 3) then begin
    tempch: = aboard[1,3];      (* Rotate the pattern 90 degrees
    and *)
    aboard[1,3]: = aboard[1,1]; (* try again. *)
    aboard[1,1]: = aboard[3,1];
    aboard[3,1]: = aboard[3,3];
    aboard[3,3]: = tempch;
    tempch: = aboard[1,2];
    aboard[1,2]: = aboard[2,1];
    aboard[2,1]: = aboard[3,2];
    aboard[3,2]: = aboard[2,3];
    aboard[2,3]: = tempch;
    rotate: = rotate + 1;
    temp: = match(aboard,rotate,mirror)
  end;
  match: = temp
end;
procedure newpattern(var srchptr:ptrnptr;level:integer);
var    (* Procedure to generate a new pattern in the list. *)
  i,j,newweight:integer;
  tempptr:ptrnptr;
begin

(* GOTOXY(40,0);WRITE('ENTERING NEWPATTERN.');
   WAIT; *)

  new(tempptr);    (* Generate a new pattern. *)
  tempptr^.nxtptrn: = nil;
  i: = (level - 1) div 2;
  if patterncount[i] = 0 then (* If the list is empty, initialize the *)
    case level of      (* pointers to the first list elements. *)
      3:pointer1: = tempptr;
      5:pointer2: = tempptr;
      7:pointer3: = tempptr;
    end;
  patterncount[i]: = patterncount[i] + 1;
  gotoxy(5,19 + i);write('Patterns, level',level:2,':',patterncount[i]:3);
  if srchptr < > nil then srchptr^.nxtptrn: = tempptr;
  (* If the original *)
  srchptr: = tempptr;      (* list isn't empty, update the list to *)
  for i: = 1 to 3 do    (* include the new pattern. Set srchptr *)
    for j: = 1 to 3 do    (* point to the new pattern. *)
      srchptr^.position[i,j]: = board[i,j]; (* Set the new pattern to *)
  case level of      (* the current game position. *)
    3:newweight: = 3;      (* Set the initial weights for this level. *)
    5:newweight: = 2;
    7:newweight: = 1
  end;
  for i: = 1 to 3 do
    for j: = 1 to 3 do    (* Assign the weight to available moves. *)
      if srchptr^.position[i,j] = ' ' then srchptr^.weight[i,j]: = newweight
        else srchptr^.weight[i,j]: = 0;
  gotoxy(5,23);write('Remaining memory: ',memavail:5)
end;
procedure genmove(srchptr:ptrnptr;rotate:integer;mirror:boolean);
var      (* Generate the move for the pattern indicated by
srchptr. *)
```

Listing continued.

Listing continued.

```
  i,j,k,total,choice:integer;
begin (* genmove *)

(* GOTOXY(40,0);WRITE('ENTERING GENMOVE.      ');
   WAIT; *)

  total:=0;
  for i:=1 to 3 do
    for j:=1 to 3 do (* BEGIN *)
      total:=total+srchptr^.weight[i,j];

    (* GOTOXY(38+3*j,19+i);WRITE(srchptr^.weight[i,j]:3)
    END; *)

  if total=0 then      (* If all possible moves have been rejected, *)
    for i:=1 to 3 do (* reinitialize the weights. *)
      for j:=1 to 3 do
        if board[i,j]=' ' then begin
          srchptr^.weight[i,j]:=1;
          total:=total+1
        end;
  choice:=rndchoice(total);
  (* Generate a random number to determine move. *)

  (* GOTOXY(40,17);WRITE('Total:',total:3,' Choice:',choice:3);
  WAIT; *)

  j:=1;i:=1;
  total:=srchptr^.weight[1,1];
  while total<choice do begin (* Generate the row and column of
  the move *)
    j:=j+1;          (* determined by total and choice. *)
    if j>3 then begin
      j:=1;
      i:=i+1
    end;
    total:=total+srchptr^.weight[i,j];
  end;

  (* GOTOXY(40,18);WRITE('Row:',i:2,' Col.:',j:2);
  WAIT; *)

history[(level-1) div 2].ptrnplay:=srchptr;
(* Update the history to *)
history[(level-1) div 2].move[1]:=i;
(* store the pattern encountered *)
history[(level-1) div 2].move[2]:=j;
(* and the move played. *)
while rotate>0 do begin
  rotate:=rotate-1; (* Rotate the row and column by 90
  degrees *)
  k:=j;          (* for as many times as the original pattern *)
  j:=4-i;        (* was rotated. *)
  i:=k;
end;
if mirror then j:=4-j; (* Generate the mirror image of
the move. *)

  (* GOTOXY(40,19);WRITE('Row:',i:2,' Col.:',j:2);
  WAIT; *)

  writemove(i,j,'X');
end; (* genmove *)
begin (* searchpattern *)

  (* GOTOXY(40,0);WRITE('ENTERING SEARCHPTRN.');
  WAIT; *)

  rotate:=0;
  mirror:=false;
  if srchptr<>nil then begin
    repeat          (* Search the list if it's not empty. *)
      rotate:=0;
      mirror:=false;
      finished:=match(srchptr^.position,rotate,mirror);
      if not finished then begin
        lastptr:=srchptr;          (* Save the last pointer and *)
        srchptr:=srchptr^.nxtptrn (* update srchptr to the next *)
      end;      (* element in the list. *)
    until finished or (srchptr=nil);
    if srchptr=nil then begin
      srchptr:=lastptr;          (* If at the end of the list set *)
      newpattern(srchptr,level); (* srchptr to the last element and *)
      rotate:=0;          (* generate the next element in the *)
      mirror:=false       (* list. *)
    end
  end
  else newpattern(srchptr,level);
  genmove(srchptr,rotate,mirror)
end; (* searchpattern *)

procedure applemove(level:integer);
var
  srchptr:ptrnptr;
  i,j,row,col:integer;
begin (* applemove *)

  (* GOTOXY(40,0);WRITE('ENTERING APPLEMOVE. ');
  WAIT; *)

case level of
  1:begin
    j:=firstmove[1]+firstmove[2]+firstmove[3];
    if j=0 then begin
      j:=3;
      for i:=1 to 3 do
        firstmove[i]:=1     (* Use the weights to generate the *)
    end;        (* first move of the game. *)
    i:=rndchoice(j);
    if i<=firstmove[1] then firstplay:=1 else
      if i<=(firstmove[1]+firstmove[2]) then firstplay:=2 else
        firstplay:=3;
    case firstplay of
      1:begin          (* Play the upper left-hand corner. *)
          row:=1;
          col:=1
        end;
      2:begin          (* Play the center position. *)
          row:=2;
          col:=2
        end;
      3:begin          (* Play the top side. *)
          row:=1;
          col:=2
        end
    end;
    writemove(row,col,'X')
  end;
3:begin          (* Set srchptr at the beginning *)
    srchptr:=pointer1;          (* of the appropriate list and *)
    searchpattern(srchptr,level) (* then begin the pattern
    search. *)
  end;
5:begin
    srchptr:=pointer2;
    searchpattern(srchptr,level)
  end;
7:begin
    srchptr:=pointer3;
    searchpattern(srchptr,level)
  end;
9:begin          (* Find the last empty position to play. *)
    for i:=1 to 3 do
      for j:=1 to 3 do
        if board[i,j]=' ' then begin
          row:=i;
          col:=j
        end;
```

Listing continued.

Listing continued.

```
        writemove(row,col,'X')
      end;
    end;
end; (* applemove *)

procedure humanmove;
const
  leftarrow = 8;
  rightarrow = 21;
var
  answer:char;
  answers:chrset;
  i,j:integer;
procedure lastblank(var row,col:integer);
begin          (* Find the last empty cell in the game board. *)
  repeat
    col: = col - 1;
    if col<1 then begin
      col: = 3;
      row: = row - 1;
      if row<1 then row: = 3
    end
  until board[row,col] = ' '
end;
procedure nextblank(var row,col:integer);
begin        (* Find the next empty cell in the game board. *)
  repeat
    col: = col + 1;
    if col>3 then begin
      col: = 1;
      row: = row + 1;
      if row>3 then row: = 1
    end
  until board[row,col] = ' '
end;
begin (* humanmove *)

  (* GOTOXY(40,0);WRITE('ENTERING HUMANMOVE. ');
  WAIT; *)

  answers: = [' ',chr(leftarrow),chr(rightarrow)];
  i: = 1;
  j: = 1;
  if board[i,j]< >' ' then nextblank(i,j);
  writemove(i,j,' + ');
  repeat
    answer: = getkey(answers);
    if answer = chr(leftarrow) then begin
          writemove(i,j,' ');
          lastblank(i,j);
          writemove(i,j,' + ')
        end
      else if answer = chr(rightarrow) then begin
            writemove(i,j,' ');
            nextblank(i,j);
            writemove(i,j,' + ')
          end
  until answer = ' ';
  writemove(i,j,'O')
end; (* humanmove *)

procedure tictactoe(level:integer);
begin (* tictactoe *)

  (* GOTOXY(40,0);WRITE('ENTERING TICTACTOE. ');
  WAIT;
  GOTOXY(40,5);WRITE('Entering level ',level:2,' of play.'); *)

  applemove(level);
  if won then status: = lose else if level = 9 then status: = draw;
  if status = play then begin
    humanmove;
    if won then status: = win
  end;
  if status = play then tictactoe(level + 2)
end; (* tictactoe *)

procedure update;
var
  moveptr:ptrnptr;
  row,col,i:integer;
procedure procwin;
begin
  wins: = wins + 1;
  gotoxy(5,6);write('Wins:        ',wins:3)
end;
procedure procloss;
begin
  losses: = losses + 1;
  gotoxy(5,7);write('Losses:      ',losses:3)
end;
procedure procdraw;
begin
  draws: = draws + 1;
  gotoxy(5,8);write('Draws:       ',draws:3);
end;
begin (* update *)

  (* GOTOXY(40,0);WRITE('ENTERING UPDATE.      ');
  WAIT; *)

  case status of
        lose:firstmove[firstplay]: = firstmove[firstplay] + 3;
        win:begin
          firstmove[firstplay]: = firstmove[firstplay] - 1;
          if firstmove[firstplay]<0 then firstmove[firstplay]: = 0
        end;
        draw:firstmove[firstplay]: = firstmove[firstplay] + 1
      end;
  for i: = 1 to 3 do begin
    moveptr: = history[i].ptrnplay;
    if moveptr< >nil then begin
      row: = history[i].move[1];
      col: = history[i].move[2];
      case status of
        lose:moveptr^.weight[row,col]: = moveptr^.weight[row,col] + 3;
        win:begin
          moveptr^.weight[row,col]: = moveptr^.weight[row,col] - 1;
          if moveptr^.weight[row,col]<0 then moveptr^.weight[row,col]: = 0
        end;
        draw:moveptr^.weight[row,col]: = moveptr^.weight[row,col] + 1
      end
    end
  end;
  case status of
    win:procwin;
    draw:procdraw;
    lose:procloss;
  end
end;

begin (* menace *)
  initmenace;
  repeat
    initboard;
    tictactoe(1);
    update
  until done; (* repeat *)
end. (* menace *)
```

End of listing.

The Spirit of Adventure

Listings. Text on p. 42.

Listing 1. Sample move subroutine.

```
1000 IF OJ$ = "" THEN GOSUB 10000: REM IN CASE
     DIRECTION NOT GIVEN
1010 OJ$ = LEFT$(OJ$,1)
1020 D% = 0
1030 IF OJ$ = "N" THEN D% = 1
1040 IF OJ$ = "S" THEN D% = 2
1050 IF OJ$ = "E" THEN D% = 3
1060 IF OJ$ = "W" THEN D% = 4
1065 IF OJ$ = "BACK" THEN GOSUB 1200
1070 IF D% = 0 THEN PRINT "I CAN'T GO THAT
     WAY.": RETURN
1080 IF NR%(D%,RM%) = 0 THEN PRINT "THERE IS NO
     PASSAGE THAT WAY.": RETURN
1090 IF NR%(D%,RM%) > 1000 THEN GOSUB 2000:
     REM OBSTACLE CHECKER
1100 IF NR%(D%,RM%) > 1000 THEN RETURN:
     REM OBSTACLE STILL THERE
1110 LR% = RM%: REM TO REMEMBER THE LAST ROOM
1120 RM% = NR%(D%,RM%): REM ASSIGN NEW ROOM
1130 PRINT DE$(RM%): REM ROOM DESCRIPTION
1140 RETURN
1200 FOR I = 1 TO 4: REM SEARCH FOR A PASSAGE BACK
1205 T% = NR%(I,RM%): REM TEMPORARY VARIABLE
     TO HOLD NR%(I,RM%)
1210 IF T% < 1000 GOTO 1250: REM NO OBSTACLE
     THAT WAY
1220 T% = T% - 1000
1230 GOTO 1210: REM TRY AGAIN
1250 IF T% = LR% THEN D% = I: REM YOU FOUND
     A DIRECTION
1260 NEXT I
1270 RETURN: REM TO LINE 1070. D% IS NOW
     DIRECTION BACK.
1275 REM IF D% STILL = 0 THEN NO PASSAGE
     EXISTS. THE MOVE SUBROUTINE
1280 REM WILL RETURN TO MAIN SAYING IT CAN'T GO
     THAT WAY.
```

<< If there are several passages leading "back" to the same room, this will find the one with the highest-numbered direction. >>

Listing 2. A partial obstacle-checking subroutine.

```
2000 IF NR%(D%,RM%) > 2000 GOTO 2100: REM OBSTACLE
     IS NOT A GATE
2010 PRINT "THERE IS A LOCKED GATE THAT WAY. . ."
2020 INPUT "DO YOU WANT TO OPEN IT? ";I$
2030 IF LEFT$(I$,1) = "N" THEN PRINT "CAUTION MAY BE
     WISE. . .": RETURN
2040 IF OL%(3) <> 100 THEN PRINT "YOU DON'T HAVE
     A KEY!": RETURN
```

<< This assumes object 3 is a key. >>

```
2050 PRINT "OKAY."
2060 NR%(D%,RM%) = NR%(D%,RM%) - 1000:
     REM OBSTACLE REMOVED
2065 RETURN: REM TO MOVE SUBROUTINE
2100 IF NR%(D%,RM%) > 3000 GOTO 2200:
     REM OBSTACLE IS NOT MAGIC SPELL
2110 PRINT "THERE IS A MAGIC SPELL BLOCKING
     THAT PASSAGE"
2120 IF OL%(4) = 100 THEN PRINT "WAIT A MINUTE.
     THE RING IS GLOWING!": PRINT "THE SPELL
     DISAPPEARED!": NR%(D%,RM%) = NR%(D%,RM%)
     - 2000
```

<< This assumes object 4 is a ring that will remove the spell. >>

A more general form of line 2120 would be for the first PRINT to be:

PRINT "WAIT A MINUTE. THE ";OB$(4);" IS GLOWING!"

With this form, you could call object 4 anything, not just a ring.

```
2130 RETURN
2200 << Subroutine for the next obstacle. >>
```

Listing 3. Sample drop subroutine.

```
5000 IF OJ$ = "" THEN GOSUB 10000: REM IN CASE
     OBJECT NOT GIVEN
5005 T% = 0
5010 FOR I = 1 TO 20: REM CHECKING ALL 20 OBJECTS
5020 IF OJ$ = OB$(I) AND OL%(I) = 100 THEN T% = I:
     REM YOU OWN IT
5030 NEXT I
5040 IF T% = 0 THEN PRINT "YOU DON'T HAVE
     ANY ";OJ$;".": RETURN
5050 OL%(T%) = RM%: REM PUT THIS OBJECT INTO
     THIS ROOM
5060 RETURN
```

Listing 4. Part of the parser.

```
<< Find VB$ and OJ$. >>
20000 IF CO$ ="" THEN PRINT "WHAT?": RETURN
20005 J = LEN(CO$) + 1: REM IN CASE NO BLANK
      FOUND IN CO$
20010 OJ$ = ""
20015 VB$ = ""
20020 FOR I = 1 TO LEN(CO$)
20025 IF MID$(CO$,I,1) = " " THEN J = I
20030 NEXT I
20040 VB$ = LEFT$(CO$,J - 1)
20045 IF J < LEN(CO$) THEN OJ$ = RIGHT$(CO$,
      LEN(CO$) - J)
<< Look for abbreviations. >>
20050 IF VB$ = "N" THEN VB$ = "MOVE": OJ$ = "N"
20055 IF VB$ = "S" THEN VB$ = "MOVE": OJ$ = "S"
<< etc. >>
20070 IF VB$ = "BACK" OR VB$ = "RETURN" THEN
      VB$ = "MOVE": OJ$ = "BACK"
20075 IF VB$ = "GO" THEN VB$ = "MOVE"
<< Decide what subroutine to call. >>
20200 IF VB$ = "MOVE" THEN GOSUB 1000
20210 IF VB$ = "EAT" THEN GOSUB 3000
20220 IF VB$ = "RUN" THEN GOSUB 4000
20230 IF VB$ = "DROP" THEN GOSUB 5000
20240 IF VB$ = "TAKE" THEN GOSUB 6000
20250 IF VB$ = "QUIT" THEN GOSUB 9000
<< etc. >>
20400 RETURN
```

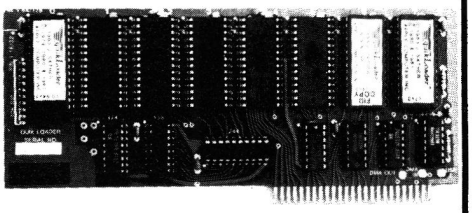
Listing 5. Part of the control structure.

```
100 GOSUB 40000: REM INITIALIZATION
200 PRINT "YOU ARE IN THE ";NM$(RM%);" ROOM.":
    REM START MAIN LOOP
210 INPUT "> ";CO$
220 GOSUB 10000: REM TO THE PARSER
230 IF RM% = 50 << the way out?? >> GOTO 500
<< Any other way to get out of here? >>
240 GOTO 200: REM REPEAT BASIC LOOP
500 << Count points or judge your performance. >>
510 END
```

SCRG PRODUCTS FOR THE APPLE COMPUTER

SOUTHERN CALIFORNIA RESEARCH GROUP

quikLoader™



designed by Jim Sather

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designed by Bob Brice software by Bob Sander-Cederlof

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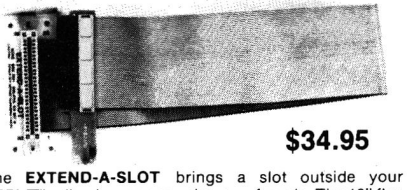

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designed by Joy George

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Paddle-Adapple

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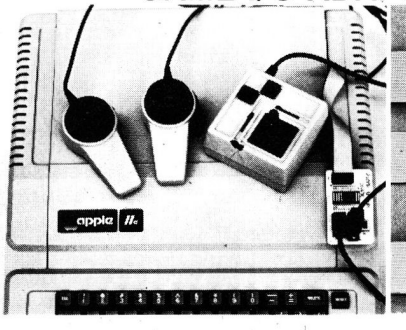

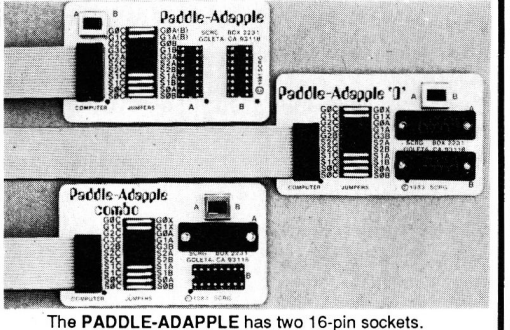

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GAME ROOM

by Brian J. Murphy

In Game Room, Brian Murphy reviews four to six of the most recent Apple games to hit the market. Look here for inCider*'s scoop on the latest fun.*

Game Ratings

Boffo ★ ★ ★ ★

Cut above ★ ★ ★

Mundane ★ ★

Futile ★

Questprobe Featuring The Hulk

★ ★ ★

Adventure International/ Scott Adams
Box 3435
Longwood, FL 32750
Any Apple II, 48K,
one disk drive
$29.95

Many pre-teen true believers, including myself, spent Saturday mornings watching the animated adventures of The Incredible Hulk. What was the big deal about the Hulk? Read on, soon-to-be true believer, and I'll tell you. He's an American legend.

Physicist Bruce Banner was the victim of one of his own experiments, and wound up being bathed in deadly gamma rays and metamorphosed into an 800-pound, green-skinned, dim-witted bruiser called the Hulk.

The Hulk is a misunderstood creature—always under attack by the Army and a gallery of super-criminals. There are the usual encounters with Marvel Comics' regular cast of superheroes and supervillains. He also endures kidnapping and other bizarre transformations—just the sort of situations the Hulk faces in his one and only computer game, **Questprobe Featuring The Hulk**, one of a 12-part series of Marvel adventures.

One of your main challenges is finding out the object of the game. The closest the documentation comes to a clue is a notation that the Hulk must unlock the riddle of the Chief Examiner and survive.

You begin the game the same way you'd expect a Hulk comic-book adventure to begin, with Dr. Banner tied up in a chair. Turning him into the Hulk is the first order of business. Emotional distress, especially rage, will trigger the metamorphosis from Banner to Hulk (**Photo 1**). Can you make Banner mad?

When you do get him out of the chair, you'll find that the Hulk is trapped in a world of mysterious domes. Some contain things like mirrors, broken chairs, and metal fans, but some of them contain gems. The trick is getting out of the dome you're in. There is a logical solution, and after a few tries (and reincarnations), you should be able to get in and out easily.

Photo 1. *Watch David Banner turn into the Hulk.*

The world outside the domes is hostile. You'll meet army ants who, despite your close ties with the hero Ant-Man, attack you at the slightest provocation. There's an underground room in which it's very easy to trap yourself—here Hulk gets a stiff dose of nerve gas. You'll find that a bar of wax is especially crucial to your success, but it's guarded by a swarm of killer bees that won't let you near it.

Those are the hazards you'll encounter in just the first 1 percent of the game. I slaved over this adventure for hours, and then, during a routine conversation with an Adventure International representative, told him about the progress I'd made.

"Is that all?" he replied. "You haven't even solved one-hundredth, no, not even half a hundredth of this game."

Thanks for the compliment, I thought, but, on reflection, I saw he was right. I may have recovered a pile of gems and solved a few riddles, but I had yet to meet Adam Pym or the mysterious Ant-Man. Nor had I encountered the friendly Dr. Strange, the unfriendly Ultron, or the deadly Nightmare. I still had a good amount of screen animation to witness, as well.

So, despite the many hours of fun and thrills I've enjoyed playing Hulk's game, I haven't even scratched the surface. All in all, it's a good entertainment investment at $29.95. There's action, surprise, strategy, and the opportunity to flex your mighty muscles and throw a few

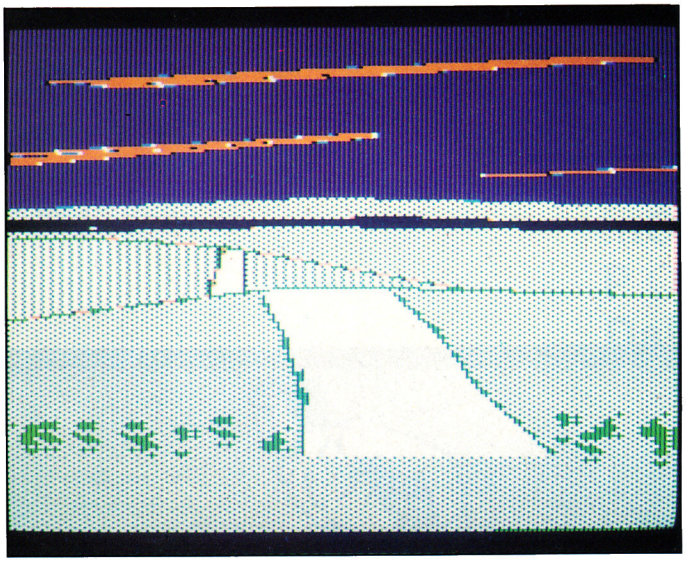

Photo 2. Follow the Ring Quest to adventure.

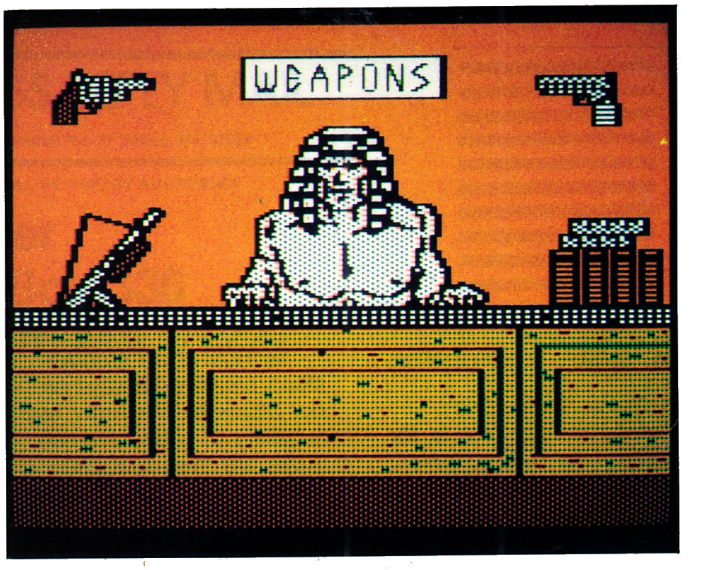

Photo 3. Buying your armaments is a Calculated Risk!

buildings around in the inimitable style of the Hulk. Based on the fun I've had and the fun yet to come, I recommend you take a look at the Hulk episode of Questprobe.

A note in passing: the version I looked at relied on a verb/object syntax for commands. It seemed appropriate, since the Hulk talks like that anyway ("Smash ants," "Get wax," and so on). The command syntax of the current edition, however, is up to current industry standards with a full-sentence interpreter.

The Hulk version of Questprobe is one of 12 Marvel Comics Questprobe adventures. We're hoping they will send us the Spider-Man game, along with any others we can get. Watch these pages for further developments, true believers.

Ring Quest

★ ★ ★

Penguin Software
830 4th Avenue
P.O. Box 311
Geneva, IL 60134
Any Apple II, 64K,
one disk drive
$34.95

It's you and Gorn again, matching wits with monsters galore in **Ring Quest**, a sequel to The Quest and another beautifully illustrated adventure game from Penguin (**Photo 2**). This time you're trying to rescue the beautiful sorceress Lisa, who has fallen under the influence of the evil Ring of Chaos. She's inside a castle surrounded by a forcefield maintained by three carefully hidden power sources. Your quest is to nullify those power sources and unite the Ring of Order, which you possess, with the Ring of Chaos.

Now for the tough stuff. The forest is full of ogres, trolls or manticoras guard the bridges, and a sorceress, perhaps Lisa herself, materializes from time to time to confuse you. To stay on the right track, you have to unravel complex puzzles and figure out why the game gives you certain details.

If you can make the connections in the following example, you'll have a clue to the solution. You encounter a white, crystalline rock in the forest. You're told that animal tracks surround the rock. Why? The bridge over the chasm is guarded by the Manticora. The bones of animals it has eaten surround the beast. Can you make the connections here? If you can, you're on your way to the mindset needed to solve this adventure.

To make progress, you'll have to play some diabolically difficult arcade games. The first one I encountered took a good hour of solid effort to beat.

Ring Quest is an ideal game for a group session. And if you happen to know a fast gun from the arcade side of the game world, bring him or her along to help you out of a few jams. This is an adventure well worth your time, trouble, and cash.

Calculated Risk!

★ ★

Woodbury Software
Box 368
Morganville, NJ 07751
Any Apple II, 48K,
one disk drive
$29.95

This game, designed for ages 7 and up, comes in a package that promises plenty of role-playing action and excitement. If you read the last page of the manual closely, however, you'll see a more ominous description: "An exciting graphics adventure game that makes math fun!"

Can anyone make math fun? If you don't already think math is fun, then no game is likely to change your mind. For me, fun is fun and math is an entirely different thing. **Calculated Risk!** hasn't changed my mind.

You may know of dozens of math games and number puzzles that are enormously entertaining for the mathematically inclined. Calculated Risk! isn't that kind of game. It's an average adventure with uninspired mathematics drills tacked on almost as an afterthought.

As implausible as the premise of any adventure or fantasy/role-playing game may be, if the game carefully and consistently simulates the world it represents, then the player will

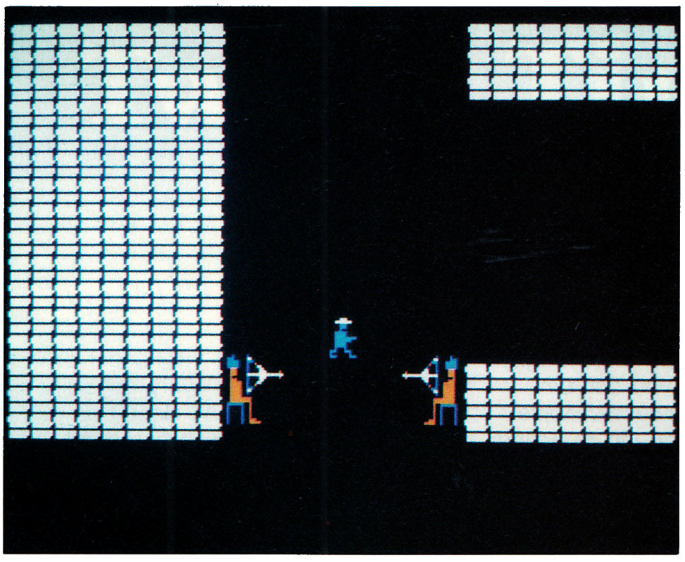

Photo 4. Only cunning and skill can get you out of the pyramid.

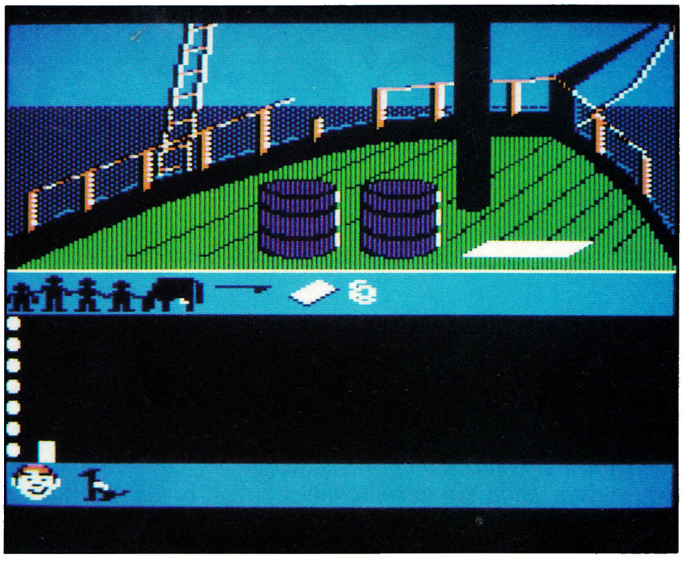

Photo 5. Salvage what you can from your shipwreck.

accept that world and find escape in playing the game. Good adventure gaming is pure escapism.

Having made that point, let's look at Calculated Risk! for a moment. The pyramid scenario is a Temple of Apshai type of maze, to describe it for all you role-playing veterans. When your character gets into trouble, he or she will fall into a trap, with escape depending on the answers to a series of math drill problems (**Photo 3**).

There goes the plausibility and the sense of escape. Picture, if you will, being caught in the mummy's lair and being handed a worksheet of third-grade arithmetic problems. Finish the worksheet and it's recess time; make a mistake and the mummy claws you to shreds. I gather the mummy only lets well-educated grave robbers rummage in his crypt.

Except for this jarring element of implausibility—which does not make math fun, no matter what it says on the package—this isn't such a bad game. In one section, you negotiate with Arab merchants for various goods you'll need to explore the mysterious pyramid, and bargaining is fun (**Photo 4**). The uplifting element of mathematics intrudes here as you check the merchants' figuring of your bills. That application of math is at least plausible.

This Apshai-like game also contains a few surprises in the maze—monsters, a phoenix, mummies that grab you, and bandits who mug you. It's not outstanding role-playing, but it's reasonably entertaining.

Swiss Family Robinson

★ ★

Windham Classics/Spinnaker Software
One Kendall Square
Cambridge, MA 02139
Any Apple II
$26.95

In its own special way, this is one of the toughest adventure games yet devised. As with all Windham games, the emphasis is on nonviolence, as you peacefully solve a variety of survival problems facing your shipwrecked family.

The first order of business is getting the survivors off the boat and ferrying the supplies to shore (**Photo 5**). You need to build a raft—you have to locate tools, select materials from the debris on the ship, and lash the boards and debris together to make a reliable craft. This should take you only the rest of your life, unless you look at the documentation or press the HELP key for a hint.

Once you get your family on shore, your list of chores is endless. You must find or build shelter, find a source of drinking water, and locate a supply of food—without falling prey to the thousand-and-one hazards on the island.

The concept of this game is very strong. It places you in a realistic survival situation, one that requires brains rather than force. Instead of shooting your way out of situations, you have to come up with an intelligent solution. This game pits mind over matter in an entertaining way.

Technically, this is an advanced adventure. The orders you give are complete sentences, and the on-screen graphics help you keep track of supplies and equipment. Younger players (the game is designed for ages 10 and up) should have no difficulty following the action. All in all, **Swiss Family Robinson** is a cute little game with a backbone of steel. It should certainly keep your interest as you try your hand at island survival. This game is especially good for kids and more than a little challenging for adults.■

Brian Murphy is anxious to learn what you think of the present state of computer games. Write him at inCider *magazine, 80 Pine Street, Peterborough, NH 03458.*

HINTS/TECHNIQUES

Apple users know that there's always *an easier way to get the job done. A shortcut here, an elegant twist there. That's what Hints/Techniques is all about. It's a technical information swap for readers who want to share their programming pointers, DOS tips, hardware secrets, and all those other insights that make you go "Aha!" in the night. So read on and see if you don't find just the solution you've been looking for.*

Ditto

by David del Castillo

When you need multiple copies of a document and photocopies just won't do, you can turn to Apple Writer II's versatile Word Processing Language for a solution. Although Apple Writer itself includes no multiple-copy facility among its print functions, the WPL program presented here, Ditto, lets you print an unlimited number of copies of any text file—just follow the simple rules outlined below.

First, use the embedded printer-format commands available to you—see the Apple Writer II manual for a complete list.

Second, if you've included an embedded print command .TL or .BL (top line or bottom line) in your text file to suppress the printing of your header or footer on the first page, then the last line of the file should contain the embedded command .TL**** or .BL****. This erases the TL or BL entry from the Print/Program Commands menu. If you don't include these new commands, Apple Writer will suppress the top or bottom line on the first page of the first copy of the file, but not on subsequent copies. (If you want the header or footer to appear on every page, including the first, don't clear it as described above. In such cases, you should enter the TL or BL directly into the Print/Program Commands

Figure. *A text file prepared for use with the WPL program Ditto.*

```
.tl*DITTO*-#-*March 15, 1985*

This is the first line of text to be printed.
This is the second line of text to be
printed.
.tl****
[ ]
```

Program Listing. *The WPL program Ditto produces two or more copies of an Apple Writer II text file.*

```
          PGO       BEGIN
CATALOG   O1
          PPR
          PGO       DOIT
BEGIN     PND
          P  THE NEXT LINE CLEARS THE SCREEN
          PPR ENTER AS CTRL/V CTRL/L CTRL/V
          PPR
          PPR
          PPR
          PPR
          PPR     **** DITTO COPY PROGRAM ****
          PPR
          PPR
          PIN     HOW MANY COPIES? =$C
          PSX $C
DOIT      PIN     FILE NAME? (CAT=CATALOG) =$A
          PIN     DRIVE NUMBER =$B
          PAS  D =$D
          PAS $D$B =$D
          NY
          PCS       /$A/CAT/
          PGO       CATALOG
          PCS       /$A/cat/
          PGO       CATALOG
          PCS       /$A/Cat/
          PGO       CATALOG
          L $A,$D
          B
          E
          F##.FF#
          Y?
LOOP      PNP
          PSX -1
          PGO LOOP
          PPR ENTER AS CTRL/V CTRL/L CTRL/V
          PPR
          PPR
          PPR ****************************************
          PPR
          PPR       $C COPIES PRINTED
          PPR
          PPR ****************************************
          PPR ENTER AS CTRL/V CTRL/G CTRL/G CTRL/G CTRL/G CTRL/G CTRL/V
          PIN     PRESS <RETURN> TO EXIT TO EDITOR
          NY
```

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menu before running Ditto.) See the accompanying **Figure** for an example of a properly prepared text file.

Third, make sure the final line in the text file is blank (no characters or spaces)—when you save the file, the cursor should be at the left margin below the last line containing either text or embedded commands. This allows Ditto to insert a form feed (.ff) at the end of the document before printing, and ensures that each copy will begin on a new page.

The pair of brackets ([]) at the end of the sample file designates the position of the cursor on the last line of the file (the line containing no characters or spaces). If the cursor is not there when you save the text, Ditto may not insert the form feed in the proper position, and only the first copy will definitely begin on a new page—others may not.

To enter the program, boot your Apple Writer II disk and type it in as shown in the **Program listing**, then save it as Ditto on the same disk.

To run the program, boot Apple Writer II and follow these steps:

1) Type control-P
Apple Writer will display [P]rint/ Program
2) Type DO DITTO and press the return key
3) Ditto then prompts you for the number of copies to be printed, the name of the file being printed (you may ask to see a catalog of your files by responding CAT), and the number of the disk drive containing the file.
4) The program then loads the selected file from disk and prints the desired number of copies. After each copy is printed, the program sends the printer a form feed that lets it begin the next copy on a new page. The bell on the computer beeps five times when the printer has finished.

If you have only one drive, you may eliminate the WPL line:

```
PIN    DRIVE NUMBER = B$
```

and replace it with:

```
PAS 1 = B$.
```

If you want to use Ditto with single-sheet paper, you can make the printer pause between copies by deleting the program line LOOP PN and inserting two lines in its place: LOOP PIN (then roll in paper and press the return key) and PNP.

With WPL, you can expand Apple Writer's print functions and produce multiple original documents at the touch of a few keys.■

Write to David del Castillo at 3204 Kylemore Road, Toledo, OH 43606.

Pseudorandom Numbers

by Ludwik Kowalski

Applesoft BASIC's random function (RND) doesn't always generate truly "random" numbers. The first time you use the function after turning on the computer (a cold boot), it always produces the same series of numbers. To generate other sequences after a cold boot, seeding is necessary.

I studied the effect seeds 1–30 had on the randomness of very long pseudorandom sequences. In particular, I tested how frequently the most-significant digits (0.0–0.9) of two consecutive randomly generated numbers occurred. For example, does the sequence 0.3, 0.7 occur as frequently as the sequence 0.5, 0.0?

Since only 100 combinations are possible, I sorted consecutive pairs of numbers into a 10-by-10 array. Then, using the chi-square statistic, goodness-of-fit probability test, I compared the distribution of sample frequencies with the numbers truly random sequences should generate. I considered any sequence with a degree of nonrandomness, DNR, outside the range of 0.7 to 1.3 to be nonrandom.

Short sequences of 1000 or 2000 pairs passed the randomness test for all the seeds I tried. On the other hand, with only one exception, all sequences longer than 40,000 pairs failed the test of randomness.

Nineteen proved to be the best seed and 11 the worst. The first time I ran the program using seed 19, the numbers were randomlike up to about 100,000 numbers (50,000 pairs). For seed 11, the numbers were random only up to 5600 numbers. Each additional time I ran the program using seed 19, numbers were random to a maximum of 40,000 numbers, while for seed 11 all consecutive sequences after the first were strongly nonrandom.

For any given seed, a degeneration of sequences into repetitive loops occurs—that is, after the program generates a certain number of numerals, N1, it repeats them in sequences of N2. Ten of the 30 seeds generated sequences with short loops where N2 equaled 201. (The **Table** shows these seeds and their respective N1 values.) A single sequence one of these "bad" seeds generates can still be pseudorandom when its length is smaller than N1. After this, however, the degree of nonrandomness increases at a rate proportional to N1, so you should certainly avoid these bad seeds in situations that require long pseudorandom sequences.

You can use the remaining "good" seeds to generate sequences of up to 32,000 pseudorandom numbers (16,000 pairs), since the N2 values are either 32,365 or 37,757, with N1 values between 500 and 65,000.

Table. *Bad seeds and their N1 values.*

Seed	N1
4	22,990
5	37,000
10	29,300
11	5,560
15	36,220
18	12,069
22	10,810
23	21,940
25	17,110
30	19,210

The percentage of bad seeds does not seem to depend on the size of the seeds; it remains approximately 30 percent for all aimlessly selected sets of large seeds. Some other good seeds follow: 213; 1931; 4791; 26,921; 31,415; 71,351; 103,603; 395,622; 494,457; 715,234; and 927,563.

If you've noticed a certain "nonrandomness" in your programs that use the random-number generator, try using one of the "good" seeds mentioned here, or reseed your sequences from a table at intervals equal to N1/2.■

Write to Ludwik Kowalski at the Department of Physics-Geoscience, Montclair State College, Upper Montclair, NJ 07043.

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ASK INCIDER

by Bob Ryan,
inCider Technical Editor

If you have a question, our technical editor has the answer. Send your queries about Apple computing to Bob Ryan, Ask inCider, *80 Pine Street, Peterborough, NH 03458.*

Directed Reading

Dear *inCider*:

The ProCAT program (April 1985, p. 32) was an eye-opener. I have some ProDOS documentation, but I've never been able to find documentation for the file-processing commands that show the construct used to read the ProDOS directory. Can you give me some information on acceptable syntax for performing this function using the ProDOS OPEN, READ, WRITE, and CLOSE commands?

Marilyn Emerson
Box 1116
Cherry Hill, NJ 08034

Dear Marilyn:

Inside Apple's ProDOS, *by John Campbell (Reston Publishing, Reston, VA), has an annotated listing on pages 34 and 35 that demonstrates how to read a ProDOS directory file from an Applesoft program. The trick is to specify the file type as TDIR when you open it. Your open statement should look like this:*

```
50 PRINT CHR$(4);"OPEN";name of
   directory;",TDIR"
```

"Name of directory" is a literal string or a string variable that contains the name of the directory you want to read into memory. You then read from the file as you would any text file.

80-Column Escapism

Dear *inCider*:

An errata insert in my Apple 80-Column Text Card Manual states that the card does not support Applesoft's INPUT and GET commands. The manual recommends using the blinking underline-cursor routine on the Applesoft Sampler disk. I've used this routine and it works quite nicely, but it does have some limitations, especially in setting a horizontal window.

Some of my students have recently started programming in 80 columns and have used both INPUT and GET without any apparent problem. Have they just been lucky?

Howard Jackson
127 Southern Boulevard
Albany, NY 12209

Dear Howard:

Yes, your students have been lucky. They probably won't have any problems with INPUT and GET in 80-column mode, as long as no one hits the escape key in response to one of these statements. The 80-column card interprets the escape code as a flag for the beginning of a command sequence, and may do strange things if you enter escape via an INPUT or GET statement.

If you anticipate someone hitting the escape key in response to an INPUT or GET, you should stick with the routine you are using.

Moving Problems

Dear *inCider*:

I read your review of the Sider (the 10-megabyte hard disk from First Class Peripherals) and bought one—it really does work well. I transferred all my files to the Sider without any problem. Then I decided to save disk-access time and wear and tear by copying some of my Strategic Simulations games to the hard disk. I soon learned that this isn't a very easy thing to do.

How can I get my copy-protected software onto the Sider? I've asked about "backing up" to a hard disk, but it seems that isn't possible with an Apple. I've even called Omega Microware (the publishers of Locksmith 5.0), only to find that Omega's technical-support personnel have no answer to my dilemma. Do you?

Paul Stromberg
3929 Fairway Drive
Wilmette, IL 60091

Dear Paul:

As long as software publishers insist on copy-protecting their products, you won't be able to transfer many of your programs from floppies to a hard disk. As the use of hard-disk drives on Apple machines becomes more common, you'll see many software manufacturers remove the copy protection from their products. Until then, you'll have to be content using the hard disk primarily for data storage.

MouseText for All

Dear *inCider*:

I own an Apple //c, and would like to know how I can call up the mouse characters from Applesoft BASIC. I have a Beagle Bros "Peeks, Pokes, and Pointers" chart showing the mouse characters and their equivalents, but I still don't know how to access them. Can you help?

Jim Hughes
419 West Washington Boulevard
Grove City, PA 16127

Dear Jim:

Accessing the MouseText characters from Applesoft BASIC is simple. First, turn on the enhanced-video software by issuing a PR#3. Next, type in PRINT CHR$(27) and the INVERSE

command. Now, whenever you print a capital letter or one of the special characters, the corresponding MouseText character will appear on your screen. To deactivate MouseText, type in PRINT CHR$(24) and the NORMAL command.

Text Times Three

Dear *inCider*:

I recently added a communications package to my Apple //e. I use it to transfer files between AppleWorks and a DEC PDP 11/60. I have no problem moving a text file from my Apple to the DEC machine; the difficulty arises when I want to download a text file from the PDP 11 to AppleWorks. Here is the procedure I follow:

1) PDP 11/60 text file to DOS 3.3 text file via Softerm 2 and modem
2) DOS 3.3 text file to ProDOS text file using ProDOS User's Disk
3) ProDOS text file into AppleWorks word-processing file

The system falls apart when I try to get AppleWorks to recognize the ProDOS text file as one AppleWorks can use. The file will be found by the "List all files on current disk" option, but not when I try to "Add file to the desktop." What is going on and how can I fix this situation?

Donald C. Williams
3441 Bryant Avenue South
Apartment #2
Minneapolis, MN 55408

Dear Donald:

AppleWorks files are not straight text files, so you can't just add text files to the desktop. To read a standard ProDOS text file into the AppleWorks word processor, you must do the following:

1) From the Main Menu, select option 1, "Add files to the Desktop."
2) From the Add Files menu, select option 3, "Word Processor."
3) From the Word Processor menu, select option 2, "From a text (ASCII) file."

AppleWorks then prompts you to type in the complete pathname of the ProDOS text file you want to load. After you enter the pathname, AppleWorks loads the file and asks you to type in the file name AppleWorks will access. Once you've named the file, it appears on your screen, and you can use it as you would any AppleWorks file.

Licensing DOS

Dear *inCider*:

Some time ago, I wrote to Apple Computer to inquire about licensing Apple DOS for commercial programs. I also wanted technical information about the //e. I've never received an answer.

The letter from Bob Santoro in July's Ask *inCider* ("Developing Dilemma") prompted me to try again. Do you have an address to which I can write for information about licensing Apple programs? Should Apple prove unresponsive, what other sources of technical information are available?

Mike Matassa
14227 Rosetta Drive
Cypress, TX 77429

Dear Mike:

Send a letter of inquiry to Apple Computer, Developer Relations M/S 23-AF, 20525 Mariani Avenue, Cupertino, CA 95014. Currently, you can license DOS and ProDOS for $50 each per year, per product.

One word of warning—I am writing this during a period of reorganization at Apple, and the information may change by the time this column sees print. If writing to Developer Relations doesn't pan out, try calling Apple's general switchboard (408-996-1010) for more up-to-date information.

By the way, you can order the //e Technical Reference Manual *and products from the Workbench series directly from your Apple dealer.*■

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Who can use the Library? Our library is supplied in DOS 3.3, 16 sector format for Apple II computers. Please note that a few machine language programs will function erratically on the IIe and IIc because of changes in the F8 monitor. We have not tested all of the programs nor do we have a list of what works. So be careful—"Caveat Emptor."

What does the Computer Learning Center do? The Computer Learning Center provides a service that copies and DISTRIBUTES software in the public domain. Our library is constructed on a "per volume" basis, each volume containing approximately 20 programs. The $4/volume fee covers the cost of the disk and costs involved in copying, labeling, packaging, mailing and other related expenses. Due to the nature of our library, PDS cannot be returned for a cash refund or exchanged for additional volumes.

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DATAGRAM

by Matthew Lesko

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▶ On-line Reading

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Editorial content features articles, columns, letters to the editor, games, contests, and movie, book, and restaurant reviews. *Modem Times* solicits articles from its users. For more information, write to *Modem Times* at 15 North 14th Street, Colorado Springs, CO 80904.

▶ On Capitol Hill

The politically minded in Massachusetts have access to a free data base that keeps them up to date on White House, state, and local government news. The service is also stocked with information ranging from Boston-area weather reports to employment listings to entertainment schedules.

The system highlights its classified- and retail-ad section. A five-line classified ad costs $6 per month; a six-line retail ad costs $30 per month. The modem number is (617) 489-4930. For details, write or call Yellowdata at 490 Trapelo Road, Belmont, MA 02178, (617) 484-6814.

▶ The Ultimate BBS

Take a look at a bulletin-board system that claims to be on the leading edge of BBS technology. Pro-Net is operated by experts in Apple, IBM, Tandy, and Commodore systems. A yearly subscription to this innovative bulletin board costs $25, but you can get a free tour by using your modem to call (416) 683-3733 or (416) 445-6696. For more information, contact Toronto Pro-Net, P.O. Box Station A, Willowdale, Ontario M2N 5S7, Canada.

▶ Bye-Bye Monthly Minimum

Time was when SDC Information Services billed you a $100 monthly minimum if you used any of the data bases in its Orbit system. Well, no longer. Starting charges still cost at least $125, plus fees ranging from $60 to $165 per connect hour and 20 cents to $1 per printed citation, but there is no minimum-usage charge. For more information contact SDC Information Services, 2500 Colorado Avenue, Santa Monica, CA 90406, (800) 421-7229, or (800) 253-6689 in California.

▶ 300 Will Get You 1200

Follow this procedure if you know your 300-baud number for Telenet, but are looking for your 1200-baud number: Call your 300-baud number, type "MAIL" at the @ sign, type "PHONES" for the user name, then "PHONES" for the password. This gives you the complete list of 300- and 1200-baud telephone numbers for all cities served by Telenet. Best of all, you don't have to wait for the entire list; you can access the system by state or area code. You can also call customer service. Voice numbers are (800) 336-0437 and (703) 689-6400.

▶ It's Academic

This fall, the National Information Utilities Company and the Maryland State Department of Education will introduce a data-base service aimed at schools. Using broadcast-band waves, the system features courseware, electronic mail, news services, journals, and special graphics for scientific experiments.

The system should also suit business applications, because it's more economical to use broadcast waves instead of telephone lines. For details contact Paul Geffert, National Information Utilities, 8150 Leesburg Pike, Vienna, VA 22180, (703) 734-7000.

Editor's note: If you can't connect with one of these data bases, it may be temporarily—or permanently—off the air. Many data bases are noncommercial ventures and can encounter financial difficulties. Feel free to contact Matthew Lesko if you continue to run into obstacles.■

Matthew Lesko is the founder and president of Information USA, Inc., a computer data-base consulting and publishing company. He is the author of seven information books—two of which made the New York Times *best-seller list. For a free copy of his newsletter on computer data bases, write to Information USA, Inc., 4701 Willard Avenue, #1707, Chevy Chase, MD 20815, or call (301) 657-1200.*

inCider

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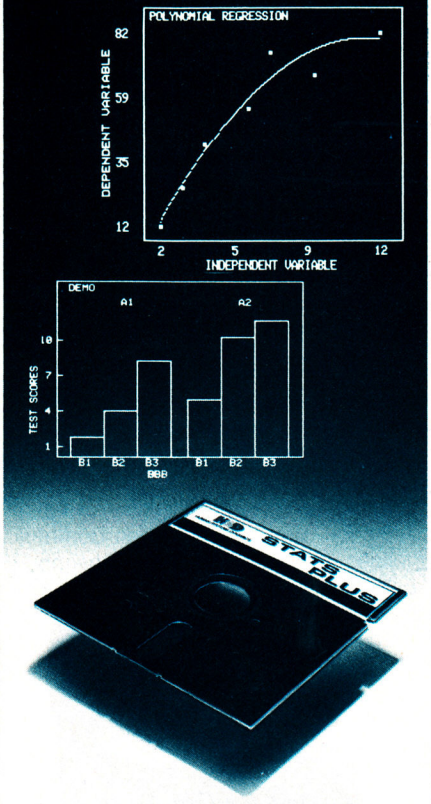

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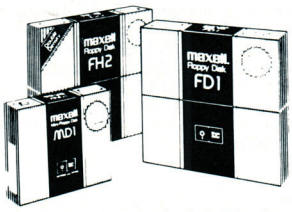

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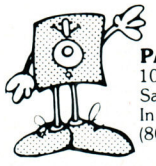

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We aren't just for clubs. An individual can enjoy all the special benefits we have been providing user groups since 1979. You may share information on new applications. Or learn the latest on products. Or keep up on Apple events. Even receive specialized training.

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EDITORS' CHOICE

Every month, hardware and software manufacturers release dozens of new products into the Apple II market. The Editors' Choice singles out one product each month that the inCider *editors feel is a significant addition to the Apple II family of products.*

With the introduction of the //c and the increasing popularity of the //e Extended 80-column card, 128K is quickly becoming the standard memory size for Apple II computers. Many software publishers have recognized this by releasing applications programs that run only on 128K Apples. Now joining the ranks of this software is a utility package—Extra K, from Beagle Bros—that lets you employ all 128K of memory from your Applesoft programs.

Extra K consists of 25 programs (some with associated machine-language files) that perform a myriad of tasks. For the serious programmer, the most important is Extra Variables, a program that stores the variables from your Applesoft programs in auxiliary memory. Normally, your Applesoft program plus variable storage cannot exceed 36K. With Extra Variables, your program alone can occupy 35K, and you'll still have 59K available for variable storage. If you write programs, such as data-base managers, that use a lot of string variables, you'll especially treasure Extra Variables—nothing gobbles up available memory faster than string variables. And Extra K also includes a utility called Peek and Poke, which lets you PEEK and POKE locations in auxiliary memory.

In what other ways can you use auxiliary memory? Extra K includes programs that use your extra 64K to speed up disk copying and disk comparisons. It also provides a routine, Disk Format, that lets you initialize a ProDOS disk from inside an Applesoft program. For those of you who are graphics-inclined, other Extra K routines let you store numerous text and graphics screens in memory and display the screen of your choice in the wink of an eye. Also provided is a program called Screens Crop that lets you crop a hi-res image, resulting in some interesting effects (see the **Photo**).

If all that isn't enough for you, Extra K divides your Apple into two 64K machines—you can even load different operating systems into the two halves of your computer. In addition, you get a print spooler, which works only on the //c, and a program called Logbook, which creates a record in auxiliary memory of everything you enter into the text screen. The folks at Beagle Bros admit they don't know exactly how people will use Logbook, but they know a neat program when they see it.

As you can imagine, Extra K has really impressed *inCider*'s editors. "Beagle Bros has done it again," Review Editor Paul Statt remarks. "Programming isn't fun unless you can play. Extra K is a sandbox for programmers—maybe you won't dig with every shovel or use every bit of memory in Extra K, but it's more fun to play when you have more toys. And reading Beagle Bros literature is always a panic." Editor in Chief Susan Gubernat says Extra K is a real bargain. "Where," she asks, "could you get 25 programs better than these for less than two dollars each?" Technical Editor Bob Ryan has one comment: "Wow!"

Oh yes—if you're one of those people who can't decide between DOS 3.3 and ProDOS, Beagle Bros isn't interested in dictating its preference: Extra K comes with DOS 3.3 format on the front of the disk, ProDOS on the back. Like all Beagle Bros software, Extra K is not copy-protected.

Extra K is published by Beagle Bros, 3990 Old Town Avenue, Suite 102C, San Diego, CA 92110, (619) 296-6400. The package sells for $39.95 and includes an updated copy of Beagle Bros' "Peeks, Pokes, and Pointers" chart.■

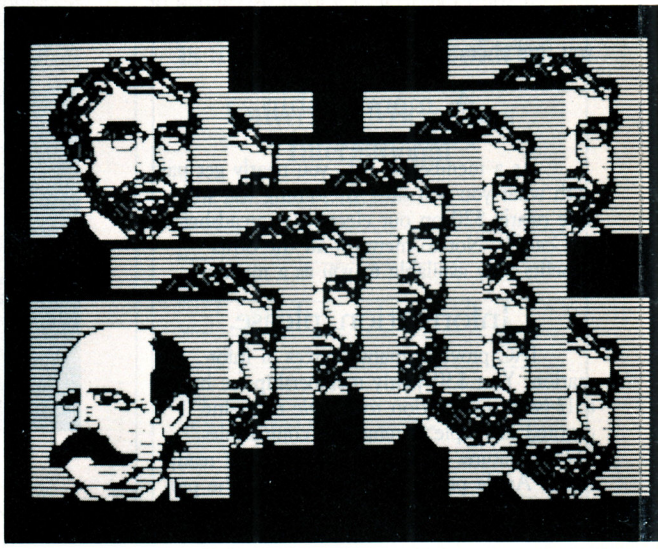

Photo. *Extra K's Screens Crop program crops high-resolution images and creates interesting effects.*

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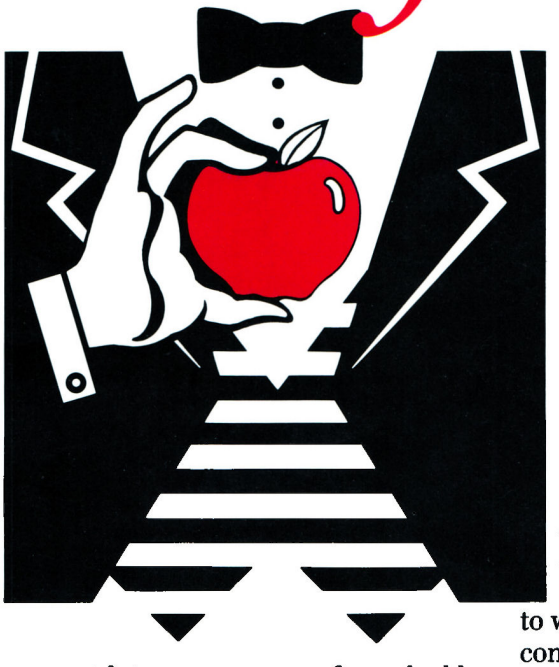

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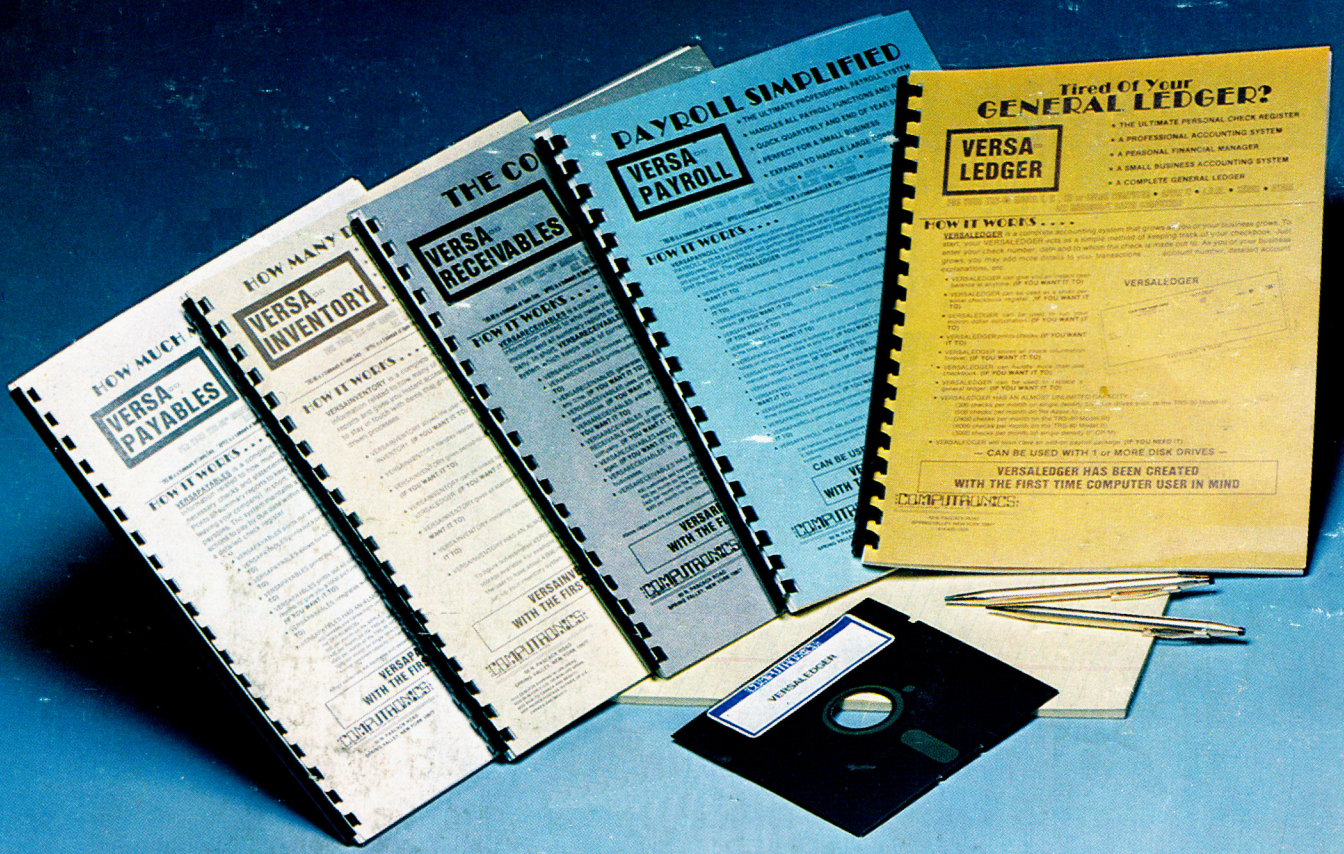

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