The Joy Of Joysticks: 12 Joysticks Compared

COMPUTE!

$2.50
February
1983
Issue 33
Vol. 5, No. 2
63379 £1.85 in UK

The Leading Magazine Of Home, Educational, And Recreational Computing

All New Games Issue

How The Pros Write Computer Games

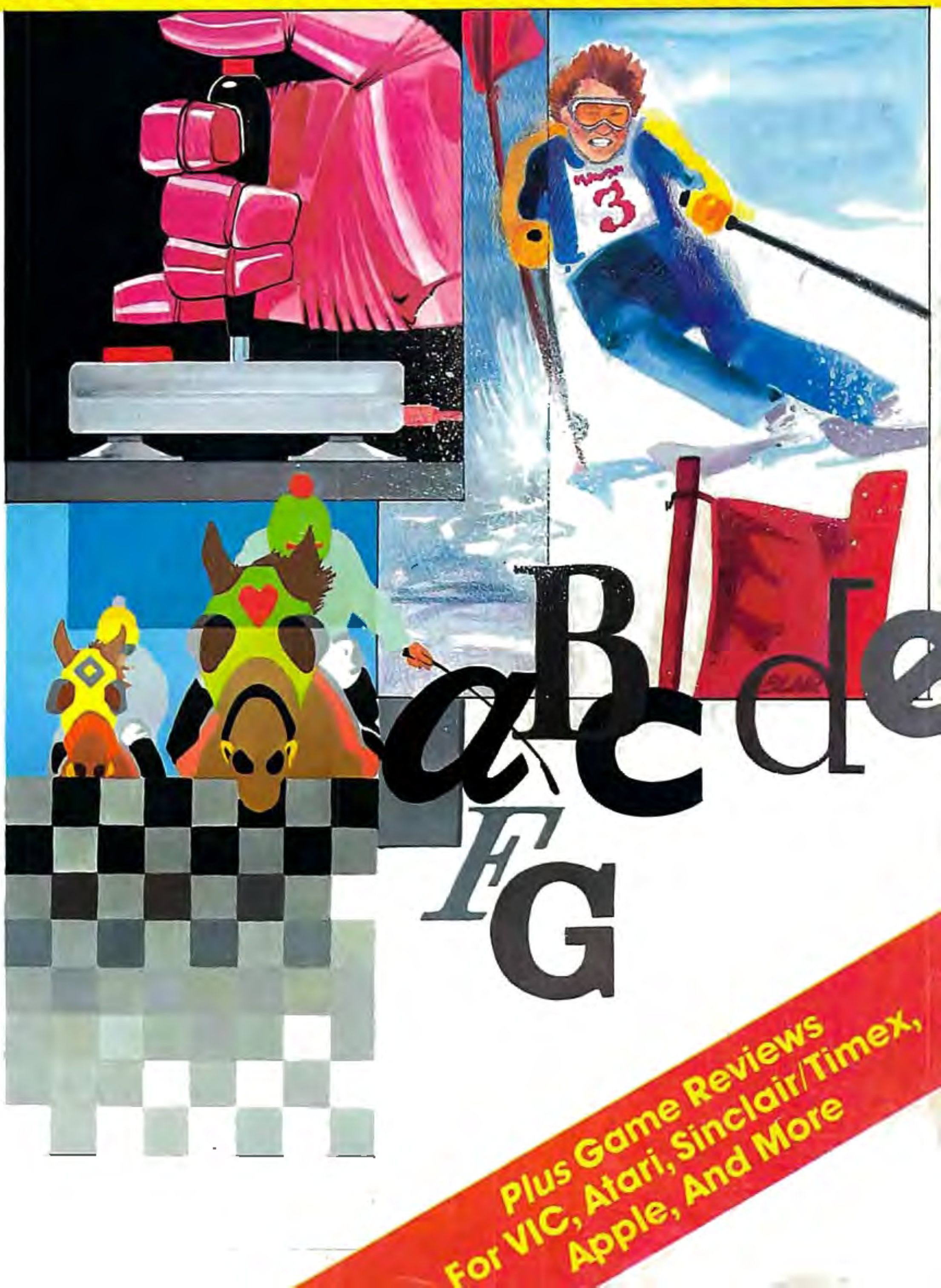
***Slalom:* 3-D Simulation Game For Atari And PET**

***A Day At The Races:* Game With Excellent Graphics And Sound Tutorial For VIC And Atari**

Super Shell Sort For PET/CBM

Creating Graphics On An Expanded VIC

SuperFont Plus For The Atari



Plus Game Reviews For VIC, Atari, Sinclair/Timex, Apple, And More

THE LEADING EDGE IN PRINTERS

ONE GREAT LINE. ONE GREAT WARRANTY.

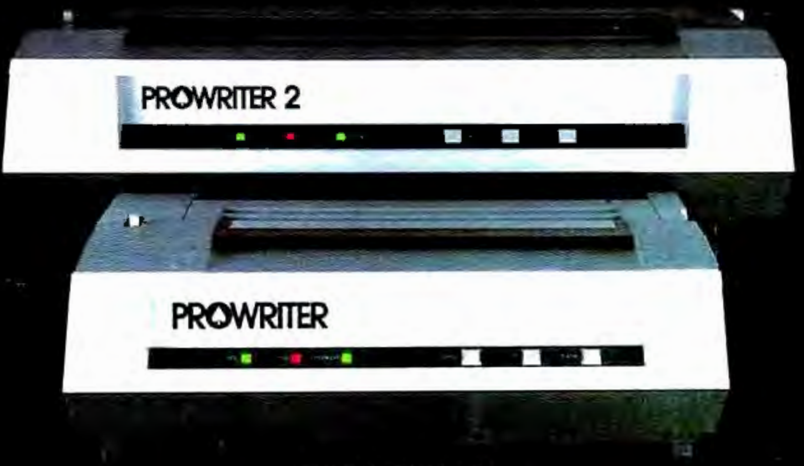
Finally, there's one full family of printers that covers every business or word processing application—all from C. Itoh, a company known for packing more product into less price; and all distributed exclusively by Leading Edge, a company known for searching out and providing that very thing. Which means that one call to one source can get you any printer, any time you need it, for any purpose. All backed by a full years' warranty from Leading Edge. (Try *that* on any other line of printers.)

THE PRO'S.

The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you denser, correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).

Prowriter: 120 cps. 80 columns dot matrix compressable to 136. 10" carriage. Parallel or serial interface.

Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode. Parallel or serial interface.



THE STAR.

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing. It plugs into almost any micro on the market, serial or parallel.

THE MASTER.

The Printmaster F-10. Does all the same good stuff as the Starwriter except, at 55 cps, the Master does it faster.

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021.
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

IF YOU'RE WAITING FOR THE PRICE OF WORD PROCESSORS TO FALL WITHIN REASON,

Everyone expected it would happen sooner or later. . . with WordPro PLUS™ it already has! Now all the marvelous benefits of expensive and advanced word processing systems are available on Commodore computers, America's largest selling computer line. WordPro PLUS, when combined with the new 80 column CBM 8032, creates a word processing system comparable to virtually any other top quality word processor available—but at savings of thousands of dollars!

New, low cost computer technology is now available at a fraction of what you would expect to pay. This technology allowed Commodore to introduce the new and revolutionary CBM 8032 Computer.

WordPro PLUS turns this new CBM 8032 Computer into a sophisticated, time saving word processing tool. With WordPro PLUS, documents are displayed on the computer's screen. Editing and last minute revisions are simple and easy. No more lengthy re-typing sessions. Letters and documents are easily re-called from memory storage for editing or printing with final drafts printed perfectly at over five hundred words per minute!

Our nationwide team of professional dealers will show you how your office will benefit by using WordPro PLUS. At a price far less than you realize.

Invest in your office's future. . .
Invest in WordPro PLUS. . .
Call us today for the name of the WordPro PLUS dealer nearest you.

Professional Software Inc.
51 Fremont Street
Needham, MA 02194
(617) 444-5224
TELEX: 95 1579

TM WordPro is a Registered Trademark of Professional Software, Inc. WordPro was written by Steve Punter
All specifications subject to change without notice

Introducing Snooper Troops™ detective series. Educational games that turn ordinary homes into Sherlock homes.

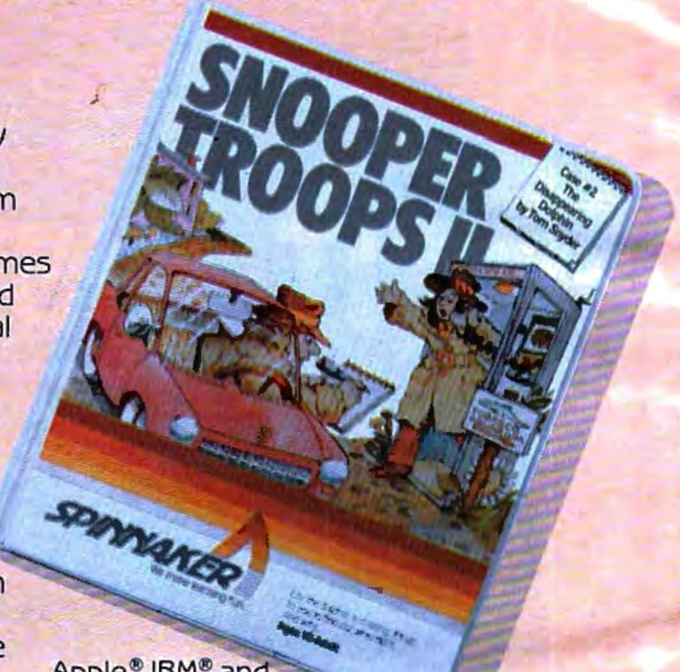
Where can you find educational games that your kids will really enjoy playing?

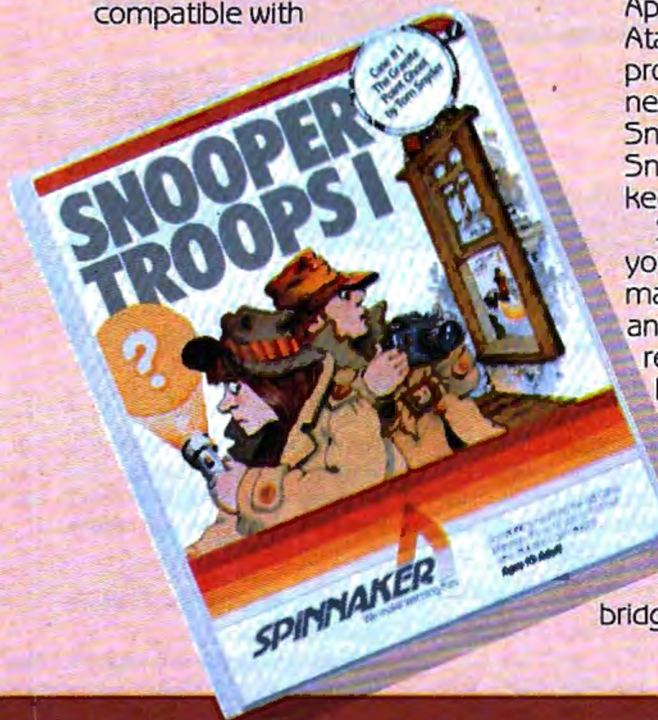
Elementary, my dear Watson. From Spinnaker.

Our Snooper Troops detective games are fun, exciting and challenging. And best of all, they have real educational value. So while your kids are having fun, they're learning.

As a Snooper Trooper, your child will have a great time solving the mysteries. But it will take some daring detective work. They'll have to question suspects, talk to mysterious agents, and even search dark houses to uncover clues.

The Snooper Troops programs are compatible with Apple,® IBM® and Atari® computers and provide your kids with everything they need: a SnoopMobile, a wrist radio, a SnoopNet computer, a camera for taking Snoopshots and even a notebook for keeping track of information.

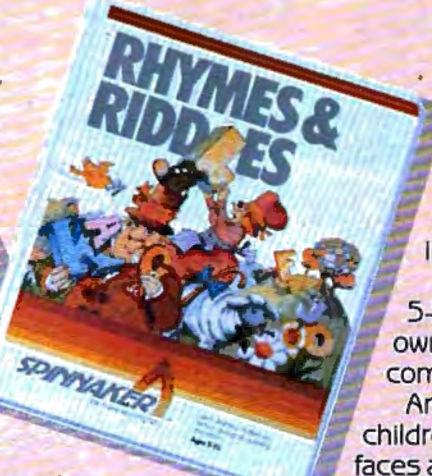




Snooper Troops detective games help your children learn to take notes, draw maps, organize and classify information and they help develop vocabulary and reasoning skills. All while your kids are having a good time.

So if you want to find educational games that are really fun, here's a clue: Snooper Troops games are available at your local software store, or by writing to: Spinnaker Software, 215 First Street, Cambridge, MA 02142.

Spinnaker's early learning games will help make your children as smart as you tell everyone they are.



Your kids are pretty smart. After all, they're *your* kids.

Spinnaker can help make them even smarter. With a line of educational software that kids love to play.

Spinnaker games make the computer screen come to life with full color graphics and sound. And they're fun. Lots of fun. But they also have real educational value.

Some of our games help exercise your child's creativity. Others improve memory and concentration. While others help to improve your child's writing, vocabulary, and spelling skills.

And every Spinnaker game provides familiarity with the computer and helps your children feel friendly with the computer. Even if they've never used a computer before.

And Spinnaker games are compatible with the most popular computers: Apple,® Atari® and IBM.®

Our newest game, KinderComp™ (Ages 3-8) is a collection of learning exercises presented in a fun and exciting manner.

Rhymes and Riddles™ (Ages 4-9) is a letter guessing game featuring kids' favorite riddles, famous sayings and nursery rhymes.

Story Machine™ (Ages 5-9) lets children write their own stories and see them come to life on the screen.

And FACEMAKER™ lets your children create their own funny faces and make them wink, smile, wiggle ears (not your kids' ears, the ears on the screen), etc.

And we're introducing new games all the time.

So look for Spinnaker games at your local software retailer, or by writing to: Spinnaker Software, 215 First St., Cambridge, MA 02142. And show your kids how smart their parents really are.

SPINNAKER™
We make learning fun.

Apple, IBM and Atari are registered trademarks of Apple Computer, Inc., International Business Machines Corp. and Atari, Inc., respectively.

64K RAM SELECT
MOSAIC 64K RAM SELECT
MOSAIC 32K for ATARI
MOSAIC EXPANDER

February 1983 Vol. 5, No. 2

FEATURES

EDUCATION AND RECREATION

REVIEWS

COLUMNS AND DEPARTMENTS

THE JOURNAL

NOTE: See page 248 before typing in programs.

AP Apple, **AT** Atari, **P** PET/CBM, **V** VIC-20, **O** OSI, **C** Radio Shack Color Computer, **64** Commodore 64, **ZX** Sinclair ZX-81, * All or several of the above.

COMPUTE! The Journal for Progressive Computing (USPS: 537250) is published 12 times each year by Small System Services, Inc., P.O. Box 5406, Greensboro, NC 27403 USA. Phone: (919)275-9809. Editorial Offices are located at 625 Fulton Street, Greensboro, NC 27403. Domestic Subscriptions: 12 issues, $20.00. Send subscription orders or change of address (P.O. form 3579) to Circulation Dept., **COMPUTE!** Magazine, P.O. Box 5406, Greensboro, NC 27403. Second class postage paid at Greensboro, NC 27403 and additional mailing offices. ISSN 0194-357X.

TOLL FREE
Subscription
Order Line
800-334-0868
In NC 919-275-9809

A Small System Services, Inc. Publication
COMPUTE!

NOW! AWESOME POWER

Data 20, the company that took the VIC-20® to the max, has now expanded their line of peripherals to include both the VIC-20 and the new Commodore 64®. Peripherals that will give you more power, more sophisticated capabilities and all are still easy to buy, easy to install, and easy to use. Just look..........

VIDEO PAK—Our VIC-20 original. Pick our PAK to give you a computer that outperforms systems costing twice as much. Plug our cartridge into your expansion port, and your display instantly goes to the industry-standard 24 lines, with a choice of 40 or 80 characters in the full Commodore character set. You also increase memory to 20K or 70K to handle more sophisticated functions—including most 8032 software. Our package includes a terminal emulator and a screen print feature. It's a must for word processing—and your key to increased performance on everything from games to spread sheets. Suggested retail is just $299.95 including 16K—or $399.95 for 64K

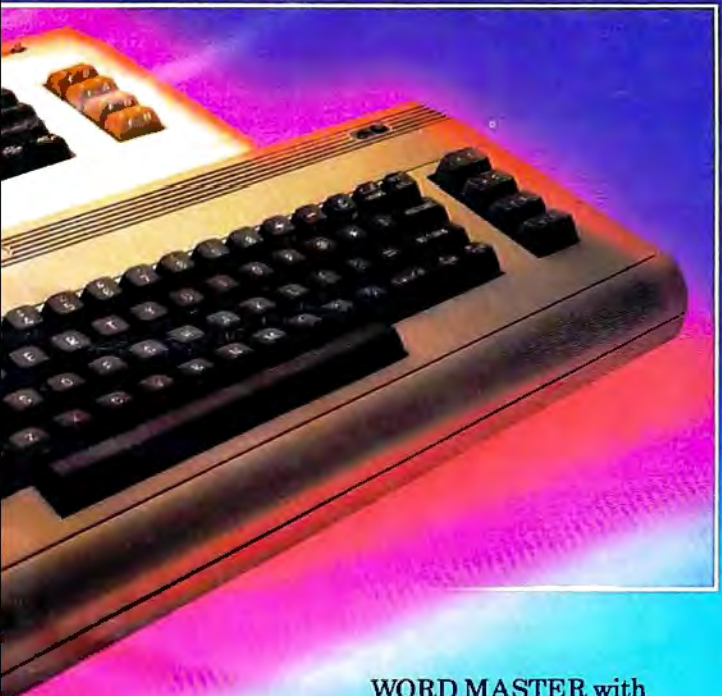
New VIDEO PAK 80 for Commodore 64. Use the industry-standard 80-column format on your CBM. Software control switches from 40 to 80 characters in black and white—and back to 40 characters in color. VIDEO PAK 80 also lets you take advantage of the terminal emulator mode and screen print feature through software we include. And it's great with word processing—see our new WORD MASTER. Suggested retail: $179.95

New Z-80 VIDEO PAK brings CP/M® compatibility to your 64. This exciting package gives you all the VIDEO PAK 80 features described above. Equally important, our built-in microprocessor and software give you CP/M compatibility for any programs formatted for the Commodore 1541® Disk Drive. The possibilities are truly awesome! Suggested retail: $299.95

New VIDEO CABLE completes the installation. Here's the easy way to connect the monitor on your VIC-20 or CBM 64 system to our VIDEO PAK. A must for 80 column use! Suggested retail: $12.95

New WORD MASTER—most cost-effective word processing system going. Use

FOR BOTH COMMODORES



WORD MASTER with our VIDEO PAKS to give your VIC-20 or Commodore 64 features found only in the most expensive systems. These include a full-function status display, up and down scrolling, and advanced on-the-screen editing features. All this and more for an exceptionally low price. Suggested retail: $89.95

SERIAL PRINTER INTERFACE is simple, yet sophisticated. Flexibility, continuous visual monitoring of data transfer functions, and easy installation make this a smart buy for your VIC-20 or Commodore 64. A glance at the status lights tells if the printer is hooked up, if the data buffer is full, and if data is being transmitted. Easily configured DIP switches match your computer to most popular printers. Our interface comes with cable and connector, needs no assembly, and virtually troubleshoots its own installation. Suggested retail: $69.95

EXPANSION CHASSIS lets you use 4 cartridges at once. Run a series of compatible memory, software or game cartridges of any make on your VIC-20. Just pop in any cartridge with the standard 22-pin edge connector. And don't worry about your computer's power supply—we protect it with a built-in 500ma fuse. Suggested retail: $49.95

New MICRO EXPANSION CHASSIS for VIC-20. Team this with our video expansion products and software cartridges. It's a neat two-slot board with one 22-pin edge connector in the normal vertical configuration and another at a right angle. This design keeps the VIDEO PAK in its normal position and gives a clean, functional layout for your hardware. Suggested retail: $34.95

MEMORY CARTRIDGE boosts VIC-20 brainpower to 20K. Here's an ideal first add-on. And when we give you more memory, you can forget about headaches. Our cartridge is housed in a rugged plastic case and features the finest quality components for reliability. Suggested retail: $99.95

Check out our AWESOME peripherals. Ask your computer dealer for a first-hand look at our extensive capabilities, high quality, and very reasonable prices. Or send $3.50 for a copy of our current catalog of Commodore compatibles. DATA 20 CORPORATION, 23011 Moulton Parkway, Suite B10, Laguna Hills, CA 92653

Commodore 64, Commodore 1541, and VIC-20 are registered trademarks of Commodore Electronics, Ltd.

CP/M is a registered trademark of Digital Research, Inc.

DATA 20
CORPORATION

Price/Performance Peripherals

EDITOR'S NOTES

Warner Communications stock has been taking it on the chin during recent weeks on Wall Street. The problems started when Atari apparently fessed up to substantially slower sales of home video game cartridges than expected. This announcement promptly caused Warner (Atari's parent company) to plunge to a new twelve month low. Not only did the announcement of diminishing video cartridge sales clobber Warner stockholders, but tremors were promptly dispatched into the stock of Mattel and Commodore, among others.

We'd like to suggest the panic was cathartic in nature, inasmuch as anyone should have foreseen a diminishing share of the video game business in the Atari corner, given that their competition in the market has increased from just a couple of companies a couple of years ago to several dozen at present. Perhaps the real problem was that Atari itself didn't appear to take the competitive horizon into account in their own forecasts, and the rug was pulled out from under the stock with Warner's sudden announcement.

No one ever quite seemed to say that the video games weren't selling. From the commentary we read, it appeared they were simply saying that Atari was selling fewer video game cartridges. Part of this decline must be attributed to increased competition from the personal computer market. When you can buy a relatively sophisticated home computer with full color graphics capabilities for anywhere from $170 to $225, it again seems reasonable to foresee a bit of encroachment taking place. From all points, we're hearing that the Atari 400, the VIC-20, and the TI-99/4A are doing quite well, thank you.

So, in one sense, Atari's doing a good job of competing with itself, albeit in a morass of tight competition with the other personal computer vendors.

Now that we've raised the spectre of competition with self, we'd like to take a look at the new Atari 1200XL. An impressive name, but we're hard pressed to figure out what Atari is up to. The XL is destined to be formally introduced at the January Consumer Electronics Show in Las Vegas with a planned price point of less than $1000. One of the better attributes of the new unit, according to initial press releases, seems to be that it's a "breakthrough in attractive styling." Would you like me to repeat that for those of you clamoring for enhancements?

We're concerned about the emperor's new clothes because the actual features of the XL seem off base when compared to the competition. For example, the Atari 800. Here's a quick comparison, gleaned from the Atari announcement on the 1200XL:

	Atari 800	Atari 1200XL
Memory	**48K**	**64K**
User Programmable Function Keys	**No**	**4**
Cartridge Slots	**2**	**1**
Colors	**256**	**256**
Voices	**4**	**4**
Controller Ports	**4**	**2**
Price	**Less than $700**	**Less than $1000**

Tom Halfhill will have a hands-on review of the 1200XL in our March issue. We're hopeful that additional capabilities and features will turn up. Right now, we're concerned that the 1200 has been introduced to fill a nonexistent hole in Atari's product line. Unless Atari plans a set of price decreases for the family of products (e.g., the 400 at less than $200, the 800 at less than $500, and the 1200XL at less than $800 or so), we fail to see the significance of the new introduction, or its competitive niche in the marketplace.

Random Bits... The Commodore™ Gazette (for the VIC-20 and Commodore 64) will premiere as a monthly with a May issue. For full details see page 245. As we noted last issue, *The Commodore Gazette* will not alter the current scope of **COMPUTE!** for VIC and 64 readers... we see the new magazine as a product geared even more to beginners than **COMPUTE!**.

We're moving. By the time this issue reaches you, we'll be in larger facilities. The growth of **COMPUTE!** and **COMPUTE! Books** has necessitated our expansion into new quarters. Our post office box remains the same, but our new street address is: 505 Edwardia Drive, Greensboro, NC 27407.

A Call For Articles: We're still looking for beginning and intermediate level applications and tutorials for TI, Atari, VIC-20, Commmodore 64, etc.

Robert Lock

AN INFORMATION MANAGEMENT SYSTEM FOR YOUR COMMODORE COMPUTER

InfoPro is a menu driven and interactive "information management" system for the Commodore 8032 computer. **InfoPro** uses "friendly" screen prompts that "guide" you from function to function. This makes **InfoPro** unusually easy to learn and just as easy to operate.

For Mailing List applications **InfoPro** can print up to 8 labels across and even has a built in "structure" with fields already pre-set. This structure can easily be changed to fit many other types of office jobs.

Another extremely powerful feature of **InfoPro** is Super Scan. The Super Scan feature acts like an "electronic filing cabinet" and provides the user with almost instantaneous access to the data stored in a file. The powerful Report Generator allows you to "select" information for printing based on up to 5 different parameters or criteria and to perform various math functions.

Another powerful and indispensable feature is **InfoPro's** ability to interact with the WordPro family of word processing programs. This provides the user with a "link" from the area of data information management to the area of word processing, allowing the user to manipulate, sort, and select data by certain criteria, which can then be inserted into "personalized" letters, documents, overdue notices, etc. **InfoPro** will also allow you to ADD, DELETE or CHANGE your information "fields" any time you wish. This means that as your business changes, **InfoPro** has the flexibility to change with it.

As with all Professional Software products, **InfoPro** comes complete with a professionally written and fully-tested user oriented manual. **InfoPro** also includes a program ROM, and **InfoPro** System Diskette.

Start managing your information today.

Call us today for the name of the Professional Software dealer nearest you.

Professional Software Inc.

51 Fremont Street
Needham, MA 02194
Tel: (617) 444-5224
Telex: 951579

WordPro™ and InfoPro™ are registered trademarks of Professional Software

Publisher/Editor-In-Chief	Robert C. Lock
Publisher's Assistant	Alice S. Wolfe
Senior Editor	Richard Mansfield
Managing Editor	Kathleen E. Martinek
Features Editor	Tom R. Halfhill
Technical Editor	Ottis R. Cowper
Editorial Assistant	Charles Brannon
Programming Assistant	Patrick Parrish
Administrative Assistant	Vicki Jennings
Copy Assistants	Juanita Lewis Mary Parker
Associate Editors	Jim Butterfield, Toronto, Canada Harvey Herman, Greensboro, NC Fred D'Ignazio, 2117 Carter Rd. S.W. Roanoke, VA 24015 David Thornburg P.O. Box 1317, Los Altos, CA 94022
Contributing Editors	Marvin DeJong Bill Wilkinson Gene Zumchak
Art Director/ Production Manager	Georgia Papadopoulos
Assistant	Irma Swain
Artists	De Potter Jean Hendrix
Typesetting	Terry Cash
Illustrator	Harry Blair
Production Assistant	Dai Rees
Associate Publisher/ National Advertising Sales Manager	Andy Meehan
Advertising Coordinator	Alice S. Wolfe
Advertising Accounts	Bonnie Valentino
Sales Assistant	Rosemarie Davis
Operations/Customer Service Manager	Carol Lock
Coordinator	Fran Lyons
Assistants	Christine Gordon Dorothy Bogan Gail Jones Chris Patty Patty Jones
Shipping & Receiving	Jim Coward Larry O'Connor
Accounting Manager	W. Jerry Day
Bookkeeper	Ellen Day
Accounting Assistant	Linda Roquemore
Assistants	Doris Hall Ruth Granger Anna Harris

Small System Services, Inc. publishes:

COMPUTE!
The Journal For Progressive Computing

COMPUTE! Books

Corporate office:
625 Fulton Street,
Greensboro, NC 27403 USA

Mailing address: COMPUTE!
Post Office Box 5406
Greensboro, NC 27403 USA

Telephone: 919-275-9809

Robert C. Lock, President
W. Jerry Day, Vice-President and Comptroller
Kathleen E. Martinek, Assistant To The President
Sonja Whitesell, Executive Assistant

Coming In March

Special Mass Memory Issue Including:

Direct Atari Disk Access

All About Mass Memory On The Commodore 64, VIC, And PET/CBM

Apple Subroutine Capture

A General-purpose TRS-80 Color Computer Data Base

TI-99/4A Trapshoot

Data Handling On The Sinclair/Timex

Two Intriguing Games: *Closeout!* and *Boggler*

Subscription Information

COMPUTE! Circulation Dept.
P.O. Box 5406
Greensboro, NC 27403

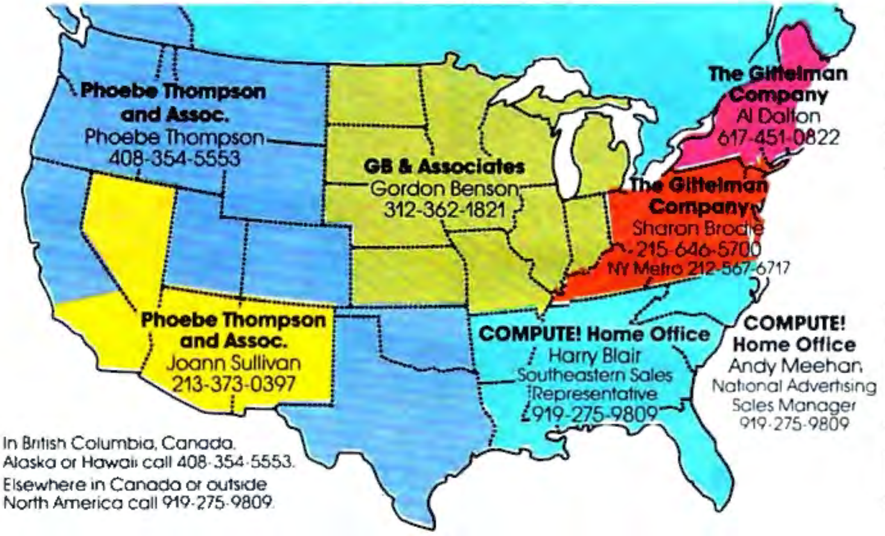
TOLL FREE
Subscription Order Line
800-334-0868
In NC 919-275-9809

COMPUTE! Subscription Rates

(12 Issue Year):

US	(one yr.) $20 (two yrs.) $36 (three yrs.) $54
Canada and Foreign Surface Mail	$25
Air	
Europe, US Possessions	$38
Middle East, Central America and North Africa	$48
South America, South Africa, Far East and Australia	$88

Advertising Sales



In British Columbia, Canada, Alaska or Hawaii call 408-354-5553.

Elsewhere in Canada or outside North America call 919-275-9809.

Phoebe Thompson and Associates
101 Church Street
Suite 13
Los Gatos, CA 95030
PHOEBE THOMPSON

Phoebe Thompson and Associates
2556 Via Tejon
Palos Verdes Estates, CA 90274
JOANN SULLIVAN

GB & Associates
P.O. Box 335
Libertyville, IL 60048
GORDON BENSON

COMPUTE! Home Office
625 Fulton Street
Greensboro, NC 27403
HARRY BLAIR
Southeastern Sales Representative

The Gittelman Company
Statler Office Building
Suite 518
20 Providence Street
Boston, MA 02116
AL DALTON

The Gittelman Company
Summit Office Center
7266 Summit Avenue
Fort Washington, PA 19034
SHARON BRODIE

Address all advertising materials to:
Alice S. Wolfe
Advertising Production Coordinator
COMPUTE! Magazine
625 Fulton Street
Greensboro, NC 27403 USA

Authors of manuscripts warrant that all materials submitted to COMPUTE! are original materials with full ownership rights resident in said authors. By submitting articles to COMPUTE!, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of Small System Services, Inc. No portion of this magazine may be reproduced in any form without written permission from the publisher. Entire contents copyright © 1983, Small System Services, Inc. Rights to programs developed and submitted by authors are explained in our author contract. Unsolicited materials not accepted for publication in COMPUTE! will be returned if author provides a self-addressed, stamped envelope. Program listings should be provided in printed form (new ribbon) as well as machine readable form. Articles should be furnished as typed copy (upper- and lowercase, please) with double spacing. Each page of your article should bear the title of the article, date and name of the author. COMPUTE! assumes no liability for errors in articles or advertisements. Opinions expressed by authors are not necessarily those of COMPUTE!

The arcade-warp is open!

YOU CAN RUN BUT CAN'T HIDE. YOU CAN KILL BUT CAN'T ESCAPE.

Tubeway! It's an insidious invasion route created by beings from a parallel universe—a strange, geometric universe. You're trapped on the rim as their fleet swarms out of the warp on a voyage of conquest. The battle is yours alone—and it's far from easy because normal strategy doesn't work! . . . you have to fight by their strange, geometric rules!

Here's the fastest, most fascinating of the new style space games. So involving and exciting it's destined to become an all-star, all-time hit. Be one of the first to take on the challenge of the lightfast Tubeway!

$34.95 for the Apple II*. At your computer store or:

DATAMOST

9748 Cozycroft Ave., Chatsworth, CA 91311
(213) 709-1202

VISA/MASTERCARD accepted. $2.00 shipping/handling charge. (California residents add 6½% sales tax.)

*Apple II is a trademark of Apple Computer, Inc.

ASK THE READERS

The Editors and Readers of COMPUTE!

Using VIC's Function Keys

Is it possible to use the special function keys on the Commodore VIC-20 while not under the control of a program? I have tried many ways and have not come up with a solution yet.

Brian A. Cohen

See "Programming VIC's Function Keys" in **COMPUTE!**, *November 1982, #30, pp. 196-198.*

Commodore 64 Add-ons

Could you tell me if the following are available, forthcoming, or possible for the Commodore 64, and, if so, how (and from whom) I may obtain them?

1. 80-column display monitor
2. external RAM expansion
3. languages: Logo, FORTRAN, FORTH, COBOL, APL, or a language text editor
4. indexed sequential disk files
5. random access files
6. 132-column dot-matrix printer

Carleton B. Bass

To answer your questions in order:

1. *Commodore has no plans to provide hardware for an 80-column display. However, a number of other vendors already make peripherals which produce 40- or 80-column displays for the VIC-20 (look for their ads in this issue), so it seems quite likely that such products will soon become available for the 64. One reason Commodore has for not developing an 80-column display is that 40 columns is about the maximum resolution capability of the average home TV set. Anything greater than that requires a separate video monitor.*

2. *The 64K of memory built into the computer represents the maximum amount the Commodore 64's microprocessor can address. Thus, any external RAM would have to be "bank switched," and Commodore has no plans to provide such an expansion.*

3. *Versions of Logo and PILOT for the 64 are under development, and FORTH is almost certain to become available from an outside vendor. The optional Z-80 microprocessor add-on card will provide CP/M capability, and thus access to versions of FORTRAN, COBOL, and other languages. Each language has its own text editor, but there are no plans to provide a text editor separate from a language.*

4. & 5. *The standard VIC-1541 disk drive for the 64 provides the capability for both sequential and random access files.*

6. *A planned serial-to-IEEE interface will make it possible to use the Commodore 8023 132-column dot-matrix printer with the 64.*

Pausing Atari Printer

Why does the Atari 825 printer stop for an extended period of time every once in a while? Is it from overheating?

Marshall Lake

Sometimes, the printer will "time out" and will halt for several seconds. This is due to a bug in the 10K ROM operating systems, not the printer. This bug, and several others, has been fixed in the new Revision B operating system.

Contact your local authorized Atari service center for information on making a minor repair to solve this problem.

A Bevy Of New Commodore Drives

I own a VIC-20. I am also contemplating a purchase of a Commodore-64. As of this date I have not purchased a disk drive for my machine primarily for two reasons. The most important of these reasons is that I haven't seen the VIC-1540 disk drive subjected to any critical evaluation in the pages of **COMPUTE!** magazine. I am sure that many of your readers would be as interested in this information as I am. Although one might argue that this information could be obtained from the manufacturer, I would feel much more confident of the objectivity of the information and evaluation if it came from one of your expert writers (perhaps Jim Butterfield?).

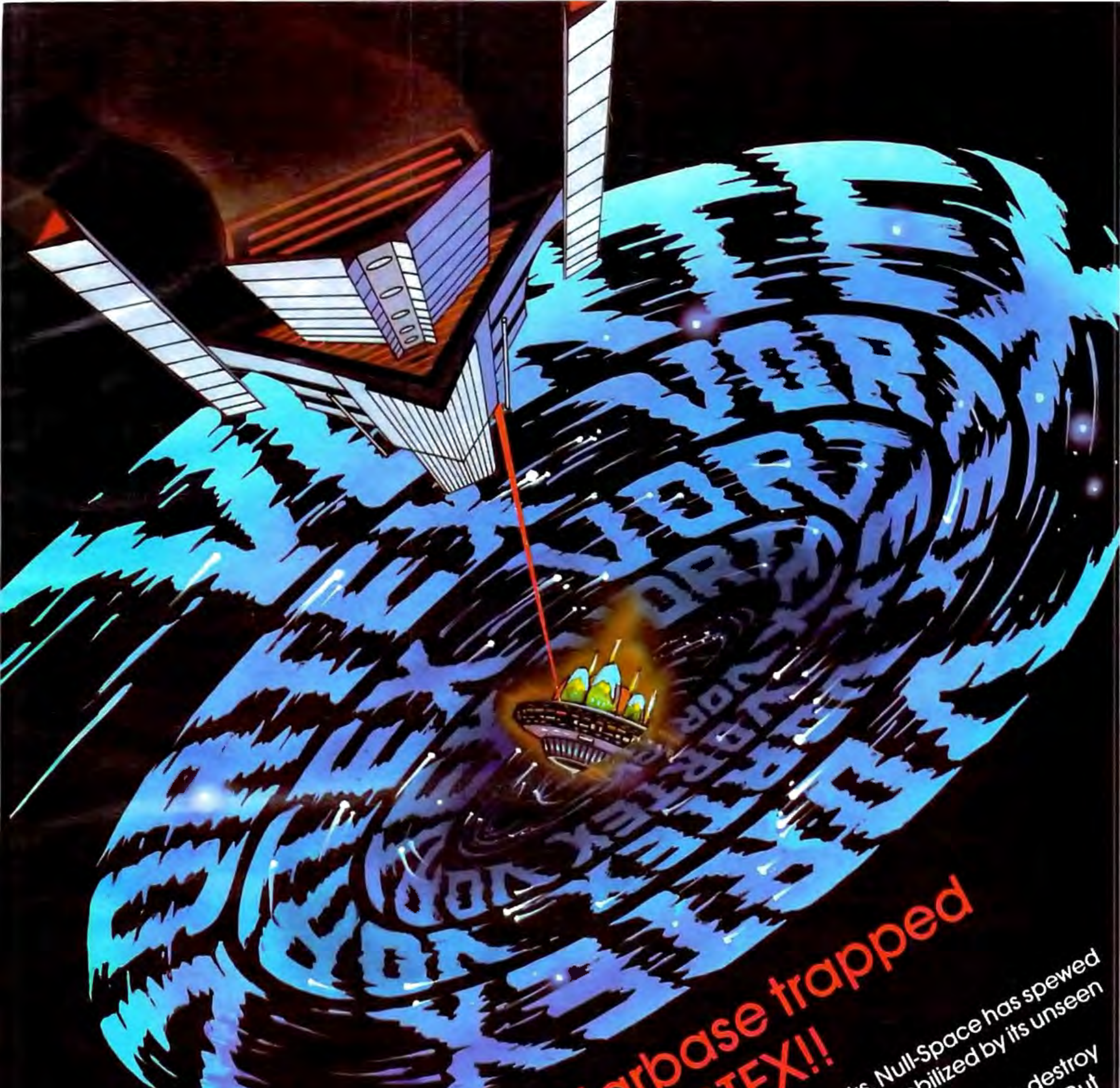
Todd Oldham

Jim replies:

Briefly, there's a whole flock of new Commodore disks.

The 2031 is a single disk unit suitable for use with PET/CBM; it uses an IEEE interface. The 1540 is a single disk unit suitable for the VIC; it uses a serial bus interface. The 1541 is a single disk unit suitable for either VIC or Commodore 64; again, it uses a serial bus interface.

All three disks are completely compatible with the 4040 dual disk in terms of format and transferability of programs and files. The 1540 and 1541 documentation hints that relative files cannot be used: in fact, they can; you'll need to do a little more programming on your VIC or 64 to get there, but the disk has all the features built in.



wabash® diskettes for as low as $1.39 each!

Now...Get High Quality at a Low Price
Wabash means quality products that you can depend on. For over 16 years, Wabash has been making high quality computer products. Wabash diskettes are made to provide error-free performance on your computer system. Every Wabash diskette is individually tested and is 100% certified to insure premium performance.

Why Wabash is Special
The quality of Wabash diskettes is stressed throughout the entire manufacturing process. After coating, all Wabash diskettes go through a unique burnishing process that gives each diskette a mirror-smooth appearance. Wabash then carefully applies a lubricant that is specially formulated to increase diskette life. This saves you money, since your discs may last longer. It also assists your disk drives in maintaining constant speed which can reduce read and write errors.

Special Seal...Helps Prevent Contamination
To keep out foreign particles, a unique heat seal bonds the jacket and liner together. A special thermal seal which avoids contamination from adhesives, is then used to fold and seal the jacket. This results in outstanding performance and true reliability. Wabash then packages each diskette, (except bulk pack) in a super strong and tear resistant Tyvek® evelope. The final Wabash product is then shrink-wrapped to insure cleanliness and reduce contamination during shipment.

Each Diskette is 100% Critically Tested
Since each step in the Wabash diskette manufacturing process is subject to strict quality control procedures, you can be sure Wabash diskettes will perform for you. And every Wabash diskette meets the ultra-high standards of ANSI, ECMA, IBM and ISO in addition to the many critical quality control tests performed by Wabash. Wabash does all of this testing to provide you with consistently high quality diskettes. Reliability and data integrity – that's what Wabash quality is all about.

Flexible Disc Quantity Discounts Available
Wabash diskettes are packed 10 discs to a carton and 10 cartons to a case. The economy bulk pack is packaged 100 discs to a case without envelopes or labels. Please order only in increments of 100 units for quantity 100 pricing. With the exception of bulk pack, we are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Wabash diskettes are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Wabash diskette compatibility hotline. Dial toll-free 800-323-9868 and ask for your compatibility representative. In Illinois or outside the United States dial 312-593-6363 between 9 AM to 4 PM Central Time.

SAVE ON WABASH DISKETTES Product Description	Part #	CE quant. 100 price per disc ($)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	F111	1.99
8" Same as above, but bulk pack w/o envelope	F111B	1.79
8" SSSD Shugart Compatible, 32 Hard Sector	F31A	1.99
8" SSDD IBM Compatible (128 B/S, 26 Sectors)	F131	2.49
8" DSDD Soft Sector (Unformatted)	F14A	3.19
8" DSDD Soft Sector (256 B/S, 26 Sectors)	F144	3.19
8" DSDD Soft Sector (512 B/S, 15 Sectors)	F145	3.19
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	F147	3.19
5¼" SSSD Soft Sector w/Hub Ring	M11A	1.59
5¼" Same as above, but bulk pack w/o envelope	M11AB	1.39
5¼" SSSD 10 Hard Sector w/Hub Ring	M41A	1.59
5¼" SSSD 16 Hard Sector w/Hub Ring	M51A	1.59
5¼" SSDD Lanier No-problem compatible	M51F	2.99
5¼" SSDD Soft Sector w/Hub Ring	M13A	1.89
5¼" Same as above, but bulk pack w/o envelope	M13AB	1.69
5¼" SSDD Soft Sector Flippy Disk (use both sides)	M18A	2.79
5¼" SSDD 10 Hard Sector w/Hub Ring	M43A	1.89
5¼" SSDD 16 Hard Sector w/Hub Ring	M53A	1.89
5¼" DSDD Soft Sector w/Hub Ring	M14A	2.79
5¼" DSDD 10 Hard Sector w/Hub Ring	M44A	2.79
5¼" DSDD 16 Hard Sector w/Hub Ring	M54A	2.79
5¼" SSQD Soft Sector w/Hub Ring (96 TPI)	M15A	2.69
5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	M16A	3.79

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

Buy with Confidence
To get the fastest delivery from CE of your Wabash computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum *prepaid* order $50.00. Minimum *purchase order* $200.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case or partial-case of 100 5¼-inch mini-discs for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Wabash diskettes from Communications Electronics today.

Copyright © 1982 Communications Electronics™ Ad #110582

MasterCard VISA MEMBER DIRECT MAIL MARKETING ASSOCIATION

Order Toll-Free!
800-521-4414
In Michigan 313-994-4444

wabash
error-free diskettes

COMMUNICATIONS ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

25 of The Hundreds of Reasons You Ought To Be A **COMPUTE!** Magazine Subscriber:

From "The Editor's Feedback" Card, a monthly part of our continuing dialogue with readers of **COMPUTE!**. These are responses to the question,

"What do you like best about **COMPUTE!** ?"

1. "It is written so a beginner can read and understand it... it's layman oriented..." **2.** "Clear, clean layout, good presentation..." **3.** "The Atari game programs..." **4.** "Best and most information on PET..." **5.** "Cover to cover, and all in between..." **6.** "Reviews of software and hardware..." **7.** "Good balance of application and technical articles..." **8.** "It is the best source of info about various levels of VIC/PET/CBM machines and applications..." **9.** "The BASIC and machine language programs..." **10.** "I like programs that can be typed into a computer, run, and then used right away (a program without bugs!)..." **11.** "That it is organized well, and covers a broad range of information concerning Atari. Keep it up! please, I'm learning..." **12.** "Table of contents listings and computer guide to articles is a great idea. Best magazine for personal home computer users..." **13.** "Best I have found for VIC info..." **14.** "Informative articles: 'Secrets of Atari', Game programs, especially programs that teach the reader about the Atari..." **15.** "I like all the articles and programs for my computer, the PET. I've learned and found out things about it that I never even thought existed. Other magazines don't have too much material for the PET and, for that reason, I find **COMPUTE!** invaluable..." **16.** "The up-to-date hardware reviews..." **17.** "Machine language utilities for Atari..." **18.** "Articles are terse but understandable and accurate. Utility and applications program listings very helpful..." **19.** "The April, '82 issue is my first. I am impressed that you not only acknowledge the VIC-20, you even have applications for it..." **20.** "I really enjoy (since I am one) the Beginner's Page..." **21.** "The attention it gives to Atari and the easy-to-understand language it's written in..." **22.** "It is concerned with explaining programs, not just listing them. It is the best VIC magazine I could buy..." **23.** "The new table of contents 'Guide to Articles and Programs' is excellent, particularly the indication of 'multiple computer' items..." **24.** "Broad range (sophistication) of programs..." **25.** "You don't speak over the average user's head..."

Whether you're just getting started with personal computers, or very advanced, you'll find useful, helpful information in every issue of **COMPUTE!** Magazine. We specialize in supporting the Atari, PET/CBM, VIC-20, and Apple computers. Editorial coverage is expanding to include the TI-99/4A, the Sinclair ZX-81, and the Radio Shack Color Computer.

Every issue of **COMPUTE!** brings you user-friendly articles, applications programs, and utilities you can type right into your computer and use. To subscribe to **COMPUTE!**, or to order a sample issue, use the attached reply card or call our toll-free number. **COMPUTE!**... We're the resource for thousands and thousands of home, educational, and small business computer users. Shouldn't you be one of them?

1 year, twelve issue subscription: $20.00 in the US.

Call Toll Free in the US 800-334-0868
In NC call 919-275-9809

COMPUTE! Magazine is a publication of Small System Services, Inc.
625 Fulton Street. P.O. Box 5406. Greensboro, NC 27403.

Also, all three disks have identical command protocols to the 4040 and 8050 disks, except that Copy and Duplicate won't do anything useful on a single disk. If the programs are compatible with the connected computer (this usually means no BASIC 4.0 commands), they will run regardless of which disk is connected. One limitation: the dual 4040 can have more files open simultaneously – up to six files – than the single units, which seem to be limited to about three at a time.

Now for the differences: the three disks are almost identical internally. Externally, the 2031 has a metal housing, but the 1540 and 1541 streamlined plastic enclosures. The 2031 communicates with the PET/CBM over the IEEE-488 bus, which means that it transfers information fast. The 1540 and 1541, by contrast,. use the relatively slow serial bus. The 1541 is a little slower than the 1540; it may be used with either the VIC or 64. The 1540 is slightly faster, but can't be used with the Commodore 64 unless the computer is POKEd to blank the screen (POKE 53265,11 will blank the screen; after the Load, POKE 53265,27 will restore it). The 1540 can be changed to a 1540 by replacing a ROM chip.

A number of manufacturers offer adapters which interface the VIC and Commodore 64 to the IEEE bus. With such a device, you can get higher speed disk action, or use a dual disk if you wish.

Commodore is rumored to be retiring the 2031 single disk; their intention seems to be to re-announce it in a new form with a streamlined plastic housing similar to the 1540 and 1541.

Commodore has recently announced two high-capacity IEEE-488 disks. The 8250 is a dual disk unit with the capability of writing on both sides of a disk surface. It has about double the capacity of an 8050 unit: that is, one disk can now hold about 1.2 megabytes (million bytes) of information, which allows the 8250 to have 2.4 megabytes on line with both drives in use.

The 8250 has partial compatibility with the 8050 unit, allowing data to be transferred from 8050 format to 8250. The 8250 is said to have some problems, mostly involving files which continue from side one to side two. In switching sides, the disk often has to move its head over a considerable distance to find the proper track on the second side; this may result in time-out problems.

The D9000-series disks are high capacity "hard" disks. There are two versions, with capacities of about 5 megabytes and 7.5 megabytes. These disks are very fast internally; but their transfer rates are limited because of IEEE-488 speed limitations. Since the disks themselves are permanently installed within the drive, these units play a somewhat different role than that of floppy disks, which are user changeable. A hard disk tends to be more closely integrated into the computer system: its data and programs are viewed more as "built-in" rather than "plug-in." Because of the lack of replaceable media, the hard disk needs close attention on the questions of data security and backup.

Both the 8250 and the D series are generally compatible with other Commodore disks in terms of command sets. The D series, being a single drive unit, does not have backup or copy facilities. Both disk systems have substantially extended relative file capability: the size of a relative file is not limited as it was in the 8050 and previous disk models.

In general, all Commodore disks have a high degree of data compatibility within the 35-track (2040, 3040, 2031 and 4040) units and the 77-track (8050 and 8250) units. The computer-to-disk commands for reading and writing files and doing special jobs such as cataloguing or scratching files are completely consistent between units. It's easy to switch from one system to another.

Fuzzy VIC TV Picture

I am getting a poor TV picture when the VIC-20 is hooked up and activated. I believe it is RF interference. Is there any way to eliminate this so that I can obtain a clearer picture?

D. Murphy

Early VICs caused severe interference problems, a feature which Commodore has made efforts to correct. For more information on solving your particular problem, call Commodore's technical assistance hotline, (215) 687-4311.

Apple DOS Toolkit on ROM

What I would like to know is if there is a ROM equivalent to Apple's "DOS Toolkit"? If one exists, I would like to know what company makes it, who or where I can get it from, and how much it costs. If it does not exist or you don't think it will in the near future, I would like to know if I could encode the existing Toolkit on an EPROM chip, put it on an interface card, and place it into any slot in an Apple's backplane? If this is possible, I would like to know if it could be used under Applesoft without disabling the Apple's firmware ROM. I know that this seems like a rather large request, but any information that you could provide would be most helpful.

Paul Lucas

Apple does not manufacture such a ROM and knows of no one who does. Since most of the utilities provided in the Toolkit are stored as binary files, they could be transferred to EPROMs. However, a substantial amount of programming would likely be necessary to modify and relocate these machine language routines so they would work from ROM.

VIC Artifacting

I purchased a 16K RAM cartridge made by Commodore for my VIC-20 and noticed some strange effects on my TV screen. As the program is run-

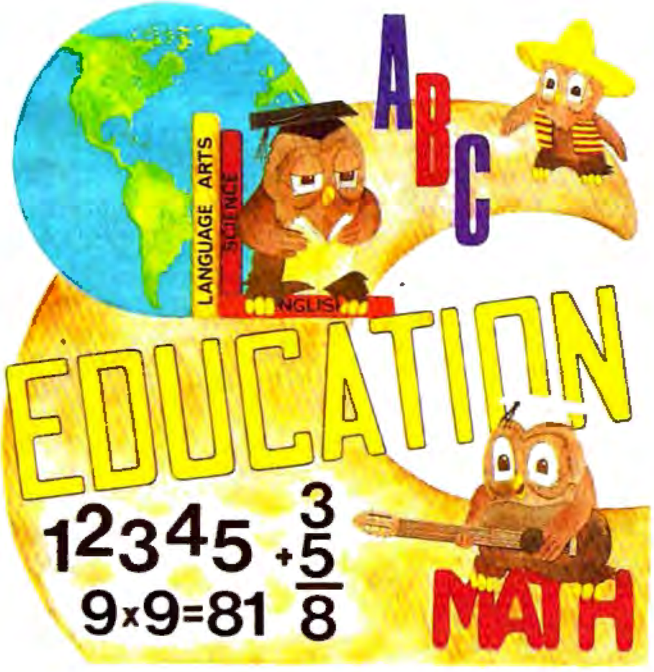
COMM*DATA SOFTWARE

GUIDES YOU AND YOUR VIC 20® DOWN ROADS OF ADVENTURE WITH:

- Maelstrom*
- Escape MCP*
- Gator Chase*
- Astro Command
- Caves of Annod
- Capture the Beast
- Whirlwind Rescue*
- Street Maze
- The Market
- Chivalry

THROUGH TRAILS OF CREATIVITY WITH:

- Sketch and Paint



ALONG THE PATH TO KNOWLEDGE WITH:

- Wordspot
- Math Tutor Series
- Alphabet Tutor
- Conversion
- Gotcha Math
- English Invaders
- Math Invaders Series

ASK FOR COMM*DATA COMPUTER HOUSE SOFTWARE AT YOUR LOCAL DEALER.

Or Send for FREE Catalog:
COMM*DATA COMPUTER HOUSE
320 Summit Avenue
Milford, Michigan 48042
(313) 685-0113

Dealer Inquiries Welcome.

Quality software also available
for Pet and Commodore 64 computers

MasterCard

VIC 20 is a Registered Trademark of Commodore Business Machines, Inc.
*High Res Full Machine Code Arcade Style Games.

VISA

ning the printing on the screen changes color, not the full word but individual letters, giving the screen a rainbow display. Also, it seems that the width of the letter changes. When the letters become the same color as the screen, it is impossible to read the words. I have tried two cartridges and both did the same. Can anyone help?

C. V. Lorigo

This "effect" is known as artifacting, and is sometimes produced intentionally on other computers. However, Commodore has had no previous reports of their RAM cartridge producing such results. Have other readers with 16K cartridges experienced this phenomenon?

Upgrading The Original PET

We have an old PET 2001-8 which has been underutilized since we purchased a 32K machine with dual floppies. Of course, we are now over-utilizing the new machine. Does anybody know how we can upgrade the old PET to run our VisiCalc on it (32K and one floppy)?

Joe Ormond

To get your PET to handle the extra memory and disk drives, you must first upgrade it to at least BASIC 3.0. For this you must take it to a Commodore service center and have some of the ROMs replaced. If your PET is an early model with 28 pin ROMs, you will need to ask for the Type 6540 Upgrade set. If yours is a later model with 24 pin ROMs, then you will need the Type 2316B Upgrade set.

Can The VIC Become A Commodore 64?

I am a VIC-20 owner contemplating selling my VIC and buying a Commodore 64. I have heard rumors that Commodore was going to manufacture a cartridge which would turn the VIC into a 64. I know a few other VIC owners who are also interested in such a conversion. If you have any knowledge of such a cartridge or expansion board in either the drawing or finished stages (from Commodore or other vendors), could you please share it? I'm sure that I and many other VIC owners would appreciate it.

Robert Pilat

Despite their external similarities, the VIC and Commodore 64 have many internal differences. As a result, Commodore has no plans to produce any sort of add-on which would allow the VIC to mimic a 64. Whether an independent vendor will attempt such a project remains to be seen.

Missing Memory

I've had an Atari 800 computer for over a year now and have an 8K and a 16K RAM module for a total of 24K of memory. Just recently I purchased a 32K RAM module to increase the memory of the computer.

I know that the maximum free RAM that I can get is 37,902 by using the 16K and 32K memory modules, so out of a possible 49,152 (1024 x 48), I lose 11,250 bytes of memory.

In experimenting with various configurations of the three modules that I have, I came up with some interesting yet unexplainable (to me) totals for free RAM available. Listed below are my results:

RAM Module	Total Possible RAM	Actual FRE(0)	Missing
8K	8192	5131	3061
8K+16K	24,576	21,518	3058
8K+32K	40,960	37,902	3058
16K	16,384	13,326	3058
32K	32,768	13,326	19,442
16K+32K	49,152	37,902	11,250

What I would like to know is why, when I put the 32K module in the computer alone, I have only 13,326 bytes of memory available and lose 19,442 bytes?

Thomas Bruton

The memory discrepancies you have noticed are common to all computers and are known as overhead. *All computers consume some "user" memory for various purposes when they're switched on. For example, a 5K RAM VIC-20 really has 3583 bytes free, and a Commodore 64 has 38,911 bytes (for BASIC programming). For an explanation of this, see this month's "Questions Beginners Ask" column.*

The reason your 32K board does not yield 32K when plugged in alone has to do with the way the Atari addresses memory. The memory board plugged into the Atari's first slot (not counting the 10K ROM Operating System board) must have certain circuitry so the Atari can address all its memory. Atari RAM boards have this circuitry, but your 32K board does not. That's why you get the full 32K from your board only when using it in combination with the 8K or 16K boards.

There are "companion" or "loopback" boards available for about $5 which fit into the first slot, adding the circuitry to allow some 32K boards to operate alone and still yield 32K.

Using VIC's Function Keys

Is it possible to use the special function keys on the Commodore VIC-20 while not under the control of a program? I have tried many ways and have not come up with a solution yet.

Brian A. Cohen

See "Programming VIC's Function Keys" in **COMPUTE!**, *November 1982, #30, pp. 196-198.*

WORD PROCESSING HAS NEVER BEEN SIMPLER

Bank Street WRITER™

Brøderbund's Bank Street Writer turns your Apple or Atari computer into a powerful word processor, with many of the advanced features you'd expect to find only in an expensive business system. Powerful, yet purposefully simple, Bank Street Writer has no complex codes to memorize. The screen guides you every step of the way. It's everything you're ever likely to need in a word processor at a price you can afford. Here are just a few of its many features: • Add, move, insert and erase blocks of text, • Universal search and replace, • Automatic centering and indent, • Automatic word wrap, so you don't have to hyphenate or "return" at the end of each line, • Potent print format routines all in memory, • Disk storage and retrieve functions with password protection, • Document chaining allows you to print documents of unlimited length, • Page headers and automatic page numbering—top or bottom, • Highlighting of text, • Upper and lowercase without additional hardware.

Brøderbund's Bank Street Writer comes complete with Tutorial and Utility programs, a comprehensive reference manual and a free back-up disk.

Student approved, the entire system has been extensively tested by Bank Street College of Education and Intentional Educations.

Bank Street Writer. The ground-breaking, sensible combination of word processing power, thoughtful design, and exceptional value.

The First Word Processor For The Entire Family.

Hardware requirements: Apple version requires Apple II or Apple II + with 48K and Applesoft in ROM of language card, DOS 3.3. Atari 400/800 version requires 48K and BASIC cartridge. Both versions require only one disk drive.

Brøderbund Software

1938 Fourth Street, San Rafael, California 94901, Telephone (415) 456-6424

Apple is a registered trademark of Apple Computer, Inc. Atari is a registered trademark of Atari, Inc.

Questions Beginners Ask

Tom R. Halfhill, Features Editor

Are you thinking about buying a computer for the first time, but don't know anything about computers? Or maybe you just purchased a computer and are still a bit baffled. Each month, **COMPUTE!** *will tackle some of the most common questions that we are asked by beginners.*

Q: When I'm experimenting with player/missiles on an Atari 400/800 or with sprites on a Commodore 64, why don't the objects disappear when I press the CLEAR key to clear the screen?

A: To explain why, we'll briefly describe what "player/missiles" and "sprites" are. They're both the same thing, except that different manufacturers call them by different names. Sprites are an advanced feature of Atari computers, the Commodore 64, and the Texas Instruments TI-99/4A. Sprites are small screen objects which you can design in various shapes and colors as part of a program. Once defined, these shapes can be moved around on the screen very smoothly and quickly, using special features of the computer. Sprites are most often used for animation in games.

Although to users sprites look like just another image on the TV screen, they appear much differently to the computer. Computers display images on a TV screen by setting aside some memory which contains the information displayed on the screen. Everything seen on the screen is contained in this *screen memory* – except sprites. The information which describes the shapes and colors of sprites is contained in another part of memory. In fact, it is even contained in a separate microprocessor chip.

When the sprite memory is overlaid upon the regular screen memory, we see the sprite on the TV screen. This system allows sprites to move independently from other screen objects. In fact, it's possible for a sprite to pass behind or in front of another screen object without disturbing it. Look closely at a game to see this feature used to advantage.

Since the CLEAR key wipes out only the screen memory, the sprite is not erased. To get rid of the sprite without destroying the program, try pressing the SYSTEM RESET key on an Atari, or the RUN/STOP and RESTORE keys simultaneously on a Commodore 64.

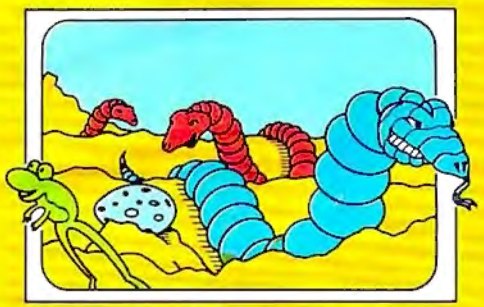
Q: I'm shopping for a computer and comparing memory, among other features. Someone told me that a 5K RAM Commodore VIC-20 really has only 3.5K, and a 16K RAM Atari 400 has only 13K, and so on for other computers. I'm confused by these numbers. What do they mean? How can I tell how much memory a computer really has available?

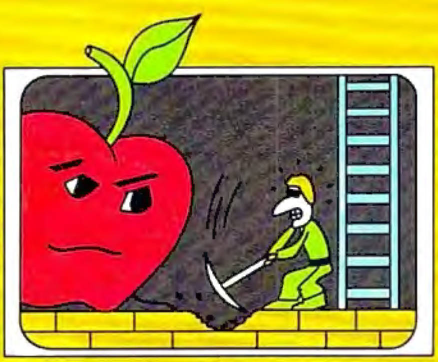
A: First, a brief explanation of RAM. Computers have two general types of memories: *RAM* (Random Access Memory) and *ROM* (Read Only Memory). ROM is permanent memory which cannot be altered by the user. ROM is used to store information which the computer needs every time it is turned on, such as the character set (the characters the computer displays), the BASIC programming language, the operating system (which governs the computer's internal operations), and so forth. ROM retains this information even when the computer is turned off.

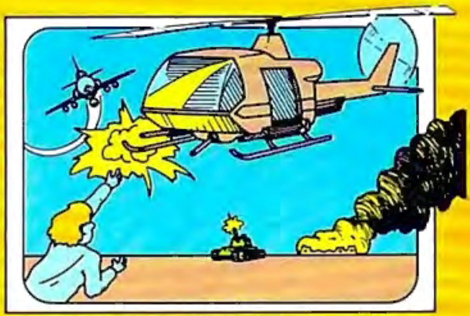
RAM, on the other hand, is memory available to users to temporarily store information and programs. Data stored in RAM can be changed or erased as often as you want. It erases itself when the power is turned off. Both RAM and ROM are measured in *kilobytes.* A *byte* stores one character. A kilobyte is 1,024 bytes, abbreviated "K." Thus, "16K RAM" means the computer has about 16,000 characters of user-available memory.

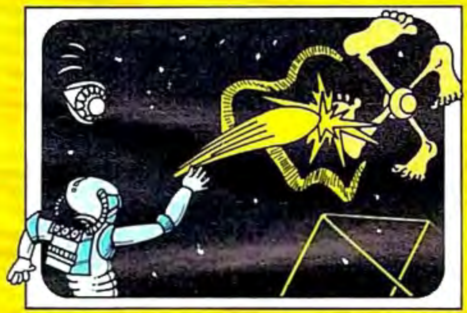
But how much of that is really available to you? To some degree, all computers commandeer some RAM when they are switched on. This is called *overhead.* That's why all computers have less free memory than advertised. This is not considered deceptive advertising; the total amount of RAM has become a standard for comparison purposes, sort of like EPA gas mileage ratings for new cars.

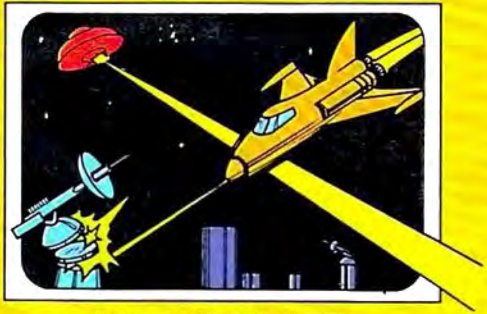
On some computers, you can determine the amount of free memory by typing PRINT FRE(0) and pressing RETURN or ENTER. An unexpanded (5K) VIC-20 has about 3500 bytes; a 16K Atari 400, about 13,300; a Commodore 64, about 38,900; a 48K Atari 800, about 36,000. On other computers, you may be able to discover the amount of free memory by checking the manual or asking a salesperson.

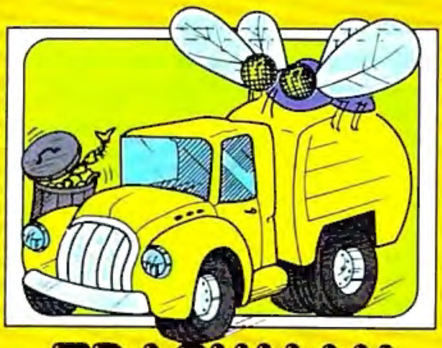


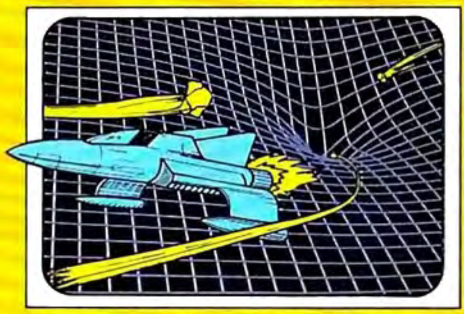












Computers And Society

David D. Thornburg, Associate Editor

Artificial Reality

A few years ago I designed an environment called the Kaleidophonic Experience. This exhibit consisted of an octagonal room about 20 to 30 feet across that was equipped with projection screens on each of the eight walls and loudspeaker columns at each of the eight corners. Each projection screen was illuminated by a programmable light source containing 16 filter wheels. Each filter wheel could contain images, polarizers, colored gels, etc., and could be used in conjunction with other color wheels to selectively control the illumination of each panel.

The speaker columns and light projectors were controlled by eight Atari 800 computers running in parallel (one for each projector and speaker column). The input for this room came from an instrumented tile floor in which each title sent position information to each of the eight computers. The software was designed to illuminate the room in a uniform glow if no one was present.

If a participant entered the room, the colors and sounds in the vicinity of the person were to be influenced by that person's activity level. If the participant just stood quietly, the region surrounding the person would fill with a warm orange light, and soft bubbling sounds would come from the speakers. If the user started to skip around the room, brighter lights would skip around as well.

In other words, the environment would respond differently to the user's various activities. If two people were in the room at the same time, they could send swirls of light to each other by making motions in each other's direction. Unfortunately, the Kaleidophonic Experience was never funded, so it was never built.

I have always wondered how people would react to responsive environments, and whether these environments might be useful laboratories for examining ways that people can convey information to computer systems. It was thus with great pleasure that I saw a copy of *Artificial Reality* by Myron Krueger. This book, recently published by Addison-Wesley, describes the results of Krueger's work over the past thirteen years, testing the idea that humans can interact positively with technology.

If you think that interactions that take place in highly instrumented rooms are artificial, consider that our present world has created an artificial reality for us that started with the industrial revolution. Most of our life is lived in a highly artificial environment. We transport ourselves with machines, we use machines to adjust our environment's temperature, we use machines to artificially enhance our communication – we seem to be totally captivated by an artificial reality. In fact, one has a hard time imagining our survival without the environmental modifications created by the industrial age.

Just as the industrial revolution (starting with the steam engine, perhaps) completely changed our relationship with our planet, our workplace, our homes, and each other, we can expect no less change to come from the information revolution, or whatever we will end up calling the computer age. The popularity of video game arcades shows one view of the electronic version of the artificial reality. Is a video game arcade anything more than an electronic version of a (principally mechanical) movie theater? Perhaps we should examine how people felt about the first commercial movie houses and compare that viewpoint with the concerns being expressed about the game arcades. Except for the change in the nature of the entertainment medium (both from the standpoint of technology and the level of user participation), I don't think there is much difference.

Metaplay

Krueger recognizes that our artificial reality is going to change and, for aesthetic reasons, he decided to build some environments that could be controlled by the user. These environments generally consisted of rooms equipped with different types of display technologies and sensor systems. One of Krueger's environments was called Metaplay and was constructed in 1970. The focus in this environment was on the participant's awareness of his or her interaction with the environment itself.

Metaplay was constructed in an empty, square dark room with one wall dominated by an 8′ x 10′ projection screen. This translucent screen

umi SOFTWARE
FOR THE COMMODORE VIC 20
RENAISSANCE
GAME CARTRIDGE
FOR THE COMMODORE VIC 20
SPIDERS OF MARS
GAME CARTRIDGE
FOR THE COMMODORE VIC 20
ALIEN BLITZ
AMOK
GAME CARTRIDGE
FOR THE COMMODORE VIC 20
METEOR RUN
GAME CARTRIDGE
FOR THE COMMODORE VIC 20
SATELLITES & METEORITES
GAME CARTRIDGE
FOR THE COMMODORE VIC 20

allowed the video projector to be placed outside the environment and to project its image from the rear. The remaining walls were painted with a phosphorescent paint. A large polyethylene sheet on the floor concealed 800 pressure sensitive switches. A computer in a separate building could generate responses to the participant's motion, or to both the participant's motion and the whims of a facilitator who was located in the same room as the computer.

Because the participants were being monitored by a TV camera, the projection screen could contain combinations of the video images of the participants along with computer generated graphics. This marriage of the computer and video images turned out to be a significant step in the development of the responsive environment. I will say more about the home applications of this marriage later.

Krueger's book describes some of the things people did in this and similar environments, as well as covering some of the technological issues associated with the creation of such technological artworks as Glowflow and Psychic Space. From his experiments with these environments, Krueger went on to develop Videoplace. Videoplace resulted from the premise that telecommunication between two places creates a third place, consisting of the information that is available to both communicating parties simultaneously.

The concept of a communication space separate from existing physical spaces has influenced Krueger's aesthetic thinking and has provided focus for hardware development. The original insight for Videoplace came when Krueger was in the gallery talking over the phone with a colleague at the computer center who was looking at an image on his display screen that was supposed to be similar to the one Krueger was seeing. In Krueger's words,

> *At first we talked over the phone about the displays we each had in front of us. However, after a few minutes of frustrating discussion, we realized that we had a far more powerful means of communication available. Using the two-way video link from Metaplay, we turned the gallery camera on the PDP-12 screen. The computer center camera was already aimed at the Adage. Both of us could now see a composite image juxtaposing the information being sent with that being received.... It was exactly as if we were sitting together at a table with a piece of paper between us.*
>
> *After a while, I realized that I was seeing more than an illusion. As I moved my hand to point to the data my friend had just sent, the image of my hand briefly overlapped the image of his. He moved his hand.... when it happened again I was struck by the thought that he was uncomfortable about the image of my hand touching the image of his.... The inescapable conclusion was that the same etiquette of personal space and avoidance of touching that exists in the real world was operating at that moment in this purely visual experience.*

Krueger goes on to describe his continuing work in this new area of artistic expression.

His book is a personal espousal of a humanism that accepts technology as part of nature – a most interesting thesis.

Those of us who don't have access to Krueger's environments can do some interesting experiments on our own. I am finishing a book on computer art and animation in which I suggest that the home VCR is a most valuable computer peripheral. Home video tape equipment, when used in conjunction with inexpensive special effects generators such as those made by Sony and Panasonic, allows computer users to mix personal computer graphics with realtime video images in some spectacular ways. The results are likely to be far more exciting than pure computer graphics (which tend to be almost too precise and static at times) and pure home-generated video.

One can see that this marriage of technology, much of it in the home already, will let people take greater control over a video medium that seemed, a few short years ago, to have us at its mercy. And personal control of technology is something we can all believe in.

You can see the fourbest for the trees.

In a time where everywhere you turn there's a forest of new video games, it's exciting to see a series of video games that obviously stand apart from the rest.

With extensive color, the best graphics anywhere and the finest sound utilization available, these Inhome arcade style games will no longer have you just playing a video game, you will be living a video adventure.

Baseball, Alien Swarm, Sentinel One and Guardians of the Gorn, from Inhome, for your Atari 400/800, just might change the way you look at video games for some time to come.

Baseball $34.95 US funds available in 16K Tape and 24K Disc, Alien Swarm, Sentinel One and Guardians of the Gorn $29.95 US funds Tape and $34.95 Disc—obviously standing apart from the rest.

INHOME

ADVANCING THE PROGRESS

Inhome Software Incorporated, 2485 Dunwin Drive,
Mississauga, Ontario, Canada L5L 1T1 (416) 828-0775
Atari is a trade mark of Atari Inc. Made in Canada.

THE BEGINNER'S PAGE

Richard Mansfield, Senior Editor

Writing An Arcade Game

When you bring home your computer, usually the first thing everyone expects you to do is to write an arcade game. Who's "everyone"? It could be your children, your friends, even you – anybody who is tired of spending lots of money and wants you to program a game to play at home for free.

The best defense is to politely point out that:

1. Arcade games are among the hardest types of software to write.
2. Professionals, working in teams, can take a year to write one.

However, it is well worth trying to write action games. You might not be able to duplicate the speed or complexity of professional games, but you can create very entertaining games of your own. After you've spent a few weeks getting familiar with BASIC and have typed in a few games from **COMPUTE!**, you are ready to take up the challenge. This is one of the best ways to learn some important programming techniques and to explore the graphics and sound capabilities of your computer.

Ten Million IF/THENs

Your main problem is going to be speed. BASIC, though fast enough for most jobs, is pretty slow when it has to keep track of ten aliens, two mother ships, torpedoes, stars, and the player's position. All these things are in motion at once. You need to have a way to control players, to detect collisions, to score points, etc. We recently received a letter from reader John Anderson which touches on these problems:

> *In order to make a fast, effective "arcade-style" game, I would like to know how to let my computer know where a large number of things are on the screen (like the walls in a maze) without 10,000,000 IF/THEN statements. I would also like to know how to keep things, like the little figures racing around during a game, from plowing through walls and wiping them out or coming back onto the other side of the screen.*

As John points out, the first solution that comes to mind is to use an IF/THEN test for every possible event in the game. IF the ball hits the target, THEN raise the score. IF the ball misses the target, THEN let it move one more space. And on and on. This quickly slows the action down to a crawl.

POKE Ping Pong

One of the simpler arcade games is a simulation of Ping Pong. You need to keep track of only three things: two paddles and one ball. Let's start off by solving the hardest problem. How can we bounce a ball around the screen both quickly and accurately?

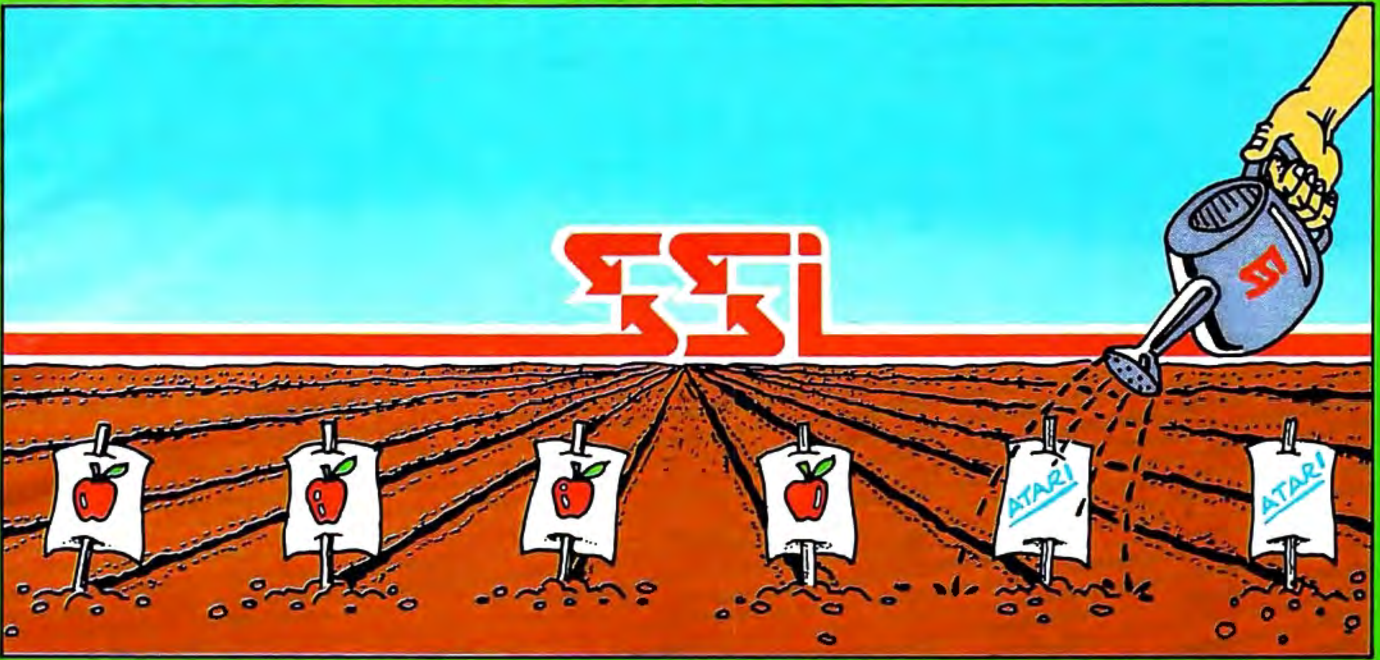
The key to the problem is the fact that many computers have an area set aside in RAM which is an *image* of what you see on screen. This is called *memory-mapped video* and most computers have it. It means that if you POKE into that area of RAM, a character will appear on screen. The next RAM byte address is the next space on screen, and so on. You can use this built-in "map" to tell what is where by using the fast "PEEK" command, and you can move things quickly with POKEs.

The example program will work as is on 5K VIC, Atari, or PET/CBM computers. Owners of other computers will need to make changes to the following variables:

SCR = The address where screen RAM memory starts.
LN = The length of one screen line.
WALL = A solid square that appears when this number is POKEd anywhere into SCR.
BLANK = A blank space character that returns the screen to normal if POKEd into SCR on top of a WALL or FIGURE.
FIGURE = A character that, when POKEd into SCR, looks like a ball.

The memory cells holding the screen image are located in different places in different computers. The Atari screen location itself can move, so you determine where it starts by using the formula in line 100. For VIC and PET/CBM, the numbers are given in line 100. First, draw a border around your screen like a picture frame. Perhaps print reversed spaces all around. (See lines 250-310.) This border is very useful. It will let you know when your ball has hit the edge.

AT SSI, WE GROW MORE THAN APPLES.



INTRODUCING SOME NEW FRUITS OF OUR LABOR...FOR THE ATARI.®

At SSI, we cultivated our fine reputation in the computer gaming world by producing some of the best Apple® games around. But to paraphrase an old saying, "Man does not live by Apples alone."

So we bent our backs to the task of converting some of our Apple crops to the ATARI® 400/800. The three games you see above are the new fruits of our labor.

As part of our exciting *RapidFire* series, they contain all the ingredients needed to make the perfect strategy simulations for your Atari. Rooted in popular science-fiction and fantasy themes, they are challenging and sophisticated – yet fast and full of fun!

Best of all, they're ripe for the picking at your local computer/game store today!

■ **CYTRON MASTERS™** puts you in charge of a small army of *Cybernetic Electronic Devices*. Your forces consist of laser-blasting shooter units, kamikaze-like mine cytrons, mobile bunker cytrons, guided missiles and anti-missiles. Use these mindless but deadly machines to crush your hapless foes, and you will someday become a...*Cytron Master*! On 48K disc for $39.95; 32K cassette for $34.95.

■ **GALACTIC GLADIATORS™** takes you to a remote corner of our vast universe to participate in a wild and crazy cosmic shootout. We're talking about four-armed Froglodytes with phasor rifles, Viking-like Wodanites wielding laser swords, and ugly Mutants whose only socially redeeming feature is their Death Touch. And these are the *nice* folks! On 48K disc for $39.95.

■ **THE COSMIC BALANCE™** is a tactical space game that not only lets you wage magnificent starship battles, it gives you the chance to *design and build* your ships from the ground up! With a host of variable parameters to choose from, you can equip your fleet with ships optimally designed to suit your style of space warfare. On 48K disk for $39.95.

Coming soon – **COSMIC BALANCE II** – the strategic-level adjunct to *The Cosmic Balance*.

If there are no convenient stores near you, VISA and M/C holders can order direct by calling *800-227-1617, x335 (toll free)*. In California, call 800-772-3545, x335.

To order by mail, send your check to: *Strategic Simulations Inc*, 465 Fairchild Drive, Suite 108, Mountain View, CA 94043. California residents, add 6½% sales tax.

®ATARI is a registered trademark of Atari Inc.

WRITE FOR A FREE COLOR CATALOG OF ALL OUR ATARI GAMES TODAY!

Program 1: PET, Atari, VIC, and 64 Version

```
100 SCR=PEEK(88)+256*PEEK(89):REM ADDRESS OF
    SCREEN MEMORY
105 REM USE SCR=32768 FOR PET/CBM,SCR=7680
    FOR 5K VIC
110 WALL=128:REM WALL CHARACTER, SOLID
    SQUARE.TRY OTHER CHARACTERS.
115 REM WALL=160 FOR PET/CBM/VIC
120 LN=40:REM LENGTH OF A LINE. USE LN=22
    FOR VIC,LN=80 FOR CBM 8032
130 GOSUB 260:REM DRAW BORDER
140 LOC=SCR+LN*10+LN/2:REM LOCATION OF BALL
    ON SCREEN AT FIRST
150 VECTR=LN:REM ALSO TRY -1,+1,LN-1,LN+1,
    ETC.
160 BLANK=0:REM BLANK=32 FOR PET/CBM/VIC
170 FIGURE=84:REM "BALL" CHARACTER. USE
    FIGURE =81 FOR PET/CBM/VIC
180 IF PEEK(LOC+VECTR)<>WALL THEN 200
190 VECTR=-VECTR:REM REVERSE DIRECTION
200 POKE LOC,BLANK:REM ERASE OLD BALL
210 LOC=LOC+VECTR:REM CALCULATE NEW POSITION
220 POKE LOC,FIGURE:REM PLACE BALL
230 GOTO 180
240 END
250 REM BORDER SUBROUTINE
260 PRINT CHR$(125);:REM CLEAR SCREEN. USE
    PRINT CHR$(147) FOR PET/CBM/VIC
270 FOR I=0 TO LN-1:POKE SCR+I,WALL:NEXT I:
    REM TOP
280 FOR I=0 TO LN-1:POKE SCR+LN*22+I,WALL:
    NEXT I:REM BOTTOM
290 FOR I=0 TO 22:POKE SCR+I*LN,WALL:NEXT I:
    REM LEFT
300 FOR I=0 TO 22:POKE SCR+LN-1+I*LN,WALL:
    NEXT I:REM RIGHT
310 RETURN
```

LOC is a variable in the program that's always changing whenever the ball changes. It keeps track of the current location of the ball. What you do is keep another variable (VECTR, in this example) which holds the direction and distance of the ball's current motion. When VECTR is added to LOC, we know where to move the ball next.

There are four possible directions to go in the simplest kind of animated games. Traveling up, VECTR=-LN since you subtract the number of spaces in one screen line to move the ball to the line above. Going down is +LN, right is +1, left is -1.

Notice line 180. That is how the computer tells if the ball has reached a border. The next position the figure is supposed to be POKEd into is checked to see if the WALL variable is sitting there. If not, the figure is moved (lines 200-220). If there is a wall, line 190 reverses the figure's direction.

If you type in the example program, you'll be on your way to making a Ping Pong game that will be as fast as you could want. What's left is to play around with VECTR to get different angles of bounce off walls so the ball can go anywhere. Then add two movable pieces of wall (paddles) and score-keeping.

Other Computers

Some computers, the Apple for example, do not have standard memory-mapped video. There are usually provisions for moving objects, however. If your computer has a PLOT command, you can draw the walls in one color and then use another color for the ball. You will also need to use a LOCATE, POINT, or SCRN command to "read" (PEEK) the screen to check for collisions or a bounce off a wall.

Program 2: Apple Version

```
100 GR : REM LO-RES GRAPHICS
110 GOSUB 1000: REM DRAW BORDER
120 X = 20:Y = 20
130 XVECTR = 1:YVECTR = - 1: REM START WITH
    UPPER DIAGONAL RIGHT DIRECTION
140 PT = SCRN( X + XVECTR,Y + YVECTR): REM
    LOOK AT POINT
150 IFPT=15 THEN XVECTR=-XVECTR:YVECTR=-YVE
    CTR:REM IF WALL HIT,REVERSE DIRECTION
160 COLOR= 0: PLOT X,Y: REM ERASE OLD BALL
170 X = X + XVECTR:Y = Y + YVECTR: REM
    UPDATE X,Y
180 COLOR= 1: PLOT X,Y
190 GOTO 140
999 END
1000 COLOR= 15
1010 FOR I = 0 TO 39: PLOT I,0: NEXT : REM
     YOU COULD USE HLIN 0,39 AT 0
1020 FOR I = 0 TO 39: PLOT I,39: NEXT
1030 FOR I = 0 TO 39: PLOT 0,I: NEXT
1040 FOR I = 0 TO 39: PLOT 39,I: NEXT
1050 RETURN
```

Since PLOT uses X, Y coordinates to locate things, it might be a good idea to keep changing the X, Y coordinates separately. Instead of using a single vector (VECTR in Program 1), use an X vector and a Y vector. For instance, the Y would be +1 and the X would be 0 if you wanted to move the ball downward. Program 2 is an example of this approach on the Apple II.

If there is a topic that you would like to see discussed in this column, send a card or letter to: The Beginner's Page, **COMPUTE!** *Magazine, P.O. Box 5406, Greensboro, NC 27403.* ©

The Home Accountant.™
The #1 best-seller.

Any home finance package will balance your checkbook. But to become the #1 best-seller you've got to be something special.

The Home Accountant™ is.

It's the only one that prints a net worth statement and a personal finance statement. So you know exactly where you stand financially every day of the year. It will even print your checks, automatically.

Not only that, The Home Accountant™ lets you label every transaction. Just imagine sitting down to do your taxes and having every penny you've spent and earned neatly listed by category—and available at the touch of a button. It's an incredible time-saver.

You can also create bar, line and trend analysis graphs for every category—in color. It's great for realistic budgeting.

Sound amazing? Wait, there's more.

Let's say you write a check to pay your Visa. The Home Accountant™ automatically debits your checking account and credits your Visa account.

And it does this with every one of the two hundred* budget categories: credit cards, checking accounts, money markets, cash, rent checks, insurance payments—you customize your own financial package.

Check out The Home Accountant™ soon. You'll find it does a lot more than simply manage your money.

It manages your money simply.

*The Home Accountant™ is available for the Apple II/IBM Personal Computer/Atari 400/800 Computers/Osborne/TRS 80 Model III/Commodore VIC 64. The actual budget capacities will vary with each computer.

Continental
Software
A Division of Arrays, Inc.

Apple II is a registered trademark of Apple Computer, Inc. IBM Personal Computer is a registered trademark of IBM Corp. Atari 400/800 are registered trademarks of Atari, Inc., a division of Warner Communications, Inc. Osborne is a registered trademark of Osborne Computer Corp. TRS 80 Model III is a registered trademark of Tandy, Inc. Commodore VIC 64 is a registered trademark of Commodore Business Machines, Inc.

It sells the most, because it does the most!

Continental Software Co., 11223 South Hindry Avenue, Los Angeles, California 90045 Telephone (213) 417-3003 • (213) 417-8031

PLATO WIDENS YOUR CHILD'S WORLD.

Announcing new educational courseware for microcomputers to improve your child's Basic Skills, High School Skills or Foreign Language vocabulary.

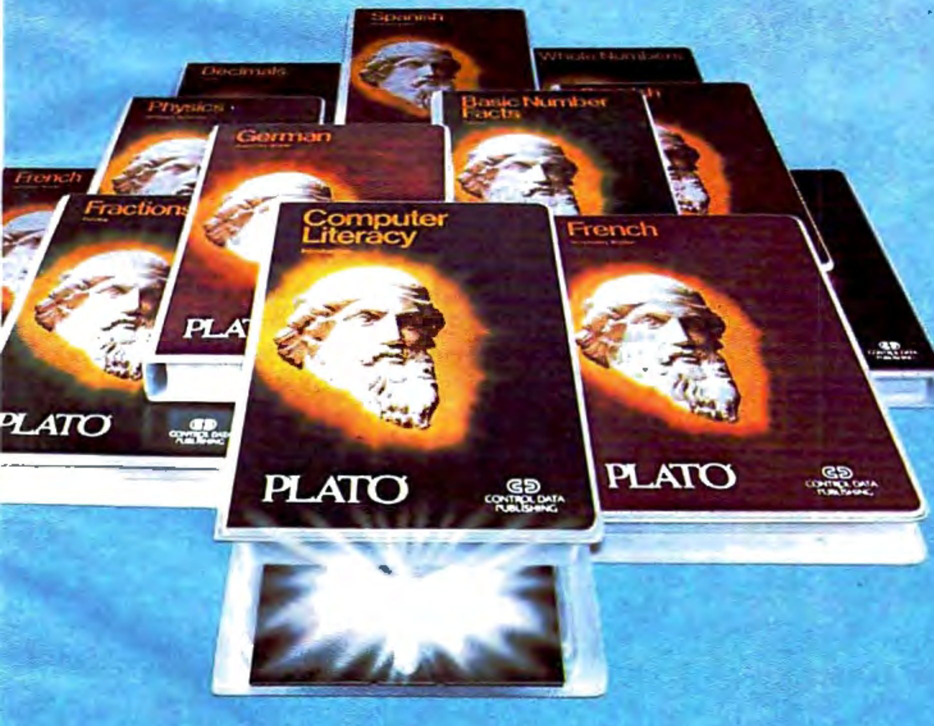
NOW. PLATO Basic Skills.
NOW. PLATO High School Skills.
Both for use with TI 99/4A.*

Control Data and Texas Instruments are working together to make this nationally recognized PLATO courseware available via microcomputers.

Control Data's PLATO Basic Skills is a comprehensive curriculum designed to enhance the development of elementary and junior high Reading, Math and Grammar skills.

Control Data's PLATO High School Skills help high school level students master Reading, English, Math, Social Studies and Science. It has been used to assist students preparing for G.E.D. exams.

*For Basic and High School Skills pricing and order information, write: Texas Instruments, Education Department, Box 53, Lubbock, TX 79408.



Spanish
Decimals
Whole Numbers
Physics
Basic Number Facts
German
French
Fractions
Computer Literacy
French
PLATO
CONTROL DATA PUBLISHING
PLATO
PLATO

How The Pros Write Computer Games

Tom R. Halfhill, Features Editor

Have you ever admired a computer game, and wondered how it was programmed? Where the programmer got the idea or what programming tools were used? Or how long it took? Here's the inside story on how professional game programmers work.

So there you are at one o'clock in the morning, nodding over your computer keyboard with bloodshot eyes, trying to program your first computer game in BASIC. "Space Weirdos" seemed like a good idea at first, but it isn't turning out that way. The Weirdos keep flying off the screen and causing errors. Even when the Weirdos are on the screen, they move so slowly that they could be zapped by a sleeping zombie. And now you realize that there's no way for the game to keep track of scores.

Obviously, there must be some trick to programming games that you don't know about. How did that guy ever program *Raster Blaster*, anyway? That fellow who did *Space Eggs* must've taken ten years....

An Individualistic Bunch

Actually, of course, there is no "trick" to programming a top-notch computer game. Like most other skills, game programming is an art which usually requires years to develop (although a few have done it in months).

Good game programming requires a high level of mastery of the computer, and the ability to constantly push the machine to its limits – or even beyond established limits. It is safe to say that some of the most innovative microcomputer programming going on today is in the field of entertainment. Techniques discovered and sharpened by game programmers spread to educational programs and even business software (witness how high-resolution graphics are becoming as standard a feature on high-end personal computers as 80-column screens).

Not only is there no "trick" to game programming, but there is also no single style. Although many people think of programming as a primarily technical task, it is really a highly creative pursuit. As a result, professional programmers tend to be a very individualistic bunch. The game programmers we contacted advocate several different styles. And it's a good thing they usually work alone on projects, because some of their styles are totally incompatible with each other. For example, some programmers work everything out on paper before they ever touch a keyboard. Others sit down at the keyboard and start hacking away without ever touching paper.

On the other hand, professional game programmers also have some characteristics in common. Nearly all are men in their 20s who have been working with computers for several years. Many were introduced to computing as teenagers. They tend to specialize on one particular computer, often the one on which they learned. Surprisingly, few professional game programmers have computer-related college degrees, or even any formal education in programming. Virtually all of them write their games 100 percent in machine language.

Start With An Idea

Computer games have a lot in common with novels. They begin life as an idea in someone's mind, an idea that is then developed into a "scenario," or plot. When the idea has matured or solidified to a certain point, work begins. As things progress, parts of the original idea may be dropped, and subplots may be added. After much revision, the work finally approaches completion. Often, the work is declared "done" only because the author is too spent to carry it any further, or because a deadline looms. Then, like a novel, the computer game hits the market and lives or dies on the effectiveness of its promotion, the reactions of reviewers, and the response of consumers. Only a few rise to the top and become best sellers.

Obviously, the first critical step is coming up with an idea. Video game designers are being criticized these days for copying each other's work, but the better ones spend lots of time racking their brains for original concepts. How do they go about it?

"That's a real tough one," says Mike Branham, manager of software development for Synergistic Software in Bellevue, Washington. "First of all, we decide what type of game we want to do – such as an adventure game, another space game, a general arcade-type game, or whatever.... The programming staff here provides a

STUN TRAP

by Mark Kuzyk

STUN TRAP

by Mark Kuzyk

You are fighting your enemy in unstable space. With the shock of every missile explosion, deadly hyperspikes break out. Contact with hyperspikes causes instant disintegration. As you tunnel through space-time, weaving in and out of hyperspikes, WATCH OUT for rammers and space mines. Be on the lookout for the sudden appearance of smart bombs and streakers on your tail. The only way to come out alive is to trap your opponent in a cage of hyperspikes. Try it — with a friend.

For ATARI® Home Computers with 32K Memory & Two Joysticks

Send for FREE Poster

Supplies are Limited

Dealer & Distributor Inquires Invited

CALL 215-485-1968

$24.95 on Disk

Affine®

Affine Software

P. O. Box 2026 • Aston, PA 19014

ATARI is a registered trademark of Warner Communications.

VISA MasterCard

lot of creativity. We'll start with an idea and develop it as the game progresses. Usually the scenario has changed by the time the game is finished, because of certain limitations and so forth."

Sometimes, says Branham, instead of building a program around a scenario, a scenario is built around a programming technique.

"*Procyon Warrior*, for example, is a game we released just to show off the capabilities of the Fast Draw portion of our *Game Animation Package* [a collection of graphics utilities sold by Synergistic]. We started with that technique and built the whole game around it."

At Synergistic, multiple minds are involved in shaping a game concept on paper before a programmer even approaches a computer. An important part of Branham's job is supervising this process, and later, helping the programmers out if they get stuck on certain routines. "We'll start by writing a list of all the things that will happen in the game. We'll write page after page of 'what-ifs' – what if this happenns or what if that happens. Then we pare it down, eliminating those things not valid to the game or possible on the machine."

One of Synergistic's staff programmers is David Kampschafer, who wrote *Planetary Guide* and parts of the *Game Animation Package*, both for the Apple. Kampschafer searches for inspiration from such diverse sources as "TV, magazines, talking to people, going to arcades, reading a story in a book. It's just a matter of looking around and seeing what people enjoy, what they want, what they think is fun."

Dropping by the local arcade, it turns out, is the most common way professional programmers generate ideas for new games. They gravitate toward the machine which attracts the largest crowd, and try to figure out what makes the game so popular. Is it the scenario, or a certain graphics technique? Often they can find out only by playing the game themselves, perhaps hundreds of times.

"I wouldn't call myself a game fanatic, but I do go to the arcades now and then," says Jack Verson of JV Software in Santa Clara, California. Verson programmed *Ghost Encounters*, *Action Quest*, and JV's latest release, *Journey To The Planets* – all combination arcade/adventure games.

Verson says a few programmers still visit arcades to find a new game to copy. "I know some people who try to copy the arcade games almost verbatim, changing it just enough to avoid problems with the legal staff."

However, more copycat programmers are abandoning this practice because of vigorous prosecution by companies such as Atari, Inc., as well as increasing competition. Still, incentive remains to quench the game-playing public's thirst for home computer replicas of arcade-style games.

That's How The Ball Bounces

Some games are conceived as accidents. Or, as programmer Nasir Gebelli admits, "Some games come from mistakes. I'm experimenting with something and a good image comes up, and I think it might be good in a game, so I develop the game around it. The image would come first and the story would come later."

Gebelli, almost legendary among Apple gamesters for such works as *Space Eggs*, *Cyber Strike*, and *Gorgon*, started programming for Sirius Software several years ago before splitting off to form his own company in Sacramento, California, Gebelli Software, Inc. He's one of those programmers who disdain paperwork; 95 percent of an idea is formulated in his head before he starts programming, he says, and only five to ten percent of the original concept changes during the course of work.

In Gebelli's case, his entire career came about by accident. "Programming games wasn't something I always wanted to do, it was just something that happened," he explains. "I got an Apple and was interested in the color and graphics, and then wrote a graphics package. And the routines in the graphics package weren't for anything, really, except to show off."

Gebelli showed the package to a Computerland salesman, who offered to buy it. Realizing he was on to something, Gebelli wrote a game called *Star Cruiser*. It was marketed by Sirius, and his career was launched.

Lots of games have been hatched from graphics experiments. Among these are two from Datamost in Northridge, California. "*Pandora's Box* and *Guardian* were both totally original concepts which I came up with just to do some graphics which had never been done before," says Datamost programmer Bob Flanagan.

"The Apple game market is so crowded that you have to do something really different to stand out. My ex-girlfriend actually suggested the name *Pandora's Box*, and I built the whole game around that name. It uses multidirectional full-screen scrolling, much like what you commonly see on the Atari. That had never been done before on the Apple because it's so much harder to do."

Another accidental game is the popular *Pool 1.5*, sold by IDSI of Las Cruces, New Mexico.

"I'll tell you what happened with *Pool*," says Howard de St. Germain, who wrote the game with his partners, Don Hoffman and David Morock. "Before I got involved in microcomputers, I was working on a Remtek system [a large minicomputer] and became interested in the idea of simulating the interaction between two

The game that puts space games in perspective. Zaxxon™, one of the most popular arcade games of 1982, is now available for use with your home computer system.

Zaxxon™ technology and creativity present a 3-dimensional-like playfield which sets Zaxxon™ apart from other computer games.

Zaxxon™ looks and sounds like aircraft flight, and players can soar to new levels of home computer entertainment. From the daring attack on the enemy's floating fortress and the blazing battle against the enemy's fighter fleet to the final showdown with the deadly armored robot, Zaxxon™ challenges the skill and imagination of every player at every level of skill.

Imagine yourself the pilot, attacking the enemy fortress—climbing, diving, strafing to score points and extra fuel. The enemy fights back with a barrage of missiles and gunfire. Then you face a fleet of enemy fighters in a gripping dogfight of altitude strategy and flying skill. Survive this battle and the enemy's fortress, defended with laser barriers, then you've earned the ultimate challenge; a blazing confrontation with the powerful robot, armed with a lethal homing missile.

Zaxxon™ is the one game that you must see to believe. You have to play it to feel its impact. If you're ready to face the challenge, check with your local software dealer or send check or money order with $2.00 postage/handling. California residents add 6½% sales tax. Available on cassette or diskette. Suggested retail price $39.95.

Available in January on Atari®, February on Apple® and Radio Shack® Color, and April on TI 99/4A™ and NEC 6000™.

Datasoft Inc.®
COMPUTER SOFTWARE
9421 Winnetka Avenue
Chatsworth, CA 91311
(213) 701-5161
©1982 Datasoft® Inc.

Datasoft® is a registered trademark of Datasoft Inc.®

Sega® and Zaxxon™ are registered trademarks of Sega Enterprises Inc.

balls – just that aspect of it, not even thinking about pool."

While contemplating how the ball bounces, de St. Germain mentioned his idea to Hoffman, who was experienced with Apple graphics. Hoffman suggested that with the proper mathematics, they could develop the concept into an entire pool simulation. They got to work, and, after three or four months of part-time labor, emerged with the first Apple version of *Pool*. Then they formed IDSI and started making money. Since then, they've translated the game to work on the Atari, and have written two variants: *Pool 400*, a stripped-down version that fits into an Atari cartridge, and *Trick Shot*.

Next, one of the partners attended an Atari workshop to learn Atari programming techniques, and developed a fast top-to-bottom, fine-scrolling routine. Without any clear idea of how the game would end up, the three spent six months of part-time work shaping the scrolling routine into *Freeway Blast*.

Freeway Blast also is proving successful. But does that mean IDSI will continue to take the dartboard approach to game concepts? No way, not in today's market, says de St. Germain.

"To tell you the truth, when we first started in this business, we didn't begin with solid ideas for games. But we do now. From experience now we know what elements a game needs to be successful."

These elements include a two-player alternating-play option, high score tabulation so players have a larger goal to aim for, a pause option in case of ringing telephones or other interruptions, and multiple difficulty levels.

Like IDSI, virtually all the software houses are taking a more studied approach to game programming. Where once a programmer would write a game on his own and drop it in a company's lap, now marketing considerations are determining the nature of games before they ever leave the planning stages. Because of hotter competition, putting a new game on the market requires an ever-larger commitment on the part of a software company, so marketing minds rule where once only lone programmers trod.

"I am not the person who knows what the market is like," explains Datamost's Flanagan. "I mean, I know what I like, but I don't know what the market likes. They [the marketing experts] do, because they're out there dealing with it every day, so I go to them to see what they want."

As an illustration, the last game Flanagan dropped in his boss's lap was *Pandora's Box*. His latest work, *Spectre*, was developed only after careful planning and consultation with Bob Gordon, owner of Datamost.

The Paper Chase

Once everyone is satisfied that the basic idea is solid enough to warrant a programmer's valuable time, work begins. But this stage – the most critical to a game's development – is where the programmer's individual style still rules supreme. You can divide programmers into two general groups: those who work everything out carefully on paper first, and those who don't. Of course, there is a range of styles in between. The two extremes are represented by Nasir Gebelli and Synergistic's David Kampschafer.

Gebelli does it all in his head. He just sits down at the keyboard, usually an Apple, and starts programming. "Theoretically, you can program anything in your head that you can program on a computer," he says.

Gebelli doesn't use a printer, and he programs the machine language with a mini-assembler so sparse that he cannot even go back and insert a line of code. Any revisions must be made by relocating the entire program in another area of memory. What's more, sometimes he doesn't even bother to save the source code after the program is assembled into machine language.

"If I wanted to change something in *Space Eggs* right now," says Gebelli, "I'd have to look at it the same way I'd look at anybody else's program – figure out what the routines are doing and then change them."

Nor does Gebelli have a predetermined goal to work toward. "I never really finish a program," he says. "I just stop working on it." Gebelli takes anywhere from one week to one and a half months to complete a game, which is less time than most of the other programmers interviewed by **COMPUTE!**. He says *Space Eggs* took seven or eight days, working eight hours a day, and that *Gorgon* took five weeks.

Still, Gebelli admits that sometimes his methods slow him down – such as when he decides to change all the shapes on the screen when the game is nearly done – but it's his style, so he sticks to it. As the saying goes, who can argue with success? But Gebelli is definitely the exception; few programmers are comfortable with these methods. Kampschafer is Gebelli's opposite.

"I'm a paper programmer," says Kampschafer. "I write everything on paper first – flowcharts, outlines, everything. I even write the assembly code on paper first before going to the computer.

"In writing any kind of program, whether it be a game or educational program or business software, you should plan it all out ahead of time so you know exactly what you're doing as you write the program. If you force yourself to work it out on paper first, you'll find that it will cause


subLOGIC
Night Mission
1
183450
2
3
4
CREDITS
BALL
BOMB AGAIN!!

you less work in the long run. You'll actually get done in less time. Of course, I do it that way because I was trained and taught to do it that way, but it really does work."

Parlez-vous 6502?

One of the things to be decided during the planning stage is what computer language to use to write the program. In most cases, there's no question: machine language. There's a good reason for this: speed.

Although BASIC and similar high-level languages are easy to use, they are also relatively slow, since their rather abstract instructions must be translated (or *interpreted*) line-by-line into the computer's own binary code *while the program runs.*

The computer interprets the instructions so fast that the delay isn't noticed in most programs. But games are a different story. Animating a multicolored object – or many objects – across a TV screen at high speed requires thousands of calculations per second, and often the only answer is to write the program in the computer's own language so it doesn't have to do any interpreting. Ergo, machine language.

Here again, programmers' styles vary widely. In the old days of computer programming (the real old days, the 1950s), programmers had to hand-assemble their code, laboriously coding the instructions directly in binary (a base 2 numbering system), octal (base 8), or hexadecimal (base 16).

Nowadays, virtually all machine language programmers use an *assembler*, a programming utility which is often flexible enough to be called a language itself. Assemblers vary in their features, but in general they make the coding process easier and more abstract. Some programmers, like Gebelli, use stripped-down assemblers with almost no extra features. Others use very advanced *macro assemblers*. Still others, like Synergistic's Kampschafer, find it easier to write programs or parts of programs in a high-level language and then translate them to machine language.

"I do this," explains Kampschafer, "to get an idea of how the action is going to happen, and how the program looks. I like to use structured languages such as Pascal because I like the structure; it helps me to organize my thoughts."

Programmers such as Kampschafer, who was formally trained in programming and is working toward a degree, also prefer to write their programs in modules, small sections. This also helps at the debugging stage.

"For example, you might have a little guy running, and monsters moving, and hazards happening, and scores updating, so you write these parts as separate modules and try them out first to make sure they're working properly before joining them together."

Some game programmers carry this even further by maintaining a library of routines for animation, scoring, initializing, and other functions common to nearly all computer games. They build a new game by modifying these tried-and-true routines to fit the task at hand. But other programmers write each game from scratch, arguing that the more specific the machine code, the faster the execution. If you haven't already guessed, that's Nasir Gebelli's method.

Flanagan, of Datamost, prefers to start most of his programming on paper. The exceptions are simple routines such as sound effects, joystick reading loops, and routines for printing characters on the screen. "The first thing I do once I've come up with the actual idea is to grab some graph paper with a 20 by 40 grid and plot out exactly what the screen is going to look like, what's going to be in each square."

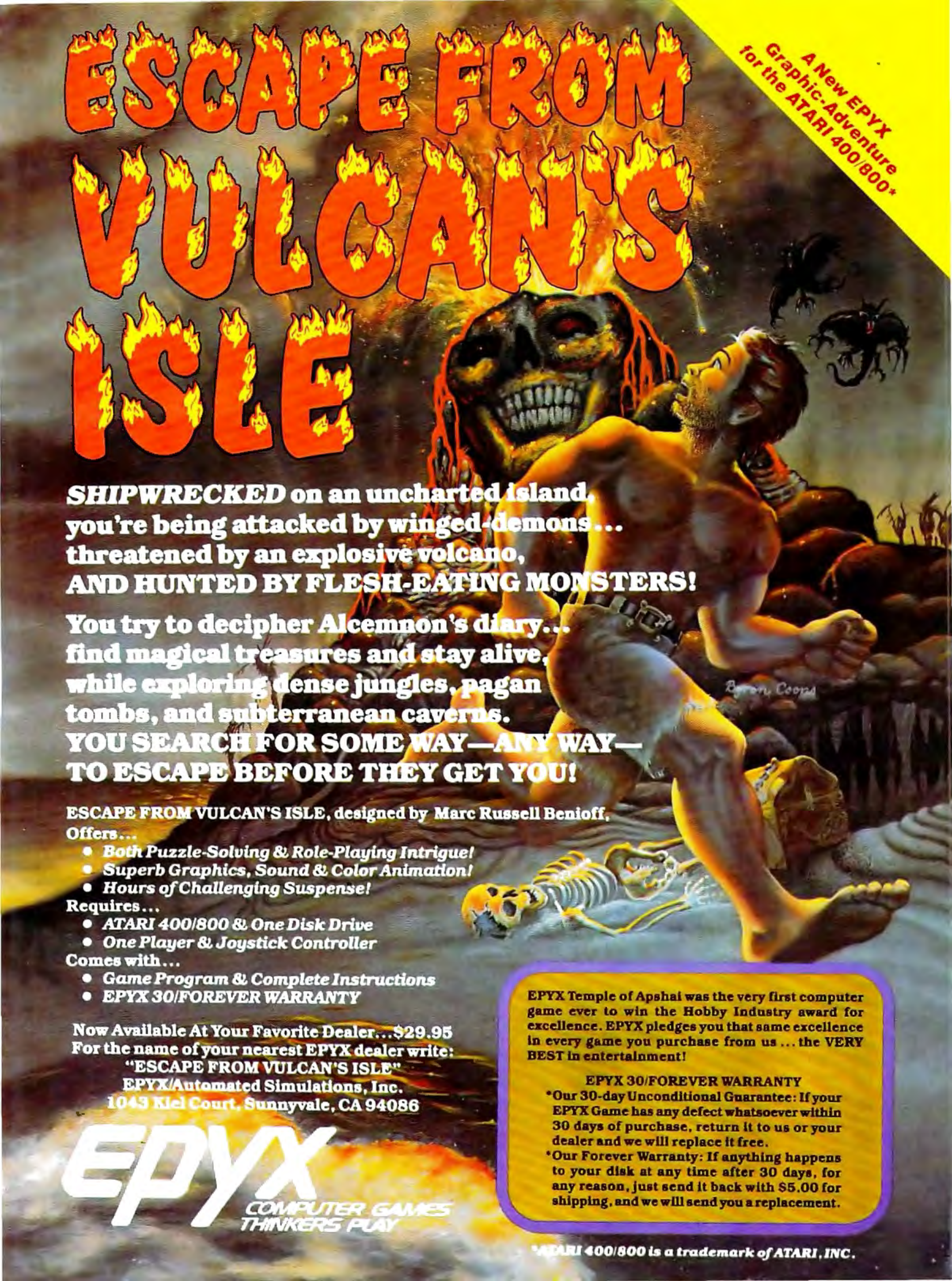
Then he sits down at his Apple and boots up Microsoft's *Assembly Language Development System* with CP/M. "I can usually get a sample screen working for a game within a couple of hours."

Next, Flanagan starts on the animation. "I use the 'top-down' programming approach that they talk about in all the books. I break the task down into a series of simple problems, and sometimes those simple problems can be broken down even further to be solved one by one. That's better than just writing a huge mess of a program and then sitting back and saying, 'Now, what's wrong with this program, which routine is messing up?' "

At Synergistic Software, the programming staff invested lots of time developing a package of utilities to streamline the game-writing process. Synergistic has a bit-mapped graphics editor and a block-draw routine running on all its machines, and its own integer BASIC compiler for the Apple (a *compiler* automatically translates a program from a high-level language into code which is very close to machine language). Branham, the software development manager at Synergistic, says one of his programmers can sit down at an unfamiliar machine and, with these utilities, begin writing an advanced game almost immediately.

"Tools are a most important part of a programmer's cache of programming skills," says Branham. "The programmer who doesn't have tools and who wants to hard-code everything from scratch is going to be in for a lot of headaches, and is going to take a lot of time. These are the type of programmers who will spend two years writing a brilliant game that becomes a bestseller and makes them a million dollars a month and everything, but then when you say, 'Translate it over to the Apple,' they answer, 'Give me another year.' They're lost because they have to re-do everything from scratch."

Although Branham encourages his program-



ESCAPE FROM VULCAN'S ISLE

A New EPYX Graphic-Adventure for the ATARI 400/800*

***SHIPWRECKED* on an uncharted island, you're being attacked by winged-demons… threatened by an explosive volcano, AND HUNTED BY FLESH-EATING MONSTERS!**

You try to decipher Alcemnon's diary… find magical treasures and stay alive, while exploring dense jungles, pagan tombs, and subterranean caverns. YOU SEARCH FOR SOME WAY—ANY WAY—TO ESCAPE BEFORE THEY GET YOU!

ESCAPE FROM VULCAN'S ISLE, designed by Marc Russell Benioff, Offers…

- ***Both Puzzle-Solving & Role-Playing Intrigue!***
- ***Superb Graphics, Sound & Color Animation!***
- ***Hours of Challenging Suspense!***

Requires…

- ***ATARI 400/800 & One Disk Drive***
- ***One Player & Joystick Controller***

Comes with…

- ***Game Program & Complete Instructions***
- ***EPYX 30/FOREVER WARRANTY***

Now Available At Your Favorite Dealer…$29.95
For the name of your nearest EPYX dealer write:
"ESCAPE FROM VULCAN'S ISLE"
EPYX/Automated Simulations, Inc.
1043 Kiel Court, Sunnyvale, CA 94086

COMPUTER GAMES
THINKERS PLAY

EPYX Temple of Apshai was the very first computer game ever to win the Hobby Industry award for excellence. EPYX pledges you that same excellence in every game you purchase from us … the VERY BEST in entertainment!

EPYX 30/FOREVER WARRANTY

- ***Our 30-day Unconditional Guarantee: If your EPYX Game has any defect whatsoever within 30 days of purchase, return it to us or your dealer and we will replace it free.**
- ***Our Forever Warranty: If anything happens to your disk at any time after 30 days, for any reason, just send it back with $5.00 for shipping, and we will send you a replacement.**

**ATARI 400/800 is a trademark of ATARI, INC.*

mers to organize their work, he says he is careful not to cramp their style. "We let our programmers retain their individuality. If we tried to force a certain way of doing things on our programmers, then our programmers would get unhappy and would go somewhere else, to Sirius or wherever."

The Difficulty Of Difficulty

Most of the programmers we talked to say it takes them a couple of months to complete a typical game program. Polishing the program is sometimes the hardest part of all. Many programmers say the final ten percent of the program causes 90 percent of the heartache. That's because errors have to be weeded out, rough edges smoothed, and the game's final "character" molded.

"You have to spend a lot of time watching other people play it," says JV Software's Jack Verson. "Especially adventure-type games where there are many objects to be picked up or cropped or moved around. There are many possible permutations.... You've got to watch the person explore all those permutations, because they'll always do things you didn't anticipate, things I would never do myself and didn't account for in the program. That's when bugs show up. You've got to cover all the possibilities."

Verson's testing stage usually takes about a month. When he "finishes" a game, he gives it to friends to test – including some who work at Atari. Other testers include teen-agers and his children, aged eight and ten. If he works on a game part-time, it requires about four months from start to finish. If he works on it full-time, he can do it in about two months.

The other software developers also spend weeks debugging and testing their new games, making sure they are ready for the marketplace. A common problem they all face is adjusting the game's difficulty.

"A lot of the difficulty in writing a game is making sure that a beginner is not going to be able to master it at the first sitting and move up to advanced levels, or that they're not going to get so frustrated that they'll throw it away," explains Flanagan.

Verson adds, "You're selling games to real young kids, maybe eight or nine, and also to people in their 20s who might spend $50 a week in the arcades, and who need something that's really challenging."

The most common solution to the "difficulty" issue is trying out the game on a variety of people, and building in features such as multiple difficulty levels. The other alternative is to aim the game at a certain age group, but that restricts sales.

For The Love Of It

Once the program is finally honed to perfection – or at least as close to perfection as patience and marketing demands allow – the game is ready to be packaged and sold. Advertising and promotional campaigns are geared up, copies are sent to key magazines and users groups in hopes of favorable reviews, and the payoff presumably follows.

Those "marketing demands" might include a deadline, such as the Christmas season. Or perhaps the software company has another assignment for the programmer. Or maybe the company has decided to maximize its investment by translating the game to work on several popular computers. When things get really hectic toward the end of a project, a company might put extra programmers on the job to finish it up in time. One programmer might be coding the sound effects while another is completing the animation.

Although software firms are far from Detroit assembly lines, they are becoming more organized and efficient as the industry grows and big consumer dollars are at stake. The days when crude games could survive and even prosper are approaching their end. As the overall level of quality increases, and competition multiplies, only the best games will satisfy the more sophisticated gamesters who make up the buying public.

But don't fear that something as inherently creative as writing games will ever become too serious. After all, the best games throughout history were invented by people who were simply out to have fun. Did it take a marketing expert with an MBA to invent baseball? Or chess? No way. That's why Verson, of JV Software, believes that one of the most important qualities a computer game programmer can possess is a love of computer games.

"It's probably important to be able to enjoy playing the types of games you're trying to program. You couldn't, for example, go into an arcade and watch people playing arcade games and say, 'Well, I don't care much for these types of games, but other people seem to, so I'll go home and write one.' You have to like what you're doing." **C**

Why let some good times slip through your fingers?

Corner the latest Synapse Software games at your local computer store.

Available in disk, cassette, and cartridge for the Atari 400/800 computers.

Other titles soon available for the VIC 64, IBM-PC and the TI 99/4.

Atari is a registered trademark [illegible] Inc.
VIC 64 is a registered trademark of Commodore, Inc.
IBM-PC is a registered trademark of IBM, Inc.
TI 99/4 is a registered trademark of Texas Instruments, Inc.
All game titles are trademarks of Synapse Software.

Synapse
SOFTWARE
5[illegible] Jacuzzi St., Suite 1, Richmond, CA [illegible]

A Day At The Races

Robert B. Ferree

This simulation of a racetrack, complete with animation and color, can serve as an effective model for beginners interested in programming their own games on the VIC or Atari. What's more, it's fun to play.

An occasional complaint heard about game playing on personal computers is the lack of the high-resolution graphics of arcade machines. In the direct or program modes, the basic VIC with 5K has a resolution of 22 x 23. This makes the mechanics of arcade games possible, but the movement is rather jerky. The VIC can be improved to a resolution of 176 x 184 through BASIC with programmable characters.

VIC Game Techniques

First, the programmer needs to know about programmable characters. An in depth explanation is found in the *VIC Programmers Reference Guide.* Briefly, the unexpanded VIC has memory locations from 7168 to 7679 for programmable characters. Each programmable character is made up of eight bytes. By POKEing numbers from 0 to 255 into these locations, a character is programmed. To shift into the programmed character mode, you POKE 36869,255. POKEing 36869,240 will return you to the direct, or program, mode. To find the memory location of a character, use:

```
10 INPUT"CHARACTER";A$
20 A=ASC(A$)
30 IFA>=64THENML=(A-64)*8+7168:PRINTML;"-";ML
    +7:GOTO50
40 ML=A*8+7168:PRINTML;"-";ML+7
50 GOTO10
```

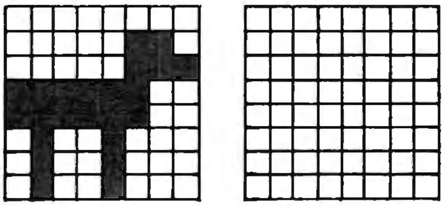
INPUTing "A" into the above program should give a reading of 7176-7183, which is the location of the character A.

The eight bytes of memory for a character each have eight digits in binary If you place these eight bytes in binary, each under the previous one, and imagine the 1's are pixel dots and 0's are spaces, you can decide what eight numbers should go into these locations. For example, type:

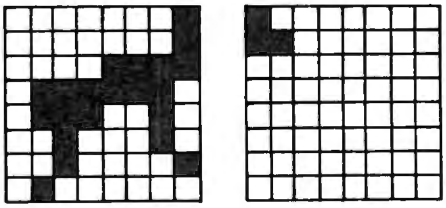
```
100 FORC=7432TO7439:READA:POKEC,A:NEXTC
110 DATA0,6,7,252,252,72,72,72
```

Now RUN. Nothing happens! Now type POKE 36869,255 and everything will turn to garbage. Type a few !'s and you should see a horse. The character ! has been reprogrammed to be a horse. Try your own, remembering to figure from the top to the bottom, or the character will appear upside down.

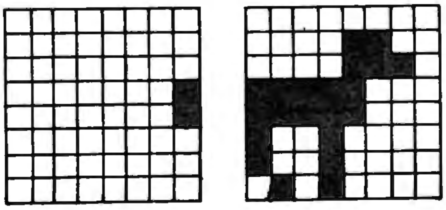
The next trick is to move these programmable characters. Most programs for personal computers in BASIC move their graphics by drawing a character and then erasing it while drawing it again in the next space. This can cause a rather jerky motion. By programming a series of characters, each just one pixel dot farther in the direction you wish to go, and then erasing the previous character, you can improve your resolution to 176 x 184. For example, your first two characters might be:



The space character is the area that you are heading for. The next two characters might be:



This would continue until:



Now you are ready to do the series over again in the next two character spaces.

For a demonstration of how this can work, try Program 1. Before RUNning, take out line 330. We will use it later in preparation for the game. RUN the program, and if the horses look funny, check your DATA lines (50-210). If it all works right, add line 330 and SAVE. This information

THE ULTIMATE IN FAST ACTION FOR YOUR VIC-20

Dive Into a Fearsome Fight!

Grab your gloves, survival pack and headgear! Your Sidewinder commandos are whooshing off into the most frenzied fight in the far side of the galaxy! You've got to out-maneuver deadly Battle pods, dodge destructive Stalker bombs and go head-to-head with alien Oblitojets… all at speeds you wouldn't imagine possible!

Suggested Retail Price $29.95

Blast An Insect Invasion!

Dive into the most awesome all-out battle ever! You'll be attacked from all directions by a barrage of deadly android wasps and alien creatures like you've never encountered before! Any contact means instant destruction! If it's not the fastest game you've ever played, you're from another planet.

Suggested Retail Price $29.95

Attack Crazy Aliens!

Fall back into the far fields of the galaxy! That bumbling formation coming at you is the crazy Galactic Blitz. These aliens have 15 different play patterns. And each time you take one out of the game they come back mad as ever! So go for the galactic score full speed ahead! If you're merely a spectator, find another sport.

Suggested Retail Price $24.95

Dealer inquiries invited. *Tronix Publishing, Inc., 701 W. Manchester Blvd., Inglewood, CA 90301. (213) 671-8440.*

TRONIX

will provide the programmable characters for the game. All programmable character information will remain in memory until the machine is turned off or the memory location information is changed. The latter can be intentional or it can happen accidentally if these locations are not protected. To protect all programmable character locations, you will need to POKE 52,28 and POKE 56,28. For this game, only the upper half is protected, leaving more program space.

After debugging the game (Program 2), be sure to SAVE it right after the already SAVEd Program 1. RUNning Program 1 will automatically LOAD/RUN Program 2 (the game).

The Rules Of The Game

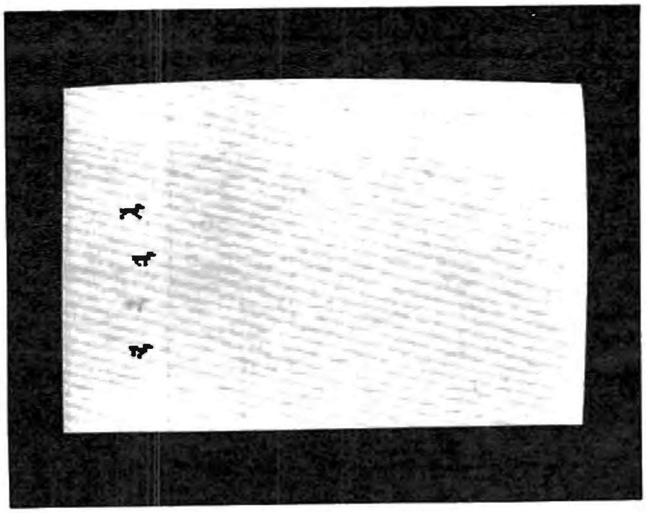
"A Day At The Races" is a game for one to six players. It consists of five races on random track conditions. Each horse is given odds for a particular track in the initialization. These odds are kept throughout the five races. Try to avoid long names for people or horses; they may cause an OUT OF MEMORY error. Five letters work nicely. Each win pays three-to-one while each loss costs you the amount you bet.

A Major Hint

Remember each horse's performance on the different track conditions. They may run the same way the next time that track condition comes up.

The game sections are marked with REM statements. Changing the denominators in lines 80-100 will change the difference between each horse's odds. You can change the number of races in line 680, the payoff in line 620, and the losses in line 630.

You will notice that one horse moves nicely when it is alone, but things slow down considerably when four horses are involved. Still, I think the programmed characters enhance the movement of the game (it was originally written with the character π as the horses and they were moving one space at a time).



Charging out of the gate in the VIC-20 version of "A Day At The Races."

Atari Notes

Instructions are included in the Atari version of Horse Race and are presented in a unique fashion. As many people can play as memory permits (at least 16K is required). Redefined characters and various screen colors add extra fun. Unlike many games, Horse Race is straightforward enough for a beginner to follow. It might be helpful as a guide when making your own games.

Character graphics are used for the horse. The two pairs of characters used for each horse show two "frames" of a horse's gallop. For more realistic motion, you could add more characters to show more views. The technique used in the VIC version could also be employed to provide smoother animation. The speed of the horses is due to the simplicity of the racing routine. Each horse is randomly selected when allowed to move. Therefore, the "odds" for the horses are not very telling. An improved race algorithm could make the game more realistic, albeit slower.

Program 1: VIC Version

```
10 PRINT"{CLEAR}":POKE36879,8:S=7856:Z=33
20 PRINT"{04 DOWN}{RIGHT}WELCOME TO VIC DOWNS
   "
30 FORX=1TO2500:NEXT
40 FORF=7424TO7559:READA:POKEF,A:NEXT
50 DATA0,0,0,0,0,0,0,0:REM DATA FOR HORSE
60 DATA0,6,7,252,252,7 ,72,72
70 DATA0,0,0,0,0,0,0,0
80 DATA3,3,14,126,116,36,34,32
90 DATA0,128,0,0,0,0,0,0
100 DATA1,1,7,63,58,17,16,32
110 DATA128,192,0,0,0,0,0,0
120 DATA0,0,31,31,9,16,16,0
130 DATA192,224,128,128,0,128,64,0
140 DATA0,0,15,15,4,8,8,0
150 DATA96,112,192,192,128,64,64,0
160 DATA0,0,7,7,2,2,4,0
170 DATA0,48,56,224,224,64,64,64
180 DATA0,0,3,3,1,1,1,0
190 DATA0,24,156,240,112,32,64,64
200 DATA0,0,0,1,1,0,0,0
210 DATA0,12,14,248,248,144,144,80
220 PRINT"{CLEAR}"
230 POKE36869,255:REM SWITCH TO PROGRAMMABLE C
    HARACTERS
240 POKES+C-2,32:POKES+C-1,32:REM ERASE OLD HO
    RSE
250 POKES+C,Z:POKES+C+1,Z+1:REM DRAW NEW HORSE

260 Z=Z+2:REM COUNT HORSES IN THIS SERIES
270 IFZ=49THENC=C+1:Z=33:REM IF SERIES IS FINI
    SHED MOVE TO NEXT SERIES
280 H=H+1:REM}COUNT HORSES
290 IFH<169THENGOTO240:IF NOT THE END OF THE L
    INE, CONTINUE
300 PRINT"{CLEAR}":POKE36869,240:PRINT"{04
    DOWN}EACH PLAYER STARTS      WITH $50
```

MEET THE NEW KID ON THE BLOCK.

Catch-up with the newest, wackiest video game you've ever played! Kid Grid! But don't get caught with your guard down because the mischievous bullies Squashface, Thuggy, Muggy and Moose are after you in hot pursuit.

It's the wildest, fastest chase you've ever been in. You've got to connect all the dots on your grid: keep on the look-out for the mysterious bouncing question mark and don't slow down at corners! Squashface, Thuggy, Muggy and Moose are always on your shirttails. Your secret weapon — the joystick button. Press it and the bullies get zapped! When they turn white and freeze, make your escape. If the bullies finally catch you the results are explosive!

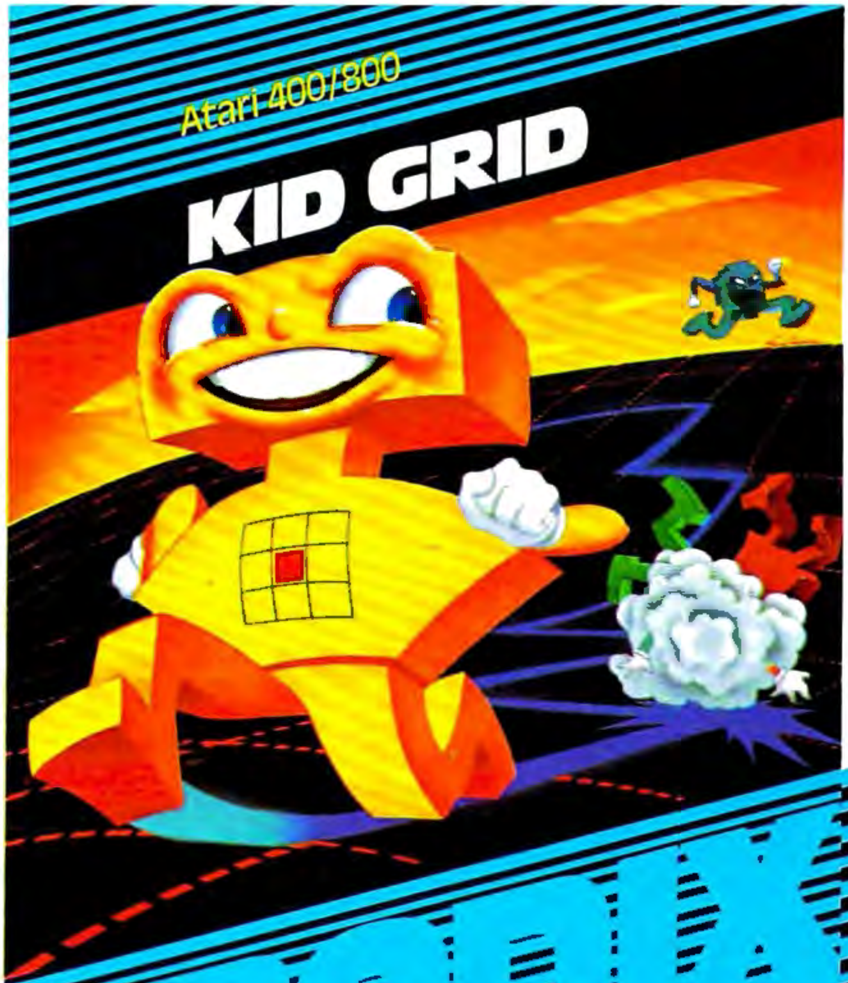
With Kid Grid you get all the sights, sounds and colors of arcade games. The better you get the faster and wackier Kid Grid becomes. Soon you'll be racing around at hyper-space speeds!

Kid Grid by Tronix. A hi-resolution video game written in 100% machine code. Designed for the Atari 400 & 800 home computer. Available now at your dealer for $29.95 (suggested retail price).

So meet the new Kid on the block. He'll be your pal forever.

Dealer inquiries invited.

Tronix Publishing, Inc., 701 W. Manchester Blvd.
Inglewood, CA 90301 (213) 671-8440



```
    0.":REM SWITCH BACK
310 PRINT"{02 DOWN}A WINNING BET PAYS      3 T
    O 1."
320 PRINT"{02 DOWN}PRESS PLAY AND WAIT."
330 PRINT"{BLK}":POKE631,131:POKE198,1:REM LOA
    D AND RUN NEXT PROGRAM
```

Program 2: VIC Version

```
40 REM INITIALIZATION
50 POKE52,29:POKE56,29:REM PROTECT MEMORY LOC
    ATIONS ABOVE 7424
60 PRINT"{CLEAR}{WHT}":POKE36879,8
70 Z=33:Z1=Z:Z2=Z:Z3=Z:Z4=Z
80 POKE36878,15:SO=36877
90 S1=7856:S2=7922:S3=7988:S4=8054
100 REM GIVE ODDS
110 D1=RND(1)/12:D2=RND(1)/12:D3=RND(1)/12:D4=
    RND(1)/12
120 D1=RND(1)/12:D2=RND(1)/12:D3=RND(1)/12:D4=
    RND(1)/12
130 T1=RND(1)/12:T2=RND(1)/12:T3=RND(1)/12:T4=
    RND(1)/12
140 REM NAME PLAYERS AND HORSES
150 INPUT"{CLEAR}{02 DOWN}HOW MANY PLAYERS";PL

160 IFPL>GORPL<1THENGOTO150
170 FOR X=1TOPL:W(X)=500
180 INPUT"{02 DOWN}NAME OF PLAYER";N$(X):NEXT
190 PRINT"{CLEAR}{DOWN}NAME THE FOUR HORSES:":
    FORX=1TO4:INPUTA$(X):NEXT
200 REM SETS TRACK CONDITIONS
210 TR=RND(1)*10:PRINT"{BLK}{CLEAR}"
220 IFTR<3THENCO$="DRY":O1=D1:O2=D2:O3=D3:O4=D
    4:POKE36879,248:GOTO260
230 IFTR<6THENCO$="TURF":O1=T1:O2=T2:O3=T3:O4=
    T4:POKE36879,216:GOTO260
240 CO$="MUDDY":POKE36879,200
250 O1=U1:O2=U2:O3=U3:O4=U4
260 R=R+1:PRINT"{CLEAR}{DOWN}RACE #"R:PRINT"TH
    E TRACK IS ";CO$
270 FORY=1TO4:PRINTTAB(5)A$(Y):NEXT
280 FORX=1TOPL:PRINTN$(X);W(X):NEXT:PRINT
290 FOR Q=1 TO PL:IF W(Q)=0 THEN B(Q)=0:GOTO 2
    98
292 PRINTN$(Q);:INPUT" BETS";B(Q):IF B(Q)<=W(Q
    ) THEN 296
294 PRINT"CAN'T BET THAT MUCH!":GOTO 292
296 INPUT"  ON";B$(Q)
298 NEXT
300 PRINT"{CLEAR}"
310 PRINT"{02 DOWN} ALL BETS ARE DOWN!!!"
320 REM SETS COLOR OF TRACK (PATHS)
330 FORX=S1TOS1+22:POKEX+30720,0:NEXT
340 FORX=S2TOS2+22:POKEX+30720,4:NEXT
350 FORX=S3TOS3+22:POKEX+30720,5:NEXT
360 FORX=S4TOS4+22:POKEX+30720,6:NEXT
370 READP:IFP=-1THENPRINT"{UP}
        ":GOTO390
380 READD:POKE36876,P:FORX=1TOD:NEXT:POKE36876
    ,0:FORX=1TO50:NEXT:GOTO370
390 POKE36869,255:REM PROGRAMMABLE CHARCTER MO
    DE
400 REM MOVE HORSES AND HORSES SOUND
410 M1=RND(1)+O1:IFM1>.9THEN440
420 POKES1+C1-1,32:POKES1+C1-2,32:POKES1+C1,Z1
    :POKES1+1+C1,Z1+1:Z1=Z1+2:H1=H1+1
430 POKESO,200:POKESO,0:IFZ1=49THENC1=C1+1:Z1=
    Z
440 M2=RND(1)+O2:IFM2>.9THEN470
450 POKES2+C2-1,32:POKES2+C2-2,32:POKES2+C2,Z2
    :POKES2+1+C2,Z2+1:Z2=Z2+2:H2=H2+1
460 IFZ2=49THENC2=C2+1:Z2=Z
470 M3=RND(1)+O3:IFM3>.9THEN500
480 POKES3+C3-1,32:POKES3+C3-2,32:POKES3+C3,Z3
    :POKES3+1+C3,Z3+1:Z3=Z3+2:H3=H3+1
490 POKESO,130:POKESO,0:IFZ3=49THENC3=C3+1:Z3=
    Z
500 M4=RND(1)+O4:IFM4>.9THEN530
510 POKES4+C4-1,32:POKES4+C4-2,32:POKES4+C4,Z4
    :POKES4+1+C4,Z4+1:Z4=Z4+2:H4=H4+1
520 IFZ4=49THENC4=C4+1:Z4=Z
530 REM FIND WINNER
540 IFH1>168THENJ$=A$(1):GOTO590
550 IFH2>168THENJ$=A$(2):GOTO590
560 IFH3>168THENJ$=A$(3):GOTO590
570 IFH4>168THENJ$=A$(4):GOTO590
580 GOTO400
590 FORC=1TO10:FORX=150TO250STEP7:POKE36876,X:
    NEXT:NEXT:POKE36876,0
600 POKE36869,240:PRINT"{CLEAR}"J$" WINS"
610 FORX=1TOPL
620 IFB$(X)=J$THENW(X)=W(X)+B(X)*3:GOTO640
630 W(X)=W(X)-B(X):IFB$(X)<>J$THENPRINT"{DOWN}
    "N$(X)" LOSES $";B(X):GOTO650
640 PRINT"{DOWN}"N$(X)" WINS $";B(X)*3
650 NEXT
660 REM READY FOR NEXT RACE
670 H1=0:H2=0:H3=0:H4=0:Z1=Z:Z2=Z:Z3=Z:Z4=Z:C1
    =0:C2=0:C3=0:C4=0
680 IFR=5THENGOTO710
690 FORX=1TO5500:NEXT
700 RESTORE:GOTO200
710 REM ENDING
720 FORX=1TO2500:NEXT
730 PRINT"{04 DOWN}   HAVE A GOOD DAY!{02
    DOWN}":FORX=1TOPL:PRINTN$(X);"$";W(X)
    :NEXT
740 REM SONG DATA
750 DATA195,50,209,50,219,50,225,50,225,50,225
    ,50
760 DATA219,50,219,50,219,50,209,50,219,50,209
    ,50,195,300
770 DATA195,50,209,50,219,50,225,50,225,50,225
    ,50
780 DATA195,50,195,50,195,50,209,300,-1
```

Program 3: Atari Version

```
100 RAM=PEEK(106)-8:ROM=57344
105 REM {CLEAR} IS ESC SHIFT CLEAR
107 REM {BELL} IS ESC CTRL 2
108 REM {A}{B} IS CTRL-A, CTRL-B
109 REM {C}{D} IS CTRL-C, CTRL-D
110 GRAPHICS 0
120 POKE 756,RAM:RAM=RAM*256
130 IF PEEK(RAM+522)=192 THEN 210
140 FOR I=520 TO 551:READ A:POKE RAM+
    I,A:NEXT I
150 FOR I=656 TO 663:POKE RAM+I,PEEK(
    ROM+I):NEXT I
160 DATA 0,0,192,63,63,48,97,131
170 DATA 48,252,48,192,192,192,128,0
180 DATA 0,0,192,63,63,48,24,12
190 DATA 48,252,48,192,192,192,96,24
200 FOR I=0 TO 471:POKE RAM+I,PEEK(RO
    M+I):NEXT I
210 POSITION 15,0:? " HORSERACE ":? :
    ? :SETCOLOR 2,0,10:SETCOLOR 1,0,2
220 DIM T$(40)
230 ? "WANT INSTRUCTIONS";:INPUT T$:I
    F T$>"" THEN T$=T$(1,1)
240 IF T$="Y" THEN GOSUB 1070
250 TRAP 250:? "HOW MANY PLAYERS";:IN
    PUT NP:TRAP 40000
260 DIM NAME$(20*NP),LN(NP),BET(NP),C
    ASH(20),ODDS(5),HORSE$(2),R(5),X(
    5),HORSE(NP)
270 FOR I=1 TO 5:ODDS(I)=5:NEXT I
280 SETCOLOR 2,4,2:SETCOLOR 1,0,14
290 ? "ALL PLAYERS PLEASE ENTER YOUR
    NAME"
300 FOR I=1 TO NP
310 ? "PLAYER #";I;:INPUT T$
320 IF T$="" OR LEN(T$)>20 THEN 310
330 NAME$(I*20-19,I*20)=T$
340 LN(I)=LEN(T$)
```

Exterminator **By Ken Grant**
Just about as action-packed and complex as is nufisically possible in your standard 5K VIC 20. This extremely well-written, machine code game is invariably praised by customers and has been called the second best tape game made for the VIC of 1982 (oh, no, not by us, we don't agree with that opinion). Rapidfire from the bottom of the screen at moving insects and creatures . . . anything that moves, and even anything that doesn't. Just don't be overrun by any or all. It's as much fun the hundredth time you play it as it was the first. This game plays stick or key and runs in standard 5K VIC 20.

3-D Man Not just another eat-the-dots-in-a-maze game, this! Though you find yourself in an edible dot-littered floor plan that may seem vaguely familiar, we guarantee you have never looked at it from this perspective (eye level) before. The dots diminish into the distance as you race down a hallway eating them one after the other. The dot-remaining counter on the right clicks downward. Race through a 4-way intersection and whoops! Head to head with one of the ghosts that haunt these halls! Back quickly on the stick puts you facing the dotless hall you just cleaned out when . . . another ghost! A quick left turn into that junction saves you, but in the confusion you've lost direction momentarily and must check the miniature radar plotting screen to set things straight. . . . Definitely, an ordinary maze game this one is *not*. 3-D Man requires a joystick and at least 3K extra memory.

Racefun Extensive use of multicolor character graphic capabilities of the VIC make this game very appealing to the eye. Fast all-machine language action, quick response to the stick or keyboard-controlled throttle, combine with the challenge of driving in ever-faster traffic to make it appeal to the rest of the body. Plays joystick or keyboard.

Antimatter Splatter! A more dastardly alien could scarcely be found than one who would wipe out an entire civilization by dropping antimatter anti-canisters, right? If your opinion of this alien troublemaker is the same as ours, probably your first thought was, get some matter! We say calm down! All is not lost. A mobile rapid splatter cannon capable of both breaking through his standard alien moving force fields and laying waste to the ever-increasing number of anti-canisters is even now hovering above us. If only our cannoneer hadn't called in sick...say, what are you doing today? *Anti-Matter Splatter* is 100% machine language and runs in standard 5K VIC.

Defender on Tri As pilot of the experimental Defender-style ship "Skyes Limited," you are the only hope for an advance party of scientists trapped in ancient alien sphere which suddenly (heat from collision course with sun presumably—G.E.) came to life. Four screens worth of unique defenses, on-off shields, fuel deposits, alien treasures, running timer, energy, score and very nice graphics display make this one that does not quickly wax old. *Defender on TRI* requires at least 3K memory expander, but will run with any memory add-on (8K, 16K, 24K, etc.) we have come across.

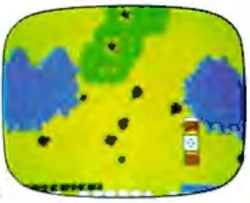
Alien Panic Standard 5K VIC 20/combination stick & keyboard. This arcade-type game pits you against time and an alien on a six level construction sight with ladders and pitfalls, but *not to worry!* You have a shovel.

And there's more...

Rescue From Nufon *Adventure*	$12.95
Collide *Crunch*..............	$12.95
Vikman *Classic*	$12.95
Search *Challenging*	$12.95

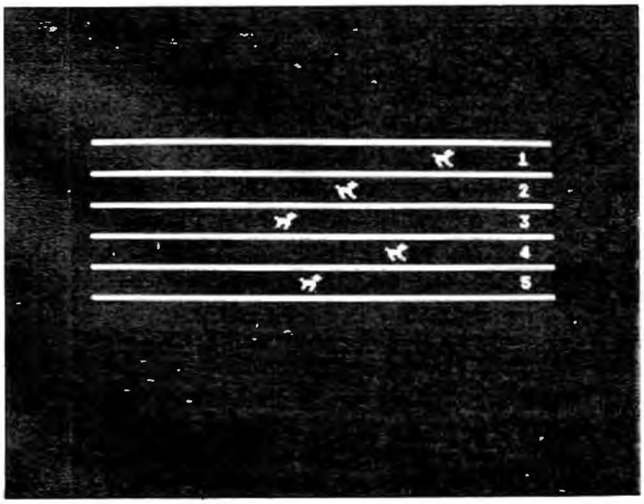
nüfekop
P.O. Box 156, Shady Cove, Oregon 97539-0156
C.O.D. Orders...call (503) 878-2113
Mastercard and Visa cards accepted
Ask for our new FREE catalog!
Games will be on tape unless you request disk.

VIC is a trademark of Commodore Business Machines, Inc.



```
350 CASH(I)=500
360 NEXT I
370 REM GET BETS
380 ? "{CLEAR}{BELL} BETTING TIME!":?
     :SETCOLOR 2,12,10:SETCOLOR 1,0,0
390 FOR I=1 TO NP:T=I-1
400 IF CASH(I)=0 THEN 510
410 GOSUB 750
420 ? NAME$(T*20+1,T*20+LN(I)),
430 ? " CASH $";CASH(I);" BET";
440 BET=0:TRAP 450:INPUT BET:TRAP 400
    00
450 IF BET=0 THEN ? "PASS":GOTO 470
460 IF BET<1 OR BET>CASH(I) THEN ? "
    {BELL}TRY AGAIN.":GOTO 420
470 BET(I)=BET:IF BET=0 THEN 510
480 ? "WHICH HORSE? (1-5)";
490 TRAP 510:INPUT T:TRAP 40000:IF T<
    1 OR T>5 THEN ? :? "ONE TO TEN!":
    GOTO 480
500 HORSE(I)=T:? "{CLEAR}"
510 NEXT I
520 REM  START RACE 
530 SETCOLOR 2,6,0:SETCOLOR 1,0,12
540 POKE 752,1:? "{CLEAR}";:FOR I=1 T
    O 6
550 COLOR 18:PLOT 2,I*2:DRAWTO 39,I*2
560 NEXT I:PLOT 39,12
570 RESTORE 580
580 DATA 237,100,177,100,140,100,117,
    200,140,100,117,200,140,100,117,2
    00
590 DATA 140,100,177,300,177,500,-1,-
    1
600 READ N,P:IF N=-1 THEN 640
610 SOUND 0,N,10,8
620 FOR C=1 TO P/4:NEXT C
630 GOTO 600
640 POSITION 2,0:? "{3 SPACES}*** THE
    Y'RE OFF !' ***"
650 FOR I=1 TO 50:SOUND 0,I*5,12,8:NE
    XT I:SOUND 0,0,0,0
660 POSITION 2,0:? "{29 SPACES}"
670 FOR I=1 TO 5:POSITION 2,I*2+1:? "
    {C}{D}":POSITION 37,I*2+1:? I;:X(
    I)=0:R(I)=0:NEXT I
680 WHICH=INT(5*RND(0)+1)
690 X(WHICH)=X(WHICH)+1
700 HORSE$="{C}{D}":R(WHICH)=1-R(WHIC
    H):IF R(WHICH) THEN HORSE$="{A}
    {B}"
710 POSITION 1+X(WHICH),WHICH*2+1:? "
     ";HORSE$
720 IF X(WHICH)=34 THEN 830
730 POKE 53279,1
740 GOTO 680
750 REM PRINT HORSE NAMES. ODDS
760 ? ,"{3 SPACES}HORSE",,"ODDS{DOWN}
    ":RESTORE 820
770 FOR J=1 TO 5
780 READ T$
790 ? J,T$,ODDS(J);" TO 1"
800 NEXT J:?
810 RETURN
820 DATA GREASED LIGHTNING,CERTAIN SA
    M,JUDGEMENT JACK,SLY SAXON,DEALIN
    ' DAN
830 REM  WIN 
840 FOR I=1 TO 30:POKE 710,255*RND(0)
    :SOUND 0,I,12,15-I/2:NEXT I:SETCO
    LOR 2,9,4
850 POSITION 2,0:RESTORE 820:FOR I=1
    TO WHICH:READ T$:NEXT I:? " #";WH
    ICH;",  ";T$;", WON!"
860 FOR I=1 TO 500:NEXT I
```

```
870 ? "{CLEAR} BETTING RESULTS {DOWN}
    "
880 SETCOLOR 2,1,10:SETCOLOR 1,0,0
890 FOR I=1 TO NP
900 IF CASH(I)=0 THEN 960
910 ? NAME$((I-1)*20+1,(I-1)*20+LN(I)
    );
920 IF HORSE(I)=WHICH THEN ? " WON $"
    ;:CASH(I)=CASH(I)+ODDS(WHICH)*BET
    (I):? BET(I)*ODDS(WHICH);:GOTO 94
    0
930 ? " LOST $";:CASH(I)=CASH(I)-BET(
    I):? BET(I);
940 POKE 85,30:IF CASH(I)<=0 THEN CAS
    H(I)=0:? " BUSTED ":Q=Q+1:GOTO 96
    0
950 ? "$";CASH(I)
960 NEXT I:POKE 752,0:IF Q=NP THEN ?
    "YOU ALL BUSTED!!!":? :GOTO 1010
970 FOR I=1 TO 5:IF I<>WHICH THEN ODD
    S(I)=ODDS(I)+1
980 NEXT I:ODDS(WHICH)=ODDS(WHICH)-(O
    DDS(WHICH)>1)
990 IF Q=NP-1 AND NP>1 THEN 1030
1000 ? :? "ANOTHER ROUND";:INPUT T$:I
     F T$<>"N" THEN 370
1010 ? :? "SEE YOU ALL LATER!"
1020 SETCOLOR 2,9,4:SETCOLOR 1,12,10:
     POKE 756,224:END
1030 FOR I=1 TO NP:IF CASH(I)=0 THEN
     NEXT I
1040 ? NAME$((I-1)*20+1,(I-1)*20+LN(I
     ));" WON!!"
1050 ? "YOU BEAT THEM ALL!"
1060 GOTO 1010
1070 GRAPHICS 0:POKE 752,1
1080 DATA HORSERACE is a simple simul
     ation
1090 DATA of the entertaining sport o
     f horse
1100 DATA racing.  There are 5 horses
1110 N=3:RESTORE 1070:GOSUB 1300
1120 RESTORE 820:FOR I=1 TO 5:READ T$
     :? I;" ";T$:NEXT I
1130 ? :? " PRESS ANY KEY TO CONTINU
     E "
1140 IF PEEK(764)=255 THEN 1140
1150 POKE 764,255:? "{CLEAR}":RESTORE
      1160
1160 DATA Each horse starts out with
     odds
1170 DATA of 10 to 1.  When you bet o
     n a horse
```



A close contest in "Horse Race" for the Atari 400/800.

```
1180 DATA the amount you win is your
     bet multi-
1190 DATA plied by the odds for that
     horse.
1200 DATA If a horse wins a race  his
      odds go
1210 DATA down by one and all the los
     ers'
1220 DATA odds are increased by one.
1230 DATA , PRESS ANY KEY TO BEGIN 
1240 N=9:GOSUB 1300
1250 IF PEEK(764)=255 THEN 1250
1260 POKE 764,255:? "{CLEAR}"
1270 POSITION 15,0:? " HORSERACE ":?
     :?
1280 POKE 756,RAM/256
1290 POKE 752,0:RETURN
1300 FOR I=1 TO N
1310 POSITION 2,22:READ T$:? T$
1320 POSITION 2,I:FOR J=1 TO 22-I:? "
     {DEL LINE}";:FOR W=1 TO I:NEXT W
     :NEXT J
1330 FOR J=1 TO 50:NEXT J
1340 NEXT I:? :? :RETURN
```

Spectra Video's New Home Computer

Tom R. Halfhill, Features Editor

If you had any doubts that 1983 would be the Year of the Home Computer, prepare to put them to rest. We're only a couple of months into the year, and already it looks as if more home computers will be introduced than in any previous 12-month period. Besides the market debut of Commodore's Max Machine and P Series, it appears that long-rumored new models from Apple, Atari, and IBM are on their way, as well as Mattel's Aquarius (see "Mattel's New Home Computer," **COMPUTE!**, January 1983).

Now there's another contender. Spectra Video, Inc., of New York, maker of the Spectravision line of video game cartridges and the Quick Shot joystick, is entering the home computer market for the first time with its new SV-318. The computer was to be shown at the winter Consumer Electronics Show in Las Vegas in January, and is expected to be available by March 1 with a full line of peripherals and software.

At $299.95 suggested retail, the basic SV-318 can be described as a low-end computer, but it also offers enough expandability to compete against higher-end machines. With its low initial price, plus color and sound, it will compete head-on with the Atari 400, Commodore VIC-20, Mattel Aquarius, and Texas Instruments TI-99/4A. But its large memory expansion, 80-column conversion, and CP/M capability will also pit it against more expensive computers such as the Atari 800 and 1200XL, Apple II, Commodore 64, and Commodore P Series. Since Spectra Video intends to market the SV-318 through department stores and other mass retail outlets instead of computer shops, the company seems most interested in the burgeoning low-end home market.

Here's a rundown of features, according to Spectra Video:

The standard $299.95 SV-318 will come with 32K of Random Access Memory (RAM). Half of that is dedicated screen memory, leaving 16K RAM for BASIC programming. The 16K dedicated screen memory is controlled by a Texas Instruments video controller chip and is accessible with the BASIC commands PEEK and POKE. RAM is expandable to 144K (including the 16K screen memory). In addition, there is 32K of Read Only Memory (ROM), expandable to 96K.

An extended Microsoft BASIC is built-in. The full-size keyboard is the "calculator" type, with flat partial-stroke keys, similar to the Radio Shack Color Computer. There are 71 keys, upper- and lowercase, including 10 definable function keys and 52 graphics symbols (similar to the Commodore VIC-20 and PET). There's a built-in text editor for editing BASIC programs, and the cursor is controlled with a built-in, but detachable, joystick to the right of the keyboard. The joystick also functions as a game controller, and two external joysticks (with standard Atari plugs) can be added. The screen format is 40 columns by 24 lines for text, and 32 columns by 24 lines for the graphics symbols.

Spectra Video's new SV-318 computer and the optional Super Expander. Note the computer's topside slot, which accepts a $49.95 adapter for Colecovision game machine cartridges. Other adapters may also be available.

Advanced Sound And Graphics

The SV-318 has some advanced graphics and sound features. It displays 16 colors with a maximum graphics resolution of 256 by 192 dots. The character set can be redesigned by the programmer, much like the Atari, VIC-20, Commodore 64, and TI computers. Another impressive feature is the SV-318's ability to display up to 32 sprites. Sprites (known as player/missiles to Atari users) are screen shapes which can be designed by the programmer and animated very quickly and smoothly. Sprites are most often used in games, and the only other home computers that have this powerful feature are the Ataris, Commodore 64, and TI-99/4A.

For music and sound effects, the SV-318 has three sound channels, each capable of eight octaves. As on the Commodore 64, the *envelope*, or shape of the sound wave, is programmable (attack, decay, sustain, and release). There is 12-bit fre-

PETSPEED

Now for COMMODORE 64!

FAST ENOUGH FOR THE HUMAN RACE

Our alien won't hang around for slow software. He wants crisp responses and really fast processing.

For the human race too, slow PET BASIC is not good enough. When we run a program, whatever it is, we want fast efficient action.

PETSPEED, the compiler recommended by Commodore, is now available for the 64 and CBM 2. It can make any BASIC program run many times faster. It even speeds up disk handling. We guarantee that PETSPEED is easier to use and generates faster code than any other BASIC compiler for Commodore Systems.

Using PETSPEED is simple. Just type in the name of the program, wait a few minutes and then watch your software run up to 40 times faster.

Petspeed is not simply a compiler, it contains a powerful OPTIMISER. While PETSPEED is compiling, it breaks your program down into tiny fragments and reassembles it removing the unnecessary and simplifying the complex. Dazzling graphics. Lightning sorts. With PETSPEED anything is possible.

Also available INTEGER BASIC COMPILER – 150 to 200 times the speed of Basic. Integer Basic is for those applications where the speed of machine code is required without the inconvenience of assembly level programming. Ideal for scientific and educational users. Compatible with Petspeed.

PETSPEED (Commodore 64)	$150
PETSPEED (8000 or 4000 series)	$300
INTEGER BASIC (8000 or 4000 series)	$175
SPECIAL OFFER: Petspeed PLUS Integer Basic	$435

SSE (415) 964-8201
SMALL SYSTEMS ENGINEERING
1056 Elwell Court • Palo Alto CA 94303

quency resolution, which means the tuning accuracy of the notes will fall midway between the Atari's eight-bit resolution and the Commodore 64's 16-bit resolution.

The Central Processing Unit is a Z-80A eight-bit microprocessor with a fast clock speed of 3.6 megahertz. This makes it possible to run CP/M 2.2 and CP/M Plus. CP/M (Control Program for Microcomputers) is a standardized operating system that is compatible with thousands of programs, mostly business-oriented. CP/M capability on the SV-318 requires a plug-in 80-column card and a disk drive. Accessory cards, boards, and peripherals plug into expander boxes which attach to the SV-318.

The Single Slot Expander costs $29.95, and a seven-slot Super Expander is $175. The disk drive (256 capacity, unformatted) sells for $525 and requires a controller board ($175). Memory boards are priced at $99.95 for 16K and $160 for 32K. Other add-ons include printer interface boards, a Dual Channel Data Cassette at $89.95, an 80-column dot-matrix printer at $499, the Sensor Touch Graphic Tablet at $129.95, and a 300/1200 baud phone modem at $175.

Besides delivering all the peripherals with the computer by March 1, Spectra Video also promises more than 100 software packages for the SV-318. ©

COMPUTER CASSETTES / BASF -DPS

THE WORLD'S FINEST Data media for all microcomputers. • Used nationwide by software manufacturers, hobbyists, schools and businesses. • Premium 5-screw shell with leader fits all standard recorders.

CASSETTE STORAGE CADDY
NEW! ORGANIZE YOUR TAPES! $2⁹⁵ EACH

FINEST QUALITY PHILIPS (NORELCO) TYPE HARD BOXES

TRACTOR FEED DIE-CUT BLANK CASSETTE LABELS

GET ONE CADDY FREE! Buy 2 doz. Cassettes & One Caddy. Get One Caddy FREE!

• SATISFACTION GUARANTEED OR YOUR MONEY BACK •

FOR IMMEDIATE SHIPMENT USE YOUR VISA OR MASTERCARD **CALL 213/710-1430**

ORDER FORM

ORDER NOW . . . MAIL TO: **YORK 10™ Computerware**
24573 Kittridge St., #CM, Canoga Park, CA 91307

ITEM	1 DOZEN	2 DOZEN	TOTAL
C-05	☐ 7.50	☐ 13.50	
C-10	☐ 8.00	☐ 14.40	
C-20	☐ 10.00	☐ 18.00	
Hard Box	☐ 2.50	☐ 4.00	
Storage Caddy @ $2.95 ea. Quantity ___ FREE Quantity ___			
Blank labels	☐ 4.00/100	☐ 30.00/1000	
		SUB TOTAL	
Calif. residents add 6% sales tax			
Shipping/handling 1 doz. $2 2 doz. $3.50 3 doz. $4.50, each additional doz. $.50			
For Parcel Post instead of UPS ADD $1			
Outside Continental USA ADD $2			
		TOTAL	

Check or M.O. enclosed ☐ Charge to Credit Card: ☐ VISA ☐ MASTERCARD
☐ PLEASE SEND QUANTITY DISCOUNTS

Each cassette includes two YORK 10 labels only. Boxes are sold separately. Shipments are by U.P.S. unless Parcel Post requested. Boxes, caddies, and blank labels are free of shipping charges when ordered with cassettes. When ordered without cassettes, shipping charges. Boxes—$1.00/doz., Caddies—$1.00 each. MINIMUM SHIPPING/HANDLING ON ANY ORDER—$2.00

Card No. ________ Exp. ____
Name ________
Address ________
City ________ State/Zip ________
Signature ________
Computer make & model ________ Disk?(y/n) ____

END TAX TRAUMA

We have the perfect way to breeze through the most dreaded task of the year. And you can do it on your computer – even if you're a complete novice.

It's called **The Tax Advantage**.™ It's fast and it's a cinch to use.

The program takes you line-by-line through Form 1040 and the other most common tax forms. It asks you for information in plain English, and you type in the numbers. That's all there is to it.

The Tax Advantage™ does complex operations like income averaging with a few simple commands. Not only that, but as tax laws change, you can easily update the tax tables.

Another terrific feature is that it automatically computes your taxes with each entry you make. So you know exactly how each line affects your overall tax picture.

Pick up **The Tax Advantage**.™ Simply stated, it's the best way to do your taxes.

But hurry. April's almost here.

The Tax Advantage™ is available for the Apple II and Atari 400/800. Price $59.95.

Continental Software
A Division of Arrays, Inc.

Continental Software Co., 11223 South Hindry Avenue, Los Angeles, California 90045 Telephone (213) 417-8031

Apple II is a registered trademark of Apple Computer, Inc. Atari 400/800 are registered trademarks of Atari, Inc., a division of Warner Communications, Inc.

Computer Talk Show

Tom R. Halfhill, Features Editor

As microcomputers penetrate the average American home, the popular appeal of computing spreads to everyday consumers. Here's another indication that home computing is gaining mass appeal.

It's 9 o'clock on a Saturday morning in Dayton, Ohio. All over town, hundreds of people are tuning their radios to WAVI-AM. To catch the morning news? To get last night's sports scores? To hear the Top 40 or a talk show?

Nope. The latest rage in Dayton is a new sort of talk show, the first of its kind in the nation. It's called *Computer Talk* – an hour-long, call-in talk show devoted exclusively to home computing.

Since taking to the air last summer, *Computer Talk* has become one of WAVI's most popular programs. "It's been a real success, and frankly no one was more surprised than me," says A. J. Austin, the deejay who hosts the show. "I figured it would be a fad for a few weeks and then go out of style, but it's proven so popular that we're considering expanding the show to two hours."

The advertising is sold out for virtually every program, a steady stream of guests has kept the discussions alive, and listeners have responded with plenty of input/output – tying up the phone lines almost constantly every week.

Vacuum Cleaner Ruminations

Not bad for what started as a tentative experiment. Although Austin is a dedicated microcomputer enthusiast – he's owned an Apple for two and a half years – it didn't occur to him that a computer talk show could have wide popular appeal. At least, not until an engineer at the station brought up the idea.

Knowing that Austin owned an Apple, engineer Kurt Farmer suggested last April that it might be interesting to air a computer-oriented talk show. At first, Austin says he was skeptical. Would there be enough people out there to support a talk show on such a narrow topic? Wouldn't the technical jargon scare away casual listeners? What could he talk about every week? Who would sponsor the show?

Austin soon had his answers. *Computer Talk* hit the airwaves on June 1, originally only a half-hour long. Within two weeks it was expanded to an hour. Austin says the incoming lines on his telephone light up when the show starts and stay lit almost constantly until the show ends. Regular sponsors include local computer stores and other computer-related businesses.

At first, Austin experimented with all kinds of ideas. At one point, he was actually broadcasting programs over the air by playing data cassettes so people could tape-record the signals off their radios. But the squealing static of digitally encoded data – described by a local magazine as "vacuum cleaner ruminations" – is no longer heard on *Computer Talk*. "The results weren't worth the three minutes of noise," explains Austin, "and the technical problems of AM radio just didn't make it practical."

Explaining The RAMifications

Instead, a more or less standard format has evolved. "I'll start off with five or ten minutes of news – you know, who's ripped off IBM this week, or so-and-so's new machine, news like that. Then we'll go to our guests and discuss whatever topics we have decided on, and I'll usually finish off with a few software reviews. During this whole time, of course, the phone lines are open for anyone to call in about anything."

Austin is encouraged because many beginners and non-computerists are calling in with questions and comments. Lots of them want advice on which computer to buy. One week his guests were TRS-80 and Atari owners who responded to a caller by discussing the relative merits of their machines. Austin tries to keep the discussions as general and as easy to understand as possible, but often a beginner will phone in with a seemingly simple question, such as asking what "RAM" means. Austin then takes a minute to explain the concept of Random Access Memory, and returns to the discussion.

"We know that the show has sold at least one computer.... This lady called in and told us she got so interested in computers by listening to our show that one day she went out and bought a TI 99/4A for her family, and she's just delighted with it. Before she heard the show, she had never even considered buying a computer."

As word about *Computer Talk* spreads, Austin says he is getting inquiries from other radio stations around the country about airing similar shows. He still can hardly believe the show is really thriving.

"I thought it would run for a few weeks and then I'd get my Saturdays off again. But no way."

Part II:

Writing Transportable BASIC

Edward Ordman

This concludes a two-part article on writing BASIC programs so that they are more easily read, revised, or translated to run on different computer brands. Though not everyone will agree with the goal (general-purpose BASIC), or the approach (structured programming), many of these suggestions are potentially useful to those programmers who later revise and improve their own programs. For contrast, see the views of some of the programmers quoted in "How The Pros Write Computer Games," elsewhere in this issue.

Structure

The major tool in making a program transportable is careful attention to program structure. This does not mean slavish adherence to "structured programming." It does mean using common sense and some of the important tools available to keep programs from becoming "spaghetti bowls" of GOTOs. This can include "structured programming" when applicable.

To consider a concrete example, suppose we have two branches in our code governed by a GOTO. A simple version might be:

```
500 IF X>2 THEN T=T+Y:C=C+2 ELSE T=T+Z:
    C=C+1
```

There is certainly no objection to writing this in one line if your BASIC allows it; the intent is clear. Remember that you should leave space for new lines, since someone may have to rewrite this as:

```
500 IF X>2 THEN 504
501 T = T+Y
502 C = C+2
503 GOTO 507
504 T = T+Z
505 C = C+1
507 REM ENDIF
```

Even this is still quite readable. It is clear where the IF starts and where its effect ends. A far worse example (but painfully common in beginners' programs) would have IF X>2 THEN 4000 and then down at line 4000 would have:

```
4000 T=T+Z: C=C+1 : GOTO 510
```

This is hard to read: how, when checking line 4000, can you know where it relates to the rest of the program? Reading lines 500-510, how can you understand the options of the other path?

My own practice, incidentally, is to avoid GOTOs over long distances, avoid upward GOTOs unless they are part of a fairly formal structure, and have GOTOs go to REM statements in a great many cases. Suppose, in the example above, line 510 was PRINT TAB(C);X;TAB(C+5); Y and some variation in the new machine meant that this had to be expanded to two lines to get the right spacing. A GOTO 510 in line 503 means that a line 509 cannot be introduced without other changes; the 507 REM means changes in the PRINT do not require changes in the IF.

A similar situation arises in programs where there is a large loop (PLAY AGAIN in a game) and some initialization before it. If you start

```
1 PRINT "WELCOME TO THE GAME"
2 T = 0
3 X = RND(1)
4 Y = 1
```

the person rewriting this may type 2 T=0: X=RND(1): Y=1, and be in big trouble when he discovers that at line 5560 you have GOTO 4. He will be in more trouble when he revises the program and needs to add another statement within the main loop, but before Y=1. Compare the program:

```
10 PRINT "WELCOME TO THE GAME"
20 T = 0:X = RND(1):REM INITIALIZE,0<
   X<1
30 REM  ENTER MAIN LOOP HERE
40 Y = 1 :REM  COUNT NUMBER OF ATTEMP
   TS
5560 GOTO 30 :REM REPEAT MAIN LOOP
```

In this version, the rewriter will not confuse line 20 and line 40; a line 35 can be added; and there is no confusion as to exactly where the GOTO is leading, even after several program revisions. In general, do not GOTO "the middle" of a line of reasoning without clearly labeling why and providing an easy way to make changes without extensive rewriting.

If you really want to avoid upward GOTOs in as many cases as possible (and it *does* make programs easier to read!), there are two alternative structures that are important: GOSUB ... RETURN and the DO ... WHILE. First, let us consider the DO...WHILE.

DO...WHILE can be regarded as an extension of FOR...NEXT. A typical form is:

```
1000 DO WHILE X>10
1010 PRINT X
1020 T = T+X
1030 X = X/2
1040 ENDWHILE
```

PET/CBM

PaperClip

Professional Word Processor at a Breakthrough Price

PaperClip™ performs all the advanced features found in Word Processors costing much more. . .

1) Full screen editing. 2) Copy/Transfer sentences and paragraphs. 3) Insert/Delete sentences and paragraphs. 4) Headers/Footers/Automatic page numbering. 5) Justification/Centering. 6) User defineable keyphrases. 7) Supports both cassette and disk. 8) Variable data – Form letters. 9) Horizontal scrolling up to 126 characters. 10) Insert/transfer/erase columns of numbers. 11) Add/subtract columns of numbers. 12) Supports most dot matrix and letter quality printers. In fact, a printer set-up routine is supplied to take the best advantage of the printer at hand. 13) French and Math technical character sets available.

Also available for Commodore 64

Requires
Basic 4.0, 32K memory.

$125.00 U.S.

Dealer enquiries welcome

BATTERIES INCLUDED

71 McCaul Street
Toronto, Ontario
Canada M5T 2X1
(416) 596-1405

Suppose X is 50 when this is entered. Lines 1010-1030 will be done for X=50, for X=25, for X=12.5; then X will become 6.25, the test will fail, and the program will go on after line 1040. This is a remarkably useful *thinking* tool, even if your BASIC does not have these statements (many do not). But, for transportability, I would argue *against* using these statements even if you have them. There is, however, no reason at all not to *think* in terms of DO...WHILE and then to write an imitation of it:

```
1000 IF X<=10 THEN 1040 :REM DO WHILE
      X>10 TO LINE 1040
1010 PRINT X
1020 T = T+X
1030 X = X/2
1035 GOTO 1000
1040 REM  END WHILE
```

Again, this is easy to read, the upward GOTO is clearly explained, and the reader is in no doubt as to the scope of the loop and where you enter and leave it.

Subroutines Are Best

Subroutines – the facility provided by GOSUB and RETURN – are the single most important feature in providing transportability. There is a strong case to be made for dividing every program of more than a few dozen lines, and many shorter ones, into subroutines. Ideally, each subroutine should have a purpose that you can describe in one or two lines, and that explanation should be given in remarks at the head of the subroutine. The subroutine should *not* interact with the rest of the program except as provided in the leading remarks. An example:

```
6000 REM  SUBROUTINE TO CONVERT TO PO
     LAR COORDINATES
6001 REM  GIVEN X,Y COORDINATES.  RET
     URN R=RADIUS,T=ANGLE.
6002 REM  X,Y UNCHANGED.  RETURN T=0
     IF R=0.
6003 REM
6010 R=SQR(X*X + Y*Y)
6020 IF R = 0 THEN T = 0 : RETURN
6030 IF X<>0 THEN T = ATN(Y/X) : RETU
     RN : REM ARCTANGENT, RADIANS
6040 IF Y > 0 THEN T = 3.14159/2
6050 IF Y < 0 THEN T = -3.14159/2
6090 RETURN
```

It is entirely appropriate for subroutines to call other subroutines, or for a main program to consist primarily of subroutine calls, with all the real work done in the subroutines. But when this is done, it is even more important to make sure that the subroutines can be debugged separately – that they do not, for instance, change the variable used elsewhere, but not mentioned in the headnote.

Where you are using a feature that you know is particular to your computer – for instance, disk input/output – it is especially important to isolate it in a subroutine, and label it as machine-dependent. This means that it can be rewritten later with a minimum of change to the main program logic.

Make Input/Output General

It is very likely that anyone rewriting a program for another machine will have to revise input/output statements. This applies to PRINT and INPUT for keyboards, terminals, CRTs, and printers; to cassette and disk storage; to game controllers and joysticks; and to all other peripherals. Essentially the only "minimal" features that all machines have in common are INPUT X and PRINT X,Y,Z, and even these are not as standard as one might like. The usual solution is to stick to minimal formatting, if you consider transportability of prime importance; or to place fancy input/output in subroutines and indicate your intention clearly, if it is essential to the program. Here we can give only a quick guide to some of the tricks and pitfalls.

INPUT Some computers allow you to cue the user (prompt) as desired, e.g., INPUT "YOUR NEXT GUESS?";N while others do not. The others can fake it by PRINT "YOUR NEXT GUESS";:INPUT N getting the question mark on the same line as the printout. Many BASICs will not allow suppression of the question mark. Inputting string variables, particularly with embedded spaces or commas, also differs dramatically from system to system, as mentioned earlier. If your program depends heavily on a precise form of string input, place the input routine in a subroutine and explain the purpose carefully. For example:

```
2000 REM  STRING S$ WILL BE ALL CHARA
     CTERS TYPED (PRINTABLE OR NOT)
2001 REM  UNTIL ENTER IS HIT (EXCLUDI
     NG THE ENTER)
2010 S$ = ""
2020 K$ = INKEY$ :REM  GETS SINGLE KE
     Y FROM KEYBOARD
2030 IF K$ = "" THEN 2020
2040 IF ASC(K$) = 13 THEN 2090 :REM
     CARRIAGE RETURN, OR ENTER
2050 S$ = S$ + K$
2060 GOTO 2020
2090 RETURN
```

Of course, other machines may require substantial rewriting of this subroutine, if the special word INKEY$ is not available or works differently. In some microcomputers, the implementation may be as easy as INPUT LINE S$. Still, having this in a single subroutine, rather than scattered throughout the program, will simplify the job of rewriting for a new machine.

PRINT Some computers allow statements like PRINT "$"X"000", without commas or semicolons, and produce the output $4000 when X is 4. Others require PRINT "$";X;"000" and produce $ 4 000 or something similar. Usually, a

WHAT'S SMALLER THAN A BUSINESS CARD?

FASTER THAN CASSETTES?

AND FAR LESS EXPENSIVE THAN DISKS?

Why the ESF-20/64 Stringy Floppy from Exatron, of course. Our exciting little storage alternative gives you near floppy disk speed and reliability at a budget-minded price. Our high quality digital mass storage system is the perfect product to fill the gap between cassettes and floppy disks. And that's especially true in the case of the Commodore VIC-20® and Commodore 64® microcomputers.

The Exatron Stringy Floppy system is based on a small endless loop tape cartridge we call "The Wafer". This wafer measures only 2 3/4" x 1" x 3/16" — or about the dimensions of a standard business card. Wafer was born to run fast — at around 7200 baud, or 14 times faster than a standard cassette and has a memory capacity of 64K bytes. The ESF-20/64 system costs less than $200 and wafers are less than $3.00 each. No wonder computer people call us the "poor man's disk system".

If you'd like to get the world on a string, and bring your VIC-20® or Commodore 64® into the 20th Century, just fill out the coupon below and mail it to EXATRON, 181 Commercial Street, Sunnyvale, CA 94086. If you need to place an order call (408) 737-7111, outside California (800) 538-8559 and ask for Chrissy or Natalie.

The ESF-20/64 Stringy Floppy System from Exatron for use with the Commodore VIC-20® and Commodore 64® microcomputer.

exatron

For exciting alternatives in mass storage.

Name ______________________

Address ______________________

City/State/Zip ______________________

Mail today for information on the ESF-20/64 from
EXATRON, 181 Commercial St., Sunnyvale, CA 94086

clear indication (in a REMark) of what you want is far more helpful than an ingenious trick to achieve it on your machine. The exact meanings of comma and semicolon differ from one machine to another: it is universal that comma means "wide space; arrange in columns" and semicolon means "short space, or no space," but the details differ. In many configurations, TAB will not work properly (this is common when using a printer attached to an Apple, for instance).

If you must engage in any fancier spacing than use of commas and semicolons, explain yourself in REMarks and leave it to the reader to implement it on his machine. Many microcomputers do not have PRINT USING; if you use it, an example output line contained in a remark is very helpful. If you use a fancy PRINT statement repeatedly in your program, consider placing it to a subroutine where the reader will have to translate it only once.

CLEAR There are a number of special commands whose implementation differs from one computer to another. Some examples are Clear Screen, Go to top-of-page, and similar ones. (Varying print character width, for instance, is usually a function of the printer model, not of the BASIC.) If at all possible, place these functions on a line by themselves and remark clearly; it will then be easy for the reader to translate them, or delete them if inapplicable to the new system.

Joysticks These also differ dramatically from one system to another. Again, place them in a clearly labeled section of the program, preferably a subroutine, and label what they do. In particular, avoid repeating these statements numerous places within the program. Example:

```
1050 GOSUB 5000 : REM  READ PADDLES
2300 GOSUB 5000
5000 REM  READ PADDLES X,Y -- VALUES
     ARE 0 - 255, SCALE TO 0 - 100
5010 X = PDL(0)/2.55
5020 Y = PDL(1)/2.55
5030 RETURN
```

Clearly, someone whose paddle-reading commands are different, or give values in a different range, can easily rewrite this subroutine.

Tape/Disk While the particular statements involved in tape and disk input/output differ for almost every system, the general functions to be performed are almost identical. Typically, one must specify a file name and number by which it will be referred, and whether it will be for input (READ or INPUT), or output (WRITE or PRINT), or both. A typical statement is something like OPEN "DATAFILE" AS 1 FOR INPUT. If your BASIC allows omitting some of this, include it in a REMark. For example,

```
1050 PRINT D$; "OPEN INPUT";F$ :REM OPEN F$,
     SEQUENTIAL, INPUT ONLY
```

is acceptable if you only have one file open at a time; the reader can insert an AS #1 if the new system requires it. Once you have opened a file, you must read from it or write to it, typically by a statement such as READ #1, A,B,C or PRINT #3,A;C$;B;C$;X :REM C$ = ",".

Notice that if your system does not require a specific indication in the statement that it refers to a file, you should include one in a REMark. It is an excellent idea to write commas as field dividers to a file, even if your system will permit a space as a divider on input. Enough systems insist on the comma that it decreases portability to omit it. A statement such as

```
1060 REM A TYPICAL LINE OF FILE IS 4 , 5 ,
     DEBITS , 2.95 (CR)
```

will often make the program much clearer to the reader than it is from just the line

```
INPUT#3 P(K),Z(K),D$,A(I)
```

In the case of a direct access file, most systems also need to know the record length and record number for each read or write. If a direct access file is opened for updating, you should read a record before you write it. Finally, on any type of file, you should remember to close it explicitly (usually CLOSE #3 or some variant). Even if your BASIC does not insist on this, someone else's will; and it can be hard to figure out *when* to do the closing in a strange program.

A program using no files is more easily transportable than one using files; the fewer the files, the more transportable. (Avoid opening more files than needed at one time.) Sequential files are easier to move than direct access files; files read or written "all-at-once" are more transportable than ones that are read or written only intermittently. If at all possible, structure a program like this:

```
1000 GOSUB 7500 : REM READ WHOLE FILE
      INTO AN ARRAY
 .... :REM  MAIN PROGRAM ACTS ON THE
ARRAY
4000 GOSUB 7700 : REM WRITE WHOLE ARR
     AY BACK OUT TO FILE
4010 GOTO 9999
```

so that all file-handling is confined to specific subroutines and the files can be kept on a cassette tape even without fancy automatic stop-start features.

Graphics

If we view BASIC as something almost geological, something that has had layers added over time, graphics capabilities are the last layer, and the layer least solidified. Graphics differ more from machine to machine than any other feature. Fancy graphics tricks are the very hardest thing to transport from one system to another. Still, it is possible to do some graphics work and still limit the problems when moving them to another system.

Atari Innovators...

New Excitement for your Atari 400/800 from Synergistic Software

Crisis Mountain, by **Ron Aldrich and David Schroeder.** Can you stop the explosion that could trigger a dreaded volcanuclear eruption spewing tons of radioactive ash into the atmosphere? In this fast-paced real-time game you leap tumbling boulders, crawl through claustrophobic tunnels, and bound over columns of bubbling lava to defuse the bombs. Be sure to avoid Bertrum — the radioactive Bat, and hurry, the bombs are ticking away! Multi levels of play. Requires 48K, one disk drive, and game paddles or joystick to play **$34.95**

Warlock's Revenge, by **Butch Greathouse.** Rid your kingdom of the evil warlock, Oldorf, who has terrorized its inhabitants. Lead a party of adventurers, including a gladiator, a strongman, a magician, a wizard, a cleric, an elf and a thief in this fearful mission. Overcome the dangerous obstacles in Oldorf's realm. A role-playing adventure game with high-res graphics. Requires 40K and one disk drive to play. **$34.95**

Probe One: The Transmitter, by **Lloyd Ollmann, Jr.** In a research center on the remote planet, Eldriss V., you must deduce how to use the scientific devices found in the lab to unlock its sealed areas. You must capture the Transmitter, a secret device needed to save your race. Use keyboard commands and paddles to fight off the building's guard droids. A strategic, arcade-action game in high-res graphics. Requires 40K, disk drive, Atari BASIC, and joystick or paddles **$34.95**

Free Yourself from Programming Drudgery with Synergistic Software's New Utilities.

Programmer's Workshop, by **Dennis M. Keathley.** A collection of seven different utility programs including: disk to cassette transfer, BASIC program compare (lists differences between 2 different programs), cassette baud rate increase, analysis of program code, etc. One utility, the ANALYZER, will unlock the mysteries of a cassette file, the computer ROM and RAM, or any portion of a diskette, by displaying data in both Hex and ASCII. Requires Atari 400/800 with 16K, disk drive, and cassette player (optional) . . **$34.95**

Disk Workshop, by **Dennis M. Keathley.** A collection of seven different utility programs including fast copying of disks, sending a formatted disk directory to a printer, using machine language character strings in BASIC, a screen dump for the MX-80 Epson Printer with Graftrax or Graftrax Plus, etc. One utility, DISK EDIT, allows you to easily modify individual bytes or entire sectors on the diskette. Requires Atari 400/800 with 16K, one disk drive, and printer. **$34.95**

Graphics Workshop, by **Lloyd Ollmann.** A collection of utility programs to improve the graphics capabilities of Atari programmers. The PLAYER-MISSILE device handler allows easy set-up and use of player missiles using the Atari BASIC OPEN, PRINT, and PUT commands. GRAPHICS ENHANCEMENTS includes a new graphics mode and bit-map capabilities. Package also includes a character editor, a bit-map editor, and a player missile editor. Requires Atari 400/800 with 48K and one disk drive. **$39.95**

Synergistic Software

Synergistic Software
830 N. Riverside Drive
Suite 201, Renton, WA 98055
(206) 226-3216

ORDER ONLY 1-800-426-6505

WE ACCEPT CHECKS, MASTERCHARGE, VISA AND C.O.D. ORDERS. $2.00 HANDLING FEE EXCEPT ON PREPAIDS.

Generally, it is easiest to transport a program that uses only "character" graphics. If we view the screen as consisting of a fixed number of rows and a fixed number of columns, then each position can be occupied by one letter or "character." If we confine ourselves to commonly available characters, our program *should* be capable of being rewritten for most systems. If it does not involve moving pictures, it should even be possible to run it on a printer-oriented system in many cases.

As you know, common systems *do* differ in screen size (in number of characters in a row or column). The first thing we must do is let the reader know what assumptions we have made:

```
50 M1=16 :REM NUMBER OF LINES ON SCREEN
60 M2=40 :REM NUMBER OF CHARACTERS PER
   LINE
```

From this point on, we should place everything in terms of the numbers M1 and M2, *not* 16 and 40. Further, to position a given character C$ at coordinates X,Y (that is, X across and Y down: position X of row Y), we should set X, Y, and C$ and then call a subroutine. On the IBM Personal Computer, we print an "A" in the center of the screen by

```
100 X=INT(M2/2) :Y=INT(M1/2) :C$="A"
110 GOSUB 7000
 ....
7000 REM  SUBROUTINE TO WRITE C$ AT
     POSITION X OVER, Y DOWN ******
7010 LOCATE Y,X : PRINT C$;
7020 RETURN
```

Again, the user of any given computer can rewrite this subroutine as a whole far more easily than he can rewrite statements like LOCATE 12,40: PRINT "A"; which are scattered throughout the program.

Sometimes a screen is built up by "jumping around," rather than line-by-line. If you wish to get hard copy of such a screen, and lack a built-in operating system procedure to do so, you can have the subroutine just mentioned build an array by 7015 S(X,Y)=ASC(C$) (or 7015 S$(X,Y)=C$) and later print the entire array. This may be as easy as:

```
8000 REM  PRINT THE SCREEN STORED IN
     ARRAY S(M2,M1) *************
8010 FOR I = 1 TO M2
8020 FOR J = 1 TO M1
8030 PRINT CHR$(S(J,I)); :REM ; LEAVE
     S NO SPACE ON IBM PERSONAL COMP
8040 NEXT J
8050 PRINT :REM  GO TO NEXT LINE - DE
     LETE IF IT CAUSES DOUBLE SPACING
8060 NEXT I
8070 RETURN
```

Note that this program must contain a line such as

```
70 DIM S(80,24) :REM SAVE SCREEN. NOTE DIM
   S(M2,M1)
```

so that a person changing M1 and M2 will know how it changes the DIM statement.

A remarkable assortment of graphics effects may be achieved just by the skillful use of standard characters: minus signs or underscores for horizontal lines, ones or a special symbol for verticals, and so on. It is not hard to generate pictures by hand: hold a piece of window screen over a picture, judge the amount of darkness as best you can (most people can rate "darkest, dark, middle, light, clear") and use characters such as M I : . and space to represent them. Some scaling may be needed; in many systems the space allocated for a character is 1 2/3 to 2 times as tall as it is wide. Fill-in-the-blanks effects, on screen or paper, may be achieved by using minus signs as underscores:

```
SOCIAL SECURITY NUMBER ? ___-__-____
```

Turning now to "high-resolution" graphics, or other extended graphics features, we find that most of them still can be expressed in terms of X-Y coordinates and making a specific mark at specific coordinates, although the mark is now usually "on" or "off" or "COLOR 7" instead of a letter. The same principle as before applies: specify the maximum size involved; if at all possible give dimensions as fractions of M1 and M2 rather than absolute numbers; and keep the actual writing in as few subroutines as possible.

In general, have one subroutine that draws a point; another that draws a line by making repeated GOSUBs to the subroutine to mark points; and so on. Even if your computer has built-in line-drawing commands, place them in subroutines (instead of HLIN 20,50 TO 30,40 write X1=50: Y1=20: X2=40: Y2=30: GOSUB 2600 where 2600 has the line HLIN Y1,X1 TO Y2,X2), so that a person whose computer lacks them can try to write a reasonable imitation.

If you write carelessly, or depend too heavily on features of a particular machine, you can have a program that is very hard to translate to any other machine. If you want to be able to move your programs to a new, different machine, or have them run on a friend's machine or on a machine at school, you must plan ahead when you first write the program.

It takes relatively little extra effort to write a transportable program, and there are many fringe benefits. You yourself will find the program easier to test, debug, or reread a few months later. A little avoidance of particular machine "special features," a little use of good structuring practices, and some care to isolate likely-to-change features in labeled subroutines, can pay off in far easier maintenance and rewriting. And if it means that some published programs will run on a larger variety of machines than they used to, it will pay off for all of us.

"...faithfully captures the look, spirit and play of arcade 'Space Invaders'".

-John Anderson,
Creative Computing

"All are excellent versions of the arcade games with super graphics and sound."

-Mark Benioff
A.N.A.L.O.G.

"The graphics display, sounds and game logic are so close to the original, that you might find yourself looking for the coin slot on your computer."

-Gary and Marcia Rose

"'Deluxe Invaders' is by far the best Space Invaders program ever released for a personal computer."

-Leigh Goldstein,
Electronic Games

Computer Games We'd Like To See

Tom R. Halfhill, Features Editor

Want to program a new computer game but find yourself stuck for ideas? Maybe you could try one of these tongue-in-cheek suggestions.

Let's face it, computer and home video games seem to be stuck in a rut. Our senses and joystick elbows are endlessly assaulted by what seem to be repetitions of the same old themes.

Space Invaders spin-offs keep descending upon us as relentlessly as...well, as *Space Invaders*. We're lost in a maze of *Pac-Man* imitations, pursued by the ghosts of programmers whose most difficult task was not the coding, but evading the wrath of copyright attorneys. Almost overnight, it seems, each new arcade hit spawns litters of look-alike offspring. *Missile Command* clones multiply as if by fission. *Zaxxon* is Xeroxed. *Donkey-Kong* is aped.

Perhaps it's time for a change. As a public service to home video game addicts everywhere, we're presenting a list of ideas for a new generation of games, in the hope that game designers from here to Silicon Valley will leave their hot tubs and stop cashing their royalty checks long enough to consider something different.

To tackle the problem, we had to come up with a new approach. What makes a game fun? It occurred to us that the game designers, by and large, are hopelessly trapped in their spaced-out, paranoid fantasies. Fantasies are fine, but they have their limits. After all, how often have you been called upon in real life to defend Earth against alien invaders?

On the other hand, we quite frequently find ourselves in one of those amusing little situations that make everyday life such a lark. You know, like the time you emerged from that midnight movie when it was 22 degrees below zero and discovered your car's battery was dead. There are thousands of these situations to choose from. Can 25 years' worth of *I Love Lucy* reruns be wrong?

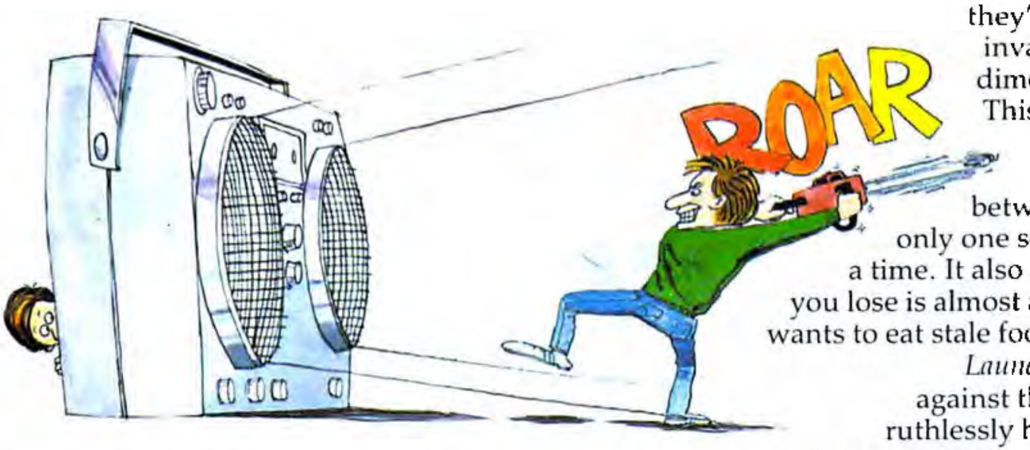
So crank up your computer and get ready to start programming....

Rush Hour Madness

A game for one to 32,768 players, *Rush Hour Madness* is an ideal project for the beginning programmer who is limited to the relatively slow BASIC language. Although *Rush Hour Madness* involves large numbers of screen objects, the animation need not be fast. In fact, animation is nearly nonexistent.

Players start by driving onto the expressway at 5:15 p.m., controlling their car with a joystick. The "fire" button honks your horn. Immediately after entering the expressway, players are entangled in a massive traffic jam. Scoring is straightforward: one point for each minute the player endures the game without going stark raving mad.

A 50-point Good Samaritan bonus is awarded for parting ranks to allow another player to join



the game from the expressway entrance ramp. Every 10,000 points (roughly 166 hours of play), players can manipulate their joysticks to move their cars a few feet. This might not seem like much to those who've been spoiled by the cheap thrills of so-called "action" games. However, our test panel reports that after hours of waiting, the moment when you move your car is very close to ecstasy.

The object of *Rush Hour Madness* is simple – reach "home" before the game re-initializes itself and starts over again the next morning.

Check-out Tribulation

If *Rush Hour Madness* is a hit, it might well give birth to numerous look-alikes. *Check-out Tribulation*, which traps the player in a supermarket check-out line, is but one example. Others might include *License Renewal Ordeal* or *Airport Inspection* ...you get the idea. The possibilities are as endless as the lines themselves.

Each version, of course, would feature its unique variations. Players of *Check-out Tribulation* would face battle with such creatures as the Sticky-Fingered Imp, who lunges from the seat of his grocery cart to squash your tomatoes, and the Absent-Minded Peruser, who forgets the line is moving while reading tabloid articles such as "Lost In Desert: Eats Own Briefcase."

Laundromat Invaders

The theme of this game suggests an answer to one of our most perplexing unsolved mysteries. Ever notice how you always go to a laundromat with an even number of dirty socks, and return home with an odd number of clean socks? Somehow, no matter how careful you are, you always seem to end up with a lonely sock.

Laundromat Invaders explains why. You see, there's a planet in another dimension, a planet populated by humanoids much like ourselves. The main difference is that these humanoids subsist entirely on a diet of socks. Their survival has been threatened by a severe sock shortage caused by a recent blight on their Orlon crop. So, they've built robots which invade laundromats in our dimension to steal socks. This explains why only *one* sock turns up missing; the portal between dimensions allows only one sock to pass through at a time. It also explains why the sock you lose is almost always a new one: who wants to eat stale food?

Laundromat Invaders pits you against these interlopers. You ruthlessly hunt down the robots and clobber them with your Prolific Family Size box of Tide as they pull their favorite tricks, i.e., making the socks cling to the insides of the washer, surreptitiously snatching them with static electricity as you empty the dryer, etc. You get 100 points for each robot you clobber (500 if it's carrying off a sock), and 1000 points if you wind up with an extra sock from somebody else's laundry.

Boom Box Blasters

This game is for those commuters who forego *Rush Hour Madness* (see above) in favor of our urban mass transit systems. *Boom Box Blaster* is a fast-action arcade game which pits the player against hordes of inconsiderate adolescents armed with those giant portable radio/tape players.

It starts off deceptively easy. Using the joystick, you maneuver your commuter down the sidewalk toward the bus stop, studiously avoiding such minor obstacles as Hare Krishnas and Moonies hawking incense and flowers. Suddenly, your ears are assaulted by the 85-decibel roar of the Shrill Sisters' latest hit, "Nerve Erosion." It's a teen-ager carrying a boom box! Pressing the joystick fire button to activate your Tri-Proton Chainsaw, you blast the noisy box to bits as the terrified teen flees in panic.

But the game gets much harder. Players soon find themselves trapped with whole gangs of boom box-wielding hoodlums inside the acoustic confines of a bus. Survivors advance to even more difficult levels, finally winding up on the subway. Other obstacles encountered in *Boom Box Blaster* include sticky gum-encrusted seats (which momentarily disable your joystick movements) and rude transit personnel (who ignore your opponents, but hassle you for exact change).

Programming Hints:

Naturally, writing these games will require some special techniques. We recommend programming languages such as BASIC (Beginner's Algorithms for Seemingly Infinite Confusion), LOGO (Logical Order for the Gobbledygook-Oriented), and PILOT (Programmer's Instruction Language for Oddball Tasks). ©

the PROGRAM STORE™

Great February Feast of

The Best ROMs ALL at 15% OFF!

MINER 2049ER

By Bill Hogue from Big Five

This is the author's first game for the Atari—he's already well known for his bestsellers for the TRS-80—and we think you'll really enjoy it. There are more than ten screens of colorful mining-related machinery that you'll move around the screens, ducking, dodging and bobbing your way to a high score. Requires joystick.

ROM Cartridge (16K), ~~$49.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $42.46

QIX

From Atari

Just like the challenging arcade game. You must surround QIX, the spinning helix, by filling in the screen with boxes of color. As the game progresses, QIX gets bigger, more dangerous, and more aggressive. *Watch out!*

ROM Cartridge (16K), $44.95 Save 15%
Now Thru Mar. 1 You Pay Only $38.21

DEFENDER

From Atari

The Aliens are roaming your planet, trying to capture humanoids to transform them into destructive mutants. You and your spaceship DEFENDER must protect them from the onslaught.

ROM Cartridge (16K), ~~$44.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $38.21

Equipment Corner

JOYSTICK EXTENSION CORDS

Now you can control your computer from anywhere in the room with our 6 or 9 foot extension cords.

Pair of 6' Cords, $9.95.
One 9' Cord, $6.95

VIDEO COMMAND XYZ CONTROLLER

From Zircon International

Direct replacement for Atari and VIC joysticks. Features include: left and right directions; left and right rotation; forward and back movement, either straight or at 45° angles. The XYZ also pulls up and plunges down. With fire button, of course.

$15.95 each

ATTACK AT EP-CYG-4

From BRAM ***Free Poster Enclosed!***

You have just been revived from 4 years of stasis. The brutal machine race called Tartillians have destroyed their humanoid creators from Epsilon-Cygnus-4 (EP-CYG-4), and are out to destroy *all humanoids* in the universe. Your Gravitron Drive attack ship was specially designed for the battle. Machine language, hi res graphics; choice of 3 missions. In 2-player games, one acts as pilot; the other as gunnery officer—both against the common enemy.

ROM Cartridge (16K), ~~$49.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $42.46

16K Tape, $29.95 24K Disk, $32.95

FORTUNE HUNTER

From Romax

You are the FORTUNE HUNTER, seeking out hidden treasure in six rooms filled with frightening evil forces. There are snakes shooting poisonous venom; knights who can appear and disappear at will, prepared to fight wherever you find them; and one room filled with *scorpions!* 9 levels of speed and difficulty control the time you can spend in each room.

ROM Cartridge (8K), ~~$44.95~~ Save 15%
Now thru Mar. 1 You Pay Only $38.21

E.T. T.M. PHONE HOME!

From Atari

Everyone's favorite Extraterrestrial comes home—to you! Maneuver Elliott with your Joystick, along the streets and paths of his home town, collecting all the pieces E.T. needs to make his phone. But hurry—the government agents and scientists are trying to capture E.T.!

ROM Cartridge (16K), ~~$38.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $33.11

Reserve Your E.T. Today!

> **trust:** *to rely on the truthfulness or accuracy of; to place confidence in.*
>
> The Program Store tries to include as much product information in its advertising as space will allow. Some retailers offer merely a list of programs. We offer a wealth of descriptive text, plus the most accurate graphics possible. And, every piece of inventory is backed by the trusted Program Store name.

SUBMARINE COMMANDER

From THORN EMI

Your mission: destroy all enemy merchant shipping in the Mediterranean. Locate enemy ships using your Sonar and periscope, attacking when they're within firing range. But watch your instrument panel carefully to monitor your fuel, oxygen, battery charge and Sonar levels, so you'll be ready for instant action—diving to avoid enemy depth charges, or firing your own.

ROM Cartridge, ~~$49.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $42.46

JUMBO JET PILOT

From THORN EMI

You're the pilot in this sophisticated flight simulation, with full instrument panel plus views through the cockpit windows. You'll take off, navigate to your required destination, then land safely. Once you've mastered the basics, try your hand at the "extras": can you fly upside down? Loop the loop? At the end of each "flight", the computer rates your performance. 10 game variations. Requires joystick.

ROM Cartridge, ~~$49.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $42.46

GORF

From Roklan

A unique sight and sound adventure in the interstellar war against the Gorfian Empire. You must repel attacks by Droids, Anti-Gravity Bonks, Anti-Particle Lasers, Gorfian fighters and torpedos, etc. Four levels, from an Astrobattle to a full-fledged Space War. Requires joystick.

ROM Cartridge (16K), ~~$44.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $38.21
Disk (24K), $39.95

THE PRINCESS AND THE FROG

From Romax

Maneuver your FROG through 4 rows of jousting knights, moving in alternating directions. Then to the landing, through the gate, across the snake-and alligator-filled moat. If you've made it this far, there are only 6 doors leading to the PRINCESS. Along the way, if you can catch a kiss from her lips, you will turn into a Prince!

ROM Cartridge (4K), ~~$44.95~~ Save 15%
Now Thru Mar. 1 You Pay Only $38.21

Over 1500 Programs for APPLE, IBM, ATARI 400/800, TRS-80 & VIC-20.

For Information Call
202-363-9797

Visit our other stores:
829 Bethel Rd., Columbus OH
White Flint Mall, N. Bethesda, MD
Seven Corners Center, Falls Church, VA
W. Bell Plaza, 6600 Security Blvd., Baltimore MD

VISA

the PROGRAM STORE™

MasterCard

Call for a free VIC catalog.

To Order Call Toll-Free
800-424-2738

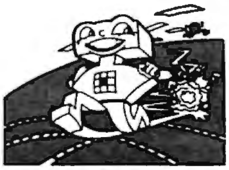
MAIL ORDERS: Send check or M.O. for total purchase price, plus $2.00 postage & handling. D.C., MD. & VA.: add sales tax. Charge cards: include all embossed information

4200 Wisconsin Avenue, NW, Dept. 10-02-3 Box 9582 Washington, D.C. 20016

Atari Adventure and Fun

the PROGRAM STORE™

Educational Software



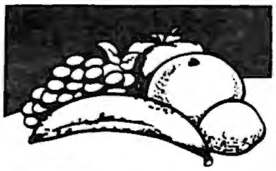
KID GRID

From Tronix

All the sights, sound and colors of the latest arcade game! Be the first on your block to play KID GRID! You're racing around a grid, connecting dots as you try to out-run Squashface, Thuggy, Muggy and Moose. Zap 'em with your joystick; escape when they turn white and freeze. Requires joystick.

16K Tape or Disk, ~~$29.95~~ *Save 20%*

Now Thru Mar. 1 You Pay Only $23.96



TUTTI FRUTTI

From Adventure International

The fruit-eating "Hungry" is *starving* for a good meal. Use your joystick to get him lots of fruits and pastries—but be sure to avoid the nasty bugs and strange trees. Hi res graphics, great color and sounds. Options include speed of attacking bugs, amount of fruit available per level and more. The goal: The Key to Everlasting Tutti Fruttiness! Requires joystick.

16K Tape or 32K Disk, ~~$24.95~~ *Save 20%*

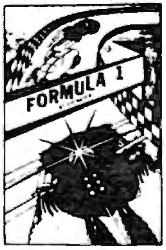
Now Thru Mar. 1 You Pay Only $21.21

STRATOS

From Adventure International

This may be the battle to destroy the universe! Your enemies have perfected the dreaded Matter Ravager. Wave after wave of the deadly craft attack your planet and puncture the energy envelope surrounding it. You are in control of the Armageddon Wave, the only weapon capable of destroying the alien ships. Exciting, challenging, non-stop action. "Out of this world" sounds and graphics. 1 or 2 players; requires joystick.

16K Tape or
32K Disk, $34.95



FORMULA 1

By Sid Meier from Acorn

Shift into gear—your FORMULA ONE Racer is ready to go! You compete against three other computer-controlled cars on the high resolution, scrolling screen. Select from five courses: Indy, Monza, Watkins Glen, Monaco, or the special Killer Course. Not for the timid!

32K Disk, $29.95

THE JAR GAME & CHAOS

From EduFun!

In **THE JAR GAME,** *you* get points when the fly lands on the yellow candies; the *computer* scores when the fly lands on green. Great for teaching probability and problem-solving. In **CHAOS**, your spaceship must capture alien satellites with the same shape and/or color of the satellite in the center square! Teaches shape and color recognition, and directionality. Lots of family fun!

16K Tape, $29.95
32K Disk, $32.95

GULP & ARROW GRAPHICS

From EduFun!

GULP: Don't let the Big Fish gobble up the Little Fish! Answer the arithmetic problems correctly—as quickly as you can. The Little Fish starts out ahead, and keeps his lead as long as you answer correctly. Wrong and slow answers speed up the Big Fish. With Bonus Game.

ARROW GRAPHICS: Create your own designs by instructing the computer to move in the direction you want. Great for treasure hunts, maps, even T-shirt designs!

16K Tape, $29.95 **32K Disk. $32.95**

FACEMAKER

From Spinnaker

Clever and fun introduction to computer programming and keyboard familiarity. In game 1, the child completes a blank face, choosing from sets of eyes, ears, noses. Game 2 starts with completed face. Child enters instructions to make face smile, wink, wiggle its ears. Game 3 presents sequences of faces which the child must reproduce in correct order. Full color graphics and sound. Ages 4 to 8.

48K Disk, $34.95

SNOOPER TROOPS

By Tom Snyder from Spinnaker

As a Snooper Trooper, you're a detective assigned to solve mysteries. You drive around town in your SnoopMobile, with wrist radio, SnoopNet computer, camera for SnoopShots, and notebook. Full color graphics and sound.

Case #1: The Granite Point Ghost
Someone is trying to scare the Kim family. Who—or What? And Why? Ages 10 to adult.
48K Disk, $44.95

Case #2: The Disappearing Dolphin
Someone Stole Lily the Dolphin from the Tabasco Aquarium. Can you find her? Ages 10 to adult.
48K Disk, $44.95

ALIENCOUNTER & FACE FLASH

From EduFun!

ALIENCOUNTER: A flying saucer appears on the screen, with a number. You must try to land that number of Aliens by pressing the + or – keys, trying for a perfect encounter.

FACE FLASH: A set of smiling faces flashes on the screen. You must remember how many there were. Each correct answer gets another screen—but the "flash" gets shorter. One wrong answer, and the game is over.

16K Tape, $29.95 **32K Disk, $32.95**

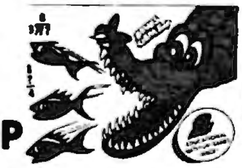
BATTLING BUGS & CONCENTRACTION

From EduFun!

BATTLING BUGS: A column of red bugs (negative numbers) and a column of black bugs (positive numbers) march toward each other. Each pair of colliding bugs disappears; the remaining bugs continue marching. You must add a new column of bugs to wipe out the survivors.

CONCENTRACTION: There are 20 fractions hidden behind lettered covers. You try to uncover *pairs* of *equivalent* fractions. Higher score for matches early in the game.

16K Tape, $29.95
32K Disk, $32.95



FRENZY & FLIP FLOP

From EduFun!

FRENZY: Choose subtraction or division, and level of difficulty before starting. Answer 20 problems before the hungry alligator eats 10 fish. With Bonus Game.

FLIP FLOP: The computer shows you 2 designs. You must decide if the left figure can be moved to look exactly like the right figure. You can slide, flip or turn the figure to make it fit.

16K Tape, $29.95 **32K Disk, $32.95**

JUGGLES' RAINBOW

From Atari

JUGGLES the Clown helps children learn to recognize spatial relationships such as: above, below, left, right—while having lots of fun. JUGGLES also helps develop skills for recognizing alphabet, reading and writing. While working with line and circles, children will learn some of the hardest letters, like p, d, b and q.

16K Tape or Disk, $29.95

Also Available:

JUGGLES' HOUSE: teaches concepts of inside, outside, upper and lower.

16K Tape or Disk, $29.95

THE PROGRAM STORE • Dept. 10-02-3 • Box 9582 • 4200 Wisconsin Avenue, NW • Washington, D.C. 20016

Item Tape/Disk/Book Price

Postage $2.00

Total ____________

☐ CHECK ☐ VISA

☐ MASTERCARD

Computer ____________

Name ____________

Address ____________

City ________ State ________ Zip ________

Card # ____________ Exp ________

For the Atari 400/800 unless specified.

Copy Cat

Mark and Dan Powell

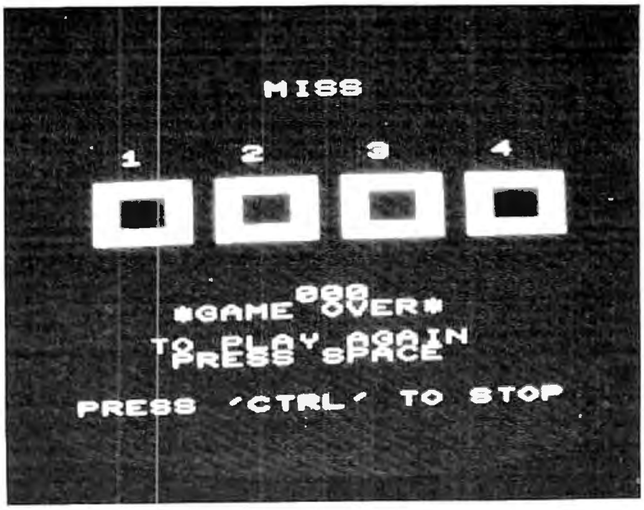
Copy Cat is an entertaining, musical, and colorful "match-me" game. It exercises pattern recognition, short-term memory and hand-eye coordination, making it an excellent game for all ages. Versions are included for the VIC-20, Atari 400/800, TRS-80 Color Computer, Apple II, and PET/CBM.

Copy Cat picks a random pattern for you to copy. Each time you correctly copy the pattern, you acquire a point.

In line 5 there is a REM in front of the POKEs. These POKEs disable the STOP key. Do not take off the REM until you've finished typing in the program (or don't put it in at all).

VIC Note

Note also that line 2020 reads "IF PEEK (653)>3THEN END". What this does is test for the VIC's CTRL key. To test for the SHIFT key, "IF PEEK (653) = 1THEN END", and to test for the Commodore key, it should read "IF PEEK(653) = 2THEN END. For combinations of these keys, just add them together (the value for CTRL is 4).



```
MISS
 1     2     3     4
000
*GAME OVER*
TO PLAY AGAIN
PRESS SPACE
PRESS 'CTRL' TO STOP
```

A flubbed response ends a game of "Copy Cat," VIC-20 version.

Program 1: VIC-20 Version

```
5 REM:POKE809,242:POKE808,199
10 DIML%(100):POKE36879,27
20 PRINT"{CLEAR}{04 DOWN}{BLK}      COPY CAT"
   :PRINT"{02 DOWN} PRESS 1-4 TO COPY TH
   E"
30 PRINT"      COMPUTER":PRINT"{02 DOWN} YOU ~
   CAN ONLY MISS":PRINT" THREE TIMES A G
   AME"
32 PRINT"{03 DOWN}{BLU}PRESS 'SPACE' TO START
   "
35 GETA$:IFA$<>" "THEN35
40 POKE36879,8:C=38400:SC=256*PEEK(648):IFSC=
   4096THENC=37888
50 PRINT"{CLEAR}{06 DOWN}{WHT}   1    2    3 ~
     4   {DOWN}  {REV}    {OFF} {REV}   ~
    {OFF} {REV}    {OFF} {REV}    {OFF}
   "
55 FORT=1TO2
60 PRINT"{WHT}  {REV} {OFF}  {REV} {OFF} {
   REV} {OFF}  {REV} {OFF} {REV} {OFF}   ~
   {REV} {OFF} {REV} {OFF}  {02 REV} {
   OFF}"
70 NEXTT
80 PRINT"  {REV}    {OFF} {REV}    {OFF} {
   REV}    {OFF} {REV}    {OFF}"
82 PRINT"{HOME}{15 DOWN}"SPC(10)"000"
85 FORLA=0TO3
87 LC(LA)=INT(RND(1)*4)+2:IFLC(LA)=3THENLC(LA
   )=6
90 FORLB=1TO4:CN=LC(LA):IFLC(LA)=LC(LB)ANDLB<
   >LATHEN87
95 NEXT:POKEC+201+5*LA,CN:POKEC+202+5*LA,CN:P
   OKEC+223+5*LA,CN:POKEC+224+5*LA,CN:NEXT

99 FORT=1TO300:NEXT
100 LF=LF+1:IFLF=100THEN2000
110 L%(LF)=INT(RND(1)*4)
120 FORLL=1TOLF:S=L%(LL):Q=160:GOSUB1000
130 FORT=1TO300:NEXT:Q=32:GOSUB1000:POKE36878,
    0:FORT=1TO200:NEXT:NEXT
135 FORLG=1TOLF:TA=TI
140 GETA$:A=VAL(A$)-1:IFTI-TA>200THENS=L%(LG):
    GOTO160
150 S=A:IFA=-1ORA>3THEN140
152 LF$=STR$(LF)
160 Q=160:GOSUB1000:FORT=1TO200:NEXT:Q=32:GOSU
    B1000:POKE36878,0
162 IFA=L%(LG)THENFORT=1TO50:NEXT:NEXT
165 IFLG=LF+1THENPRINT"{HOME}{15 DOWN}{WHT}"TA
    B(14-LEN(LF$))RIGHT$(LF$,LEN(LF$)-1):
    GOTO99
170 PRINT"{HOME}{02 DOWN}"TAB(9)"{YEL}MISS":PO
    KE36878,15:POKE36875,128:R=R+1:FORT=1
    TO400:GETA$:NEXT
175 IFR=3THENFORT=1TO100:NEXT:GOTO2000
180 FORT=1TO600:NEXT:PRINT"{HOME}{02 DOWN}    ~
              ":POKE36878,0:FORT=1TO500:NEXT

190 GOTO120
1000 POKESC+201+5*S,Q:POKESC+202+5*S,Q:POKESC+2
     23+5*S,Q:POKESC+224+5*S,Q
1010 POKE36878,15:POKE36875,7*S+217:RETURN
2000 PRINT"{HOME}{16 DOWN}{WHT}      *GAME OVER*
     ":PRINT"{DOWN}    TO PLAY AGAIN":POKE
     36878,0
2005 PRINT"      PRESS SPACE":PRINT"{02 DOWN} PR
     ESS 'CTRL' TO STOP"
2010 GETA$:IFA$=" "THENRUN40
2020 IFPEEK(653)>3THENEND
2030 GOTO2010
```

Program 2: Atari Version

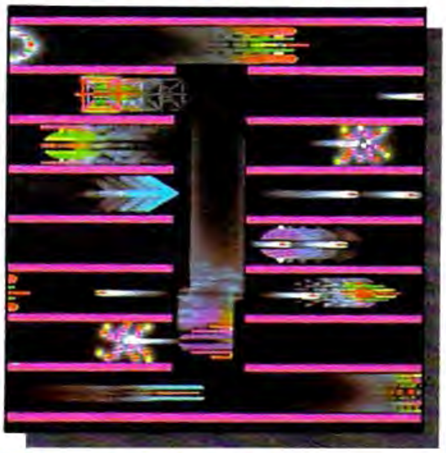
```
100 REM  ATARI "COPY-CAT" WITH
110 REM  JOYSTICKS
120 REM
130 GOSUB 670:REM Instructions
140 GRAPHICS 18:DIM WHICH$(100)
150 REM Use page four for character s
    et.
160 CHSET=1024
170 FOR I=0 TO 7:POKE CHSET+I,0:NEXT
    I
180 REM Only character in set (other
```

New From Sirius™

For The Big Game Hunte

TURMOIL™

You're being attacked from both sides by the most evil aliens to ever fly the unfriendly skies. Luckily, your intergalactic fighter can blast seven enemies into cosmic dust at once. Trouble is, those aliens are very fast. If you can turn the lights off and be in bed before the room gets dark, then you might be ready for Turmoil.



FANTASTIC VOYAGE™

An incredible medical journey is about to begin. You and your submarine are to be reduced to microscopic proportions and injected into the blood stream of a critically ill patient. You must navigate past deadly Defense Cells, Bacteria, Antibodies and Enzymes to destroy a life-threatening blood clot near each patient's brain. Prepare yourself for one Fantastic Voyage!

DEADLY™ DUCK

Those cranky crabs are trying to drive the ducks from their once quiet pond. Imagine, crabs taking to the air armed with bricks and bombs! Luckily, Deadly Duck has a few tricks of his own. His gun barrel bill can unleash a bevy of crab cracking bullets at a moment's notice. Look out, Deadly, here comes another brick! It takes more than luck to play Deadly Duck.

Fast Eddie™

You've got to be cool and you've got to be steady to play Fast Eddie. Eddie is on a wild treasure hunt, climbing up and down ladders everywhere in search of prizes. Things would sure be a lot easier if it weren't for all of those pesky little Sneakers™ running around. They literally keep him jumping!

Sirius™

Video Game Cartridges For The Atari 400, Atari 800, VIC-20 And Commodore 64 Computers

Deadly Duck, Fast Eddie, Turmoil and Fantastic Voyage program and audio visual © 1982 Sirius, packaging © 1982 Fox Video Games. Deadly Duck, Fast Eddie, Turmoil and Sirius are trademarks of Sirius Software, Inc. Fantastic Voyage is a 20th Century Fox Film Corporation Production. Atari is a trademark of Atari, Inc. VIC-20 and Commodore 64 are trademarks of Commodore Business Machines, Inc. Sirius is not affiliated with Atari or Commodore.

For more information contact your local Sirius dealer or distributor or contact us at 10364 Rockingham Drive, Sacramento, CA 95827, (916) 366-1195.

Notes For Other Machines

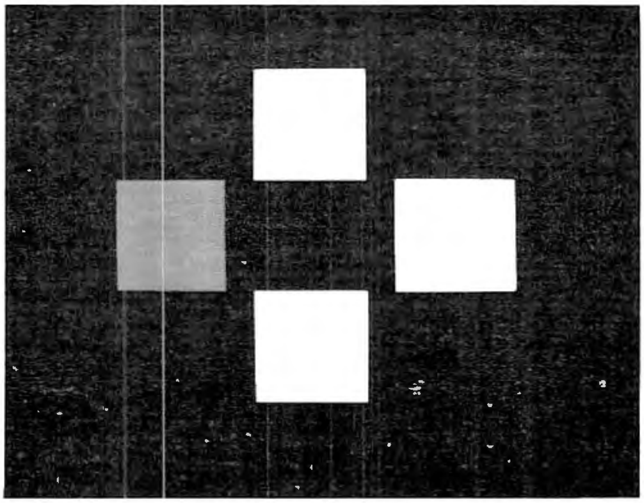
Charles Brannon, Editorial Assistant

Programs 2-5 are customized versions for the Atari, TRS-80 Color Computer, Apple II and PET/CBM. All games will run on each computer's minimum memory size. The Atari version requires one joystick plugged into the first port. Instructions are included in the program.

Special Atari Note

You can easily get four simultaneous colors in GRAPHICS 2, but there is no suitable "solid" character. This is solved by defining a solid box character (8x8 pixels), using a custom character set. It would seem wasteful to reserve 512 bytes just for one custom character, but a sneaky trick is used here: the character is stored on *page four*! ($0400) is on an even 1K boundary, and is unused most of the time by the Operating System. It's an excellent place to store just a few characters, and it doesn't consume any user RAM. Remember to clear the first eight bytes, which is the pattern used by the SPACE character.

```
    than space) is a square:
190 FOR I=0 TO 7:POKE CHSET+8+I,255:N
    EXT I
200 POKE 756,4
210 ? #6;"{8 SPACES}!!!!"
220 ? #6;"{8 SPACES}!!!!"
230 ? #6;"{8 SPACES}!!!!"
240 ? #6;"{8 SPACES}!!!!"
250 ? #6;"{3 SPACES}{4 A}{6 SPACES}!!
    !!"
```



Four colored blocks blink on and off in the Apple, Atari, and TRS-80 Color Computer versions of "Copy Cat."

```
260 ? #6;"{3 SPACES}{4 A}{6 SPACES}!!
    !!"
270 ? #6;"{3 SPACES}{4 A}{6 SPACES}!!
    !!"
280 ? #6;"{3 SPACES}{4 A}{6 SPACES}!!
    !!"
290 ? #6;"{8 SPACES}{4 E}"
300 ? #6;"{8 SPACES}{4 E}"
310 ? #6;"{8 SPACES}{4 E}"
320 ? #6;"{8 SPACES}{4 E}"
330 INDEX=INDEX+1
340 WHICH$(INDEX)=CHR$(INT(4*RND(0)+1
    ))
350 GOSUB 610
360 FOR I=1 TO INDEX
370 ST=STICK(0):WHICH=(ST=14)+2*(ST=1
    1)+3*(ST=7)+4*(ST=13)
380 IF STRIG(0)=0 THEN GRAPHICS 0:END

390 IF WHICH=0 THEN 370
400 POKE 77,0:GOSUB 530
410 IF WHICH<>ASC(WHICH$(I)) THEN 450
420 NEXT I
430 FOR W=1 TO 100:NEXT W
440 GOTO 330
450 SOUND 0,100,12,8:SETCOLOR 4,3.10:
    FOR W=1 TO 200:NEXT W
460 GOSUB 610
470 GRAPHICS 18:SETCOLOR 4,0,14:POSIT
    ION 6,2:? #6;"too bad{R}"
480 POSITION 5,6:? #6;"LENGTH:";INDEX
    -1

490 POSITION 3,8:? #6;"difficulty:";D
    IFF
500 POSITION 1,11:? #6;"  press fire.
    .."
510 POKE 711,PEEK(53770):IF STRIG(0)
    THEN 510
520 RUN
530 P=PEEK(707+WHICH)
540 HUE=INT(P/16):LUM=P-HUE*16
550 SETCOLOR WHICH-1,HUE,14
560 FOR W=15 TO 0 STEP -1
570 SOUND 0,WHICH*10+50,10,W
580 NEXT W
590 POKE 707+WHICH,P
600 RETURN
610 FOR I=1 TO INDEX
620 WHICH=ASC(WHICH$(I))
630 GOSUB 530
640 FOR W=1 TO (9-DIFF)*5:NEXT W
650 NEXT I
660 RETURN
670 REM INSTRUCTIONS, SET-UP
680 GRAPHICS 17:POSITION 6,0:? #6;"co
    py{M}cat":? #6:SETCOLOR 2,9,6
690 ? #6;"{3 SPACES}REPEAT MY NOTES"
700 ? #6;"{3 SPACES}BY PUSHING YOUR"
710 ? #6;"{3 SPACES}JOYSTICK IN THE"
720 ? #6;"{3 SPACES}RIGHT DIRECTION":
    ? #6
730 ? #6;"{3 SPACES}I CAN PLAY THE"
740 ? #6;"{5 SPACES}NOTES FROM"
750 ? #6;"{3 SPACES}(1) SLOW TO"
760 ? #6;"{3 SPACES}(9) FAST ...":? #
    6
770 ? #6;" select difficulty"
780 ? #6;" with joystick{Z}"
790 ? #6
800 ? #6;" 1 2 3 4 5 6 7 8 9"
810 ? #6:? #6;"  THEN PRESS fire"
820 DIFF=5
830 COLOR DIFF+16:PLOT DIFF*2-1,15
840 ST=STICK(0):IF ST=15 THEN 890
850 IF ST=STICK(0) THEN 850
```

Why use other computer media when you could be using

Scotch®

high quality error free media?

Get Scotch Diskettes Directly From Communications Electronics

There's a lot of valuable data stored on the diskettes in your computer or word processing system. In 1981, a diskette manufacturer calculated that the "true cost of a diskette" was $186.50 after data loading. With inflation, the actual cost is well over $200.00 today. That is why you don't want to use just *any* diskette, you want the high reliability and quality of Scotch diskettes. You can trust Scotch diskettes to deliver that accuracy because each diskette is tested before it leaves the factory and is certified error-free. That means fewer errors and less lost data. Flexible discs may look alike, but they don't all perform alike. Scotch diskettes can deliver all the performance you'll ever need. The low abrasivity of Scotch diskettes, 32% below industry average, saves wear and tear on your read/write heads, which means fewer service calls due to head problems. Longer and more reliable service is yours when you buy Scotch diskettes since they far exceed the industry standard durability tests. Finally, your Scotch diskettes are packaged in units of 10, complete with color-coded labels (except bulk product) to make your filing easier.

Flexible Disc Quantity Discounts Available

Scotch diskettes are packed 10 discs to a carton and five cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Scotch diskettes are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the 3M/Scotch flexible disc compatibility hotline. Dial toll-free 800-328-1300 and ask for the Data Recording Products Division. In Minnesota or outside the United States dial 612-736-9625 between 9 AM to 4 PM Central Time.

SAVE ON SCOTCH FLEXIBLE DISCS Product Description	Part #	CE quant. 100 price per disc ($)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	740-0	2.19
8" Same as above, but bulk pack w/o envelope	740-0B	1.99
8" SSSD Shugart Compatible, 32 Hard Sector	740-32	2.19
8" SSSD CPT 8000 Compatible, Soft Sector	740-0-8000	2.89
8" SSDD IBM Compatible (128 B/S, 26 Sectors)	741-0	2.89
8" DSDD Soft Sector (Unformatted)	743-0	3.49
8" DSDD Soft Sector (256 B/S, 26 Sectors)	743-0/256	3.49
8" DSDD Soft Sector (512 B/S, 15 Sectors)	743-0/512	3.49
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	743-0/1024	3.49
5¼" SSDD Soft Sector w/Hub Ring	744D-0RH	2.34
5¼" Same as above, but bulk pack w/o envelope	744D-0RHB	2.14
5¼" SSDD 10 Hard Sector w/Hub Ring	744D-10RH	2.34
5¼" SSDD 16 Hard Sector w/Hub Ring	744D-16RH	2.34
5¼" DSDD Soft Sector w/Hub Ring	745-0RH	3.09
5¼" DSDD 10 Hard Sector w/Hub Ring	745-10RH	3.09
5¼" DSDD 16 Hard Sector w/Hub Ring	745-16RH	3.09
5¼" SSQD Soft Sector w/Hub Ring (96 TPI)	746-0RH	2.99
5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	747-0RH	3.99

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

Save on Scotch Static Control Floor Mats

Scotch Velostat Electrically Conductive Floor Mats, drain static charge before it can cause serious problems with computer or word processing equipment. Order number 1853 is a black 4' x 5' size mat with lip. Cost is $170.00 each. Order number 9453 is the same mat, but the color is earthtone brown, which is designed to blend with any office decor. Cost on the 9453 mat is $259.00 each. All Velostat mats come complete with 15 feet of ground cord. All mats are shipped freight collect.

Save on Scotch Data Cartridges

Scotch Data Cartridges are available from CE in three different configurations. The DC100A data cartridge is a small version of the DC300A data cartridge. The DC100A contains 140 feet of 0.150" tape in a package measuring 2.4 x 3.2 x 0.5 inches. Cost is $14.00 each. The DC300A is a pre-loaded tape cartridge containing 300 feet of one mil thick by ¼" computer tape. The DC300A costs $18.00 each. The DC300XL is an extra length data cartridge with 450 feet of tape. It is the same size and interchangeable with the DC300A. The DC300XL provides a total storage capacity of 34.5 million bits at 1600 BPI. The cost of the DC300XL is $22.00 each.

Scotch Head Cleaning Diskettes – Helps Cut Downtime

When the read/write heads on information processing machines are dirty, that can cause you a lot of grief. Now...with Scotch brand head cleaning diskettes, you can clean the read/write heads on the diskette drives yourself in just 30 seconds and as often as they need it. Simply apply the cleaning solution to the special white cleaning fabric. Insert the cleaning diskette into the drive and access the heads for 30 seconds. That's all there is to it. Regular use of the head cleaning diskettes can save you much of the grief caused by dirty heads. We recommend you use them once a week, or more often if your system gets heavy use. Each kit contains two head cleaning diskettes, and enough solution for 30 cleanings. Order # 5-CLE is for 5¼" drives and order # 8-CLE is for 8" drives. Only $25.00 each plus $3.00 shipping per kit.

Buy with Confidence

To get the fastest delivery from CE of your Scotch computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum *prepaid* order $50.00. Minimum *purchase order* $200.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add $8.00 per 100 diskettes and/or any fraction of 100 *8-inch* diskettes, or $6.00 per 100 diskettes and/or any fraction of 100 *5¼-inch* mini-discs. For cleaning kits, add $3.00 per kit. For tape data cartridges, add $1.00 per cartridge, for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Scotch computer products from Communications Electronics today.

Ad #120182

MasterCard VISA MEMBER DIRECT MAIL/ MARKETING ASSOCIATION

Order Toll-Free!
(800) 521-4414

In Michigan (313) 994-4444

3M
Authorized Distributor

COMMUNICATIONS
ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

```
860 POKE 53279,0
870 COLOR DIFF+48:PLOT DIFF*2-1,15
880 DIFF=DIFF-(ST=11)*(DIFF>1)+(ST=7)
    *(DIFF<9)
890 IF STRIG(0) THEN 830
900 GRAPHICS 2+16:SETCOLOR 4,1,10:SET
    COLOR 0,7,6:SETCOLOR 2,3,4
910 POSITION 1,5:? #6;"PRESS FIRE TO
    QUIT"
920 FOR W=1 TO 200:NEXT W:RETURN
```

Program 3: TRS-80 Color Computer Version

```
100 ' TRS-80 COLOR COMPUTER
110 ' COPYCAT
120 REM
125 CLS
130 GOSUB 670:' INITIALIZATION
140 CLS 0
250 DATA 1,2,3,6,4,8,7,5
260 FOR I=1 TO 4
270 READ A,B
280 FOR J=1 TO 10
290 DRK$(I)=DRK$(I)+CHR$(143+16*(A-1)
    )
300 LT$(I)=LT$(I)+CHR$(143+16*(B-1))
310 NEXTJ
320 NEXT I
325 FORI=1TO4:WHICH=I:GOSUB 530:NEXT
327 FOR W=1 TO200:NEXT
328 SO=1
330 INDEX=INDEX+1
340 WHICH$=WHICH$+CHR$(RND(4))
350 GOSUB 610
360 FOR I=1 TO INDEX
380 Z$=INKEY$:IFZ$=""THEN380
385 WHICH=-(Z$="I")-2*(Z$="J")-3*(Z$=
    "K")-4*(Z$="M")
390 IF WHICH<1 OR WHICH>4 THEN 380
400 GOSUB 530
410 IF WHICH<>ASC(MID$(WHICH$,I)) THE
    N 450
420 NEXT I
430 FOR W=1 TO100:NEXT
440 GOTO 330
450 FORI=1TO4:CLSI:SOUNDI*10,1:NEXT:S
    OUND1,10
455 CLSO:FORI=1TO4:SO=0:WHICH=I:GOSUB
    530:NEXT
460 SO=1:GOSUB610
470 CLS:PRINT@12,"TOO BAD!"
480 PRINT:PRINT:PRINTTAB(11);"LENGTH:
    ";INDEX-1
490 PRINT:PRINT:PRINTTAB(8);"DIFFICUL
    TY:";DIFF
500 PRINT:PRINT:PRINT:PRINT:PRINTTAB(
    9);"PRESS SPACE..."
510 IF INKEY$<>" " THEN 510
520 RUN
530 TM=10-DIFF
540 IF WHICH=1 THEN Z=10 ELSE IF WHIC
    H=2 THEN Z=160 ELSE IF WHICH=3 TH
    EN Z=180 ELSE Z=330
550 FOR L=0 TO 3:PRINT@Z+L*32,LT$(WHI
    CH);:NEXT
560 IF SO THEN SOUND WHICH*10+18,TM/2
    +.5
570 FOR L=0 TO 3:PRINT@Z+L*32,DRK$(WH
    ICH);:NEXT
580 RETURN
610 FOR I=1 TO INDEX
620 WHICH=ASC(MID$(WHICH$,I))
630 GOSUB 530
640 FOR W=1 TO(9-DIFF)*5:NEXT W
650 NEXT I
660 RETURN
670 ' INSTRUCTIONS
680 PRINT@12,"COPY-CAT":PRINT
690 PRINT"REPEAT MY NOTES BY PRESSING
700 PRINT"THE I,J,K,M KEYS...
710 PRINT"I=UP,M=DOWN,J=LEFT,K=RIGHT:
    "
720 PRINT TAB(16);"I":PRINTTAB(15);"J
     K":PRINTTAB(16);"M"
730 PRINT:PRINT"I CAN PLAY THE NOTES
    FROM":PRINT
740 PRINT"<1> SLOW TO <9> FAST":PRINT
750 PRINT:PRINT"ENTER SKILL LEVEL <1-
    9>"
760 Z$=INKEY$:IFZ$=""THEN760
770 DIFF=VAL(Z$)
780 IF DIFF<1 OR DIFF>9 THEN 760
820 RETURN
```

Program 4: Apple II Version

```
100  REM  APPLE II COPYCAT
110  REM
120  GOSUB 670: REM  INITIALIZATION
130  GR
150  DATA  11,1,7,2,14,12,15,3
160  FOR I = 1 TO 4
170  READ LT(I),DRK(I)
180  NEXT
190 SO = 0: FOR I = 1 TO 4
200 WHICH = I: GOSUB 530: NEXT
210  FOR W = 1 TO 500: NEXT
220 SO = 1
330 INDEX = INDEX + 1
340 WHICH$ = WHICH$ +  CHR$ (4 *  RND (1) +
     1)
350  GOSUB 610
360  FOR I = 1 TO INDEX
370  IF  PEEK ( - 16384) < 127 THEN 370
380 A =  PEEK ( - 16384) - 128: POKE  - 1636
     8,0
385 WHICH = A - 72: IF WHICH = 5 THEN WHICH =
     4
390  IF WHICH < 1 OR WHICH > 4 THEN 370
400  GOSUB 530
410  IF WHICH <  >  ASC ( MID$ (WHICH$,I)) THEN
     450
420  NEXT I
430  FOR W = 1 TO 100: NEXT
440  GOTO 330
450  FOR I = 1 TO 50: COLOR=  INT (16 *  RND
     (0))
451 S =  - 16336: POKE S,0:Z =  PEEK (S)
455  HLIN 40 *  RND (1),40 *  RND (1) AT 40 *
      RND (1)
457  VLIN 40 *  RND (1),40 *  RND (1) AT 40 *
      RND (1)
458  NEXT
460  GR : FOR I = 1 TO 4:SO = 0:WHICH = I: GOSUB
     530: NEXT :SO = 1: GOSUB 610
470  TEXT : HOME : INVERSE : PRINT  TAB( 16)
     ;"TOO BAD!"; TAB( 39): NORMAL : PRINT :
      PRINT : PRINT
480  PRINT : PRINT : PRINT  TAB( 15);"LENGTH
     :";INDEX - 1
490  PRINT : PRINT : PRINT  TAB( 12);"DIFFIC
     ULTY:";DF
495  POKE  - 16368,0
500  VTAB 23: HTAB 7: INVERSE : PRINT "PRESS
      ";: FLASH : PRINT "SPACE";: INVERSE : PRINT
     " TO PLAY AGAIN:";: NORMAL : GET A$
520  RUN
530 TM = 10 - DF
540 X = 5 + 10 * (WHICH = 1 OR WHICH = 4) +
     20 * (WHICH = 3)
550 Y = 5 + 10 * (WHICH = 2 OR WHICH = 3) +
     20 * (WHICH = 4)
560  COLOR= LT(WHICH): FOR L = 0 TO 9: HLIN
     X,X + 10 AT Y + L: NEXT
```

Stake a Claim on the most exciting New Game for your Atari Home Computer.

- From the programming team that brought you "Robot Attack", "Defense Command" and many other great Arcade games for your TRS-80™
- 100% machine language
- 16K ROM Cartridge, the largest available anywhere!
- Written specifically for the Atari® — not a converted Apple® game.
- Ten different rounds
- Difficulty adjustment
- High score table
- Demo mode
- Spectacular sound and graphics
- Runs on any 400/800 with at least 16K memory
- Only $49.95

Here are just three of ten rounds in the game:

Round 1: The Mine Shaft.
Sharpen your miner's skill!

Round 3: The Transporters.
Beam yourself up!

Round 10: The Cannon.
Shoot yourself to the top!

BIG FIVE
SOFTWARE
P.O. Box 9078-185 · Van Nuys, CA 91409 · (213) 782-6861

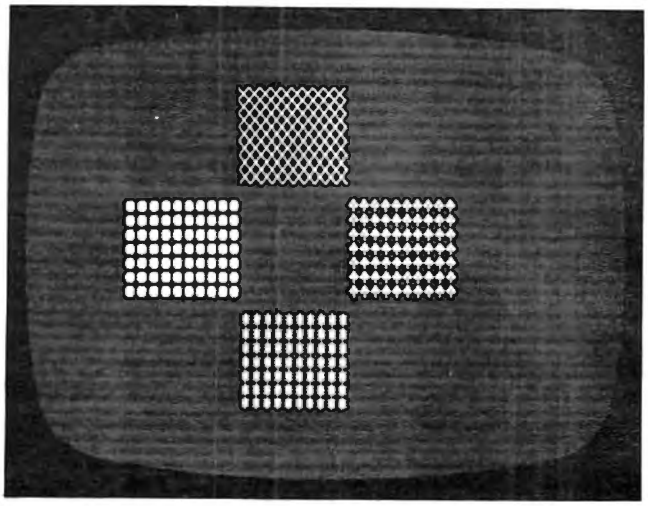
To order, see your local dealer. If they do not have "Miner 2049er" then send a check or money order to us for $49.95 plus $2.00 for shipping and handling for immediate shipment! (California residents add 6½% sales tax.)

"Atari," "Apple," and "TRS-80" are trademarks of Atari Inc., Apple Computer, and Tandy Corp., respectively.

```
570 S =  - 16336: IF SO THEN  FOR L = 1 TO T
     M * 5:A =  PEEK (S): FOR W = 1 TO WHICH
     : NEXT : NEXT
580  COLOR= DRK(WHICH): FOR L = 0 TO 9: HLIN
     X,X + 10 AT Y + L: NEXT
590  RETURN
610  FOR I = 1 TO INDEX
620 WHICH =  ASC ( MID$ (WHICH$,I))
630  GOSUB 530
640  FOR W = 1 TO (9 - DF) * 5: NEXT W
650  NEXT I
660  RETURN
670  REM  INSTRUCTIONS
680  TEXT : HOME
685  INVERSE : PRINT  TAB( 16);"COPY-CAT"; TAB(
     39);""
687  NORMAL
690  PRINT : PRINT "REPEAT MY NOTES BY PRESS
     ING
700  PRINT : PRINT "THE I,J,K,M KEYS...": PRINT

710  PRINT  TAB( 20);"I": PRINT  TAB( 19);"J
      K": PRINT  TAB( 20);"M"
730  PRINT : PRINT "I CAN PLAY THE NOTES FRO
     M": PRINT
740  PRINT "<1> SLOW TO <9> FAST": PRINT : PRINT

750  PRINT "ENTER SKILL LEVEL <1-9>:";
755  GET A$
760 DF =  VAL (A$): IF DF < 1 OR DF > 9 THEN
     755
800  RETURN
```

Program 5: PET/CBM Version

```
100 REM PET-CBM COPYCAT
110 GOSUB 5000:REM INSTRUCTIONS
115 PRINT"{CLEAR}";CHR$(142);:POKE59464,12
120 DATA "V","Q","X","*"
130 FORI=1TO4:READ DRK$
150 FORJ=1TO10:DRK$(I)=DRK$(I)+DRK$:NEXT
160 NEXT
170 SO=0:FORWHICH=1TO4:GOSUB1000:NEXT:SO=1
180 INDEX=INDEX+1
190 WHICH$=WHICH$+CHR$(4*RND(0)+1)
200 GOSUB 2000
210 FOR I=1 TO INDEX
220 GETA$:IFA$=""THEN220
230 WHICH=-(A$="8")-2*(A$="4")-3*(A$="6")-4*(A
    $="2")
240 IF WHICH=0 THEN 220
250 GOSUB 1000
260 IF WHICH<>ASC(MID$(WHICH$,I)) THEN 500
270 NEXT I
280 FOR W=1 TO 500:NEXT
290 GOTO 180
500 POKE59467,16:POKE59466,13
510 FOR I=0 TO 255 STEP 5:POKE 59464,I:POKE 32
    768+999*RND(0),255*RND(0):NEXT
520 POKE 59467,0
530 PRINT"{CLEAR}";:SO=0:FORWHICH=1TO4:GOSUB10
    00:NEXT:SO=1
540 GOSUB 2000
550 FOR W=1 TO 500:NEXT
560 PRINT"{CLEAR}{REV}";TAB(16);"TOO BAD!"
570 PRINT"{04 DOWN}";TAB(15);"LENGTH:";INDEX-1

580 PRINT"{04 DOWN}";TAB(12);"DIFFICULTY:";DF
590 PRINT"{HOME}{22 DOWN}";
600 PRINTTAB(7);"PRESS {REV}SPACE{OFF} TO PLAY
     AGAIN:"
610 GETA$:IFA$<>" "THEN610
620 RUN
1000 REM UPDATE A BOX
1010 TM=10-DF
1020 X=5-10*(WHICH=1ORWHICH=4)-20*(WHICH=3)
1030 Y=-8*(WHICH=2ORWHICH=3)-16*(WHICH=4)
1040 PRINTLEFT$("{HOME}{17 DOWN}",Y+1);
1050 FORL=1TO7:PRINTSPC(X);"{REV}";DRK$(WHICH):
    NEXT
```



"Copy Cat" awaits a pattern-matching response, PET/CBM version.

```
1060 IF SO THEN POKE 59467,16:POKE 59466,51
1065 PITCH=10*WHICH+100
1070 IF SO THEN FOR L=0 TO 4:POKE 59464,PITCH+L
    :NEXT:POKE59467,0
1075 PRINTLEFT$("{HOME}{17 DOWN}",Y+1);
1080 FORL=1TO7:PRINTSPC(X);DRK$(WHICH):NEXT
1090 RETURN
2000 FOR I=1 TO INDEX
2010 WHICH=ASC(MID$(WHICH$,I))
2020 GOSUB 1000
2030 FOR W=1 TO (9-DF)*20:NEXT
2040 NEXT I
2050 RETURN
5000 REM INSTRUCTIONS
5010 PRINT"{CLEAR}";TAB(16);"{REV}COPYCAT"
5020 PRINT"{04 DOWN}REPEAT MY NOTES BY PRESSING
     THE
5030 PRINT"{DOWN}8,4,6,2 KEYS:{DOWN}"
5040 PRINTTAB(15);" 8{DOWN}{02 LEFT}4 6{DOWN}{0
    2 LEFT}2"
5050 PRINT"{02 DOWN}I CAN PLAY THE NOTES FROM
5060 PRINT"{DOWN}<1> SLOW   TO   <9>  FAST"
5070 PRINT"{03 DOWN}ENTER SKILL LEVEL:";
5080 GETA$:IFA$<"1"ORA$>"9"THEN5080
5090 DF=VAL(A$):RETURN
```

©

JOURNEY TO THE PLANETS™

A space, adventure, and arcade action game for your ATARI® 400/800™ personal computer.

What is your favorite type of game; space, arcade, or adventure? "Journey To The Planets" presents an intriguing combination of all three as you find yourself on a strange planet in a strange universe. Luckily, the local gods are friendly and supply you with energy, a spaceship, and weaponry. In turn, you agree to search the universe for treasures for the gods. Board your ship, take off, accelerate through the upper atmosphere and out into space. Your flight should take you past many other inviting planets. With a slow approach and skilled maneuvering, you drop down through the planet's sky to a soft landing on its surface. Disembark and wander through several TV screens full of mystery and excitement. A different adventure awaits you on each planet.

Planetary adventures are designed to exercise your puzzle solving intellect, with arcade action thrown in to enhance the excitement. Although you are given as much time as necessary to solve each adventure, your score, which is based on many factors, favors those who are speedy.

After you capture all the treasures this universe has to offer, return to your adopted planet. Who knows, the gods may be so happy that you can convince them to send you back to your real home. You can't get there without their help!

Available from your local Atari retailer or send $29.95 in check or money order (California residents add 6½% sales tax) to JV Software Inc.

Atari and 400/800™ are trademarks of ATARI, Inc

A 32K assembly language program written for your ATARI® 400/800™ computer.

Other products by JV Software include Action Quest and Ghost Encounters, both 16K real time adventure games. Available on cassette or diskette for $29.95.

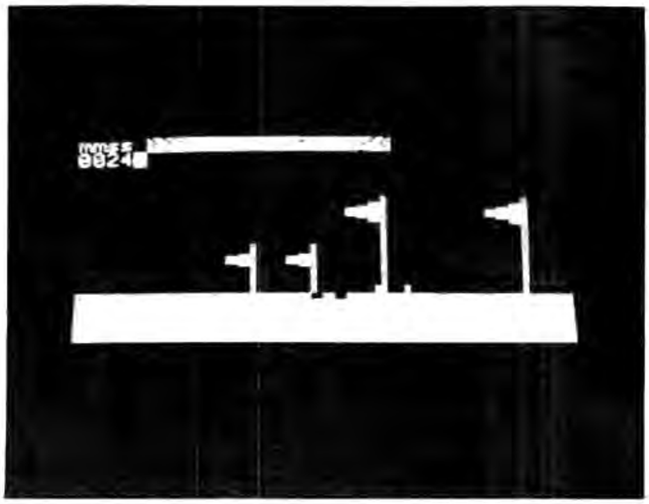
JV SOFTWARE, INC

3090 MARK AVE. SANTA CLARA, CA 95051

Slalom

George Leotti

This challenging skiing game, for PET/CBM and Atari, will test your skills and endurance as you try to maneuver through flags on a treacherous downhill race. Program versions for a 16K Atari and PET/CBM. Each version demonstrates some special programming technique, too. The PET version is in 3-D and the Atari version features fine scrolling.



Dodging oncoming flags in the PET version of "Slalom."

You may want to stop off at the Pine Mountain Slalom course.

This newly constructed course is unique, in that you select the length, from 10 to 50 flags. You also select how fast you want to ski.

The object is to beat your best time. There are two things to keep in mind:

1. You must go between each set of flags. If you miss any, you will receive a five second penalty for each set missed.

2. If you hit any flag, it will slow you down. Try to get between them.

When the display starts, you will see your skis as two indentations in the snow. To steer, push the four key to go left and the six key to go right. Push the five key to stop ski motion.

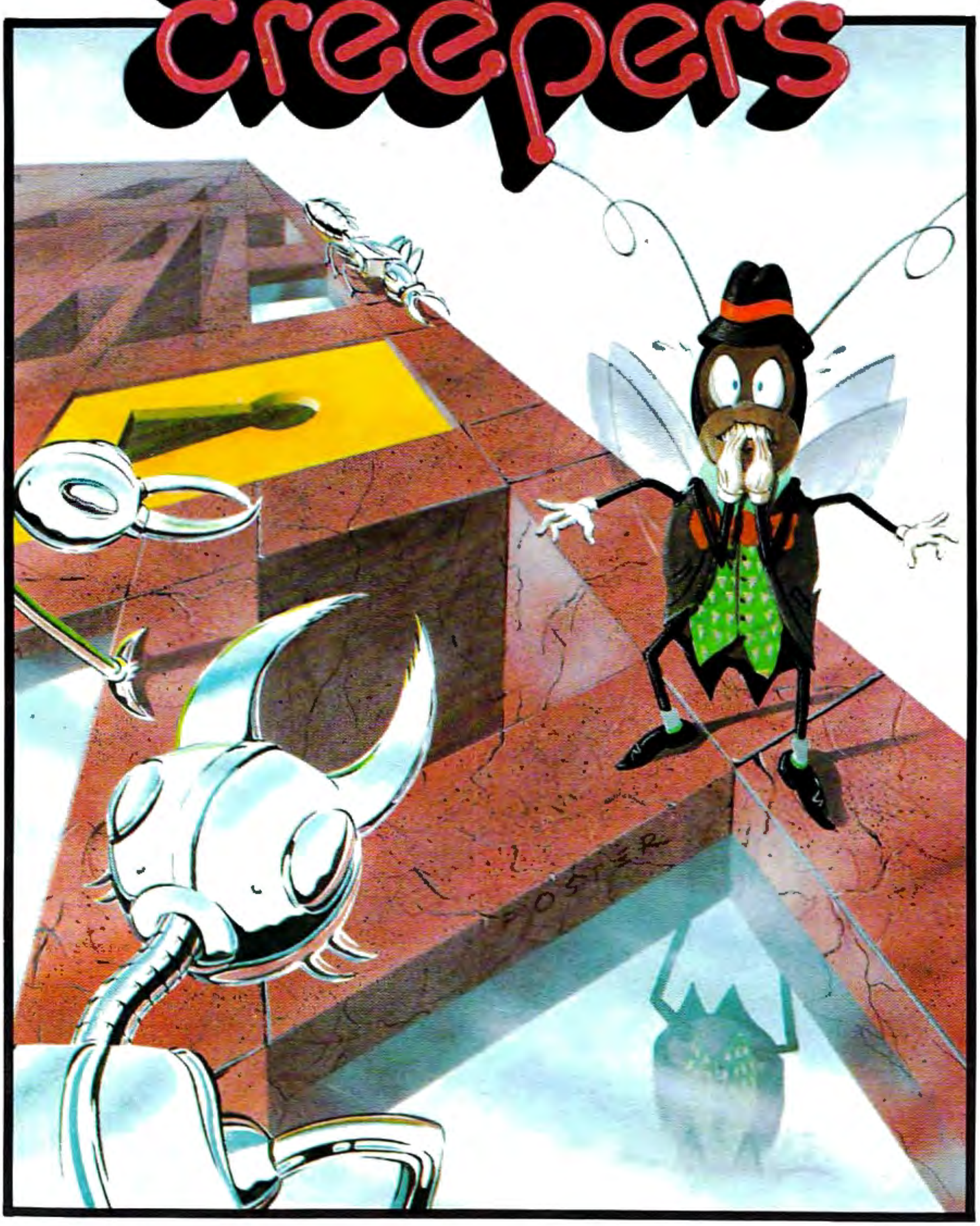
To get the fastest times, do not have any wedge-type programs active such as Toolkit, DOS Support, etc.

If you do not feel like typing the program in (PET version only), I will be glad to make a copy. Just send $3, a blank cassette and a self-addressed, stamped mailer to:

George Leotti
416 S. Elmwood Ave.
Glenolden, PA 19036

Program 1: PET Version

```
100 GOTO440
110 TI$="000000":FORI=1TON:IFI<N-1THENPRINTR$(
    I)B$R$(I+1)M$R$(I+2)L$:GOTO140
120 IFI<NTHENPRINTR$(I)B$R$(I+1)M$:GOTO140
130 PRINTR$(I)B$
140 FORJ=1TOP:PRINT"{HOME}{DOWN}"RIGHT$(TI$,4)
    :NEXT:PRINTR$(I)G$
150 GETZ$:IFZ$>""THENT=ASC(Z$)
155 IFT<>52ANDT<>54THEN180
160 TZ=-((T<55)+(T<54)):S=S+D(TZ):IFS<0ORS>35T
    HENS=S-D(TZ):GOTO180
170 PRINTD$TAB(S)S$:GOTO150
180 IFS>R(I)-1ANDR(I)+9>STHEN210
190 T=TI:IFR(I)-3>SORS>R(I)+11THENM=M+5:GOTO21
    0
200 IFTI-T<120THENPRINT"{HOME}{DOWN}"RIGHT$(TI
    $,4):GOTO200
210 IFI<N-1THENPRINTR$(I)C1$R$(I+1)C2$R$(I+2)C
    3$:GOTO240
220 IFI<NTHENPRINTR$(I)C1$R$(I+1)C2$:GOTO240
230 PRINTR$(I)C1$
240 PRINT"{HOME}{DOWN}"RIGHT$(TI$,4):NEXT:T=TI

250 PRINTD$"{DOWN}{REV}                  F  I  N  I ¯
     S  H  "
260 R=R+1:PRINT"{DOWN}";:IFMTHENPRINT"{DOWN}PE
    NALTY OF"M"SECONDS;"M/5"FLAGS MISSED"

270 J=T
280 MT$=STR$(INT(T/3600)):MT$=RIGHT$(MTS,LEN(M
    T$)-1):T=T-VAL(MT$)*3600
290 IFLEN(MT$)=1THENMT$="0"+MT$
300 ST$=STR$(INT(T/60)):ST$=RIGHT$(ST$,LEN(ST$
    )-1):T=T-VAL(ST$)*60
310 IFLEN(ST$)=1THENST$="0"+ST$
320 JT$=MID$(STR$(T/60),3,2):IFLEN(JT$)=1THENJ
    T$=JT$+"0"
330 IFLEN(JT$)=0THENJT$="00"
340 IFJ=0THENRETURN
350 PRINT"{DOWN}THIS TIME/RUN: "MTS":"ST$"."JT
    $"  RUN#"R
360 PRINT"{DOWN}{REV}OFFICIAL TIME: ";:T=J+M*6
    0:J=0:GOSUB280
370 PRINTMT$":"ST$"."JT$"{OFF}   ↑ ↑ ↑"
380 IFR=1THEN400
390 IFVAL(MT$+ST$+JT$)>=VAL(LEFTS(BT$,2)+MID$(
    BT$,4,2)+RIGHT$(BT$,2))THEN410
400 BT$=MT$+":"+ST$+"."+JT$:BR=R
410 PRINT"{DOWN}BEST TIME/RUN: "BT$"  RUN#"BR:
    FORI=0TO9:GETI$:NEXT
420 INPUT"{DOWN}WANT TO SKI AGAIN  Y{03 LEFT}"
    ;I$:IFLEFT$(I$,1)="N"THENEND
430 GOTO630
440 DIMR$(50),R(50):I=0:N=0:J=0:P=0:T=0:K=151:
    S=0:D(1)=1:D(2)=-1
450 B$="":M$="":G$="":IFPEEK(50000)=0THENK=515

460 FOR Q=1 TO 69:READ BB:B$=B$+CHRS(BB):NEXT ¯
    Q
470 FOR Q=1 TO 30:READ MM:M$=M$+CHR$(MM):NEXT ¯
    Q
480 FOR Q=1 TO 66:READ GG:G$=G$+CHR$(GG):NEXT ¯
    Q
490 L$=CHR$(172)+"{02 RIGHT}"+CHR$(187)
500 C1$=" {UP}{LEFT} {UP}{LEFT} {UP}{LEFT} {
    RIGHT}     {DOWN}{04 LEFT}     {DOWN}{
    LEFT} {DOWN}{LEFT} {DOWN}{LEFT} {DOWN}
    {LEFT} "
```


FOSTER

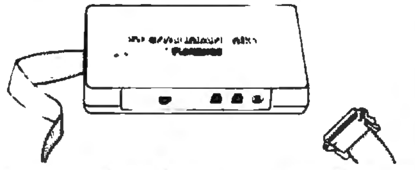
WE STOCK
EAGLE COMPUTERS **EAGLE COMPUTER**

USI Video Monitors—Green or AMBER 20 MHz hi-res. Dealer and OEM inquines invited

USI

SPECIALS on INTREGATED CIRCUITS

6502	7.45	10/ 6.95	50/ 6.55	100/ 6.15
6502A/6512A	8.40	10/ 7.95	50/ 7.35	100/ 6.90
6520 PIA	5.15	10/ 4.90	50/ 4.45	100/ 4.15
6522 VIA	6.45	10/ 6.10	50/ 5.75	100/ 5.45
6532	7.90	10/ 7.40	50/ 7.00	100/ 6.60
2114-L200		2.45	25/ 2.30	100/ 2.15
2716 EPROM		4.90	5/ 4.50	10/ 4.00
2532 EPROM		8.90	5/ 8.45	10/ 7.90
6116 2K×8 CMOS RAM		8.90	5/ 8.45	10/ 7.90
4116 RAM				8 for 14
Zero Insertion Force 24 pin Socket (Scanbe)				2.00



Anchor Automation Signalman Modems

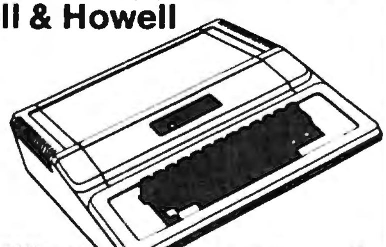
FREE SOURCE MEMBERSHIP WITH SIGNALMAN

All Signalman Modems are Direct Connect, and include cables to connect to your computer and to the telephone. Signalman Modems provide the best price-performance values, and start at less than $100. **Dealer and OEM inquiries invited**

- Mark I RS232
- Mark II for Atari 850
- Mark IV for CBM/PET with software
- Mark V for Osborne (software available)
- Mark VI for IBM Personal Computer
- Mark VII Auto Dial/Auto Answer
- Mark VIII Bell 212 Auto Dial/Answer

DC HAYES Smartmodem	**229**
RS232 MODEM — Accoustic	**119**
RS232.MODEM — CCITT frequencies	**175**

We carry Apple II+ from Bell & Howell



16K RAM Card	**for Apple**	**65**
Apple LOGO		150
Video Recorder Interface		545
Super Serial Card		149
Thunderclock Plus		119
Z80 Softcard and CP/M		295
Parallel Printer Interface/Cable		80
Grappler Interface		139
TG Products Joystick for Apple		**48**
TG Paddles		32
DC Hayes Micromodem II		299
Videx 80 Column Card		259
fullFORTH+ for Apple (fig-Forth)		85
Silentype Printer and Card		310
Graphics Tablet and Card		645
Apple PASCAL Language		195
Apple FORTRAN		160
We stock EDUWARE Software		
GENIS I Courseware Development System		145
Unicom Grade Reporting or School Inventory		250
Executive Briefing System with fonts		225
Apple Dumpling (Microtek) Printer Interface		**115**
Apple Dumpling with 16K Buffer		**160**
PIE Writer Word Processor		**120**

commodore

See us for Personal, Business, and Educational requirements. Educational Discounts available.

PETSCAN $245 base price

Allows you to connect up to 35 CBM/PET Computers to shared disk drives and printers. Completely transparent to the user. Perfect for schools or multiple word processing configurations. Base configuration supports 2 computers. Additional computer hookups $100 each.

Commodore COMMUNICATES!

COMPACK $129

Intelligent Terminal Package includes:
ACIA hardware based interface; DB25 Cable and STCP Software with remote telemetry, transfer to/from disk, printer output, XON-XOFF control, user program control, and status line.

VE-2 IEEE to Parallel Interface 119

Includes case, power supply, full 8-bit transmission, and switch selectable character conversion to ASCII.

VIC 20	189	VIC Sargon II Chess	32
VIC Printer	335	VIC GORF	32
VIC 3K RAM	32	Meteor Run (UMI)	39
VIC 8K RAM	53	VIC Radar Ratrace	24
VIC 16K RAM	99	Amok (UMI)	20
VIC Disk Drive	395	Snakman	15
VIC Pinball	32	Rubik's Cube	13
VIC Omega Race	32	Programmers Reference	15
Spiders of Mars (UMI)	39	Renaissance (UMI)	39
VIC Draw Poker	24	VIC Superslot	23

VICTORY Software for VIC

Street Sweepers	12	Maze in 3-D	12
Night Rider	11	Cosmic Debris	12
Treasures of Bat Cave	12	Grave Robbers Advent.	11
Games Pack I	12	Games Pack II	12
Victory Casino	8	Adventure Park I	12
Adventure Pack II	12	Trek	11

TNW 488/103 with DAA	450
Compute!'s First Book of PET/CBM	11
POWER ROM Utilities for PET/CBM	78
WordPro 3+ - 32K CBM, disk, printer	195
WordPro 4+ - 8032, disk, printer	300
SPELLMASTER spelling checker for WordPro	**170**
COPY-WRITER Professional Word Processor	159
VISICALC for PET, ATARI, or Apple	190
PETRAX PET to Epson Graphics Software	**35**
SM-KIT enhanced PET/CBM ROM Utilities	**40**
Programmers Toolkit - PET ROM Utilities	35
PET Spacemaker II ROM Switch	36
2 Meter PET to IEEE or IEEE to IEEE Cable	40
Dust Cover for PET, CBM, 4040, or 8050	8
VIC or C64 Parallel Printer Interface	85
CmC IEEE-RS232 Printer Interface — PET	120
SADI Intelligent IEEE-RS232 or parallel	235
Library of PET Subroutines	12
Programming the PET/CBM (Compute!) — R. West	**20**
Compute! First Book of VIC	11
Whole PET Catalog (Midnight Gazette)	**8**
Color Chart Video Board for PET	125
PET Fun and Games (Cursor)	11

REVERSAL (Spracklen) Apple or Atari	25
SARGON II — Apple or TRS-80	26
Apple II User's Guide (Osborne)	12
Introduction to Pascal (Sybex)	13
Pascal Handbook (Sybex)	16
Musical Applications of Micros (Chamberlin)	20
Starting FORTH	14
Discover FORTH	12
User Guide to the Unix System	13
6502 Assembly Language Subroutines	11
PET Fun and Games	9
KAMIKAZE (Hoyden Software-Apple)	28

DISK SPECIALS

SCOTCH (3M) 5"	10/ 2.30	50/ 2.10	100/ 2.05
SCOTCH (3M) 8"	10/ 2.45	50/ 2.20	100/ 2.15

We stock VERBATIM DISKS

Write for Dealer and OEM prices.

BASF 5" or 8"	10/ 2.00	20/ 1.95	100/ 1.85
Wabash 5"	10/ 1.80	50/ 1.75	100/ 1.70
Wabash 8"	10/ 2.25	50/ 2.20	100/ 2.10

We stock MAXELL DISKS

Write for dealer and OEM prices.

Disk Storage Pages	10 for $5	Hub Rings 50 for $6
Disk Library Cases	"—3.00	5"—2.25
Head Cleaning Kits	11	

CASSETTES—AGFA PE-611 PREMIUM

High output, low noise, 5 screw housings.

C-10	10/ .61	50/ .58	100/ 50
C-30	10/ .85	50/ .82	100/ .70

SPECIALS

Timex/Sinclair Computer		95
Zenith ZVM-121 Green Phosphor Monitor		109
INTEX Talker Text to Speech System		**265**
BMC Green and Color Monitors		
Brother Daisy Wheel Printer		880
STARWRITER Daisy Wheel Printer F10		1445
We Stock AMDEK Monitors		
Watanabe Intelligent Plotter	995	6-pen 1295
Staticide anti-static spray		6
dBASE II		445

ALL BOOK and SOFTWARE PRICES DISCOUNTED

A P Products	**15% OFF**
Synertek SYM-1 Microcomputer	**SALE 189**
KTM-2/80 Synertek Video and Keyboard	349
KTM-3/80 Synertek Tubeless Terminal	385

Alspa Computer, Inc.

The price-performance leader. Includes Z80A, 1 or 2 full 8" drives (double density, double sided), 3 serial and 1 parallel port, and winchester port. Prices start at less than $2000 DEALER and OEM inquiries invited.

ZENITH | data systems

Z90-80 64K	1995
Z90-82 64K, 1 double dens. drive	2245
Z37 1.3 Megabyte Dual Drive	1355
Z19 Video Terminal (VT-52 compatible)	695
ZT-1 Intelligent Communications Terminal	**550**
Z100 16-bit/8-bit System	**CALL**

ATARI SPECIALS

800 Computer	649	Microsoft BASIC	72
400—16K	269	**MISSILE COMMAND**	**29**
810 Disk Drive	440	**ASTEROIDS**	**29**
825 Printer	625	**STAR RAIDERS**	**34**
850 Interface	170	Space Invaders	29
Inside Atari DOS	18	Music Composer	35
Joysticks or Paddles	19	Caverns of Mars	33
16K RAM (Microtek)	69	**PAC-MAN**	**36**
32K RAM (Microtek)	99	**CENTIPEDE**	**36**
Pilot	65	First Book of Atari	11
Super Breakout	29	**Anchor Modem—Atari**	**85**
APX Software	Call	Other Atari products	Call

252 Bethlehem Pike
Colmar, PA 18915

215-822-7727

A B Computers

WRITE FOR CATALOG

Add $1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.

KMMM Pascal for PET/CBM $85

A subset of standard Pascal with extensions.

- Machine language Pascal Source Editor with cursor oriented window mode
- Machine Language P-Code Compiler
- P-Code to machine language translator for optimized object code
- Run-time package
- Floating point capability
- User manual and sample programs

Requires 32K Please specify configuration.

EARL for PET (disk file based) $65

Editor, Assembler, Relocator, Linker

Generates relocatable object code using MOS Technology mnemonics. Disk file input (can edit files larger than memory). Links ,multiple object programs as one memory load. Listing output to screen or printer. Enhanced editor operates in both command mode and cursor oriented "window" mode.

RAM/ROM for PET/CBM

4K or 8K bytes of soft ROM with optional battery backup.

RAM/ROM is compatible with any large keyboard machine. Plugs into one of the ROM sockets above screen memory to give you switch selected write protectable RAM.

Use RAM/ROM as a software development tool to store data or machine code beyond the normal BASIC range. Use RAM/ROM TO LOAD A ROM image where you have possible conflicts with more than one ROM requiring the same socket. Possible applications include machine language sort (such as SUPERSORT), universal wedge, Extramon, etc.

RAM/ROM – 4K	$75
RAM/ROM – 8K	90
Battery Backup Option	20

SUBSORT by James Strasma $35

Subsort is an excellent general purpose machine language sort routine for PET/CBM computers. Sorts both one and two dimensioned arrays at lightning speed in either ascending or descending order. Other fields can be subsorted when a match is found, and fields need not be in any special order. Sort arrays may be specified by name, and fields are random length. Allows sorting by bit to provide 8 categories per byte. The routine works with all PET BASICs, adjusts to any memory size, and can co-exist with other programs in high memory.

SuperGraphics 2.0

NEW Version with TURTLE GRAPHICS

SuperGraphics, by John Fluharty, provides a 4k machine language extension which adds 35 full featured commands to Commodore BASIC to allow fast and easy plotting and manipulation of graphics on the PET/CBM video display, as well as SOUND Commands. Animations which previously were too slow or impossible without machine language subroutines now can be programmed directly in BASIC Move blocks (or rocketships, etc.), or entire areas of the screen with a single, easy to use BASIC command. Scroll any portion of the screen up, down, left, or right. Turn on or off any of the 4000 (8000 on 8032) screen pixels with a single BASIC command. In high resolution mode, draw vertical, horizontal, and diagonal lines. Draw a box, fill a box, and move it around on the screen with easy to use BASIC commands. Plot curves using either rectangular or polar co-ordinates (great for Algebra, Geometry and Trig classes.)

The SOUND commands allow you to initiate a note or series of notes (or even several songs) from BASIC, and then play them in the background mode without interfering with your BASIC program. This allows your program to run at full speed with simultaneous graphics and music.

Seven new TURTLE commands open up a whole new dimension in graphics. Place the TURTLE anywhere on the screen, set his DIRECTION, turn him LEFT or RIGHT, move him FORWARD, raise or lower his plotting pen, even flip the pen over to erase. Turtle commands use angles measured in degrees, not radians, so even elementary school children can create fantastic graphic displays.

Specify machine model (and size). ROM type (BASIC 3 or 4)

SuperGraphics in ROM $45

Volume discounts available on ROM version for schools.

FLEX-FILE

for PET/CBM Computers

NEW VERSION II

FLEX-FILE is a set of flexible, friendly programs to allow you to set up and maintain a data base. Includes versatile Report Writer and Mail Label routines, and documentation for programmers to use Data Base routines as part of other programs.

RANDOM ACCESS DATA BASE

Record size limit is 256 characters. The number of records per disk is limited only by record size and free space on the disk. File maintenance lets you step forward or backward through a file, add, delete, or change a record, go to a numbered record, or find a record by specified field (or partial field). Field lengths may vary to allow maximum information packing. Both subtotals and sorting may be nested up to 5 fields deep. Any field may be specified as a key. Sequential file input and output, as well as file output in WordPro and PaperMate format is supported. Record size, fields per record, and order of fields may be changed easily.

MAILING LABELS

Typical mail records may be packed 3000 per disk on 8050 (1400 on 4040). Labels may be printed any number wide, and may begin in any column position. There is no limit on the number or order of fields on a label, and complete record selection via type code or field condition is supported.

REPORT WRITER

Flexible printing format, including field placement, decimal justification and rounding. Define any column as a series of math or trig functions performed on other columns, and pass results such as running total from row to row. Totals, nested subtotals, and averages supported. Complete record selection, including field within range, pattern match, and logical functions can be specified.

FLEX-FILE II by Michael Riley $110

Please specify equipment configuration when ordering.

DISK I.C.U. $40

Intensive Care Unit by L.C. Cargile

COMPLETE DISK RECOVERY SYSTEM FOR CBM DRIVES

- edit disk blocks with ease
- duplicate disks, skipping over bad blocks
- complete diagnostic facilities
- un-scratch scratched files
- check and correct scrambled files
- recover improperly closed files
- extensive treatment of relative files
- optional output to IEEE488 printer
- comprehensive user manual (an excellent tutorial on disk operation and theory).

Furnished on copy-protected disk with manual.
Backup disk available, $10 additional.

PROGRAM YOUR OWN EPROMS $75

Branding Iron EPROM Programmer for PET/CBM software for all ROM versions. Includes all hardware and software to program or copy 2716 and 2532 EPROMs.

PORTMAKER DUAL RS232 SERIAL PORT $63

Two ports with full bipolar RS232 buffering. Baud rates from 300 to 4800. For PET/CBM, AIM, SYM.

CBM Software

TCL Pascal Version 1.6	135
Petspeed BASIC Compiler	225
Integer BASIC Compiler	110
CMAR Record Handler	110
UCSD Pascal (without board)	135
Wordcraft 80	300
BPI Accounting Modules	300
Professional Tax Prep Sys.	600
Intelligent Terminal Emulator	25
ASERT Data Base	375
Personal Tax Calc	55
Dow Jones Portfolio Mgmt.	110
Assembler Development	80
Legal Time Accounting	445

FORTH for PET

BY L. C. Cargile and Michael Riley $50

Features include:

- full FIG FORTH model.
- all FORTH 79 STANDARD extensions.
- structured 6502 Assembler with nested decision making macros.
- full screen editing (same as when programming in BASIC).
- auto repeat key.
- sample programs.
- standard size screens (16 lines by 64 characters).
- 150 screens per diskette on 4040, 480 screens on 8050.
- ability to read and write BASIC sequential files.
- introductory manual.
- reference manual.

Runs on any 16K or 32K PET/CBM (including 8032) with ROM 3 or 4, and CBM disk drive. Please specify configuration when ordering.

Metacompiler for FORTH $30

simple metacompiler for creating compacted object code which can be executed independently (without the FORTH system).

PaperMate 60 COMMAND WORD PROCESSOR

by Michael Riley

Paper-Mate is a full-featured word processor for CBM/PET by Michael Riley. Paper-Mate incorporates 60 commands to give you full screen editing with graphics for all 16K or 32K machines (including 8032), all printers, and disk or tape drives. Many additional features are available (including most capabilities of Professional Software's WordPro 3).

For writing text, Paper-Mate has a definable keyboard so you can use with either Business or Graphics machines. Shift lock on letters only, or use keyboard shift lock. All keys repeat.

Paper-Mate text editing includes floating cursor, scroll up or down, page forward or back, and repeating insert and delete keys. Text block handling includes transfer, delete, append, save, load, and insert.

All formatting commands are imbedded in text for complete control. Commands include margin control and release, column adjust, 9 tab settings, variable line spacing, justify text, center text, and auto print form letter (variable block). Files can be linked so that one command prints an entire manuscript. Auto page, page headers, page numbers, pause at end of page, and hyphenation pauses are included.

Unlike most word processors, CBM graphics as well as text can be used. Paper-Mate can send any ASCII code over any secondary address to any printer.

Paper-Mate functions with all CBM/PET machines with at least 16K, with any type of printer, and with either cassette or disk.

To order Paper-Mate, please specify machine and ROM type.

Paper-Mate (disk or tape) for PET, CBM, VIC, C64 **$40**

SM-KIT for PET/CBM $40

Enhanced ROM based utilities for BASIC 4. Includes both programming aids and disk handling commands.

BASIC INTERPRETER for CBM 8096 $200

A full interpreter implementation to automatically take advantage of the extra memory available with 8096.

PEDISK II Systems from cgrs Microtech available.
FILEX IBM 3741/2 Data Exchange Software available.

JINSAM Data Base Management System for CBM.
Comprehensive version available for most configurations.

COPY-WRITER Word Processor for PET/CBM. $159

Works like expensive word processors, plus has added features like double column printing and shorthand generator.

CASH MANAGEMENT SYSTEM $45

Easy to use disk system. Keeps track of cash disbursements, cash receipts, cash transfers, expenses for up to 50 categories.

252 Bethlehem Pike
Colmar, PA 18915

215-822-7727

A B Computers

WRITE FOR CATALOG

Add $1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.

Atari Notes

Charles Brannon, Editorial Assistant

With the Atari version of Slalom, **COMPUTE!** presents its first fine-scrolling arcade style game. The Atari version, called "SKI!", lets you test your skill at electronic winter sports.

Use a joystick controller plugged into the first port to control the skier. The game will run in 16K if you remove the text from all REM statements. The mountain scenery smoothly moves down towards you, as you dodge rocks, trees, and flags and "gobble up" bonus points planted in the snow. You can move the joystick left or right to turn. You can also position your player up or down to change difficulty, points, and maneuverability.

The higher you go, the faster the scene scrolls, and the more points you win. The higher speeds necessitate fast response. The novice will want to position himself a little below midway up the screen. That way, you have room to pull back if you need to duck. If you hit a rock, tree, or flag, you crash, and start over at the bottom of the screen. You lose fifty points for every crash.

Up The Hill

Every time you play the game, a random ski course is generated. The screen scrolls in reverse as it displays the course being laid out. If you want more of a surprise, turn off your TV while the course is being drawn. Your computer will buzz when the game is ready to play. Press FIRE to begin. While the pattern is being drawn, you can imagine you're on your way up the mountain on the ski lift, previewing the course.

Fine Scrolling

Fine scrolling couples coarse scrolling (which moves the pointers to screen memory around) with a special feature of the ANTIC chip.

To fine-scroll, you set a special bit in every line of the display list you wish to scroll. You then scroll one scan line at a time by storing numbers from 0-15 in VSCROL. When you reach the limit of ANTIC's fine scrolling resolution (8 scan lines in GRAPHICS 1), you reset VSCROL and then coarsely scroll a full eight scan lines. Coarse scrolling is described in *COMPUTE!'s Second Book of Atari*. Machine language is required for fine scrolling, since you must reset VSCROL and perform the coarse scroll almost simultaneously, or else you get a jumpy, unpleasant display.

Interfacing To BASIC

The fine scrolling routine could be written as a USR statement, but BASIC would have to call it every time a scroll was needed, and this would be too slow. We need to periodically update the screen in a way that's not dependent on BASIC.

The Vertical Blank Interrupt (VBI) is perfect for this task. Every 1/60th of a second, the scroll routine is called to update the screen. BASIC can control the speed with memory location zero. POKEing a number from 1-255 controls the speed from one (fastest) to 255. A zero will stop the scrolling, although the vertical blank routine will still be "hooked up." BASIC sets up the VBLANK scrolling routine by passing the address of the Load Memory Scan counter to change in the display list (which can be found on a normal screen with LMS = PEEK(560) + 256* PEEK(561) + 4) and the number of lines to scroll. BASIC can PEEK location 1 to see how many full lines still need to be scrolled.

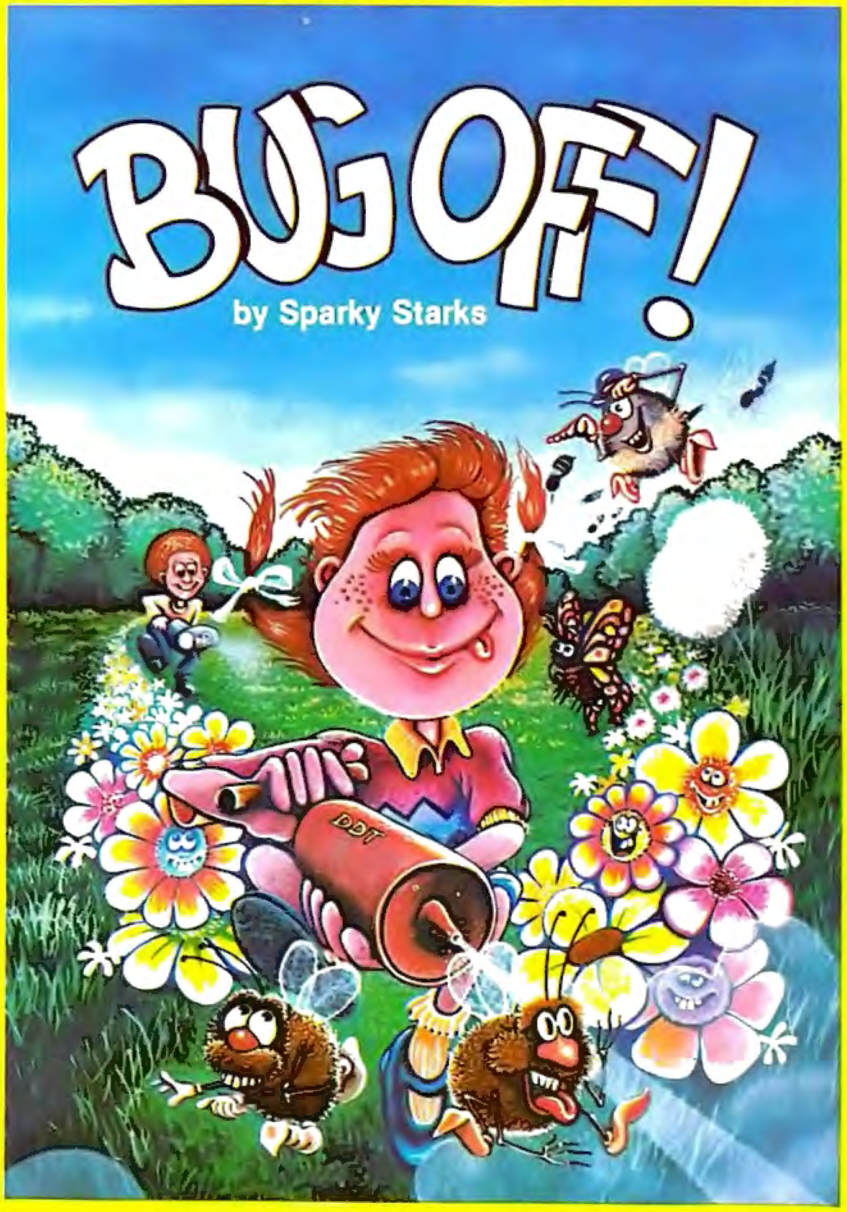
The VBLANK routine will stop scrolling when it runs out of lines, and memory location 1 will hold a zero. You could use the machine language routine in your own programs, but since it is not general-purpose, you will be limited to unidirectional scrolling in GRAPHICS 1. Be sure to use the "disable routine" (A = USR(1638)) to remove the VBI routine from the system.

An ANTIC Anomaly

It's not mentioned anywhere as far as I know, but the address of the start of your screen memory for fine scrolling should start on a 4K boundary. ANTIC apparently cannot cross a 4K boundary, so if your screen buffer (that holds the rocks, trees, etc.) is too long, ANTIC can get confused and start displaying nonsense. Another thing to watch for: when using a vertical blank routine, be sure to include a CLD (Clear Decimal) at the start of the program. If you don't, your arithmetic will be foiled every time BASIC calls the floating point routines (which use BCD math).

Strings are used extensively in the BASIC program, to prevent memory conflicts. A string is used to hold the display list, the screen memory area, the player/missile memory, and the shapes for the player. The screen memory area and the player/missile address are ensured to be on proper page boundaries by modification of the Variable Value Table. Because of this, line 100 must be typed first, in order for the program to work properly.

YOU'RE GOING TO HAVE FUN WITH YOUR ATARI!!



AND THE FUN GETS ROLLING WITH BUG OFF!

Yikes! The bugs are swarming here, there and everywhere and only a strong whiff of DDT can put 'em away. The object of the game is to control the seven different kinds of pests that are running helter-skelter over everything. The Army can airlift in more DDT to fill your bug sprayer . . . but will they make it in time?

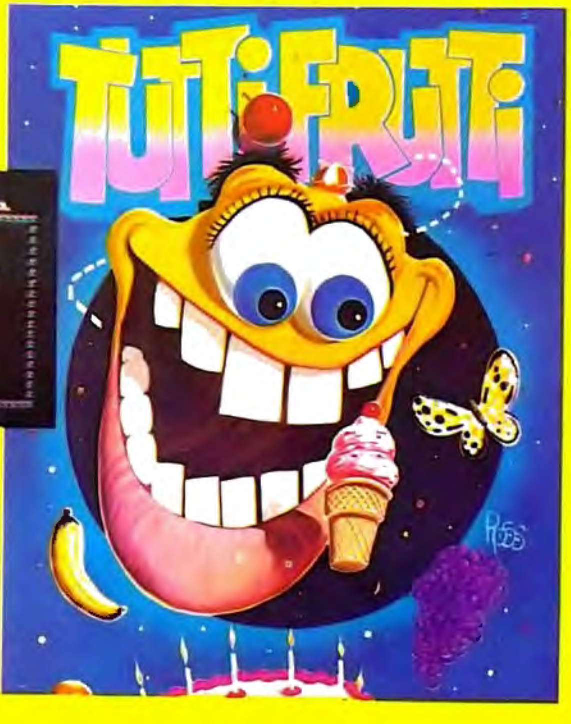
The action builds to a furious frenzy as an awesome assortment of insects attack anything and everything in sight. A definite case of "spray first and ask questions later." All this and hi-res graphics, too!

16K TAPE	050-0167	$29.95
32K DISK	052-0167	$29.95

TUTTI FRUTTI — by Alan Newman

"GRAPE FUN" FOR THE WHOLE FAMILY!

Somewhere between Never Never Land and next Thursday, there's a wild and wacky place where your joystick-controlled "Hungry" snacks on an orchard of goodies. But there are some nasty ol' bugs who'd just as soon snack on YOU, so look sharp and beware. **Fun**tastic action for all ages!



TUTTI FRUTTI . . . Wow! A crazy cast of characters in vivid hi-res color all performing in their natural habitat, otherwise known as TUTTI FRUTTI Land. Grape fun for ages 6 and up!

16K TAPE	050-0160	$24.95
32K DISK	052-0160	$24.95

Adventure INTERNATIONAL

To order, see your local dealer. If he does not have the program, then call 1-800-327-7172 (orders only please) or write for our free catalog.

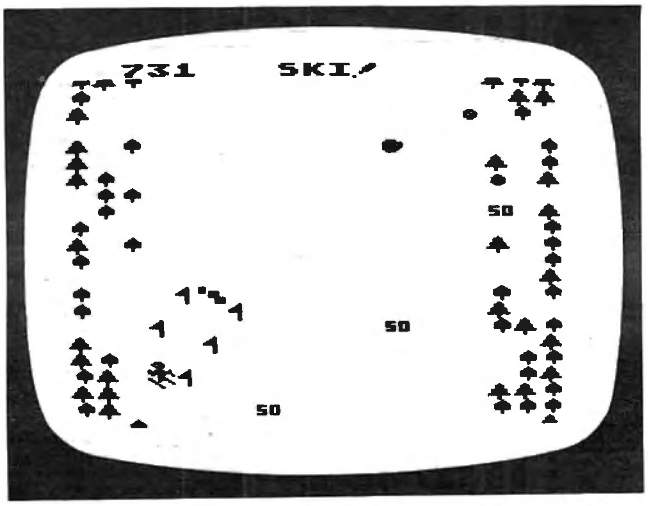
Published by ADVENTURE INTERNATIONAL
a subsidiary of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 862-6917

PRICES SUBJECT TO CHANGE

```
510 C2$="{RIGHT}{UP}{03 LEFT}    {UP}{03 LEFT}
      {02 RIGHT}    {DOWN}{03 LEFT}    {
    DOWN}{LEFT} "
520 C3$="{03 RIGHT} "
530 R$="{35 RIGHT}"
540 D$="{HOME}{09 DOWN}":S$="{REV} "+CHR$(184)
    +" "+CHR$(184)+" "
550 INPUT"{CLEAR}COURSE LENGTH (10-50)";N
560 IFN>50THENPRINT"{HOME}"LEFT$(R$,23)"50
    ":N=50
570 IFN<10THENPRINT"{HOME}"LEFT$(R$,23)"10
    ":N=10
580 INPUT"{DOWN}SPEED (1=FAST) TO (9=SLOW)";P
590 IFP>9THENPRINT"{UP}"LEFT$(R$,28)"9      ":
    P=9
600 IFP<1THENPRINT"{UP}"LEFT$(R$,28)"1      ":
    P=1
610 IFP>1THENP=P*5
620 FORI=1TON:READR(I):R$(I)=D$+LEFT$(R$,R(I))
    :NEXT:D$=D$+"{DOWN}"
630 PRINT"{CLEAR}"D$;:FORI=1TO30:PRINT"{REV}
      {OFF}";:NEXT
640 S=17:M=0:PRINTD$LEFT$(R$,S)S$"{HOME}{DOWN}
    {04 RIGHT}{REV}PRESS ANY KEY"
650 GETI$:IFI$=""THEN650
660 PRINT"{HOME}{DOWN}{04 RIGHT}              {
    HOME}MMSS {REV}>>COMMODORE TIMING<<":
    GOTO110
670 REM ** FLAG CHARACTERS (B$)
680 DATA 161,145,157,161,145,157;161,145
690 DATA 157,161,145,157,157,157,157,183
700 DATA 184,18,185,146,161,145,157,157
710 DATA 157,157,239,185,18,184,146,161
720 DATA 29,29,29,29,29,29,29,29
730 DATA 239,185,18,184,146,161,17,157
740 DATA 157,157,157,183,184,18,185,146
750 DATA 161,17,157,161,17,157,161,17
760 DATA 157,161,17,157,161
770 REM ** FLAG CHARACTERS (M$)
780 DATA 161,145,157,157,157,183,184,161
790 DATA 145,157,157,157,239,185,161,29
800 DATA 29,239,185,161,17,157,157,157
810 DATA 183,184,161,17,157,161
820 REM ** FLAG CHARACTERS (G$)
830 DATA 18,167,145,157,167,145,157,167
840 DATA 145,157,167,145,157,157,157,157
850 DATA 162,185,239,167,145,157,157,157
860 DATA 157,146,162,18,184,183,167,29
870 DATA 29,29,29,29,29,29,29,146
880 DATA 162,18,184,183,167,17,157,157
890 DATA 157,157,162,185,239,167,17,157
900 DATA 167,17,157,167,17,157,167,17
910 DATA 157,167
920 REM ** FLAG POSITIONS
930 DATA 14,6,24,27,15,13,23,15,8,25
940 DATA 19,11,14,5,3,18,24,4,19,5
950 DATA 24,13,23,4,7,10,13,24,27,20
960 DATA 23,4,25,24,3,27,8,6,9,4
970 DATA 11,14,3,7,10,13,16,19,22,25
```

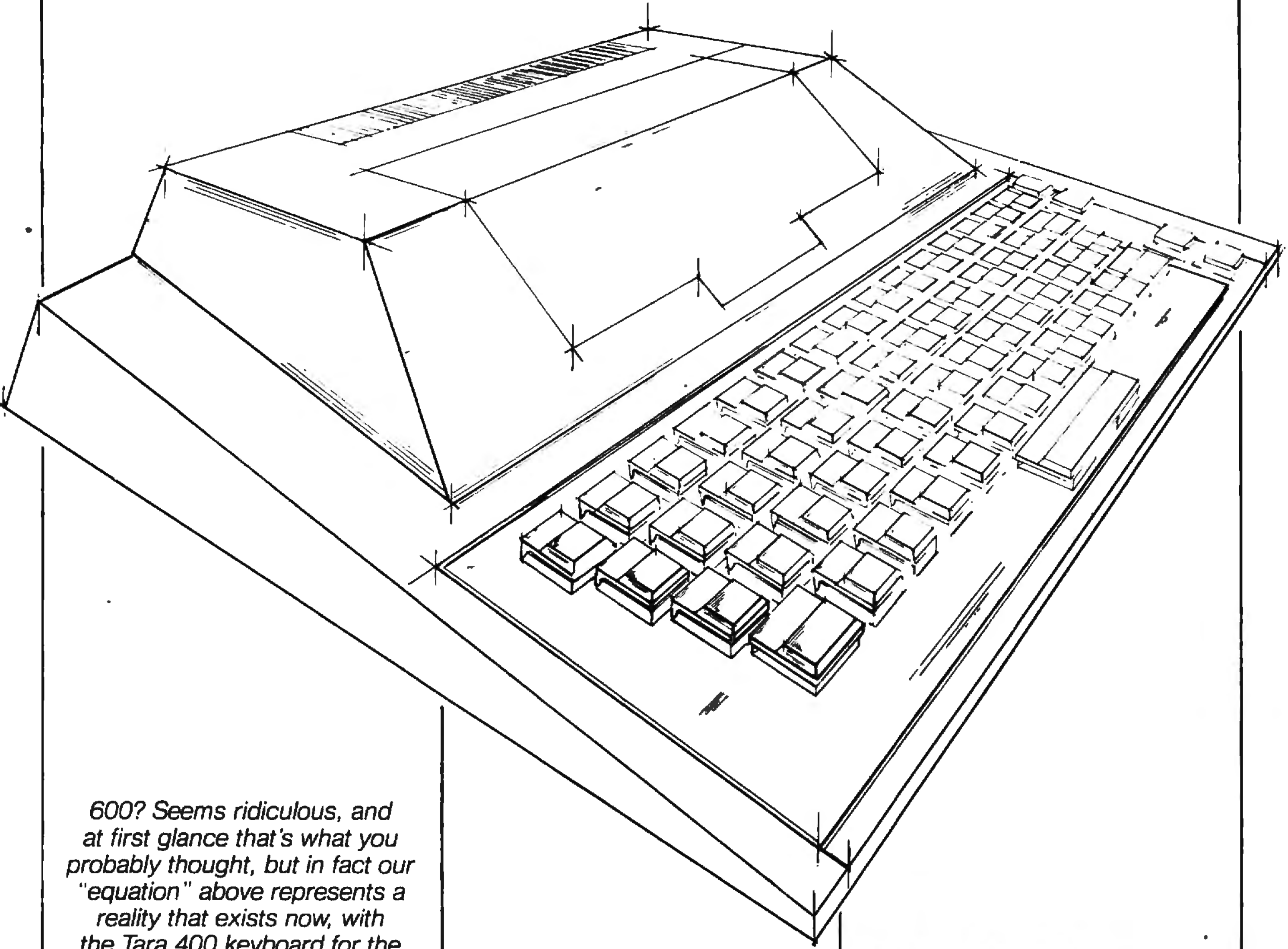
Program 2: Atari Version

```
100 DIM SCREEN$(1),PM$(1):GOTO 130
110 REM * SKI * Line 100 must be type
    d in first!!!
120 HI=INT(A/256):LO=A-HI*256:RETURN
125 POKE 66,1:FOR W=1 TO 10:POKE 5327
    9,0:POKE 53279,8:NEXT W:POKE 66,0
    :RETURN
130 GOSUB 790:REM Initialization rout
    ines
140 REM PLAYER ROUTINE
150 POKE 559,62:POKE 54279,PMBASE
160 POKE 53277,3:POKE 704,2*16+6
170 PO=1024:YP=180:XP=128
180 PM$(PO)=CHR$(0):PM$(PO+254)=CHR$(
    0):PM$(PO+1)=PM$(PO)
190 DIM LEFT$(20),CENTER$(20),RIGHT$(
    20),CURR$(20),CRASH$(20),ERASE$(2
    0),DIR(8)
200 ERASE$=CHR$(0):ERASE$(20)=CHR$(0)
    :ERASE$(2)=ERASE$
210 LEFT$=ERASE$:CENTER$=ERASE$:RIGHT
    $=ERASE$:CRASH$=ERASE$
220 FOR I=0 TO 15
230 LEFT$(I+2,I+2)=CHR$(PEEK(CHSET+20
    8+I))
240 CENTER$(I+2,I+2)=CHR$(PEEK(CHSET+
    224+I))
250 RIGHT$(I+2,I+2)=CHR$(PEEK(CHSET+1
    04+I))
260 CRASH$(I+2,I+2)=CHR$(PEEK(CHSET+2
    40+I))
270 NEXT I
280 DIR(0)=0:DIR(1)=20:DIR(2)=19:DIR(
    3)=21:DIR(4)=1:FOR I=0 TO 3:DIR(I
    +5)=-DIR(I):NEXT I
290 CURR$=CENTER$
300 PM$(PO+YP,PO+YP+20)=CURR$
310 SCR=SCR+5-PEEK(0)
320 POSITION 2,0:? #6;SCR;"  ";
330 IF PEEK(1)=0 THEN 740
340 ST=STICK(0)
350 LEFT= NOT PTRIG(1):RIGHT= NOT PTR
    IG(0):LR=LEFT+2*RIGHT
360 CURR$=CENTER$:POKE 53248,XP
370 IF LEFT THEN CURR$=LEFT$:IF LR<>O
    LR THEN SV=2:TI=5
380 IF RIGHT THEN CURR$=RIGHT$:IF LR<
    >OLR THEN SV=4:TI=5
390 IF TI>0 THEN TI=TI-1:SOUND 0,SV,0
    ,TI
400 IF LR=0 THEN SOUND 0,0,0,0:TI=0
410 XP=XP+LEFT-RIGHT:OLR=LR
420 UP=(ST=14 OR ST=10 OR ST=6):DOWN=
    (ST=5 OR ST=9 OR ST=13)
430 YP=YP-2*UP+2*DOWN:IF YP>200 THEN
    YP=200
440 IF YP<40 THEN YP=40
450 POKE 0,(YP-48)/48+1
460 IF PEEK(POPF)=0 THEN 300
470 WHICH=INT(LOG(PEEK(POPF))/LOG(2)+
    0.1):POKE 0,0
480 PM$(PO+YP,PO+YP+20)=ERASE$
490 POKE HITCLR,0:IF WHICH<>2 THEN 62
    0
500 REM POINTS
510 PTR=ASC(DLIST$(8))+256*ASC(DLIST$
    (9))
520 LINE=INT((YP-39)/8)+1
530 COL=INT((XP-49)/8)+1
```



A tricky maneuver between the flagpoles in "SKI!" for Atari computers.

400 + 400 = 600?



600? Seems ridiculous, and at first glance that's what you probably thought, but in fact our "equation" above represents a reality that exists now, with the Tara 400 keyboard for the Atari 400. Designed to provide the Atari 400 user with the hardware of tomorrow, today. Designed with an understanding of the essential superiority of a keyboard as a man–machine interface. Designed with the user in mind. For example, our keyboard does not attach to the 400 with a ribbon cable, but fits neatly into the original housing in 5 minutes, directly replacing the old membrane panel, and is styled to complement the lines of the computer itself. Sure, other keyboards have been sold, but who wants one that hangs off the computer, or whose keys fall off when you type on it? Our keys are actually gold-contact switches, offering increased reliability and performance, second to none. Coupled with the Tara 48K RAM expansion board, you can easily see how 400 + 400 = 600,* providing the user today with the hardware of tomorrow.

Why wait? This and many of the quality Tara products are waiting for you at your favorite dealer. Or call us for the Tara dealer nearest you. He'll be happy to show you how rudimentary it can all be with Tara.

Tara
Computer Products Inc.

Statler Building, 107 Delaware Ave.,
Suite 1610, Buffalo, N.Y. 14202 (716) 855-0133

2 Robert Speck Parkway, Suite 1540,
Mississauga, Ontario L42 1H8
(416) 273-6820

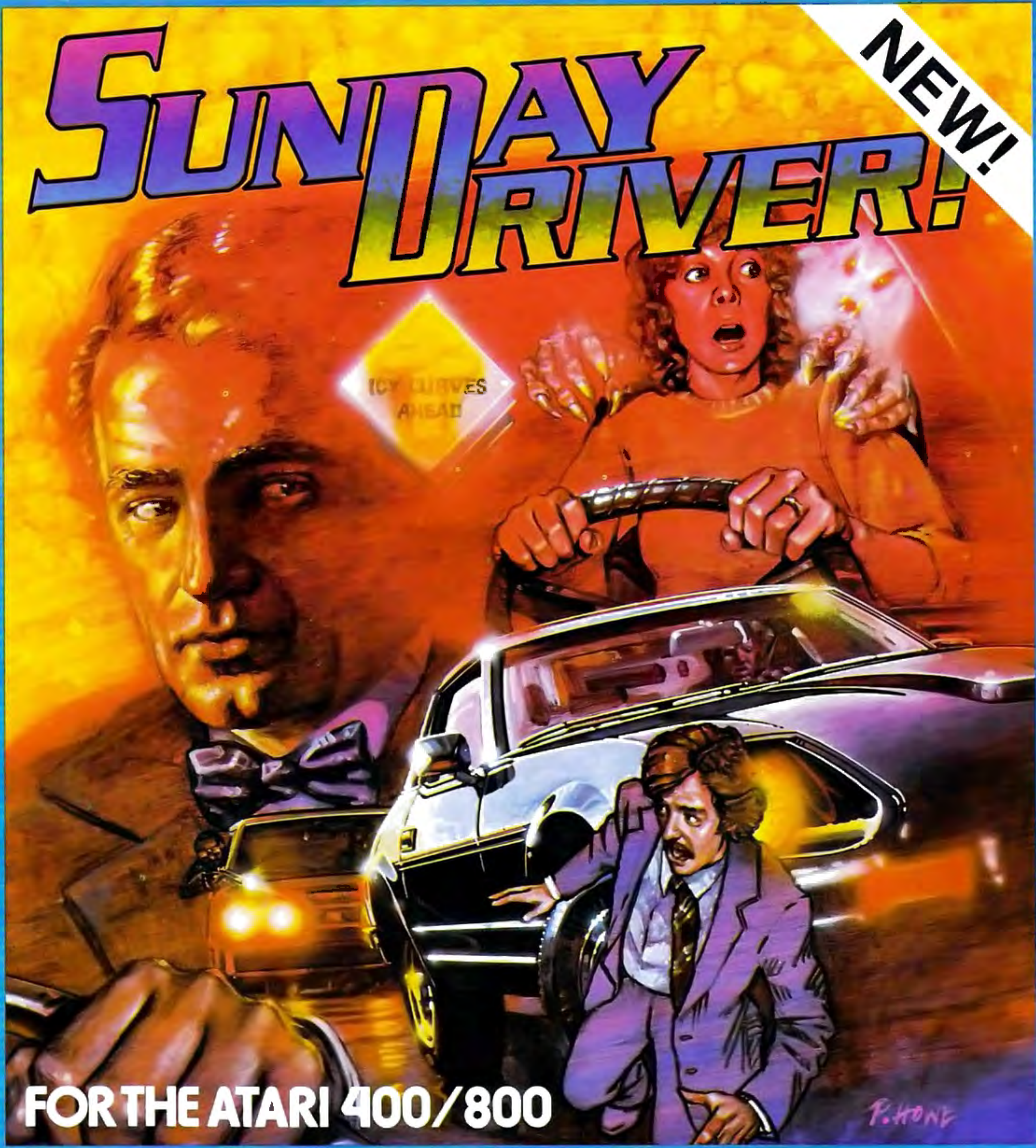
TARA PRODUCT LINE:
- Atari 400 Keyboard
- Atari 48K RAM
- Atari 32K RAM
- Apple 16K RAM

COMING SOON FROM TARA
- Apple 64K/128K RAM
- IBM 256K RAM
- Atari 64K RAM

*600 – *The Atari redesigned full keyboard version of the Atari 400.*

Atari and Atari 400 are registered trademarks of Warner Commmunications.

```
540 LOC=PTR+LINE*20+COL:SOUND 0,0,0,0
550 FOR I=0 TO 8:P=PEEK(LOC+DIR(I))
560 IF P<128 OR P>192 THEN 590
570 POKE LOC+DIR(I),0
580 SCR=SCR+(P=139)*50+(P=134)*100:I=
    8:NEXT I:GOTO 600
590 NEXT I:GOTO 300
600 FOR W=15 TO 0 STEP -1:SOUND 0,20,
    10,W:NEXT W
610 GOTO 300
620 REM  CRASH ! !
630 SOUND 0,0,0,0
640 PM$(P0+YP,P0+YP+20)=CRASH$
650 FOR W=100 TO 150 STEP 2:SOUND 0,W
    ,12,10:NEXT W
660 PM$(P0+YP,P0+YP+20)=ERASE$
670 YP=200
680 PM$(P0+YP,P0+YP+20)=CURR$
690 POKE 0,1:SOUND 0,0,0,0
700 XP=INT(72+90*RND(0)):POKE 53248,X
    P
710 IF PEEK(POPF)<>0 THEN POKE HITCLR
    ,0:GOTO 700
720 POKE HITCLR,0:SCR=SCR-50:IF SCR<0
     THEN SCR=0
730 GOTO 300
740 POSITION 8,0:? #6;"GAME OVER"
750 SOUND 0,0,0,0
760 SCREEN$(326,336)="press{,}start"
770 IF PEEK(53279)<>6 THEN 770
780 RUN
790 REM  Initialization
800 GRAPHICS 17:HILO=120:POKE 53248,0
    :POKE 0,0
810 SETCOLOR 4,0,12:SETCOLOR 1,12,8:S
    ETCOLOR 2,9,6:SETCOLOR 0,15,4
820 POPF=53252:HITCLR=53278:POKE HITC
    LR,0
830 SCRBASE=PEEK(106)-16:REM 4K BOUND
    ARY
840 PMBASE=SCRBASE-8:REM 2K BOUNDARY,
     DOUBLE-LINE RES
850 CHBASE=PMBASE:REM Fill up offset
    with characters
860 VVTP=PEEK(134)+256*PEEK(135):REM
    Variable Value Table
870 STARTP=PEEK(140)+256*PEEK(141)
880 A=SCRBASE*256-STARTP:GOSUB HILO:P
    OKE VVTP+2,LO:POKE VVTP+3,HI
890 POKE VVTP+4,1:POKE VVTP+5,16:REM
    LENGTH=4097
900 POKE VVTP+6,1:POKE VVTP+7,16
910 A=PMBASE*256-STARTP:GOSUB HILO:PO
    KE VVTP+10,LO:POKE VVTP+11,HI
920 POKE VVTP+12,1:POKE VVTP+13,8:REM
     LENGTH=2049
930 POKE VVTP+14,1:POKE VVTP+15,8
940 CHSET=CHBASE*256:IF PEEK(CHSET+9)
    <>6 THEN GOSUB 1510:GOSUB 1740
950 Z=USR(1638):REM DISABLE VBLANK
960 POKE 756,CHBASE:RESTORE 990
970 DIM T$(20),DLIST$(40),TOPLINE$(20
    )
980 A=ADR(DLIST$):GOSUB HILO:POKE 561
    ,HI:POKE 560,LO
990 DATA 112,112,112,70,0,0,102,0,0
1000 FOR I=1 TO 9:READ A:DLIST$(I)=CH
     R$(A):NEXT I
1010 FOR I=1 TO 20:DLIST$(I+9)=CHR$(6
     +32):NEXT I:DLIST$(30)=CHR$(6)
1020 DLIST$(31)=CHR$(65):DLIST$(32)=C
     HR$(PEEK(560)):DLIST$(33)=CHR$(P
     EEK(561))
1030 SCREEN$(1)=CHR$(0):SCREEN$(4095)
     =CHR$(0):SCREEN$(2)=SCREEN$:REM
     CLEAR OUT SCREEN
1040 TOPLINE$=SCREEN$
1050 A=ADR(TOPLINE$):GOSUB HILO
1060 DLIST$(5,5)=CHR$(LO):DLIST$(6,6)
     =CHR$(HI)
1070 POKE 88,LO:POKE 89,HI
1080 POSITION 8,0:? #6;"SKI!";
1090 SCREEN$(407,413)="finish"
1100 A=SCRBASE*256
1110 FOR L=24 TO 198
1120 A=A+20:GOSUB HILO:T$=CHR$(LO):T$
     (2)=CHR$(HI):DLIST$(8,9)=T$
1130 S=L*20+1:E=S+19
1140 LFLEN=INT(3*RND(0)+1)
1150 RTLEN=INT(3*RND(0)+1)
1160 FOR I=1 TO LFLEN
1170 Z=INT(3*RND(0))
1180 T$(I)=CHR$((72+Z)*(Z<2))
1190 NEXT I
1200 SCREEN$(S,S+LFLEN)=T$(1,LFLEN)
1210 FOR I=1 TO RTLEN
1220 Z=INT(3*RND(0))
1230 T$(I)=CHR$((72+Z)*(Z<2))
1240 NEXT I
1250 SCREEN$(E-RTLEN,E)=T$(1,RTLEN)
1260 REM obstacles
1270 IF RND(1)>0.05 THEN 1370
1280 IF L-LAST<10 THEN 1370
1290 LAST=L
1300 SKEW=1:IF RND(0)>0.5 THEN SKEW=-
     1
1310 SP=INT(7*RND(0)+5)
1320 SCREEN$(S+SP,S+SP)=CHR$(134)
1330 FOR I=0 TO 2
1340 RT=SP+I*40+SKEW*(I+1):LF=RT+20-S
     KEW*2
1350 SCREEN$(S+LF,S+LF)=CHR$(204):SCR
     EEN$(S+RT,S+RT)=CHR$(204)
1360 NEXT I:GOTO 1460
1370 IF RND(1)>0.1 THEN 1400
1380 SP=S+INT(13*RND(0)+5)
1390 SCREEN$(SP,SP)=CHR$(7):GOTO 1460
1400 IF RND(1)>0.1 THEN 1430
1410 SP=S+INT(13*RND(0)+5)
1420 SCREEN$(SP,SP)=CHR$(10):GOTO 146
     0
1430 IF RND(1)>0.1 THEN 1460
1440 SP=S+INT(13*RND(0)+5)
1450 SCREEN$(SP,SP)=CHR$(139):GOTO 14
     60
1460 NEXT L
1470 A=A+200:GOSUB HILO
1480 T$=CHR$(LO):T$(2)=CHR$(HI):DLIST
     $(8,9)=T$
1481 GOSUB 125:IF STRIG(0) THEN 1481
1490 A=USR(1536,ADR(DLIST$(8)),176)
1500 RETURN
1510 FOR I=0 TO 7:POKE CHSET+I,0:NEXT
      I
1520 FOR I=128 TO 471:POKE CHSET+I,PE
     EK(57344+I):NEXT I
1530 RESTORE 1570
1540 READ A:IF A=-1 THEN RETURN
1550 FOR J=0 TO 7:READ B:POKE CHSET+A
     *8+J,B:NEXT J
1560 GOTO 1540
1570 DATA 1,0,6,14,28,24,32,0,128
1580 DATA 6,192,192,220,20,28,7,5,7
1590 DATA 7,0,0,24,52,44,60,24,0
1600 DATA 8,16,56,56,124,124,254,16,1
     6
1610 DATA 9,8,28,62,62,62,8,8,0
1620 DATA 10,0,56,94,106,94,116,56,0
1630 DATA 11,0,119,69,117,21,119,0,0
1640 DATA 12,8,24,56,120,8,8,8,8
```


SUNDAY DRIVER!
NEW!
ICY CURVES AHEAD
FOR THE ATARI 400/800
P. HONE

```
1650 DATA 14,254,89,24,156,82,33,16,8
1660 DATA 13,0,0,0,48,88,56,16,186
1670 DATA 27,127,154,24,57,74,132,8,1
     6
1680 DATA 26,0,0,0,12,26,28,8,93
1690 DATA 29,186,89,24,154,170,198,65
     ,65
1700 DATA 28,0,0,24,60,60,24,24,60
1710 DATA 31,10,24,24,0,0,0,0,0
1720 DATA 30,1,18,36,74,161,18,156,77
1730 DATA -1
1740 RESTORE 1780:FOR I=1536 TO 1648:
     READ A:POKE I,A:NEXT I
1750 RETURN
1760 REM Following numbers are machin
     e language
1770 REM Type carefully!
1780 DATA 169,0,133,0,169,1
1790 DATA 141,99,6,169,8,141
1800 DATA 98,6,104,104,133,7
1810 DATA 104,133,6,104,104,133
1820 DATA 1,162,6,160,35,169
1830 DATA 7,32,92,228,96,216
1840 DATA 165,0,240,55,165,1
1850 DATA 240,51,206,99,6,173
1860 DATA 99,6,208,43,165,0
1870 DATA 141,99,6,206,98,6
1880 DATA 174,98,6,142,5,212
1890 DATA 208,27,160,0,56,177
1900 DATA 6,233,20,145,6,160
1910 DATA 1,177,6,233,0,145
1920 DATA 6,169,7,141,98,6
1930 DATA 141,5,212,198,1,76
1940 DATA 98,228,0,0,0,0
1950 DATA 104,162,228,160,98
1960 DATA 169,7,32,92,228,96
```

©

WE HAVE DONE IT AGAIN!

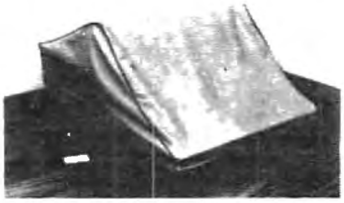
K-BYTE the company you have come to appreciate for such high quality games as Krazy Antiks, Krazy Shootout, K-star Patrol and Krazy Kritters, now brings you the same high quality wrapped up in one of the most advanced and informative instructional programs ever developed. Now, in your own home, you can teach yourself assembly language with **K-BYTE's 6502 ASSEMBLER LANGUAGE** program.

Upon completion of this self learning, self testing, menu-driven package, you will be able to enter the fascinating world of assembly language programming. This well rounded and versatile instructional package has to be experienced to be believed. Package includes disk and instruction booklet for use with your Atari Home Computer . . ., this software is distributed exclusively by

tele soft, inc.
P.O. BOX 3456, TROY, MICH 48084

Call toll free to place your order
1-800-255-2000
or in Michigan
1-800-742-4242.

When You Buy Quality . . .



Protect With Quality.

AVAILABLE FOR

Atari 800,400
CBM 8032/4032
Commodore 64
VIC-20
CBM 8050,4040
Atari 810
Atari 820
TRS 8011,111
Epson MX Series
Okidata ML Series
TRS 80 V-VIII

Leave your computer set up and ready for instant access; provide protection for your investment with a custom designed, professional touch for your home or office.

The best in its class, our new concept PROTECTIVE COVERS were designed to be functional with the user and observer in mind.

COMPARE THESE FEATURES:

- protects against dust, dirt and surface scratches
- unlike vinyl, plastic or nylon covers, static electricity is not a problem
- lint free, top quality broadcloth (65% polyester, 35% cotton) allows ventilation; minimizes risk of condensation
- durable; washable — needs no ironing; maintains proper size and shape
- designed, manufactured and packed in U.S.A.; comes with a warranty against defects in material and workmanship.
- available in Cranberry, Navy or Pewter (each piped in contrasting color) to compliment any decor.

AN IDEAL GIFT: HELP KEEP YOUR INVESTMENT LOOKING AND PERFORMING LIKE NEW!

— Custom Designers and Manufacturers of Computer Dust Covers —

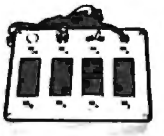
Covers for other popular hardware available / Visit your local computer store or contact us. ©1982 B.L.&W.

SHIP TO: *(Print)* ______________________
____
City ____________ State ________ Zip ________ Phone ________
Make ____________ Model ____________
CPU $18.00 $______
Printers $16.00 $______
Disk Drives $14.00 $______
Monogramming $______
(TN residents add .90 sales tax) $______
TOTAL $______
(Foreign - Pay in U.S. Funds)
Select Color: Navy ☐ Pewter ☐ Cranberry ☐
MONOGRAMMING: (Add $6.00 per cover, and allow 5 extra days for delivery. We cannot accept returns on monogrammed items.
PRINT INITIALS: ☐ ☐ ☐
Send Check or Money Order to: B.L. & W. - PO Box 381076, Memphis, TN 38138 - 901-754-4465

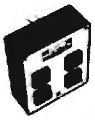
POWER LINE PROBLEMS?

SPIKE-SPIKER® ...THE SOLUTION

Protects, organizes, controls computers & sensitive electronic equipment. Helps prevent software "glitches", unexplained memory loss, and equipment damage. Filter models attenuate conducted RF interference. 120V, 15 Amps. Other models available. Ask for free literature.



DELUXE POWER CONSOLE $79.95
Transient absorber, dual 5-stage filter. 8 individually switched sockets, fused, main switch, & lite.



QUAD-II $59.95
Transient absorber. Dual 3 stage filter. 4 sockets, lite.

QUAD-I $49.95
Transient absorber, 4 sockets.

MINI-II $44.95
Transient absorber, 3 stage filter, 2 sockets.

MINI-I $34.95
Transient absorber, 2 sockets.

KALGLO®
6584 Ruch Rd., Dept. CP
Bethlehem, PA 18017

215-837-0700
Out of State Order Toll Free
800-523-9685

DEALER INQUIRIES INVITED • CODs add $3.00 + Ship.

Writing Effective Educational Programs

C Regena

When using the computer as a "teacher," you should consider several factors which are unique to this relatively new situation: how people best learn from machines. Computer tutorial programming techniques are illustrated with a geometry-teaching program for the TI-99/4A, the VIC, and the TRS-80 Color Computer (with 16K Extended BASIC).

One of the most natural uses for a microcomputer is in education. A student may use a tutorial (teaching) program to learn at his or her own pace, or use a drill program to get practice and experience.

Two capabilities of the computer are useful in educational programs. First, a computer does not get tired of repetition. A teacher or parent may get frustrated or not have time for many repetitions, but a computer has as much time to run the program as the student wishes. Second, the randomness feature can be used to change numbers each time a drill is performed or to mix up the order of questioning or to individualize instruction and practice.

Successful Tutorials

Either in programs you purchase or in programs you write yourself, several attributes should be incorporated.

Color graphics. Just a lot of words on a screen are hard to read and tiring. The program should not mimic a book. Graphics can be used appropriately to illustrate the concepts being taught.

Music, sound, and speech. Music can add variety and enhancement to a program to retain interest. Speech can be effective in reading, spelling, language programs, or in any programs for young children who may not yet be proficient in reading. Keep in mind the educational concept that the more senses the student uses (sight, sound, touch), the more efficient the learning process.

Positive and negative reinforcement. A short musical interlude, or perhaps a change in graphics, may be used for correct answers. A non-intimidating "uh-oh" tone or noise may be used for incorrect responses. Be careful that the incorrect answer doesn't result in an overly entertaining display, or the student will *want* to get the wrong answer. Avoid name-calling and "smart remarks" that are intended to be cute, but actually detract from educational programs.

Remediation. After correct answers the program should advance to higher levels of difficulty or to new concepts. After an incorrect response or two, the correct answer should be presented. Usually with a true-false or yes-no question, the student wouldn't need to be told the answer, but after an input answer which could be one of many answers, the answer is necessary.

Flexibility. The student should be able to advance quickly over sections she or he already knows and to repeat sections as needed (use menu screens or options). Also, any time the student needs to read something, she or he should be able to pause as long or as short a time as desired. It is frustrating to be reading when the program changes screens before you're ready – or to have to spend a certain length of time with a screen that you are already familiar with.

Careful use of INPUT. Keep in mind that any time a student needs to respond to an INPUT there is a greater chance of the program "crashing" or of graphics getting messed up. After an INPUT, be sure to check allowable limits. What happens if a string variable is entered when a numeric variable is expected, or vice versa? If you can arrange questions or choices to require a one-key-press response, your program will be easier for the student to use and have fewer chances for error.

If you must use INPUT, make sure the student knows what is expected, and ask for only one response at a time. Usually in scientific or higher mathematics programs you can assume the student will know what type of number is expected, but in elementary or beginning programs the student must be guided.

Plotting Points

"Coordinate Geometry" is a tutorial program written for the TI-99/4A, TRS-80 Color Computer (16K and Extended BASIC), and VIC-20 that teaches how to locate points on a rectangular coordinate grid. The program includes a section for positive and negative coordinates.

First a random example point is given with the coordinates labeled. Next a random point is given, and the student must press the numbers for the x-coordinate and the y-coordinate. The third step is to locate the point, given the coordinates. The TI-99/4A and TRS-80 CC have standard arrow keys. As an arrow key is pressed, the point moves in that direction. For the VIC-20 I chose to use the function keys since there are no standard arrow keys. F1 is up, F3 is left, F5 is right, and F7 is down.

To detect which key is pressed, the TI-99/4A uses CALL KEY (0,K,S), where K is the ASCII code of the key pressed. K is checked for (up), (left), D (right), and X (down), and any other key pressed is ignored. (Lines 1420-1690)

On the TRS-80 CC, INKEY$ is used to detect a key pressed. The character codes for the arrow keys are checked for the point to move. (Lines 1020-1180)

The VIC-20 needs the GET function to determine the key pressed. (Lines 57-72)

These programs use the graphics capabilities of the computers to illustrate the grid. A PRINT statement is used for the graphics because it is quicker than a series of CALL HCHAR or CALL VCHAR statements (TI-99/4A), SET commands (TRS-80 CC) or POKE commands (VIC-20). The grid is drawn several times in the program, so the instructions to draw it are in a subroutine.

A musical arpeggio is played for a correct answer, and an "uh-oh" is played for an incorrect answer. These procedures are also in subroutines and may be called from several places in the program.

After an incorrect answer, the correct answer is given. The student can study the problem, then press ENTER or RETURN, and another problem will be given. Numbers are chosen randomly. If the answer is correct, the student has the choice of another problem of the same type or of continuing the program.

Only key presses are necessary in the TRS-80 CC and VIC-20 versions and the first section of the TI-99/4A version. Later sections of the TI-99/4A program require INPUT for positive and negative coordinates and answers which may require a decimal.

If you wish to save typing time and effort and would like a copy of any of these programs, you may send $3, a blank cassette, and a self-addressed, stamped mailer. Be sure to specify which computer version.

C. Regena
P.O. Box 1502
Cedar City, UT 84720

Explanation of the Program: TI-99/4A

Line Numbers	
100	Defines random function.
110-460	Print title screen and define graphics characters.
490-510	Subroutine for incorrect answer music.
520-560	Subroutine for correct answer music.
570-610	Subroutine to print grid.
620-660	Subroutine to print "PRESS ENTER" and wait for response.
670-710	Subroutine to draw graphics.
720-870	Give random example of a point with coordinates.
880-910	Print instructions.
920-1240	Exercise for giving coordinates for a point.
1250-1280	Print instructions.
1290-1840	Exercise for locating a point with given coordinates.
1850-1900	Subroutine to randomly choose point.
1910-1940	Subroutine to draw vertical red line from point to x-axis.
1950-1980	Subroutine to draw horizontal red line from point to y-axis.

Explanation of the Program: TRS-80 CC

Line Numbers	
50	Branch to title screen.
60-180	Subroutine to print grid.
190-220	Subroutine to print "PRESS ENTER" and wait for response.
230-270	Subroutine to choose point and calculate graphics print position.
280-310	Subroutine to calculate coordinates to SET point.
320	Subroutine to play music for incorrect answer.
330	Subroutine to play music for correct response.
340-540	Draw title screen.
550-600	Define string variables for grid graphics; pause.
610-710	Draw grid, show example point.
720-900	Present problem to find coordinates for given point.
910-960	Print instructions.
970-1270	Present problem to locate point with given coordinates.
1280-1340	Print choice to have another problem, start over, or end program; branch appropriately.
1350	End.

Explanation of the Program: VIC-20

Line Numbers	
2	Prints title screen.
4	Defines volume and sound.
6-7	Define string variables for grid; delay.
8-26	Draw grid; show example point.
30-51	Present problem to give coordinates for given point.
52-54	Print instructions.
55-74	Present problem to locate point with given coordinates.
75-79	Print choice to have another problem, start over, or end program; branch appropriately.
80-83	Subroutine to label point and draw yellow lines from point to axes.
84	Subroutine to calculate graphics memory location.
86	Subroutine to play music for incorrect answer.
88	Subroutine for correct answer.
89	Subroutine to delay for music.
90-92	Subroutine to print grid.
94	Subroutine to get rid of buffered keys in GET function.
96-99	Subroutine to print "PRESS RETURN" and wait for response.
100	End.

Program 1: TI-99/4A Version

```
100 DEF R(N)=INT(N*RND+1)
```

NOT EVERYONE CAN TEACH THEIR ATARI™ NEW TRICKS...

WE MAKE USING AND LEARNING ABOUT COMPUTERS FUN!

PROGRAMMING GUIDE FOR BEGINNERS OR EXPERTS — MASTER MEMORY MAP.™ A 32 page book with hundreds of hints on how to use your computer. Over 500 memory locations! $6.95.

LEARN SOUND AND GRAPHICS with our exciting lessons called **TRICKY TUTORIALS.™** Each comes with a tape or disk full of examples, and a 12 to 64 page manual written in an easy to understand manner. **#1 DISPLAY LISTS** — Put several graphics modes on your screen at once. **#2 SCROLLING** — Move text or graphics smoothly up, down, sideways, or diagonally. **#3 PAGE FLIPPING** — Change TV screens as quickly as flipping pages in a book. **#4 BASICS OF ANIMATION** — A beginner's lesson in animation using PLOT, PRINT, and a surprise game. **#5 PLAYER MISSILE GRAPHICS** — Learn the basics of writing your own arcade games. **#6 SOUND & MUSIC** — Simple methods to play complete songs, with graphics. Includes PLAYER PIANO free! **#7 DISK UTILITIES** — 7 programs to help you use your disk drive. 32K. **#8 CHARACTER GRAPHICS** — The best editor available with examples using special characters YOU CREATE and ANIMATE. **#9 GTIA, GRAPHICS 9 to 11** — New tricks you can do with these 16 color modes. **#10 SOUND EFFECTS** — Many examples, from rainfall to laser blasts, with ample explanation. **#11 MEMORY MAP TUTORIAL** — 30 colorful examples of tricks your computer can do.

TUTORIALS cost only $19.95 each, except 5 and 7 which cost $29.95 each. 16K Tape/24K Disk required.

SPECIAL: Tutorials 1 through 6 in a binder for $99.95. SAVE $30.00!

USER SUBMITTED PROGRAMS

We sell many fine programs written by dedicated computer owners, such as **INSTEDIT, SPACE GAMES, MINI WORDPROCESSOR, DATA-BASE DIALER, PROTO'S ADVENTURES,** and many more.

OUR GUARANTEE: Your money back if unsatisfied!

NO LOCAL DEALER? CALL FOR A FREE CATALOG, OR ORDER DIRECT (CHARGE OR COD): 800-692-9520 OR (408) 476-4901

AVAILABLE FROM DEALERS WORLDWIDE.

Educational Software inc.

SOQUEL, CA

```
110 CALL CLEAR
120 PRINT"  *************************":"  *";TAB
    (25);"*":"  * COORDINATE GEOMETRY  *"

130 PRINT "  *";TAB(25);"*":"  ****************
    *********"::::TAB(11);"POINTS":::
140 A$="1818181818181818"
150 B$="181818FFFF181818"
160 C$="000000FFFF"
170 FOR C=96 TO 112 STEP 8
180 CALL CHAR(C,A$)
190 CALL CHAR(C+1,B$)
200 CALL CHAR(C+2,C$)
210 NEXT C
220 CALL CHAR(120,"183C7EFFFF7E3C18")
230 CALL CHAR(128,"183C7EFFFF7E3C18")
240 CALL CHAR(129,"00000000030C30C")
250 CALL CHAR(130,"030C30C")
260 CALL CHAR(64,"3C4299A1A199423C")
270 CALL CHAR(94,"00102828444482FE")
280 CALL COLOR(10,5,1)
290 CALL COLOR(11,10,1)
300 CALL COLOR(12,11,1)
310 CALL COLOR(13,7,1)
320 CALL CHAR(140,"101010101010101")
330 CALL CHAR(141,"000000FF")
340 CALL CHAR(142,"101010F")
350 CALL COLOR(14,13,1)
360 A$="`  h  h  h  h  h  h  h"
370 B$="ajjijjijjijjijjijjijjji"
380 C$="abbabbabbabbabbabbabbabb"
440 CALL CLEAR
450 CALL COLOR(2,2,1)
460 GOTO 720
490 CALL SOUND(100,330,2)
500 CALL SOUND(100,262,2)
510 RETURN
520 CALL SOUND(100,262,2)
530 CALL SOUND(100,330,2)
540 CALL SOUND(100,392,2)
550 CALL SOUND(200,523,2)
560 RETURN
570 CALL CLEAR
580 PRINT "    Y":"    ";A$:"    ";A$:"   4";B
    $:"    ";A$:"    ";A$:"   3";B$
585 PRINT "    ";A$:"    ";A$:"   2";B$
590 PRINT "    ";A$:"    ";A$:"   1";B$:"    "
    ;A$:"    ";A$:"   0";C$
595 PRINT "    0  1  2  3  4  5  6  7":::
600 CALL HCHAR(20,31,88)
610 RETURN
620 PRINT TAB(16);"PRESS<ENTER>";
630 CALL KEY(0,K,S)
640 IF K<>13 THEN 630
650 CALL HCHAR(24,18,32,13)
660 RETURN
720 GOSUB 570
730 PRINT "THE LOCATION OF A POINT IS":"GIVEN
    BY ITS X-COORDINATE"
735 PRINT "AND Y-COORDINATE (X,Y)"
740 RANDOMIZE
750 X=R(5)
760 GOSUB 1850
770 GOSUB 1910
780 CALL HCHAR(Y1,X1+2,40)
790 CALL HCHAR(Y1,X1+3,48+X)
800 CALL HCHAR(Y1,X1+4,44)
810 GOSUB 1950
820 CALL HCHAR(Y1,X1+5,48+Y)
830 CALL HCHAR(Y1,X1+6,41)
840 PRINT :"WANT ANOTHER EXAMPLE? (Y/N)";
850 CALL KEY(0,K,S)
860 IF K=89 THEN 720
870 IF K<>78 THEN 850
880 CALL CLEAR
890 PRINT "YOU WILL BE SHOWN A POINT."::"PRESS
     THE NUMBER OF THE"
895 PRINT :"X-COORDINATE THEN THE"
900 PRINT :"NUMBER OF THE Y-COORDINATE."::::::
    :
910 GOSUB 620
920 CALL CLEAR
930 GOSUB 570
940 PRINT :::
950 RANDOMIZE
960 GOSUB 1850
970 CALL HCHAR(21,7,40)
980 CALL HCHAR(21,9,44)
990 CALL HCHAR(21,11,41)
1000 CALL KEY(0,K,S)
1010 CALL HCHAR(21,8,63)
1020 CALL HCHAR(21,8,32)
1030 IF S<1 THEN 1000
1040 CALL HCHAR(21,8,K)
1050 X2=K
1060 CALL KEY(0,K,S)
1070 CALL HCHAR(21,10,63)
1080 CALL HCHAR(21,10,32)
1090 IF S<1 THEN 1060
1100 CALL HCHAR(21,10,K)
1110 Y2=K
1120 IF X2<>X+48 THEN 1190
1130 IF Y2<>Y+48 THEN 1190
1140 GOSUB 520
1150 PRINT "PRESS":"1 FOR SAME TYPE PROBLEM":"2
      TO CONTINUE PROGRAM";
1160 CALL KEY(0,K,S)
1170 IF K=49 THEN 920
1180 IF K=50 THEN 1250 ELSE 1160
1190 GOSUB 490
1200 GOSUB 1910
1210 GOSUB 1950
1220 PRINT "THE CORRECT ANSWER IS (";STR$(X);",
     ";STR$(Y);")"
1230 GOSUB 620
1240 GOTO 920
1250 CALL CLEAR
1260 PRINT "NOW YOU WILL BE GIVEN THE"::"COORDI
     NATES."
1265 PRINT :"USE THE ARROW KEYS TO MOVE"::"THE
     POINT TO THE CORRECT"
1270 PRINT :"PLACE, THEN PRESS <ENTER>.":::::
1280 GOSUB 620
1290 CALL CLEAR
1300 GOSUB 570
1310 RANDOMIZE
1320 X=R(7)
1330 Y=R(4)
1340 X1=7+3*X
1350 Y1=17-3*Y
1360 PRINT :"PLOT (";STR$(X);",";STR$(Y);")"::
1370 C1=97
1380 A=17
1390 A1=A
1400 B=7
1410 B1=B
1420 CALL HCHAR(A,B,120)
1430 CALL KEY(0,K,S)
1440 IF S<1 THEN 1430
1450 IF K=13 THEN 1700
1460 IF K<>69 THEN 1510
1470 IF A=5 THEN 1430
1480 CALL GCHAR(A-3,B,C)
1490 A=A-3
1500 GOTO 1650
1510 IF K<>88 THEN 1560
1520 IF A=17 THEN 1430
1530 CALL GCHAR(A+3,B,C)
1540 A=A+3
1550 GOTO 1650
1560 IF K<>83 THEN 1610
1570 IF B=7 THEN 1430
1580 CALL GCHAR(A,B-3,C)
1590 B=B-3
1600 GOTO 1650
1610 IF K<>68 THEN 1430
1620 IF B=28 THEN 1430
1630 CALL GCHAR(A,B+3,C)
1640 B=B+3
1650 CALL HCHAR(A1,B1,C1)
```

```
1660 A1=A
1670 B1=B
1680 C1=C
1690 GOTO 1420
1700 CALL SOUND(150,1397,2)
1710 CALL GCHAR(Y1,X1,C)
1720 IF C=120 THEN 1790
1730 GOSUB 490
1740 CALL HCHAR(Y1,X1,128)
1750 GOSUB 1910
1760 GOSUB 1950
1770 GOSUB 620
1780 GOTO 1290
1790 GOSUB 520
1800 PRINT "PRESS":"1 FOR SAME TYPE PROBLEM":"2
     TO CONTINUE PROGRAM";
1810 CALL KEY(0,K,S)
1820 IF K=49 THEN 1290
1830 IF K<>50 THEN 1810
1840 END
1850 X=R(7)
1860 Y=R(4)
1870 X1=7+3*X
1880 Y1=17-3*Y
1890 CALL HCHAR(Y1,X1,128)
1900 RETURN
1910 FOR I=Y1+1 TO 17
1920 CALL HCHAR(I,X1,112)
1930 NEXT I
1940 RETURN
1950 FOR I=X1-1 TO 7 STEP -1
1960 CALL HCHAR(Y1,I,114)
1970 NEXT I
1980 RETURN
```

Program 2: TRS-80 Color Computer Version

```
50 GOTO 340
60 CLS:PRINT@1,"Y";A$
70 PRINT@33,"3";B$
80 PRINT@66,A$
90 PRINT@98,A$
100 PRINT@129,"2";B$
110 PRINT@162,A$
120 PRINT@194,A$
130 PRINT@225,"1";B$
140 PRINT@258,A$
150 PRINT@290,A$
160 PRINT@321,"0";B$
170 PRINT@354,"0{4 SPACES}1
    {4 SPACES}2{4 SPACES}3{4 SPACES}4
    {4 SPACES}5  X"
180 PRINT:RETURN
190 PRINT @496,"PRESS <ENTER>";
200 R$=INKEY$:IF R$=""THEN 200
210 IF ASC(R$)<>13 THEN 200
220 RETURN
230 X=RND(5)
240 Y=RND(3)
250 A=322-96*Y+X*5
260 PRINT @A,CHR$(159);CHR$(159);
270 RETURN
280 B=4+X*10:C=20-6*Y
290 FOR I=C+2 TO 20:SET(B,I,4):SET(B+
    2,I,4):NEXT
300 FOR I=B-2 TO 4 STEP -1:SET(I,C,4)
    :NEXT
310 RETURN
320 PLAY "L16;O2;E;C":RETURN
330 PLAY "L16;O2;CEG;L8;O3;C":RETURN
340 PMODE 4,1:PCLS:SCREEN 1,0
350 DRAW "S8;BM20,65"
360 DRAW "NU6;R4;U1;BM+3,+1"
370 DRAW "BM+1,0;H1;U4;E1;R2;F1;D4;G1
    ;L2;BM+6,0"
380 DRAW "BM+1,-0;H1;U4;E1;R2;F1"
390 DRAW "BM+0,+4;G1;L2;BM+6,0"
400 DRAW "U4;E2;F2;D2;NL4;D2;BM+3,0"
410 DRAW "BM+2,+0;U6;NL2;R2;BM+3,+6"
420 DRAW "BM+1,0;R1;NR1;U6;NL1;R1;BM+
    4,+6"
430 DRAW "U6;F1;D1;F2;D1;F1;NU6;BM+3,
    0"
440 DRAW "BM+1,-0;H1;U4;E1;R2;F1"
450 DRAW "BM+0,+2;NL1;D2;G1;L2;BM+6,0
    "
460 DRAW "BM+7,0;U6;R3;F1;D1;G1;L3;BM
    +7,3"
470 DRAW "BM+1,0;H1;U4;E1;R2;F1;D4;G1
    ;L2;BM+6,0"
480 DRAW "BM+1,0;R1;NR1;U6;NL1;R1"
490 DRAW "BM+4,+6;U6;F1;D1;F2;D1;F1;N
    U6;BM+3,0"
500 DRAW "BM+2,+0;U6;NL2;R2;BM+3,6"
510 DRAW "BM+0,-1;F1;R2;E1;U1;H1;L2;H
    1;U1;E1;R2;F1"
520 FOR I=104 TO 168 STEP 16:LINE(20,
    I)-(236,I),PSET:NEXT
530 FOR I=28 TO 220 STEP 16:LINE(I,10
    0)-(I,172),PSET:NEXT
540 CIRCLE(76,136),4:CIRCLE(156,152),
    4
550 C$=CHR$(175)
560 D$=C$+C$+C$+C$+C$:E$="{3 SPACES}"
    +C$+C$
570 A$=E$:B$=D$
580 FORI=1TO4:A$=A$+E$:B$=B$+D$:NEXT
590 A$=C$+C$+A$:B$=C$+C$+B$+C$+C$
600 FOR D=1 TO 5000:NEXT
610 GOSUB 60
620 PRINT"A POINT HAS AN X-COORDINATE
    "
630 PRINT"AND A Y-COORDINATE (X,Y)."
640 X=RND(4):GOSUB 240
650 X$=RIGHT$(STR$(X),1):Y$=RIGHT$(ST
    R$(Y),1)
660 PRINT@A+2,"("+X$+","+Y$+")";
670 GOSUB 280
680 PRINT@480,"ANOTHER EXAMPLE? (Y/N)
    ";
690 R$=INKEY$:IF R$=""THEN 690
700 IF R$="Y" THEN 610
710 IF R$<>"N" THEN 690
720 GOSUB 60
730 GOSUB 230
740 PRINT@416,"WHAT ARE THE COORDINAT
    ES?"
750 PRINT"{5 SPACES}(?,?)"
760 X1$=INKEY$:IF X1$="" THEN 760
770 PRINT @454,X1$;
780 Y1$=INKEY$:IF Y1$="" THEN 780
790 PRINT @456,Y1$;
800 IF X<>VAL(X1$) THEN 820
810 IF Y=VAL(Y1$) THEN 850
820 GOSUB 320:GOSUB 280
830 PRINT@460,"LOCATION IS (";RIGHT$(
    STR$(X),1);",";RIGHT$(STR$(Y),1);
    ")"
840 GOSUB 190:GOTO 720
850 GOSUB 330:PRINT@460,"CORRECT!":GO
    SUB 190
860 PRINT@496,"{13 SPACES}";
870 PRINT @416,"PRESS 1 FOR SAME TYPE
     PROBLEM{9 SPACES}2 TO CONTINUE P
    ROGRAM"
880 R$=INKEY$:IF R$="" THEN 880
890 IF R$="1" THEN 720
900 IF R$<>"2" THEN 880
910 CLS
920 PRINT@66,"YOU WILL BE GIVEN THE":
    PRINT"  COORDINATES."
```

DYNACOMP

THE LEADING DISTRIBUTOR OF

Microcomputer Software for

- APPLE
- ATARI
- NEC PC 8000
- NORTHSTAR
- OSBORNE
- PET/CBM
- TRS-80
- SUPERBRAIN
- CP/M Disks & Diskettes

DYNACOMP offers a comprehensive collection of software in every category:

- ☑ Business/Utilities
- ☑ Personal Finance
- ☑ Education
- ☑ Statistics
- ☑ Engineering
- ☑ Adventure
- ☑ Games
- ☑ Thought Provokers
- ☑ Card Games
- ☑ And Much Much More!

DYNACOMP provides friendly, accessible customer service through our highly qualified and knowledgeable staff. We are as near as your telephone!

DYNACOMP'S prices are highly competitive and we promise prompt processing of every order!

***DYNACOMP**, the leading distributor of microcomputer software spans the globe in sales. We currently distribute software to over 50 countries. As we have grown, we have expanded our product line, while still maintaining a high level of quality customer support. This is confirmed by our many repeat customers, the consistent top reviews in leading industry publications, and program display on network television. We are proud of our variety (currently in excess of 150 titles!), quality and service. You can count on **DYNACOMP**.*

Write For A Free, Detailed Catalog:

DAYTIME TOLL FREE ORDER PHONES:
(800) 828-6772
(800) 828-6773

DYNACOMP, INC.
1427 Monroe Avenue
Rochester, NY 14618

24-HOUR MESSAGE & ORDER PHONE:
(716) 442-8731
OFFICE HOTLINE
(9-5 EST) (716) 442-8960


GIN RUMMY

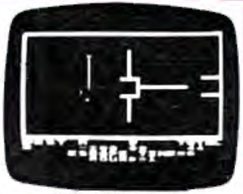

FOURIER ANALYZER

FOREST FIRE


CHECKERS 3.0


TEACHER'S AIDE


MAIL MASTER


ESCAPE FROM VOLANTIUM


BREAKUP


INTRUDER ALERT

PERSONAL FINANCE SYSTEM


CRYSTALS

```
930 PRINT@162,"USE THE ARROW KEYS TO
    MOVE"
940 PRINT"  THE POINT TO THE CORRECT"
950 PRINT"  LOCATION, THEN PRESS <ENT
    ER>."
960 GOSUB 190
970 CLS:GOSUB 60
980 X=RND(5):Y=RND(3)
990 PRINT@416,"LOCATE (";RIGHT$(STR$(
    X),1);",";RIGHT$(STR$(Y),1);")"
1000 B1=4:C1=20
1010 B=4:C=20
1020 SET(B,C,2):SET(B+2,C,2)
1030 SOUND 227,2
1040 R$=INKEY$:IF R$=""THEN 1040
1050 IF ASC(R$)=13 THEN 1190
1060 IF ASC(R$)<>9 THEN 1090
1070 B1=B+10:IF B1>54 THEN B1=54
1080 GOTO 1170
1090 IF ASC(R$)<>8 THEN 1120
1100 B1=B-10:IF B1<4 THEN B1=4
1110 GOTO 1170
1120 IF ASC(R$)<>94 THEN 1150
1130 C1=C-6:IF C1<2 THEN C1=2
1140 GOTO 1170
1150 IF ASC(R$)<>10 THEN 1040
1160 C1=C+6:IF C1>20 THEN C1=20
1170 SET(B,C,3):SET(B+2,C,3)
1180 B=B1:C=C1:GOTO 1020
1190 BB=4+X*10:CC=20-6*Y:IF B<>BB THE
     N 1210
1200 IF C=CC THEN 1260
1210 GOSUB 320
1220 SET(BB,CC,4)
1230 SET(BB+2,CC,4)
1240 GOSUB 280
1250 GOSUB 190:GOTO 970
1260 GOSUB 330:PRINT @448,"CORRECT!":
     GOSUB 190
1270 PRINT@496,"{13 SPACES}";
1280 PRINT @416,"PRESS 1 FOR SAME TYP
     E PROBLEM"
1290 PRINT"{6 SPACES}2 TO START PROGR
     AM OVER"
1300 PRINT@486,"3 TO END PROGRAM";
1310 R$=INKEY$:IF R$=""THEN 1310
1320 IF R$="1" THEN 970
1330 IF R$="2" THEN 610
1340 IF R$<>"3" THEN 1310
1350 CLS:END
```

Program 3: VIC-20 Version

```
2 PRINT"{CLEAR}{05 DOWN}    {BLK}L
   OCATING POINTS"
4 POKE36878,15:S=36876
6 A$="{GRN}  -  -  -  -  -  -":B$="{GRN}
  +**+**+**+**+**+***"
7 FORI=1TO3000:NEXT
8 GOSUB90
10 PRINT"A POINT IS LOCATED BY AN
   X-COORDINATE AND A Y-COORD
   INATE (X,Y)."
12 X=INT(4*RND(0))+1:Y=INT(3*RND(0
   ))+1
14 GOSUB84:POKEC,81:POKEC1,2
18 GOSUB80
22 PRINT:PRINT"{GRN}ANOTHER EXAMPL
   E? (Y/N){BLU}";:GOSUB94
24 GETR$:IFR$="Y"THEN8
26 IFR$<>"N"THEN24
30 GOSUB90:PRINT"WHERE IS THE POIN
   T?":PRINT:PRINT"{BLK}({
   RED}?{BLK},{RED}?{BLK})";
31 X=INT(6*RND(0)):Y=INT(5*RND(0))
   :GOSUB84:POKEC,81:POKEC1,2

32 GOSUB94
33 GETR$:IFR$=""THEN33
34 IFASC(R$)<48ORASC(R$)>57THEN33
35 POKE8099,ASC(R$):POKE38819,2:X$
   =R$
36 GETR$:IFR$=""THEN36
37 IFASC(R$)<48ORASC(R$)>57THEN36
38 POKE8101,ASC(R$):POKE38821,2:Y$
   =R$
39 IFVAL(X$)<>XTHEN42
40 IFVAL(Y$)=YTHEN48
42 GOSUB86:PRINT"  {BLK}(";RIGHT$(
   STR$(X),1);",";RIGHT$(STR$
   (Y),1);")":GOSUB80:GOSUB96
   :GOTO30
48 GOSUB88:PRINT"{GRN}PRESS":PRINT
   "1 SAME TYPE PROBLEM   2 C
   ONTINUE PROGRAM";:GOSUB94
50 GETR$:IFR$="1"THEN30
51 IFR$<>"2"THEN50
52 PRINT"{CLEAR}{BLU}YOU WILL BE G
   IVEN THE COORDINATES (X,Y)
    ":PRINT:PRINT"PRESS F1 TO
    MOVE UP"
53 PRINT:PRINTTAB(6);"F3 TO MOVE L
   EFT":PRINT:PRINTTAB(6);"F5
    TO MOVE RIGHT":PRINTTAB(6
   );"F7 TO MOVE DOWN"
54 PRINT:PRINT"MOVE THE POINT TO T
   HE CORRECT LOCATION,     T
   HEN PRESS <RETURN>.{03 DOW
   DOWN}":GOSUB96
55 GOSUB90:X=INT(6*RND(0)):Y=INT(5
   *RND(0)):A=0:B=0
56 PRINT"LOCATE (";RIGHT$(STR$(X),
   1);",";RIGHT$(STR$(Y),1);"
   )";:GOSUB94
57 POKES,231:GOSUB89:P=7990-B*66+3
   *A:POKEP,81:POKEP+30720,3
58 GETR$:IFR$=""THEN58
59 IFASC(R$)=13THEN73
61 IFASC(R$)<>133THEN64
62 B=B+1:IFB>4THENB=4
63 GOTO72
64 IFASC(R$)<>134THEN67
65 A=A-1:IFA<0THENA=0
66 GOTO72
67 IFASC(R$)<>135THEN70
68 A=A+1:IFA>5THENA=5
69 GOTO72
70 IFASC(R$)<>136THEN58
71 B=B-1:IFB<0THENB=0
72 POKEP,91:POKEP+30720,5:GOTO57
73 GOSUB84:IFP=CTHEN75
74 GOSUB86:POKEC,81:POKEC1,2:GOSUB
   96:GOTO52
75 GOSUB88:PRINT"{GRN}PRESS":PRINT
```

GAMES WITH APPEAL.

FIREBIRD AND EMBARGO ARE NOW AVAILABLE ON CARTRIDGE.
WRITE TO GEBELLI SOFTWARE INC., 1787 TRIBUTE ROAD, SUITE G, SACRAMENTO, CA 95815.
FOR MORE INFORMATION (916) 925-1432.

PERIPHERALS UNLIMITED

Fantastic Prices!

Our fast service, product selection and our customers' satisfaction make us #1.

NEC Printers

7710	Spinwriter R/O	$2295
7720	Spinwriter KSR	$2649
7730	Spinwriter R/O	$2295
7700	Bi-directional Tractor	$250
7700	Ribbons	$5
3510	Spinwriter	$1689
3515	Spinwriter	$1699
3530	Spinwriter	$1689
3550	Spinwriter	$2149
3500	Bi-directional Tractor	$225
3500	Ribbons	$14
NEC Thimbles — All Styles		$18

NEC Dot Matrix

PC-8023	A-C	$474
PC-8023	Ribbons	$14

Okidata Printers

Okidata Microline 82A	$439
Okidata Microline 83A	$679
Okidata Microline 84P	$1069
Okidata Microline 84S	$1099
Tractor (Oki 80 & 82 Only)	$60
Okidata Okigraph	$85

Call for prices on ribbons

Diablo Printers

Diablo 620	$1349
Diablo 620 Bi-Directional Tractor	$175
Diablo 630 RO	$1999
Diablo 630 KSR	$2700
Diablo 630 Bi-Directional Tractor	$275
RS232 Cable	$35

Call for prices on ribbons

NEC Monitors

NEC JB1201	GRN Phosphor	$149
NEC JC1201	Color	$339

Epson Printers

MX-80 w/Graphtrax Plus	$469
MX-80FT w/Graphtrax Plus	$529
MX-100 (15″ Carriage)	$684
Grappler Plus Interface	$129
MX-80 Ribbons	$12
MX-100 Ribbons	$18

Call for prices on interfaces & cables

IDS Printers

IDS Microprism	$539
IDS Prism 132	$1449
IDS Prism 132 w/color	$1659
IDS Grappler	$129

Amdek

Amdek 12″ 300 GRN Phosphor	$149
Amdek 13″ Color I	$319
Amdek 13″ Color II	$739
Amdek 13″ Color III	$429
Amdisk 3 (3″ Dual Microfloppy Storage for APPLE II & IBM PC)	$749

For service, quality and delivery
Call toll free

1-800-343-4114

Ordering Information: Our order lines are open 9 A.M. to 5:30 P.M. EST Monday through Friday. Phone orders are welcome; free use of Mastercard and VISA. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision. C.O.D.'s accepted. All U.P.S. shipments are subject to a shipping charge of 1% of the total purchase, with a minimum charge of $5.00.

PERIPHERALS UNLIMITED
(617) 655-7400
62 North Main Street, Natick, MA 01760

```
    " 1 SAME TYPE PROBLEM   2 ~
    START PROGRAM OVER  3 END ~
    PROGRAM";:GOSUB94
76 GETR$:IFR$="1"THEN52
77 IFR$="2"THEN8
78 IFR$="3"THEN100
79 GOTO76
80 FORI=C1+1TOC1+5:POKEI,2:NEXT
81 POKEC+1,40:POKEC+2,X+48:POKEC+3
    ,44:POKEC+4,Y+48:POKEC+5,4
    1
82 FORI=C1+22TO38710+X*3STEP22:POK
    EI,7:NEXT
83 FORI=C1-1TOC1-X*3STEP-1:POKEI,7
    :NEXT:RETURN
84 C=7990-Y*66+3*X:C1=C+30720:RETU
    RN
86 POKES,159:GOSUB89:POKES,135:GOS
    UB89:RETURN
88 PRINT"{RED} CORRECT!":POKES,195
    :GOSUB89:POKES,207:GOSUB89
    :POKES,215:GOSUB89:POKES,2
    25:GOSUB89
89 FORI=1TO150:NEXT:POKES,0:RETURN

90 PRINT"{CLEAR}{BLK}  Y":PRINTA$:
    PRINT" {BLK}4";B$:PRINTA$:
    PRINTA$:PRINT" {BLK}3";B$:
    PRINTA$:PRINTA$:PRINT" {
    BLK}2";B$:PRINTA$:PRINTA$:
    PRINT" {BLK}1";B$:PRINTA$:
    PRINTA$
92 PRINT" {BLK}0";B$;"{BLK}X  0  1
      2  3  4  5{BLU}":PRINT:R
    ETURN
94 FORI=1TO10:GETR$:NEXT:RETURN
96 PRINT:PRINT:PRINT"{GRN}PRESS RE
    TURN";:GOSUB94
97 GETR$:IFR$=""THEN97
98 IFASC(R$)<>13THEN97
99 RETURN
100 PRINT"{CLEAR}{BLU}":END
```

Beginners: See special program typing instructions on page 249.

An Intriguing
New Release from
COMPUTE! Books:

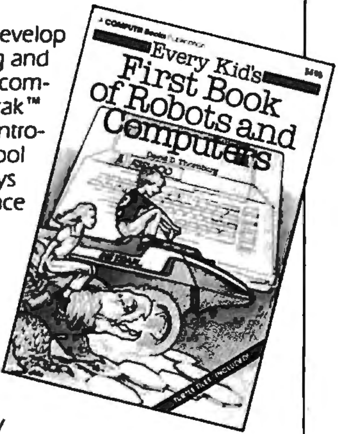
Every Kid's First Book Of Robots And Computers

By David Thornburg

From the author's preface:

"This book allows children to develop skills in computer programming and geometry through the use of a commonly available toy – the Big Trak™ robot vehicle. Programming is introduced as the communication tool through which the child conveys instructions to the machine. Once the machine's language limitations are understood, it can be made to follow any procedure which has been entered by the user.

"Our use of turtle commands as the programming language mirrors the process-based descriptions commonly used by children. For example, a child is likely to describe a nearby location, such as a friend's house, by a procedure (Go two blocks, turn right, go another block, turn left,...). Because turtle geometry has been incorporated as the graphics environment in several computer languages available for the popular desk-top computers, these programming ideas can continue to be used as the child learns to operate other computers."



In *Every Kid's First Book Of Robots And Computers*, author David Thornburg conveys a uniquely exciting learning experience for children, parents, and teachers. The book uses Big Trak, PILOT/LOGO type languages, and Turtle Tiles™ to explore the concepts and techniques of robot/computer programming. Turtle Tiles, included with every book, are designed to provide hands-on programming experience to children without access to a Big Trak or a personal computer. Additionally, the Tiles can be used in conjunction with either of these items to share and reinforce the exercises in the book.

Ask for
Every Kid's First Book Of Robots And Computers
at your computer retailer, local bookstore,
or order directly from:

COMPUTE! Books
P.O. Box 5406
Greensboro, NC
27403

For Fastest Service,
Call Toll Free
800-334-0868
In NC 919-275-9809

$4.95 plus $1.00 shipping and handling.
ISBN 0-942386-05-1. Perfect bound, 96 pages plus Turtle Tiles™. Fully illustrated.

Dealer and educator quantity discounts are available.

Big Trak is a trademark of the Milton Bradley Company.
Turtle Tiles are a trademark of David D. Thornburg and Innovision, Inc.

MASTERMAZE

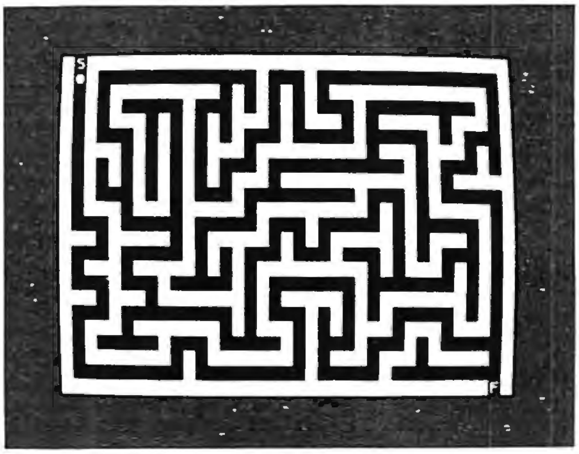
Mazing In Three Dimensions

Kenneth S Szajda

MASTERMAZE, possibly the most challenging game ever printed in **COMPUTE!**, *uses a special Atari technique, page-flipping, to create a maze with up to 32 levels. For VIC, 64, PET/CBM, and other Microsoft BASIC computers, we include the maze-generating subroutine which is at the heart of this spectacular game for the Atari. If you are of very sound mind, you can even struggle down through an invisible, multi-level maze, but the author cautions that you get the consent of a psychologist before attempting it.*

Requires an Atari with 16K RAM memory.

Almost everyone finds mazes an enjoyable challenge. If you are like me, however, you feel that mazes take only minutes to solve and can soon become monotonous. After I saw Charles Bond's maze generator routine (**COMPUTE!**, December 1981, #19), my first thoughts were to make a simple maze game. The problem, though, was that all I had done was replace the paper with my television screen and the pencil with my joystick; the boredom remained. That is why I chose to use my personal computer to its fullest, having it perform functions impractical with paper and pencil. This three-dimensional maze game is the result.



Preparing to start a one-level maze in "Mastermaze."

One Level At A Time

First, let me explain how to use the program. Since it is impractical and nearly impossible to display an entire three-dimensional maze at one time, the program displays only the level that the player is on, which is really of no consequence to the user, but makes life a lot easier for the programmer. What we are doing is analogous to a book: instead of showing the entire book in one screen, we are displaying only one page at a time – the page that is being read.

After you have typed in the entire program, the first thing you must do is SAVE a copy to tape or disk. This program plays around with the display list, so typos could cause problems and possibly crash your computer.

Once a copy has been SAVEd, type RUN and you will be prompted with the question "# OF LEVELS?". What the computer really wants to know is how deep you would like your maze to be. In other words, the computer wants you to tell it one more than the minimum number of down "tunnels" the user must pass through before he reaches the end. In terms of our book analogy, the computer is asking for the number of pages in the book.

For a first-time user, I suggest three or four levels at most. The minimum number of levels is one (which is just a standard maze), and the maximum number is 32. The maximum number of levels on any machine with less than 48K is approximately eight less than the total number of kilobytes of memory you have. For a 48K machine, the BASIC cartridge disables the top 8K, and the program uses the bottom 8K, making the maximum number of levels equal to 32.

Once you have entered your desired number of levels, the program will ask "INVISIBLE (1) OR VISIBLE (2)?". All you are doing here is entering the number to be POKEd into CHACT (location 755, hex 2F3), which tells the OS what to do with bit seven of screen output characters. POKEing a one into CHACT causes bit seven to be ignored on all screen output, and all inverse video characters appear only as blank spaces. CHACT usually contains a two, so entering two will not change screen output.

If you try invisibility, beware. Although the screen appears to be blank, the walls to the maze are still there. The one in CHACT does not change bit seven of screen characters – it just changes bit seven's function in the display handler.

Now that the program has the necessary data, the computer begins to build the maze to your specifications. Before work actually begins, the screen informs you of the work to be done. After this short delay, the screen is turned off and the

New for the New Year

#6279 Introduction to Computer Animation
(Wadsworth) Now you can produce amazing computer graphics — even if you can't draw a straight line! Learn to draw lines and shapes, make graphs, draw pictures, and do animations with popular microcomputers such as the Apple II, the TRS-80, and the PET. Takes a step-by-step approach to using low-resolution graphics. Many program listings illustrate graphic techniques using a minimum of mathematics. **$9.95**

#6256 Software Toolkit for Microcomputers: Improving Productivity with High-Level Languages and Operating Systems
(ed. Schindler) An edited compilation from *Electronic Design* magazine reflecting the importance of software in improving productivity. Stresses the importance of choosing the right language and discusses the advantages and disadvantages of high-level languages, with special attention to FORTRAN, COBOL, Forth, PL/M, Pascal, McPascal, and ADA — the operating language recently adopted by the Defense Department. **$14.95**

#5204 CP/M Revealed
(Dennon) Intended for CP/M users interested in improving their skills, this is a guide to the CP/M operating system: the console monitor (CCP), the system manager (BDOS), and the input output driver package (CBIOS). Provides a clear understanding of the data structure of the CP/M disk and other essentials for using CP/M effectively. Covers buying CP/M, booting up, logging in, changing memory size, mapping disk space, calling all programs, and more. **$13.95**

Apple is a registered trademark of Apple Computer Company, Inc.; CP/M is a registered trademark of Digital Research Corp.; none is affiliated with Hayden Book Company, Inc.

#6251 Create Word Puzzles with Your Microcomputer
(Mau) Create your own letter inserts, acrostics, cryptograms, word-finds, quote-falls, fill-ins, and other word puzzles. Contains BASIC programs for producing both blank puzzles or printouts, following magazine format. Provides complete information for establishing and maintaining word and quotation files, techniques for producing complex puzzles, and serves as a tutorial on managing large text data bases. **$14.95**

#5203 The Investor's Computer Handbook
(Packer) Manage your investments better using your micro! NO PREVIOUS MICROCOMPUTER EXPERIENCE IS NEEDED. Offers advice on choosing the system best suited for your particular investment applications, including information on hardware, software, peripherals, and a list of required and recommended components. **$11.95**

#5626 Basic Apple™ BASIC
(Coan) A complete guide to Applesoft BASIC. Takes you from beginning concepts, such as entering data and obtaining output, and planning programs, to more advanced topics, such as numeric and string arrays, and sequential and random access files. Alternate techniques for programming in Apple Integer BASIC are also covered, as well as low-resolution and high-resolution graphics. **$12.95**

#6278 Graphics Cookbook for the Apple
(Wadsworth) Use your Apple II to "paint" shapes, objects, and letters in low-resolution graphics. Contains complete annotated Applesoft BASIC programs to draw all pictures described in the book as well as suggestions for improving programming techniques. **$9.95**

Hayden

Order Today

Available at your local computer store or order by phone
1-800-631-0856
operator CO 23
In New Jersey
(201) 843-0550 ext. 382

Mail to:

Dept. # CO 23
Hayden Book Company, Inc.
50 Essex Street
Rochelle Park, NJ 07662

Method of payment:
☐ My check or money order is enclosed.
Please charge to my:
☐ Visa ☐ MasterCard
We pay postage and handling.

Residents of NJ and CA add sales tax.

Please send me the item(s) indicated below by code number.

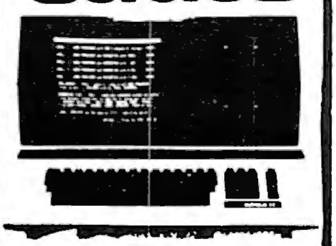
☐ ☐ ☐

If I am not completely satisfied, I may return the book(s) undamaged within 10 days for a complete refund.

Mr./Ms.
Address Apt. #
City State Zip
Visa/MasterCard # Exp. Date
Signature **Prices subject to change**

B409

EAGLE



64K Ram
780 KB Disk Storage
Word Processing, Ultracalc CP/M
C-Basic Software
Smith Corona TP 1
Letter Quality Printer

$2995.00

Retail Value	$4895.00

EAGLE 1600... CALL

TELEVIDEO TERMINALS

910	$579.00
912C	$699.00
920C	$749.00
925C	$749.00
950	$950.00

TELEVIDEO COMPUTERS

800A	$1319.00
802	$2649.00
802H	$4695.00
806	$5495.00
816	$9495.00
803	CALL
1603	CALL

MONITORS

AMDEK

100 B & W	$74.95
300G	$169.00
300A	$179.00
Color I	$339.00
Color II	$699.00
Color II A	$799.00
Color III	$399.00
Color IV	CALL

BMC

12" Green	$79.99
13" Color 1401 (Mid Res.)	$369.00
9191U 13"	$329.00

ZENITH

ZVM 121	$99.00

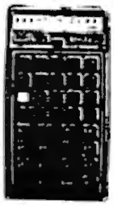
SHARP

Sharp 13" Color TV	$275.00

PANASONIC

TR-120MIP (High Res. Green)	$159.00
CT-160 Dual Mode Color	$299.00

HEWLETT PACKARD



41CV

$209

HP 41C	$149.00
HP 10C	$69.00
HP 11C	$79.00
HP 12C	$114.00
HP 15C	$109.00
NEW 16C	$114.00

PERIPHERALS

HP41 Card Reader	$144.00
HPIL Module	$99.00
HPIL Cassette	$449.00
HPIL Printer	$419.00
Quad Memory Module	$64.00
Time Module	$64.00
Extended Function Module	$64.00

NEC

COMPUTERS

8001A	$729.00
8031	$729.00
8012	$549.00

PRINTERS

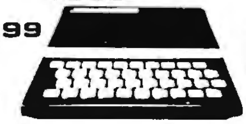
8023	$499.00
7710/7730	$2399.00
3510/3530	$1599.00

MONITORS

JB-1260	$129.00
JB-1201	$159.00
JC-1201	$319.00
JC-1203	$729.00

TIMEX SINCLAIR 1000

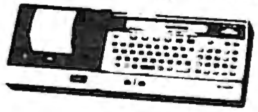
$89.99



16K Memory Module	$44.95
Vu-Calc	$17.95
Super Math	$12.95
Check Book Manager	$13.95
The Organizer	$14.95
The Budgeter	$13.95
Stock Option	$14.95
Loan & Mortgage Amortizer	$12.95

SHARP PC-1500 POCKET COMPUTER

$209



CE 150 Printer, Plotter and Cass. Interface Unit... $172.00

CE 152 Cass. Recorder... $69.00

CE 155 8K Ram Expansion Module..... $94.00

HP●85 $1969

HP 125	$1999.00
HP 85 16K Memory Module	$169.00
5¼" Dual Floppy Disk	$1799.00
Hard Disk w/Floppy	$4349.00
Hard Disk	$3549.00
"Sweet Lips" Printer	$1219.00
80 Column Printer	$649.00

IBM

NEC

3550 PRINTER...$2099

PERCOM DRIVES

5¼" 160K Disk Drive	$249 00
5¼" 320K Disk Drive	$299 00

AMDEK

310A Amber Monitor	$179.00
310G	$179.00
Amdisk (3¼" Drive)	$729 00
DXY Plotter	$759 00
Color II	$699.00

SOFTWARE

I U.S. Easywriter II	$249.00
I U.S. Easyspeller	$129.00
Peach Package (GL/AP/AR)	$419.00

PROFESSIONAL SOFTWARE

IBM/PC Word Processing	$319.00

PRINTERS

SMITH CORONA

TP 1	$599.00

C. ITOH (TEC)

Starwriter(F10-40CPS)	$1399.00
Printmaster(F10-55CPS)	$1749.00
Prowriter 80 Col.(Parallel)	$499.00
Prowriter 80 Col.(Serial)	$629.00
Prowriter 2 (132 Col.)	$799.00

OKIDATA

82A	$429.00
83A	$659.00
84 (Parallel)	$1079.00
84 (Serial)	$1199.00

IDS

MicroPrism	$649.00
132 (Fully Configured)	$1599.00
80 (Fully Configured)	$1399.00

Call for other configurations.

STAR

Gemini 10	$379.00

DAISYWRITER

Letter Quality	1049.00

DIABLO

620	$1179.00
630	$1849.00

MODEMS

HAYES

Smart	$239.00
Smart 1200 (1200 Baud)	$549.00
Chronograph	$199.00
Micromodem II (with Term)	$309.00
Micromodem 100	$309.00

NOVATION

Cat	$144.00
D-Cat	$159.00
212 Auto Cat	$589.00
Apple Cat II	$279.00
212 Apple Cat II	$609.00

CALL for Price and Availability on New **NOVATION** Cat 103, 103/212 and J-Cat.

ANCHOR

Mark I (RS-232)	$79.00
Mark II (Atari)	79.00
Mark III (TI-99)	109.00
Mark IV (CBM/PET)	$125.00
Mark V (OSBORNE)	$95.00
Mark VI (IBM-PC)	$179.00
Mark VII (Auto Answer Call)	$119.00
TRS -80 Color Computer	$99.00
9 Volt Power Supply	$9.00

commodore

8032	$1039.00
CBM 64	CALL
4032	$749.00
8096 Upgrade Kit	$369.00
Super Pet	$1499.00
2031	$469.00
8250 Dbl.Sided Disk Drive	$1699.00
D9060 5 Meg. Hard Disk	$2399.00
D9060 7.5 Meg. Hard Disk	$2699.00
8050	$1299.00
4040	$969.00
8300 (Letter Quality)	$1549.00
8023	$599 00
4022	$399.00
New Z-Ram, Adds CP/M & 64K	$549.00
The Manager	$209.00
Magis	CALL
Word Pro 5 Plus	$319.00
Word Pro 4 Plus	$299.00
Word Pro 3 Plus	$199.00
The Administrator	$379.00
Info Pro Plus	$219.00
Power	$79.00
CBM 8032 Dust Cover	$14.99
CBM 8050/4040 Dust Cover	$10.99

computer mail order east

800-233-8950

IN PA. CALL (717)327-9575, 477 E.THIRD ST., WILLIAMSPORT, PA. 17701

In stock items shipped same day you call No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the continental United States with no waiting period for certified checks or money orders. Add 3% (minimum $3.00) shipping and handling on all C.O.D. and Credit Card orders. NV and PA residents add sales tax. All items subject to availability and price change **NOTE:** We stock manufacturer's and third party software for most all computers on the market! CALL TODAY FOR OUR NEW CATALOGUE.

FRANKLIN

ACE 1000
ACE 10 with Controller Card
ACE Writer Word Processor
CALL...
FOR SYSTEM PRICE!
ACE 1200........CALL

VISICORP

for Apple, IBM & Franklin

Visidex	$189.00
Visifile	$189.00
Visiplot	$159.00
Visiterm	$89.00
Visitrend/Plot	$229.00
VisiSchedule	$229.00
Desktop Plan	$189.00
Visicalc (Apple II, Atari, CBM, IBM)	$179.00

Visicorp prices for IBM may vary slightly.

CONTINENTAL

Home Accnt. (Apple/Franklin)	$59.00
Home Accountant (IBM)	$119.00
1st Class Mail (Apple/Franklin)	$59.00

SIRIUS

Free Fall	$24.00
Beer Run	$24.00
Snake Byte	$24.00
Space Eggs	$24 00
Sneakers	$24.00
Bandits	$28.00

BRODERBUND

Apple Panic	$23 00
David's Magic	$27 00
Star Blazer	$25 00
Arcade Machine	$34.00
Choplifter	$27.00
Serpentine	$27.00

INFOCOM

Deadline	$35.00
Star Cross	$29.00
Zork I	$29.00
Zork II or III	$29.00

MPC

Bubdisk (128K Ram)	$719.00

AXLON

Ram Disk (Apple/Franklin)	CALL

Call for Price on

VIC 64

Peripherals and Software.

PROFESSIONAL SOFTWARE

Word Processing for VIC 64....$79.95

PERCOM

DISK DRIVES FOR ATARI

AT 88-S1	$399.00
AT 88-A1	$289.00
RFD 40-S1	$539.00
RFD 40-A1	$329.00
RFD 40-S2	$869.00
RFD 44-S1	$659.00
RFD 44-S2	$999.00

RANA DISK DRIVES

Call for price and availability on the new Rana Disk Drives for The Apple and Franklin Computer Systems.

μ-SCI

MICRO-SCI

DISK DRIVES FOR APPLE & FRANKLIN

A2	$299.00
A40	$349.00
A70	$459.00
C2 Controller	$79.00
C47 Controller	$89.00

FLOPPY DISKS

MAXELL

MD I (Box of 10)	$32.00
MD II (Box of 10)	$44.00
FD I (8")	$40.00
FD II (8" DD)	$50.00

VERBATUM

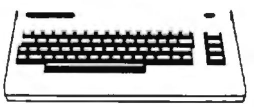
5¼" SS DD	$26.00
5¼" DS DD	$36.00

ELEPHANT

5¼" SS DD	$19.99

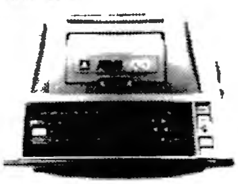
VIC 20

$179.



VIC 20 Dust Cover	$9.99
VIC 1530 Datassette	$69.00
VIC 1540 Disk Drive	$339.00
VIC 1541 (64K Disk Drive)	CALL
VIC 1525 Graphic Printer	$339.00
VIC 1210 3K Mem. Exp.	$32.00
VIC 1110 8K Mem. Exp.	$53.00
VIC 1111 16K Mem. Exp.	$94.00
VIC 1011 RS232C Term. Interface	$43.00
VIC 1112 IEEE-488 Interface	$86.00
VIC 1211 Super Expander	$53.00
VIC Mother Board	$99.00

ATARI* HOMECOMPUTERS



400

16K.........$199
32K........$274*
48K........$359*
*Non-Atari Ram

800
48K.....$499
New low price effective January 1, 1983

Call for Price and Availability of the NEW
64K ATARI 1200

410 Recorder	$74.00
810 Disk Drive	$429.00
822 Printer	$269.00
825 Printer	$589.00
830 Modem	$159.00
820 Printer	$259.00
850 Interface	$169.00
CX40 Joy Sticks (pair)	$18.00
CX853 Atari 16K Ram	$77.95

Axlon Ramdisk (128K)	$429.95
Intec 48K Board	$159.00
Intec 32K Board	$74.00
One Year Extended Warranty	$70 00
CX481 Entertainer Package	$69 00
CX482 Educator Package	$130.00
CX483 Programmer Package	$54.00
CX484 Communicator Package	$344 00

SOFTWARE FOR ATARI

ATARI

Pac-Man	$33.00
Centipede	$33.00
Caverns of Mars	$32.00
Asteroids	$29.00
Missile Command	$29.00
Star Raiders	$35.00
Galaxian	$33.00
Defender	$33.00

ON-LINE

Jawbreaker	$27.00
Softporn	$27.00
Wizard and the Princess	$29.00
The Next Step	$34.00
Mission Asteroid	$22.00
Mouskattack	$31.00
Frogger	$31.00
Cross Fire (ROM)	$36.00

SYNAPSE

File Manager 800 †	$69.00
Chicken	$26.00
Dodge Racer	$26.00
Synassembler	$30.00
Page 6	$19.00
Shamus	$26.00
Protector	$26.00
Nautilus	$26.00
Slime	$26.00
Disk Manager	$24.00

DATASOFT

Pacific Coast Highway	$25.00
Canyon Climber	$25.00
Tumble Bugs	$25.00
Shooting Arcade	$25.00
Clowns and Balloons	$25.00
Graphic Master	$30.00
Graphic Generator	$13.00
Micro Painter	$25.00
Text Wizard	$79.00
Spell Wizard	$64.00
Bishop's Square	$25.00
Sands of Egypt	$25.00

APX

Text Formatter	$18 50
Family Budgeter	$18.50
Eastern Front	$24.00
Family Cash	$18.50
Jukebox	$13.00
Downhill	$18.50
Outlaw	$18.50
Holy Grail	$24.00
Player Piano	$18.50
Keyboard Piano	$18.50
Number Blast	$13.00
Frogmaster	$18.50
747 Land Simulator	$18.50
Word Processor	$40.00

EPYX

Crush, Crumble & Chomp	$24.00
Crypt of the Undead	$24 00
Curse of Ra	$16.00
Datestones & Ryn	$16.00
Invasion Orion	$19.00
King Arthur's Heir	$24.00
Morloc's Tower	$16.00
Rescue at Rigel	$24.00
Ricochet	$16.00
Star Warrior	$29.00
Temple of Asphai	$29.00
Upper Reaches of Apshai	$16.00

CBS

K-razy Shoot Out	$32 00
K-razy Kritters	$32 00
K-razy Antics	$32.00
K-star Patrol	$32.00

STICK STAND $6.99

Arcade Action from your ATARI or VIC Joy Stick

computer mail order west

800-648-3311

IN NV. CALL (702)588-5654, P.O. BOX 6689, STATELINE, NV. 89449

INTERNATIONAL ORDERS: All shipments outside continental United States must be pre-paid by certified check only! Include 3%(minimum $3.00) shipping and handling
EDUCATIONAL DISCOUNTS: Additional discounts are available from both Computer Mail Order locations to qualified Educational Institutions.

maze is constructed. The actual time needed to construct the mazes varies greatly; a one-level maze takes approximately 30 seconds, while a 32-level maze will take approximately 16 minutes to build. For a rough estimate of the time you have for a coffee break, divide the number of levels entered by two. The result is the approximate time needed by the computer, in minutes.

Once the computer has completed construction of the maze, the screen is turned back on, and you are asked to PRESS START TO BEGIN. Watch the word START closely. See how it is flashing on and off? This effect is produced by toggling CHACT in rapid succession (alternately POKEing in one and two). You are asked to press START when you are ready because the program times you, and it would not be fair to start timing from the moment the maze was completed.

Therefore, when you are ready to begin, you press START, which tells the program that you are poised with joystick in hand; the top level is displayed and timing begins. You will see an "S" in the upper left corner of the screen, with the ball character (control-T) underneath. *You* are the ball character.

Threading The Tunnels

Just move the joystick in the direction you want to go. "Sure," you say, "but where *do* I want to go?" Simple enough. If you chose a one-level maze (chicken!), you will see an "F" at the lower right corner of the maze. That's where you want to go. If you were gutsy, however, and chose any number of levels greater than one, you will see five graphics "+" characters at random points throughout the top level. These symbols represent tunnels, through which you must pass to reach the finish (which is always in the lower right of the bottom level of the maze). As you might have guessed, you always start at the upper left of the top level.

To pass through a tunnel, simply move onto the "+" symbol and press the "fire" button. Violà! The new level is displayed instantly. Have you gone up or down? Well, if you were on the top level, the only place you could go is down. If you are in the middle of a maze of four or more levels, then I have absolutely no idea which direction you'll go; you may pass through the same level three or four times before you realize that you've gone nowhere.

In mazes of ten or more levels, be prepared to see the same level a few times before you make any progress. No matter how many levels you chose, however, the goal is still the same. You must try to go down to unexplored levels; if you end up on a level you have been on already, you have looped, and you must figure out whether you've gone up or down.

In any case, find the "F" on the lowest level, go to the space directly above it, and move down. If you do not push the joystick down, the timer will continue, and your record time will be lost. When the timer has stopped, you will hear five beeps.

If you do not hear the five beeps, you have not stopped the timer or the sound is gone on your machine. Either way, just remember to go down when you reach the finish – as you get better and better, times will get tougher and tougher to beat, and each second will become important.

That's all there is to it. After the five beeps have informed you that the timer has stopped, the screen will become visible (no change for visible mazers), and the time used to complete the maze will be displayed in hours:minutes:seconds format. The program will loop until you press the START button again, which will cause the program to re-RUN.

Possible Dead Ends

There are a few caveats, however. First, if you are attempting an invisible maze, some joystick directions may not work. There is nothing wrong with the program; if you cannot move in a certain direction, you have hit a wall (I told you they were still there!). Second, don't even try to do deep invisible mazes without the consent of your psychologist. Third, each tunnel can be used only once, so make your moves wisely.

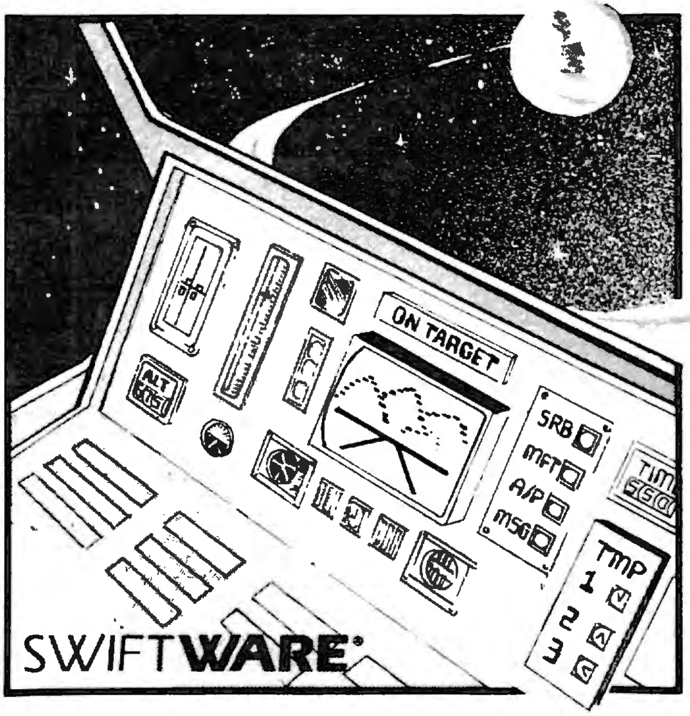
Last, and most important, don't *ever* remove lines 14 and 15. This program, as mentioned earlier, will cause the computer to do some strange things if you hit the BREAK key. Lines 14 and 15 turn off the BREAK key; the only way to get out of the program is to hit the SYSTEM RESET button.

The Program

Now let's look at how the program accomplishes what it does. Line 8 is self-explanatory. Line 10 resets the screen and sets the variable TOP to the address of the LSB of the screen memory address. By POKEing different numbers into TOP and TOP+1, we can display any area of memory. Line 12 stores the value of SAVMSC (locations 88 and 89, 58 and 59 hex) into RL and RH, respectively. This step is necessary to reset the destination of PRINT statements after these locations have been modified by the maze generator routine.

Lines 20 and 23 obtain the required data from the user and determine the value of BOT, the page number of the lowest memory address to be used. Line 25 makes sure that we haven't used up all available memory, and informs the user of any memory conflict. Line 27 lets the user know that the delay which will follow is intentional, not

Fly the SPACE SHUTTLE from your ATARI®



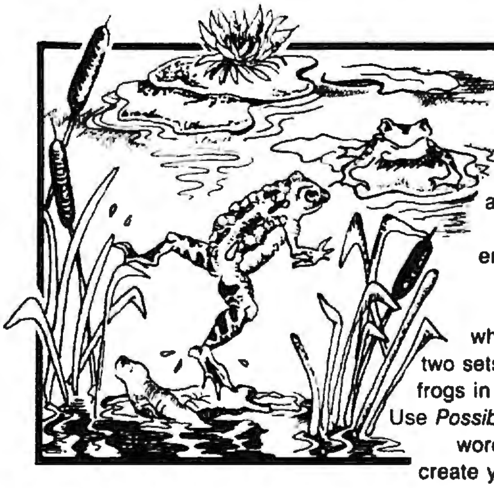
SPACE SHUTTLE

By Paul Kindl

Join the crew of the *Space Shuttle* as they prepare to take the next step into the world of space travel. Take control of the world's first reuseable spaceship, the *Space Shuttle,* and in an accurate full graphic simulation, place yourself in the cockpit. Pilot the Space Shuttle through take-off with booster stage separations, orbit, descent down the glide path and landing to touchdown — complete with a chase plane and scrolling runway visible through the cockpit windscreen. You assume command throughout all phases of the mission aided by complete instrumentation.

Price: $29.95 32K Diskette

ATARI® is a registered trademark of Atari Inc., a Warner Communications, Co.



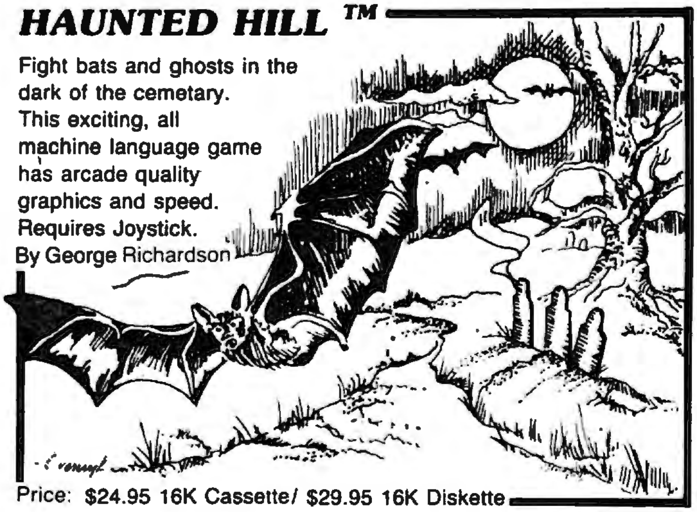
FUN 'N' GAMES™

Leapfrog, Possible, and Wordgames giving you hours of fun and entertainment. *Leapfrog* is a Chinese-Checker type jumping game in which you try to position two sets of animated jumping frogs in a minimum of moves. Use *Possible* to help descramble word jumble puzzles or to create your own. *Wordgames,* two games in one, contains *Guessit* — a deductive alphabetic reasoning *game for one or two players and Wordjumble* - a multiple word descrambling puzzle with play-on-word hints and mystery answers. Disk version of *Guessit* works with a Votrax Type'N'Talk. A real crowd pleaser. Joystick and printer optional.

By Jerry White

Price: $17.95 16K Cassette/ $19.95 24K Diskette

HAUNTED HILL ™



Fight bats and ghosts in the dark of the cemetary. This exciting, all machine language game has arcade quality graphics and speed. Requires Joystick.

By George Richardson

Price: $24.95 16K Cassette/ $29.95 16K Diskette

TRIVIA TREK™

By Jerry White

Play it for fun, test your knowledge or entertain friends. Fun for the whole family and great at parties. A multiple choice trivia game for one or two players complete with 500 trivia questions in fifty categories and two thousand multiple choice answers. Included is a program for creating your own trivia questions and answers. Joystick optional.

Price: $29.95 32K Diskette

Plus many more

AVAILABLE AT SELECT COMPUTER STORES

MAIL ORDERS: Send check or money order plus $2.50 shipping and handling. N.Y. Residents add 7¼% sales tax.

TELEPHONE ORDERS: (516)549-9141

Dealer Inquires Invited

Send for FREE catalog

MasterCard

SWIFTY SOFTWARE, INC.
64 Broad Hollow Road
Melville, New York 11747

VISA

something gone wrong with the program.

Line 28 turns off the screen and sets up the display for the start of the game. Line 29 employs a trick described by Bill Wilkinson in "Insight: Atari" (**COMPUTE!**, May 1982, #24), for clearing memory using the CLEAR key. Line 31 establishes the top of maze memory and sets up a loop to construct each of the MAXLEV levels of the maze. Lines 40-111 constitute the maze generator routine by Charles Bond.

Establishing Start And Finish

Line 120 restores the PRINT statement destination to its original value by POKEing RL and RH back into SAVMSC. Line 130 establishes the "S" in the upper left and the "F" in the lower right of the maze. Line 135 checks to see if any tunnels have to be built; in other words, if the maze is only one level, jump over the tunnel building routine (lines 140-170).

The tail end of line 170 restores the screen and sets up the console switches for reading. Line 172 executes a GOSUB to the routine that randomly sets the color of the background at the beginning and also each time the user passes through a tunnel. Line 173 loops indefinitely until the user presses the START button. This line is the one that toggles CHACT, as described earlier.

Line 174 makes the maze visible or invisible, based on your response to the second prompt at the beginning of the program. Line 175 resets the three-byte timer RTCLOK to zero. Line 180 determines the start position for the player and tells the display list where the first level of the maze is. Lines 185-321 are the main loop and should be self-explanatory.

A few notes, though: line 190 reads the joystick and the trigger, lines 200-230 perform routine motion, line 235 checks for a win, line 240 checks for walls, and lines 300-321 change levels. Lines 400-415 stop the timer, sound the bell, and display the time used. Line 420 sets up the console switches for reading and POKEs a 124 into the attract mode flag ATRACT (location 77, hex 4D). The 124 in ATRACT gives the user approximately 16 seconds before the screen goes into attract mode.

Line 430 loops until the START button is pressed. Line 450 is the string A$ (we can't PRINT it because we've changed the screen memory locations). Don't forget to put the exclamation point towards the end of the line; doing that fools BASIC into reading trailing blanks to fill up A$. Finally, line 500 reads a random number from the random number generator RANDOM (location 53770, D20A hex), masks out the four low-order bits, and uses it to set the background color. If you're interested in the technical aspects of the game, read on. If not, RUN the program and have some fun.

Inner Secrets Of Page Flipping

The programming tool behind the entire program is called page flipping. What this technique involves is changing the address that the ANTIC chip reads to determine the start of screen memory. This address is always in the display list, which is pointed to by SDLSTL and SDLSTH (locations 560 and 561, hex 230 and 231) in standard LSB, MSB order.

In the display list you will find all sorts of numbers; all have a meaning and should not be tampered with by the inexperienced programmer. In different graphics modes, the display list changes both in length and location.

In general, the display list follows two rules. First, all graphics modes accessible through BASIC have display lists that start with 112, 112, 112 in three successive bytes. These three bytes tell the ANTIC that there are to be 24 blank lines on the television screen.

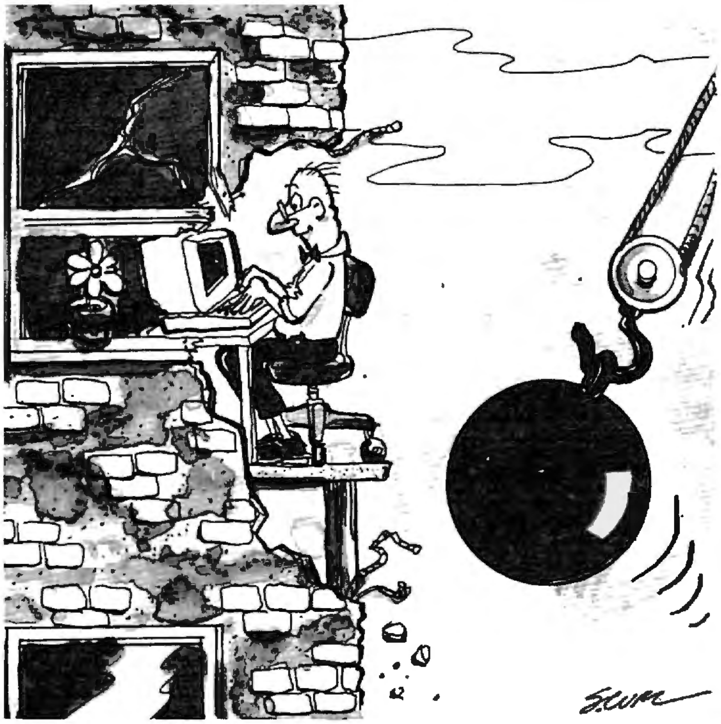
Second, the fourth location of the display list contains a byte which has its sixth bit set. The rest of the byte varies depending on the graphics mode, but bit six is always set. Bit six, when set, tells the ANTIC chip that it is to begin direct memory access (DMA) at the location pointed to by the next two bytes. Therefore, any area in memory can be displayed by POKEing the address (LSB, MSB) into the location pointed to by SDLSTL and SDLSTH plus four.

This is the basis of this program. All screens are constructed before play begins, and, instead of drawing an entire new screen, all the program does is change these addresses to point to the first byte of the new screen.

During the blank-out period at the start of the program, the entire maze is constructed, layer by layer, and the resulting mazes are stored in 1K decrements, starting with the last free kilobyte memory block before the display list. The maze generator routine does not even need to be modified for this purpose; all that was done was to change the PRINT destination pointer SAVMSC (location 88, hex 58, mentioned earlier). In other words, all I did was fool the maze generator routine into thinking that screen memory was located in middle area RAM (instead of the top), and since 960 bytes are needed for the standard GRAPHICS 0 screen, 1K blocks were very convenient.

The tunnels used this information both at construction time and at level-changing time. Random numbers were all that was necessary to build the tunnels; checks were required only to make sure that the tunnels would be within the maze and that they did not cut through maze walls. Since no other checks are made, it is possible

Q: What is the hardest thing in the world?
A: Tearing yourself away from an EPYX game.



Nobody but nobody builds more lasting playing value into their computer games than EPYX.

EPYX—computer games thinkers play. EPYX—producers of award-winning games (including "Crush, Crumble and Chomp"; "Dragon's Eye"; "Temple of Apshai"...and dozens of other thinking games.) For Atari,* Apple,* Commodore,* Radio Shack,* and IBM* personal computers. EPYX—the leader in computer game quality, creativity, innovation.

You will love them all.
Write or phone for our latest catalog; it's absolutely free...we even pay the postage. Or stop in at your favorite computer dealer. He should have a supply of catalogs and he can also show you some of those marvelous EPYX games in action.

*The trademarks, respectively, of Atari, Inc.; Apple Computer, Inc.; Commodore International; Tandy Corp.; International Business Machines. And EPYX is the trademark of Automated Simulations, Inc., just so you don't forget.

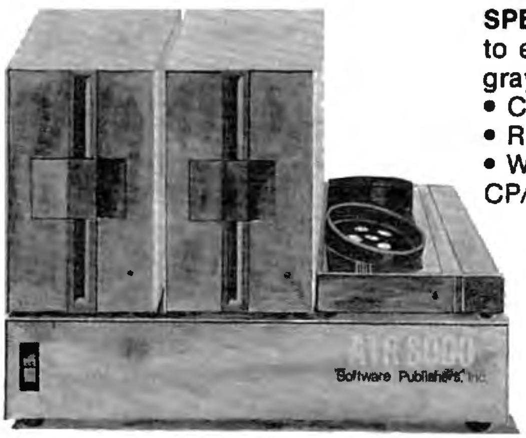
EPYX

AUTOMATED SIMULATIONS
1043 Kiel Court
Sunnyvale, California
(408) 745-0700

ATR8000: THE VERSATILE 4MHz Z80 DOUBLE DENSITY DISK INTERFACE FOR THE ATARI® 800/400

Connect the ATR8000 to convert your ATARI 800/400 into a viable business machine. Open the doors to a further dimension by adding the 64K CP/M upgrade—then you can enter the vast CP/M marketplace to select programs tailored to your specific needs.

The ATR8000 is versatile, so it can grow as you need it to. Its handling of disk drives is revolutionary . . . it runs four 5¼" or 8" drives, single or double or quad density, single or double-sided *AND* allows you to mix them!



SPECS: 4MHz Z80 processor • 16k RAM standard • Connects to expansion port of the ATARI 800/400 • 12½" x 11½" x 2½" gray and beige enclosure • Runs four drives of mixed definition • Centronics parallel and RS-232 serial port (and printer drivers) • Runs single density ATARI DOS and existing ATARI software • With OSA+, Ver. 4, is double density • 64K upgrade includes CP/M.

PRICING:

ATR8000	$499.95	OSA+, Ver. 4	$49.95
5¼" Drive	$399.95	Printer Cable	$29.00
64K Upgrade (with CP/M)	$250.00	5¼" Drive Cable	$35.00
		8" Drive Adapter	—CALL—

CONTACT: **SOFTWARE PUBLISHERS, INC.**
2500 E. Randol Mill Rd., Suite 125
Arlington, TX 76011
(817) 469-1181

ATARI is a registered trademark of ATARI, Inc. CP/M is a registered trademark of Digital Research, Inc.

to have many tunnels packed closely together.

The simple method of checking upward and downward movement causes tunnels to be disabled as they are used. When the player changes levels, a control-T character is left where the graphics plus symbol was previously. As a result, the checks for the graphics plus symbols will always fail on an already-used tunnel. This feature, added only to make the mazes more challenging, can easily be altered by changing the GOTO 185 in line 250 to GOTO 190.

This simple change makes the program think that you have just moved across or down (i.e., you have not changed levels). Therefore, the program replaces the previous space with the variable T, which contains the screen memory value of the space you were on before. When you move, the control-T is moved in the proper direction, and T is POKEd into the space you just moved from. It is confusing, but it works, and it works fast.

Tunnel Checking

The tunnels, when used, merely change the value of the sixth byte of the display list. Since 1K memory blocks are used, it is not necessary to change the fifth, LSB of the display list DMA address; it will always be zero. Either the sixth byte is added to four, or four is subtracted from it. The reason for this change should be evident – four pages constitute one kilobyte of memory.

Locating the mazes in this fashion greatly simplifies all checks. Instead of going through a series of different LSB, MSB checks to determine the location (two-dimensionally) of a space on two different levels, all that is required is a PEEK to the address plus 1024 (1K) and the address minus 1024. Again, this is how tunnel checking is done in lines 305 and 310.

Last, let's look at the timer. From the time the computer is powered up until the time it is powered down, the OS, as part of its stage one

Mazemaking For VIC, 64, PET/CBM, And Other Microsoft BASIC Computers

In the December 1981 **COMPUTE!**, we published one of the most useful (and deceptively short) subroutines for game-lovers of all ages. "Mastermaze" for the Atari is based upon Charles Bond's original idea that a random maze of any size could be created quickly right on the screen.

For those who might have missed this excellent subroutine, the basis for all kinds of games, the version in Program 1 below can be used by any computer with Microsoft BASIC where you can POKE to the screen memory. As listed, it will work on Commodore VIC, 64, and PET/CBM's. You need to know the number of columns on your screen and the memory address of the start of the screen RAM memory (the listing contains this information for Commodore computers).

This maze generator can get you started toward programming a variety of entertaining and challenging games. It always results in a maze with only one significant pathway to the solution and it will always fill the screen with pathways.

The short additional routine (Program 2) creates a semi-intelligent "mouse" that runs through the maze, attempting to solve it as best it can. Add it to the maze generator and, when the maze is drawn, hit any key. See if you can tell what rules the mouse uses to find the solution to the maze.

If you come up with an interesting game based on this generator, send it in to **COMPUTE!** and if we think others will enjoy it, we'll print it.

Program 1.

```
100 DIMA(3): REM SET UP DIRECTION TABLE
110 A(0)=2:A(1)=-80:A(2)=-2:A(3)=80:REM VALUES
     FOR 40 COLUMN SCREEN
111 REM FOR 80-COLUMN SCREEN CHANGE: A(1)=-160
    : A(3)=160
112 REM FOR THE VIC 22 COLUMN SCREEN CHANGE: A
    (1)=-44: A(3)=44
120 WL=160:HL=32:SC=32768:A=SC+81: REM CHARACT
    ER, SCREEN, & START
121 REM FOR UNEXPANDED VIC USE SC=7680:A=SC+45

130 PRINT"{CLEAR}": REM CLEAR SCREEN AND GENER
    ATE MAZE BACKGROUND FIELD
140 FORI=1TO23
150 PRINT"{REV}
                "; REM 22,40, OR 80 SPACES
151 REM PRINT THE CORRECT AMOUNT OF RVS SPACES
     TO MAKE A SCREEN LINE WHITE.
160 NEXT I
200 REM GENERATE MAZE
210 POKEA,4
220 J=INT(RND(1)*4):X=J
230 B=A+A(J): IF PEEK(B)=WL THEN POKE B,J:POKE
    A+A(J)/2,HL:A=B:GOTO220
240 J=(J+1)*-(J<3):IFJ<>XTHEN230
250 J=PEEK(A):POKEA,HL:IFJ<4THENA=A-A(J):GOTO2
    20
300 REM MAZE IS DONE.  WAIT FOR A KEY TO BE PR
    ESSED.
310 GETC$:IFC$=""THEN310
```

Program 2.

```
1000 REM MAZE MOUSE
1010 POKEA,81:J=2
1020 B=A+A(J)/2:IFPEEK(B)=HLTHENPOKEB,81:POKEA,
    HL:A=B:J=(J+2)+4*(J>1)
1030 J=(J-1)-4*(J=0):GOTO1020
```

VBLANK (vertical blank) routine, increments the three-byte jiffy counter RTCLOK. RTCLOK is located in three consecutive bytes starting at address 18 decimal, 12 hex.

Unlike most of the system numbers, this clock is stored in MSB first, LSB last order. Since vertical blanks occur once every sixtieth of a second, this timer counts "jiffies" (sixtieths of a second). When the game start is pressed, zeros are POKEd into the clock addresses (line 175). As soon as the player has completed the maze, the locations are read and stored in the variable ET (for elapsed time). Simple mathematical manipulations derive the hours, minutes, and seconds and store them in the variables EH, EM, and ES, respectively.

That's all there is to it. Since we know that we started at zero, no other manipulations are needed. (Incidentally, it is possible to stop the clock, but doing so requires a shutdown of the entire system VBLANK routine, which can have disastrous effects on your computer.)

And there's the entire program. If you have any questions or if you would like me to make a cassette copy of the program, send a cassette, a self-addressed, stamped mailer, and $3 to:

Ken Szajda
59 West Lakeshore Drive
Rockaway, NJ 07866

```
8 DIM A(3),A$(37):SW=0
10 GRAPHICS 0:TOP=PEEK(560)+256*PEEK(
   561)+4
12 RL=PEEK(88):RH=PEEK(89)
14 O=PEEK(16)-128:IF O<0 THEN O=O+128
15 POKE 16,O:POKE 53774,O
20 ? :? "# OF LEVELS";:INPUT MAXLEV:M
   AXLEV=MAXLEV-1:? "INVISIBLE (1) OR
    VISIBLE (2)";:IF MAXLEV<0 THEN MA
   XLEV=0
23 BOT=INT(TOP/256)-MAXLEV*4-4:INPUT
   INV
25 IF BOT*256<PEEK(144)+256*PEEK(145)
    THEN ? "♦♦♦INSUFFICIENT MEMORY♦♦♦
   ":GOTO 20
27 ? "{CLEAR}":POKE 755,1:POSITION 4,
   10:? "CONSTRUCTING MAZE...PLEASE W
   AIT":FOR DEL=0 TO 1000:NEXT DEL:PO
   KE 755,2
28 POKE 559,0:? "{CLEAR}":POSITION 10
   ,11:? "PRESS START TO BEGIN"
29 TM=PEEK(106):POKE 106,TM-6:POKE 88
   ,0:POKE 89,BOT:? "{CLEAR}":POKE 10
   6,TM
30 R1=BOT+MAXLEV*4:FOR X=BOT TO R1 ST
   EP 4:POKE 77,0:POKE 88,0:POKE 89,X
40 REM MAZE GENERATOR ROUTINE BY C. B
   OND
50 A(0)=2:A(1)=-80:A(2)=-2:A(3)=80:B=
   0
60 SC=PEEK(88)+256*PEEK(89):A=SC+43
65 POSITION 2,0:POKE 752,1:FOR I=1 TO
    23:? "{37 SPACES}":NEXT I
70 POKE A,5
80 J=INT(RND(0)*4):X1=J
90 B=A+A(J):IF PEEK(B)=128 THEN POKE
   B,J+1:POKE A+A(J)/2,0:A=B:GOTO 80
100 J=(J+1)*(J<3):IF J<>X1 THEN 90
110 J=PEEK(A):POKE A,0:IF J<5 THEN A=
    A-A(J-1):GOTO 80
111 IF J=128 THEN STOP
120 NEXT X:POKE 88,RL:POKE 89,RH
130 POKE BOT*256+917,38:POKE R1*256+3
    ,51
135 IF MAXLEV=0 THEN POKE 559,34:POKE
     53279,8:GOTO 172
140 FOR X=BOT TO R1-4 STEP 4:FOR Y=1
    TO 5
150 J=INT(RND(0)*876)+43
151 W=J-(INT(J/40)*40):IF W<3 OR W=39
     THEN 150
155 IF PEEK(X*256+J)=0 AND PEEK(X*256
    +1024+J)=0 THEN POKE X*256+J,83:P
    OKE X*256+1024+J,83:GOTO 170
160 GOTO 150
170 NEXT Y:NEXT X:POKE 559,34:POKE 53
    279,8
172 GOSUB 500
173 IF PEEK(53279)<>6 THEN POKE 755,-
    PEEK(755)+3:GOTO 173
174 POKE 755,INV
175 POKE 18,0:POKE 19,0:POKE 20,0
180 ST=R1*256+43:WIN=BOT*256+960:POKE
     TOP,0:POKE TOP+1,R1
185 S=PEEK(ST):T=ST:POKE ST,84
190 Q=STICK(0):R=STRIG(0):IF R=0 AND
    S=83 THEN 300
200 IF Q=7 THEN ST=ST+1
210 IF Q=11 THEN ST=ST-1
220 IF Q=14 THEN ST=ST-40
230 IF Q=13 THEN ST=ST+40
235 IF PEEK(ST)=38 THEN 400
240 IF PEEK(ST)=128 OR PEEK(ST)=51 TH
    EN ST=T
250 IF ST<>T THEN SW=0:POKE T,S:POKE
    77,0:GOTO 185
251 GOTO 190
300 IF SW=1 THEN 190
305 IF PEEK(ST+1024)=83 THEN R1=R1+4:
    ST=ST+1024:GOTO 320
310 IF PEEK(ST-1024)=83 THEN R1=R1-4:
    ST=ST-1024
320 IF R1<BOT OR R1>MAXLEV*4+BOT THEN
     330
321 POKE TOP+1,R1:SW=1:GOSUB 500:GOTO
     185
400 ET=PEEK(18)*65536+PEEK(19)*256+PE
    EK(20):EH=INT(ET/216000):EM=INT((
    ET-EH*216000)/3600)
401 FOR X=1 TO 5:FOR Y=15 TO 0 STEP -
    0.2:SOUND 0,9,10,Y:NEXT Y:NEXT X:
    POKE 755,2
402 ES=INT((ET-EH*216000-EM*3600)/60)
403 ? "{CLEAR}":? :? "445 DATA ELAPSE
    D TIME: ";EH;":";EM;":";ES;"
    {19 SPACES}!"
404 ? "CONT":POSITION 0,0:POKE 842,13
    :STOP
405 POKE 842,12
406 POSITION 2,15:RESTORE :FOR Y=0 TO 1
410 READ A$:FOR X=BOT*256+Y*40 TO BOT
    *256+Y*40+LEN(A$)-1:POKE X+2,ASC(
    A$(X-BOT*256+1-Y*40,X-BOT*256+1-Y
    *40))-32
415 NEXT X:NEXT Y
420 POKE 53279,8
430 IF PEEK(53279)<>6 THEN 430
440 RUN
450 DATA PRESS START FOR ANOTHER MAZE
    {10 SPACES}"
500 AA=PEEK(53770):AB=AA-(INT(AA/16)*
    16):SETCOLOR 2,AB,4:POKE 712,PEEK
    (710):RETURN
```

Making Change

Myron Miller

"Making Change" is an educational program to teach children the concept of using quarters, dimes, nickels, and pennies to make a given amount of change. The program uses 3K RAM memory and will work on the TRS-80 Color Computer, PET/CBM, Apple, Atari, and VIC computers.

This program first asks for the user's name and then presents the first problem. There are two types of problems which are alternately displayed. All odd-numbered problems begin like this:

```
1 JOHN GIVE ME 68 CENTS.
HOW MANY QUARTERS?
```

One is the problem number, John is the user's name, and 68 is a random integer between and including 1 and 100.

The player must enter how many quarters there would be in the requested amount. The program will then ask for dimes, nickels, and pennies in the same manner. For each type of coin the user must enter the number of coins and press RETURN. If a certain coin is not needed, the user should enter 0 and press RETURN. The total value of the user's answer should equal the requested amount (for 68 cents: 2 quarters, 1 dime, 1 nickel, and 3 pennies would be entered).

Even-numbered problems look like this:

```
2 JOHN I HAVE:
  3 QUARTERS,
  1 DIMES,
  0 NICKELS, AND
  4 PENNIES.
HOW MUCH CHANGE DO I HAVE?
```

The even problems present the opposite case. The user must add up the change and enter the total amount. Again, RETURN must be pressed after the entry. The total amount will always be in the range of 1 to 100 cents since both types of problems use the same program line to generate a random integer.

For both types of problems, the program checks the user's answer. If the answer is correct, the program will so indicate and will go on to the scoring routine. If the answer is wrong, the program will print out X CENTS SHORT JOHN, or X CENTS TOO MUCH JOHN. The youngster should be encouraged to use this information to correct the answer, for the problem will repeat up to three additional times. If the answer is still wrong, the program will display the correct answer and will move on to scoring.

Reward Or Penalty

The program keeps track of two independent scores: conventional and reward. The conventional score is similar to a test score used in schools. It records how many problems were done, how many were correct, how many were wrong, and gives a percentage of correct answers. The conventional score is applied only to the first presentation of the problem; that is, repeat problems are not counted in the conventional score.

The reward score tries to motivate the user by paying one cent for every correct answer. To keep things fair, it charges one cent for every wrong answer. Thus the user earns money for right answers, but loses money for wrong answers. The reward score is applied to the repeat problems as well as to the first presentation. The reason for this is to encourage the user to take the repeat problems seriously. There can be a difference between the two scores because the conventional is applied only to the first attempt.

In the odd problems, the program will reject an answer given in all pennies (38 pennies for 38 cents) for any amount greater than four cents. It will also reject a fractional answer (3.8 dimes for 38 cents). In either case, the user is fined one cent for cheating. This should take care of any get-rich-quick schemes. The even problems will not accept a decimal answer (.38 for 38 cents). The concern here is to avoid round off errors in floating point numbers, not cheating. Thus the score is not affected.

How To Encourage The Player

There are some changes and improvements that can be added. If your child is having a rough time with the program, I would recommend deleting line number 4100 from the program. This removes the "money lost" counter used by the reward score. The reward score can be brutal to a youngster having difficulty. Each problem has a potential earning of one cent, but a potential loss of four

THE LEARNING CENTER

"Perhaps the finest educational software that I have ever had the pleasure of reviewing. It's easy for kids to use and effective in teaching basic concepts and skills.... My kids are learning with it right now!"

Fred D'Ignazio, Associate Editor—*Compute!*, Associate Editor—*Softside*,
Author of bestseller—*Katie and the Computer*

We hope you've been using your ATARI for more than just games ... It is, and can be, a valuable educational tool for you and your children.

Bruce and Dianne Mitchell realized this potential and designed a series of programs for use in their Small World Preschool & Kindergarten located in Durham, N.C. Presented on TV's *PM Magazine* these unique educational programs will introduce your 3-9 year olds to the era of learning with computers. Using the graphics and sound capabilities of the Atari, each program develops a particular skill and reinforces correct responses with happy faces and music.

Beginning with basic concepts such as colors, shapes and the alphabet, your child will progress to an understanding of counting, arithmetic, and language skills.

Widely acclaimed, classroom designed and tested, these unique educational tools are now available to you ... *for your children.*

SPECIAL SKILLS	Preschool	K	1	2
* Color For The Non-Reader	●	●		
* Name That Color		●	●	
* Like Shape Identification	●	●	●	
* Different Shape Identification	●	●	●	
Cave Game	●	●	●	●
MATH AND NUMBER SKILLS				
Count With Me	●	●	●	
Number Recognition	●	●	●	●
Addition		●	●	
Subtraction		●	●	
Add.—Vertical/Horizontal		●	●	
Sub.—Vertical/Horizontal		●	●	
Advanced Addition/Subtraction		●	●	●
Ones and Tens			●	●
LANGUAGE SKILLS				
* Alphabet Recognition			●	●
* Letter Sequence	●	●	●	
* Like Symbol Discrimination	●	●		
* Different Symbol Discrimination	●	●		

Pricing Information	Cass.	Disk		Cass.	Disk
Single Program	6.95	9.95	Pre-School	36.95	41.95
Special Skills	24.95	29.95	Kindergarten	54.95	59.95
Language Skills	19.95	24.95	First Grade	49.95	54.95
Math and Number Skills	34.95	39.95	Second Grade	21.95	26.95
Complete Set	59.95	64.95			
Edumate™ Light Pen	19.95		Add $2.00 for postage & handling		

* Compatible with our Edumate™ Light Pen
NOTE: All software requires 8K cassette/16K disk

Start competing with your 4-year-old for computer time. Enroll in THE LEARNING CENTER. It could be the best investment you ever make ... *in your children's future.* See your local dealer or order direct.

Available now for the
ATARI 400/800
COMING SOON for the
TRS-80 Model I, III, Color
Apple, VIC, TI-99
Free Catalog Upon Request

THE PROGRAMMER'S INSTITUTE
—a division of FUTUREHOUSE™
P.O. Box 3191 Dept C
Chapel Hill, NC 27514

1-919-967-0861 10 am - 9 pm, Monday - Saturday cents. A child can lose a lot more money than he or she earns. We want to encourage the youngster, not chip away at self-esteem. Take out 4100 and the player can earn money, but not lose it (except for fines). Kids will learn far more if you let them win something.

If you enjoy programming graphics (I don't), you may want to liven up the program. Add graphics only for correct answers; don't make it interesting to get the problem wrong. For both odd and even problems, the program will go to line 3000 if the correct answer is given. Insert your graphics in lines 3001 to 3899; this space was left open for that purpose.

Kids will learn far more if you let them win something.

As the program uses no PEEKs, POKEs, or machine language, it is easy to modify. Original ROM PET machines need to have line number 540 changed to:

540 X% = 100*RND(-TI) + 1

No other changes should be necessary. On the VIC, some of the printed lines will exceed the screen's 22 columns. You will have to break up the longer lines into two shorter lines. Don't forget to leave room for the user's name in lines that include NA$.

One last item. When the computer says I OWE YOU 37 CENTS, it is speaking for the hardware owner, not the software author. In other words, the "I" ain't me; the "I" is you! Don't send me a bill stating that I owe your kid $87.52 for a job well done. Unleash this program on your kids at your wallet's peril!

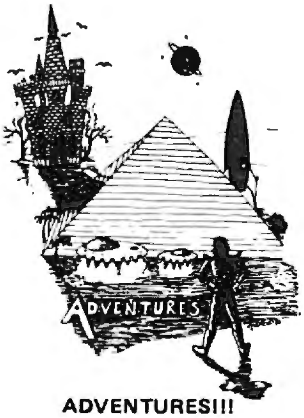
Program 1: Color Computer, Apple, Commodore Version

```
120 REM CHR$(147)= CLEAR SCREEN
140 REM CHR$(18)= REVERSE VIDEO ON
160 REM CHR$(146)= REVERSE VIDEO OF
    F
500 PRINT CHR$(147) "MAKING CHANGE"
    : PRINT: PRINT
520 INPUT "PLEASE ENTER YOUR NAME";
     NA$
540 X%=100*RND(-RND(0))+1
560 PC=PC+1: RC=0: PRINT CHR$(147)
580 IF INT(PC/2)=(PC/2) THEN 2000: ~
    REM PROBLEM TYPE SELECTION
1000 REM GIVE CHANGE PROBLEM ROUTINE

1020 PRINT PC " " NA$ " GIVE ME "X%"
      CENTS.": PRINT
1040 INPUT "HOW MANY QUARTERS"; Q: Q
     1=Q*25: PRINT
1060 INPUT "HOW MANY DIMES"; D: D1=D
     *10: PRINT
1080 INPUT "HOW MANY NICKELS"; N: N1
     =N*5: PRINT
1100 INPUT "HOW MANY PENNIES"; P: PR
     INT: PRINT
1120 Q%=Q: D%=D: N%=N: P%=P: TC=Q1+D
     1+N1+P
1140 IF Q%<>Q OR D%<>D OR N%<>N OR P
     %<>P THEN GOSUB 5000: GOTO
      1220
1160 IF P=X% AND X%>4 AND TC=X% THEN
      GOSUB 6000: GOTO 1220
1180 IF X%=TC THEN 3000
1200 GOSUB 4000
1220 IF RC>3 THEN 8000
1240 GOTO 1020: REM REPEAT PROBLEM
2000 REM COUNT CHANGE PROBLEM ROUTIN
     E
2020 PRINT PC " " NA$ ", I HAVE:"
2040 XX%=X%: QU%=XX%/25: XX%=XX%-QU%
     *25
2060 DI%=XX%/10: XX%=XX%-DI%*10: NI%
     =XX%/5: PE%=XX%-NI%*5
2080 PRINT: PRINT TAB(10) QU% "QUART
     ERS,"
2100 PRINT: PRINT TAB(10) DI% "DIMES
     ,"
2120 PRINT: PRINT TAB(10) NI% "NICKE
     LS, AND"
2140 PRINT: PRINT TAB(10) PE% "PENNI
     ES."
2160 IF RC>3 THEN RETuRN: REM FOR CO
     IN PRINT OUT AT 8040
2180 PRINT: INPUT "HOW MUCH CHANGE D
     O I HAVE"; TC: PRINT: PRIN
     T
2200 IF INT(TC)<>TC THEN PRINT NA$ "
     , DON'T USE DECIMAL POINTS
     .": GOTO 2180
2220 IF X%=TC THEN 3000
2240 GOSUB 4000
2260 IF RC>3 THEN 8000
2280 GOTO 2020: REM REPEAT PROBLEM
3000 REM CORRECT ANSWER ROUTINE *** ~
     LINES 3001 TO 3899 FOR USE
     R GRAPHICS.
3900 PRINT CHR$(18) "CORRECT " NA$ "
     !!!!!" CHR$(146)
3920 PRINT: PRINT "YOU EARN 1 CENT!!
     !!"
3940 ME=ME+1: GOTO 7000
4000 REM WRONG ANSWER ROUTINE
4020 IF TC>X% THEN 4060
4040 PRINT X%-TC "CENTS SHORT " NA$ ~
     "!": GOTO 4080
```

AARDVARK

TRS-80 COLOR OSI VIC-64 VIC-20 SINCLAIR TIMEX

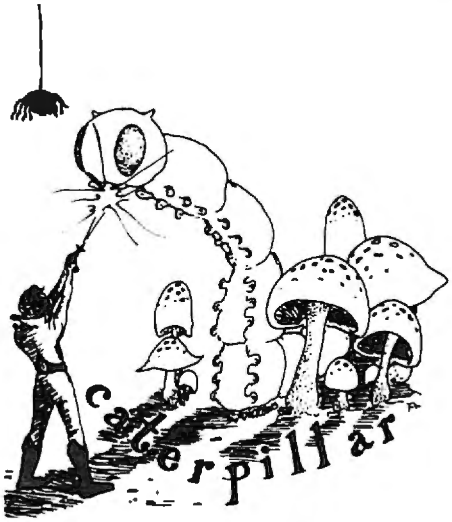
QUEST — A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16k TRS-80, TRS-80 Color, and Sinclair. 13K VIC-20. $14.95 each.



ADVENTURES!!!

These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch.")

Adventures require 16k on TRS80, TRS80 color, and Sinclair. They require 8k on OSI and 13k on Vic-20. Derelict takes 12k on OSI. $14.95 each.



CATERPILLAR

O.K., the Caterpillar does look a lot like a Centipede. We have spiders, falling fleas, monsters traipsing across the screen, poison mushrooms, and a lot of other familiar stuff. COLOR 80 requires 16k and Joysticks. This is Edson's best game to date. $19.95 for TRS 80 COLOR.

PROGRAMMERS!
SEE YOUR PROGRAM IN THIS SPACE!!
Aardvark traditionally pays the highest commissions in the industry and gives programs the widest possible coverage. Quality is the keyword. If your program is good and you want it presented by the best, send it to Aardvark.

ESCAPE FROM MARS

(by Rodger Olsen)

This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

HAUNTED HOUSE (by Bob Anderson)

It's a real adventure—with ghosts and ghouls and goblins and treasures and problems — but it is for kids. Designed for the 8 to 12 year old population and those who haven't tried Adventure before and want to start out real easy.

DERELICT

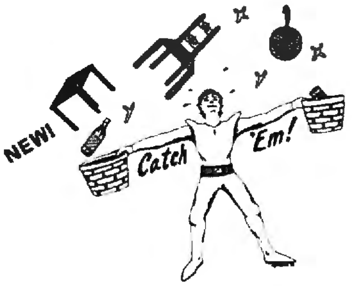
(by Rodger Olsen & Bob Anderson)

New winner in the toughest adventure from Aardvark sweepstakes. This one takes place on an alien ship that has been deserted for a thousand years — and is still dangerous!

TUBE FRENZY

(by Dave Edson)

This is an almost indescribably fast action arcade game. It has fast action, an all new concept in play, simple rules, and 63 levels of difficulty. All machine code, requires Joysticks. Another great game by Dave Edson. TRS 80 COLOR ONLY. 16k and Joysticks required. $19.95.



CATCH'EM

(by Dave Edson)

One of our simplest, fastest, funnest, all machine code arcade games. Raindrops and an incredibe variety of other things come falling down on your head. Use the Joysticks to Catch'em. It's a BALL! — and a flying saucer! — and a Flying Y!— and so on. TRS 80 COLOR. $19.95.

BASIC THAT ZOOOMMS!!
AT LAST AN AFFORDABLE COMPILER!

The compiler allows you to write your programs in easy BASIC and then automatically generates a machine code equivalent that runs 50 to 150 times faster.

It does have some limitations. It takes at least 8k of RAM to run the compiler and it does only support a subset of BASIC—about 20 commands including FOR, NEXT, END, GOSUB, GOTO, IF, THEN, RETURN, END, PRINT, STOP, USR (X), PEEK, POKE, *, /, +, -, >, <, =, VARIABLE NAMES A-Z, SUBSCRIPTED VARIABLES, and INTEGER NUMBERS FORM 0-64K.

TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20-page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI, TRS-80 Color, or VIC.

Please specify system on all orders

ALSO FROM AARDVARK — This is only a partial list of what we carry. We have a lot of other games (particularly for the TRS-80 Color and OSI), business programs, blank tapes and disks and hardware. Send $1.00 for our complete catalog.

AARDVARK - 80

2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

Phone Orders Accepted 8:00 a.m. to 4:00 p.m. EST. Mon.-Fri.

```
4060 PRINT TC-X% "CENTS TOO MUCH " N
     A$ "!"
4080 PRINT: PRINT "YOU LOSE 1 CENT!"

4100 ML=ML+1
4120 RC=RC+1: IF RC>3 THEN RETURN
4140 PRINT: PRINT "TRY AGAIN " NA$ "
     .": PRINT: PRINT
4160 IF RC=1 THEN W=W+1
4180 RETURN
5000 REM FRACTIONAL ANSWER ROUTINE
5020 PRINT NA$ ", ANSWERS WITH DECIM
     AL"
5040 PRINT: PRINT "POINTS ARE NOT AL
     LOWED."
5060 PRINT: PRINT "YOU ARE FINED 1 C
     ENT."
5080 F=F+1: GOTO 4120
6000 REM ALL PENNY ANSWER
6020 PRINT NA$ "," P "PENNIES DOES E
     QUAL" X% "CENTS."
6040 PRINT: PRINT "BUT THAT IS CHEAT
     ING."
6060 PRINT: PRINT "YOU ARE FINED 1 C
     ENT FOR CHEATING."
6080 F=F+1: GOTO 4120
7000 REM SCORING ROUTINE
7020 PRINT: PRINT: PRINT "PRESS " CH
     R$(18) "S" CHR$(146) " FOR
      SCORE,";
7040 PRINT " ANY KEY TO CONTINUE."
7060 FOR X=1 TO 10: GET A$: NEXT X
7080 GET A$: IF A$="" THEN 7080
7100 IF A$<>"S" THEN 540
7120 PRINT CHR$(147) NA$ "'S SCORE!!
     "
7140 PRINT: PRINT "TOTAL PROBLEMS:" ~
     PC
7160 PRINT: PRINT "TOTAL CORRECT:" P
     C-W
7180 PRINT: PRINT "TOTAL WRONG:" W
7200 PRINT: PRINT "PERCENT CORRECT:"
      (PC-W)/PC*100 "%"
7220 PRINT: PRINT "MONEY EARNED:" ME
      "CENTS"
7240 PRINT: PRINT "MONEY LOST:" ML "
     CENTS"
7260 PRINT: PRINT "FINES:" F "CENTS"
     : PRINT
7280 PA=ME-ML-F
7300 IF PA<0 THEN PA=ABS(PA): PRINT ~
     "YOU OWE ME" PA "CENTS!": ~
     GOTO 7340
7320 PRINT "I OWE YOU" PA "CENTS!"
7340 GOTO 7000
8000 REM CORRECT ANSWER PRINT OUT
8020 PRINT: PRINT: PRINT NA$ ", THE ~
     CORRECT ANSWER IS:"
8040 GOSUB 2040: REM COIN PRINT OUT
8060 PRINT: PRINT " MAKES" X% "CENTS
     ."
8080 GOTO 7000
```

Program 2: Atari Version

```
20 REM MAKING CHANGE  ATARI VERSION
30 DIM NA$(30)
100 REM SCREEN ASCII CODES
120 REM CHR$(125)= CLEAR SCREEN
500 PRINT CHR$(125);"MAKING CHANGE":P
    RINT :PRINT
520 PRINT "PLEASE ENTER YOUR NAME";:I
    NPUT NA$
540 X=INT(100*RND(-RND(0))+1)
560 PC=PC+1:RC=0:PRINT CHR$(125)
580 IF INT(PC/2)=(PC/2) THEN 2000:REM
     PROBLEM TYPE SELECTION
1000 REM GIVE CHANGE PROBLEM ROUTINE
1020 PRINT PC;") ";NA$;", GIVE ME ";X
     ;" CENTS.".PRINT
1040 PRINT "HOW MANY QUARTERS";:INPUT
      Q:Q1=Q*25:PRINT
1060 PRINT "HOW MANY DIMES";:INPUT D:
     D1=D*10:PRINT
1080 PRINT "HOW MANY NICKELS";:INPUT
     N:N1=N*5:PRINT
1100 PRINT "HOW MANY PENNIES";:INPUT
     P:PRINT :PRINT
1120 IF Q<>INT(Q) OR D<>INT(D) OR N<>
     INT(N) OR P<>INT(P) THEN GOSUB 5
     000:GOTO 1220
1140 Q=INT(Q):D=INT(D):N=INT(N):P=INT
     (P):TC=Q1+D1+N1+P
1160 IF P=X AND X>4 AND TC=X THEN GOS
     UB 6000:GOTO 1220
1180 IF X=TC THEN 3000
1200 GOSUB 4000
1220 IF RC>3 THEN 8000
1240 GOTO 1020:REM REPEAT PROBLEM
2000 REM COUNT CHANGE PROBLEM ROUTINE
2020 PRINT PC;") ";NA$;", I HAVE:"
2040 XX=X:QU=INT(XX/25):XX=XX-QU*25
2060 DI=INT(XX/10):XX=XX-DI*10:NI=INT
     (XX/5):PE=XX-NI*5
2080 PRINT :PRINT QU;" QUARTERS,"
2100 PRINT :PRINT DI;" DIMES,"
2120 PRINT :PRINT NI;" NICKELS, AND"
2140 PRINT :PRINT PE;" PENNIES."
2160 IF RC>3 THEN RETURN :REM FOR COI
     N PRINT OUT AT 8040
2180 PRINT :PRINT "HOW MUCH CHANGE DO
      I HAVE";:INPUT TC:PRINT :PRINT
2200 IF INT(TC)<>TC THEN PRINT NA$;",
      DON'T USE DECIMAL POINTS.":GOTO
      2180
2220 IF X=TC THEN 3000
2240 GOSUB 4000
2260 IF RC>3 THEN 8000
2280 GOTO 2020:REM REPEAT PROBLEM
3000 REM CORRECT ANSWER ROUTINE *** L
     INES 3001 TO 3899 FOR USER GRAPH
     ICS.
3900 PRINT "CORRECT ";NA$;"!!!!!"
3920 PRINT :PRINT "YOU EARN 1 CENT!!!
     !"
3940 ME=ME+1:GOTO 7000
4000 REM WRONG ANSWER ROUTINE
4020 IF TC>X THEN 4060
4040 PRINT X-TC;" CENTS SHORT ";NA$;"
     !":GOTO 4080
4060 PRINT TC-X;" CENTS TOO MUCH ";NA
     $;"!"
4080 PRINT :PRINT "YOU LOSE 1 CENT!"
4100 ML=ML+1
4120 RC=RC+1:IF RC>3 THEN RETURN
4140 PRINT :PRINT "TRY AGAIN ";NA$;".
```

```
     ":PRINT :PRINT
4160 IF RC=1 THEN W=W+1
4180 RETURN
5000 REM FRACTIONAL ANSWER ROUTINE
5020 PRINT NA$;", ANSWERS WITH DECIMA
     L"
5040 PRINT :PRINT "POINTS ARE NOT ALL
     OWED."
5060 PRINT :PRINT "YOU ARE FINED 1 CE
     NT."
5080 F=F+1:GOTO 4120
6000 REM ALL PENNY ANSWER
6020 PRINT NA$;",";P;"PENNIES DOES EQ
     UAL";X;"CENTS."
6040 PRINT :PRINT "BUT THAT IS CHEATI
     NG."
6060 PRINT :PRINT "YOU ARE FINED 1 CE
     NT FOR CHEATING."
6080 F=F+1:GOTO 4120
7000 REM SCORING ROUTINE
7020 PRINT :PRINT :PRINT "PRESS S FOR
      SCORE,"
7040 PRINT " ANY KEY TO CONTINUE."
7060 POKE 764,255
7080 K=PEEK(764):IF K=255 THEN 7080
7100 POKE 764,255:IF K<>62 THEN 540
7120 PRINT CHR$(125);NA$;"'S SCORE!!"
7140 PRINT :PRINT "TOTAL PROBLEMS:";P
     C
7160 PRINT :PRINT "TOTAL CORRECT:";PC
     -W
7180 PRINT :PRINT "TOTAL WRONG:";W
7200 PRINT :PRINT "PERCENT CORRECT:";
     INT((PC-W)/PC*100);"%"
7220 PRINT :PRINT "MONEY EARNED:";ME;
     " CENTS"
7240 PRINT :PRINT "MONEY LOST:";ML;"
     CENTS"
7260 PRINT :PRINT "FINES:";F;" CENTS"
     :PRINT
7280 PA=ME-ML-F
7300 IF PA<0 THEN PA=ABS(PA):PRINT "Y
     OU OWE ME ";PA;" CENTS!":GOTO 73
     40
7320 PRINT "I OWE YOU ";PA;" CENTS!"
7340 GOTO 7000
8000 REM CORRECT ANSWER PRINT OUT
8020 PRINT :PRINT :PRINT NA$;", THE C
     ORRECT ANSWER IS:"
8040 GOSUB 2040:REM COIN PRINT OUT
8060 PRINT :PRINT " MAKES";X;"CENTS."
8080 GOTO 7000
```

an
ATARI®
Cartridge
Storage Case
is ideal for anyone.
So don't wait
for the attractive
8 Cartridge
Storage System
$15.95
by Data Faire

Here is what you have
been looking for
ASTRO

Can you choose any of the planetiods in our solar system and land on it? Choose any of the planets or the large moons and try to land safely. Each one has it's own description and gravitational pull and is a simulation of an actual landing. Atari 32K, Disk $15.95.

DATA FAIRE
1614 SPEYER
REDONDO BEACH, CA 90278
(213)374-8743
(213)379-5798

DEALER INQUIRIES INVITED
Atari® is a registered trademark of Atari, Inc.

PLEASE ADD $2.00 SHIPPING FOR MAIL ORDERS. C.O.D. ORDERS ACCEPTED

COMPUTE! Books
P.O. Box 5406 Greensboro, NC 27403

Ask your retailer for these **COMPUTE! Books.** If he or she has sold out, order directly from **COMPUTE!**.

For Fastest Service
Call Our **TOLL FREE US Order Line**
800-334-0868
In NC call 919-275-9809

Quan.	Title	Price	Total
_____	**The Beginner's Guide To Buying A Personal Computer** (Add $1 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$ 3.95	_____
_____	**COMPUTE!'s First Book of Atari** (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$12.95	_____
_____	**Inside Atari DOS** (Add $2 shipping hand handling. Outside US add $5 air mail; $2 surface mail.)	$19.95	_____
_____	**COMPUTE!'s First Book of PET/CBM** (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$12.95	_____
_____	**Programming the PET/CBM** (Add $3 shipping and handling. Outside US add $10 air mail; $3 surface mail.)	$24.95	_____
_____	**Every Kid's First Book of Robots and Computers** (Add $1 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$ 4.95	_____
_____	**COMPUTE!'s Second Book of Atari** (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$12.95	_____
_____	**COMPUTE!'s First Book of VIC** (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$12.95	_____
_____	**COMPUTE!'s First Book of Atari Graphics** (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$12.95	_____
_____	**Mapping the Atari** Available in January. (Add $2 shipping and handling. Outside US add $5 air mail; $2 surface mail.)	$14.95	_____

All orders must be prepaid (money order, check, or charge). All payments must be in US funds. NC residents add 4% sales tax.

☐ Payment enclosed
Please charge my: ☐ VISA ☐ MC ☐ Am. Exp.
Acc't. No. Expires /
Name
Address
City State Zip
Country
Allow 4-5 weeks for delivery.

Learning With Computers

Glenn M Kleiman

Each of the prior *Learning with Computers* columns focused on a single main topic. Word processing, graphics, Logo, PILOT, preschool computing, computer camps, introducing programming, computer literacy and other topics have been discussed in the past year. Meanwhile, software, books, comments from readers, and other pieces of information have been piling up on my desk, waiting to be fit into a column. For the next few months, I will work my way through this stack, and not focus on any particular topics.

Information Directories

The stacks on my desk illustrate that products, information, resource centers, and uses of computers in education are increasing at an astounding rate. Fortunately, there are people who collect and organize this information for the convenience of the rest of us. You may find the following recently published directories useful:

Instructor Magazine Computer Directory For Schools. This directory contains four main categories of information: hardware, software, publications, and companies. Hardware is subdivided into computers, memory devices, monitors, printers, modems, networking devices, graphics devices, and other categories. Software is listed by area of use – language arts, mathematics, science, social studies, art, music, and so on.

Publications are divided into books, magazines, and other resources. For each of the nearly 2,000 products listed, there is a brief description, including, when relevant, equipment requirements, grade level, source, and price. There are also 400 companies listed. The aim of this directory is to be encyclopedic rather than selective, so no evaluative information is provided. This directory is available for $19.95 (plus $2 shipping) from Instructor Books, P.O. Box 6177, Duluth, MN 55806.

Classroom Computer News Directory. Part I of this directory lists and describes sources of information. It is divided into six sections. The first lists and briefly describes anthologies, bibliographies, indexes, on-line data bases, resource centers, and research and development projects. The second section covers software directories, sources of reviews, and clearing-houses. The remaining sections cover associations, periodicals, funding, and miscellaneous resources.

Part II is divided according to computer systems, with sections covering Apple, Atari, Commodore, Radio Shack, Sinclair, and Texas Instruments. Periodicals, software directories, and user groups are listed for each computer.

Part III covers local and regional resources, organized by state and province. User groups, projects, organizations, computer learning centers, and state or provincial personnel responsible for educational computing are listed.

Part IV lists colleges and universities offering courses on computers in education, and the types of courses offered. Part V is a calendar of national and regional conferences and workshops, and Part VI is a "yellow pages" of paid advertisements.

Overall, the directory contains a great deal of well organized information which can help you find answers to all sorts of questions. It is available for $14.95 from *Classroom Computer News*, 341 Mt. Auburn Street, Watertown, MA 02172.

Microcomputer Directory: Applications In Educational Settings. This directory lists projects using microcomputers for instructional and administrative purposes at over 1,000 sites in the United States. It includes elementary and secondary schools, computer camps, museums, prisons, alternative learning sites, and colleges and universities. Each listing includes a brief description of the project and the name and address of a person to contact for more information. It is available for $15 (plus $1 postage) from Gutman Library, Harvard University Graduate School of Education, Appian Way, Cambridge, MA 02138.

On Software Reviewing

During the past year, I have discussed many software packages. As some readers have noted, my overall evaluations have generally been very positive. There is a simple reason for this. I try to bring useful, innovative, well-designed software to your attention, and I do not take the time or space to mention software I find lacking or uninteresting. That is, I filter poor software rather than criticize it. Of course, this doesn't mean that I have found any perfect programs, but there certainly are some very good ones available now.

More Programs For Preschoolers

In last May's column, I discussed some principles

UNIQUE MULTI-USER SOFTWARE BRINGS NEW EXCITEMENT TO GROUP LEARNING.

The results are always the same. Put a computer in a classroom and children are drawn to it like steel to a magnet. And even though only one child actually uses the computer, the others coach or offer encouragement. Involving as this activity may be, it fails to take advantage of one of the best known principles of learning. But more about this later.

A simple idea.

When two educational researchers, Dr. Matilda Butler and Dr. William Paisley, studied the interaction of children around microcomputers they had an interesting, yet simple, idea. Instead of one user and several observers, why not give every child the opportunity to learn simultaneously. This idea sparked an entire line of unique educational software and gave birth to a new company, Edupro.

Learning through cooperation and competition.

Each one of Edupro's Microgroup™ computer programs presents your students with a different learning environment. It may be a visit with storybook friends. A trip through American history. Or an exploration of the world around us.

In any case, the principles are the same. Mathematical, language arts, social studies, and science problems are presented as contests, races, and puzzles. Using joysticks or paddles up to eight children work together, either competitively or cooperatively. They race against time, each other, or both.

Forgotten principle.

Now about that principle of learning other educational software ignores.

For years, studies have shown that children learn more efficiently in groups. Group learning motivates slower learners to persevere. It promotes divergent thinking. And it teaches the importance of working together for a common goal.

Atari® and 400/800™ are trademarks of ATARI Inc.

Ordinary educational software can't provide this stimulation. But with Edupro software children can experience the challenge and excitement of group learning on a daily basis.

Designed for the simplest computers.

Even with all the advances in computer science and micro-electronics, multi-user software typically requires a sophisticated, expensive computer. At a cost beyond the reach of most school districts. So the following paragraphs may contain the best news of all.

These unique programs run on Atari 400 or Atari 800 personal computers. They're available on floppy disk or cassette, and use the minimum amount of computer memory (16K bytes). So even the simplest Atari computer can teach eight students simultaneously.

And the learning doesn't have to stop in your classroom.

These Atari units are also one of the most popular home computers, so Edupro programs can involve the entire family in the group learning process. Not only can parents work with their children, brothers and sisters can share learning with each other. A feat that's hard to duplicate inside a classroom.

Your own hands-on experience.

If you were at this fall's Computer-Using Educators Conference you may have had a demonstration of our programs. Hundreds of educators did. Many of them said that this was an effective way to judge the potential of these programs. But you can have a better opportunity.

We've prepared a sampler kit of the conferences' most popular four user programs. It includes selections from six different programs spanning ages five to adult (all our programs are age graded). We'll be happy to send it to you so you can introduce these programs to your own students. The kit comes with complete instructions and our catalog listing over 50 additional programs. Plus we'll include a coupon good for a 10% discount on your first order.

We know of no other software that can turn a microcomputer into a tool for sharing the excitement of group learning.

Fill out the order form below and see the results in your own classroom.

I want to share the excitement of group learning with my students. Please send me the number of sampler kits I've indicated below. I understand that each kit includes a disk or cassette (my choice) of selected Edupro programs, instructions, catalog, and 10% discount coupon for my next order.

_____ Sampler kit(s) with disk @ $7.95 each ________

_____ Sampler kit(s) with cassette @ $7.95 each ________

California residents add sales tax ________

First Class postage & handling $ 2.00

Total: Check or money order enclosed for $________

Please bill ____ MasterCard ____ Visa

(card no.) (exp. date)

Name ________________

Address ________________

City ________________

State ________ ZIP ________

Signature ________________

Allow 3 weeks for delivery.

send to: Edupro, Dept. CO, P.O. Box 51346, Palo Alto, California 94303

Edupro™

of designing software for young children and described seven educational programs suitable for preschoolers. Since then, I have received several new excellent programs for young children.

Facemaker combines a creative tool with a memory game. The child begins by creating a face. The program presents sets of mouths, noses, ears, eyes, and hair. The child selects the specific parts, and the computer automatically combines them into a face. *Facemaker* will be reviewed in an upcoming issue.

My First Alphabet, by Fernando Herrara, is designed to help children learn to recognize letters and numbers, associate words with each letter, count, and learn to use the computer keyboard. This program was the first-place winner of an Atari competition, and is marketed by Atari.

For each letter of the alphabet, the program contains a screen display with a picture, a large version of the letter, and four words that begin with it. For example, for the letter A, first an airplane and a large A are drawn on the screen. Then large letters show the sentence "A IS FOR AIRPLANE," and the words ARROW, ARM and ANT appear. Each number also has its own display. For example, for the number five, nine clowns are drawn on the screen, then smiling faces are added to five of them and frowning faces are added to the other four.

After an initial display of the letters, accompanied by the alphabet song, the program provides several ways of using the screen displays. You can have the computer automatically show the displays for randomly selected letters and numbers, or you can specify which displays are to be shown. You can have the displays run continuously, or have the program wait for the child to type the matching letter or number for each screen display. When the child types a correct key, music plays and the screen colors change.

The pictures are excellent and realistic, so children can easily recognize each item portrayed. The program holds children's attention, and they enjoy seeing the pictures, recognizing the letters, and finding the right keys to press.

My First Alphabet is designed for a child to use with an adult present to exchange questions and answers, prompt the child, read the words, and so on. This is important since the program itself requires very little activity on the child's part. It takes quite awhile to draw each screen display and, once the display is completed, the most the child is to do is to press the corresponding key. Without someone to question, prompt and guide them, children using this program spend most of their time watching, and very little time doing anything.

Children's Television Workshop Software

Children's Television Workshop (CTW), producers of *Sesame Street*, *The Electric Company* and *3-2-1 Contact*, has developed four disks of play-and-learn programs for Apple II computers. Each disk contains four programs, many of which are variations of classic games and puzzles, such as *Hangman*, *Anagrams*, and *Tower of Hanoi*. Less expensive computer versions of these games and puzzles are available elsewhere, such as from user groups or from program listings in books and magazines.

However, the CTW versions are especially well-designed, easy to use, and contain fine graphics. There are disks for children four to seven years old, seven to ten years old, nine to thirteen years old, and a disk containing programs suitable for a wide range of ages. Each disk comes with a book containing instructions for the programs and suggestions for related non-computer activities and games.

Ernie's Quiz is the disk for the youngest children. One program on it, called "Guess Who," uses colorful, low-resolution pictures of Sesame Street Muppets, such as Bert, Ernie, Big Bird, and the Cookie Monster. The computer begins by displaying a few blocks of color and then it gradually fills in more and more of the picture. The child tries to figure out, as quickly as possible, which Sesame Street character is being portrayed.

A "Face-It" program lets children create faces on the screen. It is similar in concept to the *Facemaker* program described above, but Face-It has larger, more colorful faces, lets the child add more features (such as eyeglasses, mustaches, beards), and lets the child control colors. The game paddles are used to select features and colors. (Face-It does not contain the animation and memory game options found in *Facemaker*.)

There are two more programs on the disk. "Jelly Beans" is a simple counting game. The "Ernie's Quiz" program provides hints about a Muppet, and the child is to choose which Muppet is being described.

Mix and Match is the disk for all ages. One program on this disk lets children create pictures by combining the heads, bodies, and feet of different Muppets. For example, the child can create Muppet with Bert's head, Big Bird's body, and Oscar the Grouch's feet. The computer will show the picture and tell the children that this creature is called "Berber the Grouch."

The disk also contains an excellent version of *Animal*, a classic computer game in which the player thinks of an animal and the computer tries to figure out which animal it is by asking questions such as "Does it live on land?" and "Does it fly?" If the computer cannot guess the animal, it asks the player questions. In this way, the computer adds information to its knowledge base so it improves how well it plays the game.

There are two other programs. "Layer Cake" is a version of the *Tower of Hanoi* puzzle. It is easy to use and takes good advantage of the Apple's graphics capabilities. "Raise the Flags" is a non-violent variation of *Hangman*. The disk also contains a word editor which lets you enter your own words for the Raise the Flags program.

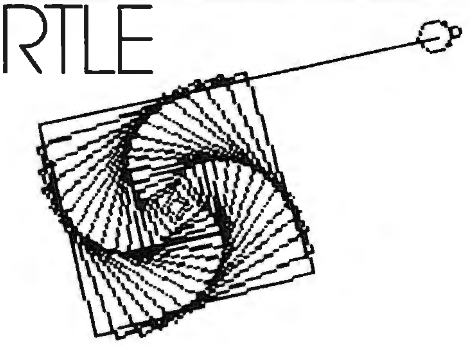
Instant Zoo is a disk for children ages seven to ten. Its four games are: Instant Zoo, a picture recognition game similar to Guess Who, but with animals instead of Muppets; Star Watch, which measures how long the child takes to press a key after a shooting star appears on the screen; Quick Match, in which two words are shown and the child presses one key if they match and another if they do not match; and Scramble, an anagram game in which the child races the computer to unscramble words. There is also a word editor for creating your own word lists for Quick Match and Scramble.

Spotlight is a disk for children ages nine to thirteen. It has two programs in which the child turns mirrors to direct lights to targets. The third program, called "Hot Stuff," is a game of logic in which the player tries to guess the computer's secret three-digit number. After each guess, the computer tells how many of the three digits are in the right place, and how many appear in the secret number, but not in the same place as guessed. Sounds simple, but complex logic is needed to figure out the secret number with as few guesses as possible.

The CTW disks are marketed by Apple and are available from Apple dealers. Each disk costs $50. The Mix and Match disk programs are in Applesoft. The programs on the other disks are in Integer BASIC, so they require either an Apple computer with Integer BASIC, or one with 64K (in which case Integer BASIC will automatically load into the extra memory when the disk is booted). Some of the programs also require game paddles.

The CTW programs, *Facemaker*, *My First Alphabet*, and those I reviewed in last May's column provide an excellent and varied set of software for introducing young children to computers. ©

FRIENDS OF THE TURTLE



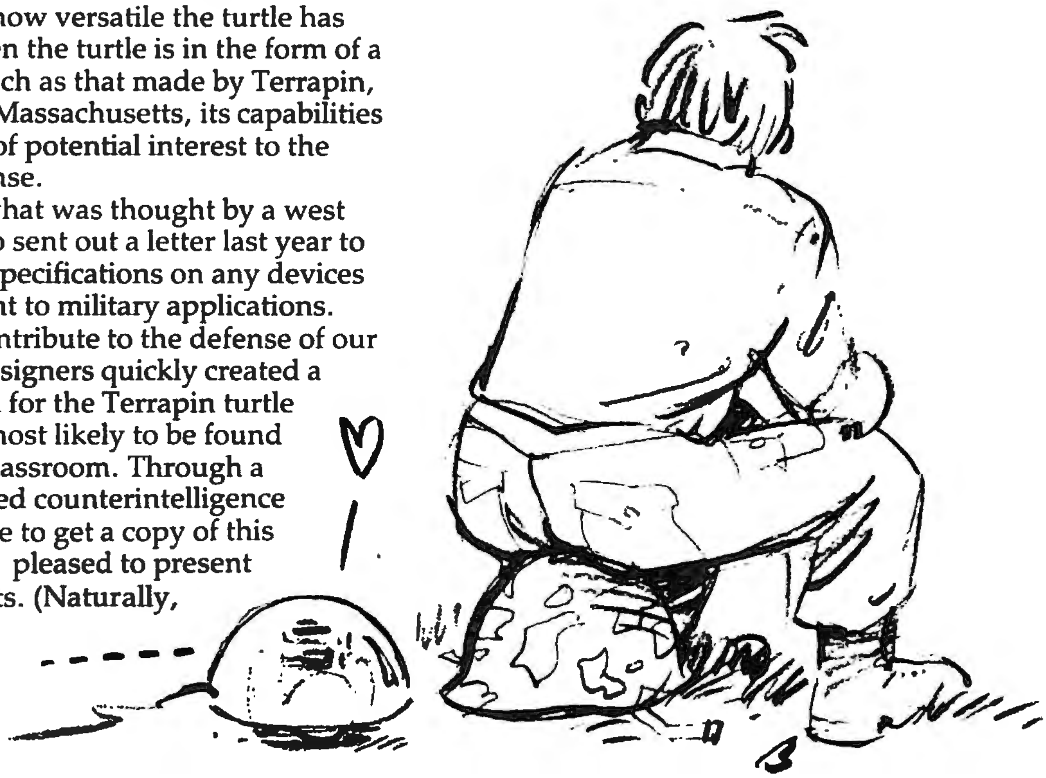
David D Thornburg, Associate Editor

The Department Of Turtle Defense

Those of us who limit our use of turtle graphics to the aesthetic pleasures of art or to its use in education have no idea how versatile the turtle has become. In fact, when the turtle is in the form of a mechanical robot, such as that made by Terrapin, Inc., in Cambridge, Massachusetts, its capabilities are so great as to be of potential interest to the Department of Defense.

At least this is what was thought by a west coast think-tank who sent out a letter last year to Terrapin asking for specifications on any devices that might be relevant to military applications.

Ever eager to contribute to the defense of our country, Terrapin designers quickly created a military specification for the Terrapin turtle – a $600 peripheral most likely to be found in a primary grade classroom. Through a network of well placed counterintelligence operatives, I was able to get a copy of this specification and am pleased to present the following excerpts. (Naturally, I have made sure that I haven't included any information that would compromise our nation's defense.)



From a functional viewpoint, Turtles show great promise as all-terrain vehicles for pushing heavy payloads to their destination. Under the heading of survivability, we find that:

> *The turtle enjoys a low observability, due to a minimal radar cross section and an almost non-existent infrared signature. In addition, its ground-hugging characteristics maximize terrain masking, resulting in lower target acquisition by most classes of SSM and ASM threats. ... The Turtle can make a 180-degree turn in less space than any military vehicle currently in use by US forces, ground, air, or sea. With minor modifications, a Turtle could be constructed that could double its cruising speed for a terminal "dash" capability that would greatly enhance survivability in the endgame.*
>
> *... Even if a suitable counter were found to all these properties of the Turtle, it is doubtful that an enemy could afford to deploy counter-weapons in sufficient number to nullify the possibility of defense saturation in the event of an all-out Turtle attack.*

On the topic of range ...

> *The Mark I, Mod 0 Turtle has an effective range of some 3 to 4 meters, depending on its winding count. Range is most severely limited by the Turtle's cable, but this limitation is trivial by comparison to the inherent advantages of wire-guidance. ... Furthermore, our research department is currently engaged in the testing of a 100 mile cable for the Turtle. ... While this does result in a shorter tooth-to-tail ratio, we feel it could significantly enhance the battlefield capabilities of the Turtle installations.*

On the topic of guidance ...

> *Because the Terrapin Turtle™ is computer con-*

YOU ARE GOING TO SMILE!

--When you see over 2000 books, programs, and accessories we carry for All Major Brands in our Computer 'SOURCE BOOK©'. From introductory level to professional, we cover it all. Listed Below is just a sample of what we carry.

DEALER INQUIRIES WELCOME

JMC

INTRODUCTORY BOOKS

Introduction to Word Processing. Plain language book for those considering a purchase.
4795-000076 300 pgs,140 illus $12.95

How to Buy the Right Small Business Compter. Easy to follow book with 'checklist'.
4925-006494 225 pgs, $ 8.95

Business System Buyers Guide. This guide cuts thru the jargon and simplifies your task.
4665-000047 166 pgs $ 7.95

Using Micros in Business. Essential background briefing for any buyer of hard.or software
4410-005152 192 pgs $ 9.95

Your Home Computer. Meant for the person who has no technical background,-buying tips!
4250-000022 211 pgs $12.95

Home Computers: Beginners Glossery & Guide. Terminology,number systems,symbols
4250-000002 147 pgs, 20 illus. $10.95

Why do YOU need a Personal Computer? Learn the 100's of everyday applications.
4925-004784 320 pages $ 8.95

Computer Dictionary & Handbook. More than 22,000 definitions,acronyms,abbreviations.
4760-021632 928 pages $34.95

Computer Dictionary. More than 12,000 definitions clear up almost any question you have.
4760-021652 624 pages, $15.95

How to Computerize Your Small Business. Shows how to plan a tailored computer system
4690-403857 171 pages $7.95

How to make MONEY with Your Micro. This book gives you dozens of money making ideas.
4250-000074 154 pages $12.95

Playing the Stock & Bond Markets w/ Micros. Learn the principals of investing in the markets
4800-001251 308 pgs,35 illus $ 9.95

ATARI™ BOOKS

Atari Pilot For Beginners. A hands-on introduction to the Atari PILOT computer language for use on either 400 or 800. Using 'turtle-graphics' approach, it is easy for beginners to play music,animate, and much, much more.
4690-000301 176 pages $12.95

101 Atari Computer Programming Tips & Tricks. Practical,useful,efficient techniques, and operating shortcuts for easy programming
4080-000022 128 pages $ 8.95

31 New Atari Computer Programs. For home, School,and Office. From games to the practical.
4080-000018 96 pages $ 8.95

Understanding Atari Graphics. This handly Guide works the reader thru the logic and mechanics of good graphics. For pros or beginners.
4040-005338 $ 2.95

Atari BASIC, A Quick Reference Guide. A 6 x 12 inch card designed to be kept next to your computer that gives you instant access to the most often needed programming commands.
4925-087044 For Atari 400/800 $ 2.95

TRS-80™ COLOR COMPUTER BOOKS

TRS-80® Color Programs. Includes 36 fully documented practical and educational programs with special eight page color section illus. how the software will look on the screen.
4800-001481 $ 29.95

Color Computer Applications. Creating visually exciting color displays is easy once you know the right techniques. This book is filled with hundreds of tips and projects.
4925-033303 250 Pages $10.95

Top-Down BASIC For The Color Computer. This is a friendly easy-to-follow course in more advanced programming skills.
4525-057861 256 Pages, 70 Illus. $12.95

55 Color Computer Programs for the Home, School & Office. Includes lots of color graphics
4080-000005 128 pgs $ 9.95

55 More Color Computer Programs. Companion volume to above,more useful programs.
4080-000008 112 pgs $ 9.95

Love Poems from the Digital Heart of an Electronic Computer. An Ideal Valentine!
4080-000013 96 Pages $ 4.95

TRS-80™ Color Computer Graphics. Comprehensive coverage of color and graphics avail.
4725-007864 $14.95

Color Computer Graphics. A must have book for owners of the TRS-80™ Color Computer.
4080-000012 128 pgs $ 9.95

Color Computer Songbook. Book of favorite songs and classics to be played on Color Comp.
4080-000011 96 pgs $ 7.95

TRS-80™ Color Computer Applications. A beginners handbook loaded with examples.
4690-007870 240 pgs $12.95

TRS-80™ Color BASIC. Self-teaching guide leads novices step by step into programming.
4925-009644 256 pgs $ 9.95

TRS-80™ Color Programs. 37 programs are fully documented in this easy to follow book.
4250-000061 323 pgs $19.95

101 Color Computer Programming Tips & Tricks. Practical,useful techniques & shortcuts
4080-000007 128 pgs $ 7.95

SINCLAIR ZX-81™ BOOKS

Programming the ZX-81 for Real Applications. Practical programs to show ability of ZX-81
4250-000090 166 pages $ 9.95

Making the Most of Your ZX-81. Information on how to write programs games.tricks,etc
4725-004186 128 pages $10.95

The ZX-81 Pocket Book. Handy programming manual that gives you everything you need
4725-009524 128 pages $9.95

Mastering Machine Code on Your ZX-81. First 'simple english' guide to machine code.
4725-004261 180 pages $12.95

49 Explosive Games for the ZX-81. Complete easy to read game rules and program instruct
4725-002086 140 pages $10.95

NEW

A Solution to a 'BASIC' Problem

Have you ever found a program written in BASIC that you really liked, but it was not compatible with your computer's version of BASIC? Frustrating, isn't it? Well, 'tis no longer a problem! Here are two *NEW* books that allow you to convert programs from one version of BASIC to another. All sorts of ways! But, we do suggest you pick-up a copy of both as there seems to be a few things each left for the other to do. . .

The BASIC Conversions Handbook for Apple®, Pet®, TRS80®, Atari® USERS
Equivalent commands are listed for TRS-80, Apple, Pet and Atari versions of BASIC. This book contains useful advice on the methodology of converting programs, explanations of machine pecularities, and detailed explanations.
4410-006267 $12.95

The BASIC Book: A Cross Referenced Guide to the BASIC Language.
Helms. Here is a convenient guide to the different implementations of the BASIC language used by Apple®, Atari®, Texas Instruments®, Commodore®, IBM®, and Radio Shack®. The commands and syntax for each version of BASIC are covered, with examples provided for difficult concepts. Commands, statements, and functions are listed alphabetically, and a handy cross-reference chart enables users to quickly determine in which versions of BASIC they appear. In addition, a special section is devoted exclusively to graphics statements. A useful book.
4525-027959 *DUE: January 1983* $ 7.95

APPLE™ BOOKS

Apple II™ Users Guide. This guide is the key to unlocking the full power of your Apple II.
4665-000046 385 pgs $16.95

APPLE™! Collection of BASIC programs that have been converted to run on the Apple II.
4665-000068 200 pages. $14.99

Assembly Lanquage Programming for the Apple II™. Comprehensive introduction.
4665-000051 $12.95

Apple™ Machine Language. A machine language book that's fun and entertaining.
4690-000230 296 pages/ Illus. $12.95

Apple™ Interfacing. Helps you to interface your Apple™ to a variety of electronic devices.
4760-021882 208 pgs $10.95

Apple™ Programming Exercies. 17 Easy to read,easy to use exercies including music.
4925-086598 192 pages $ 9.95

VIC-20™ BOOKS

Understanding Your Vic.Vol 1. Beginners guide to programing on the Vic-20™. Tips & tech.
4840-000003 148 pages $11.95
4840-000004 Cassette Supplement $7.95

Compute!'s First Book of Vic. Collection of the best articles from Compute! Magazine.
4105-000007 Fall 1982 $12.95

Starting with BASIC on the Vic-20™. Helps novices learn all the capabilities of the Vic-20
4725-007070 128 pgs,due Fall 82 $12.95

IBM™ BOOKS

IBM's™ Personal Computer. Background on the giants entry into field,with evaluations.
4700-000111 303 pages $14.95

Using the IBM™ Personal Computer. A complete handbook showing what it can do.
4725-008183 300 pages $12.95

PROTECT YOUR INVESTMENT

Your Personal Computer is an expensive investkment. If taken care of it will give you hours of enjoyment and operate trouble free for years. BUT, accidents do happen, and we suggest you take out some cheap insurance to protect it. We are pleased to offer you these high quality vinyl covers. All are Saddle Tan in color with a leatherette finish.

4108-000001	Vic-20™ Keyboard	$10.98
4108-000002	Vic-20™ Datasette	$ 4.98
4108-000003	Vic 1515 printer	$10.98
4108-000004	Vic 1540 Disk Drive	$ 9.98
4108-000005	Atati™ 400	$11.98
4108-000005	Atari™ 400	$11.98
4108-000006	Atari™ 410	$ 4.98
4108-000007	Atari™ 800	$12.98
4108-000008	Atari™ 810	$12.98
4108-000009	Atari™ 820	$ 8.98
4108-000010	Atari™ 822	$ 7.98
4108-000011	Atari 825	$11.98
4108-000012	Atari 825(w/paper roll)	$11.98
4108-000013	Apple III™	$15.98
4108-000014	Apple II™	$15.98
4108-000015	Apple II™ Keyboard	$ 9.98
4108-000016	Apple II Single Disk	$ 5.98
4108-000017	Apple II Disk(2 stacked)	$ 9.98
4108-000020	Texas-Instru. 99/4™	$10.98
4108-000026	TRS-80™ Color Comp.	$11.98

CONFUSED? No one book may offer all the answers. We suggest buying more than one book on a subject to get as many different views and opinions as possible. Books are really inexpensive when you consider the frustrations they can cause you to avoid.

Computer 'Source Book©'. Over 2000 books programs,and accessories for all micro brands
0001-198207 72 pgs $2.00 ppd.

NEW

NEW Vic 20™ GAMES

Direct from England, JMC is proud to announce that we have been appointed the exclusive U.S. importer for the following Vic-20 games.

MINEFIELD, A game for the 5K Vic 20. For Ages 6 and over. Your task is to drive an ambulance around a battle ground and pick up injured soldiers--racing the clock,and avoiding touching off the buried mines. You can adjust the complexity of the game by choosing to play against 25 to 100 mines.
4002-000001 $15.98

MAZE OF DEATH. For 5K Vic-20. For ages 8 and over. You have to travel across the screen thru a maze of walls blocking your path. Unseen hobgobblens and monsters may capture you before you reach your safe haven-on the other hand you may find buried treasure to add to your fortune. Full details scroll on the screen when you start game. 7 skill levels and 10 sensitivity levels to choose from.
4002-000002 $15.98

SPLOTTER© For 5K Vic-20.
For ages 8 and over. You control a worm type animal that moves over the screen to gobble up the ugle spots--a race against time. If you bump into a wall, or turn back on yourself to quickly--you LOSE. You choose skill level from #1 (hardest) to #20 (easiest). If you really want to drive someone crazy, buy him this game!
4002-000003 $15.98

GUZZLER© For 5K Vic-20.
For ages 8 and over. You must pilot you space shuttle thru a maze of asteroids to your mothership. But if you are not careful you will awaken the Guzzler©'s space bouys. You have to reach your mothership before running out of fuel, GOOD LUCK.
4002-000004 $15.98

DELUX 6-PAK© For 5K Vic-20.
Here is your chance to buy **6 games** on one cassette for the price of one game! You get all six of the following games for ONE low price!
War. You are defending against waves of enemy tanks. 3 levels of play...we bet you can't win at level 3!
Smashout. This version of bricks game tests skill,not reaction time,plan ahead!
Blackjack Popular card game '21',if you practice long enough maybe you can plan a system to beat Las Vegas!
Logic: You have 12 tries to break the code of 5 balls in random color sequence.
Pickupgame. You have to remove logs from the pile without disturbing any other logs.
Alarm Clock: Use the Computer as a REAL 24 hour alarm clock, bet you can't ignore its call when the alarm goes off!
4003-000001 $19.98

ANT RAIDERS© For 5K Vic-20
Ages 8 and up. An army of ants is marching its way across the land leading to your home. The land is littered with rocks which make the ants change direction often. You must shoot the ants before one gets to your door. If you shoot a rock it will divide into more rocks. If you trap all the ants, then more will come until you trap all the group, then more will come until...well you get the idea... have FUN!
4003-000003 $15.98

MORE GAME$ COMING! We are working on more Vic-20™ games which we will be importing in the near future...watch our ads for details!

FREE

--With ANY order of $50.00 or more you can receive a 1983 Computer Calendar FREE,--A $ 7.95 VALUE!

COUPON

QTY	NUMBER	DESCRIPTION OF ITEM	COST	TOTAL
			TOTAL	

(Orders Under $25. Please Add $2.50 Post. & Handling -- Illinois Residents Please Add 5% Sales Tax. ALL CATALOGS SHIPPED POST PAID.)

PAYMENT ENCLOSED: ☐ CASH ☐ CHECK ☐ MONEY ORDER

PLEASE CHARGE TO MY: ☐ MASTERCARD ☐ VISA (Min. Chg. $25.)

CARD NUMBER ____________________

EXPIRES ____________ INTRBNK # ____________

SHIP TO: ____________________

STREET ADDR: ____________________

CITY ____________ STATE ______ ZIP ______

JMC

DEPARTMENT: Z-K
1025 INDUSTRIAL DRIVE
BENSENVILLE, IL 60106-1287

PRICES AND AVAILABILITY SUBJECT TO CHANGE

> *trolled, military data processing technicians can write arbitrarily baroque programs that will cause it to do pretty much unpredictable things. Even if an enemy had access to the programs that guided the Turtle Task Team™, it is quite likely that they would find them impossible to understand, especially if they were written in ADA. In addition, with judicious use of the Turtle's touch sensors, one could, theoretically, program a large group of Turtles to simulate Brownian motion. The enemy would hardly attempt to predict the paths of some 10,000 Turtles bumping into each other more or less randomly on their way to performing their mission. Furthermore, we believe that the spectacle would have a demoralizing effect on enemy ground troops.*

And what about munitions?

> *The Terrapin Turtle™ does not currently incorporate any munitions, but even civilian versions have downward-defense capability. The Turtle can be programmed to attempt to run over enemy forces on recognizing them, and by raising and lowering its pens at about 10 cycles per second, puncture them to death.*
>
> *Turtles can be easily programmed to push objects in a preferred direction. Given this capability, one can easily envision a turtle discreetly nudging a hand grenade into an enemy camp, and then accelerating quickly away.*

But what does it cost to install one?

> *The Terrapin Turtle is designed for installation at no cost by children and elementary school teachers. We feel that the military installation cost should be under $10,000 per unit.*

I can think of no greater deterrent to all-out war than masses of robot turtles landing on the beaches and steadily moving towards the enemy.

Think of the tremendous opportunities for new patriotic songs: "When 4XQ7 Comes Crawling Home Again (Ta Raa, Ta Raa)," "Over There (Forward 20, Right 30), Over There," "How Are You Going to Keep Them Running POLY After They've Seen Paree?"

Instead of Basic training, the turtles will, no doubt, have to go through Logo training with procedures such as:

```
TO HUP :NUM1 :NUM2 :NUM3
REPEAT 4 [FD 10 WAIT 20]
HUP 2 3 4
END
```

Hats off to the Terrapin Patriots! May this be an ever safer world for turtles.

Recreational Computing Back Issues

Recreational Computing was the first and only personal computing magazine when it started in 1972 (it was called the *PCC Newspaper* back then). Bob Albrecht, David Thornburg, Isaac Asimov, Don Inman, Ramon Zamora, Robert Jastrow, Mac Oglesby, Adam Osborne – the list of authors reads like a Who's Who of microcomputing. These and many other authors contributed some of the finest articles about computers and now-classic games to the pages of *Recreational Computing*.

Last fall, *Recreational Computing* was merged into **COMPUTE!** and we are now offering available back issues. Whatever your interest, you'll find something here – from Spanish BASIC to Computers in Sports Medicine, from Future Fantasy Games to Robot Pets.

September 1974 A Practical, Low-cost Home School Microprocessor System, The Computer Illiteracy Problem, Eight Games In BASIC

March 1975 Build Your Own BASIC The Computer In Art, Biorhythms

March/April 1976 A TTY Game Games With The Pocket Calculator Dodgem Square, Tiny BASIC To Go

July 1976 BASIC Music Tiny Trek For Altair, 16 Bit Computer Kit Musical Numbers Guessing Game, Programmer's Toolbox

September/October 1976 Computer Games In The Classroom Planets Game, Dungeons And Dragons, Hats Game, Pythagoras And Rational Music

November/December 1976 Story Snake Packl Frogs Games, Make Believe Computers, The First West Coast Computer Faire Subroutines The First Computer

January/February 1977 Robot Pets, Computers And Space, Tiny Languages, Teaching Using Conversational Programming, High School Computers, Reverse, Tiny PILOT Mastermind

March/April 1977 Z-80 PILOT 6502 Assembly Programming, Tiny BASIC For Beginners Math Drills & Games, Community Information Systems, Mine, Sales Simulation, Native American Board Games

July/August 1977 Do-it-yourself CAI Pet Robots New Capabilities, PILOT, CAI In BASIC, Programming The HP-25, Capture, Inverse Reverse, 8080 Matrix Subroutines, Women And Computers

September/October 1977 The $595 PET, More Tiny Languages, Computer Networks, The Bead Game, Biofeedback And Microcomputers Part 1, Home Energy Management Sandpile Game, A BASIC PILOT

January/February 1978 Pascal Vs BASIC COMAL: Structured BASIC, Video Disks: Magic Lamps for Educators? A Computer Revolution?, Pounce, The Mechanics of Robots, TRS-80 A Status Report

March/April 1978 Epic Computer Games, Micros for the Handicapped, Buckets Game Prayer Wheel Program, Computer Contagion, Measuring Time, Frog Race, The IBM 370 Model 69

July/August 1978 Computer Whiz Kids Public Access To Computers, Man-made Minds, Post-human Intelligence, A Modern-day Medicine Show, Live Wire Design, ASCII Graphix, Baseball, Concentration Gambler's Paradox

September/October 1978 Kingdom Game Computers and Museums, Sorcerer of Exidy, Snooping With Your PET, APL, Decimals in Tiny BASIC, Apple Math, TRS-80 Level II A Grown-up Field Evaluation

November/December 1978 APL Games The Return of the Dragons, Animated Games for TRS-80, Runequest, All In The Mind, The L-5 Society, Phantnum, Some Guidelines for Microcomputer Chess Dataman

January/February 1979 A Jules Verne Fantasy, Artificial Intelligence, The Apple Corps is With Us, TRS-80 Personal Software, Vending Machine Gets "Brain," Apple II I O, The Memory Game, REINO Spanish Kingdom

March/April 1979 Calculator Comics "Lord of the Rings" Chess Reconsidered, Database, Beastiary Color Your Own Graphics, Universe, Easy POKEing with Applesoft BASIC, Air Raid TRS-80 3-D Plots Slot, Apple Rose

May/June 1979 PILOT for Apple II The Game of Life Gold Handicapping, Hunt, BASIC vs Pascal, Inspector Clew-so, Flash for SOL, Faster Jumble, Concept Sans Computer, A Beginner's Guide To FRP

July/August 1979 Summer Fun Fooling Around With Your PET, Cryptarithms, Baseball Newett Awl's Goat Zork, A Computerized Fantasy Simulation Game, What Light on Yonder Panel Flashes, The Dedicated Word Processor, The FORTE Music Programming Language

September/October 1979 TRS-80 Outside Connection, The Architecture of Multi-Player Games, The Sounds of Texas Instruments, Dynamic Color Graphics on the New Atari, An Apple PILOT, Gandalf, Spanish BASIC, Designing Animal Games, APL Mastermind

November/December 1979 SHOGI Games For You To Program, Atari Sounds, Texas Instrument Graphics and Animation, Interrupt, Match Me, Calendar, Making Music on the PET, Tower of Hanoi, Bingo, Animal Games

January/February 1980 Computing and Holistic Health, TI Graphics and Animation Part 2, Games To Program, New Directions in Numerical Computing, An Extended BASIC "IF" Facility, Beating Computer Anxiety, Capture for PET, 8080 Tic Tac Toe, Chainwalk, Programming Problems

March/April 1980 Special Games Issue Recreation Apple II Hi-res Graphics, Delicious Functions, Galaxy II, Fairy Chess, Raging Robots, Program Instruction Builder, Data Retrieval An Introduction

May/June 1980 Introduction to Computer Music CBBS Phone Numbers, 6502 Machine Language, The Electric Phone Book, Number Translation, Sea Search, Apple Animation, Twister Move Generator, DOZO, Shell Game, Home Video Displays, A Proposed Graphics Language

July/August 1980 Fantasy Games Issue: Write Your Own Computer Fantasy Simulation, Wizard's Castle, On Future Fantasy Games, Wonderful World of Eamon, In Defense of Hackers, Touch Panels and Interactive Graphics

September/October 1980 Probability Trees Big Business on the Micro, The Best of People's Computer Company, Computer Analysis of Athletics, Word Search, Computers in Sports Medicine, Wired, Revolution in Typography?, Textrapolation

November/December 1980 Computerized Voting, Computer-Using Educators, Hot-rod Computers, House of the Future, Yote, DOZO in Pascal, What is Truth?, Sixth Order Magic Squares on a TRS-80

January/February 1981 The Education Revolution Computer Games in the Classroom, An Art-producing Turtle, Computer Literacy Resources, Musical Compositions Using Computers, Microcomputers in China, Twenty Questions, The Pirate's Life for Me, Computers and the Volcanic Fallout

March/April 1981 Space Exploration Frontiers for You and Your Micro, Voyage To Antares A Spaceship Simulator, The Computer as Chess Ally, Star Trek - A Dialogue Approach, Mark of Breeding (fiction) The Fifteen Puzzle

May/June 1981 Using Computers at Sesame Place Atari PILOT and Turtle Graphics, Computer Anatomy for Beginners, The Impact of Micros, Nevada-style 8-spot Keno, Sketch Pad, Sum of the Digits, TRS-80 Property Management Program, The Pocket Corner

July/August 1981 Which Computer Should You Buy? Commodore's New Rainbow Machine, The Wired Nation Do We Want It?, Computers at the Junior Museum, 3-D Tic Tac Toe for PET Number Crossword for all Computers

September/October 1981 43 Ways To Make Money With Your Micro, How To Start A Software Exchange, Who Are Computer Criminals?, Micros Behind Bars, Number Systems Computer Knock-knock Jokes in BASIC and LISP For Photographers Only, Fibonacci Nim, Roman Numeral Conversum Programum

Special *Recreational Computing* Back Issue Pricing:

Single Issue:	**$ 3.00**	**Any Fifteen Issues:**	**$25.00**
Any Five Issues:	**$10.00**	**Any Twenty Issues:**	**$30.00**
Any Ten Issues:	**$20.00**		

For Fastest Service, Call Toll Free **800-334-0868**
In NC Call **919-275-9809**

Or Send Order and Payment to **COMPUTE!** Publications, P.O. Box 5406, Greensboro, NC 27403.

In the US, please include $.20 per issue ordered for shipping and handling. Outside the US, please include $.30 per issue for surface mail. Orders must be prepaid in US funds or international money order. All orders subject to availability.

Krell's College Board SAT* Preparation Series

NEW FOR 83

A COMPREHENSIVE PREPARATION PACKAGE / MORE THAN 40 PROGRAMS / $299.95

1. Diagnostic analysis
2. Prescription of individual study plans
3. Coverage of all SAT* skills
4. Unlimited drill and practice
5. SAT* Exam Question simulator
6. All questions in SAT* format and at SAT* difficulty level
7. Instantaneous answers, explanations and scoring for problems
8. Worksheet generation and performance monitoring - (optional)
9. A complete record management system - (optional)
10. Systematic instruction in pertinent math, verbal and test taking skills - (optional)

Krell's unique logical design provides personalized instruction for each student according to individual needs.

APPLE, ATARI, COMMODORE, CBM/PET,
CP/M, I.B.M., RADIO SHACK TRS-80

LOGO $99

NO FRILLS PAK

1. Two copies of Krell's LOGO for Apple II*
2. Utility Disk with M.I.T.'s valuable demo programs including Dynatrack
3. The official M.I.T. technical manual: LOGO FOR APPLE II by H. Abelson & L. Klotz

No Frills Turtle Price $99.00

FRILLS FOR LOGO $99.95

FRILLS FOR LOGO / Suport Pak for:
M.I.T. LOGO, KRELL & TERRAPIN INC.

1. Krell Utility Disk
2. Alice in LOGOLAND
3. LOGO for Apple II - by H. Abelson
4. Alice in Logoland Primer
5. Comprehensive wall chart
6. LOGO & Educational Computing Journal

NO FRILLS LOGO and ALL THE FRILLS COMBO FOR APPLE II* $159.95

SPRITES NOW AVAILABLE FOR APPLE* and TRS-80*

☆☆☆ Call For Information ☆☆☆

ALSO AVAILABLE

Time Traveler / Odyssey in Time
Competency Proficiency Series
Pythagoras and the Dragon
Isaac and F.G. Newton / Micro Deutsch
Super Star Baseball / Sword of Zedek
Krell Game Pak

CALL FOR DETAILS AND PRICES

KRELL®
SOFTWARE CORP.
The state of the art in educational computing
1320 Stony Brook Road / Stony Brook NY 11790
Telephone 516-751-5139

Krell Software Corp. has no official ties with the College Entrance Examination Board or the Educational Testing Service. Krell is, however, a supplier of products to the E.T.S.

*Trademarks of Apple Comp. Corp., Tandy Corp., Commodore Corp., Digital Research Corp., I.B.M., Atari Corp., Terrapin Inc., Socrates Chess Corp.

N.Y.S. residents add sales tax

Prices slightly higher outside U.S.

THE WORLD INSIDE THE COMPUTER

A Computer Language For Kids

Fred D'Ignazio, Associate Editor

In this column we have explored ways to make computers more accessible to kids. In the August to December columns, for example, we developed a computer "friend" for kids.

When the friend program is run, the friend's face appears on the TV screen. At first, the friend is asleep. "Ding! Dong!" goes a bell. The friend wakes up and winks. "I'm Ged," he announces. "Who's out there?"

The child answers by typing in her name. The friend greets the child and asks if she'd like to play a game. If she would, the friend gives her a menu of the games in its repertoire.

If the child is using a disk-based system, the friend starts the game automatically. If the child is using a cassette-based system, the friend helps the child load the game program from tape.

After the game, the friend comes back on the TV screen. "I hope you had fun," it says. It offers to play a new game with the child.

The Friendly Operating System

The friend is like a simple operating system. It is the interface, the middleman, between your child and the computer. It is a first attempt at making computers warmer, more human and personable.

In coming months, we'll be gradually expanding the friend's capabilities. Next month, for example, I will write about a way tor the friend to learn more about the child. In a preliminary program the friend and the child will be "introduced." The child will give the friend personal information: name, age, the color of hair and eyes, address, phone number, likes and dislikes.

The friend will ask what kind of friend the child would like. The child will get a chance to mold the friend – to select the friend's name, shape, history, likes, and dislikes. If the child wishes, the friend can remain a computer. Or else the friend can become something completely imaginary and make-believe.

In fact, the child will be able to use the "Introduction" program to create several friends. The friends will have different characteristics and names.

If the child wishes, she can introduce the friends to each other.

Friendly Programming

The computer friends should liven up your child's computing. But they won't help with *programming*.

No matter how many games a friend has up its "sleeve," the child is never actually programming the computer. He or she is interacting with the friend and its programs. But not programming. Instead, in a way, the friend is programming the child.

This is one of the major drawbacks of the computer friends. They don't encourage children to write programs on their own. At least half of the value of the computer is unleashed when you program it yourself. Without that opportunity, your child is missing out on a lot.

Right now the friend is a friendly operating system. What we need is a friend that can also act as a *friendly computer language*. Then the friend can encourage the child to create, save, and run programs.

Beyond Logo

"Wait a second!" you say. "What about BASIC, PILOT, and Logo? These languages are easy to learn. They are friendly. They are perfect for kids."

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. He is presently working on two major projects: he is writing a series of books on how to create graphics-and-sound adventure games. He is also working on a computer mystery-and-adventure series for young people.

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in **COMPUTE!**.

the SOFTWARE connection

FOR ALL YOUR SOFTWARE NEEDS AT THE LOWEST PRICES

We have one of the largest selections of software available for your home computer at the lowest prices. You will find all of the top games and office management software in our catalog at from 20% to 30% below retail.

ATARI®

	Retail	Our Price
Monster Maze (Rom)	$39.95	**$29.95**
Platter Mania (Rom)	$39.95	**$29.95**
Choplifter (Disk)	$34.95	**$25.95**
Embargo (Rom)	$49.95	**$34.95**
Raster Blaster (Disk)	$29.95	**$18.00**
Frogger (D/C)	$34.95	**$24.95**
Wizzard of Wor (D/C)	$39.95	**$29.95**
Slime (D/C)	$34.95	**$24.95**
Serpentine (D/C/Rom)	$34.95	**$24.95**
Steller Shuttle (D/C)	$29.95	**$20.95**

Atari® & Atari APX® programs now available at 25% off suggested retail if you mention this ad.

TG Trackball	$64.95	**$51.95**
Wico Trackball	$69.95	**$57.95**

And many, many more. Call for an update of new titles, including Atari VCS®.

IBM

	Retail	Our Price
Apple Panic	$29.95	**$23.95**
Call to Arms	$29.95	**$23.95**
Curse of Ra	$19.95	**$15.95**
Frogger	$34.95	**$27.95**
Jabber Talky	$29.95	**$23.95**
Temple of Apshai	$39.95	**$29.95**
Upper Reaches of Apshai	$19.95	**$15.95**
Oil Barons	$100.00	**$75.00**
***MatheMagic**	$89.95	**$67.50**
***Graphmagic**	$89.95	**$67.50**
***Combo Rack**	$159.90	**$119.95**

Visicorp/Micropro - 25% of all titles including Visicalc & Wordstar.

TG Joy Stick	$64.95	**$49.95**

$24.95

DISKETTE SPECIAL

Box of 10 with Plastic Library Case

Single-sided/Double Density (40 track) with reinforced hub-ring.

Call for Prices on Maxell and Verbatim.

VIC

Call for more information on new software for the fastest growing Home Computer today.

	Retail	Our Price
Crush, Crumble & Chomp (Cass)	$29.95	**$23.95**
Astroblitz (Cart)	$46.95	**$37.50**
Choplifter (Cart)	$44.95	**$35.95**
Martian Raider (Cass)	$19.95	**$15.95**
Ricochet (Cass)	$19.95	**$15.95**
Sword of Fargoal (Cass)	$29.95	**$23.95**
Serpentine (Cart)	$44.95	**$35.95**
Apple Panic (Cart)	$44.95	**$35.95**
Shark Trap (Cass)	$19.95	**$15.95**
Trashman (Cart)	$46.95	**$37.50**
Rescue at Rigel (Cass)	$29.95	**$23.95**
Multisound Synthesizer (Cass)	$19.95	**$15.95**
Monster Maze (Cart.)	$39.95	**$31.95**

APPLE

	Retail	Our Price
Sea Fox	$29.95	**$22.45**
Serpentine	$34.95	**$26.25**
***MatheMagic**	$89.95	**$67.50**
***Graphmagic**	$89.95	**$67.50**
***Combo Pack**	$149.95	**$112.50**
Oil Baron	$100.00	**$70.00**
New World	$29.95	**$22.45**
Snooper Troops	$44.95	**$33.75**
Wizardry	$49.95	**$37.50**
Star Blazer	$31.95	**$20.00**
Ruski Duck	$34.95	**$18.00**
3-Pack: Rescue at Rigel Morlock's Tower Datestone of Ryn	$49.95	**$37.50**
Raster Blaster	$29.95	**$18.00**
TG Joystick Apple II*	$59.95	**$46.00**
TG Joystick Apple III*	$64.95	**$48.95**
TG Select-a-Port	$59.95	**$46.00**

CALL TOLL FREE 1-800-828-2838 (For Placing Orders Outside California)

For Inside California and Other Inquiries Call 1-916-925-2666

MAIL ORDERS: For fast delivery, send certified check, money orders, or Visa or MasterCard number and expiration date, for total purchase price plus 1% or $2 minimum for postage and handling. Add $5 for shipment outside the continental U.S. California Residents add 6% sales tax.

COD: and Chargecard orders call **1-800-828-2838.** In California call **1-916-925-2666.** Subject to stock on hand. Prices subject to change.

Catalog free with any order or send $2 postage and handling and please specify computer type.

the SOFTWARE connection

5133 Vista Del Oro Way Fair Oaks, CA 95628

My answer to that is: Do you have kids of your own? Do you teach kids? Have you ever tried to teach little kids how to use BASIC? Or PILOT? Or Logo?

I have two kids. My daughter Catie is almost seven. She's a first grader. My son Eric is three and a half. Eric spends his mornings at "Miss Eleven's Castle" (Evelyn's Day Care).

Both kids are whizzes at using the family computers. They have their own disks and tapes. They can turn the computers on and off, boot up disks, run programs, and key in the letters, numbers, and words the programs request. Both kids know all the special-function keys on the computer keyboard.

But try getting them to program? Forget it.

I can understand Eric's reluctance to program. After all, the kid doesn't even know how to read or write. If he gets 6's and 9's mixed up, and M's and W's, how can I expect him to master FOR/NEXT loops, string variables, subroutines, and arrays?

But Catie is a different matter. She reads Nancy Drew mysteries and "Choose Your Own Adventure" books. She is good at arithmetic, and she loves logic games, puzzles, and mazes. But she has no interest in programming.

Maybe it's just getting over the first hurdle. Unfortunately, Catie and I have been stuck on that hurdle for over two years.

The first hurdle is the first line of code in a program.

That first line is invariably a FOR/NEXT loop. The FOR/NEXT loop might do different things. It might print the message "CATIE LOVES MOWIE" a thousand times, all over the TV screen. (Mowie is Catie's kitty.) It might make the sound of a police siren or a dropping bomb, or the noise of water, or of crashing dishes. Or it might draw a drunken fly wandering across the screen.

What is Catie's reaction to all this? It's not positive, I'll tell you that.

Even if I get the fly to change into 16 different colors, Catie couldn't care less. After the first line of code, her reaction is sudden and dramatic. She gets hungry. Or she has to go to the bathroom. Or she has a headache. Or her spine dissolves and I get to watch her slide out of her seat and collapse into a puddle on the floor.

Or else she begins giggling and acts silly. She begins typing on the computer with her nose. Or her tongue.

This is an embarrassing situation.

On all sides we hear about friendly computers, computer literacy for kids, teaching kids to speak "computer" along with English. And here I am, a computer expert, a writer, an advocate for teaching computing to kids. So what do I do? I try to drag my kids into the computer age.

But they don't want to go.

Computer Literacy For Whom?

It's not so much that my kids resist me actively. It's just that they don't see the point. They have too much itching powder in their pants to make them sit still long enough to program.

At least using the languages available now.

But what if we created programming languages that incorporated the same ingredients as the best software designed for children? What are these ingredients? Quick response, for one. Other ingredients include: action, sound effects, pictures, colors. Quick mastery, a sense of power and control. Progress. Encouragement. Humor. These are qualities found in all good software for kids. But these qualities are not evident in programming languages. Even in PILOT. Even in Logo.

What Do You Think?

I hope I have lit some fires. Or started some fights.

What do you think? What kind of experiences have you had with your younger kids? Have they been similar to my experiences, or different?

Over the next few months as I continue to develop the computer friend and to write about other subjects, I plan to design and develop some prototype programming languages for little kids. The languages will be written in BASIC (or PILOT or Logo). They will be simple and experimental, something you can type into your computer and try yourself.

Also, the languages should contain the same qualities that make good programs so popular with kids. Maybe the programming will be in terms of colors, or sounds. Maybe in terms of shapes.

However it's done, the kids should be able to create programs themselves. They should be able to save, retrieve, and run those programs. The programs should not be trivial. They should do something. (Of course, they are doing *some*thing if they are teaching a child how to program.)

Most of all, the programming language should be fun for the kids to use. It should teach the kids that programming isn't something ugly that you have to do to get something nice. It's fun in itself. It's a way to express yourself, like coloring or playing music, or dancing.

The language shouldn't deter kids. It should encourage them to sit down and write a whole program. Even a short program.

Please write to me and tell me what you think. Send your letters to:

Fred D'Ignazio
c/o **COMPUTE!** *Magazine*
P.O. Box 5406
Greensboro, NC 27403

CALL FOR THE BEST P.R.I.C.E.

800-343-1078

[in Mass. (617) 961-2400]

Technics SL-5 Illustrated.

Call P.R.I.C.E. for big savings on home computers, video cassette recorders, car stereo, home stereo, portable radios and tape recorders, telephone answering machines, video games, tapes, and movies.

Remember, P.R.I.C.E. will beat any legitimate offer on in-stock items.

Just pick up the phone, dial our toll-free number, and ask for P.R.I.C.E. quotes.

Pioneer CT9R cassette deck	$417
Pioneer SX6 receiver	$199
Sony hifi, car, video equipment	$CALL
Technics SLQ30 turntable	$145
Technics SL5 turntable	$125
Akai GXF66R cassette deck	$375
JVC, Aiwa equipment	$CALL
Shure V15 Type 5 cartridge	$124
Atari 800 home computer w/48K	$CALL
Commodore VIC-20 home computer	$179
Jensen RE518 car stereo	$249
Pioneer KE6100 car stereo	$232
Aiwa HSJ02 AM/FM cassette portable	$159

Prices subject to change after 1/30/83.

AND JUST SOME OF THE BRANDS WE SELL:

Sony
JVC
Technics
Pioneer
Nikko
Akai
Aiwa
Hitachi
Panasonic
Jensen
Mitsubishi
Concord
Dual
Teac
Atari
Commodore
Mattel
Magnavox
Stanton

P.R.I.C.E.™

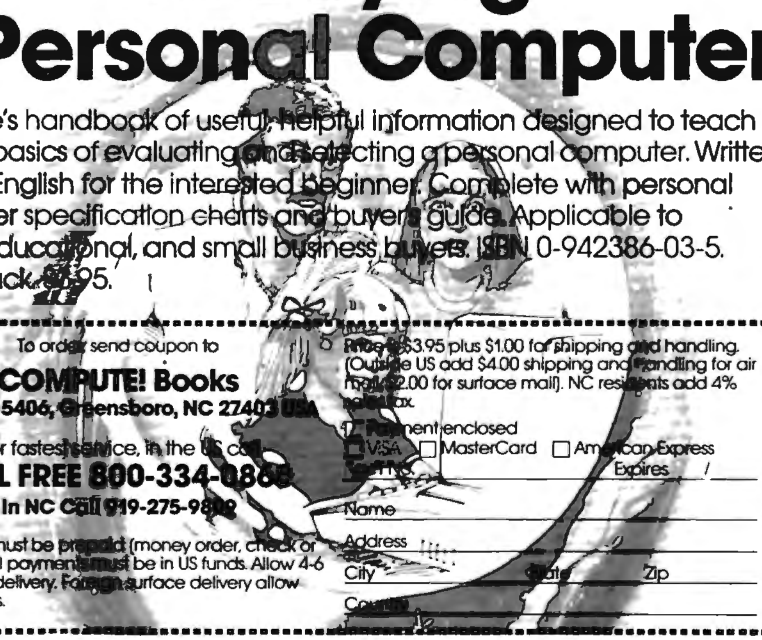
Hours: 9 to 9 Mon.-Fri.
10 to 5 Sat.

VISA

67 Teed Drive, SRE183, Randolph, MA 02368.

Turn To The Future
With COMPUTE! Publications

The Beginner's Guide To Buying A Personal Computer



A Novice's handbook of useful, helpful information designed to teach you the basics of evaluating and selecting a personal computer. Written in plain English for the interested beginner. Complete with personal computer specification charts and buyer's guide. Applicable to home, educational, and small business buyers. ISBN 0-942386-03-5. Paperback $3.95.

To order send coupon to

COMPUTE! Books
P.O. Box 5406, Greensboro, NC 27403 USA

For fastest service, in the US call
TOLL FREE 800-334-0868
In NC Call 919-275-9809

All orders must be prepaid (money order, check or charge). All payments must be in US funds. Allow 4-6 weeks for delivery. Foreign surface delivery allow 2-3 months.

Price $3.95 plus $1.00 for shipping and handling. (Outside US add $4.00 shipping and handling for air mail, $2.00 for surface mail). NC residents add 4% sales tax.

☐ Payment enclosed
☐ VISA ☐ MasterCard ☐ American Express
Card No. ____ Expires ___/___
Name ____
Address ____
City ____ State ____ Zip ____
Country ____

Join the parade to

Micro-Ed

educational software

Send for free catalogs
Specify: Pet • VIC • TI • Apple
• Commodore 64
• TRS-80 Color Computer
• TRS-80 Model III
• Atari

telephone
us at
612-926-2292

Micro-Ed Inc.
P.O. Box 24156
Minneapolis, MN 55424

The Joy Of Joysticks

Atari/Commodore Game Controller Roundup

Tom R. Halfhill, Features Editor
Charles Brannon, Editorial Assistant

These joysticks and joystick substitutes will work with the Atari 400/800/1200XL computers, Commodore 64, VIC-20, and P Series computers, the Commodore Max Machine, the Atari VCS and 5200 video game machines, and the Sears Video Arcade. Some of the products, with proper adapters, also work with Apple, TRS-80, or Texas Instruments computers, and the Colecovision game machine.

Maybe you're playing a *Pac-Man*-type game....

Fleeing desperately from a relentless ghost, you make a break for the last energy pellet that will allow you to turn the tables on your pursuer. You try to round a corner in the maze, but suddenly find yourself slapping up against a wall. Why can't you turn? Blast that sticky joystick anyway! You've had it.

Or maybe you're playing a *Missile Command*-type game....

MIRVs and ICBMs are raining down and that infernal smart bomb is making straight for your last city. Quickly positioning the crosshair with the joystick, you take aim and fire your last ABM...and miss. If only you had a trackball like the one you're accustomed to in the arcades!

Or maybe you're playing an *Asteroids*-type game....

Hopelessly surrounded by an oncoming hailstorm of space debris, you yank back on the joystick to flip your spaceship into hyperspace, and find yourself dizzily spinning instead. Oh, for a hyperspace button like the one in the arcades!

The Joy Of Joysticks

Don't give up the spaceship – there is relief. A growing national obsession with home computer/video games has spawned an expanding market in custom game controllers. Only a year ago there were few alternatives to the common Atari-type joysticks supplied by the various manufacturers which use the Atari joystick standard. Now there are more than a dozen to choose from. The controllers covered in this overview were gathered after visiting computer stores, scanning magazine advertisements, and scouting new products at trade shows. While there are sure to be even more by the time this article appears, we tried not to leave any of the existing products out.

At first, it might seem that all joysticks must be more or less alike. Can there really be that much difference? After all, what is there to a joystick?

Externally, as the photos show, there is a wide range of configurations for joysticks (the name *joystick*, incidentally, originates from an early aviators' term for an airplane's control stick). Some joysticks are made to be hand-held and manipulated with a finger or two. Others are designed to rest on a tabletop and to be controlled with one hand. Some have hand-sized grips instead of short sticks. Some mount the fire button on the base, others on the stick, and still others have both.

Internally, there can be even greater differences. Some are constructed largely of plastic, others of metal. The construction largely accounts for a joystick's "feel." Since feel is a highly subjective reaction, we will avoid value judgments as much as possible. There is no substitute for trying a joystick yourself.

Some controllers, of course, are not joysticks at all. The push-button boxes are intended largely for *Asteroids*-type games, duplicating the arcade controls. Trackballs are at their best in games requiring rapid 360-degree movement, such as *Missile Command* and *Centipedes*.

And finally, a word about the standard Atari joystick. It's received some bad press, not all of it deserved. It's accused of being too fragile, unre-

...and so there were keys for the Atari 400.

In the beginning there was the membrane keyboard.

So it was to be done that Inhome Software would create a full-stroke keyboard for the Atari 400 Home Computer and it would be called the B Key 400, and would sell for $119.95 U.S. funds.

The new B Key 400 was made so easy to install that the owner could do it himself in a miraculous two minutes.

With the B Key 400 keyboard from Inhome Software, you will follow into the land of professional home computers that are powerful, easy to program and have a great capacity that can be made even greater with Inhome Software 48K and 32K memory boards. It was done and it was good.

INHOME

ADVANCING THE PROGRESS

Inhome Software Incorporated, 2485 Dunwin Drive, Mississauga, Ontario, L5L 1T1 (416) 828-0775. Atari is a trade mark of Atari Inc. Made in Canada sponsive, and even ugly. The joysticks do wear out after months of heavy use, but this isn't all the joystick's fault. First, in our experience, many "broken" joysticks are really the victims of faulty cords. The cords are subjected to a lot of twisting and pulling, and the thin wires tend to fray and snap. A dead joystick can often be revived by replacing the cord. Keep this in mind when admiring a custom joystick's hefty construction: the standard cord is probably its weakest link.

It might seem that all joysticks must be more or less alike. Can there really be that much difference?

Second, when an Atari joystick's joint or switches do break, it is often the fault of excessive flexing. Contrary to some beliefs, the Atari joystick *is* pretty responsive. Only a slight deflection is required to activate its switches. But its inherent stiffness, and the lack of any *tactile feedback* – that is, a positive click or snap when a switch makes contact – encourages people to wrench it harder than they have to. Games with slow joystick response, especially those written in BASIC, aggravate this problem.

Atari Joystick

Since the Atari joystick is the standard against which the others are most often compared, we'll start by pointing out that it's a two-handed instrument. Note that some joysticks permit one-handed operation, freeing the other hand for the keyboard (or for holding on to a chair).

Some people increase the leverage by jamming onto the end of the stick a PVC plastic "T" connector (available at hardware stores) or even a wine bottle cap. The Atari joystick includes a four-foot cord.

Atari Joystick
Atari, Inc.
1196 Borregas Avenue
Sunnyvale, CA 94086
$9.95 Each

Slik Stik

The Slik Stik is one of two joysticks by Suncom. Both resemble the Atari joystick, but incorporate some important differences. The Slik Stik's stick is only about half the height of the Atari's, but is topped by a jawbreaker-sized red ball for easy handling. And while the Slik Stik doesn't flex any more than the Atari stick, the action is more positive and you can feel a slight detent, or click. The fire button is very small but responsive.

The Slik Stik has a long six-foot cord reinforced at both ends with tough plastic collars where the cord joins the joystick base and plug. Suncom markets the Slik Stik as a direct replacement for the Atari joystick, and it is the only controller we reviewed which costs the same as the Atari product.

Slik Stik
Suncom, Inc.
270 Holbrook Drive
Wheeling, IL 60090
$9.95

Starfighter

Suncom's Starfighter, advertised as "The Ultimate Joystick," is very similar to the company's Slik Stik. However, Suncom claims it is more ruggedly constructed than their less expensive product, and it is guaranteed for two years instead of 90 days.

Where the Slik Stik has a ball-tipped controller, the Starfighter has a smooth plastic cylinder with a rounded top. It is taller than the Slik Stik, but still shorter than the Atari stick. The action is more positive, and the contacts in all eight positions can be distinctly felt. What's more, there are definite "stops" to the stick's movements, so it can't be damaged by over-twisting as the Atari joystick can. The Starfighter has the same convenient six-foot cord and reinforced connections as the Slik Stik.

Starfighter
Suncom, Inc.
$16.95

Baylis Big Stick

The Baylis Big Stick is the largest controller we tested. Actually, its name is something of a mis-

Introducing...the Byte Book Club

FORMERLY COMPUTER PROFESSIONALS' BOOK CLUB

POWERFUL TOOLS! POWERFUL SAVINGS!

Take any 3 books
for $1 00
only each
(Values up to $68.50)

If you join now for a trial period and agree to purchase three more books—at handsome discounts—during your first year of membership. (Publishers' prices shown)

HOW TO BUILD YOUR OWN WORKING MICROCOMPUTER *By* C. Adams
582267-9 $16.95

AN INTRODUCTION TO VISICALC® MATRIXING FOR APPLE® AND IBM® *By* H. Anbarlian
016/054 $22.95

BUILD YOUR OWN Z-80 COMPUTER—*and*—Z80 USERS MANUAL *By* S. Ciarcia & J. Carr
582337-3B $29.90
(Counts as 2 of your 3 books)

MINICOMPUTER AND MICROPROCESSOR INTERFACING *By* J. C. Cluley
582585-6B $27.50
(Counts as 2 of your 3 books)

BUSINESS INFORMATION PROCESSING WITH BASIC *By* G. Struble
582360-8 $17.95

BASIC: GETTING STARTED *By* W. S. Davis
582355-1 $5.95

INTERFACE PROJECTS FOR THE TRS-80 *By* R. C. Hallgren
582466-3 $18.95

PROJECTS IN MACHINE INTELLIGENCE FOR YOUR HOME COMPUTER *By* D. L. Heiserman
582574-0 $17.95

APPLE PASCAL GAMES *By* D. Hergert & J. T. Kalash
582521-X $19.95

TRS-80 GRAPHICS FOR THE MODEL I AND MODEL III *By* D. Kater & S. Thomas
333/033 $12.95

MICROCOMPUTER GRAPHICS AND PROGRAMMING TECHNIQUES *By* H. Katzan, Jr.
582576-7 $18.95

INTRODUCTION TO WORDSTAR™ *By* A. Naiman
582594-5 $21.95

TEACHING YOUR COMPUTER TO TALK: A Manual of Command and Response *By* E. R. Teja
582433-7 $15.95

INTRODUCTION TO COMPUTER ORGANIZATION *By* I. Tomek
582561-9 $23.95

PRINCIPLES OF INTERACTIVE COMPUTER GRAPHICS, 2/e *By* W. M. Newman & R. F. Sproull
463/387B $32.50
(Counts as 2 of your 3 books)

THE SMALL COMPUTER CONNECTION *By* N. L. Shapiro
564/124 $16.95

THE DEVIL'S DP DICTIONARY *By* S. Kelly-Bootle
340/226 $8.50

THE SOUL OF A NEW MACHINE *By* T. Kidder
582439-6 $13.95

APPLE PASCAL *By* P. Luehrmann
491/712 $16.95

MICROCOMPUTER OPERATING SYSTEMS *By* M. Dahmke
150/710 $15.95

WORD PROCESSING HANDBOOK *By* I. Flores
582645-3B $34.50
(Counts as 2 of your 3 books)

INVITATION TO FORTH *By* H. Katzan, Jr.
582284-9 $17.50

PROGRAMMING WITH ADA: An Introduction by Means of Graduated Examples *By* P. Wegner
789/24X $17.95

Why YOU should join the Byte Book Club now!

- **Best and newest books from ALL publishers!** Books are selected from a wide range of publishers by expert editors and consultants to give you continuing access to the best and latest books in your field.
- **Big savings!** Build your library and save money too! Savings range up to 30% or more off publishers' list prices—usually 20% to 25%.
- **Bonus books!** You will immediately begin to participate in our Bonus Book Plan that allows you savings of between 70%-80% off the publishers' prices of many professional and general interest books!
- **Convenience!** 14-16 times a year (about once every 3-4 weeks) you receive the Club Bulletin FREE. It fully describes the Main Selection and alternate selections. A dated Reply Card is included. If you want the Main Selection, you simply do nothing—it will be shipped automatically. If you want an alternate selection—or no book at all—you simply indicate it on the Reply Card and return it by the date specified. You will have at least 10 days to decide. If, because of late delivery of the Bulletin you receive a Main Selection you do not want, you may return it for credit at the Club's expense.

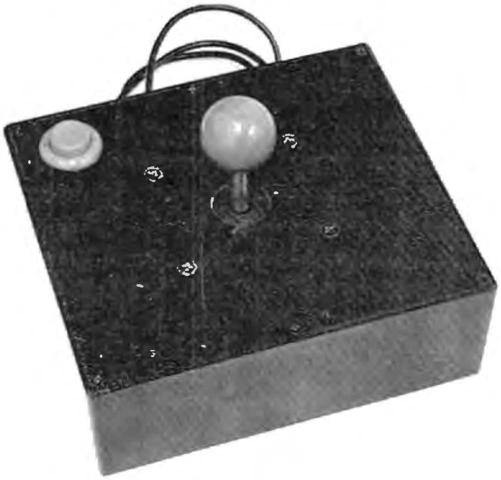
As a Club member you agree only to the purchase of three additional books during your first year of membership. Membership may be discontinued by either you or the Club at any time after you have purchased the three additional books. Orders from outside the U.S. cannot be accepted.

Fill out the card and mail today! If the card is missing, write to:
BYTE BOOK CLUB, P.O. Box 582, Hightstown, New Jersey 08520

nomer; the stick itself is only two and a half inches high, including the large red ball on the tip. It is the base that is big – nearly eight inches square. Obviously, the Baylis is designed to be rested on a tabletop or lap and operated with one hand.

The base is heavy enough to permit this kind of operation, although it does tend to rock around a bit during heavy action. However, there seems to be plenty of empty room inside the base to add weights, if you want to customize it. The stick itself is a rigid steel shaft built to tough arcade standards.

The response is very flexible and positive, with more "travel" than many joysticks. The fire button also is a large, arcade-style device. The cord is on the short side, only two and a half feet long, but since this oversized controller is not meant to be hand-held, this probably will not be a handicap.



The first Baylis Big Stick we sampled did not function in five of the eight directions. The internal switches were working perfectly, so the problem was traced to the cord. This is a perfect example of how even the most solidly constructed joystick can be paralyzed by the weakest link of any controller – its cord.

Baylis Big Stick
Released By:
Torrey Engberg Smith Co.
P.O. Box 1075
Glendale, CA 91209
$59.95

WICO Command Control

WICO's Command Control joystick is ruggedly built to arcade standards, with a steel shaft inside the plastic stick and metal parts at critical joints. This construction is not surprising, since WICO happens to be a major supplier of controllers for commercial arcade machines.

The Command Control joystick has a long "baseball-bat" handle, long enough to wrap your whole hand around. The action is smooth and flexible, with almost as much travel as the Big Stick. There is a small fire button on the tip of the stick and a larger one in the usual position on the base. A slide switch on the base selects between the two. The cord is five and a half feet long, strengthened with a plastic collar at the base end only.

WICO's product line includes two other joysticks, a trackball, extension cords, and adapters for Texas Instruments computers, the Radio Shack TRS-80 Color Computer, and the Apple II. The Red Ball joystick has a large ball mounted on the stick with the same base as the Command Control joystick, and the Command Control Deluxe features a batlike handle on a much larger base. All models are built to the same standards.

WICO Command Control
WICO-Consumer Division
6400 W. Gross Point Road
Niles, IL 60648
Command Control $29.95
Red Ball $34.95
Command Control Deluxe $39.95

Pointmaster

The Pointmaster is from Discwasher, a company whose best-known product is a popular cleaning system for phonograph records. The Pointmaster consists of a long plastic handle with a molded grip, attached with a ball joint to a plastic base. Since this unit is too light to use as a one-handed model, check to see if it is comfortable to use as a hand-held model, given its large size.

The stick is flexible enough, but there are no obvious contact points or "stops," so players should be careful not fo force the handle too far in the heat of video combat. Due to the stick's leverage and flexibility, precise positioning is sometimes difficult. The contoured fire button,

GAME PROGRAM DEVELOPMENT KIT

for the

COMMODORE VIC - 20

VIC - 20 is a registered trademark of Commodore Business Machines, Inc.

SIX TOOLS TO HELP YOU WRITE YOUR OWN FAST ACTION ARCADE-STYLE GAMES

DECODER — Decodes programs written in machine language (like game cartridges, utility cartridges, and even the computer's own internal operating programs). Produces a program in an English-like language (Assembler) which can be studied to figure out how they did it. The programs created with the decoder can be customized with the **EDITOR** AND INCORPORATED INTO YOUR OWN NEW GAME PROGRAM. The **ASSEMBLER** turns your programs created with the Decoder and the Editor back into machine language and puts them out to tape or disk so the **LOADER** can load them into the computer's memory to be tested and RUN. The **MONITOR** assists you in debugging your new game program by allowing you to run it a step at a time and making modifications if you need to. The **INSTRUCTION GUIDE** is written so that even a beginner can learn the skills needed to become a pro!!!

$49.95 plus $2.00 p&h buys the kit that could make you rich. Why wait?

Send check, M.O., VISA/MC ($2.00 s.c., please include expiration date), or specify COD (add $3.00) to:

French Silk smooth ware

P.O. Box 207, Cannon Falls, MN 55009

507-263-4821

mounted on the tip of the handle, has almost no travel. When first toying with the Pointmaster, without plugging it in, we feared the button would have a "dead" feel. But actually, it turned out to be very sensitive and fast.

The cord is five feet long, reinforced with a collar at the base end only.

Pointmaster
Discwasher, Inc.
1407 N. Providence Road
Columbia, MO 65201
$16.95

Quick Shot

Spectravision's Quick Shot joystick has one unique feature that interested us immediately – the four rubber pads that are standard on other joysticks can be removed and replaced with four suction cups. This allows Spectravision to make the joystick small and light enough to be hand-held, yet still capable of being anchored firmly to a tabletop for one-handed use without resorting to a huge base or extra weights. We found, however, that the tabletop must be very smooth for the suction cups to stick, even if they are moistened.

Plastic construction dominates in the Quick Shot. The stick is a large, molded pistol grip that fits an adult's hand better than most of the other joysticks we tested. The action is flexible, with definite stops, although the contact points are hard to feel. There are two fire buttons, one on the stick and another on the base, and both are always "live," so you can switch back and forth in mid-action. The buttons also have a detent, or "click," at the bottom of their travel.

The Quick Shot includes a four-foot cord strengthened at the base end only.

Quick Shot
Spectravision
39 W. 37th Street
New York, NY 10018
$14.88

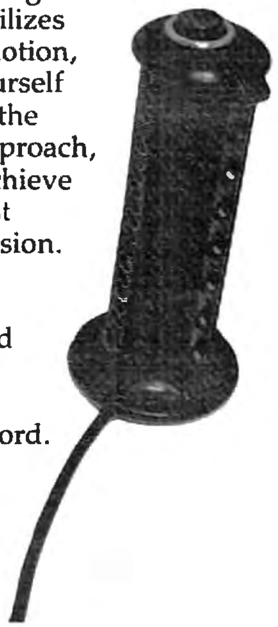
Le Stick

Le Stick is the most unusual joystick we tested. Datasoft claimed in early magazine ads that Le Stick was adapted from Air Force designs for advanced controllers. Le Stick consists only of a joystick – no base. Constructed of a pliant, rubber-like plastic, the handle incorporates four mercury switches which are activated by tilting. That is, tilting the handle forward causes the screen object to move up, tilting it backward moves the object down, and so forth.

This ingenious approach seems to have several advantages: without a mechanical connection to a base, flexibility is unlimited; there is no ball joint to wear out; true one-handed operation is possible, since the fire button is tip-mounted; and the joystick is very light.

However, since the joystick has no "self-centering" or definite "up" position relative to an attached base, it can be difficult to maneuver for those accustomed to conventional joysticks. For example, our untrained hands found it difficult to tilt horizontally without mixing in some vertical motion, and vice versa. Although squeezing the handle immobilizes the sensor and cancels any motion, it can be hard to re-orient yourself without taking your eyes off the screen. As with any novel approach, practice will be required to achieve mastery – we suggest you test Le Stick before making a decision. Our last suggestion – beware the "grip of death" when, in panic, your hand clinches and immobilizes the joystick ... a calming challenge.

Le Stick has a four-foot cord.



Le Stick
Datasoft, Inc.
19519 Business Center Drive
Northridge, CA 91324
$39.95

Starplex Video Game Controller

Unlike the joysticks reviewed, the Starplex Controller and the KY Enterprises box covered below are not really general-purpose devices suitable for all types of computer games. Instead, the Controller is intended largely for one game – *Asteroids*. The button layout is designed to simulate the controls on the commercial arcade version. Thus, we find buttons labeled "Left," "Right," "Up," "Down" (Hyperspace), and "Fire." These correspond to the rotational, rocket, and panic buttons on the arcade machine.

The Starplex Controller fulfills its task very well. Anyone accustomed to playing *Asteroids* in the arcades will feel much more at home with these large, sensitive buttons than with a joystick. One interesting feature is the "Astroblast." Selecting this option with a slide switch allows automatic repeat when the fire button is held down. In other

GEMINI–
FOR PRINTER VALUE THAT'S OUT OF THIS WORLD

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

The Gemini 10 has a 10″ carriage and the Gemini 15 a 15½″ carriage. Plus, the Gemini 15 has the added capability of a bottom paper feed. In both models, Gemini quality means a print speed of 100 cps, high-resolution bit image and block graphics, and extra fast forms feed.

Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, backspacing, double strike mode and emphasized print mode. Another extraordinary standard feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

Gemini reliability is more than just a promise. It's as concrete as a 180 day warranty (90 days for ribbon and print head), a mean time between failure rate of 5 million lines, a print head life of over 100 million characters, and a 100% duty cycle that allows the Gemini to print continuously. Plus, prompt, nationwide service is readily available.

So if you're looking for an incredibly high-quality, low-cost printer that's out of this world, look to the manufacturer with its feet on the ground—Star and the Gemini 10, Gemini 15 dot matrix printers.

star®
micronics • inc

MAKING A NAME FOR OURSELVES

1120 Empire Central Place, Suite 216, Dallas, TX 75247
For more information, please call Bob Hazzard, Vice President, at (214) 631-8560.

words, now you can machine-gun the nasty asteroids. This feature requires an AA battery to be installed inside the controller.

The Starplex also works well with *Space Invaders* and other games requiring simple up-down or left-right movement. For games that demand complex 360-degree movement, stick with a joystick. Obviously, you'll have to decide if you can use this type of controller often enough to justify its cost.

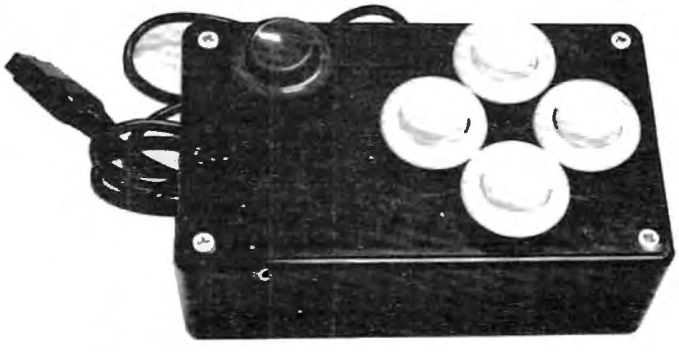
The Starplex is light enough to rest on a lap, and stable enough to hold still on a tabletop. It has a four-foot cord reinforced at the base end only.

Starplex Video Game Controller
Starplex Electronics, Inc.
E23301
Liberty Lake, WA 99019
$29.95

Fingertip Controller

This controller is very well constructed, with a heavy metal box and five large, springy, arcade-style buttons. The buttons are unlabeled, but the white ones correspond to up, down, left, and right, while the red one is the fire button.

Although you can achieve diagonal movement by simultaneously pressing both a vertical and horizontal button, the Fingertip Controller seems most suited to games with simple up-down or left-right movement, such as *Space Invaders*. Like the Starplex Controller, it also works well for *Asteroids*, but with a quirk – it's left-handed. That is, your right hand controls the rotational movement while your left hand hits the fire button, just the opposite of the arcades.



As per the instructions, it's easy to adjust the sensitivity of the buttons by opening the box and bending the spring switches. The Fingertip Controller has a five and a half-foot cord.

Fingertip Controller
KY Enterprises
3039 East Second Street
Long Beach, CA 90803
$26.95

Command Control Trackball

True arcade fans have been hungering for one of these for a couple of years now. Commercial arcade games which use trackballs – such as *Missile Command* and *Centipedes* – work okay when translated to joysticks in home versions, but the "feel" just isn't there. And since the avid arcade fan strives to re-create the arcade experience as closely as possible, joysticks sometimes just don't quite measure up.

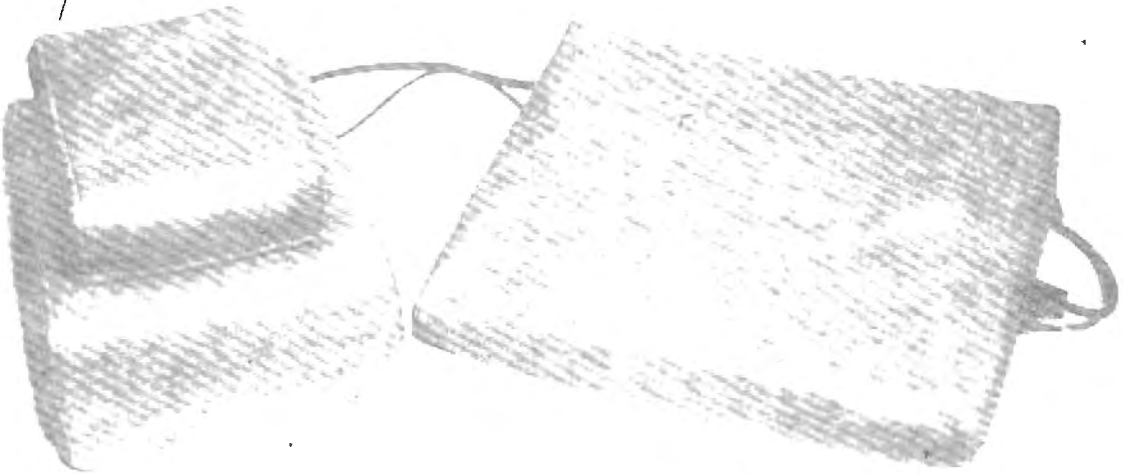
Since WICO supplies trackballs for commercial arcade machines, you would expect the company's home version to be similarly well-constructed – and you won't be disappointed. The heavy billiard-style ball rotates quite smoothly and "coasts" with a good spin. This is due to high-quality steel shafts with ball bearings (see the accompanying sidebar and inside photo describing how the trackball works). Even the five-foot cord is extra heavy-duty. The trackball's inherent weight and rubber footpads keep it from sliding around on a tabletop, and the fire button is the same as those found on WICO's joysticks.

As an example of what a trackball can do in a game demanding fast 360-degree movement, one of our testers tried it out on Atari's *Missile Command*. His former high score was 39,000. With the trackball, after a few warm-up games, he scored 66,000.

Command Control Trackball
WICO
$69.95

LOOKING FOR QUALITY ?

Stitcher™ HAS IT ALL SEWN UP !



ATARI*		**IBM-PC***	
400 COMPUTER	14.89	KEYBOARD	16.89
800 COMPUTER	16.89	MONITOR	20.89
410 RECORDER	7.89	MEMORY UNIT	25.89
810 DISK DRIVE	11.89	MON. & MEM.	39.89
820 PRINTER	13.89	**T.I.***	
825 PRINTER	17.89	99/4A	14.89
830 MODEM	6.89	MONITOR	25.89
VIC*		**EPSON***	
MODEL 20	13.89	MX70-80	17.89
RECORDER	7.89	MX80FT	18.69
DISK DRIVE	11.89	MX100	24.89

NAME ______________________________

ADDRESS ______________________________

CITY ______________ STATE ____________ ZIP ________

PAYMENT METHOD: CHECK ☐ CARD ☐ EXP. DATE ________

MASTER* ______________ VISA* ______________

PLEASE SEND COVER(S) FOR:

MFGR./MODEL	QTY.	COLOR	PRICE	
TOTAL (IN MICH. ADD 4% TAX)				

STITCHER INC. P.O. BOX 68 - STERLING HEIGHTS, MICH. 48078

LIGHT BROWN, DARK BROWN, CHARCOAL OR BLACK COVERS

AVAILABLE AT THESE FINE STORES

DEALERS***CALL COLLECT***1-313-979-1698

A B C BYTE
3361 W. DEMPSTER
SKOKIE IL.

BYTE BY BYTE
52070 VAN DYKE
UTICA MI.

COMPUTERLAND
38473 GRAND RIVER
SOUTHFIELD MI.

COMPUTERLAND
22000 GREATER MACK
ST. CLAIR SHORES MI.

COMPUTER MART
1824 MAPLE RD.
TROY MI.

EARTHRISE COMPUTERS
6 GREEN VILLAGE RD.
MADISON NJ.

EMPRISE COMPUTERS
5967 E. 82ND. STREET
INDIANAPOLIS IN.

FAMILY COMPUTER CENT.
3695 12 MILE RD.
BERKLEY MI.

MEGA RAM
51280 VAN DYKE
UTICA MI.

MICRO STATION
24484 W. 10 MILE
SOUTHFIELD MI.

RAINBOW COMPUTERS
519 BIG BEAVER.
TROY MI.

RITE WAY ENTERPRISES
8262 12 MILE RD.
WARREN MI.

SCHAAK ELECTRONICS
14600 LAKESIDE CIRCLE
STERLING HGTS. MI.

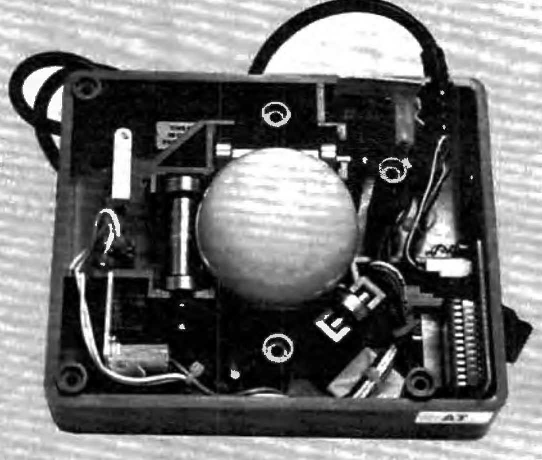
SCHAAK ELECTRONICS
OAKLAND MALL
TROY MI.

VARIATIONS IN VIDEO
1300 N. RAND RD.
ARLINGTON HGTS. IL.

VIDEO ETC.
465 LAKE COOK RD.
DEERFIELD IL.

WICO Trackball:
The Inside Story

Ottis Cowper, Technical Editor



Most joysticks operate by opening or closing switches as the handle is moved. In the standard Atari configuration, four switches provide a four-bit binary number for control of motion in eight distinct directions.

Exceptions to this rule are joysticks such as those used with the TRS-80 Color Computer which use a pair of potentiometers (variable resistors) to provide varying voltages which must be converted by the computer to meaningful binary values. Such joysticks are essentially two-dimensional game paddles. The WICO trackball uses an altogether different technique. Let's take a look inside this rather unconventional game controller to see how it works.

The ball, which is remarkably similar to a billiards cue ball, rests on three rollers with ball bearings for smooth motion. The two larger rollers, one placed vertically and one horizontally, both have a shaft with a slotted disk on one end. These disks pass through the gap in an electronic device known as a *photon-coupled interruptor* and herein lies the key to the trackball's operation. A photo interruptor consists of a light-emitting diode (LED) and a phototransistor separated by a gap. As long as the gap is not obstructed, light from the LED strikes the phototransistor and turns it on. If the light is blocked, the transistor turns off.

As the slotted disk rotates, an alternating series of solid sections and holes passes through the gap, causing the transistor to toggle on and off as light from the LED is alternately blocked and allowed to pass. (The photo interruptors make it possible to determine in which direction the disk is rotating.) Since the transistor can be thought of as an electronic switch, this has the same effect as pushing the joystick handle in one direction, except that the input is much faster and smoother.

For games which require rapid motion all over the screen, the trackball is a major improvement, although the standard joystick is probably more suitable for applications which require precise positioning.

TG Trackball

This trackball should be on the market by the time you're reading this issue. The unit we tested was a prototype that we obtained at the COMDEX trade show in Las Vegas. TG Products also is introducing an Atari plug-compatible joystick, but we were unable to obtain one of these for testing.

The TG Trackball works much like the WICO Trackball, using LEDs and phototransistors to detect the ball's spin. The plastic ball glides less smoothly than the WICO's, however, and has much less tendency to coast. Approximately one third of our testers preferred this "feel" for fine positioning, so this is purely a personal matter that should be tested by the purchaser. Inside, the TG Trackball supports the "billiard ball" on plastic shafts without ball bearings. It might be a good idea to lubricate these shafts to reduce excessive wear if this hasn't been done in production models.

The trackball's extra-heavy cord is just short of five feet and is reinforced at both ends.

TG Trackball
TG Products
1104 Summit Avenue
Suite 110
Plano, TX 75074
$64.95

©

PRODUCTS FOR ATARI* 400/800 FROM ELCOMP

BOOKS:

ATARI BASIC – Learning by Using
An excellent book for the beginner. Many short programs and learning exercises. All important features of the ATARI computers are described (screen drawings, special sounds, keys, paddles, joysticks, specialized screen routines, graphics, sound applications, peeks, pokes, and special stuff). Also suggestions are made that challenge you to change and write program routines.
Order #164 **$7.95**

Games for the ATARI Computer
This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready to run programs in BASIC and one called GUNFIGHT in machine language.
Order #162 **$7.95**

Programming in 6502 Machine Language on your PET+CBM
2 complete Editor/Assemblers (Source code 3 hexdump + description plus a powerful machine language monitor (Hexdump)).
Order #166 **$19.95**

How to program your ATARI in 6502 machine language
Introduction to machine language for the BASIC programmer
Order #169 $9.95

SOFTWARE IN BASIC FOR ATARI

Invoice Writing for Small Business
This program makes writing invoices easy. Store your products in DATA statements with order-number, description, and price. The program later retrives the description and price matching to the entered order-number. The shipping cost and the discount may be calculated automatically depending on the quantity ordered or entered manually. The description to the program tells you how to change the program and adapt it to your own needs. Comes with a couple of invoice forms to write your first invoices on to it.

Order #7201	cassette version	$29.95
Order #7200	disk version	$39.95

Mailing List
This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.

Order #7212	cassette version	$19.95
Order #7213	disk version	$24.95

Inventory Control
This program is menu driven. It gives you the following options: read/store data, define items, entry editing, inventory maintenance (incoming-outgoing), reports. The products are stored with inventory number, manufacturer, reorder level, present level, code number, description.

Order #7214	cassette version	$19.95
Order #7215	disk version	$24.95

Programs from Book #164
The programs from book no. 164 on cassette. (Book included)
Order #7100 $29.00

Game Package
Games on cassette. (Bomber, tennis, smart, cannon fodder, etc.)
Order #7216 $9.95

Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessors and support chips.
A MUST for the hardware buff.

Order-No. 29
$14.95

Care and Feeding of the Commodore PET
Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order #150 $9.95

HOFACKER

Payment: check, money order, VISA, MASTER-CHARGE, Euroscheck.
Orders from outside USA: add 15% shipping. CA residents add 6.5% tax
*ATARI is a registered trademark of ATARI Inc.
*VIC-20 is a registered trademark of Commodore

ELCOMP PUBLISHING, INC
53 Redrock Lane
Pomona, CA 91766
Phone: (714) 623 8314

Books
\+
Software
for
ATARI
VIC-20
OSI
SINCLAIR
TIMEX

SOFTWARE IN MACHINE LANGUAGE for ATARI

ATMONA-1
This is a machine language monitor that provides you with the most important commands for programming in machine-language. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load machine-language programs, start programs. Printer option via three different interfaces.

Order #7022	cassette version	$19.95
Order #7023	disk version	$24.95
Order #7024	cartridge version	$59,00

ATMONA-2
This is a tracer (debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor. At each stop, all registers of the CPU may be changed. Includes ATMONA-1.

Order #7049	cassette version	$49.95
Order #7050	disk version	$54.00

ATMAS
Macro-Assembler for ATARI-800/48k. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-Code. Very fast, translates 5k source-code in about 5 seconds. Source code can be saved on disk or cassette. (Includes ATMONA-1)

Order #7099	disk version	$89.00
Order #7999	cartridge version	$129.00

ATAS
Same as ATMAS but without macro-capability. Cassette-based.

Order #7098	32k RAM	$49.95
Order #7998	48k RAM	$49.95

ATEXT-1
This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.

Order #7210	cassette version	$29.95
Order #7216	disk version	$34.95
Order #7217	cartridge version	$69.00

GUNFIGHT
This game (8k machine-language) needs two joysticks! Animation and sound. Two cowboys fight against each other. Comes on a bootable cassette.
Order #7207 $19.95

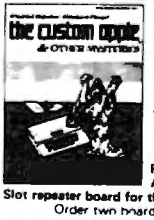
FORTH for the ATARI

FORTH from Elcomp Publishing, Inc. is an extended Fig-Forth-version, Editor and I/O package included. Utility package includes decompiler, sector copy, Hexdump (ASCII), ATARI Filehandling, total graphic and sound, joystick program and player missile. Extremely powerful!
Order #7055 disk $39.95

Floating point package with trigonometric functions (0 – 90°).
Order #7230 disk $29.95

Learn-FORTH from Elcomp Publishing, Inc.
A subset of Fig-Forth for the beginner. On disk (32k RAM) or on cassette (16k RAM).
Order #7053 $19.95

Expansion boards for the APPLE II



The Custom Apple + Other Mysteries
A complete guide to customizing the Apple Software und Hardware
Order-No. 680 $24.95

We also stock the boards which are used in the book "The Custom Apple " (barebords)

6522 I/O Board	No. 605	$39.00
EPROM Burner	No. 607	$49.00
8K EPROM/RAM Board	No. 609	$29.00
Prototyping board for the Apple II	No. 604	$29.00
Slot repeater board for the Apple II	No. 606	$49.00

Order two boards and get the book free !

COMING SOON ! ORDER NOW !

A Look in the future with your ATARI
(Astrology and how to do your own horoscope on the ATARI 800. Order No. 171 $9.95

FORTH on the ATARI – Learning by Using
Order No. 170 $7.95

Hardware – ADD–ONS for ATARI

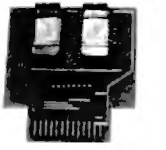
PRINTER INTERFACE
This construction article comes with printed circuit board and software. You can use the EPSON printer without the ATARI printer interface. (Works with gameports 3 and 4).
Order #7211 $19.95

RS-232 Interface for your ATARI 400/800
Software with connector and construction article.
Order #7291 $19.95

EPROM BURNER for ATARI 400/800
Works with gameports. No additional power supply needed. Comes compl. assembled with software (2716, 2732, 2532).
Order #7042 $179.00

EPROM BURNER for ATARI 400/800 KIT
Printed circuit board incl. Software and extensive construction article.
Order #7292 $49.00

EPROM BOARD (CARTRIDGE)
Holds two 4k EPROMs (2532). EPROMs not included.
Order #7043 $29.95



EPROM BOARD KIT
Same as above but bare board only with description.
Order #7224 $14.95

ATARI, VIC-20, Sinclair, Timex and OSI

New – for your ATARI 400/800

Astrology and Biorythm for ATARI (cass. or disk).
Order #7223 $29.95

Birth control with the ATARI (Knaus Ogino)
Order #7222 cass. or disk $29.95

Books + Software for VIC-20 (requires 3k RAM Exp.)

#4870	Wordprocessor for VIC-20, 8k RAM	$19.95
#4883	Mailing List for VIC-20, 16k RAM	$14.95
#141	Tricks for VICs - The VICstory Progr.	$9.95
#4880	TIC TAC VIC	$9.95
#4881	GAMEPACK I (3 Games)	$14.95
#4885	Dual Joystick Instruction	$9.95

INPUT/OUTPUT Programming with your VIC
Order #4886 $9.95

#4896	Miniassembler for VIC-20	$19.95
#4881	Tennis, Squash, Break	$9.95
#4894	Runfill for VIC	$9.95

Universal Experimenter Board for the VIC-20
(Save money with this great board). This board plugs right into the expansion slot of the VIC-20. The board contains a large prototyping area for your own circuit design and expansion. The construction article shows you how to build your own 3k RAM expander and ROM-board.
Order #4844 **$18.95**

Software for SINCLAIR ZX-81 and TIMEX 1000

#2399	Machine Language Monitor	$9.95
#2398	Mailing List	$19.95

Programming in BASIC and machine language with the ZX-81 (82) or TIMEX 1000.
Order #140 (book) $9.95

Books for OSI

#157	The First Book of Ohio	$7.95
#158	The Second Book of Ohio	$7.95
#159	The Third Book of Ohio	$7.95
#160	The Fourth Book of Ohio	$7.95
#161	The Fifth Book of Ohio	$7.95
#151	8K Microsoft BASIC Ref. Man.	$9.95
#152	Expansion Handbook for 6502 and 6802	$9.95
#153	Microcomputer Appl. Notes	$9.95

Complex Sound Generation
New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.
Order #154 **$6.95**

Small Business Programs **Order #156**
Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications. **$14.90**

PROGRAMMING THE TI

C. Regena

Write Your Own Games

Some tips on getting the most out of your TI when writing games.

You have probably discovered that one of the fun things to do with your TI-99/4A is to play games. In fact, many people who wanted one of the popular game machines have discovered that for about the same amount of money they could have a *computer* and still be able to play games. Many of the games written for the TI-99/4A are arcade quality – that is, they have good graphics and fast action.

The programs on the command modules can be programmed in UCSD Pascal, TMS9900 Assembly, and Graphics Programming Language (GPL). These languages take maximum advantage of the color, graphics, sound, and speech capabilities of the computer. GPL is an excellent language for drawing graphics and allows the speed of an assembly language.

To program your own games with fast, smoothly-moving objects, you will want to use TI Extended BASIC. It allows you to use up to 28 "sprites." You may define the shapes of the sprites and designate a certain magnification. You may also specify the sprites' speed. The row velocity and the column velocity may vary from -127 to +127, and by specifying numbers for both velocities you will get a diagonal movement. Sprites "wrap" at the edges of the screen, so you don't need to worry about "crashing" your program on edge conditions. With *one* CALL SPRITE statement you can define the sprite number, shape, color, position, and speed.

TI Console BASIC (the BASIC built in with no accessories or peripherals) is a language powerful enough that you can design a variety of fun games with it. If you have moving objects, however, they have to move a square at a time and thus will have jerky movement. Depending on the number of objects, BASIC games tend to be slow; however, I have seen several fast action games that really require nimble fingers.

Whether you are writing a game in TI BASIC or in TI Extended BASIC, I can offer a few programming tips. Keep in mind that the best way to learn is to actually start programming – and playing.

Randomness

Probably a central tool in computer games is the machine's ability to choose things randomly. Most computers have the command RND, but each computer has a slightly different syntax (way of writing the command). On the TI-99/4A, RND represents a random number between zero and one. Turn on your computer, press any key to begin, and press 1 for TI BASIC. Now type in PRINT RND and press ENTER. The computer will print a decimal fraction (to ten places). Usually in game situations you won't want a fraction, so multiply that fraction by a number. For example, multiply RND by 10 like this: PRINT 10*RND or PRINT RND*10. Now you will get ten times that decimal fraction.

You probably want just the whole number part of that mixed decimal number. Use the INTeger function to get the whole number. PRINT INT(10*RND). If you keep trying this command, you will get numbers from zero to nine. Remember, INT truncates the decimal portion; it does not round the number. Suppose you really wanted random numbers from one through ten. The command would be: PRINT INT(10*RND)+1 or PRINT INT(10*RND+1).

One more step. Assume you want a number N to be a random number between 10 and 20, inclusive. 20 - 10 = 10. There are 10 numbers plus 1 ("inclusive"). The command could be N = INT(11*RND) + 10. The portion INT(11*RND) will give you numbers from 0 to 10; then you add 10 to get numbers from 10 to 20.

Now try this short program:

```
100 FOR I=1 TO 10
110 PRINT INT(10*RND)+1
120 NEXT I
```

RUN the program. RUN it again. And again. The program is printing ten random numbers from 1 to 10. However, you'll notice that each time you run it, you get the same numbers in the same order. You need to add the line: 105 RANDOMIZE.

The RANDOMIZE command mixes up the numbers so that each time the program is run you will get different numbers – and that's what you want in a game. The *User's Reference Guide* indicates that the RANDOMIZE statement only needs to be somewhere in the program to generate different numbers; however, I have found that one RANDOMIZE statement at the beginning of a program does not always work. It is better to use the RANDOMIZE statement just before you use the statement containing RND. Note: If you are debugging a program, you may want to leave RANDOMIZE out so you'll know exactly what numbers your program is choosing. Debug your program, then add the statement and test it.

Moving Objects

In general, the fewer moving objects you have in your game, the faster the action can be, and the logic will be a lot less complex. Also, each moving object should be specified by only one character number so you don't have to use up valuable time by building an object out of several characters. To move an object in TI BASIC you need to erase the object in the first position (replace it with a space) and draw it again in the second position – each move takes two statements.

Player Input

There are two main ways the computer can understand what you want: by your using the joysticks or pressing keys on the keyboard. Your game may be designated for joysticks only, keyboard only, or both. Because of the logic involved, a game using both methods of input will be slightly slower in response; and depending on the branching sequence, one of the methods will be slower than the other.

Joysticks may be easier to use to learn a game, especially if the player is used to a video game using joysticks. My own children, and many other players I know, prefer using the keyboard for *TI Invaders* and *Munchman* because the joystick response is considerably slower than the keyboard response.

The keyboard action is easy to learn because there are standard arrow keys for all games designed for the TI-99/4A. Programmers writing games for other computers often choose their own favorite keys to use, and the directions are different for each game. On the TI-99/4A, the arrow keys are E (up), X (down), S (left), and D (right), with the shooting key either the ENTER key or the period key. If there are two players, the standard arrow keys on the right half of the keyboard are I, J, K, and M. The TI-99/4 owners have a slight advantage here – there is an overlay available for the old keyboard that shows the arrow keys, and it is easier to use the old keyboard for two-player games.

The TI joysticks (wired remote controllers) come with a little instruction book with some sample programs. The main command is CALL JOYST(K,X,Y), which returns an X and Y value for the position of the joystick, where X and Y may be 4, -4, or 0.

To detect keys pressed on the keyboard, use the CALL KEY command. This command is like the GET command in other BASIC languages. The form is CALL KEY(0,KEY,STATUS) where 0 means to scan the whole keyboard. STATUS is a variable name (it could be ST or S, or whatever you wish) which will return whether a key has been pressed or not. KEY is a variable name (again, use whatever you wish) that will return the ASCII code of the key pressed, such as 13 for the ENTER key, 65 for the letter A, 69 for the letter E, etc.

By using IF statements, you can check which key was pressed and branch accordingly. You can also GOTO the CALL KEY statement for other keys to make the computer act as if it is ignoring all responses except the keys allowed. Here is a sample using arrow keys:

```
100 CALL KEY(0,K,S)
110 IF K=69  THEN 1000        (up arrow)
120 IF K=68  THEN 2000        (right arrow)
130 IF K=88  THEN 3000        (down arrow)
140 IF K=183 THEN 4000        (left arrow)
         ELSE 100             (any other key will be ignored)
```

Remember, there are several ways to program the same procedure; this is just one way. You may prefer to use "not equal" signs or a split keyboard and an ON GOTO statement.

A split keyboard approach scans half the keyboard using CALL KEY(1,K1,S1) or CALL KEY(2,K2,S2). The key codes returned for up, right, down, and left are 5, 3, 0, and 2. A sample program using the split keyboard is:

```
100 CALL KEY(1,K,S)
110 IF (K<0)+(K>5)THEN 100
120 ON K+1 GOTO 3000,100,4000,2000,100,1000
```

Line 110 makes sure the K value is in the right range; the key value must be from 0 to 5. All other keys are ignored. Line 120 branches according to which key was pressed. The keys corresponding to 1 and 4 were not acceptable, so they return to the CALL KEY statement. If you want to try out either of these programs, add the following lines, then RUN and try pressing various keys.

```
1000 PRINT "UP"
1010 GOTO 100
2000 PRINT "RIGHT"
2010 GOTO 100
3000 PRINT "DOWN"
3010 GOTO 100
4000 PRINT "LEFT"
4010 GOTO 100
```

There is a slight problem in testing for zero on the TI-99/4A console. Use logic such as IF K+1<>1 rather than IF K<>0. Also, some of the split keyboard codes are different for the TI-99/4A than for the TI-99/4. It is better not to use the comma, period, semicolon, slash, space bar, ENTER, SHIFT, B, and G so that programs may be used on either console.

Five VIC Games From Nufekop

David Malmberg

This latest batch of Nufekop games once again proves the company is worthy of its name. The word *Nufekop*, according to the firm's early ads, has a Druid origin, and means putting an extraordinarily large amount into a small pocket or enclosure, possibly through the use of magic. This is an apt name for a software company that can pack so much fun, excitement, fantastic sound, and colorful graphics into its programs and get them to fit into the VIC-20's relatively small memory.

Before describing the individual games, let me explain the evaluation criteria. I believe the most important attribute of a great game is its "lasting power." It should be just as much fun to play the game the hundredth time as the first or second time. You shouldn't become bored or jaded. Ideally, the game should have multiple levels of difficulty. The game shouldn't be too easy for the expert or too hard for a beginning player. A great game will make you want to play it again and again – or as they say in the coin-operated video game trade, a great game is one which will keep you "pumping in the quarters."

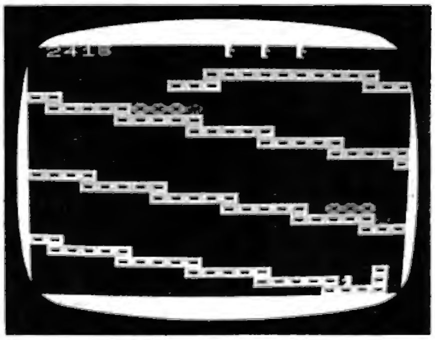
In evaluating these games, I made use of a panel of expert consultants – the neighborhood children from 8 to 14 years old. Each was asked to comment on the things he or she liked and disliked and to rate each game on a scale from zero to ten. A zero rating means it is a waste of time to play the game even *once*. A ten means it's as good as the best full-fledged arcade games, for example, *Centipede* or *Pac-Man*. The comments and ratings that follow reflect the consensus of these experts, as well as my own opinions.

Krazy Kong

The object in this game is to rescue the maidens from the evil Kong's clutches while he tries to stop you by hurling barrels down at you. There are various configurations of steps to climb. You may use either the keyboard or a joystick to climb the steps and jump over the barrels. As you save each maiden, you are presented with a new set of steps – each harder than the last. The game ends when you are killed by a falling barrel, run out of energy, or have rescued all three maidens.

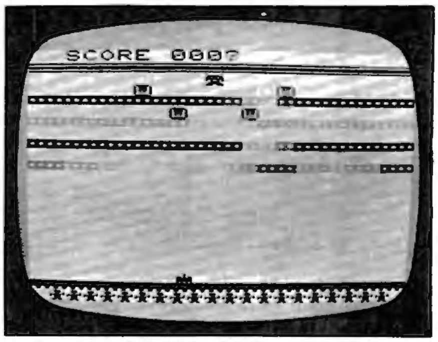
Krazy Kong is well done. It has great graphics, sound effects, and music. The action is very fast. There are four levels of play that govern the number of barrels and the length of your jumps. The highest level is tough enough to challenge even the most seasoned gamester.

However, my experts were a bit disappointed that *Krazy Kong* didn't have a little more variety in the paths up to the maidens and in the obstacles to dodge. Challenging though it was, they quickly became bored with climbing steps and jumping barrels. *Krazy Kong* doesn't have the lasting power of a really great game, so the consensus rating was seven out of a possible ten. *Krazy Kong* works in a standard 5K VIC and is priced at $12.95.



Barrels tumble down the stairways as the little man begins his ascent to rescue the maiden in Krazy Kong .

Anti-Matter Splatter



Deadly anti-matter bombs drop from the sky toward your people in Anti-Matter Splatter.

This game is difficult to describe. Anti-matter "bombs" are falling to earth. You control a splatter-matter cannon using either the keyboard or the joystick. You try to shoot the bombs with your cannon before they hit the people at the bottom of the screen and make them disappear. (What else would you expect an anti-matter bomb to do to a person?) As the game progresses, the action gets increasingly frantic

WIN $5,000 Plus Royalties!*

For the best Talking Game

For the Atari® or Apple®II+

Using the VOICE BOX™ Speech Synthesizer

Now you can make your Atari® 400/800 or Apple® II games and other programs come alive with the VOICE BOX by the Alien Group — the first low-cost, smart speech synthesizer with unlimited vocabulary.

Add jokes to your programs. Insults. Compliments. Help messages. Stories. Alien voices. Animal roars. Have your computer talk to the fire department or police in emergencies. To kids. Or blind people. Teach touch typing with immediate spoken feedback. Or just about any other subject — the fun way. Or help a speech-impaired friend communicate . . . the possibilities are limitless.

The VOICE BOX plugs into your Atari's serial port. And talks directly through your TV set. Or into any Apple II slot. No power supply or special interfaces needed.

Just select from its simple screen menu. A dictionary with thousands of common words (on diskette or cassette) automatically translates your text into speech. It's that easy.

But don't let its friendliness fool you. The VOICE BOX has all 64 phonemes (basic sounds, like "ah") built in. So you can precisely create any word or sound you can imagine. And store it all on diskette or tape. Names or foreign language words, for example. Or wierd non-human languages.

Let me entertain you — The VOICE BOX is creative too. It will crack you and your friends up with non-stop random, grammatically correct sentences, using words you specify. It also has an amusing talking face with lip-sync animation — a real crowd-stopper. Best of all, you can call the VOICE BOX from any BASIC program and make your program really hum —literally!

Singing Apples? — Apple owners get all these capabilities too — as a plug-in card plus diskette. Or there's a deluxe version with the dictionary in ROM (no diskettes to bother with), speaker, and ability to "sing" (hey we're not making this up folks) in any key. (Both Apple versions require 32K or more. Applesoft and DOS 3.3).

Don't confuse the VOICE BOX with "dumb" speech synthesizers that can't learn new words. Or software-based ones with lower speech quality — and an annoying tendency to blank out the display when they talk. The VOICE BOX is a true breakthrough in speech synthesis. Small wonder thousands of Atari and Apple owners have already bought the VOICE BOX.

The VOICE BOX is available now at leading computer stores throughout the world. Or direct from the Alien Group, with 10-day money back guarantee if you're not completely satisfied.

VOICE BOX For Atari. $169.00
16K and 32K versions included
(Specify diskette or cassette).

VOICE BOX for Apple II.+ $139.00.
(Requires speaker.)

VOICE BOX for Apple II+. $215.00
(Includes dictionary in ROM and singing capability. Comes with speaker.)

Enclose check or money order.

CHECK YOUR LOCAL COMPUTER STORE FOR TALKING "VOICE BOX" VERSIONS OF YOUR FAVORITE GAMES FROM LEADING GAME COMPANIES

*Win a $5,000 prize — plus royalties — for the best Atari 400/800 or Apple II+ game using the VOICE BOX. Deadline: May 30, 1983. Write for contest details.

Please mail to: The Alien Group, Department PT-6 , 27 W. 23 St., N.Y., N.Y. 10010
Or call in order to (212) 741-1770

Atari is a registered trademark of Atari Inc. Apple is a registered trademark of Apple Computer, Inc. VOICE BOX is trademark of the Alien Group.

with more bombs and greater speed.

You lose the game whenever a bomb hits your cannon or whenever all of the people have been reduced to anti-matter. You score points by shooting down the bombs, but the high score is not saved. No one who tried this game was ever able to "win," so it is not clear how (or if) it is possible.

Anti-Matter Splatter is written entirely in machine language so the speed is incredibly fast. The graphics and sound are outstanding. This game has good lasting power; the kids played it again and again.

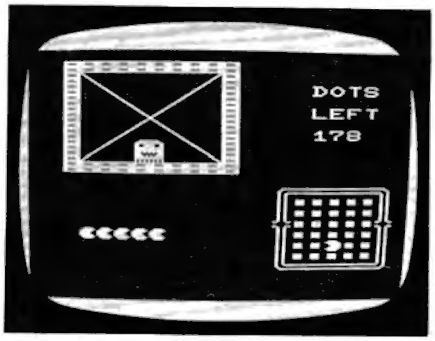
However, the game could have been improved. You get only one cannon, so the game is often over before it has barely begun. The high score should be displayed, so players would have something to try to beat. A variable level of difficulty would be a nice improvement. This could be done by varying either the speed and/or the number of cannons.

Anti-Matter Splatter was rated an eight out of ten. The program works in a standard 5K VIC and retails for $24.95.

3-D Man

3-D Man is a very clever idea for a game – you move through a maze that is displayed in three dimensions. Long corridors with occasional passageways on the sides are displayed in perspective. The object of the game is for your 3-D Man to eat all of the dots, before he is eaten by one of the four ghosts that randomly roam the maze. During the game, the screen shows what your 3-D Man sees ahead of him. At the same time, a small radar screen shows the overall maze and your 3-D Man's location and direction within it. The score corresponds to the number of dots gobbled. You get five 3-D Men before the game is over.

The graphics of *3-D Man* are extremely fast and superbly done. Sound is very effectively used, with different noises for such events as eating a dot, being eaten by a ghost, or trying to make an illegal movement (i.e., bumping into the maze wall).



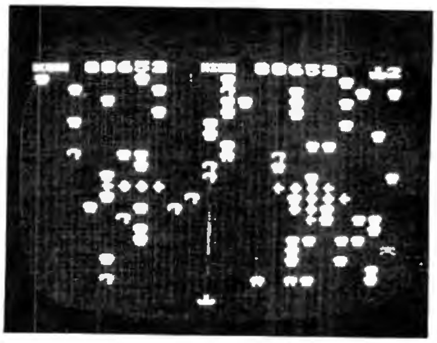
In 3-D Man, *players must eat dots in a three-dimensional maze (upper left) while watching out for pursuers on the bird's-eye view map (lower right).*

3-D Man, however, is an example of a game that lacks lasting power. Everyone loved it the first couple of times. As they continued to play, they discovered its major flaw – that the ghosts' positions are truly random; they do not move from one location to a contiguous one. As an example, it is quite common to encounter a certain ghost (e.g., the red one), then turn around and attempt to flee in the opposite direction, only to find the same ghost there, too. Because of the random nature of the ghosts, *3-D Man* is not really a game of skill. With success so dependent on luck, all of my experts soon lost their enthusiasm. The consensus rating was a five.

3-D Man requires a 3K memory expander and a joystick. It is priced at $19.95.

Exterminator

This is one of the best games I've ever seen for the VIC or any other computer. The object is to shoot everything that moves and everything that doesn't. You normally have three shooters, but you can get a free one at 5000 points. Spiders speed up when you get to 20,000 points. The screen changes color combinations whenever you annihilate all of the pieces of the current centipede.



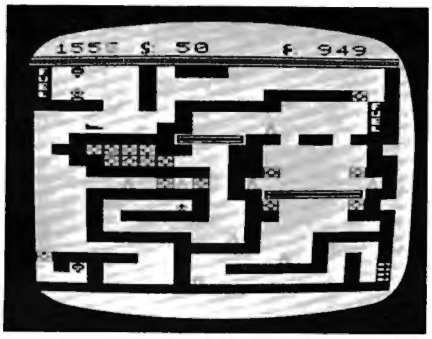
Blasting away at centipede sections, spiders, mushrooms, and other obstacles in Exterminator.

Exterminator is an absolute marvel! Written entirely in machine language, it is unbelievably fast. The graphics, sound, and music are all fantastic. This game is clearly the most popular in my library. The fact that Nufekop was able to fit all of this action and fun into a standard 5K VIC without any additional memory is a tremendous accomplishment. The rating was unanimous among my panel of experts – ten out of ten. *Exterminator* is a great buy at $24.95.

Defender On Tri

The object of this game is to save a group of scientists who have become trapped while exploring an abandoned space station (with the code name "Tri") before the station crashes into the sun. Using the joystick, you control a small rescue vessel. Unfortunately, your ship has room for only one passenger – so you must find the scientists and bring them safely through the maze of machinery in the space station one at a time. This is a very hazardous journey, since the machinery is moving very fast and will destroy your ship unless your defense shields are activated.

However, you cannot have your shields energized too often because they drain so much of



In Defender On Tri, *players must maneuver a tiny ship (upper left) through a maze of machinery in a huge space station to rescue scientists.*

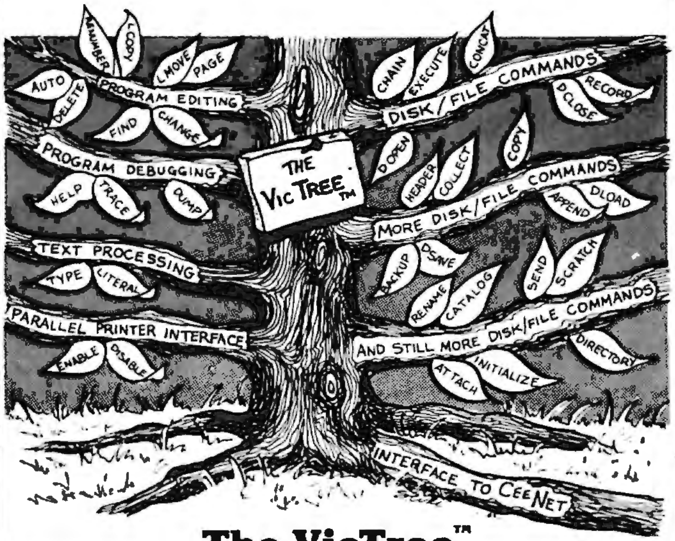
your ship's fuel that you would be unable to complete your mission. You are in a dangerous race against the clock. Time is running out. As Tri moves closer and closer to a collision with the sun, the machinery begins to speed up. You have precious little fuel left and have to make every drop count as you thread your way through a maze where one false move means sudden death.

This game, too, is exceptionally well done. The graphics are great. The action is fast. The sound effects are good. The game is quite exciting, although it is very difficult. The only complaint anyone had was that the game was probably too difficult. None of the neighborhood kids was ever able to rescue all of the scientists. Several kids got frustrated and gave up on the game. Still, the consensus rating was a high nine out of ten.

Defender On Tri requires a 3K memory expander and a joystick. It retails for $19.95.

Nufekop games are widely distributed. The games may also be purchased directly from the company.

Krazy Kong
Anti-Matter Splatter
3-D Man
Exterminator
Defender On Tri
Nufekop Software
P.O. Box 158
Shady Cove, OR 97539
5K to 8K RAM
$12.95 to $24.95



...PET/CBM/VIC? SEE SKYLES...

The VicTree™

...Leaves your new Vic (or CBM 64) with 42 additional commands.
...Branches out to most BASIC 4.0 programs.
...Roots into most printers.

New from Skyles: the VicTree, a coordinated hardware and software package that allows your Vic to branch out in unbelievable directions and makes it easier than ever to do BASIC programming, debugging and to access your disk. Unbelievably simple to use and to install, the VicTree gives you all the additional BASIC 4.0 commands to allow most BASIC 4.0 programs to work on your new Vic or CBM 64.

From Skyles, the best friend you and Commodore ever had...Skyles, the largest specialist in designing and marketing peripherals, software, expansion, memory for all Commodore computers.

Now only $89.95...or $109.95 complete with Centronics standard printer cable. (Cable alone $29.95.) Available now from your local dealer or order through your Visa or MasterCard toll free: (800) 227-9998 (California, Canada, Alaska, Hawaii: (415) 965-1735) or send check or money order directly to:

Skyles Electric Works

231 E South Whisman Road
Mountain View, CA 94041
(415) 965-1735

...PET/CBM/VIC? SEE SKYLES...

commodore VIC-20™ Computer

VIC's MOM — MOTHER BOARD EXPANDER

Expand your vic to full limit:	
3 slot provisions for switches in board	$39.95
with switches	$45.95
CHARACTER BUILDER — UTILITY AID will save and load from disk or tape design your own CUSTOM CHARACTERS use with any memory configuration	$25.00
RS-232 bi-directional INCLUDES SECOND JOY STICK PORT	$40.00
NEW SECOND JOY STICK PORT	$20.00

VIC-20 to EEE-488 Interface allows VIC to use PET/CBM Peripheral	$79.95
ROM EXPANSION BOARD put your own programs on 2K or 4K EPROM'S we can put your program in ROM— call for info	$19.50
8K RAM BOARD can be daisy chained to four	$49.95
4K RAM BOARD	$39.95
VIC DUST COVER protect your VIC	$12.95

NEW CARTRIDGE VIDEO GAMES FROM MACHINE LANGUAGE, INC. — SUPER FAST**COLORFUL AVAILABLE THRU OEM, INC. $25.00

TWO PLAYER GAMES

CLOSE ENCOUNTERS OF THE WORST KIND • BLACK JACK
ACID RAIN • BLOCK BUSTER • DOT GOBBLER • FROGMAN
SPIN TOIDS • CHES

we need good new machine language games - royalty paid
CALL FOR DETAILS

Completely Tested, 100% Guaranteed

MasterCard VISA

Dealer inquiries invited
TO ORDER CALL 305-465-9363

order from OEM Inc.
2729 South U.S. 1, Suite 12
Ft Pierce, Florida 33450

Personal checks accepted allow time to clear — add $2 for shipping — add $5 for COD
Florida residents add 5% state sales tax — Master Card & Visa add 5%

Apple Game Animation Package

Michael P. Antonovich

The *Game Animation Package* is marketed by Synergistic Software as a two-part program package: *Fast Draw* and *Micro Sketcher*. *Micro Sketcher* is for creating high-resolution color pictures which can be used as backgrounds in games or other programs. *Fast Draw* is an excellent graphics utility for creating bit-mapped shape tables which can be accessed from BASIC programs to achieve fast, smooth, flicker-free action.

Fast Draw

First, let's look at *Fast Draw*. Have you ever wanted to be able to create shape tables in color? Or to move shapes around the screen at lightning speed without screen flickering as you draw and erase the shapes? I, for one, was glad to see this package. I found *Fast Draw* a very easy way to create and manipulate shapes.

Fast Draw consists of four major program segments which allow the user to create and manipulate bit-mapped shape tables. The four segments are:

Delimit – This program is a shape table editor which allows you to create shapes using any combination of the eight standard high-resolution colors.

Examine – This program provides a very simple way of viewing each shape in the shape table as it moves across the screen at various speeds.

Placement – This allows the shapes from a table to be placed on the screen under paddle control. This option is the only way to segment a previously created shape table and to re-create it in a different form or with a different set of shapes.

Shift – This utility performs color shifts on the shapes on the screen. Shapes can also be inverted.

The Delimit program allows you to create a shape dot-by-dot in a manner somewhat similar to that used in the character generator section of the *DOS Tool Kit*. One major advantage over the *Tool Kit* is the ability to define the size of the shape in terms of the number of horizontal and vertical dots. Thus one shape is not limited to the size of a single letter. Of course, another major advantage is the ability to create colored shapes. Delimit is easy to use, and a menu is provided at the bottom of the screen in case you forget the commands or you don't read manuals. Shapes are added to the shape table one at a time.

Once a shape has been added to a table, it is relatively easy to remove that shape by using Delimit in combination with the Placement utility. Have you ever tried to combine or eliminate shapes from a regular Apple shape table by hand? With these two utilities, it is easy. Delimit also provides two modes to store shapes. There is the normal shape-saving mode for objects which require smooth movement, and a space-saving mode for objects which require smooth movement, and a space-saving mode for shapes that can move using larger jumps. In general, I found it quite easy to create fairly complicated shape tables using Delimit.

Viewing, Positioning, And Controlling Color

Examine is a simple utility for viewing the shapes in the shape table. Each shape is shown, one at a time, moving across the screen with nine different combinations of "speed" and "delay." The major problem with this utility is that if you want to see the fifth shape in the table, you must first watch the first four shapes dance across the screen nine times each. If you just want to view a shape table, it is quicker to use the Placement utility rather than Examine.

Placement allows each shape to be placed onto the screen as many times and in as many places as desired. This utility has two major uses. The first is when a background picture is needed in which a single shape is to be displayed several times in different places on the screen. Placement can place any shape anywhere on the screen as many times as necessary, after which the screen can be saved. The second major use of Placement is to edit shape tables. While a shape cannot be removed from a shape table by simply deleting the shape, the shapes you want to keep can be placed on the screen using Placement, and then reassembled into a new shape table using Delimit.

The Shift utility allows a shape's color to be shifted. Shapes can also be inverted.

Fast Draw routines are easy to access from BASIC programs. I found the instructions very clear on the methods available to access *Fast Draw* shape tables from BASIC. The only problem with the documentation is that the three demo programs listed in the manual will not work as is. However, with careful reading of the *Fast Draw* instructions, I was able to correct the demo programs. The only feature that I felt was missing from *Fast Draw* was a way to edit existing shapes. Once a shape was made, it could not be changed or used as the basis of the next shape. Therefore, if you needed a series of similar shapes, you would have to start each one from scratch.

Fast Draw (written by Glen Bredon) is an excellent graphics utility: well-written, easy to use, and well-documented. These procedures are so good that you might want to use them in your own programs. Fortunately, Synergistic Software decided not to copy-protect the diskette, so these routines can be used on any other diskette. However, Synergistic Software requests that you sign a license agreement first. There is no fee for the license agreement. That's fair enough, isn't it?

Micro-Sketcher

Micro-Sketcher is a menu-driven graphics utility for creating high-res color pictures, allowing you to create, display, edit, save, fill, and load tables to create full screens. One thing that makes *Micro-Sketcher* unique is that it allows you to create and save segments of a picture rather than having to work with the entire screen. These picture segments then can be displayed individually or in combination to create the final screen image.

I did find some problems with this package. First of all, full screen means only 256 positions horizontally, while, as we all know, the Apple screen is 280 positions in the high-resolution mode. This means there is a wide black border on the right side of the screen. This creates a problem with the fill routines, which fill out to all 280 positions. If a border is not placed around the screen, the color fill routine can cause some rather undesirable effects. In addition, once a color has been selected and an area filled, that area cannot be redefined with a new color. If a new color is desired, that sketch in the shape table will have to be redone. If you are working with the entire screen and choose the wrong color, you will have to start over or live with the color selected.

There is also no continuous draw capability. All lines are drawn as line segments by defining both end points of the line. This method is known as "rubber banding" in some packages because a flashing line is shown on the screen from the first end point to the current position. When the second end point is chosen, the line becomes solid. This is great for drawing tables, rooms, and buildings, but it is very difficult to draw curved shapes such as circles, letters, trees, etc. There are no circle utilities to create circles, or character utilities to add letters or text to your picture, either.

There is also no "paintbrush mode" such as is found in many packages which would allow you to create interesting effects such as shading, trees, bushes, and so on by using different "paint brushes."

A minor problem is that it is too easy to erase the entire screen with the "X-clear" command. After you've worked hard over a picture, a simple slip of the left hand onto the X key can make you want to bang your head against the wall. A two-key command such as CTRL-X would be far better and safer.

The edit mode of *Micro-Sketcher* is unusual. To edit a shape, the program removes one line at a time from the end of the shape. Therefore, if an error was made at the beginning of the shape, all of the lines must be removed until you get back to the line in error, and then the lines must be redrawn. Also, the edit mode may not remove all of the dots from the screen as it removes the lines. These remaining dots cannot be edited out of the picture with this package. You cannot simply draw over these dots with a black pen, because you can only draw white lines on a black background. Start over with a clean screen.

On the positive side, *Micro-Sketcher* has a fast and very efficient fill routine (written by John Conley) which is capable of handling fairly complex shapes. In fact, the fill routine is much better than those in many other graphics packages.

Except for the X key, the program has good protection against faulty input. The documentation is good, but not as clear as the *Fast Draw* documentation. Up to 32 colors are available for the fill routines, and the author has split these colors into compatible groups to eliminate the problem of color smearing when two colors are placed next to each other.

Another nice feature is the use of game paddles or a joystick to roughly position a point, and the use of the I, J, K, or M keys to disable the paddles or joystick and make fine adjustments.

In general, the *Game Animation Package* is well worth the price for people who would like to write animated games, but who do not know 6502 machine language. The *Fast Draw* routines are worth the price of the package themselves for that purpose. While the documentation is fairly good, it does help to first have an understanding of the way the Apple uses graphics and the graphics screens. However, the shape tables created by these two packages are not the same type of shape tables described in the *Apple Reference Manual* or in some other Apple books.

You must use the routines provided on the *G.A.P.* diskette to be able to draw these shapes. In fact, the shape tables created by the two different methods are not really compatible with each other (or at least I was not able to use them interchangeably). However, since the manual explains how to access these shape tables from BASIC, and since the routines are on the diskette, let's go out and add some animation to our games.

Game Animation Package
Synergistic Software
5221 120th Avenue SE
Bellevue, WA 98006
$49.95

Mazogs For Sinclair/ Timex

Arthur B. Hunkins

Mazogs is an excellent, single-player, treasure/ maze game for Sinclair/Timex computers with the 16K memory expander. Its full screen graphics make excellent use of the Sinclair/ Timex capability. *Mazogs* is written largely in machine language and runs immediately upon loading. A review copy loaded reliably on my Timex TS-1000. (The program also runs on 16K Sinclair ZX-81 and ZX-80 with 8K ROM.) It is recorded on both sides of the cassette, and comes with a four-page explanatory brochure. (You'd better read it carefully – this game can get complicated!)

Mazogs has three particularly strong points I'd like to mention: 1) there are three levels of play, from neophyte to highly skilled and self-competitive; 2) there are sufficient options so that various strategies may be tried out and implemented; 3) high score is kept (no maximum "high score" limit exists) so that there is always an incentive to do better.

Mazogs are ugly, threatening little creatures who inhabit the treasure maze and love to devour treasure-seekers. They frequently block the way; if you engage them in battle without a sword (swords are scattered throughout the maze), you have only a 50-50 chance of surviving. Your job is to find the treasure and get back out without being devoured. The maze is huge, and the number of moves to the treasure is anywhere from 120 to over 400.

Prisoners With Blinking Eyes

Most of the play takes place on a local scale (full screen), where you can see only several moves in advance. However, a "view" is always available, which gives a larger perspective in your immediate area. Also accessible is a "situation report" which informs you, among other things, how far you are from your goal (treasure or exit).

Your main allies are the "prisoners," with blinking eyes, locked in the walls of the maze by the ruthless Mazogs. Positioned randomly throughout the maze, they know both the way to the treasure and the way out. When you stop to ask advice, they show you the way (marking the path "THIS WAY"). The only problem is that their memories (or yours?) last only about ten seconds. After that, you are on your own again.

In the two advanced levels of play there are four intriguing features: 1) you get only a specified number of moves, depending on total distance – if you exceed this number, you "die" in the maze; 2) you get points (more moves) for killing Mazogs, etc., and lose points for such things as asking for "views," "situation reports" (even "buying a sword" when in the direst of straits); 3) prisoners die once they help you, and swords can be used only once before disappearing; 4) Mazogs themselves become aggressive and mobile – they jump around and attack, sometimes even in twos and threes. Of course, there are various defenses, described nicely in the instructional brochure. The point is that strategy takes a while to develop; so the game takes skill, invites involvement, and has "staying power." In short, *Mazogs* has the ability to become at least moderately addictive.

Something For Everyone

One of the best features is the graphics display. There is a fair amount of animation (Mazogs, treasure-seeker movement, prisoners' eyes blinking, as well as treasure glittering). Much of this is seen in the opening display, which, with its simultaneous animation, is quite impressive.

At game's end, you have the option of playing another game (any skill level), or of seeing (and exploring) the entire maze, including viewing its solution. A bird's-eye view of the maze takes four full screens, and you can see different parts of it by pressing the directional keys. (The same four keys are used to maneuver your treasure-seeker during the game.) Another option is offered at the beginning: a choice of two ways to enter the maze – from the left or right. An initial "view" displays the options as you prepare to start your journey.

There are numerous details, all nicely done, that add to the pleasure and challenge of the game. For example, there are two alternate keypad directional schemes – one is conceptually clearer, the other is faster. Take your choice; there is something for everyone! As a matter of fact there is only one thing I can think of to criticize about *Mazogs* – and I doubt whether the authors could have done anything about it. The program is a bit slow responding to key-presses (they do automatically repeat if you hold them down).

At $14.95, *Mazogs* is a good value and should furnish many hours of creative entertainment. It's one of the better 16K Sinclair/ Timex games out there. I recommend it.

Mazogs
Bug-Byte Software (England)
Distributed by Softsync, Inc.
P.O. Box 480, Murray Hill Station
New York, NY 10156
$14.95

Andromeda For Atari

Larry Isaacs

Andromeda is a game distributed by Gebelli Software Inc. It is written in machine language and requires an Atari 400 or 800 with at least 24K, a disk drive, and a joystick. It is a re-release of an earlier version, and current owners can get the new game by returning their old copy to Gebelli Software.

In *Andromeda* you are in control of the "Andromeda" cell, which has invaded the body of a multi-cellular organism. The object of the game is to keep Andromeda alive as long as possible, scoring as many points as you can.

The field of play is the multicellular organism, which is approximately 18 times larger than the display screen. You direct Andromeda about the screen using the joystick. When Andromeda reaches the edge of the screen, the field scrolls underneath Andromeda to display other parts of the organism. Inside the organism, you will see fat cells, which appear as smiling green faces, and blood vessel cells, which are red four-pointed stars. You can even see moving blood cells within the blood vessels, though they do not figure in the game.

One of the requirements for keeping Andromeda alive is to destroy cells inside the organism. If you fail to destroy cells, Andromeda will become weaker, and could get too weak to move. You destroy a cell by positioning Andromeda just below the cell you wish to destroy and pressing the fire button on the joystick. You may also simply hold the fire button down while you position Andromeda underneath the cells you want to destroy. Destroying cells also scores points. You get 100 points for fat cells, 200 points for a blood vessel cell, and 500 points for one of the few mutant cells in the organism. When a cell is destroyed it will disappear. However, after a certain number of that type have been destroyed, the destroyed cells will begin to reappear in a different color. The new color indicates that this regenerated cell is immune to Andromeda. When most of the cells on the screen are regenerated cells, you will have to move to another part of the organism to seek fresh cells.

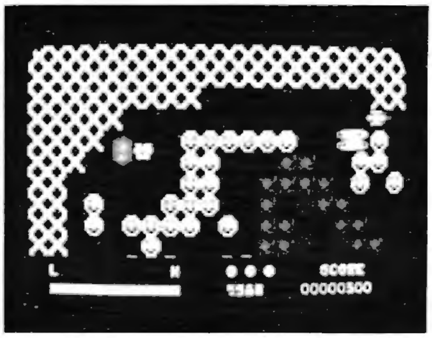
The Dread Antibodies

The foes you must face in this game are, naturally enough, antibodies. If an antibody comes in contact with Andromeda, one of Andromeda's three lives is lost. There are four types of antibodies, each with its own pattern of movement. Fortunately, Andromeda is not always at their mercy. Each time you add 5000 points to your score, Andromeda assumes an enlarged state.

If Andromeda comes in contact with an antibody while in the enlarged state, the antibody is destroyed. Naturally, destroying an antibody is worth more points than destroying the regular cells. The points range from 300 to 1000, depending on the type of antibody. Andromeda's enlarged state is only temporary. Fortunately, you are given an audible warning a couple of seconds before Andromeda reverts to its normal size and vulnerability.

At the bottom of the display are several status indicators to assist you during the game. On the left side is an indicator that shows the organism's level of resistance to Andromeda. This level is lowered by destroying cells, and once the level reaches zero, the organism itself is destroyed. On the right side, your score is shown. In the middle is

a timer which starts at 9999 and counts down. When you destroy the organism, you get a bonus of the current count times 100 points. Above the timer are indicators, up to three, which show the number of lives Andromeda has left. When Andromeda destroys an organism, Andromeda receives a bonus life and gets to invade another organism.



Dodging antibodies and destroying enemy cells in Andromeda.

Implementation of the game has been carried out fairly well. The use of graphics is simple but good, and player movement is very smooth. The game supports seven levels of play, with the speed of movement and rate of appearance of the antibodies increasing with each level. Andromeda's rate of movement is slower while moving through blood vessel cells. This contributes to the realism within the game.

My major criticism of this product concerns the instruction sheet. The instructions are very sketchy, and in some cases, incorrect. For example, the instructions state that the indicator at the lower left corner shows the level of antibodies. I was unable to see any correlation of this indicator number to the number of antibodies that have been destroyed, or the number present on the screen. Also, illustrations of the different cells in the instructions don't match with what appears on the screen.

Nor do the instructions give any hints on strategy. For example, it isn't very difficult to destroy the organism before the timer count goes below 8000. This means that your bonus score will typically be over 800,000 points. While destroying the organism, you might accumulate about 30,000 points for destroying individual cells and antibodies. As a result, points from destroying individual cells and antibodies become somewhat negligible compared to bonus points. This would seem to imply that destroying the organism as fast as possible is the primary goal. However, the instructions don't even mention that the organism is capable of being destroyed. Fortunately it isn't hard to pick up most of what the game is about just by playing it a few times. However, you could miss out on some subtleties of the game which need a hint or brief description.

One other slight annoyance is that you can't restart the game without reloading it from disk. Since it comes on a copy-protected disk, it would have been nice to eliminate any unnecessary disk wear.

Overall, it is a fairly good game, though not on the level of a *Star Raiders*. If you like the *Pac-Man* style game, you will probably like *Andromeda*. It has a different flavor than *Pac-Man* – you don't have as much control over entering the state when you can eat your opponents, but you also don't have a rigid maze to contend with.

Andromeda
Gebelli Software Inc.
1787 Tribute Road, Suite G
Sacramento, CA 95815
$29.95

Shamus For Atari

Tom R. Halfhill, Features Editor

You're prowling along the corridors of yet another unexplored room, searching for the key to the Shadow's lair...

Suddenly you are attacked by a hunting pack of Whirling Drones, Robo-Droids, and the especially deadly Snap-Jumpers. Frantically dodging their molecular disruptors, you hurl several of your contraband Ion-Shivs, blasting them to fragments. Now you're free to pick up the key they were guarding, and you hope that it fits the lock you encountered in that other room far behind you.

But you've dallied too long in this chamber. From out of nowhere descends the Shadow himself, protected by Tri-Gamma body armor impervious to your Ion-Shivs, and he's bent on revenge for the destruction of his henchmen. You break for the exit, but stumble into a wall instead...and instantly disintegrate.

A Blend Of Arcade And Adventure

That's a typical example of how Synapse Software's game *Shamus* is played – and a typical example of how it usually ends as well, since this game is extremely hard to beat. In fact, my guess is that it would take months of frequent play before any mere human could succeed in locating the Shadow's lair and destroying the elusive arch-enemy. This is a game for true addicts.

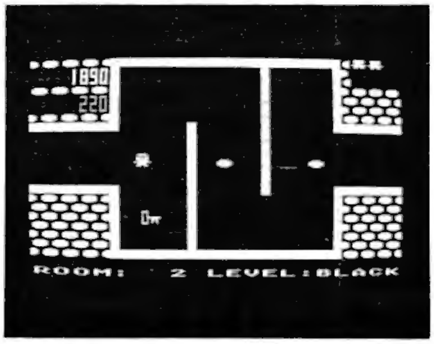
Shamus (pronounced "SHAW-muss" or "SHAY-muss," slang for *detective*) is a one-player game available on disk or cassette which requires at least 16K RAM and a joystick. Programmed by William Mataga, *Shamus* combines the puzzle-solving and exploration features of a graphics adventure game with the fast action of an arcade-style shoot-'em-up.

The object of the game is to locate the hidden lair of a creature known as the Shadow, and then to destroy him in a final struggle. Locating this lair is not easy. There are four levels of rooms to explore, and the only way to advance to the next level is to find the proper key for the proper lock. The locks and keys are color-coded and scattered throughout the rooms, forcing you to wander around, picking up keys and trying them on the various locks.

To give you some idea of the complexity of this task, each level contains no less than 32 rooms – according to the manual. Actually, in my aimless wanderings, I encountered rooms numbered as high as 37 on one level. This means there could be nearly 150 rooms!

The graphics and sound effects in *Shamus* are beautifully done. The game boots up from the disk or cassette with a very good rendition of the theme tune from the old *Alfred Hitchcock Presents* TV show. You then choose from four degrees of difficulty ranging from "novice" to "expert." The manual is absolutely correct when it states that each degree is significantly harder than the last. After briefly sampling the higher degrees, I stuck with "novice" and still found myself outmatched.

You start off in Room 0 on the first level. Your joystick controls a little man in a fedora (after all, what kind of detective would you be without a brimmed hat to pull down over your eyes?). Each of the 32 (or 37, or whatever) rooms on each level occupies a full TV screen. To move to another room, you simply head for a door and walk (or run, as is frequently the case) off the screen. Instantly, the next room appears.



Going for the key to the next level while dodging Whirling Drones in Shamus.

Shamus uses several redefined character sets, and the graphics are among the best I've seen on the Atari. Joystick response is instantaneous, and very often a half-dozen or more multicolored objects will be moving around at once.

These objects, by the way, are the Shadow's henchmen. Searching for keys and locks in scores of rooms spread over four levels would be hard enough, but these creatures are always there to make your life even more difficult. The easiest to dispose of are the Whirling Drones, little pinwheel-shaped machines that home in on your presence. The Robo-Droids aren't too bad either, although they're a headache when attacking in droves with the Whirling Drones. Far more dangerous are the Snap-Jumpers, shifty little critters who move in short leaps in the blink of an eye.

If any of these henchmen shoot you with their molecular disruptors, or even touch you, it's goodby. Your main defense is your inexhaustible supply of Ion-Shivs (Ionic-Short High Intensity Vaporizers). You can throw these in any direction by pressing the fire button while aiming the joystick, and they'll disintegrate anything. Another defense is dodging or even fleeing, but watch out – if you brush against a wall, you'll be instantly zapped to atoms.

By far the most dangerous obstacle, though, is the Shadow himself. If you stay in one room too long – say, half a minute or so – he appears out of nowhere and tries to destroy you with his deadly touch. Since the Shadow wears Tri-Gamma body armor, your Ion-shivs will not kill him. However, they will stun him for a second or two, making escape at least possible.

No Rest For The Weary

Running randomly from room to room spreading wanton destruction doesn't do much good either, since the rooms are repopulated with henchmen as soon as you leave. And they're always positioned between you and the next doorway, or else guarding a lock or key if one is present. This makes your mission a never-ending battle against relentless enemies.

As you advance from level to level (assuming you *do* advance), everything speeds up. The manual describes the final level as "insanely fast." I never made it that far, but I'm not skeptical.

There are a few factors in your favor. You start off with several "lives," and your little man is replaced at the spot where he's zapped – you don't have to restart at Room 0 on the first level. You can also accumulate bonus lives by retrieving bubbling flasks found in some rooms, or occasionally by checking out the question marks left as clues in some rooms. A scoreboard awards points for destroying henchmen and clearing out rooms, but apparently the points are for measuring your progress against other games; they don't seem to win you extra lives or otherwise affect the current game. Although *Shamus* is a one-player contest pitting you against the computer, the manual recommends that two people participate – one to work the joystick and fight the henchmen, and another to keep track of the room layout and locations of locks and keys.

As a final twist, the manual mentions "pod rooms" which exist in another dimension, accessible only through a small "time window." On several occasions I encountered one of these portals, but was never able to pass through.

Overall, I found *Shamus* an exceptionally high quality game, very addicting, and more difficult than most. The programming is top-notch. The only feature I missed was some sort of "pause" option in case the phone rings or the neighbor's house starts burning down. But since the challenge of *Shamus* depends on not giving you time to puzzle out the arrangement of the rooms, a pause key would make it too easy to cheat. Since there is also no way to save games in progress until later, *Shamus* becomes a test of endurance as well as of memory, cleverness, and reflexes. It succeeds in combining some of the best qualities of arcade and adventure games.

Shamus
Synapse Software
5327 Jacuzzi St. Suite 1
Richmond, CA 94804
$34.95

©

Moptown – Educational Games For Apple

Sheila Cory

Colorful blocks of varying sizes and shapes that are found in many elementary school classes are called Attribute Blocks. They are used to stimulate rational thinking by giving children experience in distinguishing attributes and carrying out logical operations.

The "Moppets" who live in *Moptown* are computerized Attribute Blocks, with each of the inhabitants identifiable by their peculiar combination of traits.

The traits used to identify the 16 Moppets who populate *Moptown* are: (1) tall or short, (2) fat or thin, (3) red or blue, and (4) Bibbit or Gribbit. All Bibbits have big noses and big feet, and all Gribbits have tails. Like work with Attribute blocks, games in *Moptown* involve logical thinking. Working with attributes on the computer allows, among other things, the random assignment of the attributes, feedback as to the correctness of response, and immediate reinforcement.

Moptown

Moptown is a program designed for elementary school-aged youngsters. Programmed by Leslie Grimm (whose excellent programs – *Bumble Plot, Bumble Games,* and *Juggles' Rainbow* – were reviewed in **COMPUTE!** recently), this set of programs consists of 11 different games that develop the ability to identify and isolate attributes. The games are carefully sequenced from easy to hard, providing an ideal structure for understanding and learning. The programs would be appropriate for use in kindergarten through grade six, with the most difficult even providing challenging fun and learning for children in junior high school.

Recognition Games: Easy To Difficult

In Make My Twin, the simplest of the games, the user looks at a *Moptown* villager (or Moppet, as they're called), and then describes its four attributes in order to make its twin. To do this, the child needs to be able to separate each of the attributes from the whole – an excellent activity for the development of analytical thinking. To save typing, the program allows the child to use a one-letter input to describe the attribute. With young children, this can be a very important feature in a program, yet one that some programmers forget to consider.

Who's Different? lines four Moppets up assembly-line style and asks the user to find the one that is different. After identifying the different Moppet, the user then must identify which of the four attributes makes it different. Another possibility in this game is to have four different Moppets drawn, and have the user choose which one is *most* different. This variation is considerably more difficult than the previous one.

What's the Same? is similar to the previous game, except the object is to find the one attribute the Moppets have in common. As in the other games, no help is given if the user continually selects the wrong answer. This could be a problem for a child who chooses to play a game that is beyond his or her level of skill.

```
** MOPTOWN PARADE **
DO YOU WANT THE INSTRUCTIONS?
(TYPE Y OR N.)
```

"Moppets" line up for review in the Moptown Parade game.

Who Comes Next? is a pattern recognition game. There are three possible patterns: ABABAB, ABBABB, or AABAAB. Four Moppets are lined up; the user determines the pattern and then describes what the fifth Moppet should look like. The task involves not only identifying the pattern, but also dissecting the appropriate Moppet into its four attributes in order to describe them. If the Moppet is described incorrectly, it is drawn the way it was described and the user again has an opportunity to describe the Moppet correctly.

User-Determined Patterns

The next game is Moptown Parade. Like all of these games, it is introduced with an appropriate picture and song – in this case, "She's a Grand Old Flag!" The object of this game is to create the participants in a parade according to a rule determined by the user.

The rule establishes how many traits each successive Moppet in the parade should have that are different from those of the previous Moppet. For example, if the rule is "1", then the next Moppet in the parade will differ from the Moppet in front of him by just one trait. If Moppet 1 is tall, blue, fat, and a Gribbit, then Moppet 2 could be tall, red, fat, and a Gribbit. If a mistake is made, the incorrect Moppet is drawn and then erased so the user can try again.

Who's Next Door? makes trait analysis of two Moppets an essential step for determining the second Moppet of another set. The first pair of Moppets are compared to see which single trait is different. A third Moppet is shown, and its pair must be described so that the two differ in the same attribute as the first pair.

In My Secret Pal, the user selects four traits to describe a

Moppet. The program responds by drawing the Moppet described, and then telling how many of those traits are correct to describe the secret pal. This game is quite a challenge, as the program does not tell you *which* traits are correct, only *how many* are correct. It is up to the user to develop good guessing strategies!

Careful trait analysis is necessary to be successful in the next game, Change Me!. In this game, four boxes are drawn on the screen. A Moppet is drawn in box one and box four. Again, as in Moptown Parade, a rule of "1" or "2" determines how many trait differences there should be in each successive Moppet. The problem is to determine what the second and third Moppet should look like in order for the fourth Moppet to have just the specified number of different attributes.

Clubhouse is more difficult still, requiring logical deductions to decide which Moppet can join the Moppets Club. Each time a Moppet is described, the program responds by telling whether or not he can join the club. The object of the game is to figure out what rule or rules are being applied to each Moppet to either accept him into or reject him from the club.

The last two programs, Moptown Map and Moptown Hotel, carry the skills developed in the previous games a step further. In both of these games, the user has to be concerned with attributes shared by Moppets in the same row *and* the same column. Thinking of relationships in two dimensions makes these two games substantially more difficult than the previous ones; but with mastery of the earlier games, these should be challenging enough to be interesting, yet easy enough to be fun.

Color Monitor Crucial

The documentation for *Moptown* is clear and concise. I disagree with the claim that these programs are suitable for use with a black and white monitor, however. Color is crucial to these programs, as it is one of the four attributes by which the Moppets are distinguished from each other. As the manual states, it *is* possible to discern the differences on a black and white monitor, but I feel it makes the games too difficult. One outstanding feature of the manual is the inclusion of suggestions on how to use these programs when there is just one computer for a whole class.

Sound adds a lot to this program. However, sound can be a distraction in some classroom situations. The program does not have a "sound/no sound" option, which might make it inappropriate for some classes. The program also makes different sounds when a child gets an answer correct than when he or she gets an answer wrong. Some children could be very upset about having others know how they're doing when they're working so hard to master a difficult concept.

How Children Rate *Moptown*

Because it is difficult for me to assess how kids would respond to a program, I gathered a group of "kid consultants" to test out these programs. Bret, 11 years old, spent about two hours on *Moptown*. He said he enjoyed all the games, but felt his friends would most enjoy Moptown Hotel, which is the most difficult. He said he would like to borrow the programs from me in order to have more time with them.

Cara, ten years old, enjoyed all of the programs *except* Moptown Map and Moptown Hotel, which she felt were too difficult. She had only a little more than an hour to spend on the programs, so she would possibly enjoy those difficult ones more if she could work with the games a bit longer. Cara felt her friends would enjoy Clubhouse the most. Like Bret, she asked if she could borrow the diskette for more work with these programs.

Chrissa, eight years old, loved the games. She thought Make My Twin was a little boring because it was too easy, but enthusiastically endorsed Clubhouse. The Kids all tended to ask adults how to play the games rather than read the instructions. In a classroom situation, it would be a good idea for the teacher to introduce each of the games to the whole class before having the children play individually.

Moptown runs on an Apple II Plus with 48K. It comes on diskette, with back-up diskette and manual included in a handy package.

Moptown
Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95014
$50

VIC Searcher

Heinz Wrosch

There are times when you just can't find something in a large program. Instead of reading every line and wasting your time, why not join the growing number of people who say: "Let the computer do it. It does it better."

This short program is a "BASIC loader" which means that it's written in and can be used in BASIC, but is actually a machine language program. Those DATA statements represent the various instructions (coded as numbers) that the computer can read even more easily and faster than it can follow BASIC instructions. Machine language is, after all, the computer's native tongue.

So Much Faster

You don't have to know machine language to use this handy tool. Tools like "Searcher" are often called *utilities* which means "programs that help you program." For Searcher, all you need to do is to type in the mysterious program (SAVE it for future use) and then any time it's RUN it will figure out where your VIC's highest free memory area is, put itself up there, and build a wall around itself by telling the VIC a white lie: that there is a tad less memory available than there really is.

Finally, it self-destructs using NEW in line 60. *It* does all this, *you* just type LOAD and RUN. That's one good reason why computers should, quite often, do things for you. So much faster.

Now for the fun part. LOAD and RUN your Searcher. It will print a number on the screen which is the address you are going to send the computer to. On many VIC's this will be 7547, but it depends on how much memory your VIC has. Whatever the number is, make a note of it. Now LOAD in some long program. Imagine that you want to remove all the REM statements to save memory. To search them out, type a new BASIC line number into the program at line zero:

0:REM (hit RETURN)

following the zero with a colon and then the thing you want to search for (in this case "REM"). Then directly on the screen (not in a BASIC program) type: SYS 7547 (or whatever number the program told you to use). Instantly you'll have a list of all the places where your REM's appear in the program.

Searching is often useful in *debugging* programs (getting them to work right). You might need to know where all the examples of A$ are in a program, or where all the FOR/NEXT loops are, or something else. You can make adjustments more easily to the entire program if you know where and how often things are used. Or you might decide to change all the occurrences of the name "Tom" to "Sam" or something in a long series of DATA statements.

There are many ways to benefit from Searcher. Add it to your toolbox of VIC utilities and then the next time you need to analyze or modify a long program, to save memory space, or to remove or change a name in your address book program – let the computer do it.

```
10 T=PEEK(55)+256*PEEK(56):CS=0
20 T=T-133:TL=(T/256-INT(T/256))*256:TH=INT(T
   /256)
30 POKE55,TL:POKE56,TH
40 FORI=TTOT+132:READA:POKEI,A:CS=CS+A:NEXTI
50 IF CS<>14881 THEN PRINT"ERROR IN DATA STAT
   EMENTS":STOP
60 PRINT"{CLEAR}SYS";T;"TO START":NEW
100 DATA 160, 0, 177, 43, 133, 1, 200, 177, 43
   , 133, 2
110 DATA 160, 0, 177, 1, 208, 1, 200, 177, 1,
   208, 1
120 DATA 96, 160, 0, 177, 1, 141, 52, 3, 200,
   177, 1
130 DATA 141, 53, 3, 200, 177, 1, 133, 99, 200
   , 177, 1
140 DATA 133, 98, 200, 24, 165, 43, 105, 5, 13
   3, 67, 166
150 DATA 44, 144, 1, 232, 134, 68, 177, 1, 240
   , 55, 162
160 DATA 0, 193, 67, 240, 4, 200, 24, 144, 242
   , 192, 0
170 DATA 240, 10, 136, 230, 1, 208, 2, 230, 2,
    24, 144
180 DATA 242, 160, 0, 177, 67, 240, 8, 209, 1,
    208, 218
190 DATA 200, 24, 144, 244, 169, 35, 32, 210,
   255, 166, 99
200 DATA 165, 98, 32, 205, 221, 169, 32, 32, 2
   10, 255, 173
210 DATA 52, 3, 133, 1, 173, 53, 3, 133, 2,  2
   4, 144, 134
```

SuperFont Plus

John Slaby

You can generate excellent Atari game graphics by using ANTIC modes 4 and 5. This program provides an ANTIC version of SuperFont. Requires 16K RAM.

After typing in "SuperFont" (**COMPUTE!**, January 1982), I was very pleased. I couldn't imagine needing any additional functions or purchasing any font that could possibly improve upon it. Then I bought *De Re Atari*, and everything I had read previously in the *Hardware Manual* on ANTIC modes 4 and 5 fell into place. At the same time I realized that it was ANTIC mode 4 that allowed the great graphics in *Caverns Of Mars*. I realized I *could* make some useful additions to the original program. Therefore, I offer SuperFont Plus.

Mr. Brannon stated in his article that it would be easy to expand the program, so I did. The additional commands are the ANTIC, PRINT, and Color Change modes. Of these, only the PRINT mode can be used along with the original version of graphics modes 0, 1, and 2. This expanded version is about 40% longer and, if you only have 16K RAM memory, some manipulation will be required; but you can have an ANTIC version of SuperFont. For those of you that already have SuperFont, just add lines 10, 20, 1601 through 1606 and all lines after and including 2000. Also note the changes in lines 100 through 120, 270, 320, 340, 390 through 400, 650, 1300, 1360, 1370, and 1400 through 1410. Once you do this, you will have the capabilities of designing your own ANTIC 4/5 character set.

For those of you with only 16K, there is a way out. You will have to end up with two fonts: one font, the original, for the Basic-supported graphics modes, and one for the ANTIC 4/5 graphics modes. If you delete the following commands and change lines 250 and 300 to say RAM-4 instead of RAM-8, you will have a functional font. The deleted commands which have limited use for ANTIC 4/5 are: RESTORE (920-930), OVERLAY (870-910), GRAPHICS (1370-1390), WRITE DATA (1290-1360), and QUIT (1130-1140).

Original SuperFont

Here's a quick review of the original SuperFont commands:

EDIT: The character you select via the joystick and pressing of the trigger is copied to the grid in the upper section of the screen. The cursor is relocated to this grid, and you can instantly modify the character by moving the joystick and pressing the trigger to either set or remove a point, as desired.

RESTORE: This will copy the pattern from the first character set to the second, located in the lower half of the screen.

COPY FROM: Select a character which will be copied to the current one you are working on.

COPY TO: The current character will be copied to the selected place.

SWITCH: Exchanges the current character for the one selected.

OVERLAY: Adds the selected character's pattern to the current one.

CLEAR: Clears the pattern of the current character. A must for ANTIC 4/5.

INVERT: Turns current character upside down.

SAVE FONT: Saves character set to disk or tape. Answer "Filename" with either C: or D:filespec. If you see an error message, press any key to return to the menu.

LOAD FONT: Retrieves a character set that you saved. Answer "Filename" like SAVE FONT.

CURSOR-UP or SHIFT DELETE: The line of points the cursor is on is deleted, and the following lines are pulled up to fill the gap.

CURSOR-DOWN or SHIFT INSERT: A blank line is inserted on the line the cursor is in, and all lines below it move down one. The bottom line is lost.

SCROLL LEFT: The bit pattern of the character is shifted left.

SCROLL RIGHT: The bit pattern of the character is shifted right.

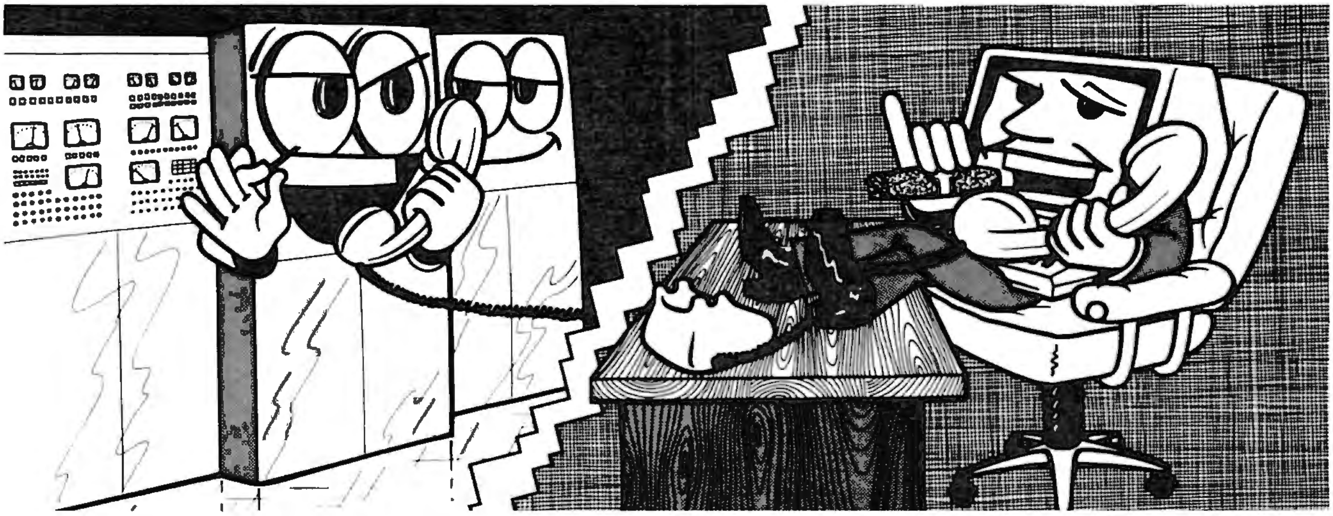
WRITE DATA: The internal code (0-127) of the character and the eight bytes that make it up are displayed in the menu area. Press any key to return to menu.

GRAPHICS: This toggles the TEXT/GRAPHICS option of graphics modes 1 and 2 to let you see each half of the character set.

REVERSE: All blanks become points, and vice

DON'T ASK PROVIDES THE MISSING LINKS

the link between your modem and the outside world. For hassle-free communications, phone right in with TELETARI, The Friendly Terminal.



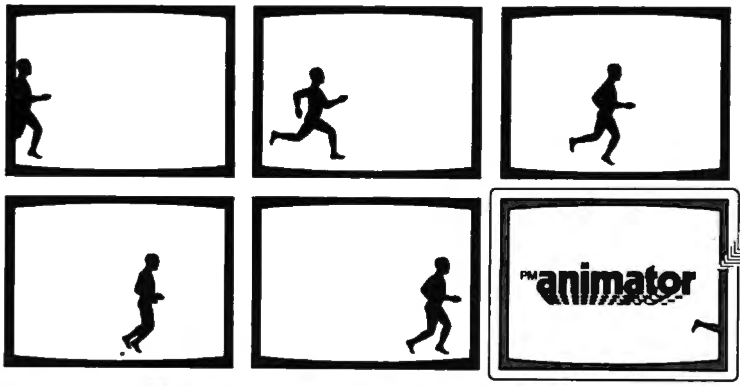
Your Atari has never had such easy access to the whole world of telecommunications – bulletin boards, news reports, large time-sharing computers, the works. Now it's a snap to tap into all these, and it's just as easy to transfer your program or text files to and from a remote computer. Meet TELETARI, The Friendly Terminal. It's just what your modem needs: a powerful, adaptable telecommunications package that's a cinch to use. With TELETARI, you simply choose the desired communications function from a menu. Commonly used terminal parameters are included in the program, but you can change them to suit your needs with a couple of keystrokes, using another handy menu, and store the ones you plan to use again. TELETARI's generous buffer stores up to 20K, so you can review, print, or save received information long after you've hung up the phone. You never knew using a modem could be so convenient. Because it's very flexible, TELETARI is compatible with most modems and a wide variety of computers. And because it works through the RS 232 port, TELETARI is not limited to modem/telephone uses. Put it to work in any RS232 application your imagination can devise – even operating a laser disk!

- buffer of up to 20K
- menu-driven
- highly adaptable
- supports all 850 options
- compatible with 1200 baud modems and BiT 3 Full-view 80™ board
- suitable for any RS232 application

$39.95 Requires Basic, 32K RAM, disk, 850 Interface

---

the link between BASIC and arcade-style graphics. Draw and animate pictures for your own BASIC games and other programs with pm ANIMATOR. Create running men, flying rockets, moving figures of all kinds.

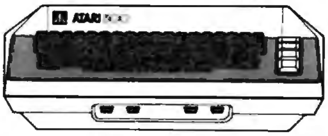


Coming soon from DON'T ASK.

BASIC programmers, pm ANIMATOR puts the power of Player-Missile Graphics at your fingertips.

$34.95 Requires 32K RAM, BASIC, disk.

PM animator



To order direct from Don't Ask, send a check or money order, or call to order COD. Add $2.00 for shipping and handling. California residents add 6% sales tax (6.5% if you reside in L.A. County).

---

the link between fast game action and verbal learning:

WORDRACE

Kids and adults, increase your vocabulary while you compete in this exciting word game.

Disk version:
  3 levels of play – Beginner, Regular, Challenge
  Requires 32K RAM, disk, BASIC. $24.95

Cassette version:
  2 levels of play – Beginner, Intermediate
  Requires 16K RAM, cassette, BASIC. $19.95

turn WORDRACE into a history game or a famous athletes game, and get more vocabulary words, with the WORDRACE accessory disk: CLAIM TO FAME/SPORTS DERBY. 3 new games in all.

Disk only. Requires WORDRACE disk. $19.95

Atari is a trademark of Atari, Inc. Full-view 80 is a trademark of BIT 3 Computer Corporation.

the link between you and what your Atari is really thinking:

ABUSE

the insult-exchange program.
Have you cursed out your computer? Now it can understand you and answer back!
Requires 40K RAM, BASIC, disk. $19.95
Release your aggressions! Inflict ABUSE on anyone who's got it coming!

DON'T ASK
the link between technical excellence and the fun of computing. Why do we give you so much? Don't Ask.

DON'T ASK INC
COMPUTER SOFTWARE

2265 Westwood Bl., Ste. B-150
Los Angeles, CA 90064
(213) 475-4583 or 397-8811

versa. Works the same as pressing the Atari logo key and then typing.

QUIT: Exit program.

SuperFont Plus: Three New Commands

The ANTIC(A) command mode modifies the display list so that the lower section of the screen now becomes ANTIC mode 4 except for the last line, which is ANTIC 5. Press A again to return to the original graphics 0, 1, and 2. Once you activate this command, the character set will become mostly unrecognizable. This is because the characters are now four pixels wide instead of eight, but the overall displayed width remains the same. This loss of resolution is the price you have to pay for the multicolor ability of these ANTIC modes.

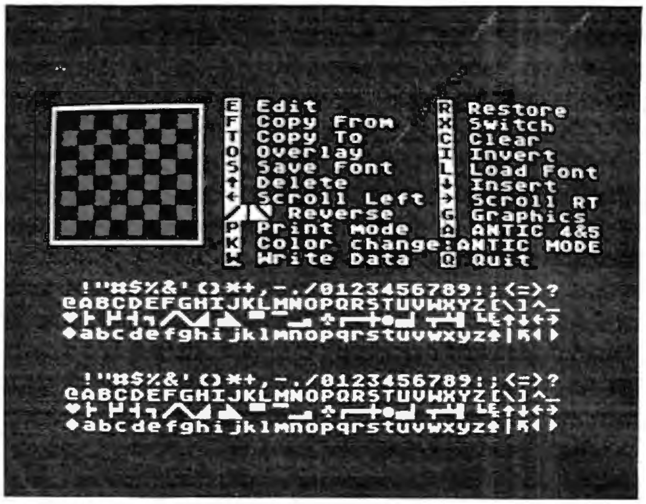
Use all other commands as before; they will work. Please note that the grid now has double-wide pixels when compared to the first display. This is because that binary number you place in each pixel determines the color that will be displayed and you need two bits per color. The binary number is related to the color registers as follows: 00 = Background; 01 = Playfield 0; 10 = Playfield 1; and 11 = Playfield 2. To use Playfield 3's color, you also use binary 11, but the internal code must be 128-255. This is accomplished by using reversed characters via the Atari logo key. There is no way to use this key in any of the original commands, so the PRINT command was created.

The PRINT mode (P) allows you to print any character in the bottom window next to another one just as in normal typing. This mode allows you to see that third playfield color via the logo key. You can type as long as you like, but if you exceed 38 characters, the first one will be lost and all the others will shift left. As noted before, this command can be used with the original graphics 1 and 2.

Since the keyboard is used for typing, the START and SELECT buttons will, respectively, return you to the menu and clear the typing area. When you return to the menu, the typing area isn't automatically cleared; this allows you to work on more than one character at a time, i.e., three characters together as a car, etc. This mode is also useful to get a full screen effect for one line of modified characters.

The final new command is the Color Change mode (K). When I started working with the first two new commands, it became obvious that the ability to change the color of the character I was working on would be very useful. Thus I expanded the Display List Interrupt to give me that ability and added a second interrupt for the background color change.

When you activate this command, you will be able to change only the colors for the ANTIC 4/5 character set. If you want to change the colors for the original graphics modes, modify lines 170 and 300 as desired. The menu area will be cleared, and you will be given the choice of the playfield or background color you want to change. If you change the background, it will affect only the typing window area. I did this to keep the clarity of the character set at its best, and you will probably want to see the change for only one or two characters at a time.



The menu and character fonts ready for editing in "SuperFont + ."

After your register selection, you will be asked for the color and luminosity value (0-14) you want. To help you, a list of colors will be supplied in the menu area. If you give a bad input, you will be asked to try again, starting with the color value. To get the decimal value being used by that register, press R when being offered the color registers and then select a register.

That covers everything; now you should be able to generate some excellent graphics characters like those in *Caverns of Mars* and *Eastern Front*.

The author will make tape copies of the program for those not wanting to type it in themselves. Send a cassette, an SASE mailer, and $3 to:

John Slaby
3328 Kaywood Drive
Easton, PA 18042

```
10 GOTO 100
20 POKE 82,14:POSITION 14,0:FOR I=ST
   TO ED:? "{25 SPACES}":NEXT I:RETURN
100 REM *** SUPERFONT + ***
105 REM Character Set Editor
106 REM original
110 REM 11/10/81 Charles Brannon
115 REM ANTIC,COLOR, AND PRINT MODES
120 REM BY John Slaby 8/22/82
140 DIM I(7),FN$(14),N$(3)
150 IF PEEK(1536)=0 THEN GOSUB 1400
160 GRAPHICS 0:POKE 752,1
170 SETCOLOR 2,7,2:SETCOLOR 4,7,2
180 DL=PEEK(560)+256*PEEK(561)+4
```

FIRST and FINEST

In Systems Software for Atari and Apple

MAC/65

First we delivered Atari's Assembler/Editor (the cartridge).

Then we produced our enhanced "EASMD."

Now OSS is introducing the **finest** integrated assembly language development system yet!

In addition to being ideal for writing small, "quick and dirty" subroutines and programs, **MAC/65** shows its full power and speed when used with even the most complex of large assembly language source files.

Naturally, **MAC/65** is upward compatible with both EASMD and the Atari cartridge. And, of course, the object code output is also compatible with OS/A+, Atari DOS, and/or Apple DOS, as appropriate.

MAC/65 .... **$80.00***

OS/A+

Optimized Systems Software — the group that produced **both** the **first** Apple DOS **and** the **first** Atari DOS — now brings you OS/A+, which combines the **finest** features of these and other successful personal computer operating systems.

OS/A+ is the **first** and **finest** operating system available for **both** Apple II and Atari computers and features a **keyboard-driven**, easy-to-use command processor. In addition to several simple resident commands, OS/A+ allows logical and readable requests for even the most sophisticated utility commands. In fact, the user can even add system commands as desired.

But the real power and flexibility of OS/A+ is its ability to easily interface to devices and **disk drives** of virtually any kind and size. File compatibility (with Apple DOS or Atari DOS, as appropriate), device independence, batch processing, easy of use — OS/A+ truly brings the **finest** in operating systems to **your** computer.

AND NOW OS/A+ (for standard Atari or Apple drives) is included as a part of **every** standard OSS language package. Versions of OS/A+ for some higher capacity drives available at extra cost.

Unless otherwise noted, all OSS products require 48K and at least one disk drive. We recommend 64K for the Apple version of OS/A+.

SpeedRead+

The **first** and still **finest** speed reading tutor designed for **you** to use on **your** computer is available **only** from OSS.

SpeedRead+ uses time-proven techniques to train **you** to instantly recognize words and phrases, and yet it goes far beyond what mere mechanical devices are capable of.

SpeedRead+ exercises your peripheral vision, improves your eye movement and timing, and generally works **with you** at your pace... now and in the future.

NOTE: The Atari version of SpeedRead+ needs only 16K of RAM.

SpeedRead+ **$59.95**

tiny c

As a product of Tiny C Associates, **tiny-c** was the **first** structured language interpreter for microcomputers. Now OSS brings this innovative interpretive language to **your** home computer. While not having the speed and power a true **C** compiler, **tiny-c** is an excellent choice for the programming student who is ready to begin learning the valuable techniques of structured languages.

tiny-c provides an easy-to-use, easy-to-modify environment that encourages experimentation while promoting proper programming style. The **tiny-c** package includes not only a comprehensive and instructional user manual but also **complete source**.

tiny-c **$99.95***

C/65

NOW AVAILABLE!

The **first** native mode **C** compiler ever produced for Atari **and** Apple computers.

C/65 supports a very usable subset of the extremely powerful and popular **C** language. Just as **C** is used by the most sophisticated programmers from the professional and academic communities, so shall **C/65** prove to be a powerful and much-needed tool for 6502 software developers.

C/65 supports integer and character types (and arrays), pointers, fully recursive functions, and much more.

NOTE: C/65 requires MAC/65 or an equivalent assembler. Two disk drives recommended but not required.

C/65 .... **$80.00***

BASIC A+

"From the authors of Atari BASIC..."

It's a fact! OSS gave you that **first** and **most popular** language for Atari Home Computers. But why be content with the **first** when you can have the **finest**?

BASIC A+ is the **only** logical upgrade available to the Atari BASIC programmer. While retaining **all** the features which make Atari BASIC so easy to use, we've **also** given BASIC A+ features that place it at the forefront of modern interpretive languages. BASIC A+ will let **you** explore the worlds of structured programming, superior input/output, helpful programming aids, and even a very comprehensive PRINT USING command. **And**, exclusively for the Atari computer, an almost unbelievable array of PLAYER/MISSILE GRAPHICS commands and functions.

BASIC A+ **$80.00***

***REMEMBER**: Standard OS/A+ is **included** at no extra charge with BASIC A+, MAC/65, C/65, and tiny-c.

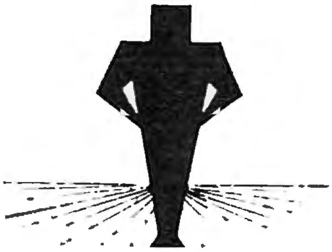
ATARI, APPLE II, and TINY C are trademarks of Atari, Inc., Apple Computer, Inc., and Tiny C Associates, respectively. ***SpeedRead+***, MAC/65, C/65, BASIC A+ and OS/A+ are trademarks of Optimized Systems Software, Inc.

Optimized Systems Software, Inc., 10379 Lansdale Ave., Cupertino, CA 95014, (408) 446-3099

```
190 SD=PEEK(88)+256*PEEK(89)+12*40:AS
    D=SD+5*40
200 A1=1630:FUNC=1631:A2=1632:LOGIC=1
    628
210 RAM=PEEK(106)-8:PMBASE=RAM*256
220 CHRORG=57344
230 POKE 559,46:POKE 54279,RAM
240 POKE 53277,3:POKE 53256,3
250 CHSET=(RAM-8)*256
260 POKE DL+23,6:POKE DL+24,7
270 POKE DL+17,130:POKE DL+18,112
280 POKE 512,0:POKE 513,6
290 POKE 54286,192
300 POKE 1549,RAM-8:POKE 1672,RAM-8:P
    OKE 1538,0
310 A=USR(1555,CHSET)
320 P0=PMBASE+512+20:P1=PMBASE+640+20
    :P2=PMBASE+768+20:P=PMBASE+896+20
    :T=85:GOSUB 330:GOTO 350
330 FOR I=0 TO 7:FOR J=0 TO 3:T=255-T
    :POKE P0+I*4+J,0:POKE P1+I*4+J,T:
    T=255-T
340 POKE P2+I*4+J,T:NEXT J:T=255-T:NE
    XT I:RETURN
350 POKE 53248,64:POKE 53249,64:POKE
    53250,64
360 POKE 704,198:POKE 705,240:POKE 70
    6,68
370 POKE 53256,3:POKE 53257,3:POKE 53
    258,3:POKE 623,1
380 ? " {Q}{8 R}{E}":FOR I=1 TO 8:? "
     |{8 SPACES}|":NEXT I:? " {Z}{8 R}
    {C}"
385 GOSUB 390:GOTO 490
390 POKE 82,14:POSITION 14,0
400 ? "E Edit{8 SPACES}R Restore"
410 ? "F Copy From{3 SPACES}X Switch"
420 ? "T Copy To{5 SPACES}C Clear"
430 ? "O Overlay{5 SPACES}I Invert"
440 ? "S Save Font{3 SPACES}L Load Fo
    nt"
450 ? "{ESC}{DEL LINE} Delete
    {6 SPACES}{ESC}{INS LINE} Insert"
460 ? "{ESC}{CLR TAB} Scroll Left
    {ESC}{SET TAB} Scroll RT"
470 ? "{F}{E}{G} Reverse{3 SPACES}G G
    raphics"
475 ? "P Print mode  A ANTIC 4&5"
477 ? "K Color change:ANTIC MODE"
480 ? "W Write Data  Q Quit":RETURN
490 FOR I=0 TO 3:FOR J=0 TO 31:POKE S
    D+J+I*40+4,I*32+J:POKE ASD+J+I*40
    +4,I*32+J:NEXT J:NEXT I:?
500 POKE 82,2:POSITION 0,0
510 OPEN #2,4,0,"K:"
520 P=PEEK(764):IF P=255 THEN 520
530 IF P=60 THEN 520
540 IF P=39 THEN POKE 764,168
550 GET #2,K
560 IF K<>ASC("E") THEN 790
570 GOSUB 1750
580 FOR I=0 TO 7:A=PEEK(CHSET+C*8+I):
    FOR J=0 TO 3:POKE P0+I*4+J,A:NEXT
     J:NEXT I
590 POKE ASD+169+(ANTIC*10),C:POKE AS
    D+190+(ANTIC*30),C
600 JX=0:JY=0
610 POSITION JX+4,JY+1
620 ? CHR$(32+128*FF);"{LEFT}";:FF=1-
    FF
630 IF STRIG(0)=0 THEN 750
640 IF PEEK(764)<255 THEN ? " ";:GOTO
     520
650 ST=STICK(0):IF ST=15 THEN 610
660 IF STRIG(0) THEN FOR I=0 TO 100 S
    TEP 20:SOUND 0,100-I,10,8:NEXT I
670 POSITION JX+4,JY+1:? " ";
680 JX=JX+(ST=7)-(ST=11)
690 JY=JY+(ST=13)-(ST=14)
700 IF JX<0 THEN JX=7
710 IF JX>7 THEN JX=0
720 IF JY<0 THEN JY=7
730 IF JY>7 THEN JY=0
740 GOTO 610
750 POKE A1,PEEK(CHSET+C*8+JY):POKE A
    2,2^(7-JX):POKE FUNC,73:A=USR(LOG
    IC)
760 POKE CHSET+C*8+JY,A:FOR J=0 TO 3:
    POKE P0+JY*4+J,A:NEXT J
770 FOR I=0 TO 10:SOUND 0,I*4,8,8:NEX
    T I:SOUND 0,0,0,0
780 GOTO 650
790 IF K<>ASC("F") THEN 830
800 S=C:GOSUB 1750
810 FOR I=0 TO 7:A=PEEK(CHSET+C*8+I):
    POKE CHSET+S*8+I,A:NEXT I
820 C=S:GOTO 580
830 IF K<>ASC("T") THEN 870
840 S=C:GOSUB 1750
850 FOR I=0 TO 7:A=PEEK(CHSET+S*8+I):
    POKE CHSET+C*8+I,A:NEXT I
860 C=S:GOTO 600
870 IF K<>ASC("O") THEN 920
880 S=C:GOSUB 1750
890 FOR I=0 TO 7:POKE A1,PEEK(CHSET+C
    *8+I):POKE A2,PEEK(CHSET+S*8+I):P
    OKE FUNC,9:A=USR(LOGIC)
900 POKE CHSET+S*8+I,A:NEXT I
910 C=S:GOTO 580
920 IF K<>ASC("R") THEN 940
930 FOR I=0 TO 7:POKE CHSET+C*8+I,PEE
    K(CHRORG+C*8+I):NEXT I:GOTO 580
940 IF K<>ASC("C") THEN 960
950 FOR I=0 TO 7:POKE CHSET+C*8+I,0:N
    EXT I:GOTO 580
960 IF K<>ASC("{R}") THEN 980
970 FOR I=0 TO 7:POKE CHSET+C*8+I,255
    -PEEK(CHSET+C*8+I):NEXT I:GOTO 58
    0
980 IF K<>ASC("X") THEN 1010
990 S=C:GOSUB 1750
1000 FOR I=0 TO 7:A=PEEK(CHSET+S*8+I)
     :POKE CHSET+S*8+I,PEEK(CHSET+C*8
     +I):POKE CHSET+C*8+I,A:NEXT I:GO
     TO 580
1010 IF K<>ASC("I") THEN 1030
1020 FOR I=0 TO 7:I(I)=PEEK(CHSET+C*8
     +I):NEXT I:FOR I=0 TO 7:POKE CHS
     ET+C*8+I,I(7-I):NEXT I:GOTO 580
1030 IF K<>ASC("{UP}") AND K<>ASC("
     {DEL LINE}") THEN 1050
1040 FOR I=JY TO 6:POKE CHSET+C*8+I,P
     EEK(CHSET+C*8+I+1):NEXT I:POKE C
     HSET+C*8+7,0:GOTO 580
1050 IF K<>ASC("{DOWN}") AND K<>ASC("
     {INS LINE}") THEN 1070
1060 FOR I=7 TO JY STEP -1:POKE CHSET
     +C*8+I,PEEK(CHSET+C*8+I-1):NEXT
     I:POKE CHSET+C*8+JY,0:GOTO 580
1070 IF K<>ASC("{LEFT}") THEN 1100
1080 FOR I=0 TO 7:A=PEEK(CHSET+C*8+I)
     *2:IF A>255 THEN A=A-256
1090 POKE CHSET+C*8+I,A:NEXT I:GOTO 5
     80
1100 IF K<>ASC("{RIGHT}") THEN 1130
1110 FOR I=0 TO 7:A=INT(PEEK(CHSET+C*
     8+I)/2)
```

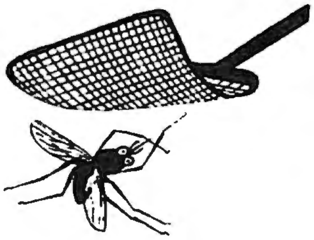
NEW FOR ATARI® FROM MMG MICRO SOFTWARE

NOW — THE TWO MOST POWERFUL AIDS FOR ATARI BASIC!!



BASIC COMMANDER

- **Single key entry file commands**
  - — ENTER "D:
  - — SAVE "D:
  - — LIST "D:
  - — RUN "D:
  - — LOAD "D:
- **Single Key DOS functions from BASIC**
  - — FORMAT a disk
  - — LOCK a file
  - — RENAME a file
  - — UNLOCK a file
  - — DELETE a file
  - — DISK DIRECTORY
- THREE PROGRAMMABLE KEYS!!
  - — single keys programmed for your own use, even whole subroutines
- AUTONUMBER
  - — automatically generates line numbers for you — speeds program entry 25-75%.
- BLOCK DELETE
  - — deletes any range of lines instantaneously!
- RENUMBER
  - — renumbers lines and all references
  - — extensive error trapping
  - — 3 seconds to renumber 500 lines



MMG BASIC DEBUGGER

- **TRACE through your Basic program**
  - — Single step
  - — TRACE while
  - — TRACE UNTIL
  - — change variables
  - — LIST line numbers executed
  - — examine variables' values
- **Full screen BASIC editing**
  - — scroll up or down by cursor
  - — edit your whole program easily
  - — no more LIST line number ranges
- **Split screen mode**
  - — view two parts of your BASIC program at once, and edit both!
  - — scroll each window independently
- CROSS REFERENCE
  - — provides a list of variables and the line numbers in which they are used in your program
- SEARCH FOR PHRASE
  - — search your BASIC program for any phrase, command or string of characters; let your computer do the searching for you!

EACH PRODUCT ALONE REQUIRES 16K, AND IS AVAILABLE ON DISK FOR *ONLY $34.95*

Now, the convenience of both powerful utilities together in your Atari *at once*

The Combined Basic Commander and MMG Basic Debugger requires 24K. $74.95

ADDITIONAL PRODUCTS

NECESSITIES

RAM TEST II - The fastest and most thorough memory test available for the ATARI has now been further improved! Tests not only all locations, but also tests the memory addressing system. This all machine language program takes 4 minutes to test 48K. It's the only program that tests the cartridge area of RAM. Good for new 400/800 computer owners, for testing new RAM boards and for use in computer stores to test and pinpoint bad memory locations. Bad memory locations are pinpointed so repair is as simple as replacing a chip!

Requires 8K, Disk or Cassette **$29.95**

DISK COMMANDER II - Just save this program on your BASIC disks and it will autoboat and automatically list all programs for the disk into your screen. Simply run any program by typing a single number.

Requires 16K, Disk Only **$29.95**

TUTORIALS

ASTEROID MINERS - This 50 page book and program provides for a unique intermediate to advanced tutorial. A 32K BASIC game utilizing over 25 players in player-missle graphics, machine language subroutines, a redefined character set, multiprocessing utilizing the vertical blank interrupt interval, and much more! The 50 page book included with the program documents each part of the entire program and contains the fully documented source code for both the BASIC and assembly language parts of the program. Use these routines in your own programs. These examples make it easy!

Requires 32K, Disk or Cassette **$34.95**

GAMES

CHOMPER - An all machine language arcade style game with intelligent monsters. Requires 16K Ram, 1 Joystick and nerves of steel.

Available on Disk or Cassette **$29.95**

BUSINESS/HOME

MAILING LIST - Extremely fast BASIC and machine language program. Each data disk holds over 500 files. Sort on any of 6 fields at machine langugage speed or search on any fragment of a field! Use any size labels or envelopes.

Require 40K, Disk Only **$39.95**

NEW

MMG DATA MANAGER - If you frequently find yourself looking for something, only to find it eventually right under your nose, then MMG DATA MANAGER is for you. Organize virtually anything into a computer-searchable format, and let your ATARI do the hunting for you. MMG DATA MANAGER is the first of a series of business applications from MMG MICRO SOFTWARE, all of which will share the ability to access files created by any of them. This flexible database manager will allow many fields, with machine language sorting, on any field. In addition, you have total control of the structure of your data, allowing you to design a database which you feel most comfortable. A special feature of MMG DATA MANAGER is its ability to select for a given value of any single field, or any combination of values from many fields. You could, for instance, determine who lived in Las Vegas, Nevada, and bought item #3145 from you, and whose last name began with SM, and whose telephone number began with (702) 873-4. You'll never lose track of information again! Multiple print options add to the versatility of MMG DATA MANAGER.

Requires 40K, Disk Only **$49.95**

Available At Your Favorite Computer Store
OR Send a Check or Money Order to:

MMG MICRO SOFTWARE

P.O. Box 131 • Marlboro, NJ 07746
OR CALL

(201) 431-3472

For MasterCard, Visa or COD Deliveries

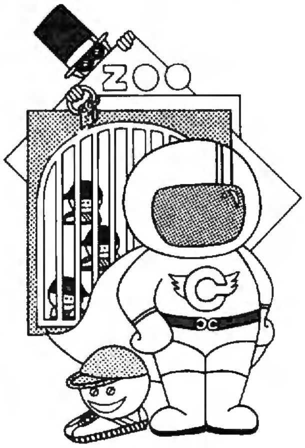
(Please Add $3.00 For Postage & Handling)

NJ RESIDENTS ADD 5% FOR SALES TAX

ATARI is a registered trademark of ATARI, Inc.

```
1120 POKE CHSET+C*8+I,A:NEXT I:GOTO 5
     80
1130 IF K<>ASC("Q") THEN 1150
1140 POKE 53248,0:POKE 53249,0:POKE 5
     3250,0:POKE 53277,0:GRAPHICS 0:E
     ND
1150 IF K<>ASC("S") THEN 1210
1160 GOSUB 1610:POKE 195,0
1170 TRAP 1190:OPEN #1,8,0,FN$
1180 A=USR(1589,CHSET)
1190 CLOSE #1:TRAP 40000:IF PEEK(195)
      THEN 1260
1200 POKE 54286,192:GOTO 580
1210 IF K<>ASC("L") THEN 1290
1220 GOSUB 1610:POKE 195,0
1230 TRAP 1250:OPEN #1,4,0,FN$
1240 A=USR(1619,CHSET)
1250 CLOSE #1:TRAP 40000:IF PEEK(195)
     =0 THEN 1200
1260 POSITION 14,0:? "{BELL}*ERROR -"
     ;PEEK(195);"*"
1270 IF PEEK(764)<255 THEN POSITION 1
     4,0:? "{19 SPACES}":GOTO 1200
1280 GOTO 1270
1290 IF K<>ASC("W") THEN 1370
1300 ST=0:ED=11:GOSUB 20:N$="
     {3 SPACES}":L=LEN(STR$(C)):N$(1,
     L)=STR$(C):L=LEN(N$):POSITION 14
     ,0
1310 FOR I=1 TO L:? CHR$(ASC(N$(I,I))
     +128);:NEXT I:? ">"
1320 Z=0:FOR I=0 TO 2:FOR J=0 TO 1+(I
     >0):A=PEEK(CHSET+C*8+Z):Z=Z+1
1330 SOUND 0,(I*3+J)*10+50,10,8
1340 ? A;",":NEXT J:? "{BACK S}":NEXT
      I:SOUND 0,0,0,0
1350 IF PEEK(764)=255 THEN 1350
1360 GOSUB 20:GOSUB 390:GOTO 520
1370 IF K<>ASC("G") THEN 2000
1380 CF=1-CF:POKE 1549,RAM-8+2*CF
1390 GOTO 520
1400 GRAPHICS 2+16:SETCOLOR 4,1,4:POS
     ITION 5,3:? #6;"SUPERFONT +"
1410 POSITION 5,5:? #6;"patience{3 N}
     ":POSITION 2,11:? #6;" john slaby
     ":POSITION 2,7:? #6;"ORIGINAL by
     "
1415 POSITION 2,8:? #6;"CHARLES BRANN
     ON":POSITION 2,10:? #6;"+  by"
1420 FOR I=1536 TO 1710:READ A:POKE I
     ,A:POKE 709,A:SOUND 0,A,10,4:NEX
     T I
1430 SOUND 0,0,0,0:RETURN
1440 DATA 72,169,100,141,10,210
1450 DATA 141,24,208,141,26,208
1460 DATA 169,6,141,9,212,104
1470 DATA 64,104,104,133,204,104
1480 DATA 133,203,169,0,133,205
1490 DATA 169,224,133,206,162,4
1500 DATA 160,0,177,205,145,203
1510 DATA 200,208,249,230,204,230
1520 DATA 206,202,208,240,96,104
1530 DATA 162,16,169,9,157,66
1540 DATA 3,104,157,69,3,104
1550 DATA 157,68,3,169,0,157
1560 DATA 72,3,169,4,157,73
1570 DATA 3,32,86,228,96,104
1580 DATA 162,16,169,5,76,58
1590 DATA 6,9,104,169,0,9,0,133
1600 DATA 212,169,0,133,213,96
1601 DATA 72,138,72,152,72,169,0,162,
     0,160,0
1602 DATA 141,10,212,141,26,208
1603 DATA 142,24,208,140,25,208
1604 DATA 169,0,141,22,208,141,10,210
     ,169,6,141,9,212,169,0,141,23,20
     8,169,156,141,0,2
1605 DATA 104,168,104,170,104,64,72,1
     69,0,141,10,212,141,26,208,169,1
     04,141,10,210,141,0,2,104,64
1610 POSITION 14,0:? "Filename?";
1620 FN$="":K=0
1630 POKE 20,0
1640 IF PEEK(764)<255 AND PEEK(764)<>
     39 AND PEEK(764)<>60 THEN 1670
1650 IF PEEK(20)<10 THEN 1640
1660 ? CHR$(21+11*K);"{LEFT}";:K=1-K:
     GOTO 1630
1670 GET #2,A
1680 IF A=155 THEN ? " ";:FOR I=1 TO
     LEN(FN$)+10:? "{BACK S}";:NEXT I
     :RETURN
1690 IF A=126 AND LEN(FN$)>1 THEN FN$
     =FN$(1,LEN(FN$)-1):? "{LEFT}";CH
     R$(A);:GOTO 1630
1695 IF A=126 AND LEN(FN$)=1 THEN ? C
     HR$(A);:GOTO 1620
1700 IF A=58 OR (A>48 AND A<57) OR (A
     >65 AND A<=90) OR A=46 THEN 1720
1710 GOTO 1630
1720 IF LEN(FN$)<14 THEN FN$(LEN(FN$)
     +1)=CHR$(A):? CHR$(A);
1730 GOTO 1630
1740 END
1750 REM GET CHOICE OF CHARACTER
1760 CY=INT(MRY/32):CX=MRY-32*CY
1770 C=CX+CY*32
1780 POKE SD+CX+CY*40+4,C+128
1790 POKE ASD+CX+CY*40+4,C+128
1800 IF STRIG(0)=0 OR PEEK(764)<255 T
     HEN MRY=C:GOTO 1900
1810 ST=STICK(0):IF ST=15 THEN 1880
1820 POKE 53279,0
1830 GOSUB 1900
1840 CX=CX-(ST=11)+(ST=7):CY=CY-(ST=1
     4)+(ST=13)
1850 IF CX<0 THEN CX=31:CY=CY-1
1860 IF CX>31 THEN CX=0:CY=CY+1
1870 IF CY<0 THEN CY=3
1880 IF CY>3 THEN CY=0
1890 GOTO 1770
1900 POKE SD+CX+CY*40+4,C
1910 POKE ASD+CX+CY*40+4,C
1920 RETURN
2000 IF K<>ASC("A") THEN 2200
2005 POKE 54286,0
2007 POKE ASD+169+(ANTIC*10),0:POKE A
     SD+190+(ANTIC*30),0
2010 IF ANTIC=1 THEN 2100
2020 POKE DL+24,5
2030 FOR I=19 TO 23:POKE DL+I,4:NEXT
     I:POKE DL+22,132
2040 POKE 512,104:ANTIC=1
2050 COLF0=2*16+6:COLF1=6*16+6
2060 COLF2=10*16+8:COLF3=15*16+8
2070 POKE 1664,COLF0:POKE 1648,COLF1
2080 POKE 1650,COLF2:POKE 1677,COLF3
2090 POKE 54286,192:T=51:GOTO 2127
2100 ANTIC=0:POKE DL+23,6:POKE DL+24,
     7
2110 POKE 512,0:FOR I=19 TO 22:POKE D
     L+I,2:NEXT I
2120 POKE 54286,192:T=85
2127 GOSUB 330:POKE ASD+169+(ANTIC*10
     ),C:POKE ASD+190+(ANTIC*30),C:GO
     TO 520
2200 IF K<>ASC("P") THEN 3000
2205 ST=0:ED=10:GOSUB 20
```

NEXA *presents*

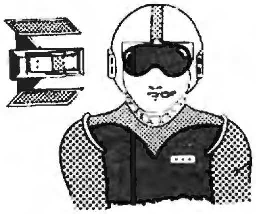


Captain Cosmo is an exciting fast-action video arcade game. It can be played by 1 to 4 players and has 99 skill levels. Try it and you can't let go!

Requires Atari 400/800 with 32K Joysticks, and a Disk Drive.

Delta Squadron is a strategic war game that really puts you in the pilot's seat. With this game you will experience the thrill and excitement of a real space pilot. **Delta Squadron** is a "must" for all strategic game enthusiasts, and a change of pace for those who wants a challenge!

Requires 64K Apple II with DOS 3.3 and paddle.



Superbowl Football is a realistic football game. You can design your own plays and has thousands of defensive and offensive plays. This is the ultimate in computer football games.

Requires Atari 400/800 with 48K, a Disk Drive and Joysticks.

We revolutionize our packaging designs to be convenient, compact, durable, and to protect the diskettes from dust and moisture.

Ask for us at your local stores or your distributor.

NEXA **NEXA CORPORATION**
P. O. Box 26468
San Francisco, CA 94126-6468
(415) 387-5800

CRAM UP TO 90K IN YOUR ATARI

ACA introduces the next generation of memory upgrades. By using simple yet innovative techniques, the cRAM board puts complete control of up to 90K of addressable memory at your fingertips.

Features:

Powers up with 52K of continuous RAM. 4K overwrite protected RAM for assembly object code and BASIC user functions; 52K for boot users.

Cartridge ROM can be replaced by RAM under program control. Simplifies cartridge program development and testing; or 8K/16K hidden RAM for temporary data.

OS ROMs can be replaced by RAM, for OS development or use of an alternate OS.

Built-in flexibility. Several customizing options have been built into the cRAM board. These, along with the features above, convert your Atari 400 into a truly powerful tool.

IN STOCK for immediate shipment.

INTRODUCTORY PRICE

KIT: $169.00
(regular price $189.00)

ASSEMBLED AND TESTED: $209.00
(regular price $229.00)

ACA **Applied Computer Alternatives, Inc.**

1600 Wilson Boulevard, Suite 900
Arlington, Virginia 22209
(703) 525-6960

DEALER INQUIRIES INVITED.

Requires minor modification to your Atari RAM board For Atari 400 only

ATARI 400 is a registered trademark of ATARI, Inc.

```
2210 POSITION 14,0:CT=0
2220 ? "{5 SPACES}PRINT MODE"
2230 ? :? " Press START to return"
2240 ? "{5 SPACES}to menu"
2250 ? :? " Press SELECT to clear"
2260 ? "{3 SPACES}typing area"
2270 KK=PEEK(53279):IF KK=6 THEN GOSU
     B 390:GOTO 520
2280 IF KK=5 THEN 2600
2290 P=PEEK(764):IF P=255 THEN 2270
2300 GET #2,K
2302 IF K>=0 AND K<32 OR K>=128 AND K
     <160 THEN K=K+64:GOTO 2310
2304 IF K>=32 AND K<96 OR K>=160 AND
     K<224 THEN K=K-32
2306 IF CT>(ANTIC+1)*17 THEN 2320
2310 POKE ASD+161+CT,K:POKE ASD+181+(
     ANTIC*20)+CT,K:CT=CT+1:GOTO 2270
2320 FOR I=0 TO 17*(ANTIC+1):POKE ASD
     +161+I,PEEK(ASD+162+I):POKE ASD+
     181+(ANTIC*20)+I,PEEK(ASD+182+(A
     NTIC*20)+I)
2330 NEXT I:CT=17*(ANTIC+1):GOTO 2310
2600 FOR I=0 TO 19*(ANTIC+1):POKE ASD
     +161+I,0:POKE ASD+181+(ANTIC*20)
     +I,0:NEXT I:CT=0:GOTO 2270
3000 IF K<>ASC("K") THEN 520
3010 ST=0:ED=10:GOSUB 20:DIS=0
3020 POKE 82,14:POSITION 14,0:? "COLO
     R CHANGE MODE"
3030 ? " PRESS K TO RETURN"
3040 ? "{5 SPACES}TO MENU"
3050 ? " 0 PLAYFIELD 0"
3060 ? " 1 PLAYFIELD 1"
3070 ? " 2 PLAYFIELD 2"
3080 ? " 3 PLAYFIELD 3"
3090 ? " B BACKGROUND":? "R READ REGI
     STER"
3100 GET #2,K:DIS=0:IF K=ASC("O") THE
     N DIS=18
3105 IF K=ASC("R")THEN RDE=1:GOTO 3100
3110 IF K=ASC("1") THEN DIS=31
3120 IF K=ASC("2") THEN DIS=2
3130 IF K=ASC("3") THEN DIS=4
3140 IF K=ASC("B") THEN DIS=48
3150 IF K=ASC("K") THEN GOSUB 390:GOT
     O 520
3155 IF RDE=1 THEN 3410
3160 IF DIS=0 THEN 3100
3170 ST=2:ED=10:GOSUB 20
3180 POKE 82,14:POSITION 14,0
3190 ? "0 GREY  1 GOLD  2 ORANGE"
3200 ? "3 RED{3 SPACES}4 PINK  5 PURP
     LE"
3210 ? "7 BLUE  8 BLUE  9 LT.BLUE"
3220 ? "10 TURQOUISE 11 GREENBLUE"
3230 ? "12 GREEN{5 SPACES}13 YELLOW/G
     R"
3240 ? "14 ORANGE/GR 15 LI.ORANGE"
3245 TRAP 3400
3250 INPUT COL:?"{3 SPACES}Luminosity"
3260 ? " input(0-14)";
3270 INPUT LUM
3280 CLCHG=COL*16+LUM
3290 POKE 1646+DIS,CLCHG
3300 GOTO 3010
3400 TRAP 40000:POSITION 14,6:? "TRY
     AGAIN":FOR I=1 TO 100:NEXT I:POS
     ITION 14,6:? "{9 SPACES}":POSITI
     ON 14,6:GOTO 3245
3410 RDE=0:DRE=PEEK(1646+DIS):POSITIO
     N 14,9:? "COLOR REGISTER ";CHR$(
     K);"=";;"{3 SPACES}";"{3 LEFT}";
     DRE:GOTO 3100
```

Creating Graphics On The Expanded VIC

Ed Harris

This short program will simplify creating new character sets and graphics on an expanded VIC.

Do you have more than 8K of RAM in your VIC? Do you want to make your own character set? Any character sets in RAM must be in the VIC's *internal* memory. When you add the first 8K memory expander, screen memory changes to 4096, and BASIC starts at decimal 4608, leaving no room to put your character set.

This program raises the bottom of memory to 8192 ($2000) and copies the character sets from 32768 to 35839 down into RAM starting at 5120 and going to 8191. You can then create new character sets or game graphics for use on your expanded VIC.

The BASIC program puts the machine code at $3000 and will be erased when you load a program.

All commands still work properly, and you can change from standard to custom characters with "POKE 36869,PEEK(36869) AND 240 OR 13" and restore to normal by "POKE 36869,PEEK (36869)AND 240 OR 0".

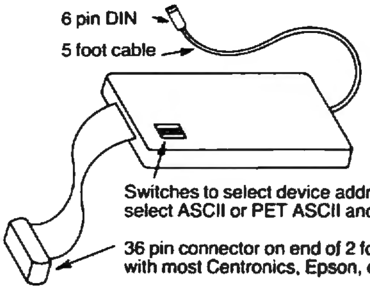
```
5 REM ***************
6 REM FOR VICS WITH
7 REM  MORE THAN 8K.
8 REM  ***************
9 REM  MOVES BASIC TO
10 REM 8192
11 REM **************
12 REM AND COPIES
13 REM CHARACTER SET
14 REM TO 5120-8191
15 REM **************
16 FORT=12288 TO 12379: READ N:POKE T,N:NEXTT
17 PRINT"{CLEAR}SYS12288":FORT=631TO633:POKET
   ,145
18 NEXT T
19 POKE634,13:POKE635,131:POKE198,5:END
20 DATA56,32,156,255,200,24,32,156,255
21 DATA 174,44,0,232,142,44,0,142,46
22 DATA 0,173,46,0,201,32,208,230,169
23 DATA 0,141,0,32,141,1,32,141,2
24 DATA 32,169,205,141,5,144,162,0,142
25 DATA 123,48,174,123,48,189,0,128,157
26 DATA 0,20,224,255,240,7,232,142,123
27 DATA 48,76,47,48,172,55,48,192,31
28 DATA240,14,200,140,55,48,174,52,48
29 DATA 232,142,52,48,76,42,48,96,96,0,0
```

NEW CBM-64 AND VIC-20 PRODUCTS

***** CBM-64/VIC-20 PRINTER INTERFACE *****

Model MW-302 $119.95

This unit will interface your VIC-20 or CBM-64 to standard parallel printers such as Epson, Centronics, C. Itoh, and many others. Allows printing of full upper and lower case.



Switches to select device addresses 4 through 7. Also select ASCII or PET ASCII and bit 8 output.

36 pin connector on end of 2 foot cable. Compatible with most Centronics, Epson, etc. printers.

MW 302 PRINTER INTERFACE

***** SYSTEM 310 ***** **$1195.00**

Consists of CBM-64, MX-80, Printer interface MW-302, and C2N cassette (CBM-64 sold separately for $595)

***** DIGITAL TO ANALOG CONVERTER OR 8 CHANNEL ANALOG TO DIGITAL CONVERTER *****

Model MW-304v $129.95

Allows your VIC or CBM to output analog signals or digitize up to 8 analog channels.

MICRO WORLD ELECTRONIX INC
6340 W. Mississippi Ave.
Lakewood Colorado 80226 **(303) 934-1973**

WUNDERWARE

FOR YOUR VIC-20. SEND FOR GAME CATALOG AND FOR INFORMATION ABOUT COMMODORE 64 PROGRAMS.

KILLER CATERPILLAR! Here he comes...the dreaded Killer Caterpillar! He's weaving his way through the mushrooms trying to get to you. You can't let him through! If that isn't enough, you occasionally get visits from crazed spiders leaving a trail of mushrooms behind. Shoot them for extra points. Great graphics. For 5K VIC 20, requires joystick. Cassette $9.95, Disk $12.95

MAD PAINTER! This game is a little unique and a lot of fun. You control a paint brush, moving it around a colorful maze. Your job is to paint the entire maze. This is not as easy as it sounds, because in the maze with you are two voracious Bristle Biters (they love paint brushes). Occasionally you will receive a visit from an Invisible Stomper who leaves footprints in your fresh paint. Requires joystick. Cassette $9.95, Disk $12.95

SNAKE! A fast and fun action game for one player. You're a big snake roaming around the screen. Mice, rabbits, eggs, and feet appear at random. Your mission in life is to bite these targets. You have to be quick—the targets don't stay for long. The main problem is; you always seem to be running into the wall or into yourself (the longer you play, the longer, and harder to avoid your own tail)! Snake! Keeps high score and requires a joystick. Cassette $9.95, Disk $12.95

■ Price includes postage & handling. ■ Catalog is included with order. ■ Foreign orders & COD's, please add $3.00. ■ Prices are subject to change without notice.
■ At your dealer or send check or money order to:
WUNDERWARE, P.O. Box 1287, Jacksonville, OR 97530 ☎503-899-7549.
VIC-20 is a registered trademark of Commodore Business Machines.

Vehicle Cost Performance

Linton S Chastain

Use your Radio Shack Color Computer to analyze your car's performance. The program is written for systems with 32K, Extended BASIC, and disk capability, but the article notes the necessary changes for use with 16K systems or for non-Extended BASIC systems with cassette.

Have you ever wondered how much your car was costing to operate or whether you were getting good fuel performance? If so, you may want to load the following program and run it.

The program – "Vehicle Cost and Performance" – was written on a 32K Color Computer with Extended BASIC and disk drive. It requires a minimum of 4.813K to load and 12.727K to run, as is. If you have a 16K machine with Extended BASIC and a disk drive, you will have to use "Pclear1" and adjust lines 40 and 50 in order to run the program. Line 40's clear x is 10 times "MR" for safety. I have two years of data and a minimum of two entries per month, and have not run out of storage in memory.

Those of you who have a cassette recorder and non-Extended BASIC will have to make the following changes:

```
130 PRINT"5-READ OLD MASTER FILE":PRINT"FROM C
    ASSETTE
150 PRINT"7-WRITE NEW MASTER FILE":PRINT"TO CA
    SSETTE
670 OPEN"I",#-1,T$:PRINT"READING FILE: ";T$:IN
    PUT#-1,N
680 IFN>MR THEN PRINT"*** TOO MANY FILES ON CA
    SSETTE***":END
700 FORJ=1 TO N:INPUT#-1,A(J),D$(J),O(J),G(J),
    NO$(J),C(J):PRINTJ:NEXTJ
720 CLOSE:GOSUB1440
770 OPEN"O",#-1,T$:WRITE#-1,N
790 FORJ=1 TO N:PRINT#-1,A(J),D$(J),O(J),G(J),
    NO$(J),C(J):PRINTJ:NEXTJ
800 CLOSE:GOSUB1440
```

CHANGE LINE 540 "PRINT @ 192, "STRING$(31,"-")" TO
PRINT @ 192, "———————————————"

CHANGE LINE 1140 "PRINT @ 320, "STRING$(62,32)" TO
PRINT @ 320, "{type 62 spaces}"

CHANGE LINE 1350 "PRINT @ 320, "STRING$(32,32)" TO
PRINT @ 320, "{type 31 spaces}"

CHANGE LINE 1580 "PRINT #-2, "STRING$(48,32);" TO
PRINT #-2, "{type 48 spaces}";

Those who have Extended BASIC do not have to change anything in lines 540, 1140, 1350, or 1580.

Record Keeping

The program keeps records on Maintenance (accnt #4), Gas (accnt #5), Operating Fees (accnt #6), and Other (accnt #7). It also has two flags that are keyed to Dates. They remind you at least one month in advance of the event's due date, so that you can organize your budget and have time to accomplish the task. These two flags are in record position (J), one and two. You can use these two records to alert you to dates for needed oil changes or to the due dates of your tag, license, inspection, and insurance.

One word of caution about record numbers, "J = 1 to N": if you change a record number less than "N", you must enter the last record that is in memory in order to establish the proper "N" again. If you do not enter the last "N", then "N" will become the changed record number.

A third flag, in record position (J) three, keeps track of your vehicle's best MPG performance as well as the date of entry in which it occurred. This flag will flash on your screen if your present entry is equal to one MPG lower than your best MPG (recorded in record three) when you are in the "DISPLAY MILEAGE" section of the program. If you wish to tighten or loosen this criterion, you can change line :1260 IF G(3)-Z = >1 to anything smaller or larger than one.

Making Hard Copies

This program also permits you to make a hard copy of the information generated by the program and/or its data base. You can make a hard copy of "Display Cost," "Display Mileage," "Display Data," and "Display Cost/Mile" by pressing shift down arrow when "PRESS ENTER FOR RETURN" appears on the screen. This action activates line 1540, which in turn activates an eight-line subroutine. The subroutine is very handy if you want a hard copy of text generated by a program. It is incorporated in my "Energy Monitor" program (**COMPUTE!**, August 1982, #27).

The nice thing about this subroutine is that it not only prints out what is on the screen, but it also allows you to control how much paper you wish to waste by controlling "VIM". "VIM" is defined as the last video text memory location which you want outputted to a printer. The Color Computer video memory occupies decimal memory 1024 through 1535. Each of the 16 lines has 31 memory locations plus the first memory of that line. For example, line one contains decimal memory location 1024 through 1055, while line two contains decimal memory location 1056 through 1087, and so forth until line 16.

This subroutine probably can be used on other computers as long as you are aware that the video memory location may be different; the number of each line's memory location and the number of lines may also be different. Try to incorporate the subroutine into your programs. On at least two occasions, it has helped me avoid having to write two different programs, one for the screen and one for the printer.

The second hard copy is generated in the "Display Data" part of the program. By pressing the up arrow, you will dump all records to your printer in nice, neat columns on a 80-character/line printer. This may come in handy if you are selling your car and the buyer wants a fairly complete record of maintenance and cost. However, if you want one or more of the data records, you can selectively print out each one by using shift down arrow, instead of the up arrow, while in the "Display Data" mode.

I hope you will find this program as useful as I have in helping keep track of cost and maintenance problems. It may help you make a more objective decision when purchasing your next vehicle or determining whether keeping your current vehicle might not be more cost effective.

```
10 'VEHICLE COST AND PERFORMANCE
40 CLEAR2000
50 MR=200:N=0
60 DIMA(MR),D$(MR),O(MR),G(MR),NO$(MR),C(MR)
70 CLS:AA=0:AB=0:AC=0:AD=0
80 PRINT"VEHICLE COST AND PERFORMANCE":PRINT:
   PRINT"COMMAND LIST #1"
90 PRINT"1-DISPLAY COST"
100 PRINT"2-DISPLAY MILEAGE"
110 PRINT"3-DISPLAY DATA"
120 PRINT"4-DISPLAY COST/MILE"
130 PRINT"5-READ OLD MASTER FILE FROM DISK"
140 PRINT"6-INPUT NEW DATA"
150 PRINT"7-WRITE NEW MASTER FILE TO DISK"
160 PRINT:INPUT"ENTER COMMAND BY NUMBER";R:IFR
    <1 OR R>7 THEN70
170 ON R GOSUB 470,1160,580,1410,650,190,740
180 GOTO70
190 CLS:PRINT:PRINT"ENTER THE FOLLOWING AS REQ
    UESTED"
200 PRINT:INPUT"INPUT N";R:N=R:IFN<0 THEN 200
210 INPUT"ACCOUNT CODE";R:A(N)=R:IFR<0 THEN 21
    0
220 INPUT"DATE (E.G. 07/31/82)";R$:R=LEN(R$):I
    FR<8 OR R>8 THEN 220
230 D$(N)=R$
240 INPUT"ODOMETER M=MILES OR K=KILOMETERS";R$

250 IFLEFT$(R$,1)="M" THEN 260 ELSE 270
260 INPUT"ODOMETER IN MILES";R:O(N)=R:IFR<0 TH
    EN 260 ELSE 280
270 INPUT"ODOMETER IN KILOMETERS";R:O(N)=R*.62
    :IFR<0 THEN 270
280 INPUT"FUEL MEASUREMENT G=GAL AND L=LITER";
    R$
290 IFLEFT$(R$,1)="G" THEN 300 ELSE 310
300 INPUT"AMOUNT OF FUEL IN GAL.";R:G(N)=R:IFR
    <0 THEN 300 ELSE 320
310 INPUT"AMOUNT OF FUEL IN LITER";R:G(N)=R/3.
    785:IFR<0 THEN 310
320 INPUT"NOTE";R$:NO$(N)=R$:R=LEN(R$):IFR>10
    THEN 320
330 INPUT"COST";R:C(N)=R
340 CLS:PRINT:PRINTTAB(3);"CHECK    N:";N
350 PRINTTAB(3);"    ACC #:";A(N)
360 PRINTTAB(3);"    DATE:";D$(N)
370 PRINTTAB(3);"    ODOMETER:";O(N)
380 PRINTTAB(3);"    FUEL:";G(N)
390 PRINTTAB(3);"    NOTE:";NO$(N)
400 PRINTTAB(3);"    AMT:";C(N)
410 PRINT:PRINT"   -IS INPUT O.K.?-":PRINT
420 INPUT"(Y=YES,N=NO,F=YES AND FINISHED)";R$:
    R$=LEFT$(R$,1)
430 IFR$="N" THEN PRINT"REDO LAST DATA":GOTO20
    0
440 IFR$="F" THEN RETURN
450 IFR$<>"Y" THEN 420
460 GOTO200
470 VIM=1279:FORJ=4 TO N
480 IFA(J)=4 THENAA=AA+C(J)ELSE490
490 IFA(J)=5 THENAB=AB+C(J)ELSE500
500 IFA(J)=6 THENAC=AC+C(J)ELSE510
510 IFA(J)=7 THENAD=AD+C(J)
520 NEXTJ
530 AE=AA+AB+AC+AD
540 CLS:PRINT@0,"CATEGORY","COST":PRINT@64,"MA
    INTENANCE",AA:PRINT@96,"GAS",AB
545 PRINT@128,"OPER. FEES",AC:PRINT@160,"OTHER
    ",AD:PRINT@192,STRING$(31,"-")
549 PRINT@224,"TOTALS",AE
550 YR(3)=2:YR(4)=2:MO(3)=2:MO(4)=2:E=0:F=0:GO
    SUB820
560 GOSUB1440
570 RETURN
580 VIM=1247:K=0:L=0:CLS
590 K=K+1:L=L+1:IFL>N THEN L=N
600 FORJ=K TOL:PRINT"N",J:PRINT"ACCNT",A(J):PR
    INT"DATE",D$(J):PRINT"MILEAGE",O(J):P
    RINT"FUEL",G(J)
605 PRINT"NOTE",NO$(J):PRINT"AMOUNT",C(J):NEXT
    J:PRINT
610 PRINT@384,"PRESS ↑ TO PRINT TO PRINTER"
620 IFPEEK(341)=247 THEN 1480
630 IFL=N THEN GOSUB1440:RETURN
640 PRINT@416,"HIT ENTER TO CONTINUE":GOSUB144
    0:CLS:VIM=1279:GOTO590
650 R$="READING":PRINT
660 INPUT"NAME OF FILE";T$
670 OPEN"I",#1,T$:PRINT"READING FILE: ";T$:INP
    UT#1,N
680 IFN>MR THEN PRINT"*** TOO MANY FILES ON DI
    SK ***":END
690 PRINT"READING RECORDS # ";
700 FORJ=1 TO N:INPUT#1,A(J),D$(J),O(J),G(J),N
    O$(J),C(J):PRINTJ:NEXTJ
710 PRINTN;" DATA RECORDS READ"
720 CLOSE#1:GOSUB1440
730 RETURN
740 IFN<1 THEN PRINT"*** NO DATA TO WRITE ***"
    :GOSUB1440:RETURN
750 R$="WRITING":PRINT
760 INPUT"NAME OF FILE";T$
770 OPEN"O",#1,T$:WRITE#1,N
780 PRINT"WRITING FILE: ";T$:PRINT"      RECORD
    S # ";
790 FORJ=1 TO N:WRITE#1,A(J),D$(J),O(J),G(J),N
    O$(J),C(J):PRINTJ:NEXTJ
800 CLOSE#1:GOSUB1440
810 RETURN
820 YR$(0)=RIGHT$(D$(N),2):YR$(1)=RIGHT$(D$(1)
    ,2):YR$(2)=RIGHT$(D$(2),2)
```

```
830 YR(0)=VAL(YR$(0)):YR(1)=VAL(YR$(1)):YR(2)=
    VAL(YR$(2))
840 YR(3)=YR(1)-YR(0):YR(R)=YR(2)-YR(0)
850 IFYR(3)=0 OR YR(3)=1 THEN GOSUB970 ELSE 86
    0
860 IFYR(4)=0 OR YR(4)=1 THEN GOSUB880 ELSE RE
    TURN
870 RETURN
880 MOS$(0)=LEFT$(D$(N),2):MOS$(2)=LEFT$(D$(2),2
    )
890 MO(0)=VAL(MOS$(0)):MO(2)=VAL(MOS$(2))
900 MO(4)=MO(2)-MO(0)
910 IFYR(4)=0 THEN 920 ELSE 930
920 IFMO(4)=0 OR MO(4)=1 THEN MO(4)=0 ELSE MO(
    4)=1
930 IFYR(4)=1 THEN 940 ELSE 950
940 IFMO(4)=-10 OR MO(4)=-11 THEN MO(4)=0 ELSE
     MO(4)=1
950 IFMO(4)=0 THEN F=2 ELSE F=0
960 GOTO1070
970 MOS$(0)=LEFT$(D$(N),2):MOS$(1)=LEFT$(D$(1),2
    )
980 MO(0)=VAL(MOS$(0)):MO(1)=VAL(MOS$(1))
990 MO(3)=MO(1)-MO(0)
1000 IFYR(3)=0 THEN 1010 ELSE 1020
1010 IFMO(3)=0 OR MO(3)=1 THEN MO(3)=0 ELSE M
    O(3)=1
1020 IFYR(3)=1 THEN 1030 ELSE 1040
1030 IFMO(3)=-10 OR MO(3)=-11 THEN MO(3)=0 EL
     SEMO(3)=1
1040 IFMO(3)=0 THEN E=1 ELSE E=0
1050 IFMO(3)=0 THEN GOSUB1090 ELSE1070
1060 RETURN
1070 E=0:IFMO(4)=0 THEN GOSUB1090 ELSE RETURN
1080 GOTO560
1090 FORI=1 TO 10
1100 GOSUB1120
1110 NEXTI
1120 PRINT@320,D$(E),NOS$(E),D$(F),NOS$(F)
1130 FORH=1 TO 300:NEXTH
1140 PRINT@320,STRING$(62,32):FORH=1 TO 300:N
    EXTH
1150 RETURN
1160 VIM=1119:CLD:PRINT"OVERALL MILES PER GAL
     LON":PRINT:PRINT"COMMAND LIST # 2"
1170 PRINT:PRINT"1-DISPLAY MILES/GALLON"
1180 PRINT"2-RETURN TO COMMAND LIST #1"
1190 INPUT"ENTER COMMAND BY NUMBER";R:IFR<1
    OR R>2 THEN 1160
1200 ON R GOSUB 1210,1400:GOTO1160
1210 X=0:Y=0:Z=0:FORJ=4 TO N
1220 X=(O(N)-O(4)):Y=Y+G(J)
1230 NEXTJ
1240 Z=X/Y:Z=INT(Z*100):Z=Z/100
1250 CLS:PRINT"TOTAL MILEAGE",X:PRINT"TOTAL
     GALLONS";Y:PRINT"MILES/GALLON",Z
1260 IFG(3)-Z=>1 THEN GOSUB 1300
1270 IFZ>G(3) THEN D$(3)=D$(N) ELSE D$(3)=D$(3)

1280 IFZ>G(3) THEN G(3)=Z ELSE G(3)=G(3)
1290 GOTO1380
1300 FORI=1 TO 10
1310 GOSUB 1330
1320 NEXTI
1330 PRINT@320,D$(N),"POOR PERFORMANCE"
1340 FORH=1 TO 300:NEXTH
1350 PRINT@320,STRING$(31,32):FORH=1 TO 300:N
    EXTH
1360 RETURN
1370 RETURN
1380 GOSUB1440
1390 RETURN
1400 GOTO70
1410 VIM=1055:CLS:PRINT"COST/MILE =";"$";AE/X
1420 GOSUB1440
1430 RETURN
1440 PRINT@448,"PRESS ENTER TO RETURN"
1450 B$="":R$=INKEY$:IFR$=B$ THEN 1450
1460 IFPEEK(342)=247 THEN 1540 ELSE 1470
1470 RETURN
1480 POKE153,10:POKE154,66:POKE115,80
1485 PRINT#-2,"N","ACCNT","DATE","MIL.","FUEL",
    "NOTE","AMOUNT"
1490 PRINT#-2,CHR$(10)
1500 FORJ=1 TO N
1510 PRINT#-2,J,A(J),D$(J),O(J),G(J),NOS$(J),C(J
     )
1520 NEXTJ
1530 RETURN
1540 ZW=0:FORZX=1024 TO VIM:ZW=ZW+1
1550 ZY=PEEK(ZX)
1560 IFZY=>96 AND ZY<128 THEN ZY=ZY-64 ELSE ZY=
    ZY
1570 PRINT#-2,CHR$(ZY);
1580 IFZW=32 THEN PRINT#-2,STRING$(48,32);
1590 IFZW=>32 THEN ZW=0
1600 NEXTZX:PRINT#-2,CHR$(32)
1610 RETURN
```

Joysticks And Sprites On The Commodore 64

Sheldon Leemon

As the owner of an Atari 800 computer, I welcomed Commodore's announcement of the Model 64 computer, because it closely parallels the Atari in its consumer orientation. One example is the inclusion of two ports for Atari-type joystick controllers. These controllers provide a simple way for the user to interact with any type of program, including, of course, arcade games.

A Fascinating Chip

When I bought the computer, however, I discovered, to my dismay, that the consumer-oriented design approach did not seem to carry through to the BASIC interpreter and *User's Guide*. Not only was there no BASIC command for reading the joystick controllers, but the BASIC manual also made no mention whatever of these ports! This meant that if I discovered how to use these sticks any time soon, I would have to play hardware detective.

Fortunately, the 64 is quite similar to the VIC-20 in a number of ways. Since the VIC reads the joystick through the VIA (Versatile Interface Adapter) chip, it stands to reason that the 64 would read its joystick through the analogous CIA (Complex Interface Adapter) chip. An early memory map from Commodore shows CIA #1 to be addressed at location DC00, or 56320 decimal. The CIA is a fascinating I/O chip, and could well serve as the basis for an article in itself, but here I'll focus attention on the registers that read the joysticks.

Like the VIC-20, the 64 uses Peripheral Data Registers A and B to read these sticks, and I/O (input/output) through these registers is controlled by Data Direction Registers A and B. These registers are addressed at the chip's first four locations, so that on the 64 Data Register A is addressed at 65320, Register B is addressed at 56321, and Data Direction Registers A and B are addressed at 56322 and 56323, respectively.

Reading The Joysticks

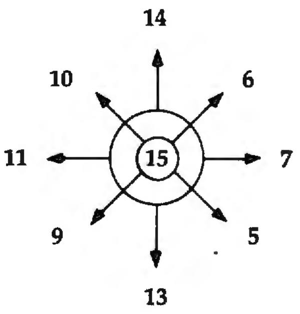
Knowing this, with a bit of trial and error I was able to figure out how to read the joysticks. A quick try seemed to indicate that it was not necessary to write to the Data Direction Registers before reading the sticks, as must be done on the VIC-20. Checking the values of Registers A and B while moving joysticks connected to Control Ports 1 and 2 revealed that the data from the stick connected to Control Port 1 appeared in Register B, and that the data from the stick in Port 2 showed up in Register A. This observation conflicts slightly with the memory map which Jim Butterfield published in the October issue of **COMPUTE!**. That map shows that Register A controls Joystick 0, and Register B controls Joystick 1.

The relationship of the data returned in the register to the direction of stick movement is exactly the same as on the Atari. Each of the low bits (0-3) corresponds to one of the switches that is closed by moving the stick in one of the four primary directions. These bits are normally set to 1, but are reset to 0 when the corresponding switch is closed. Bit 0 corresponds to the up switch, bit 1 corresponds to the down switch, bit 2 is left, and bit 3 right. Bit 4 is used to read the joystick trigger button. It is set to 1 normally, and reset to 0 if the button is pushed.

What this means to the hardware-weary reader who has borne with me thus far, patiently waiting for an explanation in plain English of how to use the Commodore 64 joysticks, is that it takes only a couple of BASIC statements to do the job. Those familiar with the Atari system of numbering the joystick positions (as I am) may want to use the following statements:

```
S1=PEEK(56321) AND 15: REM Reads Stick 1
S2=PEEK(56320) AND 15: REM Reads Stick 2
```

Because these registers can contain irrelevant information in bits 4-7, the logical AND is used to mask (block out) those bits. The figure below shows the way in which the number returned in variable S1 or S2 corresponds to the direction in which the stick is pushed.



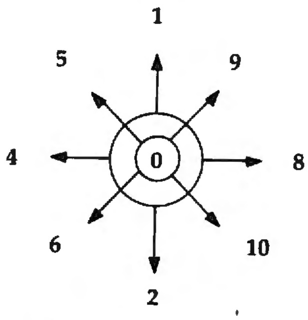
To read the trigger buttons, the following statements will return a 1 if a button is pressed, and a 0 if it is not:

```
T1=-((PEEK(56321) AND 16)=0)
T2=-((PEEK(56320) AND 16)=0)
```

Of course, if you prefer a system where the variable will be 0 when the stick is not pressed, you can use the logical operator NOT to adjust the values accordingly.

```
S1=NOT PEEK(56321) AND 15
S2=NOT PEEK(56320) AND 15
```

This will produce the following pattern:



A Keyboard Bonus

The variations on these basic schemes are limited only by your applications. If you are using the joystick for an action game, for example, you may want to read the change in horizontal position and vertical position separately. You can do this with the following formulas:

```
H1=((PEEK(56321) AND 15)=4) - ((PEEK(56321)
   AND 15)=8)
H2=((PEEK(56320) AND 15)=4)-((PEEK(56320 AND
  15)=8)
V1=((PEEK(56321) AND 15)=1) - ((PEEK(56321) AND
  15)=2)
V2=((PEEK(56320) AND 15)=1)-((PEEK(56320) AND
  15)=2)
```

The value of H1 will be 1 if the stick is pressed to the right, -1 if the stick is pressed to the left, and 0 if centered. Likewise, the value of V1 will be -1 for an upward press, 1 for a downward press, and 0 if the stick is centered. If you wish, you can even read each switch separately. Program 1, short and not exciting, demonstrates the technique.

One interesting sidelight demonstrated with this program is the fact that some CIA registers that are used to read the joysticks are used also to read the keyboard. The four keys at the top left of the keyboard (Control, Left Arrow, 1, and 2) are read exactly the same as joystick switches 0-3. While you are running Program 1, try pressing these keys, and you will see what I mean.

Pressing the Control key has the same effect as moving the stick to the left, while the Left Arrow, 1, and 2 keys function like a joystick moved down, up, and to the right, respectively.

Graphics Movement

The initialization routine, which I have put out of the way at the back of the program, starting with line 1000, sets up a flying saucer in double width, and then returns to the movement loop at line 2. The ON-GOSUB routes the program to the proper line number without having to test each stick position, which would slow down the loop.

There are a couple of points to note. First, the registers that designate sprite horizontal and vertical positions are not write-only registers, as are the Atari horizontal position registers. This means that you can find out the current position of the sprite just by reading those registers, without having to set up separate RAM variables to keep track of them as must be done on the Atari. I set up variables %X and %Y in Program 2 only for purposes of readability.

To move a sprite one position to the right, we need only read the current horizontal position, add 1, and POKE that number back into the horizontal position register. Of course, you must keep in mind that you can't POKE in a value less than 0 or greater than 255. If you examine the move-down and move-up subroutines at lines 80 and 90, you will see that I have incorporated logical statements to move the sprite to the bottom of the screen if it hits the upper limit, and which will move it to the top if the value tries to get below 0. This wraparound feature guarantees that no errors will result from trying to POKE in an illegal quantity.

The Horizontal "Seam"

A more complicated situation arises when we deal with horizontal movement. Because there are 320 horizontal positions available, but only 256 combinations which can be accessed from the horizontal position register, we need to set the Most Significant Bit in the register located at 53264 whenever we wish to use a horizontal position between 256 and 320. Any time the sprite moves into or out of this zone, therefore, special handling of this bit will be required.

Accordingly, the horizontal movement routines (lines 40-45 and 70-75) have to test to see if this "seam" is encountered before moving the sprite. If the horizontal position register reads 0, for example, we don't know whether the sprite is located at the left edge of the screen or at the "seam" (i.e., location 256) until we check the MSB register. This extra checking is time consuming, and as a result the saucer moves noticeably faster up and down than it does right and left.

Because of the slowness of the motion in BASIC, I have multiplied all motion by the factor WUN, which is defined in line 1005, and which can be set from 1 to 3. When its value is 1, the motion is very smooth, but extremely slow. When it is 3, each push of the stick changes the position of the sprite by three places, speeding up the motion, but making it somewhat jerky.

CALC RESULT™

Finally . . . A More Powerful Planning And Forecasting Tool That Takes Less Time, Work And Money Than Any Other On The Market!

With all the knowledge and experience gathered through previously released spread-sheet programs, it had to be possible to create a tool that would be easier to understand, easier to handle, and more powerful than those which already existed. And thus a new product was born!

CALC RESULT is just that . . . the result of dynamic enhancements to earlier versions of electronic spread-sheet programs! Below are listed just some of the highlights of this revolutionary new product!

- A three-dimensional spread-sheet with a minimum of 32 pages of 63X254 cells
- Utilizes only the memory in cells that are active
- Consolidation of pages
- Graphics (Histograms) on screen and printer
- Flexible Print format can be different than screen format
- View as many as three spread-sheets at one time through a window and split screen
- Replicate, copy and move commands
- Help function on-line
- Cells containing formulas are protected
- IF-THEN-ELSE with AND, OR and NOT-ELSE gives you unlimited possibilities in each cell
- RANDOM function
- Independent column width for column "A"
- Ability to Edit Formulas within a Cell
- Can load VisiCalc™ files

Contact Your Nearest Commodore Dealer Today . . .
You'll Be So Glad You Did!

For: Commodore 64 - Cartridge/Tape Version - $69.95
Commodore 64 - Cartridge/Disk Version - $149.95
Commodore 8032/8096 with 8050 Disk Drive - $199.00

Distributed By:
COMPUTER
MARKETING SERVICES INC.
300 W. Marlton Pike, Suite 26
Cherry Hill, New Jersey 08002
(609) 795-9480

A Product Of:
handic
software ab
Box 42054
Vretensborgsvagen 8
126 12 Stockholm, Sweden

VisiCalc is a trademark of VisiCorp
CALC RESULT is a trademark of Handic Software ab

Machine Language Motion

The best solution to the problem of achieving quick, smooth motion is the use of a machine language subroutine which will read a joystick, and move the sprite accordingly. Program 3 uses just such a subroutine. Though I POKE it into memory starting at C000 (49152 decimal), it is completely relocatable.

If it later proves that this large block of free RAM can be better used otherwise, you will be able to move the routine with no rewriting. You should be aware, however, that, as written, the routine checks only the joystick in Port 1, and moves only Sprite 0 in response to movement of that stick. Since some lines of Program 3 duplicate those of Program 2, you may want to edit the latter program rather than typing in Program 3 from scratch.

One difference that you will notice immediately is that this program asks you to select a speed (you should respond with a value from 1-5). The reason for this is that I wanted to demonstrate the degree to which even a machine-language subroutine is slowed down by BASIC. At Speed 1, each time through the loop the program calls the subroutine once and returns to BASIC. Though this produces smooth motion, it is still somewhat slow. At Speed 2, the program calls the subroutine twice in a row before returning, and so on up to Speed 4, which produces rather quick motion. At Speed 5, the machine language subroutine goes into a continuous loop, without ever returning to BASIC. At this speed, if you push on the stick diagonally, it will appear as if there are dozens of saucers on the screen at once!

Though my examples may seem most applicable to game programs, do not overlook the joysticks as input devices for more "mundane" tasks. Because each stick has only four switches, it limits the number of choices available to the user. It therefore reduces the number of mistakes that can be made, as compared with a keyboard, which has over 60 keys, each key having both a shifted and non-shifted value.

Program 1.

```
10 FOR I=1 TO 25:DOWN$=DOWN$+CHR$(17):NEXT:HO
    ME$=CHR$(19):PRINTCHR$(147);CHR$(5)
15 PRINT" THIS PROGRAM READS STICK #1":PRINT"
     INSERT JOYSTICK, AND MOVE IT AROUND!
    "
20 S=NOT PEEK(56321) AND 15
30 UP=S AND 1:IF UP THEN PRINT HOME$;LEFT$(DO
    WN$,10);TAB(15);"UP    ";:GOTO 50
40 DOWN=S AND 2:IF DOWN THEN PRINT HOME$;LEFT
    $(DOWN$,10);TAB(15);"DOWN ";
50 LEFT=S AND 4:IF LEFT THEN PRINT HOME$;LEFT
    $(DOWN$,10);TAB(25);"LEFT ";:GOTO70
60 RIGHT=S AND 8:IF RIGHT THEN PRINT HOME$;LE
    FT$(DOWN$,10);TAB(25);"RIGHT";
70 IF S=0 THEN PRINT HOME$;LEFT$(DOWN$,10);TA
    B(15);"                    "
80 GOTO 20
```

Program 2.

```
1 GOTO 1000
2 S=PEEK(S0)AND15:ONSGOSUB3,3,3,3,20,30,40,3
    ,50,60,70,2,80,90,3:GOTO2
3 RETURN
20 GOSUB 40:GOSUB 80:RETURN
30 GOSUB 40:GOSUB 90:RETURN
40 X%=X%+WUN :IF X%>255 THEN X%=0:POKE SP+16,
    1
43 IF X%>65 AND PEEK(SP+16)=1 THEN POKE SP+16
    ,0:X%=0
45 POKEHP,X%:RETURN
50 GOSUB 80:GOSUB 70:RETURN
60 GOSUB 90:GOSUB 70:RETURN
70 X%=X%-WUN:IF X%<1 AND PEEK(SP+16)=1 THEN X
    %=255:POKE SP+16,0
73 IF X%< 1 AND PEEK(SP+16)=0 THEN X%=65:POKE
     SP+16,1
75 POKEHP,X%:RETURN
80 Y%=Y%+WUN+HI * (Y%>HI):POKEVP,Y%:RETURN
90 Y%=Y%-WUN-HI * (Y%<WUN):POKEVP,Y%:RETURN
1000 FORI=871TO895:POKEI,0:NEXT:FOR I=832TO870:
    READA:POKEI,A:NEXT:SP=53248
1005 HP=SP:VP=SP+1:X%=160:Y%=100:WUN=3:HI=252:S
    0=56321
1010 POKESP+21,1:POKE2040,13:POKESP+39,6:POKESP
    +29,1:POKEHP,X%:POKEVP,Y%
1020 POKESP+32,0:POKESP+33,0:PRINTCHR$(147)
1030 FORI=1 TO 50:POKE 1024+INT(RND(0)*1000),46
    :NEXT
1040 DATA 0,56,0,0,124,0,0,254,0,0,170,0,1,171,
    0,15,255,224,15,255,224,13,85,96
1050 DATA 13,85,96,15,255,224,15,255,224,0,254,
    0,0,124,0
1060 GOTO 2
```

Program 3.

```
10 PRINTCHR$(147);CHR$(5): INPUT"SPEED ";S:GO
    TO 1000
20 ON S GOTO 30,40,50,60,70
30 SYS(49409):GOTO 30
40 SYS(49406):GOTO 40
50 SYS(49403):GOTO 50
60 SYS(49400):GOTO 60
70 SYS(49413):GOTO 70
1000 FORI=871TO895:POKEI,0:NEXT:FOR I=832TO870:
    READA:POKEI,A:NEXT:SP=53248
1010 POKESP+21,1:POKE2040,13:POKESP+39,6:POKESP
    +29,1:POKESP,160:POKESP+1,100
1020 POKESP+32,0:POKESP+33,0:PRINT CHR$(147)
1030 FORI=1 TO 50: POKE 1024+INT(RND(0)*1000),4
    6:NEXT
1040 DATA 0,56,0,0,124,0,0,254,0,0,170,0,1,171,
    0,15,255,224,15,255,224,13,85,96
1045 DATA 13,85,96,15,255,224,15,255,224,0,254,
    0,0,124,0
1050 FOR I=1 TO 101:READ A:POKE 49151+I,A:NEXT
1055 FOR I=1 TO 19:READ A:POKE 49399+I,A:NEXT:G
    OTO 20
1060 DATA 173,1,220,74,176,3,206,1,208,74,176,3
    ,238,1,208,74,176,38,173
1070 DATA 0,208,208,15,173,16,208,41,1,240,12,1
    73,16,208,41,254,141,16
1080 DATA 208,206,0,208,96,173,16,208,9,1,162,6
    3,141,16,208,142,0,208,96
1090 DATA 74,176,32,238,0,208,240,28,173,16,208
    ,41,1,240,20,169,64,205
1100 DATA 0,208,208,13,173,16,208,41,254,162,0,
    141,16,208,142,0,208,96
1110 DATA 173,16,208,9,1,141,16,208,96
1200 DATA 32,0,192,32,0,192,32,0,192,32,0,192,9
    6,32,0,192,76,5,193
```

SJB DISTRIBUTORS. THE MOST COMPETITIVE PRICES ON COMMODORE.

commodore

MONITORS--GREAT RESOLUTION (64 or VIC)

Panasonic 13" 1320V (Also a great color TV)	$489
Amdek Color I	329
Nec JB 1201M, 12" Color	329
Nec JB 1201, 12" Green Phosphor	159
Amdek Video 300L	159
Transtar (High Resolution)	143
Video/Audio Cable	25

Arcade Joysticks--Heavy duty with 2 firing buttons! Great for the VIC or 64 .... $25

SuperPET (5 languages, 2 processors)	$1409
CBM 8032 Computer, 80 column	1029
CBM Memory Expansion, 64K	359
PET 4032, 40 column	950
CBM 8050, 1 Mg, Dual Drive	1259
CBM D9060, 5 Mg, Hard Disk	2240
CBM D9090, 7.5 Mg, Hard Disk	2600
CBM 4040, 340K Dual Drive	919
CBM 2031, 170K Single Drive	489
DC Hayes Smart Modem	220

PRINTERS--LETTER QUALITY

CBM 8300, 40cps	$1450
Diablo 620, 25cps	995
Nec Spinwriter 7700, 55cps	2350
Nec Spinwriter 3500, 35cps	1600

PRINTERS--DOT MATRIX

CBM 4022, 80cps/graphics	$395
CBM 8023, 150cps/graphics	599
Okidata 82A, 120cps/serial or par	449
Nec 8023A (parallel)	499
Epson MX 50 F+	529
IDS Microprism	539

BUSINESS SOFTWARE

WordPro 4+ or 5+	309
Administrator (Awesome Database)	489
VisiCalc (expanded)	199
The Manager (database)	199
Legal Time Accounting	400
BPI A/R, G/L, Job Cost, Inventory, Payroll	325 pkg.

SJB will service any VIC or CBM64.

MasterCard, Visa, Money Order, Bank Check
COD (add $5) accepted.
Add 3% surcharge for credit cards.
In stock items shipped within 48 hours, F.O.B, Dallas, TX
All products shipped with manufacturer's warranty.

TO ORDER CALL TOLL FREE
800-527-4893 800-442-1048 (Within Texas)
SJB will meet any competitive price under similar in-stock conditions.

SOFTWARE FOR CBM 64

Word Processing (Word, Palabra)	$85
WordPac	70
COCO (great computer tutoring game)	44
COCO II (build your own games easily)	49
Home Finance Package	25
General Ledger, A/R, Inv.	175 pkg.
CBM EasyCalc	90
CBM Easy Finance	50
CBM Easy Schedule	80
Data Manager	70
Pet Emulator (emulates 4.0 basic)	30
Sprite-Magic (build sprites on screen with Joystick, save to disk or cassette)	$19
Assembler Package for CBM 64 (cassette) Editor (creates and updates source code) Assembler, Loader, Disassembler	50
Mail Mate	45
IEEE Interface (64)	95
Parallel Interface (Epson, Okidata, IDS, Nec)	80
RS232 Printer Interface (Okidata etc.)	65
Apple Loader	100
Programming Reference Guide	18

VIC PRODUCTS

VIC 20 Computer, 5K	$179
VIC Datasette Recorder	60
VIC 1541 Disk Drive	395
VIC MODEM (for CBM 64)	95
VIC 1525 Graphic Printer (for CBM 64)	325
8K Memory Expansion Cartridge	49
16K RAM	99
24K RAM	155
IEEE Interface (VIC)	85
VIC 3 slot Expander	43
VIC 6 slot Expander	83
RS232 Printer Interface	65
Cassette Interface	27
Intro to Basic I or II	23
Home Finance Package	48
Turtle Graphics	35
Heswriter (great wp)	35

VIC GAMES

Choplifter (cartridge)	37
Apple Panic	37
Trashman	37
Blackhole	37
Sargon II	30
Satellites & Meteorites	38
Seawolf	23
Cosmic Cruncher	23

SJB DISTRIBUTORS, INC.
10520 Plano Road, Suite 206
Dallas, Texas 75238
(214) 343-1328

Business Hours
M-F 8 to 6
Sat. 10-2

Prices are subject to change without notice.

Assembly Language And The PET

R. D. Wink

Designed for those as yet unfamiliar with machine language programming, this tutorial presents a detailed analysis of a simple machine language program which computes factorials.

Interested in machine language programming? Find the books tough going? This article could be for you!

As a PET owner who is fairly competent in BASIC, I have often wanted to try my hand at writing machine language programs. Yet, as I worked through several texts on the topic, I found that they are apparently written for readers who already have a good grasp of the basics. Perhaps I'm a little slow at catching on, so this article is written for those who, like me, might be interested in a line-by-line analysis of a simple program. The program calculates the factorial function to a precision in excess of 80 digits and is written in 6502 assembly language. Hex dumps and a BASIC loader program are provided for those who do not have access to an assembler.

The factorial is a mathematical function useful in probability studies. N factorial (written N!) is defined as:

$$N! = N \times (N-1) \times (N-2) \times \ldots 2 \times 1$$

As an example, 5! = 5x4x3x2x1 = 120. A few moments thought will show that as N gets bigger, the value of N! rapidly becomes vast. Indeed 69! is of the order of ten to the 99th. This function was chosen because it is complicated enough to require multiple-precision (see below), yet it avoids the problems that decimal fractions cause the machinne language programmer.

Since the 6502 microprocessor does not have a built-in multiplication function, multiplication must be accomplished by repeated addition. Also, since the 6502 is an eight-bit processor, the largest number it can handle in one operation is 255 – not a very promising start for a number like 69!. In fact, using only a single eight-bit word (byte), the largest factorial that can be computed is 5! or 120. 6! is 720, and this is too large to be held in a single byte. Obviously, it will be necessary to use a series of consecutive bytes to represent the big numbers involved and then to handle these numbers a byte at a time. This is what is meant by the term "multiple precision."

We shall first write a BASIC program which computes factorials (though only to nine-digit precision), and then we shall make a line-by-line comparison between this and the assembly code version. The first version in Program 1 uses multiplication. Line 5 sets the initial value of the product P to one. Line 10 calls the required factorial (e.g., 3! means that N is 3). Lines 15 to 25 multiply the existing product value by values of N which are reduced by one each time around the loop. The first time through line 15, P is three. The next time P is 3x2 or six, and the last time P is 3x2x1 which is still six.

We shall now replace the multiplication in line 15 with a subroutine which does the same job, but by using repeated addition (Program 2). This subroutine requires the use of two new variables C and M. C is a counter which is set equal to N at the start of the subroutine. It is used to count the number of additions which have taken place. M is a variable which holds the successive sums needed in the multiplication process.

For example, suppose the routine is to do the multiplication 7x6 where P = 7 and N = 6. Lines 110-120 cause the number seven to be added to the variable M six times:

$$7+7+7+7+7+7=6\times 7$$

The result, 42, is stored in the variable P prior to a return to the main program. The reader should understand that the product (line 15) P = P*N has been replaced by an equivalent subroutine which uses only addition.

As we discuss the assembly language version of the program, we shall make frequent reference to three registers in the microprocessor. The contents of any byte of memory may be copied into the accumulator, the X or the Y register, with the

JINSAM™
EXECUTIVE™

OFFICIALLY APPROVED BY COMMODORE

**Used at NASA,
Kennedy Space Center
With Multiple Applications Related
to the Columbia Space Shuttle Project
including rescue operations, statistical
reports, inventory and vehicle tracking.**

JINSAM EXECUTIVE™

has broken the 10,000 record limit. You may now have up to 65,000 records in one database.

We also have included a free form report generator for data entry, eliminating the need for WordPro™ and have included automatic mathematical relations eliminating the need for VisiCalc™. However, you still have these superb interfaces available.

Executive™ will be available for CBM and IBM personal computers.

JINI MICRO-SYSTEMS, Inc.

DATABASE MANAGEMENT SYSTEM DESIGN

BOX 274 KINGSBRIDGE STN., RIVERDALE, N.Y. 10463 (212) 796-6200 appropriate load instruction, LDA, LDX, or LDY. The contents of these registers may be sent to any memory location using the store instructions STA, STX, and STY. Moving a number between these registers is managed with the transfer instructions (e.g., TXA moves the contents of the X register into the accumulator). Arithmetic is done using the accumulator. The contents of a memory location may be added to the contents of a memory location may be added to the contents of the accumulator using the ADC or "add with carry" instruction. The result of the addition remains in the accumulator, and, if the sum exceeds 255, a special bit called the carry flag is set so that on the next addition the "carry one" is added in.

We are now ready to translate the BASIC program (Program 2) into a single precision assembly language program. A corresponding BASIC method is in parentheses in the comment column.

1. *=$33A	An assembler instruction that sets the start of memory into which the machine code is to be assembled. Hex 33A is the start of the second cassette buffer, which is usually not used and is a "safe" location.
2. SED	Puts the 6502 into decimal mode. Easier for us beginners to work with than hex. Each byte contains a two-digit decimal number less than 100.
3. JSR INITP	Jump to subroutine "INITP" which initializes P (5 P=1).
4. FOUR LDA FACT	Put the value of the required factorial into the accumulator (10 INPUT N).
5. STA C	Store the contents of the accumulator in the variable C (100 C=N).
6. JSR ZERM	Jump to subroutine ZERM which initializes the variable/memory location M (105 M=0).
7. THREE JSR ADD	Jump to subroutine ADD (110 M=M+P).
8. DEC C	Decrement the value of C (115 C=C-1).
9. BNE THREE	If the last value operated on (C) is not zero, then branch to label THREE, line 7 above (120 IF C<>9 THEN 110).
10. JSR MTOP	Jump to subroutine M TO P (125 P=M).
11. DEC FACT	Decrement the value of FACE (20 N=N-1).
12. BNE FOUR	Branch to label FOUR if the last operand "FACT" is not zero (25 IF N<>0 THEN 15).
13. CLD	Clear decimal mode. If we don't return microprocessor to its normal hex mode, PET throws a fit on return to BASIC.
14. BRK	(35 STOP)

Now the four subroutines referenced above:

15. INITP LDA #1	Place 1 in the accumulator.
16. STA P	Place 1 in P.
17. RTS	Return.
18. ZERM LDA #0	Place zero in the accumulator.
19. STA M	Place zero in M.
20. RTS	Return.
21. ADD CLC	Clear the "carry" flag prior to addition.
22. LDA M	Load the accumulator with contents of M.
23. ADC P	Add to the contents of the accumulator the contents of P.
24. STA M	Store the result of the addition in M.
25. RTS	Return.
26. MTOP LDA M	Copy the value of M into the accumulator.
27. STA P	Store the value in location P.
28. RTS	Return.
29. FACT .BYTE 4	Assembler instructions which reserve space for the variables.
30. C .BYTE 0	FACT, C, P, and M. (The precise method of doing this varies depending on the assembler used.)
31. P=*	
32. M=*+1	
33. .END	

The program listed above can be assembled and run, though it is probably not worth the trouble of typing it all in and assembling it, merely to have the number 4! or 24 appear in the byte which P represents. Program 3 contains the assembled code, and the reader may wish to use the resident monitor in the Upgrade ROM PET to test the program. Type SYS 4 and press RETURN in order to call the monitor. Display the appropriate memory locations by typing M 033A, 037A RETURN. The screen should fill with hex codes, which should be carefully replaced by those listed in Program 3. At the end of each line, be sure to press RETURN in order to enter the code into memory.

After 037A has been completed, type G 033A, RETURN in order to run the program from the start. After a moment, the microprocessor registers should be displayed and the reader will note that the accumulator (AC) contains the number 4! or 24 where 4 was the number placed in the variable FACT. The memory locations can be relisted by moving the cursor back up to the line M 033A, 037A and pressing RETURN. Watch the location 0379, which is P, change to 24. The location 0377, immediately after hex code 60, is FACT. Use the cursor controls to change it from 00 to 05. Press RETURN, cursor down to G 033A and press RETURN, again. Relist the memory locations 033A, 037A and note that P (0379) now contains the number 20, which is the last two digits of 5! or 120. Code X will return control to BASIC.

It is fairly simple to compare the assembled code in Program 3 with the assembly language program. Looking at the line.: 033A F8 20 59 03 AD 77 03, we may interpret the codes as F8=SED, 20=JSR, 59 03 is address 359 where subroutine INITP starts, AD=LDA, and 77 03 refers to location 377, which is FACT.

This article has so far described a simple assembly language program which computes factorials. Since the routine is only single precision, the largest factorial that can be handled is 5! or 120. The reader will have noticed that subroutines were extensively used; although this slows down the execution time, it will now make program revision much simpler.

The rest of the article describes the modifications necessary to incorporate multiple precision

PROOFREADING SOFTWARE

OFFICIALLY APPROVED BY COMMODORE

NOW ... A 50,000 WORD DICTIONARY

largest capacity available for Commodore Word Processors

Now you can rapidly eliminate misspellings from your word processing text. Spellmaster can quickly pay for itself in reduced clerical time spent on correcting misspellings.

SPELLMASTER

by Dwight Huff & Joe Spatafora

Features include:

50,000 Word Capacity. Spellmaster (CBM 8050 version) is delivered with a 36,000 word dictionary, allowing the user to add up to 15,000 words.
Direct Screen Editing of Mistakes. Words "suspected" to be incorrect are displayed in "reverse video" on the screen; simply correct the mistakes and resave your corrected file.
Add Words with a Single Keystroke! Spellmaster makes it easy to Permanently Add any correctly spelled word in your text to your User Dictionary.
Menu-Driven and User Friendly. The average user can learn to operate Spellmaster in 30 minutes.

Machine Language Speed allows a large word processor textfile to be Proofread in 2 minutes or less. Proofreading of linked files is easy and automatic.
Legal and Medical Dictionaries are available to add 4500 technical terms to the dictionary.
Compatible with the Commodore 8032, 4032, 8096, SuperPET, & the Commodore 64. Operates with the Commodore 2040, 4040 and 8050 Disk Drives.
Complete Documentation is provided to guide you through Spellmaster on a "step by step" basis.

Spellmaster $199 Legal/Medical Modules $75

SPELLMASTER SYSTEMS SOFTWARE
6219 Thirteenth Avenue South
Gulfport, Florida 33707
(813) 347-6733

Dealer inquiries are invited.

"Finally a decent spelling program for the Pet!
If you do much word processing ... you need Spellmaster."
"HIGHLY RECOMMENDED" Jim Strasma, *Editor, Midnight Software Gazette, & The (PET) Paper*

BATTERIES INCLUDED

village by the grange, 71 mccaul st. (f6) toronto m5t 2x1 telephone 596-1405

ARBITER 1.4 MULTI-USER DISK SYSTEM FOR COMMODORE 4.0 COMPUTERS

OVER THREE HUNDRED IN USE ACROSS ONTARIO

Since September 1981 **BATTERIES INCLUDED** has been installing the ARBITER system in classrooms of Commodore BASIC 4.0 computers. The computers are connected to CBM Disk Drives and printers. All users have access to all disk drives and printers plus a host of commands to make this system configuration really usable!

THE ARBITER 1.4 SYSTEM IS READY TO GO!

FEATURES

1) Easy installation.
2) Uses no RAM or Utility Sockets.
3) Up to 32 computers in one system.
4) System self initializes on power up.
5) Operation is completely transparent to the user.
6) Extended commands allow a friendly multi-user environment.
7) System design virtually eliminates interleaved printer output.

$150.00 per unit

SPECIAL COMMANDS

@S – Allows students to protect files with a five character password. A three character user ID is forced into the file name.

@L – Allows the students to load protected files if the password code is known.

LISTC – Used to produce program listings with a Commodore printer. Clumsy OPEN, CMD, LIST, PRINT#, CLOSE sequence not needed. It overcomes the listing problems found on other multi-user hardware systems.

LISTP – Used to get program listings on systems which have an ASCII printer. The cursor control characters are expanded and displayed in brackets. e.g. <home>

ALL FILE TYPES ARE SUPPORTED – During relative or sequential file access a delay has been built in so the computer will retain control of the system until the file is closed.

TEACHER UTILITY – A utility is supplied on disk to allow the teacher to produce a hardcopy listing and output from any of the protected or unprotected files selected. Once the files are chosen from the disk directory the teacher may do other tasks while the job is completed.

IF YOUR CLASSROOM WAS DESIGNED TO TEACH COMPUTER LITERACY OR STRUCTURED BASIC THEN THIS SYSTEM WAS DESIGNED FOR YOU.

Arbiter and Arbiter 1.4 are copyrights of Batteries Included.

and a way of linking the machine code to a simple BASIC program which displays the results in a more palatable form.

We shall extend the precision to 40 bytes (or 80 significant decimal digits) merely by altering the subroutines. The mainline program is unchanged. Eighty-digit precision was chosen as being the maximum that could be fitted into the memory available in the second cassette buffer.

The variables, P and M, should now be considered as 40 consecutive bytes each, rather than as the single byte allowed in the previous subroutines. Each of the bytes in P can be addressed as P+0, P+1, P+2...P+39, and similarly with M. In order to avoid massive duplication of code, a technique called "indexed addressing" will be used.

Consider the subroutine INITP, which originally had the function of initializing P to a value of one. In the multiple precision scheme, we shall need to place 00 in locationns P+0, P+1...P+38 inclusive, and 01 in the least significant byte P+39. In this way P is initialized to 000000000000 000000000000000000000000000000000000000000000 00000000000000000000001.

A loop is used to place the zeros in the first 39 bytes, together with the instruction STA P,X. This instruction copies the contents of the accumulator into location P+X of the variable P, where X is the contents of the X Index register. If X is initialized to 38, and the accumulator contains zero, then the instruction STA P,X will place zero in the location P+38. The value of X can then be decremented (reduced by one) each time around the loop so that P+37, P+36, etc., will each have zero copied into them.

```
INITP  LDX #39    Place 39 into the X index register.
       LDA #0     Place zero into the accumulator.
ONE    DEX        Decrement the X register (first value=38).
       BMI FIN    If the X register contents is less than zero,
                  branch to label FIN.
       STA P,X    Store zero in byte P+X.
       JMP ONE    Go to label ONE.
FIN    LDA #1     Place one in the accumulator.
       STA P+39   Store one in the byte P+39.
       RTS        Return.
```

Subroutine ZERM sets the value of M equal to zero and so must be modified to place 00 in each of the bytes M+0, M+1, M+2...M+39.

```
ZERM   LDY #40    Place 40 into the Y index register.
       LDA #0     Place zero into the accumulator.
TWO    DEY        Decrement the Y register (first value=39).
       BMI RET    Branch on a negative value of Y to label RET.
       STA M,Y    Store zero in byte M+Y.
       JMP TWO    Go to label TWO.
RET    RTS        Return.
```

Subroutine ADD first loads the accumulator with the least significant byte of M (M+39). The least significant byte of P (P+39) is added to it, and the carry flag is set if the result exceeds 99. The sum is then placed in byte M+39, replacing the previous contents. The process is then repeated with bytes M+38 and P+38, except that the "carry" will be added in if appropriate. The addition of corresponding bytes continues for P+37, P+36, etc., all the way down to P+0.

```
ADD    LDY #40    Place 40 in the Y register.
       CLC        Clear the carry flag prior to addition.
LOOP   DEY        Decrement the Y index register (first
                  value=39).
       BMI DONE   Branch on a negative value of Y to label DONE.
       LDA M,Y    Place the contents of byte M+Y in the
                  accumulator.
       ADC P,Y    Add (with carry) the contents of P+Y to
                  accumulator.
       STA M,Y    Place the sum in byte M+Y.
       JMP LOOP   Go to label LOOP.
DONE   RTS        Return.
```

Subroutine MTOP transfers the contents of all 40 bytes of M to the corresponding 40 bytes of P.

```
MTOP   LDX #40    Place 40 in the X register.
SIX    DEX        Decrement the X index register (first
                  value=39).
       BMI FIVE   Branch on a negative value of X to label FIVE.
       LDA M,X    Place byte M+X in the accumulator.
       STA P,X    Copy the contents of the accumulator into
                  byte P+X.
       JMP SIX    Go to label SIX.
FIVE   RTS        Return.
```

These subroutines, together with the original mainline program, can be assembled and run using the resident machine language monitor. An assembled version is listed in Program 4, and it can be entered using the monitor. Location 039C contains FACT and this is set to a value of six in Program 4. The 40 bytes from 039E to 03C5 are the variable P. If the program is run with the instruction G 033A and memory listed using M 039E, 03C5, then the answer 720 can be seen in the least significant bytes.

The required factorial should be converted to hex and placed in location 039C prior to running the program. If 20! is to be computed, then hex value 14 (16+4) is placed in this byte. The answer will appear in decimal form when M 039E, 03C5 is listed. For 20!, the result is 2432902008176640000 and the largest factorial which can be displayed fully is 58! (hex 3A). If it is required to link the program to BASIC, the BRK instruction (00) must be replaced by RTS (60) in location 0358. You can then save the routine using the monitor and write a BASIC program which calls it using SYS 826.

Program 5 is a BASIC listing which obtains the machine codes from data statements and POKEs them into the second cassette buffer. Note that each hex code has been converted into its decimal equivalent as required by the POKE instruction. The second portion of the program requests the required factorial and prints the answer in two lines on the screen.

Should greater precision be required, the

VERSACALC

VERSACALC
VERSACALC
VERSACALC
VERSACALC
VERSACALC
VERSACALC
VERSACALC
VERSACALC
VERSACALC

TUTORIAL
UTILITIES
AND FILE MANAGER

Everything you always wanted to do with Visicalc, (but thought you couldn't).

YES! We said "SORT VISICALC"!

NOW YOU CAN:

- * SORT a Visicalc screen on any column, ascending or descending; all related formulas and labels are sorted too.
- * put the entire disk CATALOG on the screen at once!
- * easily do Year-To-Date accumulations!
- * "pound" formulas to expose the full formulas in place on the screen![1]
- * append two Visicalc files![1]
- * print the contents of a /SS file!
- * print the contents of a /PF file!
- * AND our EASEL BINDER is so nice that you will put your other manual in it!

If you use Visicalc™ but you are bumping into its limitations, then you need Versacalc™! Versacalc runs within Visicalc but uses no extra memory; in fact, it effectively increases memory by letting you call in modules from disk as needed.

A Tutorial section makes clear such features as @LOOKUP, DIF, @NA, @ERROR, which are not well explained in the Visicalc manual.

A Utilities section makes it easy to create your own menu-driven modules which condense hundreds of commands into four keystrokes. You can build in sophisticated error checking (e.g. Is the input value between certain limits?). Now it is possible for people untrained in Visicalc to perform the weekly updating without constant instruction.

Apple II*	$100
PET & CBM*[1]	125
IBM PC[1]	150
Apple III[1]	150

*specify DOS

Anthro-Digital Software
P.O. Box 1385
Pittsfield, MA 01202
413-448-8278

Apple II is a trademark of Apple Computer Inc
Versacalc is a trademark of Versacalc Enterprises, Inc
Visicalc is a trademark of Visicorp Inc

Announcing . . . THE WHOLE PET CATALOG

A two year compendium of the **Midnite Software Gazette** and other resources for users of Commodore, CBM, PET, and VIC computers.

*The **Whole PET Catalog** contains:*

- **Over 500 independent reviews of commercial products.**
- **Over 700 education programs reviewed & organized by course.**
- **Over 200 reviews of free games.**
- **Information on over 1,800 free programs.**
- **Information about dozens of PET and VIC user groups.**
- **Many pages of hints and helps for all Commodore users.**
- **"Commodore's Family Tree", by Jim Butterfield.**
- **Completely reorganized and greatly expanded edition.**
- **Typeset and printed full-size on bond paper.**
- **In all, 320 pages of useful information.**

If you've seen **Midnite** before, directly or reprinted in the **TorPET** newsletter, here it is, complete in one volume, completely reorganized for easy reference, and greatly expanded with new information from members of the Toronto PET Users' Group.

"I still use my copy of **The Best of the PET Gazette** regularly. It was a treasure trove of information, and a great bargain for $10 three years ago. I hope you'll feel the same way about my **Whole PET Catalog** someday. Considering that it's three times as long, completely organized by topic, printed on bond paper instead of newsprint, typeset instead of dot matrix printed, bound instead of stapled, and still only $10, in spite of inflation, I'm sure you will." *—Jim Strasma, Contributing Editor, **Micro***

Whole PET Catalog $8

252 Bethlehem Pike
Colmar. PA 18915

215-822-7727

A B Computers

WRITE FOR CATALOG
Add S1 25 per order for shipping We pay balance of UPS surface charges on all prepaid orders Prices listed are on cash discount basis Regular prices slightly higher Prices subject to change

code will have to be assembled into the high end of RAM memory, so that a BASIC calling program can be used. The end of BASIC pointer can be lowered and the precision extended up to 255 bytes or 510 digits. I hope that readers will find this article a simple way of getting their feet wet exploring 6502 machine and assembly language.

Program 1.

```
5  P=1
10 INPUT N
15 P=P*N
20 N=N-1
25 IF N<>0 THEN 15
30 PRINT P
35 END
```

Program 2.

```
5  P=1
10 INPUT N
15 GOSUB 100
20 N=N-1
25 IF N<>0 THEN 15
30 PRINT P
35 STOP
100 C=N
105 M=0
110 M=M+P
115 C=C-1
120 IF C<>0 THEN 110
125 P=M
130 RETURN
135 END
```

Program 3.

```
033A F8 20 59 03 AD 77 03 8D
0342 78 03 20 5F 03 20 65 03
034A CE 78 03 D0 F8 20 70 03
0352 CE 77 03 D0 E7 D8 00 A9
035A 01 8D 79 03 60 A9 00 8D
0362 7A 03 60 18 AD 7A 03 6D
036A 79 03 8D 7A 03 60 AD 7A
0372 03 8D 79 03 60 04 00 00
037A 00 00 00 00 00 00 00 00
```

Program 4.

```
033A F8 20 59 03 AD 9C 03 8D
0342 9D 03 20 6C 03 20 7A 03
034A CE 9D 03 D0 F8 20 8D 03
0352 CE 9C 03 D0 E7 D8 00 A2
035A 27 A9 00 CA 30 06 3D 9E
0362 03 4C 5D 03 A9 01 8D C5
036A 03 60 A0 28 A9 00 88 30
0372 06 99 C6 03 4C 70 03 60
037A A0 28 18 88 30 0C B9 C6
0382 03 79 9E 03 99 C6 03 4C
038A 7D 03 60 A2 28 CA 30 09
0392 BD C6 03 9D 9E 03 4C 8F
039A 03 60 06 00 00 00 00 00
```

Program 5.

```
10 DATA 248 , 32 , 89 , 3 , 173 , 156 , 3 , 141
15 DATA 157 , 3 , 32 , 108 , 3 , 32 , 122 , 3
20 DATA 206 , 157 , 3 , 208 , 248 , 32, 141 , 3
25 DATA 206 , 156 , 3 , 208 , 231 , 216 , 96 , 162
30 DATA 39 , 169 , 0 , 202 , 48 , 6 , 157 , 158
35 DATA 3 , 76 , 93 , 3 , 169 , 1 , 141 , 197
40 DATA 3 , 96 , 160 , 40 , 169 , 0 , 136 , 48
45 DATA 6 , 153 , 198 , 3 , 76 , 112 , 3 , 96
50 DATA 160 , 40 , 24 , 136 , 48 , 12 , 185 , 198
55 DATA 3 , 121 , 158 , 3 , 153 , 198 , 3 , 76
60 DATA 125 , 3 , 96 , 162 , 40 , 202 , 48 , 9
65 DATA 189 , 198 , 3 , 157 , 158 , 3 , 76 , 143
70 DATA 3 , 96
75 FOR K = 826 TO 923
80 READ A:POKE K,A
85 NEXTK
90 :
95 REM BASIC CALLING PROGRAMME.
99 :
100 INPUT"FACTORIAL";N
105 POKE 924,N
110 SYS826
115 FOR K = 0 TO 39
120 A=PEEK(926+K)
125 H=INT(A/16)
130 L=A-H*16
135 A=10*H+L
140 IF A<10 THEN A$="0"+RIGHT$(STR$(A),1):GOTO 150
145 A$=RIGHT$(STR$(A),2)
150 S$=S$+A$
155 NEXT K
160 PRINT S$:S$=""
165 GOTO 100
170 END
```

©

Programming The PET/CBM

by Raeto Collin West

The book described by Jim Butterfield as

"...unquestionably the most comprehensive and accurate reference I have seen to date..."

The Reference Encyclopedia for Commodore 2000, 3000, 4000, and 8000 series computers and peripherals.

Here's just a sample of reviewer and reader reaction:

From reviewers:

Educational Computing Review by Stephen Potts
"Of all the books I have read on the PET this book *Programming the PET/CBM* by Raeto West must rank as one of the most comprehensive and readable accounts on the PET that I have ever had the pleasure to see...

"If you wish to get more from your PET than arcade games and simple teaching programs then this book is a must for your bookshelf. It does not matter whether you run on BASIC 1, BASIC 2, or BASIC 4 since all routines are supplied with addresses and changes to make them run on any machines wherever possible...

"...this book, with its lucid explanations of the PET, its useful routines and programming hints, is an essential purchase."

IPUG Magazine Review (British PET User Group) by Ron Geere
"This publication represents over a year's intensive research ... and the resulting product is a valuable work of reference. A tremendous amount of useful information has been packed in this 500+ page work at which I was so over-awed that I did not know how to start this review at first...

"This book is a must for every CBM/PET user."

From readers:

"...a book the average to advanced user cannot afford *not* to possess..."

"My copy of your '*Programming the PET/CBM* has been in daily use for nearly a month and I am finding it totally addictive, suffering severe withdrawal symptoms whenever I try half-heartedly to move on to other reading matter. It is without doubt the best book on its subject available today..."

"I have recently acquired a copy of your book *Programming the PET/CBM* and must congratulate you on its concept and on packing in so much detail. It's so very much better than anything I have had up to now that it'll be my constant reference manual."

"I have received my copy of *Programming the PET/CBM* by Raeto West and I have recommended it to several of my students. This book is so valuable that I cannot now afford to be without it."

Published exclusively in North America by **COMPUTE! Books**. The book is an astonishing reference manual of useful information. Contents include this and much more:

1 **Introduction and overview:** Plan of the book, sources of information, features and chronology of CBM hardware.
2 **BASIC and how it works:** Storage of BASIC and its variables; tokens, pointers, syntax; optimising BASIC.
3 **Program and system design:** Capabilities of the equipment; charts, algorithms, space, timing.
4 **Effective programming in BASIC:** Seventeen examples, including subroutines, dates, DATA, INPUT, rounding.
5 **Alphabetic reference to BASIC keywords:** Full descriptions, with examples, of all keywords, with methods for adding additional commands not present in CBM BASIC, e.g. AUTO, DEL, OLD, POP, PRINT USING, SORT, VARPTR.
6 **Disk drives:** Descriptions of operation and workings of disk drives, with BASIC and machine-code examples; bugs.
7 **Alphabetic reference to disk BASIC commands:** BASIC 4 disk commands with examples and notes.
8 **Other peripherals and hardware:** Tape storage and handling; printers; modem; keyboard; EPROMs; reset switches.
9 **Graphics and sound:** Tables of CBM characters; CRT chip; animation, bar plots, 80 by 50 etc.; user-port sound.
10 **The transition to machine-code:** Introductory concepts; a BASIC monitor; use of MLM, Supermon, Extramon; easy examples.
11 **More 6502 machine-code:** 6502 hardware features; eighteen common problems in programming; debugging.
12 **Alphabetic reference to 6502 opcodes:** Examples, notes, and explanations on each opcode from ADC to TYA.
13 **Using ROM routines:** IRQ, NMI, RESET; the Kernel; examples – modifying LIST; ordinary and relocating loaders.
14 **Effective 6502 programming:** Assemblers; CHRGET and wedges; PIAs, VIA, IEEE; common mistakes.
15 **Index to BASIC ROMs and RAM:** Memory map of RAM and ROM, detailing and comparing BASICs 1, 2, and 4.
16 **Mathematical programming:** Precision; equations; statistics; simulation; finance; calculus; machine-code.
17 **Programming in business and education:** Examples, applications and pitfalls in business and education.
Appendices: 6502 reference charts; Supermon listings; ASCII; glossary

Plus many programs, diagrams and charts. Paperback, 504 pages. ISBN 0 942386 04 3. **$24.95.**

To Order
Programming The PET/CBM
Call
TOLL FREE 800-334-0868
In NC Call 919-275-9809
Or send coupon to
COMPUTE! Books, P.O. Box 5406, Greensboro, NC 27403

In England, order from Level Limited, P.O. Box 438, Hampstead, London, NW3 1BH. Price in England is £14.90, including P & P.

Please send ________ copy (copies) of **Programming The PET/CBM** at $24.95 each. (In the US and Canada, add $3 shipping and handling. Outside North America add $10 for air mail delivery, $3 for surface delivery).

All orders must be prepaid in US funds (money order, check, or charge).

☐ Payment Enclosed
Please charge my ☐ VISA ☐ MasterCard ☐ Am. Express
Account No. Expires /
Name
Address
City State Zip
Country
Allow 4-6 weeks for delivery. Foreign surface delivery allow 2-4 months.

Simple OSI Graphics

Donald Pitts

OSI beginners can get started with graphics and games by following the suggestions in this tutorial on memory mapped graphics for the C4P and C1P.

The new OSI owner need not shy away from graphics simply because there are no special commands for its use.

Many beginning programmers might not consider using graphics, because of the large number of PEEKs and POKEs required. My object here is to help you visualize the way in which graphics works so that the initial barrier will be broken, enabling you to better utilize the potential of your computer.

First, look at the CRT and envision it as separated into little boxes similar to those on graph paper. In each box you may put one symbol from a table of 255 symbols, ranging from numbers and letters to cars and airplanes. Suppose that a symbol is placed in a box that previously contained a different symbol. The new symbol appears, and all traces of the other symbol are lost. You may erase a symbol in a box by putting a blank symbol there.

Now that you have a basic understanding of the concepts involved, we can begin to discuss the actual commands that can be used in graphics. This is where the POKE command comes into play. The POKE command is used essentially as a statement that says "Put this symbol in that box." The POKE command generally takes this form:

```
POKE /address/ , /ASCII number of character/
```

The address is usually a number from 0 to 65,535 that indicates a specific place in memory. The OSI screen is *memory mapped,* meaning that the screen display is a representation of the contents of a certain area in memory.

The way in which the memory is interpreted is straightforward. The first byte of the screen memory is shown on the upper left corner of the screen. The consecutive bytes move their way across the upper row from left to right. The byte following the one in the upper right of the screen is represented as the box just immediately below the box in the upper left corner. Thus, the memory is shown in a manner resembling the way you might read a page in a book. (See Figure 1.)

Figure 1.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31											

A theoretical 14-column screen in which the numbers within the boxes represent the byte's position in screen memory

Now for some tangible evidence that what I have been talking about works on your computer. Program 1 fills all of the screen's memory with a single symbol. It moves slowly from one box to another and puts the character into each box. Type it in and RUN it to watch it work.

ASCII And POKE

By now either you already know what an ASCII number is, or you are rather perturbed with me for not defining it for you. It is a standard way of representing characters as numbers. ASCII stands for American Standard Code for Information Interchange. Some quick examples are "A"-65, "1"-49, "P"-80, and "*"-42.

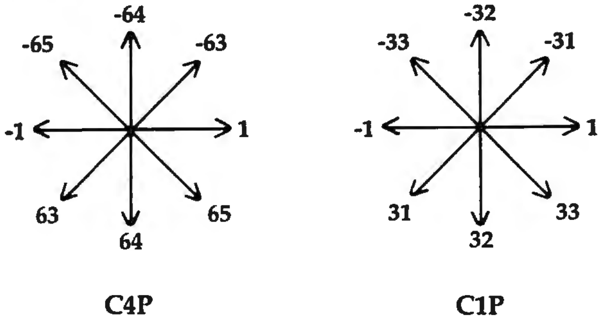
Another statement that is practical in graphics is the PEEK command. This acts similar to a window in which you can see what is displayed in a certain memory location. It has the form:

```
X=PEEK ( /address/ )
```

X could be any variable, and an address such as 54016 could be used. Please note that the parentheses are part of the command and are necessary to avoid a syntax error. After the statement is executed, the variable on the left will contain the ASCII number of the symbol located in the address specified. The realistic uses of PEEK range from checking to see if a tank has been blown up to detecting whether a ball has hit the boundary. Program 2 will first place on the screen the number of men that you specify and then will count how many are on the screen by searching every location in the screen memory for the symbol 240.

Suppose the variable X is assigned to be the location of a car that you have just POKEd on the screen. Now, how do you create the illusion of movement? First we must erase the old car with the statement POKE X,32. The number 32 is the ASCII code for a blank. You must change X to the new location of the car on the screen and then POKE X, 0 since 0 is the number for a car. When you change the car's position, you simply execute the statement X=X+Z, where the variable Z depends upon the direction you wish to move and whether you are using a C1P or a C4P. Here are the values:

Figure 2.



C4P C1P

Thus, if we wanted to move down, the statement would be X=X+64 for a C4P and X=X+32 for a C1P. Program 3 uses these constants from their tables to move a cross in random directions. The program does not check for the edges of the screen to see if the cross has travelled past its boundaries, so if you don't press CTRL-C before it goes far, the program might hang up.

Program 1.

```
10 REM FILL SCREEN WITH AIRPLANE
20 P=PEEK(57088):REM LOOK AT KEYBOARD
30 ST=53315:EN=54205:REM C1P VALUES
40 IFP<129THENST=53376:EN=55295:POKE56832,1:R
   EM C4P VALUES
50 FORLO=STTOEN:POKELO,236:NEXT
60 GOTO 60
```

Program 2.

```
10 REM PUT SPECIFIED NUMBER OF MEN ON SCREEN
15 REM AND COUNT THEM. THERE IS AN INCREASING
     AMOUNT OF ERROR
17 REM AS THE NUMBER OF MEN IS INCREASED DUE
   TO THE FACT THAT
18 REM THE MEN ARE PUT IN THE SAME BOX AS ONE
     ANOTHER.
20 SU=0:ST=53315:EN=54205:X=24:Y=28
30 IFPEEK(57088)<129THENST=53376:EN=55295:X=6
   4:Y=30:POKE56832,1
40 INPUT"NUMBER OF MEN";ME:FORCO=1TO30:PRINT:
   NEXT
50 FORCO=1TOME:POKEST+INT((EN-ST)*RND(1)),240
   :NEXT
60 FORCO=STTOEN:IFPEEK(CO)=240THENSU=SU+1
70 NEXT:PRINT"THERE WERE";SU;"MEN ON THE SCRE
   EN."
```

Program 3.

```
10 REM MOVE CROSS
20 FORX=1TO8:READP(X):NEXT:LO=54016
30 IFPEEK(57088)>128THENFORX=1TO8:READP(X):NE
   XT:LO=53775
40 DATA1,65,64,63,-1,-65,-64,-63
50 DATA1,33,32,31,-1,-33,-32,-31
55 FORX=1TO30:PRINT:NEXT
60 POKELO,219:FORX=1TO30:NEXT:POKELO,32
70 LO=LO+P(INT(RND(1)*8+1)):GOTO60
```

OLYMPIC SALES CO
Telex: 67 34 77 Toll-Free Phone Orders:
Toll-free (in CA) 800-252-2153 800-421-8045 (out of CA)
Order Desks open 6 days a week! 7:00 AM to 6:00 PM Mon-Sat
P.O. Box 74545 216 So. Oxford Ave. Los Angeles, CA 90004
Phone: (213) 739-1130 Cable: "OLYRAV" LSA

We carry close to $5,000,000 inventory at all times. Corp. accts. invited.
Good subject to availability; this ad supercedes all previous ads; fob our warehouse; prices subject to change without notice; not responsible for typographical errors; all orders subject to verification; minimum shpg & hndlg $5.95. Send $2 (or $5 foreign) for our famous catalog

APPLE COMPUTER
48K Plus 1069.95
Disk dr w/controller 494.95
Disk dr - no controller 419.95

Texas Instruments Home Computer
TI-99/4A
Now Only 16K
$100.00 REBATE FROM TI!
NOW!
$199.95 AFTER MFG'S REBATE—you pay OSC $299.95, TI rebates you $100.
(offer good thru 1/31/83)
Plus FREE $50 RF Modulator with purchase of TI-99/4A
Call & ask about FREE Speech Synthisizer OFFER!
10" color monitor high res 339.95
Extended Basic 75.00
Speech synthesizer 129.95
Telephone coupler (modem) 189.95
Printer (solid state) 319.95
TI-LOGO 99.95
TI EXPANSION BOX SYSTEM
Peripheral expansion box 199.95
RS 232 card 139.95
Disk control card 199.95
Mem. exp. 32K card 239.95
P-code card (1270 req) 199.95
Disk memory drive 379.95
An enormous amount of peripherals, accessories & software, at great prices
Programmable TI-59
Your Cost: $169.95 plus-$20.00 rebate from TI plus Free Library
TI LCD Programmer 59.95

HEWLETT PACKARD LCD
HP-16C Computer Scientist— for Programmers & Digital Designers 127.50
WE ARE AUTHORIZED FULL LINE HP Dealers.

FRANKLIN ACE 1000
64K Computer, Apple Compatible uses all Apple software, peripherals & accessories.
ACE 1000 including disk drive w/ controller plus 'ACE Writer' word processor software. RE:$1776.00
Your Cost:$1299.95

TIMEX/SINCLAIR
TS1000 2K Computer 99.95
TS1600 Memory expansion 49.95
MEMOTECH Memopak Peripherals
MT64K 64K $179.95
MT32K 32K 109.95
MT16K 16K 59.95
More peripherals available

VICTOR YOUR COST: $395.00
VICTOR 5080 80 Column Printer
A real work horse! 100 cps, graphics, buffer, 4 interfaces including HP-IB
Retail:$995.00 Wholesale:$670.00
Fully guaranteed by Victor, in business since 1918

ATARI 800 — 48K
It is 100% Atari $499.95
IN STOCK
410 Program recorder 79.95
810 Disk drive 449.95
850 Interface module 189.95
830 Acoustic modem 169.95
Printer Centr. 737/739 499.95

$199.95 16K ATARI 400

commodore VIC-20
5K Personal Computer (Expands to 32K) Works with any TV!
$169.95
COMMODORE VIC-20
1530 Datasette rec. 59.95
1541 Disk drive 339.95
1525E Printer, great unit 339.95
1600 Phone modem 99.95
We carry an enormous amount of software & games for the VIC-20.
WE ARE A FULL-LINE COMMODORE DEALER & CARRY IN STOCK ALL COMMODORE MODELS MOST OF THE TIME.

olivetti "PRAXIS 35" Your Cost $429.95
ELECTRONIC TYPEWRITER
Interchangeable 'Daisy Wheel' type element, 3 sizes-Pica, Elite & Micro plus cartridge ribbon & more!

BASF Chrome Video Tapes
T 120 VHS 2-4-6-hr 10.95
L 750 Beta 2-4-6-hour 10.95
L 500 Beta 1-2-3-hour 7.95

MULTITECH Computer $349.95
64K Apple compatible with tape software, available with Apple compatibility with diskette in January 1983, great unit. Plenty of educational & other software.
Full size keyboard $49.95
With Chinese lang. $479.95
5¼" Disk drive w/cont. 269.95
150 line p/m ptr 179.95
Cassette recorder 69.95
Sound generation board & speech synthesizer 129.95

NEW COMEX Printer
Similar to the Epson 80 FT Has 80 cps, tractor feed, block graphics, great unit $399.95

WE CARRY THE FOLLOWING MONITORS
BMC as low as $89.95
SANYO all models
COMREX all models
AMDEK all models
NEC all models
Texas Instruments & more!

PRINTERS . . .
Epson, the whole line
CODEX
OLIVETTI
C ITOH
NEC
COMREX
OKIDATA
VICTOR
DIABLO
ANADEX
ANADEX
and more. . .

COLECOVISION
YOUR COST $199.95 including FREE Donkey Kong Cartridge.
ARCADE QUALITY TELEVISION GAME
from COLECO

DISKETTES Box of 10
Verbatym SS SD 40 track 29.95
3M SS DD 744D 29.95
Maxell SS DD Soft sect 34.95
Dysan 104 Soft sect 44.95
BASF Soft sectored 28.95
OMNI SS SD 19.95
Head cleaning kit 11.95
Refill 19.95

COMPUTER CALCULATORS

Jim Butterfield, Associate Editor

Number conversion, masking, even translations of floating point variables are possible when you use the more sophisticated "programmer's calculators." Here are some techniques for using various types of calculators when your computer is doing other things.

Why have a calculator when you already have a computer? Indeed, why would you need a special calculator when the simple four-function units will do all the arithmetic you might need?

The answer is: convenience. It's sometimes handy to be able to zip through a quick calculation and get the results in binary, hexadecimal, octal, or whatever. If your computer isn't handy (or someone is playing space invaders on it at the moment), there are questions you can work through if you have a calculator to help.

But make no mistake about it: the sophisticated machines are not indispensable. You can do the job with no calculator at all. You can use a simple four-function unit. You can do useful calculations with a simple programmable unit, entering programs to do the work. Or you can get a "programmer's calculator."

No Calculator

Honest, there are still people out there who add and subtract – and even multiply and divide – without a calculator of any sort. There are programmers who know how to add and subtract in hexadecimal or octal. It's probably good for you to know number systems from firsthand experience.

For example, to convert a decimal number to hexadecimal, divide the number repeatedly by 16. The remainder from each division is a hexadecimal digit; you'll generate the digits from right (low order) to left. So 200 decimal is converted as follows: 200 divided by 16 gives 12 with a remainder of 8. Our last hex digit is 8. Continuing: 12 divided by 16 gives nothing with a remainder of 12. Our next hex digit is 12, which we write as C. The hex value: C8.

Going the other way – from hexadecimal to decimal – is just as easy. We take the digits from the left. After we pick a digit, we see if there are any more. If so, we multiply by 16 and add the value of the next digit. So hex C8 becomes 12x16 +8 or 200 decimal.

On The Computer

It's not hard to write a program to do the conversions. The problem is this: we usually have a program half-written on our machine at the moment we wish to convert something. Loading a program is out; we'd lose our work in progress. For this reason, we usually use direct statements.

From hex to decimal, we usually multiply by powers of 16. Thus, the hex address 027A is evaluated by the direct statement PRINT 0*4096 +2*256 +7*16 +10. 4096 is 16 to the third power; 256 is 16 squared.

From decimal to hex, there's no fixed method. Some people divide the number by 4096 to get the first digit. For example, 59468 divided by 4096 yields 14.5185547 – 14 is a letter E, our first digit. After that, there are a variety of methods: subtracting out the high amount (59468 - 14*4096) is one way, and using the fractional value (.5185547 x 16) is another. In either case, a little work starts to reveal the following digits.

The Four Function Calculator

Most calculators aren't very good at giving you remainders after a division. They will happily tell you that 59486 divided by 16 is 3716.75, rather than that it gives 3716 with a remainder of 12. For this reason, many users like to work decimal to hex conversions from the high-order end.

For a 16-bit number (0 to 65536), divide by 4096. Repeat four times: note the integer value, which is your hex digit; subtract that value to give a fraction; and multiply by 16.

So for 59468 we divide by 4096 to get 14.5185547. Subtract the 14 – that's E, our first digit – and multiply by 16 to get 8.296875. Subtract the 8 – now we have E8 as the start of our hex value – and multiply by 16 to get 4.75. Subtract the 4 – our number is almost complete at E84 – and multiply by 16 one last time. Our final digit will be close to 12, hex C, so we may write our final hexadecimal value as E84C.

Micro Power Bench™

NEW!

- Single Switch Control of CPU and Peripherals
- Built in circuit breaker protects your system
- Four power expansion outlets
- Options: Power Surge Protect and Cooling Fan
- Compatible with IBM, APPLE, TRS-80 and others

SAVE! SAVE! ONLY $79^00

Order Direct

800-343-4311

Master Charge and Visa Accepted

CAB-TEK, Inc.

Riverside St., Nashua NH 03062

CIVILIZING COMPUTERS

MX 80

ACOUSTIC ENCLOSURE $99!

DEALER INQUIRIES INVITED

P.M.P. 2000™

Property Management Program

By T & F SOFTWARE COMPANY

Turn your computer into a property manager with great programs like APARTMENT STATUS REPORT, TENANT STATUS REPORT, CASH RECEIPTS WORKSHEET, INVOICING, DISTRIBUTION OF EXPENSES/BANK ACCOUNT STATEMENT and INCOME/EXPENSE SCHEDULES. P.M.P. 2000 allows you an efficient and low cost way to take care of all your property management needs.

Retail $219.95

Template for the VisiCalc® Program

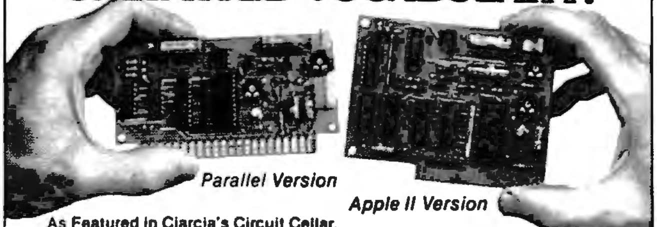
Available for Atari® 400/800 32K & Apple® II/II plus 64K

Check your local dealer or send check or M.O. with $2.00 postage and handling. California residents add 6½% sales tax.

T & F SOFTWARE COMPANY
A Talcove & Familian Company
10902 Riverside Drive • North Hollywood, CA 91602
(213) 501-5845

©1982 T & F Software Co. Atari is a registered trademark of Atari Computers Inc. Apple is a registered trademark of Apple Computers Inc.

SWEET-TALKER, IT GIVES YOUR COMPUTER AN UNLIMITED VOCABULARY.



Parallel Version

Apple II Version

As Featured in Ciarcia's Circuit Cellar, Byte Magazine, September 1981.

The Sweet-Talker voice synthesizer allows you to add speech of unlimited vocabulary to your computer. Utilizing the Votrax SC-01A chip, you can output any message by programming individual phonemes. Comes in two versions; one plugs directly into your Apple II, the other connects to any computer with an 8-bit parallel printer port. + 12 volts and + 5 volts required for parallel board.

- Contains 64 different phonemes accessed by a 6-bit code.
- Automatic and manual inflection modes.
- Parallel port driven or plug-in compatible with Apple II.
- Super text-to-speech algorithm on disk for Apple II. Makes Sweet-Talker equivalent to units 3 times the cost.
- On board audio amplifier
- Sample program on cassette with Apple II board.
- Optional power supply for parallel board.

ST01	Sweet Talker Parallel Port Board A & T	$139.00
ST02	Sweet Talker Apple II plug in board	149.00
ST06	Text-to-Speech algorithm on disk for Apple II	35.00
SC01A	Votrax Speech Synthesizer chip	70.00
	5 or more	55.00 each
UPS01	Universal Power Supply-A & T	35.00

Add $2.00 for shipping & handling.

To Order: Call Toll Free 1-800-645-3479
(In N.Y. State Call: 1-516-374-6793)
For Information Call: 1-516-374-6793

MICROMINT INC.
561 Willow Ave.
Cedarhurst, NY 11516

MICRO MINT

Largest US Distributor of Votrax Chips

NEW GENERAL LEDGER SYSTEM for ATARI* 800

$149^95

Microsoft Base

- CHART OF ACCOUNTS
- TRIAL BALANCE
- INCOME STATEMENT
- BALANCE SHEET

$219.95 - includes Microsoft Compiler

VISA - MASTER CHARGE - CHECK - MONEY ORDER

F.C.C. inc.

4712 CHASTANT ST.
METAIRIE, LA. 70002
(504) 454-2421

*Trademark ATARI, INC.

Get More From Your PET/CBM!

NEW! • ***DISK-O-MATE***™ (Write for Price)

A must for 2040/4040 disk owners. Write protect indicators/switches, power indicator and error beeper.

• ***"Real World" SOFTWARE*** ($17 - $25)

Word Processor, Mailing List, Catalog, Ham Radio, Frequency Counter.

"OLD" 8K PETs

• **2114-TO-6550 RAM ADAPTER** ($12-$26)

Replace 6550 RAMs with low cost 2114s. *Hundreds Sold!*

• **4K MEMORY EXPANSION** ($16 - $62)

Low cost memory expansion using 2114s for bigger programs.

Write for FREE Catalog!

OPTIMIZED DATA SYSTEMS
Dept. C, P.O. Box 595 - Placentia, CA 92670

DISK-O-MATE trademark Optimized Data Systems -- PET/CBM trademark Commodore

Hexadecimal to decimal is much easier. Take the first digit's value. If there are any more digits, multiply by 16 and add the next digit. Keep going until you have the value. Hex E84C works quickly to its decimal value via these numbers: 14, 232, 3716 and finally 59468.

The Programmed Calculator

With a programmable unit, we can place the above calculations into a program and have the steps done automatically for us.

Many programmable units have a FRAC function which simplifies the sequence of steps. FRAC is the opposite of the INT function. For example, FRAC of 8.296875 yields .296875 and allows us to save a subtraction step in the conversion.

Since most programmable calculators can't input, calculate, and display hexadecimal digits, it is not possible to show (or enter) a value such as E84C. The usual way to overcome this problem is to use a "double digit" hex display, so that E84C will be displayed as 14080412 – the 14 standing for E, the 08 for 8, and so on.

The TI Programmer

The Texas Instruments Programmer is a special-purpose calculator which allows input and display of decimal, hexadecimal, and octal numbers, together with easy conversion between them. Simple four-function arithmetic can be performed, plus logical functions such as AND and OR.

The calculator is not programmable. It has a memory which allows storing a number or accumulating a total. In decimal mode, fractions can be entered – for example, 36.25 – but no fractions can be used in the other number bases.

Relative branch address calculations can be performed by simple subtraction. And the conversions are very simple – just push a button.

The Hewlett-Packard 16C

The H/P 16C is a more expensive calculator, but has many more features. Not only does it have all the logical functions (AND, OR, XOR, and NOT), but it also has an extensive set of Rotate and Shift commands, including a Carry flag. There are commands to set, clear, or test individual bits within a number, and functions which create a "mask" of any number of high bits or low bits.

Conversion of numbers is simple, of course. The 16C will copy with negative numbers, if you wish. You may set it to: unsigned numbers; twos-complement signed numbers (the "usual" way of holding signed numbers); and ones-complement signed numbers, a relatively rare way of representing negative values. We may limit the calculator to a specific number of bits, so that -1 will be shown as hex FFFF in 16 bits or FFFFFF in 24 bits.

The 16C has an "integer" side, with decimal, hexadecimal, octal, and binary display modes; and a "floating" side, which allows decimal numbers complete with fractional parts. The floating mode is good for conventional calculation, although it has no scientific functions.

A remarkable thing about this calculator is that it allows you to convert between floating point numbers and floating binary notation. This is a good trick, since it involves generating an exponent and a mantissa. Not everyone needs this feature, but it's surprising to see such a powerful calculation available.

Floating Point To Decimal

Let's work through this calculation on a variable in Microsoft BASIC. Somewhere in BASIC is a floating-point value stored as hex 81 49 0F DA A2. The 81 is the exponent, and the rest is the mantissa. Let's find its decimal value. Press "f" "2's" to ensure that the machine is in twos-complement signed mode; press "HEX" 30 "f" "WSIZE" to put us into the hexadecimal mode with enough bits to work on.

Now we enter the mantissa: 490FDAA2. Microsoft drops the high bit from positive numbers; we must put it back by pressing "ENTER" 1F "f" "sb" (for set bit 1F, or bit 31). Now we should see C90FDAA2, our corrected mantissa. Now for the exponent: type in the 81. To adjust for differences between Microsoft and Hewlett-Packard, we must subtract hex A0: type "ENTER" A0 "-" (minus).

The display will show something like FFFFFFE1, our adjusted exponent. We're all ready: press "f" -"FLOAT" -8 and we'll see the value: 1.57079633, or one-half pi. We can go the other way just as easily: press "HEX"; adjust the exponent by adding A0; flip to the mantissa by pressing "X-Y"; knock out the high bit by typing 1F "f" "CB". Easy. Remarkable.

The 16C is programmable. The above sequence of operations, or any other, may be entered as programmed instructions so that a simple key sequence (for example, GSB A for GOSUB A) will trigger the whole computation. The calculator has continuous memory; even if it's switched off, the program – and for that matter the data – will remain.

The calculator has many memory locations. How many? That depends on two factors. First, the size of the programs you have stored, if any. Each program instruction takes away from memory space. Second, the "word size" that we have selected. If we decide to work only with eight-bit numbers, for example, we'll have a very large number of memory locations – up to 203. With the maximum size number – 56 bits – or floating point numbers, we get up to 29 memory registers. Up to 32 registers can be accessed from the keyboard, and all registers can be reached via indirect addressing.

Substantial memory plus programming can yield quite powerful systems. It's not too hard to store dozens of 16-bit addresses in a memory table, and look them up as desired. The bit manipulation capabilities can be used to good effect for chip register decoding. Where is the screen and character table for a given VIC configuration? Just type in the appropriate VIC register contents and let the calculator work it out.

Do you need a calculator that's this good? It depends on what kind of work you do. It's an expensive toy, but could be an invaluable work tool.

It's probably good for you to work out things by hand, once or twice. You will understand the mechanism better, and appreciate your calculator/ computer more.

Simple calculators or your computer will do number conversion jobs for you nicely at minimum expense. You'll need to remember the proper procedures, but they are not difficult.

The specialized calculators cost more. They do a nice job. You'll have to decide whether the work you do merits the investment. C

FIRST BORN IN 1978!

the original & continuously updated

CCA Data Management System

Now Available For Atari Computers $ 99.50
For Apple Computers 150.00
For CPM Based Computers 225.00

CCA Data Management System

Uses

- Business
  Accounts Receivable
  Accounts Payable
  Inventories
  Billing
  Lists and Rosters
- Home Phone Lists
  Budgets, Hobbies

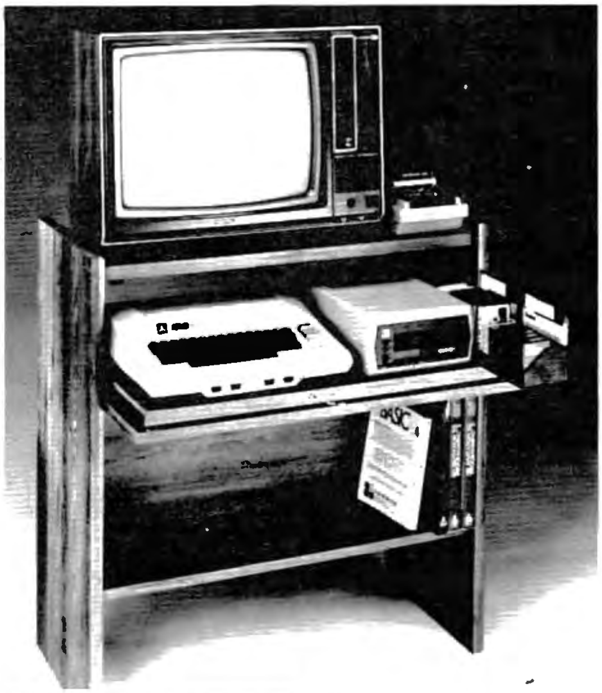
Features And Capabilities

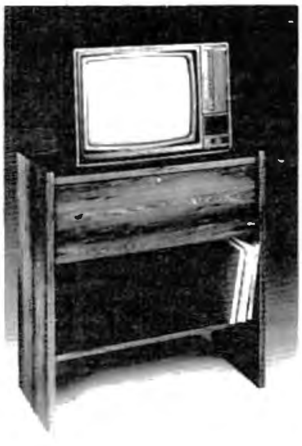
- Long record lengths
- Up to 24 fields per record
- Not Copy Guarded
- Alpha numeric items
- Numeric only items
- Add, update, scan, etc. files
- 10-Level sort ascending, descending, allows alphabetizing data file.
- Contact your local dealer for details or write us for our catalog

DIVISION OF CUSTOM ELECTRONICS, INC
SOFTWARE
238 Exchange St., Chicopee, Massachusetts 01013
(413) 592-4761
Mastercard & VISA Accepted
• Dealer And Distributor Inquiries Invited
• Closed Mondays — Open Daily 'Til 5:30 — Fridays 'Til 8

ARE YOU A SMART BUYER?

For $89.95 this is a smart buy if you're looking for a place to store your computer, peripherals, and accessories without spending a fortune.





The CS 1632 computer storage cabinets compact yet functional design fits almost anywhere while housing your computer monitor, joysticks, software, books and peripherals all for only $89.95.
The slide out shelf puts the computer at the right height and position for easy comfortable operation.
The fold up locking door keeps unwanted fingers off the key board when not in use.
To store joysticks just turn them upside down and slide them into the inverted storage rack.
Twist tabs on the back of center panel allow for neat concealed grouping of wires, while power packs rest hidden behind center panel on shelf.
The slide out software tray has room for 14 cartridges or cassettes and up to 30 diskettes. Most brands of software will fit between the adjustable partitions with a convenient hook for the spare key at rear.
Stand fits Atari 400 & 800, Commodore 64 & VIC 20, Ti 99/4A and TRS-80.
Cabinet dimensions overall 36" high x 33-7/8" wide x 16" deep.
Cabinet comes unassembled. Assembly requires only a screwdriver, hammer, and a few minutes of your time.
Choice in simulated woodgrain, of warm golden oak or rich natural walnut finish.

To order CS1632, send $89.95 to:

HYTEC Systems
P.O. Box 446 West Linn, OR 97068
Phone orders call, (503) 636-6888

Name ______________________
Address ______________________
City ____________ State ________ Zip ________
☐ Golden oak finish ☐ Natural walnut finish
☐ My personal check, cashiers check or money order is enclosed.
☐ Bill my VISA # ____________ Exp. Date ________
☐ Bill my Mastercard # ____________ Exp. Date ________
Card Holders Signature ______________________

Immediate shipment if in stock. If personal check is sent, allow additional 2 weeks. Prices subject to change. Shipment subject to availability. Cabinet shipped unassembled in 2 cartons. Ships UPS frt. collect FOB Portland, Oregon.

Part I:

Commodore 64 Video – A Guided Tour

Jim Butterfield, Associate Editor

We're about to embark on a guided tour of the 6566 chip, which gives the Commodore 64 its video. It's called the VIC, for Video Interface Chip; that's the same name used for the 6560 chip in the VIC computer, but the 6566 is a whole new story. Along the way we'll stop for lots of experiments, tricks for you to type in to see the effects of manipulating this remarkably versatile part of your computer.

Before setting off on our expedition, we need to establish a few landmarks which will place the chip within the Commodore 64 architecture.

Memory And Video

The 6566 chip relates to memory in two ways. First, the chip's control registers are accessible in addresses 53248 to 53294, or if you'd rather, hexadecimal D000 to D02E. We'll change these registers if we want to change the behavior of the chip.

The chip itself looks directly into memory as it generates video. It is usually looking for at least two things: what characters to display, and how to display them. It finds what characters to display in an area called "screen memory," or, more formally, the "video matrix." It finds out how to display the characters by looking at the "character generator" table, or the "character base."

Since the chip generates a lot of video, it looks at memory a great deal. Most of the time, it can do this without interfering with the processor's use of memory; but every five hundred microseconds or so, it needs to stop the processor briefly in order to get extra information. This doesn't hurt anything: the pause is so short that we don't lose much processing time.

But occasionally, the microprocessor is engaged in timing a critical event and does not want to be interrupted. In this case, it shuts off the 6566 chip until the delicate work is over. Ever wondered why the screen blanks when you read or write cassette tape? To give the computer an extra edge while timing tape, that's why.

Charting The 64

When the video chip goes to memory for its information, it has a special problem: it can reach only 16K of memory. That's OK for most work. For example, the screen (or video matrix) is usually located at 1024 to 2023 (hex 0400 to 07E7), so we'll use it there. But if we wanted to move screen memory to a new location, say 33792, we would need to work out some details, since the chip would not normally be able to reach addresses so high in memory.

We are given some help in doing this by the 64 architecture itself. There are two control lines called VA15 and VA14 which allow us to select which block of 16K memory we want the video chip to use. Note that once we've selected a block, the chip must get all its information from that block: we can't mix and match.

The control lines are available in address 56576 (hex DD00) as the two low-order bits. The memory maps you get are:

- **POKE 56576,4** the chip sees RAM from 49152 to 65535. There's no character generator; you'll have to make your own.
- **POKE 56576,5** the chip sees RAM from 32768 to 36863 and from 40960 to 49151. The ROM character generator is in the slot from 36864 to 40959.
- **POKE 56576,6** the chip sees RAM from 16384 to 32767. No character generator.
- **POKE 56576,7** the chip sees RAM from 0 to 4095, and from 8192 to 16383. The ROM character generator is in the slot from 4096 to 8191. This is the normal Commodore 64 setup.

Also note that the chip never has access to RAM at addresses 4096 to 8191 and 36864 to 40959. You will not be able to put screen memory or sprites there.

Be careful with these. If you move the chip's memory area, you'd better be sure to move the screen. For example, try the following:

```
POKE 648,132:POKE 56576,5
```

You'll find yourself transferred to a new, alternate screen. The new screen will be "dirty" – it hasn't been cleaned up. Typing a screen clear will make things look neat, and you may then play around with an apparently normal machine. When you're finished, turn the power off for a moment to restore your machine to the standard configuration.

The Chip: Video Control

Now for the 6566 chip itself. We'll go through the registers, but not in strict numeric order.

Table 1:

6566 Video Chip
C64 Control and Miscellaneous Registers

D011		Extended Color Mode	Bit Map	Display Enable	Row Select	Y-Scroll			53265
D012	Raster Register								53266
D013	Light Pen Input							X	53267
D014								Y	53268
D016	X	X	Reset	Multi Color	Col Select	X-Scroll			53270

	Screen				Character Base				
D018	VM13	VM12	VM11	VM10	CB13	CB12	CB11	X	53272
D019	IRQ	Interrupt ←Sense→			LP	SSC	SBC	RST	53273
D01A	Interrupt Enable →				Light Pen	Sprite Collision with Sprite	Back	Raster	53274

Color Registers

D020	X	Exterior	53280
D021	X	Background #0	53281
D022	X	Background #1	53282
D023	X	Background #2	53283
D024	X	Background #3	53284
D025	X	Sprite Multicolor #0	53285
D026	X	Sprite Multicolor #1	53286

Table 2:

6566 Video Chip
C64 Sprite Registers

Sprite 0	Sprite 7				Sprite 0	Sprite 7
D000	D00E	Position	X		53248	53262
D001	D00F		Y		53249	53263
D027	D02E	X		Color	53287	53294

Sprite

	7	6	5	4	3	2	1	0	
D010	X-Position High								53264
D015	Sprite Enable								53269
D017	Y-Expand								53271
D01B	Background Priority								53275
D01C	Multicolor								53276
D01D	X-Expand								53277
D01E	Interrupt: Sprite Collision								53278
D01F	Interrupt: Background Collision								53279

Location 53265 (hex D011) is an important control location. It contains many functions; its normal value is 27 decimal.

Values from 24 to 31 control the vertical positioning of the characters on the screen. Try this:

```
FOR J=24 TO 31:POKE 53265,J:NEXT J
```

You'll see the screen move vertically, leaving an empty spot near the top. POKE 53265 back to 27.

If we subtract 8 from the value in the 6566, the screen will lose a line: instead of 25 lines we'll have only 24. The best way to see this is: clear the screen; write TOP on the top line, BOTTOM on the bottom line (don't press RETURN!) and then move the cursor to about the middle of the screen and type:

```
POKE 53265,19
```

You'll see the top and bottom trimmed to half a line each.

Think about using these two features together. If we have a screen full of information, we would normally scroll when we wanted to write more – the characters would jump up a line. But if we can switch to 24 lines, slide the characters up gently, and then switch back to 25 lines, we'd have a smoo-ooth scroll.

```
POKE 53265 back to 27
```

If we subtract 16 from this location, we'll blank the screen. We mentioned this before: it will give the processor a little more accuracy in timing. In fact, this POKE is the key to allowing us to LOAD a program from an old-style 1540 disk unit. If the disk hasn't been modified, it will deliver bits slightly too fast for the computer. But we can bridge the gap with POKE 53265,11:LOAD and the loading will take place successfully. When the load is complete, we can get the screen back with POKE 53265,27.

High Resolution

The next control bit – value 32 – switches the display to pure bits. No more characters: the screen will be purely pixels as we switch to high resolution mode. We'll use a lot of memory for this one: memory to feed the screen will be 8000 bytes.

High resolution needs to be carefully set up, but let's plunge right into it. Type POKE 53265,59 and you'll see an intricate pattern on the screen. What you are looking at now is a bit map of RAM memory addresses 0 to 4096, plus the character generator area. The top of the screen will twinkle a little: those are the page zero values changing – things like the realtime clock and the interrupt values are constantly in motion.

In the bottom half of the screen, we'll see the character generator itself. Oddly enough, the characters are readable. That's because of the way high resolution bit mapping works: each sequence of eight consecutive bytes maps into a character space, not across the screen, as you might think.

Now we're going to play around a little. First, clear the screen. Surprise! It doesn't clear, but the colors change. That's because screen memory, into which we are typing, holds color information for the high resolution screen. Now, we'll clean out a band of hi-res data by typing in a BASIC line. We must do this "blind"; the screen won't help us. Type:

```
FOR J=3200 TO 3519:POKE J,0:NEXT J
```

If you've typed correctly, you'll see a blank band across the screen. Don't worry about the color change as you type. Now we'll enter (blind again):

```
FOR J=3204 TO 3519 STEP 8:POKE J,255:NEXT J
```

You should see a high-resolution line drawn across the screen.

That's all the high resolution fun we're going to have this session, but you may be starting to get an idea of what's going on. Turn off the power, and let's look at other things.

Extended Color

If we add 64 to the contents of 53265, we'll invoke the extended color mode. This will allow us to choose both background and foreground colors for each character. Normally, we may only choose the foreground: the background stays the same throughout the screen. You lose some colors, but get better combinations.

Try POKE 35265,91. Nothing happens, except that the cursor disappears, or at least becomes less visible. Why? We've traded the screen reverse feature for a new background color. Try typing characters in reverse font, and see what happens. Try choosing some of the specialized colors – the ones you generate with the "Commodore" key rather than CTRL. See how you like the effect. Think how you might be able to use it.

Extended color is purely a screen display phenomenon. POKE 35265,27 will bring all the characters you have typed back to their normal appearance.

The High Bit

There's one more bit in location 53265, the one we would get if we added 128. Don't do this now: this bit is part of a value we'll discuss later: the "raster value." You won't use this one out of BASIC, but it can be handy at machine language speeds.

Tune In Again

We've done a lot of things so far, using only one control location. There are more locations, and we'll discuss some of them next time.

It's a big chip. It will take a lot of time to digest all its possibilities. It's fun, and it can create remarkable effects. ©

Bi-directional VIC Scrolling

Charles Saraceno

How would you like to be able to check and debug your VIC programs by turning your screen into a window which can move anywhere over the listing, stop or start at will, and even move upwards toward the start of the program? All this can be achieved by just touching different keys when using this clever "controlled scrolling" program. If your VIC has the 3K RAM memory expander plugged in, use POKE 44,4 (instead of POKE 44,16) in the instructions in the final paragraph.

Now that memory expansion modules are readily available, it is possible to write longer VIC programs. This does make it harder, however, to edit the contents without a hard copy from a printer to examine for typing errors. Screen editing is time consuming, to say the least; with 22 characters per line, you are limited to four or five lines at a time between LIST commands. A very useful LIST would scroll the screen and stop or continue when you want it to. The ideal LIST would also scroll backwards.

This small program efficiently accomplishes all these tasks. Line 63001 determines the starting address (SA) for any memory installed into the VIC. Line 63002 calculates the line number (LN) of your program. Line 63003 sets your screen up to perform the tasks needed to list the line, then continues the program. It is written in white so you won't see the commands and keeps the screen uncluttered for reviewing the listed line.

Once a "list" has been initiated in a program, the program will end. This is where the keyboard buffer commands in line 63004 both control the list and then continue the program with the "go to" 63010 command. Lines 63010-63030 let you review the line just listed and wait for you to press the "+" key to advance to the next line or the "-" key to back up to the previous lines listed. Line 63100 looks for the next "0" in BASIC, which indicates the end of that BASIC line, and then sends you back to calculate the next line number. Line 63200 is the routine that looks for the end of the previous line. You have to eliminate the possibility of finding a "0" in the addresses that determine the line number by disallowing a "0" in either of those two addresses.

One other little trick will let you avoid having to type in this program after each main program has been entered. Find the end of BASIC by typing in:

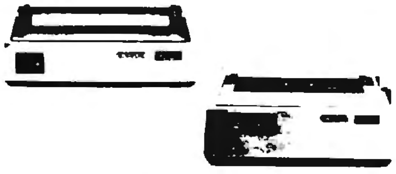
```
CLR: PRINT PEEK (45), :PRINT PEEK (46)
```

Now type the following line which moves the beginning of BASIC to two bytes less than the end of the program (either a null or a "0" is needed to start loading in a new program):

```
POKE 43, PEEK (45)-2:POKE 44,PEEK (46)
```

Now load in "+/- LIST" program, reset BASIC pointers (POKE 43,1; POKE 44,16, for VIC with no expansion). Start editing by typing in RUN 63000. You will be able to scrutinize your program on a line-by-line basis. Any mistakes discovered should be noted on paper and corrected after your review.

```
63000 REM**  +/- LIST  **
63001 SA=PEEK(44)*256+PEEK(43)-1
63002 LN=PEEK(SA+3)+PEEK(SA+4)*256
63003 PRINT"{CLEAR}{WHT}GOTO 63010":PRINT"LIST
    ";LN;
63004 POKE631,19:POKE632,17:POKE633,31:POKE634
    ,13:POKE 635,19:POKE636,13:POKE 198,6:E
    ND
63010 IF PEEK(197)=5 THEN 63100:REM TEST FOR "
    -" KEY
63020 IF PEEK(197)=61 THEN 63200:REM TEST FOR
    "+" KEY
63030 GOTO 63010
63100 IF PEEK(SA+5)<>0 THEN SA=SA+1:GOTO 63100
63110 SA=SA+5:GOTO 63002
63200 SA=SA-1:IF PEEK(SA)=0 AND PEEK(SA-4)<>0
    AND PEEK(SA-3)<>0 THEN 63002
63210 GOTO 63200
```



INSIGHT: Atari

Bill Wilkinson

This month we will examine the possibility of a "default" drive number under DOS. There is also a tidbit about initializing DOS disks from BASIC. Next month, we will begin what will be a three- or four-month series on how to write your own BASIC interpreter.

Deriving The Drive

First, let me state that I do *not* recommend this section to the relative novice. While it is true that you can perform the operations I am about to describe entirely from BASIC, it is also true that you can destroy memory very nicely if you slip up. Enough warning. To begin:

Have you ever (often?) grumbled over the fact that you have to specify not only the file name, but also the disk name and drive number (e.g., "D2:MISSILE.CMD")? I sure have. In fact, I hate it so much that when we did OS/A+ for the Apple II, we allowed the user to supply a default device specifier (e.g., "D2:"), which is automatically prefixed to all file names which do not specify a device. (Consequence: you *must* use a colon when you really want a device; "P" is seen as "D2:P", though "P:" works fine.)

This concept is not new or unique; even in the micro world, such giants as CP/M use default drive assignments. Usually, the advantage of such defaults is that people with multiple disk systems need not always run a given program in a certain drive. Or the user might choose which drive will receive his data files via a simple set of keystrokes at system powerup. Suffice it to say that those who get used to default drives love them.

Unfortunately, as much as I would like to do the same thing for the Atari, I can't. The initial device name determination under Atari's OS is done in the OS ROMs, and Atari OS simply looks at the first letter of any file name and assumes that it is the device name.

However... (You knew there was a "however" lurking, didn't you?) At least we could modify the File Manager System (also known as FMS, DOS, or even OS/A+) to understand the concept of a default device NUMBER. In other words, we could have the FMS inspect the file name and assume a particular drive number if "D:..." were coded. Then we could have some means of telling the FMS what the "current" drive was (and, in fact, such means already exist in OS/A+), and the system would automatically insert the correct drive number.

And yet, I am reluctant to adapt such an approach with Atari DOS. Too many programs have been written which assume that "D:..." is equivalent to "D1:...", and I am loath to introduce more confusion than is necessary. So, if you really would like to modify your copy (copies?) of FMS to allow "D:" to represent "Dn:", let me just point you in the right direction. For this purpose, I will presume that you have a copy of *Inside Atari DOS* (**COMPUTE! Books**, 1982).

There is a routine labeled FNDCODE (File Name DeCODE) which begins on page 83 of the book and is the heart of the entire disk file name processing. Lines 4101 through 4106 start at the third character of the name and search from there backwards for the colon (':') which terminates the device specifier (and ignore the comments in the listing...they are flat out irrelevant). Obviously, it would be no big deal to check to see if the character before the colon is the 'D' and, if so, assign a default device number.

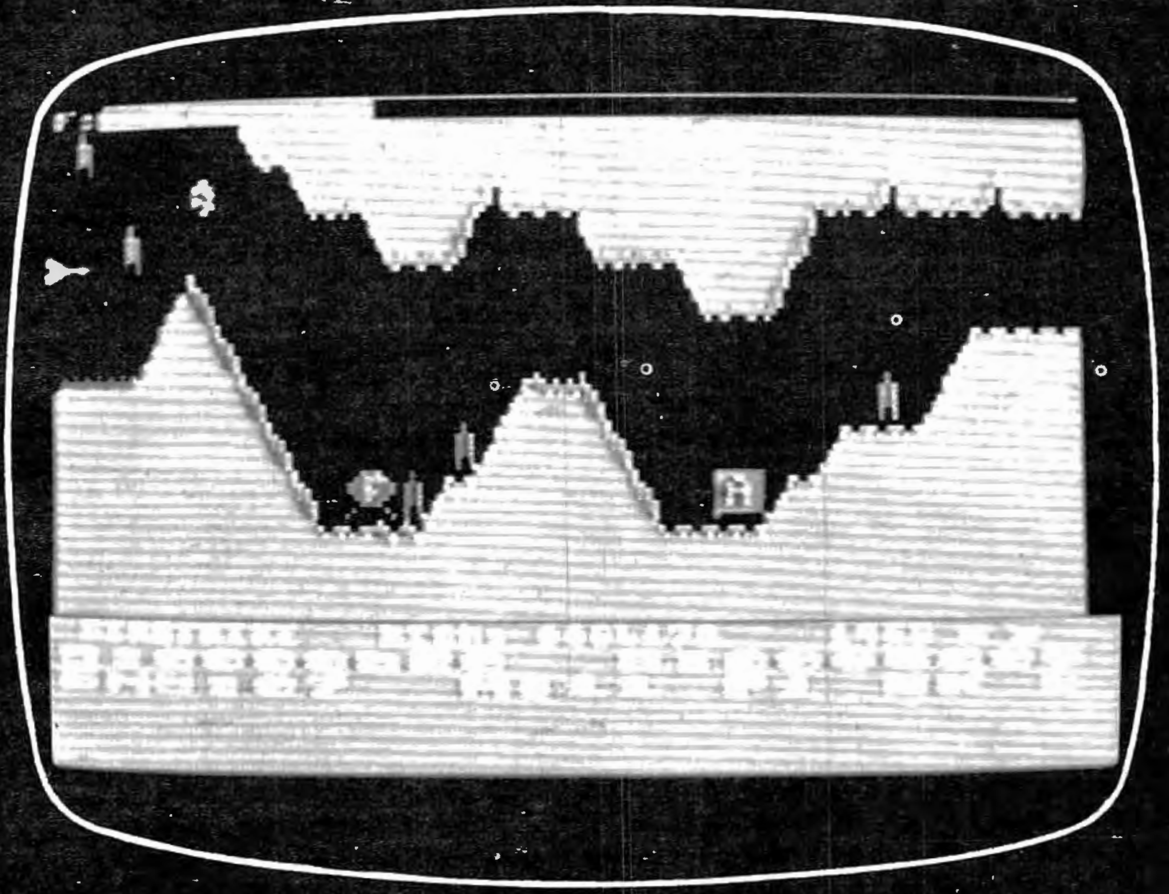
Changing FMS

Now, for the rest of you, I have an alternate proposal. How about changing FMS so that, if it sees a file name of "D0:..." it assigns the default device instead. I chose "D0:" because there should be no conflict with existing software. And, yet, it is a legal device specifier which is easily detectable and changeable.

Since the OS ROMs have already decoded the device number by the time FMS gets control, we don't need to look at the file *name* at all. Instead, we look at the field labeled ICDNO (or, in zero page, ICDNOZ), the device number as set up by the OS ROMs. And, conveniently, FMS is already manipulating this number in a single, well-defined place, the "SETUP" routine (as listed on page 92 of *Inside Atari DOS*). Currently, the code sequence is simply:

```
LDY ICDNOZ ; move device number...
STY DCBDRV ; ...to device control block
```

What we want instead is something like the following:



```
     LDY     ICDNOZ     ;get device number...
     BNE     OKDNO      ;...if wasn't "D0:", it is OK
     LDY     DEFAULT    ;otherwise, change 0 to default
OKDNO
     STY     DCBDRV     ;in either case, set up DCB
```

Now I can't think of a much simpler change than adding two instructions, but how do we make such a change? The solution is to use what is known as a "patch." Generally, there are two kinds of machine language patches: those that fit into the original code space and those that don't. The former kind are easy; simply overlay the old code with the new. The latter are not so easy. Naturally, this change falls into the latter category.

With a 6502, the usual method of installing out-of-line patches is to try to replace a three-byte instruction with a JMP or JSR to the patch (failing this, you must replace two or three instructions, which may involve putting a NOP before or after the JSR or JMP). Luckily, we do indeed have a three-byte instruction that we can replace (the STY DCBDRV uses three bytes, since DCBDRV is not in zero page).

So our patch will look like this:

```
DCBDRV  = $301          ;object of the STY
   *=     $1176         ;address of the STY instruction
   JSR    PATCH

   *=     PATCH
   BNE    OKDNO         ;non-zero device number
   LDY    DEFAULT       ;replace zero device number
OKDNO
   STY    DCBDRV        ;the patched-over instruction
   RTS
```

So far, so good. It makes sense, I hope. But there are two locations undefined in the above listing: we don't know where PATCH and DEFAULT are going to be located. Again, we will refer to the book for some clues as to where they should be.

As it turns out, there is no patch space at all within the main code space of FMS. However, if we look at the very end of the listing (page 98 in the book), we find that FMS (including its internal buffers, etc.) ends at $1500. But remember that "DOS.SYS" consists of more than just FMS. In the case of OS/A+, DOS also includes "CP," the console processor, and actually ends at $1D00. For Atari DOS, version 2.0S, DOS.SYS ends at $1A7C (to accommodate "MINI-DUP," the routine which handles MEM.SAV and loads the main DUP.SYS).

But, fortuitiously, whether by design or by chance, both MINI-DUP and CP begin at $1540. Thus, we have locations $1501 through $153F for patch space. Not a huge patch space, but patch space nevertheless. So, I would suggest that you add the following two lines to the front of the listing given above:

```
DEFAULT = $1501
PATCH = $1502
```

This means, then, that you *must* put a valid disk drive number (1 through the number of drives you have) into location $1501 *before* using a drive specifier of "D0:".

So, how do we make and save this patch? If you have an assembler capable of doing memory-to-memory assemblies (e.g., the cartridge, EASMD, MAC/65, etc.), I would suggest typing in the lines given and actually assembling the code directly in place. (Doing the memory-to-memory assembly avoids doing FMS accesses while patching FMS...safety first!) Then, with the patch in place, use the Write-DOS-Files option (of Atari DOS, or use INIT to rewrite DOS.SYS with OS/A+) to save your patched system.

Does it work? Sure does. I wrote all the above and then went over to the machine and typed it in. Worked first time! Is it handy? Only time will tell.

And one more point. If you do have OS/A+, you will note that the Command Processor (CP) already supports the concept of a default drive. Why not use that same default drive specifier for our "D0:" trick? The only difference is that CP stores that default specifier as an ASCII character ('1', '2', etc.), so we must look at only the low order bits of the default (and we must obtain it from its memory location according to OS/A+ rules). So here's another version of the same patch, specifically for OS/A+, version 2:

```
PATCH    = $1501
CPALOC   = $0A
DEFAULT  = 8
DCBDRV   = $301
  *=       $1176
  JSR      PATCH

  *=       PATCH
  BNE      OKDNO         ;drive # is non-zero
  LDY      #DEFAULT      ;offset to default drive #
  LDA      (CPALOC),Y    ;gets default in ASCII
  AND      #$0F          ;just the lower bits
  TAY                    ;where FMS expects drive #
OKDNO
  STY      DCBDRV        ;the patched-over code
  RTS                    ;back to the original
```

And, as a postscript to all this, I would like to comment on the whole subject of adding things to DOS. So long as you can patch in place or use the limited patch space starting at $1501, you should have no problems. If, however, you want to add significant code to DOS, it will not be easy if you are using Atari DOS.

If we look at pages 94 and 95 of *Inside Atari DOS*, we will see the routine which begins with the label "WD0". It is this routine which actually writes the file "DOS.SYS" to the disk. And, if you look at lines 5441 through 5449, you will see that what is written out is all of memory from $7CB

ATARI
A Warner Communications Company

MEMORY

FOR THE ATARI* 400/800

ATARI
A Warner Communications Company

48K

*$124.95

(With 16K in trade)

32K

$94.95

2 YEAR FULL WARRANTY

THESE BOARDS DO EVERYTHING THE COMPETITORS WILL DO — BUT COST YOU MUCH LESS.

48K (Without 16K trade) **$149.95**

32K LOOPBACK — Allows 32K to be used alone in the 800 . . . . **$5.00**

48K LOOPBACK — Allows 48K to be used alone in the 800 . . . . **$5.00**

Call **JERSEY SYSTEMS**

OR YOUR LOCAL PARTICIPATING DEALER

Alpha Computer Center
West Seneca, New York
716-674-5511

Computer Concepts
Cedarhurst, New York
516-374-0255

Comtech
Brooklyn, New York
212-332-5933

S.T.C. Marketing
Richmond Hill, New York
212-848-8878

Tri-Comp H.C.S.
Bayport, New York
516-472-9769

Video Village Inc.
Massapequa Park, New York
516-779-1616

Computer Land
Charlotte, North Carolina
704-536-8500

A B Computers
Colmar, Pennsylvania
215-822-7727

Computer Terminal
Summerville, South Carolina
803-875-4727

Hi-Fi Buys
Springfield, Virginia
703-644-5252

H.E.L.
Fairfax, Virginia
703-698-8595

ASMUS Electronics Inc.
Fond Du Lac, Wisconsin
414-923-4107

Madison Books & Computers
Madison, Alabama
205-772-9250

All Systems Go
Tempe, Arizona
602-966-4275

Data Concepts
Phoenix, Arizona
602-242-9961

Data Concepts
Scottsdale, Arizona
602-990-3366

Leisure Electronics
Littlerock, Arkansas
501-227-4837

H.C.M.S.
Westminster, Colorado
303-427-9036

Sound Trader and
Computer Corner
Tampa, Florida
813-977-4868

Computech
Tallahassee, Florida 32312
904-893-1743

Computer One
Indianapolis, Indiana
317-259-4827

The Computer Shop
South Bend, Indiana
219-232-9918

New Generation
Baton Rouge, Louisiana
504-272-1700

World Wide Home Video
Metairie, Louisiana
504-456-9926

Software Asylum Inc.
Carteret, New Jersey
201-969-1900

Video Home Center
Manalapan, New Jersey
201-431-7636

A & B Software
Union, New Jersey
201-575-5331

- **TO ORDER CALL: 800-526-3647**
- **NO CHARGE FOR SHIPPING**
- **ORDERS SHIPPED U.P.S. BLUE LABEL WHEN POSSIBLE**
- **2% CREDIT FOR ORDERS NOT SHIPPED IN 24 HRS.**

FROM NEWELL INDUSTRIES:

FASTCHIP

- Up to 3 and one half times the speed of the original floating point routines.
- Pin compatible masked ROM — Permanent replacement for the original ROM.
- No modifications, cuts or wires.
- 90 DAY FULL WARRANTY
- Fits 400/800

— $41.95 —

JERSEY SYSTEMS
P.O. BOX 332
EDISON, N.J. 08818

☐CHARGE MY master charge VISA
EXP. DATE ____________
CARD NO. ____________

☐______48K BOARD $149.95 ☐________32K BOARD $94.95

☐______FASTCHIP $41.95 ☐ MORE INFORMATION

N.J. RESIDENTS ADD 5% SALES TAX, PLEASE

NAME ____________

ADDRESS ____________

PHONE NUMBER ____________

*** PARTICIPATING DEALERS ONLY** • Trademark of Atari Inc.

through the contents of location "SASA" (which are usually $1A7C or $1D00, as noted above).

Sidelight: in a way, this is poor design, since SASA also specifies the beginning address of the disk buffers. If you move the disk buffers (e.g., to the top of memory) and then try to write the DOS file(s), you might be writing out much more than you bargained for. You might want to change those compares to

"CMP #..."

if you are doing hefty modifications.

Anyway, with Atari DOS, you can't really add on to the end of the DOS.SYS since DUP.SYS begins immediately after it in memory and would overwrite your additions. With OS/A+, though, you could add stuff at $1D00 (or wherever SASA points to) and move SASA up (which not incidentally will thus move the buffers out of the way of your addition).

The Rites For Right Writes

I was reminded by all of the above of another "feature" of Atari DOS (and, yes, OS/A+) which is not well documented. In particular, would you like your program (including one written in BASIC) to be able to write (or rewrite) the "DOS.SYS" file? In the unlikely case that your answer is "yes," read on.

Strange but true: when you OPEN the file named "DOS.SYS" for output (i.e., mode 8 only), *right then and there* the FMS will automatically write the complete boot (sectors 1, 2, and 3) and the file "DOS.SYS" to the disk! You do *not* have to copy anything from memory to disk, from disk to disk, or what have you. FMS does it all! (And that explains why Atari DOS won't let you copy *to* a file called "DOS.SYS".)

Thus, from BASIC, you could initialize a disk AND write the DOS.SYS file via the following simple code:

```
10 XIO 254,#1,0,0, "Dn:"
20 OPEN #1,8,0,"Dn:DOS.SYS"
30 CLOSE #1
```

Of course, the "n" can be any valid disk number (including 0, if you applied the patches discussed in the first section of this column). Also, you can omit line 10 if you don't want to initialize the disk.

Unfortunately, this procedure will not place "DUP.SYS" on the disk if you are using Atari DOS, so you will still have to somehow copy it. (But you can use AUTORUN.SYS based systems without DUP.SYS, of course.) Again, though, if you are using OS/A+ you don't (and can't) use a DUP.SYS file, so the above little program will perform all you need to initialize a master, bootable disk.

Postscript: If you really *need* to copy a "DOS.SYS" file from one disk to another (because, for example, you don't want to boot the version that you are copying), you can simply rename "DOS.SYS" to something else ("GORP.SYS", for example), perform the copy, and then rename both the old and new "GORP.SYS" back to "DOS.SYS". Thanks to the peculiarities of FMS, this method will even cause the three boot sectors to be updated to point to your new DOS file. ©

ATARI 400 48K UPGRADE KIT 99.95
- Uses your current memory board • Prime quality 64k memory chips all guaranteed • Easy installation • Add $3.00 postage and handling

ATARI REFERENCE CARD 5.95
- Atari Basic commands • All error codes • All Peek/Poke locations

PRINTER REFERENCE CARD 3.95
- Printer control codes • CITOH, EPSON, OKI DATA, NEC...

CERMETEK 212A 300/1200 MODEM 560.00
- Integral auto dialer • Switched or leased line operation
- Add $5.00 postage and handling

MSX
Micro Systems Exchange
P.O. Box 4033
Concord, CA 94524
(415) 355-7130
VISA master charge

ATARI
PAYROLL SOFTWARE
FOR
THE ATARI® 800™

Miles Payroll System™ is an advanced and comprehensive payroll accounting system designed for businesses today. Cumulative totals are maintained for each employee, as well as complete reporting, check writing, and W-2 reporting. Some features include:

- Random access file organization for fast updating of individual records.
- Allows weekly, biweekly, semimonthly or monthly pay periods.
- Completely menu-driven and user-friendly.
- Regular, Overtime, Double time, Sick, Holiday, Vacation, Bonus and Commission earning categories.
- Payroll deductions include Federal W/H Tax, State W/H Tax, City W/H Tax, FICA, SDI, Group Insurance and 3 user-defined deductions.
- Tax sheltered annuity deduction capability for IRAs and other tax shelters.
- State and Federal Unemployment Insurance maintained.
- Complete file viewing and editing capability.
- Maintains up to 50 employees
- Up to 10 user-defined Worker's Compensation classifications.
- Federal Tax tables may be changed in only 15 minutes each year by user when IRS changes tax.
- Table method used for State and City Tax, allowing compatibility with any state's or city's tax.
- Produces 15 different reports, including W-2 Forms Report.
- Checks calculated and printed automatically.
- PROGRAM ENABLING MODULE™ protects valuable payroll information from unauthorized users.
- 3 user-defined payroll deductions to accommodate customized needs such as savings, profit sharing, tax shelters, pensions, etc.
- Pay period, monthly, quarterly and yearly cumulative totals maintained for each employee.
- Automatic input error detection and recovery protects system from user-generated errors.
- Easy-to-follow, detailed, and comprehensive user's manual and tutorial leads the user step by step allowing anyone with little computer experience to easily operate the package. Includes index.
- Color, sound, and graphics utilized for user ease.
- Maintains employee pay history
- Allows for manual payroll check writing.
- Packaged in a handsome 3-ring deluxe pocketed binder with 3 diskettes and manual.
- Reasonable price.

See your local store, or contact Miles Computing.

Miles™

MILES COMPUTING
7136 Haskell Ave. #204
Van Nuys, CA 91406
(213) 994-6279

Atari is a registered trademark of Atari, Inc.
Miles Computing, MILES PAYROLL SYSTEM, PROGRAM ENABLING MODULE are trademarks of Miles Computing, Van Nuys, California. Not affiliated with Atari, Inc.
$179.95. Requires 32K and two Atari® 810™ disk drivers. Payment in U.S. funds required with order. California residents add 6.5% sales tax. C.O.D or prepayment only. Dealer inquires welcome.

ComputAbility™ presents the Newest in Software Products for Atari

ATARI

SUPER SPECIALS

CLAIM JUMPER	$22.95 DISK/TAPE
CLOWNS & BALLOONS	$19.95 DISK/TAPE
AIRSTRIKE	$29.95 DISK/TAPE
CROSSFIRE	$19.95 DISK/TAPE
SEAFOX	$19.95 DISK
DARTS	$21.95 TAPE

Prices effective February 1 through February 28, 1983

FREE* SOFTWARE

FREE* SLIK STIK

ATARI

CONVERSATIONAL LANGUAGES - T	43.95
INVITATION TO PROGRAMMING 2 & 3 - T	21.95
MUSIC COMPOSER - C	32.95
MY FIRST ALPHABET - D	26.95
TOUCH TYPING - T	19.95
HOME FILING MANAGER-D	37 95
MAILING LIST - T	19.95
ASTEROIDS - C	26.95
CAVERNS OF MARS - D	28.95
COMPUTER CHESS - C	26.95
MISSILE COMMAND - C	26.95
SUPER BREAKOUT - C	26.95
STAR RAIDERS - C	32.95
ASSEMBLY EDITOR - C	44.95
BASIC - C	44.95
MACROASSEMBLER - D	65.95
MICROSOFT BASIC - D	65.95
PILOT (HOME PACKAGE) - C	58.95
INVITATION TO PROGRAMMING I - T	18.95
SPEED READING - T	55.95
BASKETBALL - C	26.95
GRAPH-IT - T	15.95
JUGGLE'S HOUSE - D/T	22.95
PILOT (EDUCATOR) - C	97.95
VIDEO EASEL - C	26.95
DEFENDER - C	32.95
GALAXIAN - C	32.95
QIX - C	32.95

APX

ALL ITEMS - 20% OFF RETAIL. WE CARRY THE ENTIRE APX CATALOG!

ADVENTURE INTERNATIONAL

PREPPIE - D/T	23.95
S.A.G.A. ADVENTURES - D	23.95
SEA DRAGON - D/T	27.95
STRATOS - D/T	27.95
BUG OFF - D/T	23.95

ANALOG

RACE IN SPACE - D/T	20.95
CARNIVAL - D/T	20.95
SUNDAY DRIVER - D/T	23.95
CRASH DIVE! - D/T	23.95

ON-LINE

JAWBREAKER - D/T	23.95
ULTIMA I - D	31.95
THRESHOLD - D	31.95
ULTIMA II - D	44.95
MOUSKATTACK - D	27.95
FROGGER - D/T	27.95

SIRIUS

BANDITS - D	27.95
WAY OUT - D	31.95
BEER RUN - D	23.95

THE DISCOUNT SOFTWARE COMPANY THAT PAYS YOU A DIVIDEND!!!

DATASOFT

SHOOTING ARCADE - D/T	23.95
PACIFIC COAST HIGHWAY - D/T	23.95
MICROPAINTER - D	27.95
CANYON CLIMBER - D/T	23.95
FATHOMS FORTY - D	27.95
O'RILEY'S MINE - D/T	27.95
ROSEN'S BRIGADE - D/T	27.95
SANDS OF EGYPT - D	31.95

BIG FIVE

COAL MINER 2049'ER - Cart	39.95

I.D.S.I.

POOL 1.5 - D	27.95
POOL 400 - Cart	31.95
SPEEDWAY BLAST - Cart	31.95
JUGGLER - D	23.95
SURVIVAL OF THE FITTEST - Cart	31.95

FIRST STAR

ASTRO CHASE - D/T	23.95

SENTIENT

CYBORG - D	27.95
GOLD RUSH - D/T	27.95

WE CARRY HUNDREDS OF ITEMS FOR ATARI 400/800, ASK FOR OUR FREE CATALOG.

*COUPON PROGRAM

The purchase of each program (with the exception of Super Specials, Atari, and APX) will earn you 1 COMPUTABILITY DIVIDEND COUPON. Save 3 coupons and redeem them for your choice of Slik Stik, a Lefty Adaptor, or an Extension Cable. OR save 10 coupons and redeem them for your choice of any program we sell for $24.00 or less (with the exception of Super Specials, Atari, and APX). You pay only a $2.50 shipping and handling charge.

BRODERBUND

APPLE PANIC - D/T	23.95
STELLAR SHUTTLE - D/T	23.95
DAVID'S MIDNIGHT MAGIC - D	27.95
STAR BLAZER - D	25.50
TRACK ATTACK - D	23.95
LABYRINTH - D/T	23.95
SERPENTINE - D	23.95
DUELING DIGITS - D	23.95
DEADLY SECRETS - D	27.95
CHOPLIFTER - D	27.95
GENETIC DRIFT - D/T	23.95

SPINNAKER

SNOOPER TROOPS #1 - D	35.95
SNOOPER TROOPS #2 - D	35.95
FACEMAKER - D	27.95
STORY MACHINE - D	27.95

EDU-FUN

CALL FOR ITEMS AND PRICES

THORN

CALL FOR ITEMS AND PRICES

NEW ITEMS

PIG PEN - D	23.95
BAJA BUGGIES - D/T	25.50
STARBOWL FOOTBALL - D/T	25.50
MASTER TYPE - D	31.95
ALI BABA - D	26.50
JEEPERS CREEPERS - D	23.95
PAINT - D	33.95
KID GRID - D/T	23.95
MOSAIC 32K	97.95

D - Disk T - Cassette
C - Cartridge

ATARI is a trademark of ATARI, Inc.

Starfighter

The Ultimate Joystick
- 2 Year Warranty
- More Accurate
- Easier to Hold

$16.95

SLIK STIK

- 90 Day Warranty
- Easy Ball Top Control

$9.95

LEFTY JOYSTICK ADAPTOR

Adapts to *any* Atari Joystick.
Moves fire button to top Right. $9.95

EXTENSION CABLE (5 ft.)

Adapts to *any* Atari controller. $6.95

ALL JOYSTICKS WORK WITH Atari VCS, Sears Telegame, Commodore VIC 20, Atari 400/800 (All products have registered trademarks)

30 Day Money Back Guarantee on all Suncom Products - Dealers inquiries invited!!!

Mastercard/VISA Order Toll Free

MasterCard

800-558-0003

No surcharge for credit cards

VISA

In Wisc. Call 414/351-2007

ORDERING INFORMATION

To order by mail send money order, certified check or personal check (allow 14 days to clear) to COMPUTABILITY. Include $2.00 shipping on software orders and $2.50 shipping on hardware orders (FREE OR PURCHASED). Mastercard & VISA please include card number and expiration date. WI residents please add 5% sales tax. Outside of continental U.S.A. please add 15% shipping (U.S. Funds only). Prices subject to change without notice.

Order Hours:
Mon. - Fri. 12 pm - 9 pm C.S.T.
Sat. 12 pm - 5 pm C.S.T.
ComputAbility
P.O. Box 17882
Milwaukee, WI 53217

Jim Butterfield, Associate Editor

The New 6500 Chips

The 6502 is a member of a family of chips. The original family included the 6501 (long since extinct), the 6502, 6503, 6504, 6505, 6506, and 6507. A parallel branch of the family comprised the 6512, 6513, 6514, and 6515; these were identical to their 650x counterparts except for the external clock circuitry.

The 6502 is the big member of the family; it has a full 40 pins. The 6503 to 6507 are cut-down versions of the same chip, with only 28 pins. Internally, the chips are the same: the programmer will use exactly the same instructions regardless of which chip is involved. The practical difference is how the chip is wired, and how much memory it is able to address.

If the same chip goes into a 6502 and, say, a 6504, why not take the fully-featured processor every time? The answer is this: if you don't need the extra pins, you can save money by going for the small one. Process controllers often need very little memory; savings in board space and a lesser number of connections can be quite worthwhile.

Quick And Easy

The 6502 burst onto the microprocessor scene in 1976. It was remarkably inexpensive and seemed to have a very simple internal structure. The architecture was closest to Motorola's 6800 microprocessor series, and many users suspected that the 6502 was a cheap imitation. This proved to be untrue: the 6502 had special features which made it a landmark in microprocessor design.

The technique which gave the 6502 speed is called "pipelining." It means that information rolls into the processor as if it were on a conveyer belt. Before the last piece of information is digested, the next one is coming in. For the first time, the microprocessor didn't need to "stop and think": new information was rolling in as the old was being digested. The result: no wasted memory cycles, and amazing speed.

The small number of registers within the 6502 seemed to be a limitation. It proved not to be: registers could be loaded and used so quickly that the small number seldom gave problems. In addition, page zero of memory could be used to hold 16-bit pointers for "indirect addressing" – in a sense, this provided an extra 128 registers for the programmer's use.

The 6502 used the same style of instructions as the 6800 – the simple, traditional data processing instructions: load, store, add, and test. Programmers found the instructions easy and natural. The 6502 is relatively easy to program.

The New Processors

Recently, new 6500-family processors have come into production. They are still familiar: the instruction set is the same as before and the addressing modes haven't changed. But there are new features, and you'll be meeting them in the VIC and in forthcoming Commodore products.

The 6510

The 6510 is a 6502, except that addresses 0000 and 0001 have special functions. There's an input/output port built into the chip: eight pins marked P0 to P7 are available on the microprocessor chip itself. Address 0000 is used as the direction register of the I/O port, and 0001 is the port itself. Otherwise, the 6510 is identical to a 6502.

What does this mean in the Commodore 64? First of all, locations 0000 and 0001 are no longer RAM. PET uses these locations to hold the USR jump; on the Commodore 64, this jump has been moved to address hex 0310 (784 decimal).

Second, you may use address 0001 to test and control some of the 64's activities. Refer to the memory map in **COMPUTE!**, October 1982, for details. For example, you can sense if the cassette tape switch is down by checking PEEK(1) AND 16. The three lowest-order bits are used for switching out ROM and switching in RAM. Don't ever do this from BASIC, and use prudence if you do it from machine language. More on these bits in a moment.

A little more information on memory control from address 0001: bit 0, mask 1, controls the BASIC ROM in addresses A000-BFFF. Switch this bit to zero and the BASIC ROM is gone: in its place is RAM. Now you can write your own language. Bit 1, mask 2, controls the Kernal ROM in addresses E000-FFFF. Switch this bit to zero and the Kernal is gone; be very careful, since you've just switched away all of the programs that support interrupts, keyboard, screen, and so on. If you switch off both bits 0 and 1, you will get a 64K RAM machine: the I/O block will be switched out, too.

The 6509

The 6509, too, is a 6502 with a change to addresses 0000 and 0001. In this case, the changes are more profound: they cause a switch to a new memory bank. The 6509 is expected to be used in the newest CBM products: the PET II (P128) and the CBM II (B and BX series).

Both addresses 0000 and 0001 are used to provide access to memory beyond the normal 64K limitation. These addresses are used to "bank switch" to one of 16 memory banks, each of which is 64K in size. Thus, the 6509 can access over one million memory locations.

If we place a value of zero to 15 in address 0001, we will influence only one kind of address: indirect, indexed. So if we code LDA #$01:STA $01 we are selecting bank one for indirect addressing. Now, if we code LDA ($F0),Y we will perform the following steps: go to addresses 00F0 and 00F1 in the current bank and get the new address stored there; add the contents of the Y register to this new address; and finally, load the A register with the contents of the resulting address, from bank one. Indirect addressing is generally used to obtain or store data; the extra capability provided with address 0001 allows us to obtain or store a very large amount of data.

Address 0000 changes the bank from which we obtain instructions. If we code LDA #$01:STA $00 we will immediately start executing instructions from bank one. This is tricky: we have not jumped, so we will start executing from precisely the same address we left in the other bank. We must carefully write "synchronized" programs so that when we leave one bank, there will be a program in exactly the right place in the new bank to allow processing to continue. It's a good trick, but it can be done.

The new chips are still 6500 style. They use the same instructions in exactly the same way. But they open up new possibilities, and we'll need to learn how to cope with them. ©

Use the handy reader service cards in the back of the magazine for information on products advertised in **COMPUTE!**

MICROSPEC

Quit Playing Games . . .
Disk Based Software to Make Your Computer Get Down to Business

Disk Data Manager—Create and manage your own data base. Allows you to create, add, change, delete, search, sort, print, etc. Up to 1200 records on a single disk.
VIC 20. . . 59.95 CBM 64 . . . 79.95

Payroll System—Full featured, complete payroll system. Even prints checks.
VIC 20. . . 89.95 CBM 64 . . . 99.95

Mailing List—Up to 1200 records on a single disk. Presorts by Zip Code. Prints on stock up to four labels wide.
VIC 20. . . 44.95 CBM 64 . . . 54.95

Inventory Package—Maintains quantity on hand, cost, sales price, reorder point, etc. Generates suggested reorder, sales report, and sales analysis.
VIC 20. . . 79.95 CBM 64 . . . 99.95

General Ledger—Up to 75 accounts! Generates Balance Sheet, Income Statement, Update Report, etc.
VIC 20. . . 89.95 CBM 64 . . . 99.95

Checkbook Manager—Up to 25 expense categories. Tracks all outstanding checks until they are paid.
VIC 20. . . 49.95 CBM 64 . . . 49.95

CONTACT US FOR ALL YOUR DISK BASED SOFTWARE NEEDS
Call for specifics on Hardware Configurations.
Send Self-Addressed Stamped Envelope for Catalogue of Games and other Applications
DEALER INQUIRIES WELCOME

2905 Ports O'Call Court
Plano, Texas 75075
(214) 867-1333
VISA and MASTERCARD Accepted

HARDWARE & SOFTWARE
COMPUTER Products by Mail
SAVE 20—40%

Mail the attached coupon to CPM with $1.25 (check or money order) and receive our listing of computer hardware and software. Listed below are a few of the many software manufacturers currently in stock.

Software in Stock for ■ **Software**

■ Apple
■ Atari
■ Vic-20
■ IBM
■ Radio Shack

☐ Broderbund
☐ Thorn, EMI
☐ Big Five
☐ Sirius
☐ Synapse

☐ Quality Software
☐ Sierra On Line
☐ Automated Simulations
☐ Continental Software
☐ Avalon Hill

Over 1200 software titles currently in stock.

☐ Yes, I am interested in **Computer Products By Mail.** I am enclosing a check or money order for $1.25 for my complete computer print-out catalog. I understand that this amount is applied to my first purchase.

Name ______________________
Street ______________________
City ____________State_______Zip_______

Mail to: CPM P.O. Box 19137 Charlotte, NC 28219

CPM

PET Dynamic Bookkeeping

Ron Kushnier

This bookkeeping program saves data with a program on tape. Using the "dynamic keyboard" technique and other modifications, it illustrates a useful subroutine for those who want extra power from a tape-based system.

It was my objective, after several years of enjoying my 8K PET, to create a program which I could incorporate into my everyday activities at home. I decided on the proverbial bookkeeping program. Entering all those numbers was a job of which I was not overly fond, but it was all too necessary for income taxes.

This program would have to be practical. It would have to be fast, with easy access, and it would have to do more than could be done by just entering the same information on 3x5 cards.

I tried to consider all the options. Sure, it would be easy if I bought a disk system and something like VisiCalc, but that wouldn't be much of a challenge.

Trial And Error

I took stock of what I had available: standard 8K PET with Upgrade ROMs, and a ROM Toolkit mounted on a PC board which plugged into the PET Expansion socket.

The first thing I did was to buy the Rabbit ROM from Eastern House Software. This high speed cassette firmware improved my access time tremendously. By making a simple modification to the Toolkit board, I was able to change the address of the existing extra socket to that of the Rabbit ROM(A000).

But I ran into two problems. The first was that the Rabbit would not work with the PET's internal tape drive. And since Commodore, at that time, could not supply me with an updated PC board replacement, it was necessary to switch to a whole new CBM cassette unit. The second problem was that the Rabbit could not be used for data files. This meant that I would have to do something really tricky.

The original program was stored with the Rabbit. The data was stored with conventional Commodore data files on another tape. No good! *It took forever*! The time had come for the tricky part.

Again, I explored the options. I could convert array information to data statements. It had been done before. But there was the conversion time both back and forth. The idea was unappealing.

I started fooling around with a dynamic keyboard approach, but without much success. The dynamic keyboard is a method that lets the computer modify the program in memory by POKEing to the keyboard buffer. See lines 58000 on.

It was not until a co-worker, Howard Bicking, came along that the solution was found. He managed to write a small tag-along routine that could be added, which would save all variables and array data along with the program. This was a real breakthrough. I was now able to save 10K worth of program and data in under one minute.

The bookkeeping part of the program is fairly straightforward. It consists of menu-driven, nested arrays of information which allow for easy update and display. Some protection routines were written into the program so that mistakes could be easily corrected.

Obviously, the program must be tailored to the individual user. Its modular construction should make this a fairly easy job.

The Special SAVE

There is a little procedure which must be followed when using the SAVE routine.

After you have entered the bookkeeping program or a modification of the program, it is necessary to run it in order to initially set up the various parameters and pointers. Start the run after the 0 statement number. This is accomplished with a:

```
RUN10
```

Then just follow the program instructions printed on the screen. When all the data is entered, you will want to do a SAVE. The dynamic keyboard will take over, change pointers, and will then display that it is OK to save in a conventional manner.

The next time the program is to be used, a normal RUN will bring in the works.

The SAVE program can be added to any program as the last thing to be done. As a result, self-learning programs can be saved with an ever-increasing library of entries.

```
0 GOSUB59010:GOTO1000
10 DIM Q(3,6,12),M$(12)
1000 PRINT"{CLEAR}";"BOOKKEEPING PROGRAM
1010 FORH=1TO500
1020 NEXTH
1030 GA$(0)="CASH
1040 GA$(1)="AMOCO
1050 GA$(2)="ARCO
1060 GA$(3)="GULF
1070 GA$(4)="SHELL
```

```
1080 UT$(0)="PECO
1090 UT$(1)="BELL OF PA
1100 BL$(0)="CHARGES
1110 BL$(1)="GASOLINE
1120 BL$(2)="UTILITES
1130 BL$(3)="MISCELLANEOUS
1140 CH$(0)="BAMBERGERS
1150 CH$(1)="GIMBELS
1160 CH$(2)="PENNEYS
1170 CH$(3)="PNB
1180 CH$(4)="SEARS
1190 CH$(5)="STRAWBRIDGES
1200 CH$(6)="WANAMAKERS
1210 MI$(0)="MORTGAGE
1220 MI$(1)="TAX
1230 MI$(2)="PAPER
1240 MI$(3)="EXTERMINATOR
1250 MI$(4)="AUTO EXPENSE
1260 MI$(5)="ENTERTAINMENT
1270 M$(1)="JAN
1280 M$(2)="FEB
1290 M$(3)="MAR
1300 M$(4)="APR
1310 M$(5)="MAY
1320 M$(6)="JUN
1330 M$(7)="JUL
1340 M$(8)="AUG
1350 M$(9)="SEP
1360 M$(10)="OCT
1370 M$(11)="NOV
1380 M$(12)="DEC
1390 Z1$="RECORD ALL DATA?(Y/N)
1400 Z$="DO YOU WANT TO CHANGE THE LIST?(Y/N)
1410 PRINT"{CLEAR}";"BILLING LIST":PRINT"------
    ------"
1420 FORI=0TO3
1430 PRINTI+1;BL$(I);" (";BL(I);")"
1440 NEXTI
1450 PRINT" 5 END PROGRAM
1460 T=5
1470 GOSUB2440:REM* LIKE TO SEE*
1480 F=A-1:ONAGOTO1490,1720,1950,2200,2430
1490 GOSUB 2880:REM* PRINT BILLING LIST COMPONE
    NT *
1500 FORI=0TO6
1510 PRINTI+1;CH$(I);"(";C(I);")"
1520 NEXTI
1530 PRINT" 8 BACK TO BILLING LIST
1540 T=8
1550 GOSUB2440:REM* LIKE TO SEE*
1560 IFA=8THEN1410
1570 I=A-1
1580 PRINT"{CLEAR}";CH$(I);"(";C(I);")":PRINT"-
    --------
1590 GOSUB2770:REM* MONTHLY PRINTOVERFLOW*
1600 GOSUB2910:REM* "CHANGE LIST?" *
1610 IF F1<>0THENF1=0:GOTO1490
1620 GOSUB2630:Q(F,I,A)=V+Q(F,I,A):REM* INPUT A
    MT*
1630 C(I)=0:GOSUB2970:C(I)=X:REM*ADD TOTALS *
1640 BL(F)=0:FORK=0TO T-2
1650 BL(F)=BL(F)+C(K):NEXTK
1660 GOSUB2840:REM * PRINT MONTH-AMT *
1670 PRINT:PRINTZ1$:REM* "RECORD?"*
1680 GOSUB2510:REM* YES-NO*
1690 IFA$="N"THENGOTO1490
1700 GOTO58000
1710 GOTO1490
1720 PRINT"{CLEAR}":PRINTBL$(F);"(";BL(F);")"
1730 FORI=0TO4
1740 PRINTI+1;GA$(I);"(";G(I);")"
1750 NEXTI
1760 PRINT" 6 BACK TO BILLING LIST
1770 T=6
1780 GOSUB2440
1790 IFA=6THEN1410
1800 I=A-1
1810 PRINT"{CLEAR}";GA$(I);"(";G(I);")":PRINT"-
    --------
1820 GOSUB 2770:REM* MONTHLY PRINTOVERFLOW*
```

```
1830 GOSUB2910:REM* "CHANGE LIST?" *
1840 IFF1<>0THENF1=0:GOTO1720
1850 GOSUB2630:Q(F,I,A)=V+Q(F,I,A):REM* INPUT A
    MT*
1860 G(I)=0:GOSUB2970:G(I)=X:REM* ADD TOTALS *
1870 BL(F)=0:FORK=0TOT-2
1880 BL(F)=BL(F)+G(K):NEXTK
1890 GOSUB2840
1900 PRINT:PRINTZ1$
1910 GOSUB2510
1920 IFA$="N"THENGOTO1720
1930 GOTO58000
1940 GOTO1720
1950 GOSUB 2880:REM* PRINT BILLING LIST COMPONE
    NT *
1960 FORI=0TO1
1970 PRINTI+1;UT$(I);"(";U(I);")"
1980 NEXTI
1990 PRINT" 3 BACK TO BILLING LIST
2000 T=3
2010 GOSUB2440:REM* LIKE TO SEE*
2020 IFA=3THEN1410
2030 I=A-1
2040 PRINT"{CLEAR}";UT$(I);"(";U(I);")":PRINT"-
    --------


2050 GOSUB2770:REM* MONTHLY PRINTOVERFLOW*
2060 GOSUB2910:REM* "CHANGE LIST?" *
2070 IF F1<>0THENF1=0:GOTO1950
2080 GOSUB2630:Q(F,I,A)=V+Q(F,I,A):REM* INPUT A
    MT*
2090 U(I)=0:GOSUB2970:U(I)=X:REM*ADD TOTALS *
2100 BL(F)=0:FORK=0TOT-2
2110 BL(F)=BL(F)+U(K):NEXTK
2120 GOSUB2840:REM * PRINT MONTH-AMT *
2130 PRINT:PRINTZ1$:REM* "RECORD?"*
2140 GOSUB2510:REM* YES-NO*
2150 IFA$="N"THENGOTO1950
2160 GOTO58000
2170 GOTO1950
2180 GOTO58000
2190 GOTO1950
2200 GOSUB 2880:REM* PRINT BILLING LIST COMPONE
    NT *
2210 FORI=0TO5
2220 PRINTI+1;MI$(I);"(";MI(I);")"
2230 NEXTI
2240 PRINT" 7 BACK TO BILLING LIST
2250 T=7
2260 GOSUB2440:REM* LIKE TO SEE*
2270 IFA=7THEN1410
2280 I=A-1
2290 PRINT"{CLEAR}";MI$(I);"(";MI(I);")":PRINT"
    ---------


2300 GOSUB2770:REM* MONTHLY PRINTOVERFLOW*
2310 GOSUB2910:REM* "CHANGE LIST?" *
2320 IF F1<>0THENF1=0:GOTO2200
2330 GOSUB2630:Q(F,I,A)=V+Q(F,I,A):REM* INPUT A
    MT*
2340 MI(I)=0:GOSUB2970:MI(I)=X:REM*ADD TOTALS *

2350 BL(F)=0:FORK=0TOT-2
2360 BL(F)=BL(F)+MI(K):NEXTK
2370 GOSUB2840:REM * PRINT MONTH-AMT *
2380 PRINT:PRINTZ1$:REM* "RECORD?"*
2390 GOSUB2510:REM* YES-NO*
2400 IFA$="N"THENGOTO2200
2410 GOTO58000
2420 GOTO2200
2430 GOTO58000
2440 REM*** WHAT WOULD LIKE TO SEE ***
2450 PRINT: PRINT"WHAT WOULD YOU LIKE TO SEE? I
    NPUT 1 TO";T
2460 GETA$:IFA$=""THEN2460
2470 A=VAL(A$)
2480 IFA<1ORA>TTHEN2460
2490 RETURN
2500 :
2510 REM*** YES- NO QUESTION ***
```

```
2520 GETA$:IFA$=""THEN2520
2530 IFA$<>"Y"THENIFA$<>"N"THEN2520
2540 RETURN
2550 :
2560 REM*** WHAT MONTH ***
2570 PRINT:PRINT"WHAT MONTH? INPUT 1 TO 12":PRI
    NT"THEN HIT RETURN KEY
2580 GOSUB2650
2590 A=V
2600 IFA<1ORA>12THEN2580
2610 RETURN
2620 :
2630 REM *** INPUT AMOUNT ***
2640 PRINT:PRINT"INPUT AMOUNT. THEN HIT RETURN
    KEY
2650 AA$=""
2660 OPEN1,0
2670 GET#1,A$
2680 IF A$<>CHR$(20)THEN2710
2690 IFLEN(AA$)-1 <0THEN2670
2700 AA$=LEFT$(AA$,(LEN(AA$)-1)):PRINT"{LEFT} {
    LEFT}";:GOTO2670
2710 PRINTA$;
2720 AA$=AA$+A$
2730 IFA$<>CHR$(13)THEN2670
2740 V=VAL(AA$)
2750 CLOSE1:RETURN
2760 :
2770 REM*** MONTHLY PRINTOVERFLOW ***
2780 FORJ=1TO6
2790 PRINTJ;M$(J);"...";TAB(9);Q(F,I,J);TAB(20)
    ;(J+6);M$(J+6);"...";TAB(28);
2800 PRINTQ(F,I,J+6)
2810 NEXTJ
2820 RETURN
2830 :
2840 REM*** PRINT MONTH-AMT ***
2850 PRINTM$(A);"...";Q(F,I,A)
2860 RETURN
2870 :
2880 REM***PRINT BILLING LIST ***
2890 PRINT"{CLEAR}":PRINTBL$(F);"(";BL(F);")":R
    ETURN
2900 :
2910 PRINT:PRINTZ$:REM*"CHANGE LIST ?"*
2920 GOSUB2510:REM* YES-NO*
2930 IFA$="N"THEN F1=-1:RETURN
2940 GOSUB2560:REM* WHAT MONTH*
2950 GOSUB2840:RETURN
2960 :
2970 REM *** ADD TOTALS ***
2980 X=0
2990 FORJ=1TO12
3000 X=X+Q(F,I,J):NEXTJ:RETURN
3010 FORK=0TO T-2
3020 BL(F)=BL(F)+C(K):NEXTK
3030 RETURN
3040 :
3050 :
58000 REM-SAVE PROGRAM BY HOWARD BICKING
58010 PRINT"{CLEAR}{02 DOWN}":FORI=2TO6 STEP2
58020 N4=I*5:GOSUB58190:N5$=N4$
58030 N4=PEEK(40+I):GOSUB58190:N6$=N4$:N4=PEEK(4
    1+I):GOSUB58190
58050 PRINT"59"+N5$" POKE"40+I","N6$":POKE"41+I"
    ,"N4$:NEXT
58060 PRINT"58130 POKE42,"N6$":POKE43,"N4$":END
58080 PRINT"GOTO 58110
58090 POKE 158,5:FORI=0TO7:POKE623+I,13:NEXT:PRI
    NT"{HOME}":END
58110 PRINT    :PRINT"{CLEAR}{REV}{03 DOWN}{03 RI
    RIGHT}YOU MAY NOW SAVE THIS PROGRAM
58130 POKE42,016:POKE43,032:END
58190 N4$=RIGHT$("00"+RIGHT$(STR$(N4),LEN(STR$(N
    4))-1),3):RETURN
58200 GOSUB 59010:END
59010 POKE 42 ,187:POKE 43 ,022
59020 POKE 44 ,057:POKE 45 ,023
59030 POKE 46 ,016:POKE 47 ,032
59090 RETURN
```

VIC High-res Plotter

Sal Raciti

If you need to illustrate something graphically, few options are superior to plots. This program, especially useful to students studying algebra, creates a high resolution picture of a mathematical equation. After seeing a plot, press the RUN/STOP and RESTORE keys at the same time to return the screen to its normal state.

"Y = F (X) Plot Program" is a high resolution plot program for a 5K VIC-20. It plots equations in the form Y = F (X), e.g., Y = SIN (X). It is basically written as a high school level educational program to allow a student to select an equation, envision how it plots, and select the X and Y axes limits. If the student selects the axes limits incorrectly, he can try again. The program builds VIC's custom characters "on the fly" as values of Y are computed. Prior to the plot, it draws on the screen the X and Y axes limits selected by the student.

The program breaks the VIC-20 screen into 20 columns of characters, 20 characters high, in the upper left corner of the screen. It further subdivides each character column into eight dot columns, creating a matrix of 160 dots by 160 dots, or a total of 25,600 dots.

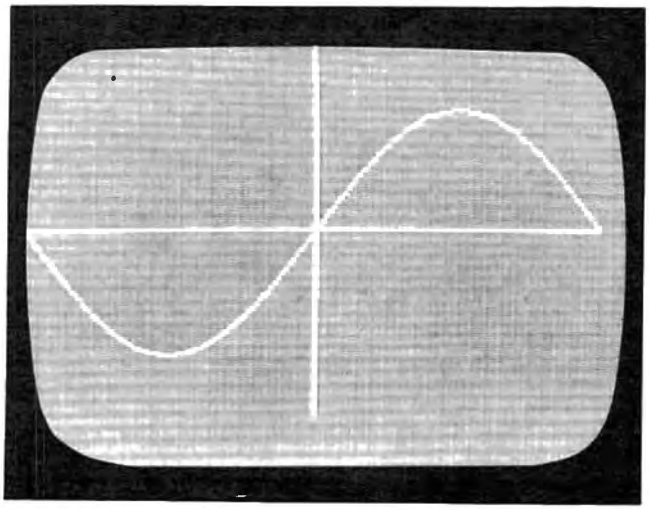
Lines 1 through 7 are the initial setup of the program. Lines 3 and 4 clear the custom character section of the RAM to all blank characters, i.e., 512 locations starting at 7168. Lines 6 and 7 set up the screen to allow selection of the equation to be plotted at location 550. *The program is restarted by typing RUN 9.*

Lines 9 through 47 allow selection of X and Y axes limits by the user through the use of INPUT prompts. These steps also do reasonableness checks on the inputs and prompt if there is an error. Lines 30 and 40 enter the X axis limits as string variables C$ and D$. This was done because of an idiosyncrasy of the VIC-20 that does not accept the π key as a numeric entry. Subroutine 5000 is used to convert the allowed values of π to numerics. Line 47 activates subroutine 6000 when Y is typed. Subroutine 6000 will be explained below.

Lines 48 through 230 plot the X axis using the INPUTted values of A, B, C and D from lines 10, 20, 30 and 40. Lines 50-80 calculate the numeric distance between horizontal dots. Line 90 tests if the axis is off the screen and skips to line 191. Lines 92-130 calculate the position of the X axis in numbers of characters from screen bottom and number of dots left over. Lines 140-230 create the 0 "TH" custom character and POKE it across the screen. Line 85 selects the screen and border color. Line 192 and 195 select character color (in this case, dot color). Line 191 invokes the custom character RAM locations.

Lines 240-440 plot the Y axis. Line 250 skips the entire routine if the Y axis is off the screen. Lines 255-330 create the 1 "TH" custom character, i.e., a vertical line at the correct dot column. Lines 340-440 POKE the 1 "TH" custom character vertically at the correct screen position. As this is accomplished, each POKE location is tested to see if it's not blank, that is, to test where the crossing of the X axis occurs. When this is sensed, the 1 "TH" custom character is logically ORed with the 0 "TH" custom character to create the 2 "TH" character. This is accomplished by lines 380-430.

The equation's high-resolution plot is executed by lines 490-780. Calculation of Y amplitude (YA) is treated as dot columns within character columns. For each character column, custom characters are made up "on the fly" as necessary by lines 520-770. The amplitude of Y (YA) is calculated by line 560 in numbers of dots from screen bottom. Line 570 finds the number of characters from screen bottom and 580 finds the excess number of dots. 600 calculates the character screen position and the dot row at the dot column being processed. 610-765 logically OR this dot with any other dots on the screen at the character location



Tracking a sine wave on the VIC-20 with "Hi-Res Plotter."

being processed. These dots were on the screen from previous calculations of Y or the X and Y axis plot.

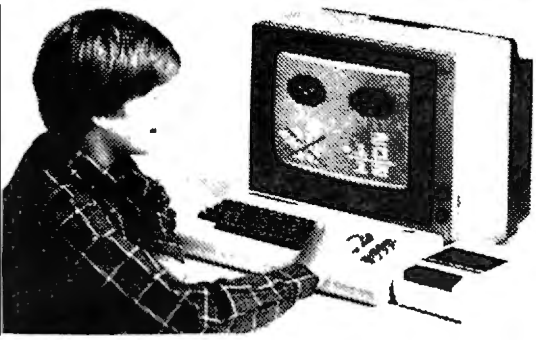
Avoiding Screen Clutter

If at line 47 Y was typed, then line 775 invokes subroutine 6000. The VIC-20 is limited to 64 custom characters. If the equation to be plotted is very complicated, e.g., Y=SIN (2X), the 64 characters are used up; then the program starts using screen RAM locations as custom locations, and the screen clutters. Subroutine 6000 starts a search of the screen RAM to see if any custom characters with character column just completed are identical to previously generated characters; if so, they are replaced by the earlier generated character. Subroutine 6000 finds the last custom character ("N"TH) created and sets the scan direction. Subroutine 8000 is called by 6000 and does the actual character comparisons and replacement.

Note: The π(pi) characters in lines 25 and 5000-5110 are obtained by holding down the SHIFT key and typing the ↑(up arrow) key.

```
1 REM INTIALIZATION
3 FORG=7168+32*8 TO 7168+32*8+7
4 POKEG,0:NEXTG
6 PRINT"{CLEAR}";:PRINTSPC(1);:PRINT"Y=F(X) ~
    PLOT PROGRAM"
7 PRINT"{03 DOWN}";:PRINT"ENTER Y=F(X) @ 550
     AND THEN RUN9"
8 LIST550
9 PRINT"{CLEAR}";:PRINTSPC(1);:PRINT"Y=F(X) ~
    PLOT PROGRAM{02 DOWN}"
10 INPUT"Y-MIN VAL";A
20 INPUT"Y-MAX VAL";B
23 IFA>=BTHENPRINT"{03 DOWN}AXIS INCORRECTLY ~
    INPUT-START OVER!":STOP
25 PRINT"{02 DOWN}REM TRIG FUNC LENGTH  OF X-
    AXIS <=2π. SELECT +OR-2π,π,π/2, OR NU
    M-BER.
26 PRINT"{02 DOWN}"
30 INPUT"X-MIN VAL";C$
40 INPUT"X-MAX VAL";D$
43 GOSUB5000
45 IFC>=DTHENPRINT"{03 DOWN}AXIS INCORECTLY I
    NPUT-START OVER!":STOP
47 INPUT"PLOT BREAK? TYPE Y  N{03 LEFT}";Z$
48 REM X-AXIS PLOT
50 YS=ABS(B-A)
60 XS=ABS(D-C)
80 XD=XS/160
85 POKE36879,104
90 IF(A<0ANDB<0)OR(A>0ANDB>0)THENGOTO191
92 AA=ABS(A)
95 YA=INT(24+8*20*(AA)/YS)
121 T=7168:V=7175:GOSUB2000
127 NB=INT(YA/8)
130 ND=YA-8*NB
140 N=7175-ND
150 POKEN,255
190 CD=22-NB
191 POKE36869,255:PRINT"{CLEAR}"
194 FORG=38400TO38905
195 POKEG,1:NEXTG
197 IF(A<0ANDB<0)OR(A>0ANDB>0)THENGOTO250
200 Q=7680+CD*22
210 FORQ=QTOQ+19
220 POKEQ,0
230 NEXTQ
240 REM Y-AXIS PLOT
250 IF(C<0ANDD<0)OR(C>0ANDD>0)THENGOTO500
255 CC=ABS(C)
260 XA=INT(8*20*CC/XS)
270 NB=INT(XA/8)
280 ND=XA-8*NB
290 T=7176:V=7183
310 GOSUB4000
320 FORM=TTOV
330 POKEM,R:NEXTM
340 FORZ=7680+NBTO8098+NBSTEP22
350 IFPEEK(Z)<>32THENGOTO380
360 POKEZ,1
370 GOTO440
380 FORS=0TO7
390 Y=PEEK(S+7176)
410 X=PEEK(7168+S)
420 POKE(T+8+S),(XORY)
425 NEXTS
430 POKEZ,2
440 NEXTZ
490 REM Y=F(X) PLOT
500 N=2
510 X=C-XD
520 FORD=0TO19
525 R=256
530 FORE=0TO7
535 R=R/2
540 X=X+XD
550 Y=(X*X)
560 YA=INT(20*8*(Y-A)/(B-A))
570 NB=INT(YA/8)
580 ND=YA-8*NB
590 IFNB>=20ORNB<0THENGOTO770
600 Z=8098+D-22*NB
605 ND=ND+1
610 O=PEEK(Z)
620 IFO<NORO=32THENGOTO720
640 IFPEEK(Z)=NTHENGOTO750
720 N=N+1
723 IFN=32THENN=N+1
734 FORM=0TO7
735 J=PEEK(7168+8*O+M)
736 POKE(7168+8*N+M),J
737 NEXTM
750 J=PEEK(7168+8*N+8-ND)
760 POKE(7168+8*N+8-ND),(JORR)
765 POKEZ,N
770 NEXTE
775 IFZ$="Y"THENGOSUB6000
780 NEXTD
930 END
2000 FORW=TTOV
2010 POKEW,0:NEXTW
2020 RETURN
4000 R=256
4010 FORP=1TOND
4020 R=R/2:NEXTP
4030 RETURN
5000 IFC$="-2π"THENC$="-6.2832
5010 IFC$="-π"THENC$="-3.1416"
5020 IFC$="-π/2"THENC$="-1.5708"
5040 IFD$="π/2"ORD$="+π/2"THEND$="1.5708"
5050 IFC$="π"ORC$="+π"THENC$="3.1416"
5060 IFD$="2π"ORD$="+2π"THEND$="6.2832"
5070 IFC$="π/2"ORC$="+π/2"THENC$="1.5708"
5080 IFD$="π"ORD$="+π"THEND$="3.1416"
5100 IFD$="-π/2"THEND$="-1.5708"
5110 IFD$="-π"THEND$="-3.1416"
5200 C=VAL(C$):D=VAL(D$):RETURN

6000 MM=0
6010 IFMM=0THENQQ=0:SS=418:TT=22
6020 IFMM=1THENQQ=418:SS=0:TT=-22
6030 FORBB=QQTOSSSTEPTT
6040 CC=8098+D-BB
6050 DD=PEEK(CC)
6060 IFDD=32ORDD<3GOTO6090
6070 IFDD<NANDDD>2ANDMM=0THENBB=418:NEXTBB:MM=1
     :GOTO6020
6080 IFDD=NANDDD>2THENGOSUB8000
6090 NEXTBB
```

AMERICAN PERIPHERALS



122 BANGOR ST.
LINDENHURST, N.Y. 11757
516-226-5849

VIC 20
The friendly computer

V 6 **FOUR ACROSS**
Vertical game for two players; similar to tic-tac-toe. $9.95

V 10 **SNAKE**
Like the Arcade game SURROUND. One or two players. $9.95

V 12 **BREAKOUT**
Adaption of the classic Ping-Pong against the wall. All time favorite. $9.95

V 78 **BRICK**
The computer has a brick float across the screen and it disappears before it hits the window. You have to stop the brick before it breaks the glass. $7.95

V 79 **SHOOT**
You have to shoot a moving object. The game has five different skill levels. $7.95

V 80 **REVERSE**
This game is played with two sets of pegs. The board starts with a set of pegs at each end and you must reverse them. $7.95

V 81 **CAPTURE**
You have to capture the two beasts by containing them in the brick cage that you build. It has nine skill levels. $9.95

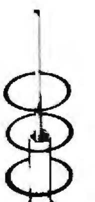
V 82 **WORLD CAPITALS**
An entertaining and educational variation of STATE CAPITALS. $9.95

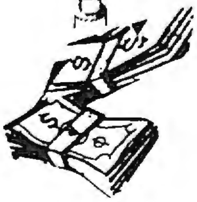
V 83 **JACKPOT**
You must see this one armed bandit in action to believe it. Full color graphics and sound. $7.95

V 84 **STATE CAPITALS**
The computer displays a state or capital; the student types in the corresponding capital or state. Even corrects spelling mistakes. $9.95

V 85 **HANGMAN**
Unbelievable graphics and sound with a twist of humor. Kids of all ages will love this one. $9.95

V 86 **TAC-TAC-TOE**
The perennial favorite, a fast-paced colorful game. Try if you can to beat the VIC. $7.95





V 87 **MEMORY**
The VIC challenges your memory to the ultimate degree. Just like the old T.V. show Concentration. $9.95

V 88 **MATCH**
Hand and eye coordination are a must in this game. Beat the clock and get the maximum number of points. $7.95

V 89 **MONKS**
A devilish game of logic. It will have you glued to the VIC for days. $7.95

V 428 INTRUDER-SCRAMBLE
Just as fine as the arcade game. Machine language. A must! $19.95

V 90 **MOSAICS**
A variation of Rubics cube for the VIC. This game has never been seen before for any computer. We wrote the program but could not solve the puzzle. $9.95

V 91 **SENKU**
If you like thinking logically, this one will challenge you all the way! Based on the popular game of Mastermind. $7.95

V 92 **MAGIC PAD**
A mini-version of Visi-Calc for the VIC. Allows storage and retrieval of data from cassette; invaluable for personal and business use. Turns VIC into the perfect record keeper. $20.00

V107 **BINARY NUMBERS**
This program is designed to introduce you to the binary number system and the conversion to binary from base 10 numbers and back. $9.95

V108 **BOMBER**
You must decide who you want to fly for. You then get to pick a target and your experience level. $9.95

V151 **BIZZ-BUZZ**
Math game that tests the student on division by 2&3. Good for elementary school students. With color and sound. $9.95

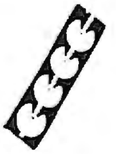
V152 **MISSILE COMMAND**
You have three bases and you must destroy as many space ships as you can before you run out of missiles. $9.95

V153 **TANK VS. UFO**
The tank is moving back and forth along the base and you must shoot the UFO before it shoots you. $9.95

V190 **BIORHYTHM**
Just like the biorhythm charts you find in books. $9.95

V191 **BLACKJACK**
Just like Blackjack in the casinos. $14.95

V192 **BEST STRAIGHT LINE**
This program finds the equation for the best straight line through the desired points on a graph. $9.95



V194 **SNAKMAN**
Pacman for the VIC. $24.95

V197 **ASTROBASE-2001**
Destroy the alien invaders from space as they attack your planet. Requires 3K memory expander. $9.95

V199 **SUBROUTINES**
The use of this standard programming technique allows you to save much room and effort. Typical uses are stressed. $14.95

V299 **A CAT HAS NINE LIVES**
You're an alley cat who is trying desparately to defend himself from unidentified deadly objects. Fast paced game. $7.95

V300 **PSYCHIC MISSILES**
The object of the game is to guess where the target will be, then fire the missile! This program will exercise your psychic ability. Requires $9.95
By Richard Leiman

V301 **BEECHA GOTCHA**
Play "Beecha Gotcha." If the harpoon hits the monster fish, I "beecha." If the monster eats the boat, I "gotcha." Requires 3K expander. $9.95
By Richard Leiman

V302 **AIR ATTACK**
You must shoot down enemy aircrafts with your limited supply of missiles. $7.95

commodore

WRITE FOR FREE SOFTWARE CATALOG

Please send me the **A**
VIC 1982 CATALOG
AMERICAN PERIPHERALS
122 Bangor Street
Lindenhurst, NY 11757

NAME ____________
ADDRESS ____________
CITY ________ STATE ________
ZIP ________ COMPANY ________

```
6100 RETURN
8000 FORGG=DTO0STEP-1
8003 IFMM=0THENUU=0:VV=19:WW=1
8004 IFMM=1THENUU=19:VV=0:WW=-1
8010 FORRR=UUTOVVSTEPWW
8020 HH=8098+GG-22*RR
8030 II=PEEK(HH)
8040 IFII=32ORII=NTHENGOTO8120
8050 FORJJ=1TO8
8060 KK=7167+8*II+JJ
8070 LL=7167+8*N+JJ
8090 IFPEEK(KK)<>PEEK(LL)THENJJ=8:GOTO8110
8100 IFJJ=8THENPOKECC,II:N=N-1:IFN=32THENN=31
8105 IFJJ=8ANDMM=0THENRR=19:GG=0
8106 IFJJ=8ANDMM=1THENRR=0:GG=0
8110 NEXTJJ
8120 NEXTRR
8130 NEXTGG
8140 RETURN
```

THE INTERNATIONAL USER'S CASSETTE MAGAZINE FOR **20 Load**

VIC 20™ OWNERS

The only monthly cassette which exchanges ideas and gives you "READY TO RUN" educational, adventure, utility, and game programs. Send for information, NOW- Send to: Load 20 Magazine, 550 Grant Avenue, Junction City, Kansas 66441.

(VIC-20 is a trademark of Commodore Business Machines, Inc.)

POCKET A WINNER!

PRODUCT LIST

*Tax Helper, 1040 & Schedule A	$16.95
*Mail Helper	16.95
*Stock Helper	16.95
*Check Helper	16.95
**General Ledger	19.95
**Accounts Payable	16.95
**Accounts Receivable	16.95
**Inventory	16.95
**Order/Invoice	16.95
**Suppliers	14.95
**Customers	14.95
**Payroll (Checks, etc.)	29.95
Word Pouer	19.95

*(M)agreeable Software
**Available for: Cassette; Disk (add $2 to list price); Printers (VIC 1515 & 1525. IEEE-488. Forms available).
Buy all ** software at once for $99.95 and save $47.65!

PM SOFTWARE
A DIVISION OF PM BUSINESS SERVICES

4400 Arden View Ct. St. Paul, MN 55112 (612)633-0891

Write today for free catalog! VIC-20 is a t m of Commodore Computer Systems

Now Available

COMPUTE!'s First Book Of VIC

The newest title in COMPUTE!'s First Book series...

Our *First Book of VIC* contains the best of our VIC articles and applications published since the summer of 1981. In one convenient spiral bound volume, you'll find approximately 200 pages of information.

☐ **Chapter 1:** Getting Started
☐ **Chapter 2:** Diversions — Recreation and Education
☐ **Chapter 3:** Programming Techniques
☐ **Chapter 4:** Color and Graphics
☐ **Chapter 5:** Maps and Specifications
☐ **Chapter 6:** Machine Language

In addition to material previously published in **COMPUTE!**, several of the articles and programs including a screen print program, append, tutorials on screen formatting and keyboard input and others, are being published for the first time.

Order your copy of *COMPUTE!'s First Book Of VIC* today by calling TOLL FREE:

800-334-0868
In NC Call 919-275-9809

$12.95 plus $2 shipping and handling. MasterCard, Visa, and American Express accepted, or send your check or money order to: **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403. US funds only. Foreign order add $5 for air mail, $2 for surface delivery.

THE ARFON MICRO VIC 20 EXPANSION CHASSIS FEATURES

- 7 expansion slots
- All aluminum construction
- Large power supply with torodial transformer
- 5 volt supply direct to expansion board for more reliable operation
- Low voltage output jack
- Detachable cover protects cartridges
- Houses VIC and Expansion in one portable unit
- Holder for RF modulator
- Supports all VIC 20 cartridges from Arfon Micro, Commodore and others

VIC 20 HARDWARE FROM ARFON MICRO
- 8K CMOS Static RAM
- 16K CMOS Static RAM

DR. WATSON COMPUTER LEARNING SERIES
- Beginners Assembly Language Programming Manual for the VIC 20

VIC 20 SOFTWARE FROM ARFON MICRO

BALDOR'S CASTLE is a fast moving real time adventure. Can you fight off 9 different types of monsters with just your bare hands or will you need bow & arrow, magic sword, potions and more to steal Baldor's gold? Fast on-screen graphics make this the adventure of a lifetime (if you live.) Game cartridge. (More fun with joystick.)

TOTL. TEXT 2.0 is a full featured word processing program which allows you to create and format professional looking documents. $25.

TOTL. TEXT 2.5 has all the features of TOTL. TEXT 2.0 plus up to 4 heading lines per page, footing line every page, footnotes, keyboard input for form letters, special characters for printer, right justify, and 3K additional working memory for editing. $35

TOTL TIME MANAGER 2.0 allows you to create personal or business schedules, calenders of events, and checklists of activities. Prints 56 different bar chart formats. $25

RESEARCH ASSISTANT 2.0 allows you to keep track of reference data and create sorted keyword cross reference lists. Keep data on reference sources: author, title, bibliography. Keep reference notes: page(s), text, up to 12 key words, date[illegible] $25

TOTL LABEL 2.0 mailing list and label program features easy editing, add or delete labels, define your own labels (width, length, number of printed lines), sort alphabetically or numerically and more. $20.

ALL TOTL 2.0 series programs work with tape and/or disk and require VIC 20, 8K expansion, cassette deck and/or disk drive, VIC printer or RS-232 printer.

MINVIC cassette programs allows software written for the unexpanded VIC to run with memory expansion installed. $5

TOTL TEXT AND TOTL TIME MANAGER NOW AVAILABLE FOR THE COMMODORE 64

Ask your VIC Dealer, or Contact

ARFON
MICROELECTRONICS, U.S.
111 Rena Drive
Lafayette, LA 70503
(318) 988-2478

VIC 20 is a registered trademark of Commodore Business Machines.

The Atari Cruncher

Andrew Lieberman

Many longer programs could benefit from this memory-saving technique, which saved 7,000 bytes in the music DATA within the author's music program.

Programs are written every day using DATA statements. Often the numbers in these statements are for SOUND and PLOT commands, and happen to be in the range of 0 to 255. Frequently, the program loads these numbers into a matrix. This method of DATA storage is inefficient; it wastes *lots* of memory.

There is, however, a way to solve this problem, and an easy way to change already existing programs to a more compact form. Using the "Cruncher," I knocked 7K – that's right, 7000 bytes – off a music program. It took about 40 minutes, and that includes debugging. Many programs can easily be done in half that time.

Each character on the Atari has an ATASCII value ranging from 0 to 255. Look in your *BASIC Reference Manual*, Appendix C. Take, for example, the letter A. Its corresponding number is 65. By using this code, we can convert each number (using one to three digits) to a single character using only one character. It would be a very tedious process if we took each number, looked it up on the chart, and then replaced the number in a program with a single character.

That's where the Cruncher comes in. It won't do all of the work, but it will do most of it. We can further save memory by condensing all of these single characters into one large string instead of a matrix. This is the big memory saver: each character in a matrix takes about seven bytes, but in a string takes only one. So, pull out a program with a lot of numbers and let's get to work. (*Note:* This is a standard procedure. Your program may require modifications of the process of conversion. Read through the procedure and think about what you are doing; otherwise, you may find yourself hopelessly lost.)

First, type the following subroutine into your Atari, and LIST it to cassette or disk. This way you can load it on top of the program to be converted.

```
0 A=PEEK(136)+PEEK(137)*256:? "WHAT L
  INE";:INPUT X:TRAP 32003:GOTO 32000
32000 LI=PEEK(A)+PEEK(A+1)*256:IF LI<
      >X THEN A=A+PEEK(A+2):GOTO 3200
      0
32001 A=A+1:IF PEEK(A)=90 THEN READ D
      :POKE A,D
32002 GOTO 32001
32003 END
```

Second, load the program to be converted. Put in a DIM statement and DIMension a string, say A$, to the number of numbers in the DATA statements. If your program READs the DATA and then puts it in a matrix, get rid of the READ statements. Otherwise, change a routine like this:

```
100 FOR I=1 TO 100:READ A,B:PLOT A,B:
    NEXT I
```

to this:

```
100 FOR I=1 TO 100:A=ASC(A$(I,I)):B=A
    SC(A$(I+1,I+1)):PLOT A,B:NEXT I
```

or better yet:

```
100 FOR I=1 TO 100:PLOT ASC(A$(I,I)),
    ASC(A$(I+1,I+1)):NEXT I
```

If your program handles the DATA in a different way, then it's up to you to figure out the rest of that part on your own.

Now we are almost ready to convert the DATA. Before we can put the characters into A$, we must have an A$. It is already DIMensioned, but we must add space for the characters in the program. Get an idea as to approximately how many numbers are to be converted, say 200. Then type something like this into your program:

```
50 A$(1,50)="ZZZZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZZZZZZZZZZZZZZZZZZZZZZZZ"
52 A$(51,100)="ZZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ"
54 A$(101,150)="ZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ"
56 A$(151,200)="ZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ"
58 A$(201,225)="ZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZ"
```

It doesn't hurt to put in some extras; you can always take them out later. To easily duplicate a line, just type it, press RETURN, move the cursor back to the line number, change it, and press RETURN. (*NOTE:* You *must* use capital Z's.) Once you have done this, type RUN. Tell the computer what line your Z's start at (in our sample, 50). Now, wait while the computer figures everything out. When READY appears, LIST the program and see what happens. Voilà! The Z's now look like a lot of garbage!

Fourth, and last, get rid of any extra Z's and delete line 0, lines 32000 to 32003, and all of the numerical DATA statements. Now type RUN and watch your program run faster than ever. Sit back and say to yourself, "Gee, that was easy. What program should I fix next?"

The Mystery Revealed

For those of you who would like to know how this program works, I will explain it step by step. The first thing the computer does is find out where the program is stored in RAM. By PEEKing addresses 136 and 137, the Cruncher finds out the first address of the program. The TRAP is so that when the computer is out of DATA, it ENDs without an error.

Next, the computer finds line X. The first three bits of each line give very important information. The first two tell the line number, and the third tells the length. To check if we are at line X, we first find out at which line we are. If LI isn't equal to X, we must advance the pointer to the next line. We do this by adding the length of the line to our original number and trying again.

Now the conversion process begins. A loop begins that checks each address to see if it is 90, or a Z. If it is, the program READs a piece of DATA and POKEs it into the program. We then loop back and continue the process. When we run out of DATA, the TRAP is sounded and the program ENDs. ©

CALL NOW
TOLL FREE INFORMATION
PRODUCT OR SHIPPING
800-821-2169
CALIFORNIA RESI

ATARI 800	529.00
NEC 8023 A	469.00
OKIDATA 82 A	439.00
MX-80 FT	489.00
HAYES SMARTMODEM	209.00
HAYES MICROMODEM II	269.00
SMITH CORONA TP-1	599.00
SIGNALMAN MODEM	85.00
NEC COLOR MONITOR	299.00
NEC GREEN MONITOR	109.00
VERBATIM DISKETTES	25.00/box

PLUS THE LARGEST SELECTION OF SOFTWARE YOU HAVE EVER SEEN

unicomm™ INC

THE SOFTWARE AND COMPUTER SERVICE STORES
18639 1/2 VENTURA BLVD. TARZANA, CA. 91356
TOLL FREE 800/821-2169 CALIF. 213/996-5722
FOR FREE QUARTERLY NEWSLETTER DROP US A LINE

ATARI SPECIALS

400 16K	$258.95
800 48K	618.95
810 DISK DRIVE	419.95
825 PRINTER	564.95
850 INTERFACE	157.95

*** SUPER PRICES**

PERCOM D/D DRIVE	$545 95
PERCOM S/D DRIVE	429 95
SIGNALMAN MK II	77 95
NEC PRINTER (8023A-C)	459 95
MAXELL DISCS (MD-1)	28 95

BEAR BOTTOM SOFTWARE PRICES

ATARI	
Asteroids (R)	$25 95
Caverns of Mars (D)	27 95
Centipede (R)	31.95
Missile Command (R)	25 95
Pac Man (R)	31 95
Star Raiders (R)	31 95
Super Breakout (R)	25.95
Assembler Editor (R)	43 95
Microsoft Basic (D)	64 95
AUTOMATED SIMULATIONS	
Invasion Orion (C&D)	$16 95
Temple of Apshai (C&D)	25 95
Datestones of Ryn (C&D)	14 95
Rescue at Rigel (C&D)	19 95
Star Warrior (C&D)	25 95
Crush, Crumble, Chomp (C&D)	19 95
Ricochet (C&D)	14 95
Dragon's Eye (C&D)	19 95
Crypt of the Undead (D)	19 95
Nightmare (D)	19 95
Escape/Vulcan's Island (D)	19 95
Curse of Ra (D)	14 95
BRODERBUND	
Apple Panic (D)	$19 95
Choplifter (D)	22 95
Deadly Secrets (D)	22 95
Midnight Magic (D)	22 95
Star Blazer (D)	20 95
Track Attack (D)	19 95
DATASOFT	
Basic Compiler (D)	$68 95
Text Wizard (D)	68 95
Canyon Climber (C&D)	20 95
O'Riley's Mine (C&D)	23 95
Rosen's Brigade (C&D)	23 95
Pacific Coast Hiway (C&D)	20 95
Shooting Arcade (C&D)	20 95
Clowns & Balloons (C&D)	20 95
Sands of Egypt (D)	26 95
Fathoms 40 (D)	23 95
Teletalk (D)	39 95
GEBELLI	
Matchracer (C&D)	$19 95
Andromeda (C&D	22 95
Pathfinder (D)	22 95
Dr. Goodcode's Cavern (D)	19 95
Embargo (R)	31 95
Firebird (R)	28 95

INFOCOM	
Zork I, II, III (D)	$26 95
Deadline (D)	33.95
Starcross (D)	26 95
I.D.S.	
Pool 1 5 (D)	$22 95
Pool 400 (R)	26 95
Speedway Blast (R)	26 95
Survival of the Fittest (R)	26.95
K-BYTE	
K-Razy Shootout (R)	$33 95
K-Razy Kritters (R)	33.95
K-Star Patrol (R)	33 95
K-Razy Antiks (R)	33 95
ON-LINE	
Mission Asteroids (D)	$16 95
Crossfire (C&D)	19 95
Jawbreaker (C&D)	19 95
Frogger (C&D)	22 95
Wizard & Princess (D)	22 95
Mouskattack (D)	22 95
Ulysses (D)	22 95
Threshold (D)	25 95
Ultima I (D)	25 95
Ultima II (D)	38 95
The Next Step (D)	26 95
ROKLAN	
Gorf (D)	$26 95
Wizard of Wor (D)	26 95
Deluxe Invaders (D)	23 95
Deluxe Invaders (R)	26 95
Antisub Patrol (D)	19 95
SIRIUS	
Bandits (D)	$22 95
Cyclod (D)	19 95
Snake Byte (D)	19 95
Sneakers (D)	19 95
Space Eggs (D)	19 95
SYNAPSE	
Dodgeracer (C&D)	$22 95
Protector II (C&D)	22 95
Nautilus (C&D)	22 95
Slime (C&D)	22 95
Chicken (C&D)	22 95
Shamus (C&D)	22 95
Picnic Paranoia (C&D)	22 95
Claim Jumper (C&D)	22 95
File Manager 800+ (D)	64 95
Disk Manager (D)	22 95

Call or write for **VIC 20** or **APPLE** Software prices.
* Many other products not listed. D - Disk C - Cassette R - Rom Cartridge

OPTOMAM CONSUMER PRODUCTS

TO ORDER CALL OR WRITE

TOLL FREE: 1-800-338-3830 (ORDERS ONLY). For info. and Calif. resid. call 916-621-1090 Terms Certified Check, M/O or personal check (2 wks. to clear), bank wire, U.S. Funds only. VISA, M/C add 3% surcharge, inc. card # & exp. date. Sorry no C.O.D. Calif. resid. add 6% tax. Ship. & handling add 4% or (Min. $4) in Cont'l. U.S. (Call to ship other areas). Send $2 for catalog get $2 off coupon next order. Inc. phone # all orders. Prices subject change w/o notice. Dealer inquiries welcome. Mail to: Optomam Consumer Products - Div. CF, P.O. Box 1038, Placerville, CA 95667

Super Shell Sort For PET/CBM

John W. Ross

There are many programs which would benefit from an extremely fast sorting subroutine. This one is among the fastest ever written for a micro: it sorts 1000 names in less than 30 seconds. The version here is for PET/CBM's with 32K of memory.

One approach a programmer can take to gain an increase in sorting speed involves the use of more sophisticated sorting algorithms. This approach is useful to a point, but has ultimate limitations, not the least of which is the limit imposed by the use of an interpretive language like BASIC.

Suppose you finally do get around to writing that non-recursive version of Quicksort, and you find that it isn't quick, or at least not as quick as you had hoped.

This is the problem that faced me recently. The answer for me (and you, I hope) turned out to be a switch to machine language programming. This resulted in a really dramatic increase in speed. In one typical application, my sorting time went from 54 seconds to less than two seconds!

There are other machine language sorts around – why should you consider this one? It has several features that I believe make it unique. First of all, it is very convenient to use. It sorts any character array, in place. You do not have to move your data to a special location or assign the array a particular name. It can be incorporated into any program without disturbance.

Second, it uses a Shellsort algorithm which is quite efficient as sorts go – certainly far better than the oft-encountered bubble sort. Finally, it is modular in design – the actual sorting part of the program can be extracted from the framework and replaced with something more efficient if you are feeling ambitious.

To get a feel for how the thing works, let's look at a sample application, such as the one shown in Program 1. (You might want to try this out on your favorite BASIC sort first to establish a benchmark.) Lines 100-220 set up a random array of 1000 elements, each one between one and five characters long. This is the array to be sorted.

Lines 300-330 transfer parameters to the sort program. In lines 300 and 310, we POKE the ASCII codes for the letters of the name of the array we want to sort into memory locations 32160 and 32161. If the array name has only one letter, 128 is POKEd for the second letter. For instance, if we wanted to sort the array CD$ we would use:

POKE 32160,67 : POKE 32161,68

In lines 320-330 we POKE a two-byte encoding of N into locations 32162 and 32163, where N is the number of elements to participate in the sort. Element zero is never sorted, so it may be used for special applications. That's all there is to it. The subroutine is called in line 350.

An error code is returned in location 32164. This is zero if all goes well, one if the array name cannot be found, and two if an attempt is made to sort a multi-dimensioned array.

You will note that the program lives at the top of user memory, from $7DA0 to $7F5F including variable storage. Thus, before loading the program, you must reset the top of memory pointer – line 130 in Program 2. This sets the pointer to $7D9F (32159 decimal).

Program 1.

```
100 REM MACHINE CODE SORT TEST PROG
    RAM
110 N=1000
120 DIM A$(N)
125 REM CREATE TEST ARRAY
130 FOR I=1 TO N
140 :  N1=INT(RND(0)*5+1)
150 :  A$=""
160 :  FOR J=1 TO N1
170 :     B$=CHR$(INT(RND(0)*26+65)
    )
180 :     A$=A$+B$
190 :  NEXT
200 :  A$(I)=A$
210 NEXT
220 PRINT CHR$(7)
300 POKE 32160,65
310 POKE 32161,128
320 N2=INT(N/256)  : POKE 32163,N2
330 N1=N-N2*256    : POKE 32162,N1
340 T1=TI
350 SYS 32179
360 T2=TI
370 EC=PEEK(32164)
380 IFEC=1THENPRINT"ERROR - ARRAY N
    OT FOUND": GO TO 420
390 IFEC=2THENPRINT"ERROR - DIMENSI
    ON NOT = 1": GO TO 420
400 FOR I=1 TO N : PRINTA$(I)  : NEX
    T
410 PRINT:PRINT N"ELEMENTS SORTED I
    N"(T2-T1)/60"SECONDS"
420 END
```

Program 2.

```
100 REM MACHINE CODE SORT LOADER
110 REM
120 REM LOWER TOP OF MEMORY POINTER

130 POKE53,125:POKE52,159:CLR
140 REM LOAD PROGRAM
150 GOSUB 30000
160 END
30000 READN,L:FORI=1TON:READX:POKEL,X
    :L=L+1:NEXT:RETURN
30010 DATA429,32179
30020 DATA173,160,125,41,127,141,160,
    125,173,161,125,9,128,141,
    161,125
30030 DATA169,0,141,164,125,165,44,13
    3,84,165,45,133,85,160,0
30040 DATA177,84,205,160,125,208,8,20
    0,177,84,205,161,125,240,4
    2
30050 DATA160,2,177,84,141,165,125,20
    0,177,84,141,166,125,24,16
    5
30060 DATA84,109,165,125,133,84,165,8
    5,109,166,125,133,85,197,4
    7
30070 DATA144,207,240,205,169,1,141,1
    64,125,76,224,126,160,4,17
    7
30080 DATA84,201,1,240,8,169,2,141,16
    4,125,76,224,126,24,165
30090 DATA84,105,7,133,84,165,85,105,
    0,133,85,173,162,125,141
30100 DATA177,125,173,163,125,141,178
    ,125,173,178,125,208,12,17
    3,177
30110 DATA125,240,4,201,1,208,3,76,22
    4,126,78,178,125,110,177
30120 DATA125,56,173,162,125,237,177,
    125,141,175,125,173,163,12
    5,237
30130 DATA178,125,141,176,125,162,0,1
    38,141,168,125,141,169,125
    ,173
30140 DATA177,125,141,170,125,173,178
    ,125,141,171,125,238,168,1
    25,208
30150 DATA3,238,169,125,173,169,125,2
    05,176,125,240,4,176,85,14
    4
30160 DATA10,173,168,125,205,175,125,
    240,2,176,73,238,170,125,2
    08
30170 DATA3,238,171,125,160,3,165,84,
    133,88,133,90,165,85,133
30180 DATA89,133,91,24,165,88,109,168
    ,125,133,88,165,89,109,169

30190 DATA125,133,89,24,165,90,109,17
    0,125,133,90,165,91,109,17
    1
30200 DATA125,133,91,136,208,223,32,2
    25,126,173,167,125,240,163
    ,48
30210 DATA161,32,80,127,162,1,76,115,
    126,138,208,129,76,52,126
30220 DATA96,160,0,140,167,125,177,88
    ,141,172,125,177,90,141,17
    3
30230 DATA125,200,152,205,172,125,240
    ,2,176,15,205,173,125,240,
    25
30240 DATA144,23,169,1,141,167,125,76
    ,79,127,205,173,125,240,2
30250 DATA176,64,169,255,141,167,125,
    76,79,127,140,165,125,160,
    1
30260 DATA177,88,133,86,200,177,88,13
    3,87,172,165,125,136,177,8
    6
30270 DATA141,174,125,140,165,125,160
    ,1,177,90,133,86,200,177,9
    0
30280 DATA133,87,172,165,125,177,86,2
    00,205,174,125,208,3,76,24
    0
30290 DATA126,144,180,76,15,127,96,16
    0,2,177,88,72,177,90,145
30300 DATA88,104,145,90,136,16,243,96
```

Atari Line Range Manipulator

Chuck Beach

This will enhance your BASIC editor by allowing you to copy, delete, or move entire line ranges. The utility takes about 4K and was written in the upper line range (from 30000 to 31000), allowing you to use the lower 30000 for work.

The principles involved in this utility have been demonstrated in several **COMPUTE!** publications. An article in *COMPUTE!'s First Book of Atari* ("The Ouch in Atari BASIC") described some Atari BASIC limitations and inspired me to put together a line range manipulation utility. Another article in the same book ("Inside Atari BASIC") showed how to PEEK at the line number of your BASIC program. And it was the June 1982 issue of **COMPUTE!** ("A Self-Modifying P/M Graphics Utility") that first demonstrated to me the technique which let a program manipulate itself.

There are two methods you can use to incorporate this utility in your programs. One way is to simply type up the lines into your program for each and every use. Another, more desirable method is to type up the utility separately, LIST it to a device, then use the ENTER command to merge the LISTed into your BASIC program. Be sure that the line range for the utility is free to use so you don't lose some nifty routine. Another caution: check that your program won't accidentally fall into the utility logic.

The Options

To use the utility, just enter GOTO 30000. The utility will enter a menu and allow you to select whether you want to Copy, Move, Delete, or Count a range of lines. Select an option and follow the directions.

For the DELETE option, you'll be asked for a range. The specified range is then deleted.

For MOVE, you'll be asked a source range to be moved. After verifying that the range is valid, you'll be prompted for a target line number (where the source range is to be moved) and an increment value. The source range is then copied to the target line number, with each copied line incremented by the value specified. As each line is copied, it is also deleted from the source range.

For the COPY option, you'll be asked for a source range. After verifying that the line range is valid, you'll be prompted for a target line number and an increment value.

For a COUNT operation (spelled KOUNT in the menu), you are asked for a line range. The utility will then return the number of lines within that range.

The END option interrupts the utility with a STOP command. It was designed so you can interrupt the utility, do some other function (further editing, saving the file, etc.), then issue the CONT to reenter the utility menu. Of course, if you execute any other code, this will change the "next line" pointer, and you'll have to reenter the utility through more conventional methods.

For all operations (except COUNT and END), the source range is limited to 100 lines. This was an arbitrary figure. Since line numbers are stored in an array, a larger range capacity would require more storage. The utility already takes up about 4K; if it took up any more, the overhead might make it impractical for an 8K computer. Feel free to expand the arrays by changing the D value in line 30005.

You will find that, unlike other self-modifying programs, this one allows you to watch the modifications in action. Not only do you have something to watch, but you can also get some idea how far along a particular operation is. Don't expect this thing to whiz through a 100 line move in a couple of seconds. In a large program, one line change means a lot of shifted text. In fact, the speed of the changes increases noticeably as more lines are deleted from the program.

Other Uses

You can also use this utility to renumber program lines. The simplest method would be to MOVE the source range to an unused target range, then MOVE it back using the desired increment. In some instances, however, you can renumber in one operation. The reason is that the MOVE precalculates all source line numbers and moves each line one at a time.

Therefore, if you have a range of lines that is incremented by X, you can safely MOVE that range to the same beginning line number with any increment smaller than X. There are many

You've invested a lot of time and money into your computer . . .
It's time that investment paid off!

THE COLOR ACCOUNTANT

The Programmer's Institute introduces **THE COLOR ACCOUNTANT**, the only complete personal financial package specifically designed for the Atari 400/800 and VIC-20 computers. This unique package includes:

1. Complete Checkbook Maintenance
2. Chart of Accounts Maintenance
3. Income/Expense Statement
4. Net Worth Statement
5. Payments/Appointments Calendar
6. Color Graph Design Package (graphs any files)
7. Check Search
8. Home Budget Analysis
9. Decision Maker
10. Mailing List

After the initial setup, **THE COLOR ACCOUNTANT** requires less than an hour of data input each month.

The checkbook maintenance program is the key to the entire package. Once your checkbook is balanced, the checkbook summary file will automatically update the home budget analysis, net worth, and income/expense statements. You can then graph any file, record bills and appointments, make decisions, print a mailing list, and analyze various accounts.

All programs are menu-driven and allow add/change/delete. Files and statements can be listed to screen or printer, and saved to casette or diskette. **THE COLOR ACCOUNTANT** also comes with 60 pages of documentation that leads you step-by-step through the entire package. The Atari 400/800 requires 24K cassette and 32K diskette; the VIC-20 requires 13K. **($74.95 cassette, $79.95 diskette).**

THE TAX HANDLER

The perfect supplement to **THE COLOR ACCOUNTANT**, *The Tax Handler* includes:

1. Complete From 1040
2. Schedule A (Itemized Deductions)
3. Schedule G (Income Averaging)
4. Schedule B

This year let *The Tax Handler* prepare *your* taxes **($34.95 cassette, $39.95 diskette).**

Add $3 for postage and handling.
For information: 1-919-967-0861
See your local dealer or order direct:

THE PROGRAMMER'S INSTITUTE
a division of **FUTUREHOUSE**
P.O. BOX 3191, DEPT. C
CHAPEL HILL, NC 27514

1-800-334-SOFT
Mon-Fri 10-6; Sat 11-3

NEW FOR YOUR ATARI

MAGIC MAIL*

An exciting New Data Base Mailing and Personal Information System for your Atari 400/800** Personal Computer. Never before have all these features been designed into a single Mailing and Information System, so easy to use and so powerful.

COMPARE THESE FEATURES:

- Data Fields: Name, Address, City, State, Zip Code, Area Code, Phone Number, Birthday (m/d/y), and Entry Type.
- Up to 1027 records per Diskette'
- Less than 1 second Search Time over 95% of your Data, and 2-4 seconds over the other 5%.***
- Up to 62 SEPARATE and UNIQUE files permitted per Diskette
- Single or Double Disk Drive Capability.
- Built in SORT, capable of Sorting ANY Data File by ANY Field with up to 10 Sub-fields.
- Command-Driven with simple English-like commands. FIND, MODIFY, PRINT, ADD, SORT, etc.
- Position Independent & Position Dependent Fields.
- Files compatible with Atari DOS II **
- Recorded on High-Quality Verbatim Diskettes.
- Every Diskette Pre-tested for Bad Sectors and recording integrity
- Versions for: Epson MX-80, Prowriter, Centronics
- Print Single-width Mailing Labels or Directory Listing.
- 100% Machine Language.
- 16 K Minimum Memory
- 60-Page User Manual.
- 90 Day Buyer Protection Guarantee

Call or write for FREE additional information.

*MAGIC MAIL is a Trademark of A-BIT-BETTER Software
**ATARI is a Registered Trademark of Atari Inc.
***Search time is for an Indexed File.

ABBS
A-Bit-Better Software
Post Office Box 28
Laurel Md 20707
(301) 953-7256

Dealer Inquiries Invited.

ONLY $59.95
*Plus tax, shipping and handling
VISA AND MASTERCARD ACCEPTED.

At Last, A Program to Test Your Programming Potential

Give yourself or your family the opportunity to be in demand in the job market.
PASE, Programmer Aptitude Self Evaluation, can allow you, at home on your own Atari 400 or 800 to measure your potential for the field of computer programming. For the first time, this program offers the novice a try at programming with absolutely no prior computer experience or knowledge of a computer language. Presented in a game format, PASE will instruct you through every step of a first program to give you a feel for what actual computer programming is like. PASE is suitable for both adults and children, excluding no one from discovering their aptitude for a field that has nowhere to go but up!

For the ATARI
Home Computer 16K Tape

$19.95

Send Check or money order to

TRIDATA CORPORATION
COMPUTER PROFESSIONALS
3057 College Heights Blvd., Allentown, Pa. 18104
(215) 820-9577

situations in which the MOVE can be used as a renumber operation, but try to gain an understanding of just how the utility is doing it before trying anything fancy.

You may also use this utility for interspersing lines. For instance, if the target range starts at 100 and is incremented by 10, you can safely MOVE or COPY to 105 with an increment of 10.

For all MOVE and COPY functions (where the source and target overlap), please remember that the program does not ensure that unintended lines won't be deleted. Back up your file often as you work with this until you get the hang of it.

Techniques In The Program Itself

Some of the techniques used in this program may not be immediately apparent. If you do not have the **COMPUTE!** articles handy for reference, here is an explanation of some of the tricks used:

- Making the computer accept commands from screen.

  This is done by modifying the IOCB.

  POKE 842,13 – Sets the IOCB to accept input only from the screen starting at the cursor position.

  POKE 842,12 – Resets the IOCB to resume normal input modes.

  If the IOCB is not reset to 12, either by a screen command or, in this case, by the program, your computer will lock up and be slightly less useful than the "MEMO PAD" mode. Not even SYSTEM RESET will help you now. Your only alternative is to re-IPL with the ON/OFF switch.

  To ensure that the IOCB is reset, the last screen command is a CONT instruction. The utility is then reentered at the line following the last STOP instruction. At this point, the IOCB is reset for normal input. (This utility actually puts two CONT statements on the screen as a precaution.)

  One cautionary note: *please* practice with it before using it on something you've spent a while developing. Though errors in programs are always annoying, an error in a self-modifying program can be positively disastrous!

- Finding the BASIC line numbers.

  Location 136/137 of BASIC memory contains the LH (low/high) address of the first line of the program. Each tokenized line contains its line number in the first two bytes in the usual LH format. The third byte contains the displacement from the beginning of the line to the beginning of the next line.

- Trapping and displaying an error number.

  When the TRAP is sprung, the error number may be found at location 195 in memory.

Program Description

Lines 30000-30005 – Start of utility. Define arrays. Set variables.
Lines 30010-30015 – Menu to options.
Lines 30020-30040 – Determine user selection and branch to desired code.
Lines 30060-30070 – END option stops and is followed by branch to menu to allow user to enter CONT to continue.
Line 30090 – Subroutine to set screen up for self-modify code.
Lines 30091-30092 – Subroutine to invoke self-modification.
Line 30095 – Subroutine to retrieve next line address and number.
Lines 30100-30150 – DELETE subroutine.
Lines 30200-30250 – MOVE subroutine.
Lines 30300-30350 – COPY subroutine.
Lines 30400-30490 – KOUNT subroutine.
Lines 30500-30530 – Subroutine to get source line range.
Lines 30550-30560 – Subroutine to get target line number and increment value.
Line 30580 – Error trap.

```
30000 REM --> LINE MANIPULATION UTILI
      TY <--
30005 D=100:DIM A(D),B(D),A$(1),L$(25
      ),ER$(5)
30010 TRAP 30580:? "{CLEAR}":? " LINE
       RANGE MANIPULATION UTILITY":?
      :? :? L$:? :? :L$=""
30015 ? "SELECT (D)ELETE, (M)OVE, (C)
      OPY,":? "{7 SPACES}(K)OUNT, OR
      (E)ND":? :? "SELECT ";:INPUT A$
30020 IF A$="D" THEN 30100
30025 IF A$="M" THEN 30200
30030 IF A$="C" THEN 30300
30035 IF A$="K" THEN 30400
30040 IF A$="E" THEN 30060
30045 L$(1,1)="'":L$(2,2)=A$:L$(3,25)
      ="' UNKNOWN. REENTER.":GOTO 300
      10
30060 STOP
30070 GOTO 30010
30090 ? CHR$(125):? :RETURN
30091 ? :? :? "CONT":? "CONT":POSITIO
      N 0,0:POKE 842,13:STOP
30092 POKE 842,12:? CHR$(125):? :RETU
      RN
30095 ADDR=ADDR+PEEK(ADDR+2):LNUM=PEE
      K(ADDR)+PEEK(ADDR+1)*256:RETURN

30100 REM DELETE
30105 ? :? "DELETE";:GOSUB 30500:IF C
      =0 THEN 30150
30110 X1=INT(C/15):X2=C-(X1*15):IF X1
      =0 THEN 30120
30115 FOR Y1=0 TO (X1-1):GOSUB 30090:
      FOR Y2=1 TO 15:PRINT A(Y1*15+Y2
      ):NEXT Y2:GOSUB 30091:NEXT Y1
30120 IF X2=0 THEN 30130
30125 GOSUB 30090:FOR Y1=1 TO X2:PRIN
      T A(X1*15+Y1):NEXT Y1:GOSUB 300
      91
30150 L$(1,LEN(STR$(C)))=STR$(C):L$((
```

```
      LEN(L$)+1),25)=" LINES DELETED.
      ":GOTO 30010
30200 REM MOVE
30205 ? :? "MOVE";:GOSUB 30500:IF C=0
       THEN L$="NULL RANGE SPECIFIED.
      ":GOTO 30010
30210 ? :? "MOVE TO";:GOSUB 30550
30215 FOR X1=1 TO C:GOSUB 30090:LIST
      A(X1):POSITION 2,3:L1=LEN(STR$(
      A(X1))):L2=LEN(STR$(B(X1)))
30220 FOR Y1=1 TO L1:PRINT " ";:NEXT
      Y1:IF L2<=L1 THEN 30230
30225 FOR Y1=1 TO (L2-L1):PRINT "
      {INSERT}";:NEXT Y1
30230 POSITION 2,3:PRINT B(X1):? :? :
      PRINT A(X1):GOSUB 30091:NEXT X1
30250 L$(1,LEN(STR$(C)))=STR$(C):L$((
      LEN(L$)+1),25)=" LINES MOVED.":
      GOTO 30010
30300 REM COPY
30305 ? :? "COPY";:GOSUB 30500:IF C=0
       THEN L$="NULL RANGE SPECIFIED.
      ":GOTO 30010
30310 ? :? "COPY TO";:GOSUB 30550
30315 FOR X1=1 TO C:GOSUB 30090:LIST
      A(X1):POSITION 2,3:L1=LEN(STR$(
      A(X1))):L2=LEN(STR$(B(X1)))
30320 FOR Y1=1 TO L1:PRINT " ";:NEXT
      Y1:IF L2<=L1 THEN 30330
30325 FOR Y1=1 TO (L2-L1):PRINT "
      {INSERT}";:NEXT Y1
30330 POSITION 2,3:PRINT B(X1);"
      {4 DOWN}":GOSUB 30091:NEXT X1
30350 L$(1,LEN(STR$(C)))=STR$(C):L$((
      LEN(L$)+1),25)=" LINES COPIED."
      :GOTO 30010
30400 REM COUNT
30405 ? "COUNT RANGE (FROM,TO) ";:INP
      UT L1,L2:IF L2>32767 THEN L2=32
      767
30410 IF L2<L1 THEN ? " BAD RANGE. RE
      ENTER.":GOTO 30405
30415 ADDR=PEEK(136)+PEEK(137)*256:LN
      UM=PEEK(ADDR)+PEEK(ADDR+1)*256:
      C=0
30420 IF L1>LNUM THEN GOSUB 30095:GOT
      O 30420
30425 IF L2>LNUM THEN C=C+1:GOSUB 300
      95:GOTO 30425
30490 L$(1,LEN(STR$(C)))=STR$(C):L$((
      LEN(L$)+1),25)=" LINES COUNTED.
      ":GOTO 30010
30500 ? " RANGE (FROM,TO) ";:INPUT L1
      ,L2:IF L2>32767 THEN L2=32767
30505 IF L2<L1 THEN ? " BAD RANGE. RE
      ENTER.":GOTO 30500
30510 ADDR=PEEK(136)+PEEK(137)*256:LN
      UM=PEEK(ADDR)+PEEK(ADDR+1)*256:
      C=0
30515 IF L1>LNUM THEN GOSUB 30095:GOT
      O 30515
30520 IF L2<LNUM THEN RETURN
30525 IF C<D THEN C=C+1:A(C)=LNUM:GOS
      UB 30095:GOTO 30520
30530 L$="RANGE TOO LARGE FOR DIM.":P
      OP :GOTO 30010
30550 ? " RANGE (LINE #,INCRE) ";:INP
      UT L1,L2
30555 FOR X1=1 TO C:B(X1)=L1+(X1-1)*L
      2:IF B(X1)<32768 THEN NEXT X1:R
      ETURN
30560 ? " BAD LINE NUMBER IN RANGE. R
      EENTER.":GOTO 30550
30580 ER$=STR$(PEEK(195)):?"ERROR NU
      MBER ";ER$:POP :GOTO 30060
```

Easy Apple Editing

Roland Brown

This editor routine provides a powerful utility for Applesoft programmers: the ability to easily modify BASIC program lines.

The Apple II+ was created for its advanced BASIC. Programming in Applesoft is much better and easier than with integer BASIC. One main problem, however, with Applesoft is its editing. Some people invest in a ROM editor, others create their programs using a text editor, and others just suffer with the frustrating ESCape codes. Presented here is a 3/4K machine language program for the Apple II+ 48K or equivalent with DOS 3.3.

The BASIC Line Editor will not destroy the current BASIC program, but will destroy its strings. Once saved on disk as a binary file, Editor can be loaded into memory by the command:

```
]BRUN B.L.E.,A$9A00
```

To edit a BASIC program line, type

```
]& (line number)
```

for example,

```
] &100
```

This will clear the screen, display the line, and place the cursor at the top left of the screen. The line is displayed in a different format from Applesoft's. The differences are: the line is continuous instead of centered on the screen, there are no spaces in the line except between quotes, and all control characters are displayed in inverse.

In the Editor numerous commands are available to you. These commands edit the line:

CTRL-B	**block back**
-C	**convert hex to decimal**
-D	**delete**
-F	**block forward**
-H	**back arrow**
-I	**insert**
-M	**return**
-S	**search**
-T	**truncate**
-U	**forward arrow**
-V	**verbatim**
ESC	**return to BASIC**

CTRL-B moves the cursor back to the previous colon, or if there is no previous colon, the beginning of the line.

CTRL-C clears the bottom of the screen, places a $ prompt on the screen and allows a line to be input. This line is converted to decimal, printed, and the cursor is returned to its original position on the line. This can be used to convert bytes in hex that need to be POKEd/PEEKed.

CTRL-D deletes the character at the cursor.

CTRL-F moves the cursor to the next colon, or if there is no next colon, to the end of the line.

CTRL-H (back arrow) moves the cursor back one space.

CTRL-I inserts a space in the line at the cursor position. Note: CTRL-I will not insert at the top left of the screen.

CTRL-M (return) can be entered at any place in the line and the entire line will be entered into the program.

CTRL-S searches for the next character entered.

CTRL-T truncates the line at the cursor position, so the cursor is at the end of the line+1.

CTRL-U (forward arrow) moves the cursor forward one space.

CTRL-V allows raw control characters to be entered into the line. This can be used to enter returns or backspaces for easier printing control.

ESC will exit the Editor with the line untouched (so if you make a mistake, the line is not lost).

The Editor provides a ‹ at the left side of line 7 as a guide to where BASIC truncates its lines. This will not affect your line if you pass the line through it.

Typing It In

Program 1 is a BASIC program which loads the machine language for the Editor into memory. If the DATA statements have all been entered correctly, the program will provide instructions for saving the binary file to the disk, which should be done immediately. If an error is detected in the data, the program will stop. If this happens, check your DATA statements carefully, correct all mistakes, and run the program again.

Program Explanation

Loading the program resets the stack to the same level as BASIC does, sets up the ampersand vector ($3F5), clears the screen, moves the DOS buffers down so it is safe, prints the title and restarts BASIC.

The entry of the program uses BASIC routines to read in the line and find the line in memory. If the line is not there, the program returns to

BASIC.

The line is disassembled into the input buffer ($200-$2FF) by using a modified version of CHRGET. If the character is text, CHRGET places it in the line. If the character is one representing a command, CHRGET looks it up in the table of BASIC commands and puts the command name in the buffer. Once the end of the line is reached, CHRGET enters the edit section of the program.

The edit program displays the line, gets a character from the keyboard, and processes it. Explanations of the different commands would take too long, but fairly adequate documentation of the program's workings can probably be understood by many Apple owners. If you do not understand any of the Editor commands, just experiment with them for a while.

```
100  FOR I = 39424 TO 40065: READ A:CK = CK +
     A: POKE I,A: NEXT
110  IF CK <  > 88754 THEN  PRINT "ERROR IN
     DATA STATEMENTS": STOP
120  HOME : PRINT : PRINT "BASIC LINE EDITOR
      INSTALLED AT": PRINT "LOCATIONS 39424-
     40065 ($9A00-9CB1)": PRINT
130  PRINT "TYPE 'BSAVE B.L.E.,A$9A00,L$282'
     ": PRINT "TO STORE BINARY FILE": PRINT
140  PRINT "TYPE 'CALL 39424' TO ACTIVATE"
150  NEW
200  DATA  162,251,154,169,76,141,245,3
210  DATA  169,43,141,246,3,169,154,141
220  DATA  247,3,32,88,252,169,153,141
230  DATA  1,157,32,212,167,169,12,133
240  DATA  36,169,112,160,156,32,58,219
250  DATA  76,208,3,32,12,218,32,26
260  DATA  214,176,1,96,165,155,133,184
270  DATA  165,156,133,185,32,88,252,32
280  DATA  224,158,104,104,32,95,156,32
290  DATA  95,156,170,32,95,156,32,36
300  DATA  237,162,5,189,0,4,41,127
310  DATA  157,0,2,202,16,245,162,6
320  DATA  134,36,32,95,156,240,61,48
330  DATA  7,157,0,2,232,76,98,154
340  DATA  160,208,132,254,132,255,160,0
350  DATA  41,127,133,253,240,15,177,254
360  DATA  8,200,208,2,230,255,40,16
370  DATA  245,198,253,208,241,177,254,8
380  DATA  200,208,2,230,255,157,0,2
390  DATA  232,40,16,241,41,127,157,255
400  DATA  1,76,98,154,134,252,170,133
410  DATA  250,133,251,32,88,252,160,0
420  DATA  185,0,2,201,32,144,2,9
430  DATA  128,32,240,253,200,196,252,144
440  DATA  239,169,188,141,0,7,165,250
450  DATA  133,36,165,251,32,90,156,32
460  DATA  12,253,201,136,208,22,202,198
470  DATA  250,16,230,160,39,132,250,198
480  DATA  251,16,222,232,160,0,132,250
490  DATA  230,251,240,213,201,149,208,30
500  DATA  164,250,200,132,250,232,228,252
510  DATA  144,7,134,252,169,32,157,0
520  DATA  2,192,40,144,188,160,0,132
530  DATA  250,230,251,76,193,154,201,141
540  DATA  208,20,166,252,169,0,157,0
550  DATA  2,32,81,168,32,88,156,162
560  DATA  255,160,1,76,68,212,201,137
570  DATA  208,39,224,0,240,32,134,249
580  DATA  166,252,230,252,240,20,189,0
590  DATA  2,157,1,2,202,228,249,176
600  DATA  245,232,169,32,157,0,2,76
610  DATA  171,154,166,249,198,252,76,193
620  DATA  154,201,132,208,24,228,252,176
630  DATA  245,198,252,134,249,189,1,2
640  DATA  157,0,2,232,228,252,144,245
650  DATA  166,249,76,171,154,201,130,208
660  DATA  38,224,0,240,18,198,250,16
670  DATA  17,160,39,132,250,198,251,16
680  DATA  9,160,0,132,251,132,250,76
690  DATA  193,154,202,240,250,189,0,2
700  DATA  201,58,208,225,76,193,154,201
710  DATA  134,208,12,228,252,176,232,169
720  DATA  58,32,58,156,76,193,154,201
730  DATA  147,208,11,32,12,253,41,127
740  DATA  32,58,156,76,193,154,201,150
750  DATA  208,18,32,12,253,201,160,176
760  DATA  109,41,127,157,0,2,32,240
770  DATA  253,76,240,154,201,148,208,5
780  DATA  134,252,76,171,154,201,131,208
790  DATA  66,134,249,162,0,189,0,2
800  DATA  157,0,187,232,208,247,169,8
810  DATA  133,37,160,0,32,66,252,169
820  DATA  164,133,51,32,103,253,32,199
830  DATA  255,32,167,255,32,142,253,169
840  DATA  189,32,240,253,165,63,166,62
850  DATA  32,36,237,162,0,189,0,187
860  DATA  157,0,2,232,208,247,166,249
870  DATA  76,193,154,201,155,240,21,201
880  DATA  160,144,11,32,240,253,41,127
890  DATA  157,0,2,76,240,154,32,226
900  DATA  251,76,193,154,32,88,156,76
910  DATA  208,3,133,255,164,250,200,132
920  DATA  250,192,40,144,6,160,0,132
930  DATA  250,230,251,232,228,252,176,7
940  DATA  189,0,2,197,255,208,229,96
950  DATA  169,15,133,37,76,34,252,230
960  DATA  184,208,2,230,185,160,0,177
970  DATA  184,56,233,48,56,233,208,96
980  DATA  194,193,211,201,195,160,204,201
990  DATA  206,197,160,197,196,201,212,207
1000  DATA  210,0
```

©

"Stringing" Atari Machine Code

Edward C. Smith

Atari BASIC provides the user with page 6 of memory for storing machine code programs executed via the USR function. Page 6 is by definition hexadecimal locations 600 to 6FF (1536 to 1791 decimal). With the increasing use of machine code, the programmer is sometimes faced with the problem of an overcrowded page 6. (*See "Insight: Atari" this month for further comments on this topic – Ed.*) What are the alternatives?

One solution is to float programs in memory by transferring machine code bytes from data statement lines to an Atari string which then becomes addressable with the ADR function. To qualify for "stringing," the machine code must be fully relocatable – no JMP's, no JSR's and no data tables may be enclosed within it. In addition, the first byte of the machine code must be the start of execution.

This utility (Program 2) provides a means for placing into a string machine language that meets the above criteria. It also inserts necessary statement lines and LISTs the modified version of your program to disk. The procedure for transferring data bytes into a string is based on information on the *Atari Assembler Editor User's Manual.*

The utility should be ENTERed after you have LOADed the program you want to modify. Please note that statement line 1 as well as the region 27000-30000 will be overlaid. Although five variables are dimensioned in line 1, only ML$ (the newly created machine code string) will be used with the modified program. A series of five prompts lead the user through the procedure. After each prompt the program comes to a STOP so that the user may LIST his program to the screen to make indicated changes or determine replies to questions.

To begin with, the user is reminded that the first argument of each USR function must be the address of the machine code string (to make the string fully relocatable) and also that all statement lines that POKE bytes onto page 6 must be deleted. The computer then uses input data to create the string and calculate the number of statement lines that will have to be inserted.

The number of lines is dependent upon the length of the string and the occurrence of two special hex codes: 22 (decimal 34) and 9B (decimal 155). When creating the string, these codes are temporarily replaced with hex code 20 (decimal 32) to avoid confusing the BASIC interpreter. After the statement line defining the string is established, the original values are restored.

Next a suitable location for the insertion of statement lines is requested. Since the first of these lines is a dimension statement, a location near the beginning of the program should be chosen. Care must be taken so that no existing lines are overlaid. Finally, a statement line number for the last line of the modified program is requested. This will allow the user to exclude the data statement lines containing the machine code, provided that they occur at the end of the original program.

A Practical Test

Program 1 is an example of a program that uses page 6 to store machine code bytes (in this case 70 bytes). To demonstrate the use of the utility program, type Program 1 and SAVE to disk; then type Program 2 and LIST to disk. Next LOAD Program 1 and ENTER Program 2. Now change the first argument of each USR function in lines 62 and 66 from "M" to "ADR(ML$)". Next, delete line 40 and type RUN. Answer "Y" to the first two questions because you have just made these changes.

Respond to the third prompt with "9000" and then "70". Next, you are asked for a starting line number for the insertion of *two* statement lines. In reviewing the listing of Program 1, you will see that there is room for extra lines between line 30 and line 50. Type CONT and respond with "35". Answer the last prompt with "78". The computer will now automatically create Program 3 and LIST it to disk as "D:PROGRAM3.LST". When the LISTing is completed type NEW, then ENTER Program 3 and RUN. The result should be the same as when Program 1 is RUN.

Description Of Program 2

Line #		
1	DIM ML$(300) -	allows up to 300 bytes to be placed in a string. At 90 bytes/line, up to four statement lines of machine code can be inserted.
	DIM Q$(300) and DIM R$(300)	- keep track of the occurrence of ASC 34 (double quotation marks) and ASC 155 (RETURN) in the machine code. Allows up to 100 34's and 100 155's.

COMPUTE!'s Second Book Of Atari

After only three years on the market, the Atari 400/800 microcomputers have become among the most popular personal computers ever made. So it was no surprise when *COMPUTE!'s First Book of Atari*, a collection of the best Atari articles published during 1980-81 in **COMPUTE!** Magazine, also became a "bestseller" with Atari enthusiasts. The first printing sold out in just a few months.

That's why we've followed up with *COMPUTE!'s Second Book of Atari*. Available immediately, the *Second Book of Atari* continues **COMPUTE!**'s tradition for personal computer users.

But the *Second Book of Atari* differs from the *First Book* in one important respect—all the articles are totally new and previously unpublished. The *Second Book of Atari* includes such interesting articles as "Page Flipping," "Fun With Scrolling," "Perfect Pitch," "Player-Missile Drawing Editor," and "TextPlot Makes a Game." Whole chapters are devoted to subjects such as "Advanced Graphics and Game Utilities," "Programming Techniques," and "Beyond BASIC." With 250 pages – more than 25 percent thicker than the *First Book* at the same price – the *Second Book of Atari* is crammed with information and ready-to-type program listings. And the book is spiral-bound to lie flat and is fully indexed for quick reference.

Best of all, *COMPUTE!'s Second Book of Atari*, like **COMPUTE!** Magazine itself, is written and edited to appeal to all computer enthusiasts – beginners and experts alike. Priced at only $12.95.

iv Introduction . . . . Robert Lock
1 Chapter One. Utilities.
2 Atari BASIC Joystick Routine . . . . Kirk Gregg
5 Joystick Tester . . . . Robert Rochon
7 Keyboard Input Or Controlled Escape . . . . Brian Van Cleve
9 POKE TAB In BASIC . . . . Lawrence R. Stark
11 The 49 Second Screen Dump . . . . David Newcorn
15 Memory Test . . . . Ed Stewart

21 Chapter Two. Programming Techniques.
23 Atari BASIC String Manipulation Tricks . . . . David E. Carew
26 Using The Atari Forced Read Mode . . . . Frank C. Jones
33 A Simple Screen Editor For Atari Data Files . . . . Lawrence R. Stark
36 Plotting Made Easy . . . . John Scarborough
41 Graphics Generator . . . . Matthias M. Giwer
44 Analyze Your Program – An Atari BASIC Utility . . . . . Fred Pinho
51 Inside Atari Microsoft BASIC: A First Look . . . . Jim Butterfield

53 Chapter Three. Advanced Graphics And Games Utilities.
55 Player-Missile Drawing Editor . . . . E. H. Foerster
67 Point Set Graphics . . . . Douglas Winsand
76 Page Flipping . . . . Rick Williams
78 An Introduction To Display List Interrupts . . . . Alan Watson
85 Extending Atari High Resolution Graphics . . . . Phil Dunn
85 Part 1: The Polygon Fill Subroutine
92 Part 2: Textured Graphics
114 Part 3: Multi-colored Graphics In Mode 8
160 Textplot Makes A Game . . . . David Plotkin
169 Fun With Scrolling . . . . David Plotkin

183 Chapter Four. Applications.
185 A Simple Text Editor . . . . Osvaldo Ramirez
194 The Atari Keyboard Speaks Out . . . . Walter M. Lee
198 Atari Screen As Strip Chart Recorder . . . . Helmut Schmidt
209 Fast Banner . . . . Sol Guber
213 Perfect Pitch . . . . Fred Coffey

219 Chapter Five. Beyond BASIC.
221 Put Your USR Code Into A BASIC Program Automatically . . F. T. Meiere
225 Back Up Your Machine Language Programs With BASIC . . Ed Stewart
229 Loading Binary DOS Files From BASIC . . . . Robert E. Alleger
249 The Resident Disk Handler . . . . Frank Kastenholz

248 Listing Conventions
249 Index

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2.00 shipping and handling. Outside the U.S., add $5.00 for air mail, $2.00 for surface mail. All orders prepaid, U.S. funds only

	DIM P$(3) - used for formatting Q$ and R$.
	DIM M$(100) - will hold up to three instructions per line for restoring CHR$(34) and/or CHR$(155) in the machine code string.
27100-27625	First three user prompts.
27630-27650	Develop machine code string ML$ with CHR$(32) replacing CHR$(34) and/or CHR$(155).
27660-27690	Determine number of statement lines to be inserted.
27700-27732	Last two user prompts.
27800-27830	Format input value P to a three-byte left-justified value.
29100	Establishes DIM for ML$.
29170-29270	Establish ML$ (90 bytes per statement line).
29330-29800	Develop statement lines for restoring CHR$(34) and/or CHR$(155).
29900-29910	LIST modified program to disk.

Program 1.

```
30 DIM Y2$(30),Y1$(30)
40 M=1536:FOR I=M TO M+69:READ A:POKE
    I,A:NEXT I
50 Y2$="{4 SPACES}software{5 SPACES}"
   :Y1$="{5 SPACES}title{7 SPACES}"
54 GRAPHICS 18:POSITION 0,0:? #6;"***
   *****************":POSITION 0,10:?
    #6;"********************"
58 FOR I=1 TO 9:POSITION 0,I:? #6;"*"
   :POSITION 19,I:? #6;"*":NEXT I:I=0
62 I=I+1:A=USR(M,ADR.(Y2$),LEN(Y2$),I)
   :POSITION 2,3:? #6;Y2$:GOSUB 78:IF
    I<18 THEN 62
65 SOUND 0,0,0,0:I=0
66 I=I+1:A=USR(M,ADR(Y1$),LEN(Y1$),I)
   :POSITION 2,6:? #6;Y1$:GOSUB 78:IF
    I<18 THEN 66
77 SOUND 0,0,0,0:GOTO 77
78 SOUND 0,230/I,10,10:SETCOLOR 0,I+2
   ,9:RETURN
9000 DATA 104,104,133,204,104,133
9010 DATA 203,104,104,133,205,133
9020 DATA 206,104,104,133,207,201
9030 DATA 1,208,22,160,255,200
9040 DATA 177,203,153,218,6,169
9050 DATA 32,145,203,198,205,165
9060 DATA 205,201,0,240,2,208
9070 DATA 236,216,56,165,206,229
9080 DATA 207,168,162,255,232,200
9090 DATA 189,218,6,145,203,198
9100 DATA 207,165,207,201,0,240
9110 DATA 2,208,239,96
```

Program 2.

```
1 DIM ML$(300),Q$(300),P$(3),M$(300),
  R$(300):SETCOLOR 2,12,1:GOTO 27000
27000 REM
27010 REM *****************************
27020 REM *{6 SPACES}UTILITY for
      {8 SPACES}*
27030 REM *{6 SPACES}'STRINGING'
      {8 SPACES}*
27040 REM *{5 SPACES}MACHINE  CODE
      {7 SPACES}*
27050 REM *{10 SPACES}by{13 SPACES}*
27060 REM *{4 SPACES}Edward C. Smith
      {6 SPACES}*
27070 REM *{4 SPACES}Harrisburg, Pa.
      {6 SPACES}*
27080 REM *{5 SPACES}OCTOBER 1982
      {8 SPACES}*
27090 REM ******************************
27095 ? CHR$(125);"{TAB}{3 SPACES}UTI
      LITY FOR 'STRINGING'":? "{2 TAB}
      MACHINE CODE"
27098 ? :? "This utility program shou
      ld be ENTERedafter program you
      want to modify has  been LOADed
       into memory."
27100 ? :? "1)Has the first argument
       of each USR{3 SPACES}instructi
      on in your program been
      {6 SPACES}replaced with ";
27110 ? "'ADR(ML$)' (Y/N)";:INPUT P$
27112 IF P$<>"Y" THEN ? :? "  Please
      LIST your program and make
      {5 SPACES}the necessary changes
       - then type{5 SPACES}CONT"
27114 IF P$<>"Y" THEN STOP
27120 ? :? "2)Have you deleted STATEM
      ENT LINE(S){4 SPACES}in your pr
      ogram that read DATA and
      {4 SPACES}POKE onto page 6 ";
27130 ? "of memory (Y/N)";:INPUT P$
27132 IF P$<>"Y" THEN ? :? "  Please
      LIST your program and delete
      {3 SPACES}these lines - then ty
      pe CONT":STOP
27610 ? :? "3)Scan program listing to
       determine{5 SPACES}data statem
      ent line number where the  mach
      ine code bytes ";
27612 ? "begin and count{4 SPACES}num
      ber of bytes.":? "  Type CONT t
      o resume program":STOP
27615 ? "  Enter data statement line
      #";:INPUT MACHINECODE
27620 TRAP 27620:? "  Enter NUMBER of
       machine code bytes{4 SPACES}to
       be placed into a STRING ";:INP
      UT NUMBYTES
27625 TRAP 40000
27630 RESTORE MACHINECODE:FOR I=1 TO
      NUMBYTES:READ A
27635 REM CHECK FOR 34 OR 155 DATA BY
      TES AND CHANGE TO A SPACE (32)
27640 IF A=34 THEN P=I:GOSUB 27800:Q$
      (LEN(Q$)+1)=P$:ML$(I)=CHR$(32):
      GOTO 27650
27643 IF A=155 THEN P=I:GOSUB 27800:R
      $(LEN(R$)+1)=P$:ML$(I)=CHR$(32)
      :GOTO 27650
27645 ML$(I)=CHR$(A)
27650 NEXT I
27655 REM DETERMINE NUMBER OF STATEME
      NT LINES TO BE INSERTED.
27660 M$=Q$:GOSUB 27920:NQ=N
27670 M$=R$:GOSUB 27920:NR=N
27680 NN=INT(NUMBYTES/90)+1:IF INT(NU
      MBYTES/90)=NUMBYTES/90 THEN NN=
      NN-1
27690 NUMLN=1+NN+NQ+NR:P$=STR$(NUMLN)
      :FOR I=1 TO LEN(P$):P$(I,I)=CHR
      $(VAL(P$(I,I))+176):NEXT I
27700 ? :? "4)Now scan your program l
      isting to{6 SPACES}determine an
       area where ";P$;
27710 ? " statement{3 SPACES}lines ca
      n be inserted."
27712 ? "  Select an insertion point
      near the{4 SPACES}beginning of
      the program."
27715 ? :? "  Type CONT to resume pro
      gram ":STOP
27720 ? "  Enter the  FIRST  stateme
      nt  line{4 SPACES}number for th
      is insertion ";:INPUT LN
27730 ? :? "5)Next determine number f
      or LAST state  ment line of mod
```

```
      ified program - then  type CONT
      .":STOP
27732 ? "  Enter number for LAST line
      ";:INPUT LL
27790 GOTO 29000
27800 P$=STR$(P):ON LEN(P$) GOTO 2781
      0,27820,27830
27810 P$(LEN(P$)+1)="  ":GOTO 27830
27820 P$(LEN(P$)+1)=" "
27830 RETURN
27920 IF INT(LEN(M$)/9)=LEN(M$)/9 THE
      N N=LEN(M$)/9:GOTO 27940
27930 N=INT(LEN(M$)/9)+1
27940 RETURN
28000 REM ADD STATEMENT LINES THAT CO
      NTAIN CHR$(34) (QUOTATION MARK
      CODE).
28050 SETCOLOR 2,0,0:? CHR$(125):POSI
      TION 2,2:? M$:? :? :? "CONT":PO
      SITION 0,0:POKE 842,13:STOP
28100 POKE 842,12:RETURN
29000 REM ADD DIMENION LINE DEFINING
      LENGTH AS EQUAL TO THE NUMBER O
      F MACHINE CODE BYTES.
29100 M$=STR$(LN):M$(LEN(M$)+1)="DIM
      ML$(":M$(LEN(M$)+1)=STR$(NUMBYT
      ES):M$(LEN(M$)+1)=")":LN=LN+1:G
      OSUB 28000
29150 REM ADDING STATEMENT LINE(S) CO
      NTAINING 'STRINGS' OF MACHINE C
      ODE.
29170 JM=NUMBYTES/90:IF INT(NUMBYTES/
      90)=NUMBYTES/90 THEN JM=JM-1
29180 FOR J=0 TO JM
29190 SETCOLOR 2,0,0:? CHR$(125):POSI
      TION 2,2
29210 A=90*J+1:B=A+89:IF B>NUMBYTES T
      HEN B=NUMBYTES
29220 ? J+LN;"ML$(";A;",";B;")=";CHR$
      (34);
29230 FOR I=A TO B:? CHR$(27);ML$(I,I
      );:NEXT I
29260 ? CHR$(34):? :? :? "CONT":POSIT
      ION 0,0:POKE 842,13:STOP
29270 POKE 842,12:NEXT J
29300 REM REPLACING 34'S AND 155'S
29330 IF LEN(Q$)=0 AND LEN(R$)=0 THEN
       29900
29335 QQ=34:T=1
29340 IF LEN(Q$)<>0 AND LEN(R$)=0 THE
      N 29400
29350 IF LEN(Q$)<>0 AND LEN(R$)<>0 TH
      EN T=2:GOTO 29400
29360 IF LEN(Q$)=0 AND LEN(R$)<>0 THE
      N QQ=155:Q$=R$
29400 L=0:XM=LEN(Q$)/3
29420 L=L+1:M$=STR$(LN+J+L-1):M$(LEN(
      M$)+1)="ML$("
29440 IF XM>2 THEN A=LEN(Q$)/3-XM+1:B
      =A+2:XM=XM-3:GOTO 29520
29460 IF XM>0 THEN A=LEN(Q$)/3-XM+1:B
      =LEN(Q$)/3:XM=0:GOTO 29520
29500 GOTO 29800
29520 FOR X=A TO B
29550 M$(LEN(M$)+1)=Q$(3*X-2,3*X):M$(
      LEN(M$)+1)=",":M$(LEN(M$)+1)=Q$
      (3*X-2,3*X):M$(LEN(M$)+1)=")="
29560 M$(LEN(M$)+1)="CHR$(":M$(LEN(M$
      )+1)=STR$(QQ):M$(LEN(M$)+1)=")"
29570 M$(LEN(M$)+1)=":ML$(":NEXT X
29600 M$=M$(1,LEN(M$)-5):GOSUB 28000
29650 IF XM>0 THEN 29420
29800 IF T=2 THEN T=0:QQ=155:Q$=R$:LN
      =LN+NQ:GOTO 29400
29900 ? :? "Now  LISTing  modified  v
      ersion  of{3 SPACES}PROGRAM 1 t
      o disk as D:PROGRAM3.LST"
29910 LIST "D:PROGRAM3.LST",2,LL
```

The Expanded/ Unexpanded VIC

Gary L. Engstrom

As more and more VIC owners add expansion memory to their computers, there is an increasing need for programs which run on all VICs, of any memory size. Here's how to write them.

The "where's my memory located now" problem can be overcome by careful programming. With or without an 8K or 16K VIC RAM expansion in place, you should be able to run any of your own programs that require 3.58K or less of RAM. Of course, you will have to put up with removing and installing the expansion cartridge when using programs written by others, but you can have the convenience of universal VIC programs you write yourself.

For programs to be universal, they need to fulfill three requirements:

1. The program must not need more than 3.58K of memory. You just cannot squeeze more than that into the unexpanded VIC-20.
2. The program must contain memory location information for both the expanded and unexpanded VIC-20.
3. The program must be able to determine if expansion is in place and be able to choose between the two sets of memory locations.

To understand how a program can conform to these last two requirements, you need to understand that when the VIC-20 is turned on, its operating system goes through an initialization procedure. During initialization, one of the tasks that the operating system does is check to see if memory expansion is in place.

If so, the operating system sets certain pointers to one set of memory locations; if there is no memory expansion, these pointers are set to a different set of memory locations. If you have 8K or 16K RAM memory expansion for your VIC-20, you should be familiar with three of these memory locations (see the table below). The computer uses the correct locations because, during initialization, pointers are set to the correct locations. It is the knowledge of the alternate memory locations and the existence of these pointers that make universal programs possible.

Table 1.

	Unexpanded	Expanded
Screen Memory	7680-8191	4096-4607
Color RAM	38400-38911	37888-38399
User BASIC Area	4096-7679	4608-*
	*The end of user BASIC Area in an expanded VIC-20 depends on the size of the expansion memory.	

Establish Alternate Values

Memory locations used as pointers can be used by a BASIC program to run on either an expanded or an unexpanded VIC-20. I chose memory location 43-44 ($002B-$002C), the pointer to the start of the BASIC program in memory. When the VIC-20 is not expanded, the decimal value of the high bit (location 44) is 16; when the VIC-20 is expanded, the decimal value of the high bit is 18.

This gives us enough information (using a PEEK statement) to create two paths for alternate memory values in a BASIC program. Thus we can assign the values for the beginning of screen memory and of color RAM for the expanded and unexpanded VIC-20 (see Program 1).

Program 1: Alternate Values

```
10 PRINT "[CLR]" : REM *SET ALTERNATE VALUES*

20 IF PEEK (44)=18 GOTO 70: IF MEMORY IS IN P
   LACE
30 SM=7680 : REM SCREEN MEMORY FOR UNEXPANDED
    VIC
40 CM=38400 : REM COLOR MEMORY FOR THE UNEXPA
   NDED VIC
50 CS2=242 : REM CHARACTER SET 2 POINTER FOR ~
   THE UNEXPANDED VIC
60 GOTO 110 : REM SKIP
70 SM=4096 : REM SCREEN MEMORY FOR THE EXPAND
   ED VIC
80 CM=37888 : REM COLOR MEMORY FOR THE EXPAND
   ED VIC
90 CS2=194 : REM CHARACTER SET 2 POINTER FOR ~
   THE EXPANDED VIC.
```

You might have noticed that I threw in an extra value. If you want to POKE characters from Character Set 2 to the screen, you have to POKE the character set pointer to the alternate set. The character set pointer is at memory location 36869. I have included the character set pointer value to demonstrate that you might want to use other alternate values in some of your programs.

Enter Common Values

After the alternate values have been set, you can set the values that are common to both the expanded and unexpanded VIC-20 (see Program 2). Of course, if you are not going to use a particular value, it can be left out.

Program 2: Common Values

```
100 REM *SET COMMON VALUES*
110 SB=36879 : REM SCREEN/BOARDER COLOR
120 V=36878 : REM VOLUME
130 S1=36874 : REM SPEAKER 1
140 S2=36875 : REM SPEAKER 2
150 S3=36876 : REM SPEAKER 3
160 S4=36877 : REM SPEAKER 4
```

Another benefit of using this method is that you don't have to constantly look up these memory locations or reenter these numbers each time you are going to use them. Every time you can avoid reentering a number, you are avoiding the possibility of an entry error.

Crunch And Save

Program 3 is a "crunched" version of Programs 1 and 2. Enter Program 3, then SAVE and VERIFY it on tape. Every time you start a new program, LOAD these four lines before you start to enter your own listing. When you write your program, start with line 100. Lines 50-90 can be used for defining variables and constants for your program.

Program 3: Lines 10 to 160 "Crunched"

```
10 PRINT"[CLR]":IFPEEK(44)=18GOTO30
20 SM=7680:CM=38400:CS2=242:GOTO40
30 SM=4096:CM=37888:CS2=194
40 SB=36879:V=36878:S1=36874:S2=36875:S3=3687
    6:S4=36877
```

Try It Out

When all the values have been set, you can start to create your program. Program 4 is a short program that you can enter to demonstrate the flexibility of Program 3.

Program 4: Demonstration Program

```
100 REM *DEMONSTRATION PROGRAM*
110 POKE SB,120 : REM SET YELLOW SCREEN AND BL
    ACK BOARDER
120 POKE 36869,CS2 : REM POINT TO CHARACTER SE
    T 2
130 SS=INT(RND(1)*128)+128 : REM RANDOM VALUE ~
```

NEW

VISA VIC SOFTWARE VIC MasterCard

Great VIC Software

Use Joystick or keyboard

ALIEN INVASION — Arcade style excitement for your VIC. Look out here they come. Aliens are descending from the sky. Move your laser into position and defend the earth. The attacks are unending — can you survive or will Vader rule the galaxy. Many extras on this one. 20 levels of play. $12.95

CATTLE-ROUNDUP — The cows are loose in the maze. You have 2 minutes to get each cow back into the corral. You can push, coax and call the cows. Some cows are not very smart and some are very stubborn. You will have to help them. Be careful that you don't leave the corral gate open. Color graphics and sound. Eight levels of play and a time limit. $12.95

HEAD ON — Your car moves forward around the race track. You can move up, down, right and left. Try to score points by running over the dots on the track. Watch out for the crusher — if you crash you lose a car. Four cars and bonus levels. Full color graphics and sound. Fast action and very addicting. 9 levels of play. $12.95

SNAKEOUT — Blocks appear on the screen at random. You move up, down, right and left and try to move your snake over the blocks. Each block that you get raises your score. Keep building your score but watch out because the escape routes keep getting smaller. Time limit, color graphics and sound. 3 games on this cassette. Snakeout — 2 player Snakeout and Trapper. 9 Levels of Play. $12.95

TARGET COMMAND — Move your laser into position and get ready for some quick action. Different types of missiles are dropping. How many can you shoot down. They all travel at different speeds and different levels. You must be fast on the trigger to get them all. Time limit, bonus points and very addicting. Color graphics and sound. Arcade style fun. 10 levels. $12.95

COMMODORE 64 SOFTWARE

Let the ELECTRIC COMPANY turn your 64 into a home arcade!

COLOR • GRAPHICS • SOUND
ON CASSETTE

ARCADE PAK - $24.95
3 Programs
Head On
Alien Invasion
Target Command

EDUCATION PAK $24.95
3 Programs
Geography Match
Math - Adventure
King

ADVENTURE PAK - $14.95
2 Programs
Adventure
Caves of Silver

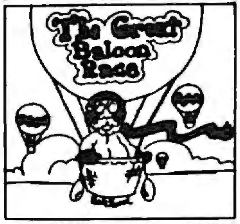
GAME PAK $14.95
2 Programs
Dragon Chase
Deflect

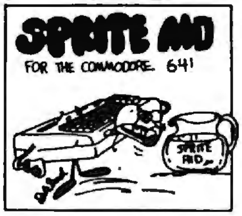
Joystick and Keyboard versions included

COMPUTERMAT • BOX 1664, DEPT -20
LAKE HAVASU CITY, ARIZONA 86403

WRITE FOR FREE CATALOG

THE ELECTRIC COMPANY
P.O. Box 388C • Lake Havasu City • Arizona 86403





You Can COUNT On Abacus Software

VIC * COMMODORE 64 * PET

*SPRITE-AID sprite editor with joystick option	$14.95
*SYNTHY-64 music & Sound Synthesizer.Fantastic!	$29.95
*SCREEN-GRAPHICS-64 add graphics commands to BASIC incl. sprites	$24.95
*SKIER-64 exciting gameware	$19.95
Tiny Basic Compiler for Vic, CBM-64 or Pet	$19.95
*BUDGETEER Visual planner for Vic, CBM-64 or Pet	$19.95
*VIC QUICK CHART presentation chartmaker	$14.95
*VIC GREAT BALLOON RACE another exciting game	$14.95
VIC I-CHING oriental fortune teller(16Kexp)	$24.95
VIC SUPER EXPANDER SCREEN DUMP prints your graphics	$14.95
VIC JOYSTICK PAINTER	$14.95
VIC OR PET VIGIL games language with 9 games	$29.95
VIC OR PET PIPER the music machine!	$19.95
VIC HIRES / MULTICOLOR GRAPHICS UTILITIES (no extra memory)	$19.95
VIC GRAPHVICS super full-screen graphics (req. 3K or 8K mem.exp.)	$24.95
VIC TINY PILOT educational language	$17.95
*VIC CRIBBAGE (req. 16 K exp.)	$14.95
VIC MACHINE LANGUAGE GUIDE ($6.95 foreign)	$ 5.95
PET MACHINE LANGAGE GUIDE ($7.95 foreign)	$ 6.95
PET TINY PASCAL PLUS + (req. 32 K)	$39.95
BASIC REFERENCE CARD ($2.00 foreign)	$ 1.50

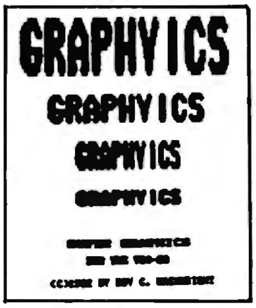
* NEW

Write for FREE Catalog or for fast service, call our Order Line.

Abacus Software

P.O. Box 7211, Grand Rapids, MI 49510 616/241-5510

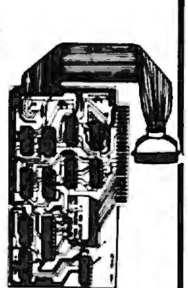
All software packages come with complete instructions or manuals. Manuals ordered separately creditable towards purchase of software $5.00 each, $7.00 foreign. Add $3.00 per disk package. FREE POSTAGE in US and Canada. Foreign add $3.00 per item. Payment acceptable in US Dollars by check or international money order or via VISA, MC, ACCESS, Barclaycard.



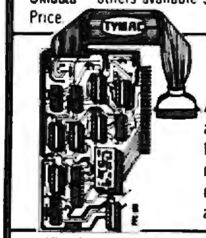
TINY PILOT

APPLE HARDWARE

THE TACKLER ™ – DUAL • MODE PARALLEL INTERFACE FOR THE APPLE® 2 BOARDS IN ONE FOR NO MORE COMPATIBILITY PROBLEMS!



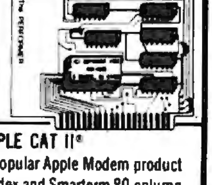
An intelligent board to provide easy control of your printer's full potential. Plus a standard parallel board at the flip of a switch – your assurance of compatibility with essentially all software for the APPLE® Hires printing with simple keyboard commands that replace hard to use software routines. No disks to load. Special features include inverse, doubled, and rotated graphics and many text control features, available through easy keyboard or software commands. Uses Industry standard graphics commands. This is the first truly universal intelligent parallel interface! Change printers – no need to buy another board. Just plug in one of our ROM'S and you're all set. ROM'S available for Epson, C. Itoh, NEC, and Okidata – others available soon. Specify printer when ordering. Call for Price.



THE UPGRADEABLE PPC-100 PARALLEL PRINTER CARD

A Universal Centronics type parallel printer board complete with cable and connector. This unique board allows you to turn on and off the high bit so that you can access additional features in many printers. Easily upgradeable to a fully intelligent printer board with graphics and text dumps. Use with EPSON, C. ITOH, ANADEX, STAR-WRITER, NEC, OKI and others with standard Centronics configuration. $139.00

IF YOU WANT GRAPHICS AND FORMATTING THEN CHOOSE THE PERFORMER



for Epson, OKI, NEC 8023, C ITOH 8510 provides resident HIRES screen dump and print formatting in firmware. Plugs into Apple slot and easy access to all printer fonts through menu with PR# command. Use with standard printer cards to add intelligence $49.00 specify printer

THE MIRROR FIRMWARE FOR NOVATION APPLE CAT II®

The Data Communication Handler ROM Emulates syntax of an other popular Apple Modem product with improvements. Plugs directly on Apple CAT II Board Supports Videx and Smarterm 80 column cards, touch tone and rotary dial, remote terminal, voice toggle, easy printer access and much more. List $39.00 Introductory Price $29.00

MINI ROM BOARDS

Place your 2K program on our Mini Rom Board. Room for one 2716 EPROM. Use in any slot but zero. Only $34.95

DOUBLE DOS Plus

A piggy-back board that plugs into the disk-controller card so that you can switch select between DOS 3.2 and DOS 3.3 DOUBLE DOS Plus requires APPLE DOS ROMS $39.00

VIC ITEMS

Word Wizard For The Vic 20® (Requires at least 8K memory expansion) A user friendly WORD PROCESSOR with full joystick control (use of joystick optional). Easy edit and string manipulation commands that follow the standard VIC 20® format. Full use of function keys for easy of use. Includes the following options; 1). 100% machine language for lightning fast operation. 2). Uses standard VIC editing commands. 3). Has Delete Word and Search functions. 4). Optional use of joystick for cursor movement. 5). Prints justified and centered text. 6). Has a Delete Buffer to retrieve deleted text. 7). Prints to VIC Graphic printer, or any centronics compatible printer connected to the user port. 8) Saves and Load using tape or disk. 9). Provides complete printout control including: Top Margin, Bottom Margin, Text Width, Left Margin, Page Length, Line Spacing and Page Numbering. 10) All print parameters can be changed from within a document. 11). Can generate Roman numerals for page numbering. 12). Allows printing specific pages within a document. 13). Text can be appended to existing files. 14). Free space display. $34.95

Bomber. Word. A unique graphic word game on cartridge that provides the full thrill of arcade action to increase word skills. Complete with six modes of play options for added enjoyment. Play against the computer or another player. Clever use of graphics and sound make this an enjoyable game for ages 6 to adult $29.95

Universal Tape Interface & Duplicator (Use on the CBM 64 also) No need to use the VIC 20 Recorder with this device you can easily load, save or even duplicate tapes easily with your recorder. Full LED indication of Data transfer makes this the most reliable way to load. Save and Duplicate. A complete I/O device with extras. Only $49.95

TIC ATTACK – A fast action Arcade Game Cartridge for the VIC 20 with over 100 levels of play. Dodge the ROBOT warriors, bomb dropping Phobian Tics, and the super intelligent Radar Tics. Shoot as many creatures as you can in this multi skill, super fast, hi-res, smooth action game. $29.95

SKETCH PAD & CHAR-GEN – Two for the price of one. One program allows you to create your own special characters for math symbols, secret codes, game creatures and foreign language characters. The second program is a hi-resolution drawing program (optional use of joystick draw) that allows you to save pictures that you have created. $24.95

TRIPLE PLAY – Three stimulating word game programs to tickle your brain. Crosswords contains a number of puzzles to solve. Crypto-Solve is a unique Computer approach to solving those strange encrypted messages found in books and newspapers (approx. 50 puzzles included for your enjoyment.) Hidden Words tests your talents of observation with over 20 ever changing puzzles included. $29.95

DOT-A-LOT – As you wander through the maze of life collecting berries and magical fruits, hidden treasures appear. It would be so nice if only those meanies had stayed home. This adventure packed graphic arcade game on cartridge is a must to include in your cartridge library. $29.95

Look out for our NEW exciting cartridge and tape programs, reasonably priced memory boards and more for the VIC 20 and soon for the VIC 64. Call or write for catalog of exciting Vic 20 products.

Dealer and Distributor Inquiries Invited.

VISA MasterCard

MICRO-WARE DIST. INC.
P.O. BOX 113 POMPTON PLAINS, N.J. 07444
201-838-9027

```
     FOR SPEAKER
140 CV=INT(RND(1)*8) : REM RANDOM COLOR VALUE
150 VS=INT(RND(1)*15)+1 : REM RANDOM VALUE FOR
     VOLUME
160 X= INT(RND(1)*22) : REM RANDOM VALUE FOR X
     COORDINATE
170 Y=INT(RND(1)*23) : REM RANDOM VALUE FOR Y ~
     COORDINATE
180 POKE SM+X+22*Y,95 : REM POKE CHARACTER TO ~
     SCREEN
190 POKE CM+X+22*Y,CV : REM POKE COLOR TO SCRE
    EN
200 POKE V,VS : POKE S1,SS : POKE S2,SS : POKE
     S3,SS : POKE S4,SS : REM SOUND
210 FOR T=1 TO 10 : NEXT T : REM PAUSE
220 GOTO 130 : REM REPEAT
```

Once you have entered Programs 3 and 4, SAVE and VERIFY the resulting program. Then, try it on both your expanded and unexpanded VIC-20. (Don't forget to turn the computer off before installing and removing the memory expander.) The program will adjust to the correct alternate set of values and work correctly with either configuration.

Practice POKEing

Using labels in place of actual numbers for POKEing might be confusing at first. However, once you get used to the labels, programming will be quicker and more accurate. To help you make the transition, I will explain two ways that labels can be used to POKE color and characters to the screen.

Method 1: X/Y Coordinates

The X/Y coordinate method for POKEing characters to the screen takes advantage of the 22 columns and 23 rows of the VIC-20 screen. Refer to the chart below. The 22 columns are labeled X and are numbered 0 to 21; the 23 rows are labeled Y and numbered 0 to 22. All of the screen locations can be identified by column (X) and row (Y). For example, the center of the screen is at X=11 and Y=11; the lower left-hand corner is at X=0 and Y=22. To POKE characters to the screen, you

Table 2: Memory Map

X=	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Y=0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
2	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
3	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
4	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
5	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131
6	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
7	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
8	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197
9	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
10	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241
11	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263
12	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
13	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307
14	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329
15	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351
16	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373
17	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395
18	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417
19	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439
20	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461
21	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483
22	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505

NEW SOFTWARE

PractiCalc® VIC-20 16K RAM

The extraordinary electronic shreadsheet program that does formula calculations, replicates formulas and data, has adjustable column width and numeric format, over 20 mathematical functions, alpha and numeric sorting, prints, and saves spreadsheets. Tape and disk versions available $35.00

Sensational and International Software for Domestic VIC-20.

RABBIT BASE – Rabbit Base is a data file manager that allows sort routines, password protection output to printer, error checking routine, add, delete, change, fast find, crashproof code, simple screen instructions, and more. (16 RAM) $19.95

VIC SKETCH – The versatile etch-a-sketch program for the VIC-20. Drawings can be written in one of seven colors. All drawings can be printed, saved, and erased. Drawings can be performed by using keyboard keys or joystick. (Unexpanded) $6.95

JOHNNIE JUMPET – Johnnie Jumpet is late for supper. He has to run, jump, and avoid the white mice to reach the elevator to home. The bridges blink on and off, so go across quickly or fall to the spikes below. The mice appear out of their holes at the top of the screen. Do not run head-on or fall onto them for its DEADLY! So now, hop to it, and get Johnnie home for supper. (Unexpanded) $12.95

REFLECTIONS – If you are always competing against "jock types" and losing badly, now is your golden opportunity to get even. Reflections is the game that will send jocks into a tailspin. The object of the game is to demolish a star by directing a ball with the use of floating paddles. Patience and keen reflexes are required for all players. (Unexpanded) $9.95

Sinclair Timex 1000 16K RAM Required

SUPER INVADERS – Negotiations have ended. Now comes a show of strength. "The Earth is Being Invaded!" All beings on Earth are depending on you. Don't let us down. (16 Ram) $12.95

GRAPHICS STARTER PACK – (Four 1k Graphic programs – Kaleidoscope, Large Print, Medium Print, Draw a Picture). Explains and discusses GOSUB, INKEY, PRINT AT, PLOT AND UNPLOT, the way the ZX81 stores character shapes (and where!), the decomposition of the decimal to binary and how to use the cursor keys to "draw" on screen. (16 RAM) $7.95

Other programs for the VIC-20 or SINCLAIR TIMEX 1000 in the areas of home use, business applications educational needs, and other games are available.

Order direct by calling 1-800-343-1078.

We're looking for new software

CSA is searching for programmers who are creating software for Commodore, Timex, or Atari. We offer you an immediate, wide distribution network. Contact us at the address below.

We're looking for new dealers

CSA is a distributor for U.S. and foreign software. Call or write us for a complete list of programs.

COMPUTER SOFTWARE ASSOCIATES

50 Teed Dr., Randolph,
Massachusetts 02368
617-961-5700

VIC20™ PERSONAL COMPUTER

TOP 10 SALE!!
ARCADE GAMES
(VIC-20 TAPE PROGRAMS)

Rank	Name	List	Sale
1.	Super Paratrooper (Fantastic)	$24.95	$19.95
2.	Exterminator-Plus (Better than Centipede)	$24.95	$19.95
3.	Cricket (Better than Frogger)	$24.95	$19.95
4.	3-D Hackman (3-Dimensional)	$24.95	$19.95
5.	Snackman (Better than Packman)	$19.95	$15.95
6.	Bug Blast (Creepy)	$19.95	$16.95
7.	Anti Matter Splatter (Nuclear Disaster)	$24.95	$19.95
8.	Bombs Away (Great)	$18.95	$15.95
9.	3-D Maze-Escape	$16.95	$14.95
10.	Krazy Kong	$16.95	$14.95

BUY ANY FOUR — DEDUCT 10% MORE

VIC-20
ACCESSORY SALE!!

1. **TRACTION-FRICTION LINE PRINTER** This new COM-STAR deluxe printer, prints 8½" x 11" full size letter quality single, roll or fan fold paper, labels and etc. Impact dot matrix bi-directional 40, 66, 80, 132 columns. Includes interface cable that plugs direct into the VIC-20 computer, no other costly interface is needed. List $599.00 — Sale $399.00.

2. **UP TO 60K EXPANSION MODULE** Aero Space designed—6 slot—add up to 6 cartridges—switch select any program. Start and stop any program with reset button—not necessary to remove cartridges or turn off computer, saves time, television and computer (one year warranty) List $149.00 — Sale $89.00.

- 10 DAY FREE TRIAL
- WE HAVE THE LOWEST PRICES
- ONE DAY DELIVERY EXPRESS MAIL
- FREE CATALOGS
- WE LOVE OUR CUSTOMERS!

PROTECTO
ENTERPRIZES (FACTORY-DIRECT)

BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

must use the following formula: POKE SM + X + 22 * Y,N where SM = 7680 for the unexpanded VIC-20, SM = 4096 for the expanded VIC-20, and N is the character code.

You can POKE color to the screen in the same way: POKE CM + X + 22 * Y,N where CM = 38400 for the unexpanded VIC-20, CM = 37888 for the expanded VIC-20, and N is the color code.

LOAD Program 3 and then enter the following POKE statements (Program 5).

Program 5: X/Y Coordinate Practice

```
100 X=0 : Y=0 : REM SET VALUES FOR X AND Y
110 POKE SM+X+22*Y,81 : POKE CM+X+22*Y,6 : REM
     BLUE BALL--UPPER LEFT
120 X=21 : Y=0 : REM SET VALUES FOR X AND Y
130 POKE SM+X+22*Y,83 : POKE CM+X+22*Y,2 : REM
     RED HEART--UPPER RIGHT
140 X=11 : Y=11 : REM SET VALUES FOR X AND Y
150 POKE SM+X+22*Y,90 : POKE CM+X+22*Y,0 : REM
     BLACK DIAMOND--CENTER
160 X=0 : Y=22 : REM SET VALUES FOR X AND Y
170 POKE SM+X+22*Y,65 : POKE CM+X+22*Y,4 : REM
     PURPLE SPADE--LOWER LEFT
180 X=21 : Y=22 : REM SET VALUES FOR X AND Y
190 POKE SM+X+22*Y,88 : POKE CM+X+22*Y,5 : REM
     GREEN CLOVER--LOWER RIGHT
```

To make a character move on the screen, add a +1 to the value of X for right movement, add a -1 to the value of X for left movement, add a +1 to the value of Y for down movement, and add a -1 to the value of Y for upward movement. The limits of the screen are defined by X = 0 to 21 and Y = 0 to 22. Experiment by changing the values for X and Y in Program 5.

Method 2: Direct Method

There are 506 screen locations for both color and characters. The first location is SM (for Screen Memory) and CM (for Color Memory). The first location is the upper left-hand corner of the screen. The second location is to the right of the first location and has a value of SM + 1 (for character placement) or CM + 1 (for color placement).

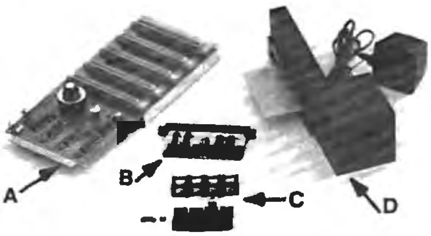
We can continue to add values to the labels until we are at the bottom right-hand corner of the screen, where the values are SM + 505 and CM + 505. Therefore, any position on the screen can be addressed by adding the values of 0 through 505 to the labels SM or CM (see the memory map). LOAD the Alternate Values Listing (Program 3) and then enter the following practice POKE statements (Program 6).

Program 6: Memory Location Practice

```
100 POKE SM+0,81 : POKE CM,6 : REM BLUE BALL--
     UPPER LEFT-HAND CORNER
110 POKE SM+21,83 : POKE CM+21,2 : REM RED HEA
     RT--UPPER RIGHT-HAND CORNER
120 POKE SM+253,90 : POKE CM+253,0 : REM BLACK
     DIAMOND--CENTER
130 POKE SM+484,65 : POKE CM+484,4 : REM PURPL
```

VIC-20 OWNERS

Expand your System with these Exclusive Factory Direct Products



A. DATASPAN-20
- 5 slot-switch selectable (not an inconvenient DIP switch) allows control between computer mode and game mode
- Fully buffered
- Reset button
- Auxiliary power supply jack
- Fuse protection
- Write protection on one slot

DATASPAN Kit $54.95
DATASPAN Assembled $79.95

C. RAMcharger
- Turn your Commodore 8K cartridge into a full 16K cartridge
- Full address switching capabilities
- Sockets allow future EPROM substitution

RAMcharger Kit $29.95

B. RAMraider
- Makes your 3K or *Superexpander cartridge a full 4K RAM
- Recaptures your RAM for BASIC and moves it into Expansion memory (lower half of Blocks 1, 2, or 3)

RAMraider Kit $24.95
RAMraider Assembled $34.95

D. BREEZE MACHINE
- Extend the life of your computer with our *Whisper Quiet* FAN
- Plugs directly into your expansion port
- Designed to work with any VIC-compatible cartridge or expansion board

BREEZE MACHINE Assembled $59.95

All assembled units have full 90-day limited guarantee.

Digital Interface Systems Co.
P.O. Box 8715
Portland, Oregon 97207
(503) 295-5890

TERMS:
Shipping and Handling $3.00
VISA/MASTERCARD — Add 3%
Most orders shipped within 48 hours
(Personal checks — allow 2 weeks.)

VIC TIP OF THE MONTH

Don't place program tapes on VIC transformer or on television!
Accidental erasure could occur.

RINGS OF SATURN ©

PILOT THE SCOOP SHIP VOYGER
INTO THE RINGS OF SATURN TO
BECOME A MULTIMILLIONAIRE
CALL
(408) 738-1751.
MAIL
D. SMITH & CO.
1164 ANDOVER DR.
SUNNYVALE, CAL.
94087
VISA & MASTERCARD WELCOME
ONLY $ 19.95
FOR THE UNEXPANDED VIC-20

SYNTAX SOFTWARE INC.

VIC-20

CASSETTE SOFTWARE

CRABS

A new challenge every time.

Agility is the key to successfully guiding HERBIE (the halibut) through the maze, avoiding the deadly gaze of SONIC CRABS while feeding on delectable night crawlers.

The more you eat, the higher your score. Each time you clear the maze of tasty morcels, you will receive more time, additional lives, and a new group of night crawlers, as the game of SURVIVAL continues

But beware! With the passing of time your presence becomes increasingly aggravating to the KILLER crabs who lurk within, improving the accuracy of their menacing sonic waves.

Set at beginner or advanced levels each game is played in a totally new maze, and may consist of any number of rounds that start identically for each player

CRABS can be played using your VIC-20 keyboard or joystick, and will work on all standard VIC-20 memory configurations.

TANK WAR

Exciting action for two players

Your opponent watches closely as the BATTLEFIELD unfolds, and you both carefully plan strategies for the pending CONFLICT. Suddenly, both LASER TANKS fire to initiate movement. You begin to thread the way through your home territory, avoiding obstructions and buildings, as you proceed toward enemy ground.

Outscore the rival tank by destroying enemy buildings as well as placing direct hits on your opponent during one to one combat. Higher skill levels will add additional targets, mountain ranges and landmines to the battle zone for increasing EXCITEMENT.

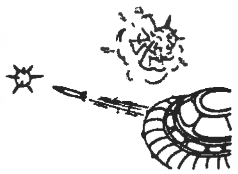
One of three skill levels, with a new battlefield created for each game, provides a new challenge for both players every time

TANK WAR may be played using your VIC-20 keyboard or paddles, and will work on all standard VIC-20 memory configurations.

CYCLONS

Full Hi-Res Graphics, Arcade-Like Action

The ultimate inter-stellar conflict



Continuing with their plan to conquer the universe, the CYTRON EMPIRE has chosen your sector as the first target in our galaxy As COMMANDER of the protective forces, you must manoeuvre your craft, avoiding collision and enemy missiles, to attack and destroy enemy war ships

The CYCLON fighters relentlessly enter the battle zone, attempting to lure you into making errors that will lead to your destruction. The menacing PULSAR DEATH SHIP also begins to attack, its only purpose to zero in on your location, chase you down, and put an end to your defense of civilization as we know it

Our future lies with your skill

CYCLON requires memory expansion to function When loaded on a system with a 3K expander (or Super Expander) you will play an advanced level game. Loading the cassette onto a system with 8K or more expansion, you will be allowed to choose between a variety of difficulty/game-feature options The game is controlled with the VIC-20 joystick

CRITTERS

Full Hi-Res Graphics, Arcade-Like Action

Skill-testing defense against a new evil

While inspecting his prize pumpkin patch, Mr. GREENSLEEVES becomes aware of a flock of strange CRITTERS hovering in the sky above Without warning small groups begin to leave the formation and dive in order to knock him down and STEAL the fruits of his labour. Armed only with a revolver, he must now DEFEND his crop against this new blight

You will guide Greensleeves in his COURAGEOUS effort to save the patch. Run or crouch in order to avoid the swooping MENACE, and attempt to exterminate the critters before they can loot the entire crop Most important, once a pumpkin is stolen, destroy the thief before he can reach the flock (taking care not to hit the pumpkin) or his prize will be your loss

As the struggle progresses, larger flocks will arrive and the speed of their attack will increase. But don't despair New pumpkins will grow with your point total providing additional opportunities to successfully fend off the raid When they succeed in clearing the field, the conflict is over

CRITTERS requires a minimum of 8K memory expansion and is controlled with your VIC-20 joystick

Check for availability with your local dealer, or use the order form provided.
Dealer enquiries are invited.

FORWARD TO: SYNTAX SOFTWARE INC, 33 ELMHURST AVE., SUITE 502
WILLOWDALE, ONTARIO, CANADA M2N 6G8 PHONE (416) 221-8008

☐ CERTIFIED CHEQUE
☐ MONEY ORDER
Please Forward Charges To
☐ VISA
☐ MASTER-CARD
☐ AMERICAN EXPRESS
CARD NO ______
EXPIRY DATE ______

PLEASE SEND ME
__ CRABS @ $15.95 (U.S.)/$18.95 (CDN.) = ______
__ TANK WAR @ $15.95 (U.S.)/$18.95 (CDN.) = ______
__ CYCLONS @ $19.95 (U.S.)/$23.95 (CDN.) = ______
__ CRITTERS @ $19.95 (U.S.)/$23.95 (CDN.) = ______
Shipping and Handling @ $1.00 per Cassette = ______
Ontario Residents Please Add 7% Sales Tax = ______
TOTAL = ______

____
SIGNATURE

Please Print
NAME ____________
ADDRESS ____________
____
POSTAL CODE/ZIP ____________

VIC-20 is a registered trademark of Commodore Business Machines Inc

```
     E SPACE--LOWER LEFT-HAND CORNER
140 POKE SM+505,88 : POKE CM+505,5 : REM GREEN
      CLOVER--LOWER RIGHT-HAND CORNER
```

To make a character move on the screen, add a +1 for right movement, add a -1 for left movement, add a +22 for down movement, and add a -22 for upward movement. The limits of the screen are defined by SM+505 and SM (for character placement) and CM+505 and CM (for color placement). Experiment by changing the values added to SM and CM in Program 6.

To demonstrate how the direct method works in a program, replace lines 260 through 290 in Program 4 with the following lines (Program 7).

Replace lines 260 through 290 in Program Listing 3 with the following lines:

Program 7: Alternate To Program 3

```
260 M=INT(RND(1)*505) : REM RANDOM SELECTION O
    F MOVEMENT
280 POKE SM+M,95 : REM POKE CHARACTER TO SCREE
    N
290 POKE CM+M,CV : REM POKE COLOR TO SCREEN
```

Which Method Is Best?

At this point you may be wondering which method for POKEing should be used. Each method has its place, depending on the requirements of your program. Generally, the direct method requires fewer commands for some applications and runs faster than the X/Y coordinate method. However, it is much easier to define complex screen boundaries using the X/Y coordinate method.

For example, let's place a five-character by five-character square on the screen. We'll use the X/Y coordinate method to place a square in the center of the screen, and the direct method to place a square in the lower left-hand corner. LOAD Program 4 and then enter Program 8.

Program 8.

```
100 REM X/Y COORDINATE METHOD
110 FOR X=9 TO 13 : FOR Y=9 TO 13 : REM SET VA
    LUES OF X AND Y
120 POKE SM+X+22*Y,160 : POKE CM+X+22*Y,8 : RE
    M POKE CHARACTER AND COLOR
130 NEXT Y : NEXT X : REPEAT
140 REM DIRECT METHOD
150 L=396 : REM BEGINNING VALUE OF M
160 FOR M=L TO L+4 : REM RANGE OF M FOR ONE LI
    NE
170 POKE SM+M,160 : POKE CM+M,8 REM POKE CHARA
    CTER AND COLOR FOR ONE LINE
180 NEXT M : REM REPEAT TO END OF LINE
190 L=L+22 : IF L>488 THEN END : IF AT END OF
    LAST LINE END
200 GOTO160: REPEAT
```

When RUNning this program, you might have noticed that the second square was printed a little faster than the first one. In applications where speed is important, it is useful to know that the direct method does run quite a bit faster than the X/Y coordinate method.

This can be best illustrated by Program 9. In this program, the entire screen is filled with characters by using both methods. An added feature is that each segment of the program is timed by the VIC-20 built-in timer. LOAD Program 4 and then enter the following lines:

Program 9: Fill Screen Test

```
100 REM *FILL SCREEN TEST*
110 REM FILL SCREEN USING SCREEN MEMORY LOCATI
    ONS
120 PRINT "[CLR]" : REM CLEAR SCREEN
130 TI$="000000" : REM ZERO TIMER
140 FOR J=CM TO CM+505 : REM SET VALUES FOR CO
    LOR MEMORY
150 POKE J,8 : REM POKE COLOR
160 NEXT J : REM REPEAT
170 FOR I=SM TO SM+505 : REM SET VALUES FOR SC
    REEN MEMORY
180 POKE 1,160 : REM POKE CHARACTER
190 NEXT I : REM REPEAT
200 T1$ = TI$ : RECORD TIME
210 REM FILL SCREEN USING X/Y COORDINATES
220 PRINT "[CLR]" : REM CLEAR SCREEN
230 TI$="000000" : REM ZERO TIMER
240 FOR Y=0 TO 22 : FOR X=0 TO 21 : SET VALUES
     FOR X AND Y
250 POKE CM+X+22*Y,8 : REM POKE COLOR
260 POKE SM+X+22*Y,160 : REM POKE CHARACTER
270 NEXT X : NEXT Y : REPEAT
280 T2$=TI$ : REM RECORD TIME
290 PRINT "[CLR]" : CLEAR SCREEN AND PRINT RES
    ULTS
300 POKE SB,157 : REM CHANGE SCREEN AND BORDER
     COLOR
310 PRINT "DIRECT METHOD   "T1$ : REM PRINT TI
    ME
320 PRINT "X/Y COORDINATES "T2$ : REM PRINT TI
    ME
330 END
```

As you can see, the direct method RUNs about twice as fast as the X/Y coordinate method. If you are writing a program using a lot of POKEs, you might consider using the direct method wherever possible. This will help to speed up your program. However, the X/Y coordinate method remains the most useful when defining complex screen boundaries.

By using alternate values for screen memory and color memory, you are not only able to POKE characters and colors to the screen easily and accurately, but you will also be able to run your programs (3.58K or less) with or without your 8K or 16K expansion cartridge. **C**

Left-handed Atari Joysticks

P E Thompson

If you're left-handed, ordinary joysticks are awkward to use. A simple adjustment (all you need is a screwdriver) can fix them.

Several of my friends and family members are left-handed and have complained vociferously about the "right-handed" Atari joysticks. They are especially frustrated when trying to control the spaceship with the left hand, fire at the Zylons with the right hand, and firmly hold the joystick with the other hand (try it sometime, you right-handers!). As the proud owner of the computer which is causing this distress, I am the one who is expected to answer the question, "If you're so smart, why can't you make this thing work right?"

If you, as a right-hander, hold the joystick in the right-handed position (i.e., top away from you), you will see that the fire button is located on the left-hand side. In order to satisfy left-handers, the fire button must be on the right-hand side, which means that the directions of the joystick motions must be rotated as follows:

Direction	Becomes
Forward	**Right**
Backward	**Left**
Right	**Backward**
Left	**Forward**

In other words, if you hold a hypothetical left-handed joystick the right-handed way, then when the joystick is pushed for the forward direction, movement would be to the right. Similarly, the directions would change for all other motions.

Before tackling this seemingly simple task of creating a left-handed joystick, I realized that two obstacles stood in the way of possible solutions:

1) A software patch was impossible since my knowledge of assembly language programming can't get past my confusion as to the difference between a bit, a byte, and a nybble.
2) Any sort of hardware fix was impossible since my soldering ability is limited.

At this point, I decided to make do. I took the joystick apart, hoping to figure out some way of rearranging its mechanism, and was indeed able to convert it for left-handed use.

Before starting, make sure that the joystick is disconnected from the computer and then remove the four screws in the bottom which hold it all together.

Once the screws are removed, place the base on a table and carefully lift off the top. (See Figure 1.) Now set aside the pieces of the fire button (the red button and a spring) in a container. The wires inside are attached by slip-on connectors and you can slip them off and on without damaging anything.

Notice that on each side of the circuit board with silver dots are three wires. The left side wires are ORG (orange), WHT (white), and GRN (green), while the right side wires are BRN (brown), BLU (blue), and BLK (black). This color coding of the wires and the circuit board with silver dots is a fortunate feature of the Atari joystick because it provides the guide to proper (right-hand) reassembly of the joystick. After you have connected the wires according to the arrangement shown in Figure 2, the joystick becomes left-handed.

Finally, reassemble the joystick in the reverse order in which it was taken apart. Here's how:

1) Hold the top of the joystick upside down. The top is the part with the stick.
2) Place the red fire button into its hole in the top. It's easy to see that the fire button goes in upside down too, since that's the only way it fits.
3) Put the spring onto the post in the center of the fire button. Make sure that the spring is completely clean of any dust it may have accumulated since it was removed. In this case, the spring doesn't have an upside down since it's the same on both ends.
4) Be sure that all the connectors are firmly attached to the circuit board with silver dots.
5) Lay the circuit board into the top so that the two posts in the top come through the hole in the board. Top and bottom are easy to determine since these pieces fit only one way.
6) Fit the bottom onto the rest of the assembly. Be careful that the wires are not between the circuit board with silver dots and the posts for the mounting screws. These parts also fit together only one way.

Figure 1.

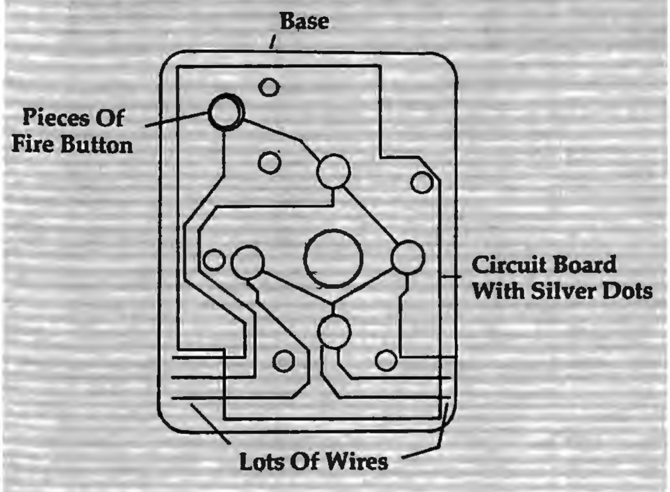
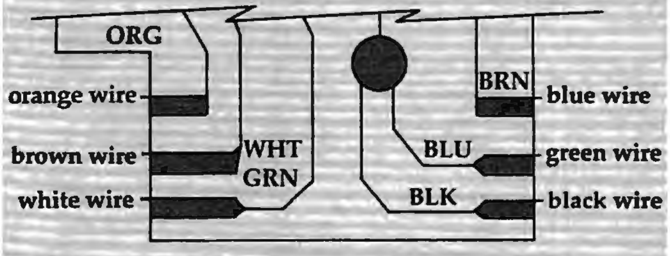


Figure 2.



(NOTE: The ORANGE and BLACK wires are not moved.) ©

Beginners: See special program typing instructions on page 249.

FOX 20:™ "The magazine for *VIC-20 users

© 1982

FOX 20 will provide you, each month, with 5 or more ready-to-run programs on cassette - exciting, imaginative game, educational, and utility programs for all VIC memory configurations. In addition, you will receive Foxtales, an informative Video Newsletter, on Side 2. Novice and pro alike, **FOX 20** is the magazine for you. Be a sly little fox for only $43 a year - Subscribe to:

FOX 20:™

P.O. Box 507, Deer Park, Texas 77536

FOX 20 is a division of: Foxfire Systems, Inc.

3811 Newton, Pasadena, Texas 77503

Dealer Inquiries Invited (713) 473-6723

Texas residents add 5% Sales Tax

Canada and overseas $53

Orders pre-paid

U.S. Dollars only

™

*VIC-20 is a trademark of Commodore Business Machines, Inc.

MERLIN

ATARI

VIC 20®

coming soon... C64®

CODENAME:COBALT

This is the one you've been waiting for — not a text game! Experience the ultimate adventure in this 3-D, full-color, high resolution future world Can you outwit the guardians of this behemoth Labrinthion a hurtling, living COBALT BOMB? Find and arm the self-destruct before the Earth is vaporized but can you escape with your life?!

You will be equipped with a visual directional indicator, visual radar indicator and an array of weapon-devices known to be undetectable by the Alien system.

Available for· ATARI 48K disk or cassette . . $24.95

LASER ARENA

Race a Laser Chariot, be a Gladiator with the Bolt of Death, and battle in a fight to the death. Laser Chariot and Bolt of Death, two separate complete games, are controlled by either keyboard or joystick When challenging the computer opponent, the difficulty level can be selected, offering an infinitely skillful opponent!

Available for VIC-20 16K cassette
ATARI 24K disk, 16K cassette . . $14 95

MIND LEXICA

Three complete games each of 16K, forming a compendium of familiar and futuristic challenges for everyone to enjoy.

PRESSURE is a game of reaction and concentration. Different difficulty and skill levels make PRESSURE a test of anyone's endurance

MEGA QUIZ probes deeper and deeper into your reserves of knowledge Could anyone, anywhere know all the solutions?! Categories to suit all tastes

BET-A-LETTA is a new slant on an old favorite; but don't ponder too long or your S.Q will plummet! Categories to suit all tastes

Available for: VIC-20 16K cassette
ATARI 24K disk, 16K cassette . . $9.95

ARTHUR IS HERE!

ARTHUR DAVIS IS HERE! Now you can relive his most famous cases Can you, as the famous Welsh detective, aid a baffled Scotland Yard in unravelling these tangled webs of intrigue. The many characters in each encounter may be lying, conspiring, falsifying or even telling the truth? Ask the right questions and draw the correct conclusions from the events you witness to trap the guilty and see that justice finds its course

\#3 MURDER IN THE MANOR
Lord Colin lies murdered and everyone seems to have a motive

\#4 DEATH FOR DESSERT
Friends, relatives, benefactors . . . why would anyone want to murder Mr Pym?

\#5 TRANSATLANTIC TREACHERY
The Innocents in London and the guilty in New York? Oceans must be traversed to solve this one.

\#6 TERMINAL EXPRESS TO VICTORIA
Perfect alibis for everyone? Or complete conspiracy!

Available for: VIC-20 16K Cassette
ATARI 48K Cassette or disk

TWO FOR ONE SPECIAL:
VIC-20 . . . . Two for $17.95
ATARI . . . . Two for $19.95

MERLIN alpha-series

Action games controlled by joystick or keyboard, specially available for the unexpanded VIC-20 and Atari computers, on cassette only

bottomless abyss

You are Dervo, the guardian of Somnoland. You have to move the Bridge of Dreams to stop the sleepwalkers falling into the BOTTOMLESS ABYSS! $8.95

pyromania

You control the fire department in a desperate attempt to save the inhabitants of the high-rise block who must jump before the flames engulf them! $8.95

parking lot fever

Move the cars in and out to keep the customers happy, but keep the lot full to keep the boss happy! The pressure never ceases in thsi fast action simulation $8.95

wet cement

Don't let frustration ruin your concentration! Keep the schoolboys off your patch or be on your knees forever. Different speed and difficulty levels $8.95

Alpha-series special: Any 2 for $15.95
Any 3 for $22.95
All 4 for $27.95

SHIPPING—$2⁰⁰, 2 OR MORE SHIPPED FREE
CALIF. ADD 6% TAX .send check or money order to

MERLIN ENTERPRISES
P.O. BOX 2876, TORRANCE, CA 90509 213/316-0945

UFO Pilot:

VIC Custom Characters For Game Graphics

Bud Banis

The current high score in the game "UFO Pilot" is 3411. While seeing if you can top that, you also have the opportunity to learn a good deal about using the VIC "multicolor mode" in your own games.

Commodore's VIC-20 has outstanding color graphics capabilities. However, the unexpanded machine has limited memory to take advantage of these capabilities, and the average computerist who is trying to justify "buying more than a video game" has to provide his family with a reasonable amount of entertainment without buying a lot of expensive memory expansion.

Two options have been offered for designing game graphics characters:

1. The Commodore graphics keys can be used to build multiple space characters. These take up a lot of space and are cumbersome to move around.
2. Custom characters can be drawn if you're willing to give up valuable RAM instead of taking existing characters from ROM. Basically, whole sets of characters are moved from ROM to RAM, and then some of the characters can be redefined by a series of POKEs to RAM. Because the pointer indicating the start of character memory has to be reset (36869), this is an all or nothing process. Any standard characters you want to use must also be relocated from ROM to RAM.

As an alternative, some perfectly acceptable single space characters can be created from standard characters in ROM just by POKEing their screen locations into multicolor mode. This approach uses no memory and gives a wide variety of "new" characters (about four million) to choose from.

This article describes the use of multicolor mode in detail, includes a program to find interesting characters, and concludes with a game demonstrating the technique.

How Characters Are Stored

In order to explain multicolor mode, it's important to first describe how characters are formed on the screen in the first place. The *VIC-20 Programmer's Reference Guide* (pp. 82-94) has several errors in its description of this process.

Characters are stored in memory as an 8x8 grid of dots. Each dot (bit) is turned either "on" or "off." Each eight-bit line (byte) can be represented by a number which uniquely turns some bits "on" and others "off." Each bit is represented by a number which is a power of two if "on" or by zero if "off." The value assigned to the byte is the sum of the values of its eight bits.

bit number	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
value of 2^N	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**

Thus, if only bit zero is "on," the value of the byte is $2^0=1$. If only bit four is "on," the value of the byte is $2^4=16$. If bits zero and four are both "on" and all the others are "off," then the value of the byte is 2^0 and $2^4=1+16=17$. If all eight bits are "on," then the value of the byte is $128+64+32+16+8+4+2+1=255$. A whole character takes eight lines or eight bytes of memory. For example, the letter A is:

bit no.		**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**value of byte**
byte	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	$2^4+2^3=24$
	2	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	$2^5+2^2=36$
	3	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	$2^6+2^1=66$
	4	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	$2^6+2^5+2^4+2^3 \quad +2^2+2^1=126$
	5	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	$2^6+2^1=66$
	6	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	$2^6+2^1=66$
	7	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	$2^6+2^1=66$
	7	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Custom characters can be stored in RAM locations by POKEing the desired values into the individual memory locations (bytes).

The unexpanded VIC-20 has room for 5000

bytes in RAM or about 3.6 thousand (K) bytes user available RAM after buffers and screen memories, etc., are allocated. Since each character takes up eight bytes, moving 64 characters from ROM to RAM, available for use or modification in the custom character mode, uses 64 * 8 = 512 bytes of RAM and makes it unavailable for other uses.

Multicolor Mode

Storing multicolor characters. In multicolor mode, characters are stored in the same way, but bits are read two at a time to specify one of four colors in a two-dot space. Taking two bits at a time allows four possibilities, as opposed to the two ("on" or "off") when bits are taken one at a time.

bit pair	colors selected	memory location (POKE)
00	16 background colors	36879, bits 4-7
10	8 character colors	38400-38911, bits 0-2
01	8 border colors	36879, bits 0-2
11	16 auxiliary colors	36878, bits 4-7

Thus, if you were custom designing a flag with alternating background color and border color stripes, a character color square in the upper left-hand corner, and an auxiliary color pole, the stored data might look something like this:

	bit pairs	value of byte (POKE)
byte 1	(10) (10) (01) (01)	128+32+4+1=165
2	(10) (10) (00) (00)	128+32=160
3	(10) (10) (01) (01)	128+32+4+1=165
4	(00) (00) (00) (00)	0
5	(01) (01) (01) (01)	64+16+4+2=86
6	(11) (00) (00) (00)	128+64=192
7	(11) (00) (00) (00)	128+64=192
8	(11) (00) (00) (00)	128+64=192

This character wouldn't be very interpretable in ordinary, single color, mode.

Once a character is stored in memory in this way, in order to print it on screen in its full multicolor glory, we need to first specify multicolor mode in that screen location, then choose the appropriate colors for border, background, character, and auxiliary use. By POKEing these other reference locations, we can make substantial changes in the character. For example, if the auxiliary color is the same as the background color, the flagpole disappears.

Selecting Colors

Specifying colors is a little more complicated than just POKEing a number into a memory location (byte). The reason is that the color codes use only specific bits, and the rest of the bits in the byte are used for something else. For example, the auxiliary color code uses only bits 4-7 in memory location 36878. The other four bits (0-3) are used for setting volume on the sound. Selection of multicolor mode for a given screen location involves turning on a single bit in the memory for that space on the screen. The other bits hold other information.

Choosing Border and Background Colors

By now, you should be pretty well versed in this operation, and you have probably tried some of the combinations listed in Appendix E (p. 134) of the book that came with your VIC. It seems simple enough – POKEing a number out of the table into memory location 36879 gives you the indicated combination of screen and border colors. Actually, byte 36879 specifies three things which could be referenced independently.

Border colors are specified by bits 0-2. The decimal translation is values 0-7, to give eight possible choices (0 is all "off," 7 is all "on"): 0 is black, 1 is white, 2 is red, etc., in the same sequence as the color keys. Bits 4-7 specify background, or screen, colors. The values associated with these bits are multiples of 16. For example, if bit four is turned "on," its decimal value is $2^4 = 16$; if all four bits 4-7 are turned "on," the combined decimal value of these bits is $2^4 + 2^5 + 2^6 + 2^7$ = 16 + 32 + 64 + 128 = 240.

A little fooling with the numbers should convince you that these four bits can give you any multiple of 16 from 0 * 16 to 15 * 16, or 16 possibilities. This corresponds to the 16 choices of screen color in the order listed in Appendix E of the book *Personal Computing on the VIC-20* (p. 134). Casual inspection of this table reveals that some possible values are not listed – for example, 0-7, 16-23, etc. The lowest value listed is 8. What this means is that bit number three, decimal value 2^3 = 8, is always "on" when one of the values in the table is used. If you POKE 36879, X, where X is a value not in the table, bit three is turned "off," and the screen is put in the *inverted* mode, which makes all the printing appear in the reverse.

Thus, byte 36879 contains three separate memory references: bits 0-2 for border color (eight colors); bit 3 for inverted mode (when "off"); and bits 4-7 for screen color (16 colors from 0 * 16 to 15 * 16).

Setting Character Color And Selecting Multicolor Mode

Character color is specified separately for each location on the screen (see pp. 143-144 in *Personal Computing on the VIC-20*) or can be specified before printing a series of characters by using the control color keys. Character color is specified separately for each screen location by POKEing locations between 38400 and 38905 with values from 0-7 to give the familiar sequence of black to yellow character colors (eight choices). Values from 0-7 represent bits 0-2.

If bit three is turned "on," i.e., values from 8 to 15 are used instead of 0-7, the screen location is put into multicolor mode and the bits are evaluated two at a time to give the results described above

¢OMPU ENE

VIC-20®

VIC-20®	**Personal Computer**	$179.95
VIC-1011A	**RS232C Interface**	39.95
VIC-1515	**Printer**	334.95
VIC-1530	**Datasette**	67.50
VIC-1540	**Disk Drive**	349.95
VIC-1010	**Expansion Module**	139.95
VIC-1311	**Joystick**	9.95
VIC-1312	**Game Paddles**	19.95
VIC-1600	**Telephone Modem**	99.95
VIC-1210	**VIC 3K Memory Expander Cartridge** Plugs directly into the VIC's expansion port Expands to 8K RAM total	34.95
VIC-1110	**VIC 8K Memory Expander Cartridge** 8K RAM expansion cartridge plugs directly into the VIC	52.50
VIC-1011A	**RS232C Terminal Interface** Provides interface between the VIC-20 and RS232 telecommunications modems Connects to VIC's user port	39.95

CARDBOARD 6 An expansion interface for the VIC-20 Allows expansion to 40K or accepts up to six games May be daisy chained for more versatility	$99.95
CARDBOARD 3 Economy expansion interface for the VIC-20	$29.95
CARD "?" CARD/PRINT Universal Centronics Parallel Printer Interface for the VIC-20 or CBM-64 Use an Epson MX-80 or OKIDATA or TANDY or just about any other	$79.95
CARDETTE Use any standard cassette player/recorder with your VIC-20 or CBM-64	$39.95
CARDRITER A light pen with six good programs to use with your VIC-20 or CBM-64	$29.95

BUSINESS & HOME APPLICATIONS

CW-107A	**Home Calculation Program Pack**	$48.95
CPV-31	**Data Files** - your storage is unlimited	14.95
CPV-96	**Household Finance Package** - to keep records of all your household expenses	30.95
CPV-97	**Loan Analyzer** - analyze all types of loans	7.95
CPV-203	**Accountant** - a must for every small businessman	24.95
CPV-208	**Bar-Chart** - display your numerical data	8.95
CH	**Turtle Graphics** - learn programming	34.95
CH	**VIC Forth** - is a powerful language for BASIC programming	49.95
CH	**HES MON** - is a 6502 machine language monitor with a mini-assembler	34.95
CH	**HES Writer** - time-saving word processing tool	34.95
CH	**Encoder** - keep your personal records away from prying eyes	34.95
CT-21	**Statistics Sadistics** - statistical analysis	14.95
CT-121	**Total Time Manager 2.0** - creates personal or business schedules	15.95
CT-124	**Totl Label** - a mailing list and label program	13.95
CT-125	**Totl Text BASIC**	15.95
CT-126	**Research Assistant** - keep track of reference data	17.50
CT-140	**Totl Text Enhanced**	29.95
CM-152	**Grafix Designer** - design graphic characters	12.95
CM-151	**Terminal 40** - produces 40 column output of information received through the modem	25.95
CQ-5	**Minimon** - allows you to program, load, save, or execute machine language programs	13.95
CT-3	**Order Tracker**	15.95
CT-4	**Business Inventory** - to maintain record of inventory	15.95
CT-32	**The Mailman** - to keep addresses of business or personal acquaintences	10.95
CPV-210	**Bidder**	13.95
CPV-211	**Billing Solver**	15.95
CPV-217	**Cash Flow Model** - determine cash flow	12.95
CPV-220	**Client Tickler**	16.95
CPV-221	**Club Lister**	13.95
CPV-224	**Depreciator**	9.95
CPV-227	**Gasoline Un-Guzzler** - energy consumer saver program	8.95
CS-102	**Home Inventory** - Maintains an inventory of all your personal effects	17.95
CPV-236	**Investment Analyst** - keep track of investments and investment opportunities	12.95
CPV-238	**Lease/Buy**	12.95
CPV-251	**Present Value**	10.95
CPV-254	**Ratios** - communicate by percentages	8.95
CPV-269	**Super Broker**	12.95
CPV-270	**Syndicator** - calculates whether to buy or sell	13.95
CPV-274	**Ticker Tape** - maintains investments profile	14.95
CPV-276	**Un-Word Processor** - screen editor	16.95
CPV-286	**Phone Directory** - never lose a phone number again	9.95
CPV-287	**Amortizer** - print complete mortgage or loan amortization schedules	18.95
CS-111	**Checkbook** - home "utility" program	14.95
CPV-294	**Calendar My Appointments** - print a calendar for every month in any year	14.95
CPV-296	**The Budgeter** - place your personal finances in order	12.95
CPV-327	**HESCOM** - transfers data and programs bidirectionally between VICs at three times the speed od a disk drive	40.95
CPV-328	**HESCOUNT** - monitors program execution	19.95
CPV-329	**HESPLOT** - Hi-res graphics subroutines	12.95
CPV-330	**VIC Forth**	49.95
CPV-343	**Simple Inventory Control Life System** Complete documentation	41.95
CPV-360	**Decision**	7.95
CPV-367	**Conversions** - figures volume, length, weight, area, and velocity to all possible configurations	7.95

COMMODORE SOFTWARE

VIC-1211A	**VIC-20 Super Expander** Everything Commodore could pack into one cartridge - 3K RAM memory expansion, high resolution graphics plotting, color, paint and sound commands Graphic, text, multicolor and music modes 1024x1024 dot screen plotting All commands may be typed as new BASIC commands or accessed by hitting one of the VIC's special function keys Includes tutorial instruction book Excellent for all programming levels.	$55.99
VIC-1212	**Programmer's Aid Cartridge** More than 20 new BASIC commands help new and experienced programmers renumber, trace and edit BASIC programs Trace any program line-by-line as it executes, pause to edit. Special KEY command lets programmers redefine function keys as BASIC commands, subroutines or new commands	$45.99
VIC-1213	**VICMON Machine Language Monitor** Helps machine code programmers write fast, efficient 6502 assembly language programs Includes one line assembler/disassembler	$48 99

GAMES FOR YOUR VIC-20 and 64

C-101	**Cribbage**	$15.95
CCD	**Motor Mouse**	12.99
CW-1901	**Avenger Cart.** - an invasion of space intruders and you're the VIC "Avenger"	24.95
CW-1904	**Superslot Cart.** - great music and sound effects!	24.95
CW-1906	**Super Alien Cart.** - you're trapped in a maze	24.95
CW-1907	**Jupiter Lander Cart.** - pilot your "Jupiter Lander"	24.95
CW-1908	**Draw Poker Cart.**	24.95
CW-1909	**Midnight Drive Cart.** - authentic night driving	24.95
CW-1910	**Radar Rat Race**	24.95
CW-1911	**Sky Falling**	24.95
CW-1912	**Mole Attack** - a colorful "cartoon action" game	24.95
CW-1913	**Raid on Ft. Knox** - try to escape the guards	24.95
CW-1914	**Adventure Land** - Formerly available only on larger, more expensive computers All Adventure games are decoded to "talk" on the Type N Talk voice synthesizer (available from VOTRAX)	31.95
CW-1915	**Pirate Cove Adventure** - Yo, ho, ho, & a bottle of rum	31.95
CW-1916	**Mission Impossible Adventure**	31.95
CW-1917	**The Count Adventure** - trapped in Dracula's castle with 3 days to find and destroy the vampire	31.95
CW-1918	**Voodoo Castle Adventure** - you have to free Count Yorga from a curse	31.95
CW-1919	**Sargon II Chess** - seven challenging play levels	31.95
CW-1920	**Pinball Spectacular**	24.95
CW-1923	**Gorf** - (The smash-hit arcade game!)	31.95
CW-1924	**Omega Race** - the ultimate space game	31.95
CW-1937	**Seawolf** — an explosive Bally Midway arcade "classic"	24.95
CH-G201	**Skier** - thrill to downhill skiing	15.95
CH-G202	**Maze of Mikor** - adventure-packed game with stunning graphics	15.95
CH-G203	**Tank Wars**	15.95
CH-G205	**Pinball**	13.45
CH-G206	**Simon** - It gets tougher as you get better Great for kids of all ages	13.45
CH-G207	**Fuel Pirates**	13.45
CH-G208	**Pak Bomber**	13.45
CH-G209	**Laser Blitz**	15.95
CH-G210	**Tank Trap**	15.95
CH-G211	**Concentration**	13.45
CH-G212	**Dam Bomber** - pilot your plane, avoid enemy fire	13.45
CH-C305	**Aggressor** - protect your fuel dump from space ships	34.95
CH-C306	**Synthsound** - an incredible music synthesizer	49.95
CH-C307	**Shamus** - search room after room for the shadow-eluding androids, two levels of intense arcade action	34.95
CH-C308	**Protector**	36.95
CPU-10	**Snake** - like the arcade game "Surround" 1 or 2 players	14.95
CPU-12	**Breakout** - adaptation of the classic Ping-Pong	15.95
CPU-78	**Brick**	7.95
CPU-79	**Breakout**	7.95
CPU-83	**Jackpot** - one-armed bandit, full color graphics	7.95
CPU-85	**Hangman** - unbelievable graphics and sound	9.95
CPU-86	**Tic-Tac-Toe**	7.95
CPU-87	**Memory** - VIC challenges your memory	9.95
CPU-88	**Match** - hand and eye coordination	7.95
CPU-89	**Monks** - a devilish game of logic	7.95
CPU-93	**VIC Lemonade** - two people compete selling lemonade	12.95
CPU-108	**Bomber** - you must decide who you want to fly for, then pick a target and your experience level	9.95
CPU-109	**Amok** - the halls of Amok are populated by robots that obey one instruction - get the intruder	20.95
CPU-123	**Alien Blitz** - find out how good you are at blasting aliens	20.95
CPU-153	**Tank vs. UFO** - the tank is moving back and forth along the base, shoot the UFO before it shoots you	9.95
CPU-191	**Blackjack** - just like blackjack in the casinos	12.95
CPU-194	**Snakman** - Pacman for the VIC	14.95

MORE — MORE — MORE

Prices subject to change.

TO ORDER:
P.O. Box 18765
Wichita, KS 67218
(316) 684-4660

MasterCard VISA

Personal checks accepted (Allow 3 weeks)
or C.O.D. (Add $2) *Handling charges $2.00*

VIC-20® is a registered trademark of Commodore under "Storing multicolor characters." In multicolor mode, the character color code is (value-8). For example, POKE 38400, 8 puts the first space into multicolor mode with character color black (0). POKE 38422,15 puts the twenty-second space (first space, second row) into multicolor mode with character color yellow (7).

Bits 4-7 are used for something else which is not clear from the manuals. Randomly POKEing these bits eventually gives peculiar results such as "out of memory" errors. This can be avoided by ANDing POKEs with 15.

Boolean Operators

There is a way to read and write to specific bits within a byte without disturbing other bits which might carry other information. Unless you've been exposed to set theory before, the action of Boolean operators OR and AND may seem strange. These operators are used to combine information from two sets.

When AND is used, the result includes only that information which is included in *both* sets. For example, if all eight bits in a byte were turned "on," the decimal value of that byte would be 255. If another byte had only the first four bits turned "on," its decimal value would be 15. The result from ANDing bytes one and two would have only "on" bits that were "on" in *both* sets. This gives the peculiar result that 255 AND 15 = 15.

If you wanted to know the status of only a single bit, you could screen out extraneous information by ANDing with the decimal value for that bit: PRINT PEEK (38400) AND 8 would return 8 if the third bit is "on" or 0 if the third bit is "off." The status of other bits doesn't matter.

The OR operator combines sets so that the result includes all bits "on" which were "on" in *either* set. Thus, 255 OR 15 = 255; 248 OR 15 = 255. These operators can be used to POKE a given bit "on" or "off" without disturbing other information in the byte. For example, suppose we wanted to POKE bit three (decimal value 8) in 38400 "on." We could do this by POKE 38400, 8 OR PEEK (38400). To turn bit three "off," POKE 38400, 247 AND PEEK (38400). 247 is the decimal value for a byte with all bits "on" except for bit three.

Setting Auxiliary Color

The fourth color available in multicolor mode is called auxiliary color, and is set by POKEing values into the upper four bits of memory location 36878. The lower four bits are used to set volume on the sound. There are 16 colors available, in the same order as the 16 screen colors. As with the screen colors, values POKEd into the upper four bits are multiples of 16.

For example, POKE 36878, 1 * 16 sets auxiliary color white; POKE 36878, 15 * 16 sets auxiliary color light yellow. These POKEs would also set sound volume to 0. If you wanted to set auxiliary color red at the same time as keeping volume at the maximum, 15, you could POKE 36878, 15 + 2 * 16, or, to leave the sound volume alone, use the Boolean operators: POKE 36878, 2 * 16 OR (PEEK (36878) AND 15).

Sampler – A Program To Find Interesting Characters

Given the above detail on multicolor mode, the first program listing, "Sampler," should be self-explanatory. Ten characters are displayed, with the middle eight in multicolor mode to show the range of character colors. The cursor keys can be used to look at the next or previous characters. Cursor down and cursor up act as "fast forward" and "fast reverse," respectively. Cursor right and cursor left can also be used to give a time delay (lines 70 and 90) in the display before changing characters.

After finding an interesting character, press F1 to explore the effects of the 128 different combinations of screen and border colors. The space bar allows a rapid perusal. F3 gives another dimension, again using the space bar (or "any key") to run through the 16 available auxiliary colors. To look at character set 2 (*Personal Computing on the VIC-20*, Appendix H, pp. 139-142), press the SHIFT and COMMODORE keys simultaneously.

Including reverse mode and both character sets, there are about 255 characters which can be modified through use of multicolor mode. With 8 border colors, 16 screen colors, 8 character colors and 16 auxiliary colors, the number of combinations for your selection is roughly 255 * 8 * 16 * 8 * 16 or about four *million* "new" characters to choose from!

UFO Pilot – A Game Demonstrating Multicolor Mode Graphics

Having progressed through the theory to empirical selection, it seems logical to come to the point of this article. "UFO Pilot" is a game demonstrating the use of multicolor mode to make "new" game graphic characters. The program uses about 2K RAM and the only expansion required is a $9 Atari joystick.

Character 88 (the club) is transformed to a multicolor UFO which you pilot using the joystick. The objective is to achieve the longest flight without running into your own trail of white dots or the warplane (character 62) that's in constant pursuit. A collision results in an explosion (character 42 taken through a series of character color changes in lines 9500-9510) and a return to the demonstration mode at the beginning of the program.

If you don't have anything better to do, you

VIC-20 w/8K & CBM-64

RAPIDWRITER

The Finest Word Processor *For VIC Computers*

From Mailing Labels To Manuscripts
Editing Freedom - Editing Speed
It Does It All

For VIC-1515/25 Serial or Parallel Printers
Rapidwriter Wordprocessing On Disk or Tape
Program w/manual and tutorial **$39.95**

NOW RAPIDWRITER PLUS!

Mail Merge, Acct'g & Communications
Complete The System

Everything You Need To Put Your VIC to Work
Incld. Disk Utilities **$79.95**

RAPIDWRITER
91 Long Hill Rd.
Leverett, MA 01054
413-549-3744

Rapidwriter (c) H.D. Mfg. Inc. 1982
All rights reserved

YOU DON'T HAVE TO BE A PIRATE *TO AFFORD* TOTL *SOFTWARE*

for the VIC 20* *and* COMMODORE 64*

WORD PROCESSING **$35.00**
Full capability word processing. Word-oriented—not a line editor. Menu-driven. Outstanding features including: footnotes, headings, footing, keyboard input, special printer control, and more. VIC: TOTL.TEXT 2.5 64: TOTL.TEXT 2.6

MAILING LIST and LABELS **$20.00**
Easy editing, automatically sorted, optional non-printing data line(s), browse and select functions. Menu-driven. VIC or 64: TOTL.LABEL 2.0

KEYWORD CROSS REFERENCE **$25.00**
Students and authors: keep track of reference notes and bibliographies. Quick reference by keyword. Requires printer. VIC or 64: RESEARCH ASSISTANT 2.0

TIME MANAGEMENT **$25.00**
Keep track of activities by date (and time). Screen inquiry by date, person, project. 56 different bar chart formats available. VIC or 64: TOTL TIME MANAGER 2.0

BUSINESS ACCOUNTING ***(To be announced)***
Accounts receivable and payable. Inventory and expense tracking. Print invoices, statements, reports. Disk only.

SPECIAL VERSIONS AVAILABLE for QUANTUM DATA INC.
40/80 COLUMN VIDEO BOARD.
All programs work with disk and/or tape; VIC or RS-232 printers. VIC requires minimum 8K expansion.

LOOK for TOTL Software at your Dealer or order direct—shipping included.

Send check or money order and be sure to specify machine. California residents add 6% sales tax.

TOTL software
P.O. Box 4742 • Walnut Creek, CA 94596

Call (415) 943-7877

*VIC 20 and COMMODORE 64 are trademarks of Commodore Business Machines.

CARDETTE LETS YOU USE YOUR OWN CASSETTE PLAYER/RECORDER WITH YOUR VIC-20®

With the new CARDETTE from Cardco, Inc. you can interface with any standard cassette player/recorder to save programs and load them with unerring ease into your VIC-20®.

No longer are you restricted to using only the VIC Datasette. Just add a CARDETTE and you can use the tape unit of YOUR choice.

The CARDETTE comes with all necessary cables and wires to complete the hook-up. There is nothing else to buy. All you need to supply is YOUR tape player/recorder and your tapes.

Price: Just $29.95.

COMPU SENSE

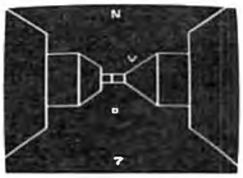
TO ORDER:
P. O. BOX 18765
WICHITA, KS 67218
(316) 684-4660
Personal checks accepted (Allow 3 weeks) or
C.O.D. (Add $2)
Handling charges $2.00

VIC-20® is a registered trademark of Commodore

VIC-20® COMMODORE

VICTORY SOFTWARE®

COMMODORE 64® *



TREASURES OF THE BAT CAVE $14.95
Explore the ancient caves filled with treasures and guarded by deadly vampire bats. The realistic 3-D display brings out your claustrophobia. Machine code for fast action: keyboard or joystick. Over 6x10^{23} different caves to explore!

LUDWIG'S LEMON LASERS $14.95
You'd never think blasting lemons out of the sky could be so much fun! Fast machine code action. One or two players. Written by the demented doctor who gave us "Hospital Adventure".

COSMIC DEBRIS $14.95
This highly addictive arcade type game will keep you battling the aliens for days.

***ONLY ADVENTURES ARE AVAILABLE FOR THE COMMODORE 64**

ADVENTURES*
The best adventures at the best prices! Controlled from the keyboard.

GRAVE ROBBERS* $14.95
Introducing the first GRAPHIC ADVENTURE ever available on the VIC-20! Explore an old deserted graveyard. Actually see the perils that lie beyond.

ADVENTURE PACK I*
(3 Programs) **$14.95**
MOON BASE ALPHA—Destroy the meteor that is racing towards your base.
COMPUTER ADVENTURE—Re-live the excitement of getting your first computer.
BIG BAD WOLF—Don't let the wolf gobble you up.

ADVENTURE PACK II*
(3 Programs) **$14.95**
AFRICAN ESCAPE—Find your way off the continent after surviving a plane crash.
HOSPITAL ADVENTURE—Written by a medical doctor. Don't check into this hospital!
BOMB THREAT—Get back to town in time to warn the bomb squad of the bomb.

ANNIHILATOR $19.95
Protect your planet against hostile aliens in this defender-like game. All machine code for fast arcade action. Joystick required.

KONGO KONG $19.95
Climb ladders; avoid barrels the crazy ape is rolling at you. Rescue the damsel. Partially machine code for smooth, fast action. Keyboard or joystick.

Send for free catalog
All programs fit in the standard VIC memory, and come on cassette tape.

Ordering—Please add $1.50 postage & handling per order. PA residents add 6% sales tax. Foreign orders must be drawn in U.S. funds or use credit card.
Credit card users—include number and expiration date.

VICTORY SOFTWARE CORP.
7 VALLEY BROOK ROAD
PAOLI, PA 19301
(215) 296-3787

can watch this display run through all the possible color combinations. The pause in midscreen in which the UFO "flashes its lights" is a demonstration of changing auxiliary colors (line 10). Otherwise, auxiliary color 0 (black) is used throughout the game – specified by POKE 36878, 15 (high volume). If the demonstration mode begins to wear on you and you want to concentrate on the game, change line 9530 to GOTO19.

Fortunately, the warplane erases dots to keep the screen less cluttered and to make higher scores possible. After a few months of high scores in the range of 200-400, my wife discovered a pattern giving the current high of 3411.

If you wish to save the time of typing and prevent possible typographical errors, I'd be glad to copy the programs on tape for you. Send $3, a blank tape, and a stamped, self-addressed mailer to:

Bud Banis
555 Concord Place
Bourbonnais, IL 60914

Program 1.

```
2 PRINT"{CLEAR}SAMPLER,SHOWS SOME     STANDA
   RD CHARACTERS    IN MULTICOLOR MODE.
4 PRINT:PRINT"USE THE CURSOR KEYS   TO CHANG
   E CHARACTERS, F1,F3 TO CHANGE COLORS
6 PRINT:PRINT"HIT A KEY"
8 GETC$:IFC$=""THEN8
10 N=0:GOTO130
20 GETC$:IFC$=CHR$(17)THEN80
30 IFC$=CHR$(29)THEN70
40 IFC$=CHR$(145)THEN100
50 IFC$=CHR$(157)THEN90
55 IFC$=CHR$(133)THEN400
57 IFC$=CHR$(134)THENGOSUB600
60 GOTO20
70 FORTT=1TO300:NEXT
80 N=N+1:IFN=256THEN10
85 GOTO130
90 FORTT=1TO300:NEXT
100 N=N-1:IFN=-1THEN10
110 GOTO130
130 PRINT"{CLEAR}":PRINT
140 FORI=2TO20STEP2
150 POKE7680+22+I,N
160 POKE38400+22+I,((I/2+6)AND15)
170 NEXT
180 PRINT:PRINT"CHARACTER NO.";N
190 PRINT:GOTO20
400 PS=8+16*INT(CC/8)+CS
410 POKE36879,PS:PRINT"{HOME}{05 DOWN}SCREEN C
    OLOR= {LEFT}";PS:PRINT"AUX COLOR=0
    "
420 GETC$:IFC$=""THEN420
430 IFC$=CHR$(134)THENGOSUB600
450 CC=CC+1:CS=CCAND7:IFPS=255THENPOKE36879,27
    :CC=0:CS=0:GOTO20
460 GOTO400
600 FORAN=0TO15
610 POKE36878,16*AN
650 PRINT"{HOME}{05 DOWN}SCREEN COLOR= {LEFT}"
    ;PS:PRINT"AUX COLOR=  {02 LEFT}";AN
660 GETC$:IFC$=""THEN660
670 NEXT:POKE36878,0
680 PRINT"{HOME}{06 DOWN}AUX COLOR=   {02
    LEFT}0"
690 GETC$:IFC$=""THEN690
700 RETURN
```

STOP PLAYING GAMES

NEW Commodore 64 & VIC-20

- Calculate odds on HORSE RACES with ANY COMPUTER using **BASIC**.
- SCIENTIFICALLY DERIVED SYSTEM really works, TV Station WLKY of Louisville, Kentucky used this sytem to predict the odds of the 1980 Kentucky Derby. See the Wall Street Journal (June 6, 1980) article on Horse-Handicapping. This system was written and used by computer experts and is now being made available to home computer owners. This method is based on storing data from a large number of races on a high speed, large scale computer. 23 factors taken from the "Daily Racing Form" were then analyzed by the computer to see how they influenced race results. From these 23 factors, ten were found to be the most vital in determining winners. NUMERICAL PROBABILITIES of each of these 10 factors were then computed and this forms the basis of this REVOLUTIONARY NEW PROGRAM
- SIMPLE TO USE: Obtain "Daily Racing Form" the day before the races and answer the 10 questions about each horse. Run the program and your computer will print out the odds for all horses in each race. COMPUTER POWER gives you the advantage!
- YOU GET: 1) Cassette.
  2) Listing of BASIC program for use with any computer.
  3) Instructions on how to get the needed data from the "Daily Racing Form"
  4) Tips on using the odds generated by the program.
  5) Sample form to simplify entering data for each race.

————————MAIL COUPON OR CALL TODAY————————

3G COMPANY, INC. DEPT. CO (503) 357-9889
RT. 3, BOX 28A, GASTON, OR 97119

Yes, I want to use my computer for FUN and PROFIT. Please send me ______ programs at **$24.95 each.** Circle the cassette you need: TRS-80, Color-80, Apple, PET/CBM, VIC-20, Commodore 64, or Sinclair Timex 1000

Enclosed is: ☐ check or money order ☐ MasterCard ☐ Visa

Card No. ______ Exp. date ______
NAME ______
ADDRESS ______
CITY ______ STATE ______ ZIP ______

START USING YOUR COMPUTER FOR
FUN and PROFIT!

VIC 20/PET/CBM OWNERS

ROADTOAD - Hop your toad across 5 lanes of traffic, avoid deadly snakes, and dodge the dreaded toad-eaters. Cross a raging river full of logs, turtles, alligators, and park your toad in the safety of a harbor. Each time you park 5 toads, you enter a tougher level where the action is faster and the toad-eaters are more numerous. ROADTOAD is written in machine language and uses high resolution graphics. The sound effects are excellent and you can use a joystick or the keyboard to control your toad.
CASS/5K/VIC 20 .... $15.00
(CALIF. RES. ADD 6% SALES TAX)

WALLBANGER - Blast your way through the dodge'm, blast'm, and attack modes. If you destroy the bouncing balls before they destroy you, the walls close in for the next round. WALLBANGER is written in machine language, has great sound, and encourages complex strategies.
CASS/5K/VIC 20/CBM 8032
CASS/8K/40 COL SCREEN/OLD-NEW ROMS/FAT FORTY $15.00
(CALIF RES. ADD 6% SALES TAX)

Write for FREE catalog:

NIBBLES & BITS, INC.
P.O. BOX 2044
ORCUTT, CA 93455

Using *your* computer
in an interesting
application?
Write it up for
other **COMPUTE!**
readers to use.

LUNA SOFTWARE

TWO HEADS ARE BETTER THAN ONE:

SPECIFIC SOFTWARE would like to borrow a moment of your time to introduce you to LUNA SOFTWARE.

Maximization of skills is what the merging of SPECIFIC SOFTWARE with LUNA is all about. We've decided to combine our talents and give you, the consumer, only the best in quality, service and price.

We are to the best of our knowledge the largest manufacturers of 64 software available and intend to remain that way.

Currently we have a multitude of software packages available for immediate delivery for both the VIC 20 and the Commodore 64.

Who knows where we'll be tomorrow. Our Research and Development Department never sleeps.

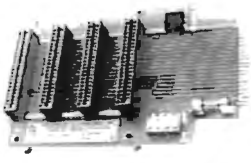
COMMODORE: Excellence in the industry.

LUNA: Eager to support that excellence through only the finest in both business and entertainment software.

Why settle for second best when you can shoot for the stars with

LUNA SOFTWARE

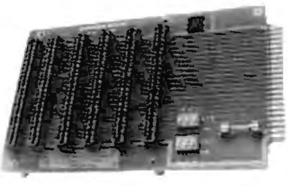
VIC-20 and CBM 64 EXPANDER BOARDS



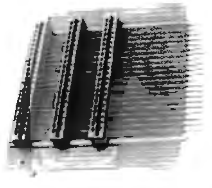
4 Slot 64 $69.95

PTI EXPANDERS OFFER:
- Thoughtful design
- Quality construction
- Excellent value

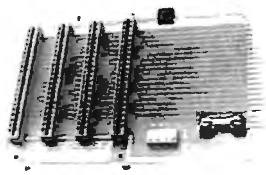
Write for complete information on these and our other products.



6 Slot VIC $79.95



3 Slot VIC $49.95



4 Slot VIC $69.95

3 Slot VIC $59.95

PRECISION TECHNOLOGY, INC.
COMPUTER PRODUCTS DIVISION
SALT LAKE CITY, UTAH 84115
(801) 487-6266
Mail address: P.O. Box 15454

See your dealer, or place your order direct
VISA - M/C - CHECK - COD

Apropos introduces RAMAX

The only RAM your VIC-20® will need

FEATURES

- A FULL 27K bytes. (Added to VICs 5K)
- Fully switchable in sections. (may be used with Super Expander and games, and other plug-ins
- Built in reset button.
- Fuse protected.
- Totally self contained
- 2 extension connectors for any device normally plugged into the expansion port
- Very low power useage
- High reliability, gold plated connectors

THIS SUPERB PLUG-IN GIVES YOUR VIC-20 REAL POWER AND EXPANDABILITY

FOR ONLY $165.00

6 month parts and labor warranty
WE SERVICE WHAT WE SELL

TO ORDER:

Send Check or Money Order For the Total, plus Shipping: $2.00 (Software) or $4.00 (Hardware), max $5.00. Calif. residents add 6% tax.

Phone orders: CALL (805)482-3604
For credit card orders, include all information on card.

VISA Foreign orders, add $8.00. All items shipped from stock. master charge

SOFTWARE

DR. FLOYD

Psychoanalysis by computer? - well, not quite, but Dr. Floyd will carry on a conversation with you using psychoanalytic techniques giving the appearance of artificial intelligence. Requires 16K or more. $12.95

WORD PLAY

Includes: "Jargon" - a jargon word generator. "Animal" - a fun game where the player teaches the computer about animals. "Story" - the computer writes stories using the players input names, places, etc. "Haiku" - the computer writes HAIKU like poetry. Requires 16K or more. $12.95

All software is on high quality cassettes and is replacement guaranteed.

VIC-20 is a registered trademark of Comodore Business Machines, Inc.

APROPOS TECHNOLOGY
Camarillo, CA 93010
350 N. Lantana Ave., Suite 821

COMPU SENSE

"CARD/?"
(CARD/PRINT)

UNIVERSAL CENTRONICS PARALLEL PRINTER INTERFACE FOR THE VIC-20®

Now you can use your VIC-20® with an EPSON MX-80 printer, or an OKIDATA printer, or a TANDY printer, or just about anybody's printer. And you don't have to give up the use of your user port (MODEM), or change to special printer commands, or load any special software driver programs to do it.

- Outputs standard ASCII codes to the printer.
- Plugs in the VIC-20® printer serial i/o port.
- Understands all standard VIC-20® print commands.
- No modification to your VIC-20®.
- No special programs required.
- Includes all necessary cables to hook up a standard printer using centronics parallel input.
- MADE IN THE U.S.A.

The "CARD/?" is a product of CARDCO, Inc

$79.95

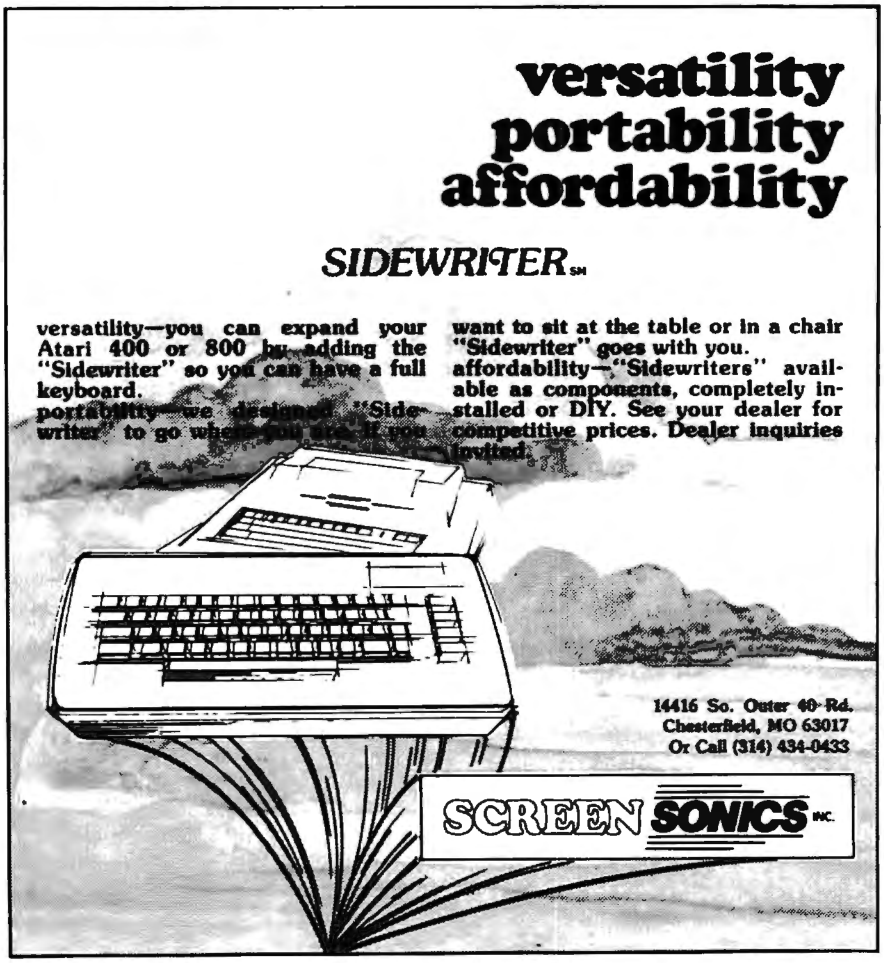
TO ORDER
P O BOX 18765
WICHITA, KS 67218
(316) 684-4660

VISA MasterCard

Personal checks accepted (Allow 3 weeks) or C.O.D (Add $2.00)
Handling charges $2.00
VIC-20® is a registered trademark of Commodore

Program 2.

```
1 SS=24:POKE36879,63:POKE36878,15:DIMJS(2,2)

2 PRINT"{CLEAR}":PRINTSPC(5):PRINT"**********
   ****":PRINTSPC(5)
3 PRINT"**{REV}UFO PILOT{OFF}**":PRINTSPC(5)
   "**************":PRINT"     *  7-28-82
     *"
4 PRINTSPC(5):PRINT"**************":PRINT"{DO
   DOWN}      BY BUD BANIS";SPC(8);"BOUR
   BONNAIS,ILL.
5 PRINT"{03 DOWN}  SET DIRECTION OF ":PRINT"
       SHIP WITH THE"
6 POKE37139,0:DD=37154:PA=37137:PB=37152:PRI
   NT"     JOYSTICK"
7 PRINT"{DOWN}  DON'T RUN INTO YOUR":PRINT" ~
      OWN TRAIL OR HIT"
8 PRINT"      THE WARPLANE.":PRINT"{02 DOWN} ~
      HIT FIRE TO START
9 FORAA=0TO21:POKE7812+AA,88:POKE38532+AA,9:
   GOSUB9000:IFFRTHEN19
10 IFAA=10THENFORTY=0TO15:POKE36878,15OR16*TY
   :POKE36874,244:FORM=1TO50:NEXT:NEXT
11 POKE36878,15
12 POKE36874,234+AA:POKE36874,0:POKE7812+AA,3
   2:NEXT:CS=SSAND7
13 FORAA=0TO21:POKE7701-AA,60:POKE38421-AA,9:
   POKE7878+AA,62
14 POKE38598+AA,9:GOSUB9000:IFFRTHEN19
15 POKE36874,215:FORTT=1TO40:NEXT:POKE36874,0
   :POKE36875,255-5*AA
16 FORTT=1TO10:NEXT:POKE36875,0:POKE7878+AA,3
   2:POKE7701-AA,32:NEXT
17 PS=8+16*INT(SS/8)+CS:POKE36879,PS:SS=SS+1:
   IFPS=255THENSS=0
18 GOTO9
19 FORI=0TO2:FORJ=0TO2:READJS(J,I):NEXTJ,I
20 FF=505:PRINT"{CLEAR}{REV}                 ~
                           "

22 XX=0:AD=0:GOSUB10000:IFSC>PHTHENPH=SC
24 POKE7680+FF,88:POKE38400+FF,9:GOSUB9000:IF
    JS(X+1,Y+1)=0THEN24
29 SC=0:YY=22:GOSUB10000
30 GOSUB9000:GOSUB8000:QQ=FF:XZ=ZX:ZX=XX+22*Y
    Y
31 PRINT"{HOME}{REV}                  ":PRINT"{
    HOME}{REV}   SCORE=";SC;"   "
32 IFJS(X+1,Y+1)THENAD=JS(X+1,Y+1):POKE36876,
    220
33 POKE36876,0
35 POKE7680+FF,46:POKE38400+FF,1
40 FF=FF+AD:IFFF<44THENFF=QQ:GOTO9500
42 IFPEEK(7680+FF)=62THEN9500
45 IFPEEK(7680+FF)=46THEN9500
46 POKE7680+FF,88:POKE38400+FF,9
47 IFFF=XZTHEN9500
50 IFFF>505THENFF=QQ:GOTO9500
55 BL=(255-INT(ABS(XX+22*YY-FF)/2)OR128)
56 POKE7680+XZ,32:IFPEEK(7680+ZX)=88THEN9500
58 POKE7680+ZX,62:POKE38400+ZX,9
59 POKE36874,BL:POKE36874,0
70 GOTO30
100 DATA-23,-22,-21,-1,0,1,21,22,23
8000 SC=SC+1:XX=XX+1:IFXX=22THENXX=0:YY=INT(FF/
    22)
8020 RETURN
9000 POKEDD,127:S3=-((PEEK(PB)AND128)=0):POKEDD
    ,255
9010 P=PEEK(PA):S1=-((PAND8)=0):S2=((PAND16)=0)
    :SO=((PAND4)=0)
9020 FR=-((PAND32)=0):X=S2+S3:Y=SO+S1:RETURN
9500 POKE36879,138:POKE36877,220:POKE7680+FF,42
    :FORZZ=1TO100
9510 POKE38400+FF,ZZAND15:POKE36878,INT(15-ZZ/7
    ):NEXT:POKE36877,0
9520 XX=0:RESTORE:POKE36879,57:POKE36878,15
9530 GOTO2
10000 PRINT"{HOME}{REV}                  ":PRINT"{
    HOME}{REV}   SCORE=";SC;"   "
10010 PRINT"{HOME}{DOWN}{REV}PREVIOUS HIGH=";PH:
    RETURN
```



If you deal with computers, then Microtek has something for you. Microtek is the time-proven industry standard second source manufacturer for microcomputer peripherals. We offer an unparalled selection of hardware and software support for your every need.

Microtek Computer Products for Apple and Franklin Computers.

DUMPLING-GX

Hi-Resolution Graphics Parallel Printer Interface Card with graphics features.

DUMPLING-64

64K Spooler Buffer for Text, Block and Dot Addressable Graphics.

Both **DUMPLINGS** have Rotation, Inversion, Emphasized Mode, Dual Page Dump and a myriad of graphics manipulation routines. The **DUMPLING-64** includes Space Compression, Pause immediate, Pause delayed, Insert Editing for text and more than 2 dozen control codes for text and graphics storage and output.

One version of each **DUMPLING** works with most major graphics printers!

BAM-16MM	16K Memory Card with MMS (includes MOVE-DOS).
MAGNUM-80	80 column Video Board
Q-DISC	Self-contained 128K Disc Emulation. Firmware for Self-Test, DOS facilities and supplied with Visicalc Expansion Software.
RAINBOW-256	RGB Driver with 256 colors.
RV-611C	7 or 8 Bit Parallel Interface Card.
BAM-128	64K or 128K Memory supplied with Visicalc Expansion Software.

The IBM P.C.

HAL-64, 128, 192, 256 Memory Expansion with and without Parity.

The **HAL** Parallel Printer Cable.

Disc emulation and Printer Spooler Software for the **HAL** series or ANY IBM compatible memory card.

Atari 400 & 800 Computers

AMB-16	16K Memory Card.
AMB-32A	32K Slot Independent Memory Card.
ATC-P	Parallel Printer Cable.
ATC-S	Serial or Modem Cable.

Commodore Products for the VIC-20

VIM-16	16K Memory Expansion Module.
VIM-8	8K Memory Expansion Module.
VIM-0	EPROM/RAM User Definable Module.

Miscellaneous

SCAMP SERIES—RS-232C Serial Interface Cables.

All Microtek products carry a 2 Year Warranty.

Micro Spooler III & IV—Stand-alone printer spoolers with serial/parallel conversion and 256K memory.

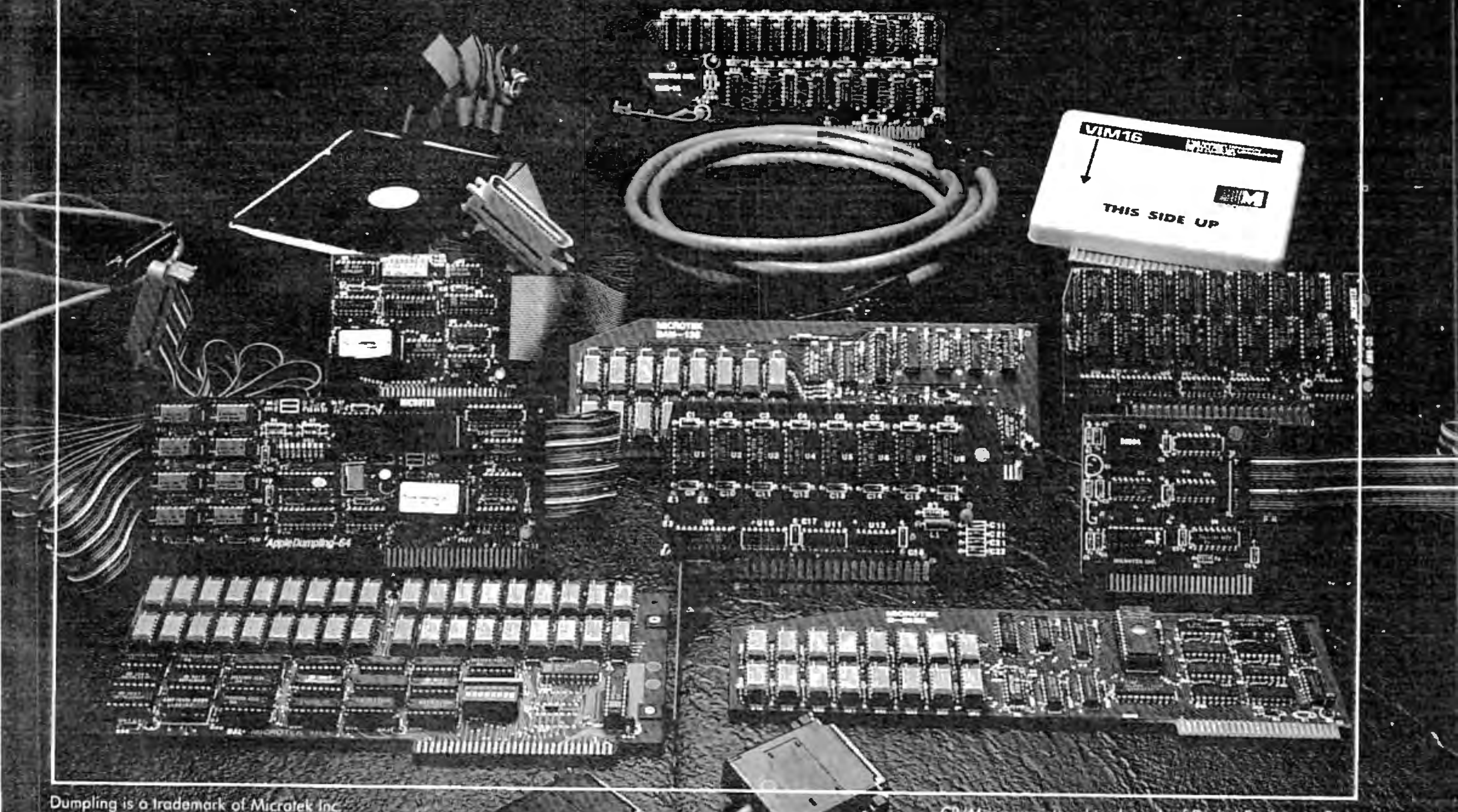
MICROTEK inc.

9514 Chesapeake Drive
San Diego, CA 92123
(619) 569-0900

Toll Free Outside CA
(800) 854-1081
TWX. 910-335-1269

©Microtek, 1982

Microtek is The Source!



Dumpling is a trademark of Microtek Inc.
Apple is a registered trademark of Apple Computer Inc.

CP/M is a registered trademark of Digital Equipment Corp.
Visi-Calc is a registered trademark of Visi-Corp.

TELECOMMUNICATIONS

Michael Day

Part I:
Communication Errors

Success in transmitting information reliably can depend on the error-checking scheme being used. This is the first of a two-part column which surveys all of the major error-detection methods.

The world of telecommmunications is fraught with danger. Computer data is a very precise form of information that is intolerant of any form of distortion. The computer handles the problem internally by using a form of redundancy that provides for an error potential low enough to be ignored. The environment inside the computer can be controlled, and the data can be actively maintained. The environment outside the computer is much different.

Since little can be done to control the communications environment outside the computer, errors in the transferred data are of much greater concern.

Transmitted data can be distorted in a number of different ways, and the resulting types of errors need to be considered.

Parity Checking

One of these errors is the parity error. A parity error indicates that some portion of the transmitted data is incorrect, but does not say what the error is. The most common parity error check is Vertical Redundancy Checking (VRC). When a character is transmitted, it is sent as a series of on/off bits. When data is transmitted asynchronously, even parity is normally used if VRC is implemented. In even parity, an additional bit is added to the end of each character that is transmitted. If there are an odd number of ON bits in the character, the additional bit is turned ON to make the number of ON bits an even number. If the number of ON data bits is already an even number, then the additional bit will be OFF in order to keep an even number of ON bits.

When data is transmitted synchronously, odd parity is normally used. Odd parity works on the same principle as even parity: the difference is that an odd number of ON bits is desired. Odd parity is used for synchronous transmission to insure that at least one bit in the transmitted character is on, since this helps maintain synchronization in the older modems. (If all the bits of the character were OFF, there would be zero ON bits, an even number. The parity bit would have to be turned ON to make the total count odd.)

Another form of parity checking is the Horizontal Redundancy Check (HRC), sometimes referred to as block parity. HRC is similar to VRC, but, instead of checking vertically through the character, HRC performs a horizontal check through all the characters. Instead of adding up all of the bits on a single character, block parity adds up all of the "1" bits in bit position one of all the transmitted characters. The resulting parity bit forms bit one of the block parity character. (The block parity character is also referred to as the Block Check Character – BCC.) This procedure is repeated for all the bits of the transmitted characters. This form of parity is often implemented along with VRC to obtain a reasonably reliable method of error detection; the two forms complement each other, since each checks for error conditions that the other one ignores.

Spiral Redundancy Check (SRC), a modification of the HRC, adds together successively lower bits of successive characters to form the parity bits. That is, bit one of character one is added to bit two of character two, and so on. Although the SRC is more difficult to implement than the HRC, it more evenly distributes the parity testing throughout the data.

Improved Detection

Interleaving is not a form of parity, but it is a type of transmission used to increase error detection. In interleaving, a group of characters is re-formed: a new character is formed from the one bits of the characters, another one from all of the two bits, and so on until the entire group has been re-formed. Normally used with VRC, this method often includes HRC as well.

Two major types of errors in telecommunications are line hits and noise bursts. A line hit disrupts only a single bit or two, but a noise burst disrupts large groups of bits. HRC and VRC can usually detect errors caused by line hits (the most common type of error) but often have difficulty with errors caused by noise bursts.

SRC increases error detection by spreading out the parity checking to cover a wider area of the transmitted data. Transmitted data tends to have rather consistent patterns. Unfortunately, communication errors also tend to occur in patterns. If the two patterns match, the error can often go undetected. Interleaving attempts to decrease undetected errors by purposely randomizing the transmitted data to reduce possible patterns.

VRC, HRC, SRC, and interleaving came to be used as means of error detection because they are easily performed in the hardware that actually does the transmission. The error detectors and parity generators were simply added to existing transmitters and receivers. Because SRC and interleaving are more difficult to do, they are not as common as VRC and HRC.

The HRC implementation is now often not found in the hardware, since the function can be easily done in software. The VRC, however, is very easy to do in hardware but somewhat more difficult in software. As a result, VRC is often provided in the hardware, generally a UART (Universal Asynchronous Receiver Transmitter), which converts the characters into the serial (or bit by bit) form needed for transmission over the telephone network or other communications system.

While the VRC can detect about 90% of the errors encountered, it is often desirable to be able to detect a greater percentage of the errors. This can be done by adding one of the previously mentioned error detection schemes, or some other type of error detection.

Echoplexing Problems

A very popular form of error detection is *echoplexing* (sometimes incorrectly referred to as full duplex). This form of error detection works by having each transmitted character returned to the transmitter by the receiving computer. This allows 100% error checking since each character is returned to the transmitter for verification. There are many disadvantages to this method, however.

First, it can generally be implemented in only one direction: the transmitter can detect any errors in transition, but the receiving computer has no way of insuring that the data it has transmitted is correct. Another problem is that it is a slow procedure – each character must be transmitted, received, processed, retransmitted, received by the originator, and checked for correctness.

Therefore, the actual transmission time (the processing time involved at each end) is reduced by more than one half the physical speed. If a human is at the transmitter end, we can improve things a bit. The human can check for errors and thereby decrease the amount of processing the computer has to do. (We also gain the superior detection abilities of the human.)

The main problem, as stated before, is that we can implement the echoplexing in only one direction. Another problem is that human error detection relies on the ability to detect pattern errors, rather than specific, individual types of errors. Consequently, if we intend to send computer data which is essentially random in nature, we cannot use the detection capabilities of the human and must implement some other form of error detection.

Although one or several of the previously mentioned error detection schemes could be implemented, they are generally not easy to do in software. It is also undesirable to add more hardware to the system to perform the error detection; in many cases, adding hardware is not possible.

Checksum

Since it is desirable to perform error detection in software, a different form of error detection more suitable to software implementation needs to be considered. A very common software-generated error checking routine is the checksum, a form of HRC that can be easily implemented in software. It is simply a sum without carry of all of the characters transmitted. The second character is added to the first character, the third character is added to the resulting sum, the fourth character is added to that sum, and so on. After all the data have been transmitted, the final sum is transmitted. The receiving computer checks the transmitted sum against the sum that *it* added up. If the two sums do not match, there is an error in the transmitted data. Using the checksum along with the VRC results in detection of approximately 99% of all errors.

An error detection rate of 99% in text is in general quite acceptable. Only about one error in every million characters transmitted over the telephone will get through undetected (about one error every 10 hours at 300 baud). For text this is an acceptable error rate; there will generally be far more errors than that embedded in the text to begin with. **C**

Comets

Chris Williams

For Applesoft on a 48K Apple II, this simulation of a comet's motion in high-res allows you to alter several variables. You can even send the comet into deep space.

In this article we'll be concentrating on comets. Comets have a couple of characteristics that make them well-suited to illustrate several concepts embedded in the program.

The first of these is their long periods; you have plenty of time to see what's going on. Comets can take hundreds of years to complete one orbit. Fortunately, we won't have to wait that long.

Second, they have highly elliptical orbits. Large variances in the comet's distance from the star are a visual plus.

The program makes use of both these traits to demonstrate idiosyncrasies of cometary motion. It is written in Applesoft to run on an Apple II+ (48K). The Apple, of course, uses a BASIC interpreter. If areas of code (especially in the main execution loop) look strangely written, it's because the program was designed for speed. REM statements are also placed with speed in mind.

Newton's Laws

The program, unlike most celestial simulations, does not directly use Kepler's laws. Instead, Newton's gravity equations are applied in two dimensions to drive the movements of a high-res dot which represents the comet.

A delta time interval (DT) of 120 days is used to get things done in a reasonable amount of time. Having a 120 day DT has some interesting ramifications. But we'll touch on that later.

Operation of the program is straightforward. It opens with a brief introduction, and then gives some suggestions for input parameters that will produce a stable, visually pleasing orbit. After the last input parameter is entered, execution begins.

The screen goes into high-res, a sprinkling of stars appears to set the mood, and the update loop starts. A clicking sound with distance-dependent pitch is also produced, again merely for effect.

The values used for constants and variables are not arbitrary. All numbers in the program – those the user inputs and those displayed at the bottom of the screen – have meaning. The mass of the central bright star (cross) is equal to the sun's in all calculations. The comet's mass is a plausible 1000 kgs. The screen scaling is such that its edge represents a radius just outside Pluto's orbit.

One last point of interest. If you input the following parameters:

DX=5555
DY=0
VX=0
VY=1

you'll see some strange behavior. The comet will curve inbound, pass very close to the star, and then whip right off the screen.

You Can Lose The Comet

This can be traced back to the 120 day DT value mentioned previously. As the comet gets in close to the star, its velocity increases tremendously. As a result, there are passes through the execution loop in which a very large velocity is applied over 120 days. This yields a relatively large distance traveled from the star at the completion of that pass.

Gravity is an inverse-square relationship. With a large distance *and* a high velocity, there is not sufficient attractive force to keep the comet in orbit.

This doesn't happen in nature. It is simply a peculiar effect of large DTs in numerical integration. There are many cures, but I chose to leave it alone, as a demonstration.

Try it out and experiment. I've found some unusual input combinations that seem to be on the threshold of the above problem. They result in a semi-spiral until the comet gets too close to the star and streaks out of the system.

This doesn't happen in nature either. It's just another illustration of the need for care when creating an accurate simulation.

```
10  REM  *** COMETS ***
11  REM  BY CHRIS WILLIAMS
13  REM  **************
20  ONERR  GOTO 370
30  HOME
35  REM  GO TO INTRODUCTION SUBRO
     UTINE
40  GOSUB 350
45  REM  ENTER INPUT PARAMETERS
47  REM  AND SET UP THEIR UNITS
```

```
50  INPUT "ENTER DX(X 10^6 KM)";D
     X: PRINT
60 DX = DX * 10 ^ 9
70  INPUT "ENTER DY(X 10^6.KM)";D
     Y: PRINT
80 DY = DY * 10 ^ 9
90  INPUT "ENTER VX(KPS)";VX: PRINT
100 VX = VX * 10 ^ 3
110  INPUT "ENTER VY(KPS)";VY: PRINT
120 VY = VY * 10 ^ 3: HGR
125  REM  PLOT THE CENTRAL STAR A
     S A +
130  HCOLOR= 3: HPLOT 140,80: HPLOT
     141,80: HPLOT 140,81: HPLOT
     139,80: HPLOT 140,79
135  REM  NOW SPRINKLE STARS FOR
     MOOD
140  FOR RD = 1 TO 100:X =  RND (
     1) * 279:Y =  RND (1) * 159:
      HPLOT X,Y: NEXT
145  REM  SET GRAV. EQN. CONSTANTS
146  REM  AND DT=120 DAYS, ALSO
147  REM  HI RES SCALING
150 MS = 329390 * 5.98 * 10 ^ 24:
     G = 6.67 * 10 ^ ( - 11):DT =
     120 * 3600 * 24:SXCALE = 279
      / (2 * (5900 * 10 ^ 9)):SYC
     ALE = 159 / (2 * (5900 * 10 ^
     9))
155  REM  PLACE VARIABLE LABELS
156  REM  AT BOTTOM OF PAGE
160  VTAB 22: HTAB 25: PRINT "VX=
     ": VTAB 23: HTAB 25: PRINT "
     VY="
170  VTAB 22:: PRINT "DX=": VTAB
     23:: PRINT "DY=   "
175  REM  CM IS COMET MASS IN KGS.
177  REM  CR IS SCREEN SIZE IN ME
     TERS
179  REM  OTHER CONSTANTS FOR SPE
     ED
180 CM = 1000:CR = 5900 * 10 ^ 9:
     ZERO = 0:THREE = 3:T2 = 22:T
     3 = 23:FR = 4:T8 = 28:RE = 1
     .49 * 10 ^ 11:TLL = 9 * 10 ^
     11
185  REM  LOOP STARTS AT 190
186  REM  NO COMMENTS WITHIN
187  REM  FOR SPEED
190 SS = (DX * DX) + (DY * DY):SQ
      =  SQR (SS)
200 F = CM * MS * G / SS
210 AX =  - F * (DX / SQ) / CM
220 AY =  - F * (DY / SQ) / CM
230 VX = VX + (AX * DT)
240 VY = VY + (AY * DT)
250 DX = DX + (VX * DT)
260 DY = DY + (VY * DT)
270  VTAB T2: HTAB FR: PRINT DX;"
      ": VTAB T2: HTAB T8: PRINT
     VX: VTAB T3: HTAB FR: PRINT
     DY;"  "
280  VTAB T3: HTAB T8: PRINT VY
290  HCOLOR= ZERO: HPLOT XNU,YNU
300 XNU = (DX + CR) * SXCALE
310 YNU = (DY + CR) * SYCALE
320  HCOLOR= TH: HPLOT XNU,YNU
325  GOSUB 700
330  GOTO 190
340  STOP
342  REM  GOSUB 700 AT 325
343  REM  IS "CLICK" ROUTINE
350  HTAB 17: PRINT "COMETS": PRINT
     : PRINT "   THIS PROGRAM IS
     A SIMULATION OF THE": PRINT
     : PRINT "ORBITAL TRAJECTORIES
      CHARACTERISTIC OF": PRINT :
      PRINT "COMETS."
352  PRINT : PRINT "SUGGESTED INP
     UTS:DX=5555,DY=0,VX=0,VY=3":
      PRINT : PRINT
355  REM  360 CONTAINS ASSMBLY
356  REM  LOAD OF CLICK ROUTINE
360  PRINT : PRINT "HIT ANY KEY W
     HEN READY": GET A$: HOME : PRINT
     : PRINT : FOR DP = 771 TO 78
     9: READ DA: POKE DP,DA: NEXT
     : RETURN
365  DATA  173,48,192,136,208,4,1
     98,1,240,8,202,208,246,166,0
     ,76,3,3,96
368  REM  370 IS WHERE YOU GO WHEN
369  REM  ERROR FROM OFF SCREEN
370  HOME : TEXT : FOR YY = 1 TO
     10: PRINT  CHR$ (7): NEXT YY
     : HOME :: PRINT : PRINT "OKA
     Y, PAL.  ONE OF THREE THINGS
      JUST": PRINT : PRINT "HAPPE
     NED.": PRINT
380  PRINT "EITHER YOUR INITIAL V
     ELOCITIES": PRINT : PRINT "W
     ERE TOO LARGE OR YOU PASSED
     TOO": PRINT : PRINT "CLOSE T
     O THE STAR.  PASSING TO CLOS
     E": PRINT : PRINT "TO THE ST
     AR CAUSES PROBLEMS WITH A": PRINT
     : PRINT "120 DAY LOOP INTERV
     AL."
390  PRINT : PRINT "OR PERHAPS YO
     U JUST MESSED UP.": PRINT : PRINT
     "IN ANY CASE, TRY AGAIN.": END
700  POKE 1,3: POKE ZE,(T8 * SQ /
     CR) + FR: CALL 771: RETURN
```

©

FORTH PAGE

A FORTH/BASIC Benchmark Test

Michael F Heidt

This article has a twofold purpose. First, it makes a timing comparison between FORTH and BASIC by comparing runtimes for a benchmark program. Second, it demonstrates FORTH's extensibility by the implementation of a simple integer array.

Benchmarks are frequently used in acceptance testing mainframe computers. The BASIC Benchmarks used by Rugg and Feldman (*Kilobaud*, June 1977) became so popular that they were frequently used in advertising implementations of BASIC. Benchmark 7 from the *Kilobaud* article (Program 1) is the most comprehensive and was chosen for this comparison.

A quick look will show you that the program doesn't actually do much. The variable K is used as a loop counter. M is a simple array into which the values calculated in line 510 are to be stored. The subroutine at line 820 doesn't do anything. The object here is to measure the overhead required by calling a subroutine. The print statements at lines 300 and 700 allow you to start and stop a stopwatch to time the benchmark. Program 2 is the FORTH equivalent of Program 1 (the BASIC program).

The Results

BASIC	FORTH
27.43	13.58

Benchmark 7 results (seconds)

The above figures show the speed comparisons for the two versions of Benchmark 7. The measurements were made on an OSI C4-P running a 6502 processor at two megahertz. Each benchmark was run ten times and the results then averaged. This was done to average out variations in reaction time in starting and stopping the stopwatch.

As you can see from the table, the FORTH version is twice as fast as the BASIC version. The FORTH version could be made even faster by leaving out error checking, an option not available in BASIC.

It should be noticed that the FORTH version does not have a GOTO statement. FORTH has no GOTO. The structure of the FORTH program is "bottom up." This means that the most primitive sections are built first, then the next level uses the primitives and so on until the desired functions are built. However, it is possible to do "top down" programming in FORTH.

In fact, this is really how it should be done. For example, I essentially wrote the word B7 first, then added the more primitive routines. By doing it this way, you know what primitives to write, what variables will be needed, and you get some idea of just how big the job is going to be.

If you're not familiar with FORTH, the program presented here may appear complicated compared to the BASIC version. However, you should keep in mind that in addition to creating the benchmark, I have extended FORTH here to include a general integer array capability that can be used by other programs.

Program 1.

```
10 REM BENCHMARK 7,
   Kilobaud #6 p66
300 PRINT"START"
400 K=0
430 DIM M(5)
500 K=K+1
510 A=K/2*3+4-5
520 GOSUB820
530 FOR L=1 TO 5
535 M(L)=A
540 NEXT L
600 IF K<1000 THEN
     500
700 PRINT"END"
800 END
820 RETURN
```

Program 2.

```
SCR # 96
( BENCHMARK 7  WITH INTEGER ARRAYS                 MFH 1/11/81)
FORTH DEFINITIONS DECIMAL
: DIM <BUILDS DUP , 2 * 2 + ALLOT DOES> ;
: RANGE DUP ROT DUP ROT @ > ;
; READ RANGE IF ." RANGE ERROR " CR DROP @ (LEAVES MAX DIM
  IF ERROR )      ELSE 2 * + 2 + @ ENDIF ;
( READ WANTS ELEMENT NAME, E.G. E M READ - LEAVES CONTENTS )
: ADD RANGE IF ." RANGE ERROR" CR DROP DROP ELSE 2 * 2
 + + ! ENDIF ; ( WANTS VALUE ELEMENT NAME )
  0 VARIABLE K 0 VARIABLE A
: START ." START " ; : STOP ." END " CR CR ; : GOSUB ;
5 DIM M ( CREATE ARRAY M WITH 5 ELEMENTS )
: K+ K @ 1 + DUP K ! ; ( INCREMENT VARIABLE K BY ONE )
: B7 START 0 K ! BEGIN K+ DUP 2 / 3 * 4 + 5 - A ! GOSUB
        6 1 DO A @ I M ADD LOOP 1000 = UNTIL STOP ;
;S
```

The Commodore™ Gazette

The Monthly User's Guide for VIC-20™ and 64™ Personal Computers

The Commodore™ Gazette, a monthly publication of **COMPUTE!** Publications, is a layman's guide to consumer computing. Written for beginning and intermediate level owners and users of the Commodore VIC-20 and 64 computers. Regular features include best seller lists for recreational and educational software, reviews, new products, tutorials on home and educational applications, and much more. Written for entertainment as well as teaching, *The Commodore™ Gazette*, while appealing to users wishing to learn more about programming and computers, has continuing appeal for those who simply want to obtain maximum use from their computers in a non-technical way.

The Commodore™ Gazette premières with a May 1983 issue of an estimated 128 pages. The paid circulation monthly will have a first issue estimated press run of 75,000 copies. Cover price: $2. Annual subscription: $15.

To subscribe to *The Commodore™ Gazette*, call TOLL FREE 800-334-0868 (in NC or outside the US, call 919-275-9809), or write to: *The Commodore™ Gazette*, P.O. Box 5406, Greensboro, NC 27403, USA.

Other than as an independent supplier of quality products regarding the Commodore personal computer systems, **COMPUTE!** Publications is in no way associated with Commodore Business Machines, Inc.

Commodore, VIC-20, and Commodore 64 are trademarks of Commodore Business Machines, Inc., and/or Commodore Electronics Limited.

Spring releases from COMPUTE! Books.

January

COMPUTE!'s First Book Of Atari Graphics, $12.95.

Mapping The Atari, $14.95. A Definitive Reference Manual and Resource Book on Atari BASIC.

February

Home Energy Applications, $14.95. Complete, ready-to-use programs for home energy conservation. Versions for VIC, Atari, Apple, TI-99/4A, PET/CBM, Radio Shack Color Computer, OSI, and Commodore 64.

March & April

Machine Language For Beginners, $12.95. By Richard Mansfield. For Atari, PET/CBM, Apple, Commodore 64, and VIC.

Programmer's Reference Guide For The TI-99/4A, $12.95. A tutorial sourcebook with sample programs for beginning, intermediate, and advanced TI-99/4A users.

COMPUTE!'s First Book of VIC Games, $12.95.

COMPUTE!'s First Book of Atari Games, $12.95.

For more information, or to order **COMPUTE! Books** call toll free: **800-334-0868** (in NC or outside the US, call **919-275-9809**).

COMPUTE! Subscriber Services

Please help us serve you better. If you need to contact us for any of the reasons listed below, write to us at:

COMPUTE! Magazine
P.O. Box 5406
Greensboro, NC 27403

or call the Toll Free number listed below.

Change Of Address. Please allow us 6-8 weeks to effect the change; send your current mailing label along with your new address.

Renewal. Should you wish to renew your **COMPUTE!** subscription before we remind you to, send your current mailing label with payment or charge number or call the Toll Free number listed below.

New Subscription. A one year (12 month) US subscription to **COMPUTE!** is $20 (2 years, $36; 3 years, $54. For subscription rates outside the US, see staff page). Send us your name and address or call the Toll Free number listed below.

Delivery Problems. If you receive duplicate issues of **COMPUTE!**, if you experience late delivery or if you have problems with your subscription, please call the Toll Free number listed below.

COMPUTE!
800-334-0868
In NC 919-275-9809

CAPUTE!

Modifications Or Corrections To Previous Articles

Commodore 64 Sprite Editor

In the program from the December 1982 issue, (p. 212), the following changes should be made:

```
LINE 74 - {F2} SHOULD BE {F3}
LINE 75 - {F3} SHOULD BE {F5}
LINE 76 - {F4} SHOULD BE {F7}
```

Also, the following modifications allow the menu to reflect changes in the sprite color options:

```
23 PRINT"1  MC 0-"A$(PEEK(V+37) AND 15)
24 PRINT"2  SC  -"A$(PEEK(V+41) AND 15)
25 PRINT"3  MC 1-"A$(PEEK(V+38) AND 15)
```

Atari TAG

Our thanks to reader Paul Havey who uncovered a bug which causes unpleasant results in the Atari version of TAG (October 1982, p. 76). Line 1090 should read as follows:

```
1090 DATA 26,208,142,9,212,162
```

VIC Pixelator

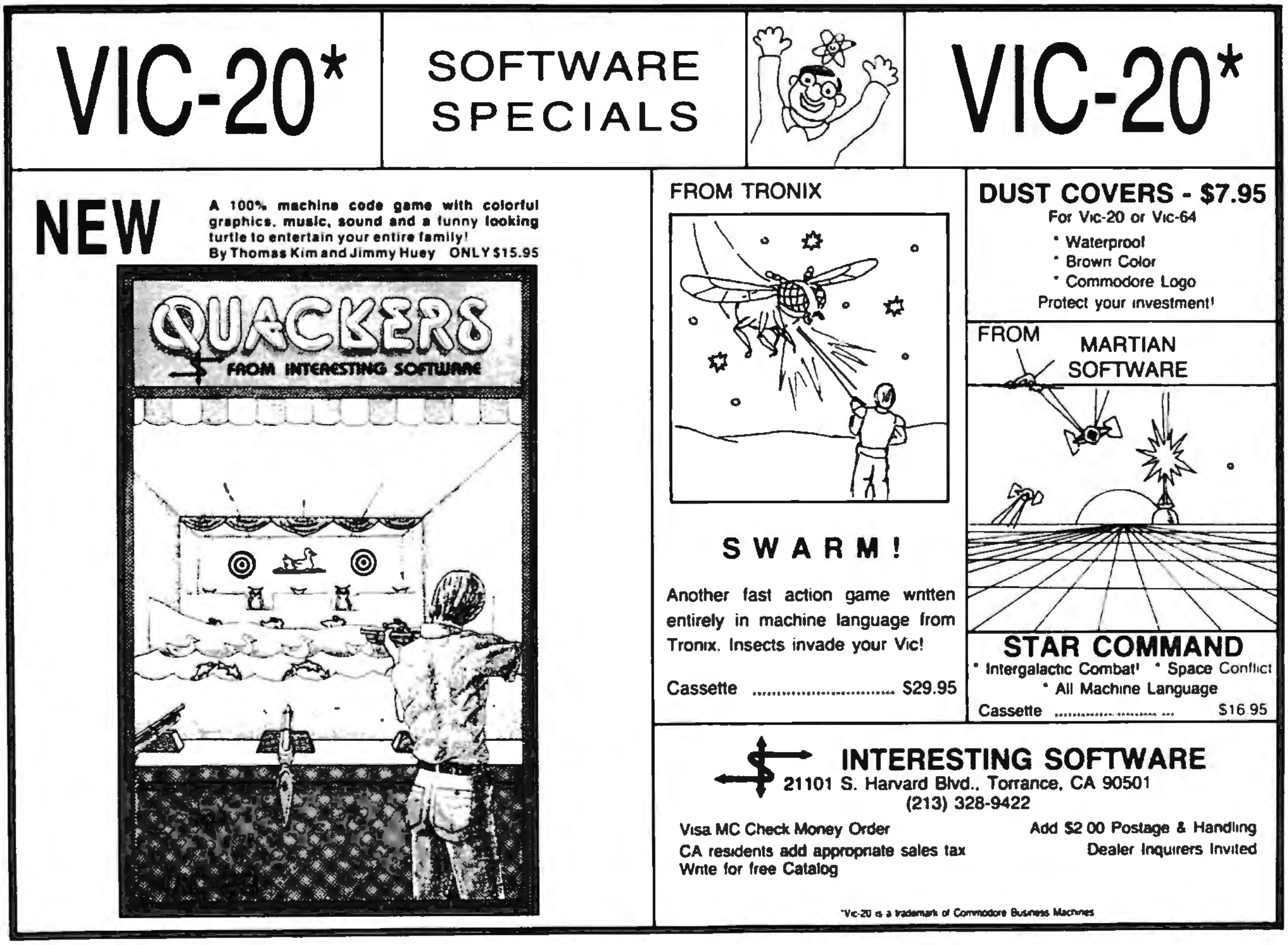
In Program 1 (October 1982, p. 144) the following changes should be made:

```
LINE 140 - {F2} SHOULD BE {F3}
LINE 500 - {F2} SHOULD BE {F3}
LINE 510 - {F3} SHOULD BE {F5}
LINE 520 - {F4} SHOULD BE {F7}
```

Also, author James Calloway notes that, in addition to the modifications noted last month in Capute!, the following changes permit the program to run on a VIC with an 8K expander added:

```
3570 IF S2>1 THEN POKE 36869,PEEK(36869) AND NO
     T 15 OR 2:GOTO 160
3580 POKE 36869,PEEK(36869) AND NOT 15:GOTO 160
```

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in **COMPUTE!** *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on this page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* **COMPUTE!**, *please send them to Ask The Readers, P.O. Box 5406, Greensboro, NC 27403.*



COMPUTE! Back Issues

Here are some of the applications, tutorials, and games from available back issues of **COMPUTE!**. Each issue contains much, much more than there's space here to list, but here are some highlights:

February 1981: Simulating PRINT USING, Using the Atari as a Terminal for Telecommunications, Attach a Printer to the Atari, Double Density Graphing on C1P, Commodore Disk Systems, PET Crash Prevention, A 25¢ Apple II Clock.

May 1981: Named GOSUB/GOTO in Applesoft, Generating Lower Case Text on Apple II, Copy Atari Screens to the Printer, Disk Directory Printer for Atari, Realtime Clock on Atari, PET BASIC Delete Utility, PET Calculated Bar Graphs, Running 40 Column Programs on a CBM 8032.

June 1981: Computer Using Educators (CUE) on Software Pricing, Apple II Hires Character Generator, Ever- expanding Apple Power, Color Burst for Atari, Mixing Atari Graphics Modes 0 and 8, Relocating PET BASIC Programs, An Assembler In BASIC for PET, QuadraPET: Multitasking?

July 1981: Home Heating and Cooling, Animating Integer BASIC Lores Graphics, The Apple Hires Shape Writer, Adding a Voice Track to Atari Programs, Machine Language Atari Joystick Driver, Four Screen Utilities for the PET, Saving Machine Language Programs on PET Tape Headers, Commodore ROM Systems, The Voracious Butterfly on OSI.

August 1981: Minimize Code and Maximize Speed, Apple Disk Motor Control, A Cassette Tape Monitor for the Apple, Easy Reading of the Atari Joystick, Blockade Game for the Atari, Atari Sound Utility, The CBM "Fat 40," Keyword for PET, CBM/PET Loading, Chaining, and Overlaying.

October 1981: Automatic DATA Statements for CBM and Atari, VIC News, Undeletable Lines on Apple, PET, VIC, Budgeting on the Apple, Switching Cleanly from Text to Graphics on Apple, Atari Cassette Boot-tapes, Atari Variable Name Utility, Atari Program Library, Train your PET to Run VIC Programs, Interface a BSR Remote Control System to PET, A General Purpose BCD to Binary Routine, Converting to Fat-40 PET.

December 1981: Saving Fuel $$ (Multiple Computers: versions for Apple, PET, and Atari), Unscramble Game (multiple computers), Maze Generator (multiple computers), Animating Applesoft Graphics, A Simple Printer Interface for the Apple II, A Simple Atari Wordprocessor, Adding High Speed Vertical Positioning to Atari P/M Graphics, OSI Supercursor, A Look At SuperPET, Supermon for PET/CBM, PET Mine Maze Game.

January 1982: Invest (multiple computers), Developing a Business Algorithm (multiple computers), Apple Addresses, Lowercase with Unmodified Apple, Cryptogram Game for Atari, Superfont: Design Special Character Sets on Atari, PET Repairs for the Amateur, Micromon for PET, Self-modifying Programs in PET BASIC, Tinymon: a VIC Monitor, Vic Color Tips, VIC Memory Map, ZAP: A VIC Game.

February 1982: Insurance Inventory (multiple computers), Musical Transposition (multiple computers), Multitasking Emulator (multiple computers), Disassemble Apple Programs from BASIC, Plotting Polar Graphs on Apple, Atari P/M Graphics Made Easy, Atari PILOT, Put A Rainbow in your Atari, Marquee for PET, PET Disk Disassembler, VIC Paddles and Keyboard, VIC Timekeeping.

March 1982: Word Hunt Game (multiple computers), Infinite Precision Multiply (multiple computers), Atari Concentration Game, VIC Starfight Game, CBM BASIC 4.0 To Upgrade Conversion Kit, Apple Addresses, VIC Maps, EPROM Reliability, Atari Ghost Programming, Atari Machine Language Sort, Random Music Composition on PET, Comment Your Apple II Catalog.

April 1982: Track Down Those Memory Bugs (multiple computers), Shooting Stars Game (multiple computers), Intelligent Input Subroutines (multiple computers), Ultracube for Atari, Customizing Apple's Copy Program, Using PET/CBM In The High School Physics Lab, Grading Exams on a Microcomputer (multiple computers), Atari Mailing List, Renumber VIC Programs The Easy Way, Browsing the VIC Chip, Disk Checkout for PET/CBM.

May 1982: VIC Meteor Maze Game, Atari Disk Drive Speed Check, Modifying Apple's Floating Point BASIC, Fast Sort For PET/CBM, Extra Atari Colors Through Artifacting, Life Insurance Estimator (multiple computers), PET Screen Input, Getting The Most Out Of VIC's 5000 Bytes.

June 1982: Outpost Game (multiple computers), Apple Pascal Lister, Income Property (multiple computers), VIC Intelligent Videodisc System, Atari Disk Operating Systems, PET/Apple Search, A Self-modifying Atari P/M Utility, Use Atari Joysticks with VIC, VIC/PET Program Transfers.

July 1982: Gold Miner Game (Atari and VIC), IRA Planner (multiple computers), Atari Video Graphics, Apple DOS Changer, Super QuadraPET, VIC Overview, Maze Race (multiple computers), Direct Access File Editor (PET and Atari), VIC Super Expander Memory Map, Using The 6560 Video Interface Chip, PET Compactor, Headless FORTH Metacompilation, Test RAM Nondestructively (multiple computers).

August 1982: The New Wave Of Personal Computers, Household Budget Manager (multiple computers), Word Games (multiple computers), Color Computer Home Energy Monitor, Intelligent Apple Filing Cabinet, Guess That Animal (multiple computers), PET/CBM Inner BASIC, VIC Communications, Keyprint Compendium, Animation With Atari, VIC Curiosities, Atari Substring Search, PET and VIC Electric Eraser.

September 1982: Apple and Atari and the Sounds of *TRON*, Commodore Automatic Disk Boot, VIC Joysticks, Three Atari GTIA Articles, Color Computer Graphics, The Apple Pilot Language, Sprites and Sound on the Commodore 64, Peripheral Vision Exerciser (multiple computers), Banish INPUT Statements (multiple computers), Charades (multiple computers), PET Pointer Sort, VIC Pause, Mapping Machine Language, Editing Atari BASIC With the Assembler Cartridge, Process Any Apple Disk File.

Home and Educational COMPUTING! (Fall 1981 and Summer 1981 – count as one back issue): Exploring The Rainbow Machine, VIC As Super Calculator, Custom Characters, Alternate Screens, Automatic Line Numbers, Using The Joystick (Spacewar Game), Fast Tape Locater, Window, VIC Memory Map.

Back issues are $3 each or six for $15. Price includes freight in the US. Outside the US add $1 per magazine ordered for surface postage. $4 per magazine for air mail postage. All back issues subject to availability.

In the Continental US call

TOLL FREE 800-334-0868

(In NC Call 919-275-9809)

Or write to **COMPUTE!** Back Issues, P.O. Box 5406, Greensboro, NC 27403 USA. Prepayment required in US funds. MasterCard, Visa and American Express accepted. North Carolina Residents add 4% sales tax.

How To Type COMPUTE!'s Programs

Many of the programs which are listed in **COMPUTE!** contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: [illegible]
Enter these characters with the Atari logo key, {⅄}.

When you see	Type	See	
{CLEAR}	ESC SHIFT <	↖	Clear Screen
{UP}	ESC CTRL -	↑	Cursor Up
{DOWN}	ESC CTRL =	↓	Cursor Down
{LEFT}	ESC CTRL +	←	Cursor Left
{RIGHT}	ESC CTRL *	→	Cursor Right
{BACK S}	ESC DELETE	◀	Backspace
{DELETE}	ESC CTRL DELETE	◧	Delete character
{INSERT}	ESC CTRL INSERT	◨	Insert character
{DEL LINE}	ESC SHIFT DELETE	⬒	Delete line
{INS LINE}	ESC SHIFT INSERT	⬓	Insert line
{TAB}	ESC TAB	▶	TAB key
{CLR TAB}	ESC CTRL TAB	▣	Clear tab
{SET TAB}	ESC SHIFT TAB	▣	Set tab stop
{BELL}	ESC CTRL 2	▣	Ring buzzer
{ESC}	ESC ESC	↰	ESCape key

Graphics characters, such as CTRL-T, the ball character ● will appear as the "normal" letter enclosed in braces, e.g. {T

A series of identical control characters, such as 10 spaces, three cursor-lefts, or 20 CTRL-R's, will appear as {10 SPACES}, {3 LEFT}, {20 R}, etc. If the character in braces is in inverse video, that character or characters should be entered with the Atari logo key. For example, { ■ } means to enter a reverse-field heart with CTRL-comma, {5▥} means to enter five inverse-video CTRL-U's.

Commodore PET/CBM/VIC

Generally, any PET/CBM/VIC program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor-down key; {3DOWN} would mean to press the cursor-down key three times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listing. For example, S̲ would mean to type the S key while holding the shift key. This would result in the "heart" graphics symbol appearing on your screen. Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

Sometimes in a program listing, especially within quoted text when a line runs over into the next line, it is difficult to tell where the first line ends. How many times should you type the SPACE bar? In our convention, when a line breaks in this way, the ~ symbol shows exactly where it broke. For example:

```
100 PRINT "TO START THE GAME  ~
    YOU MAY HIT ANY OF THE KEYS
    ON YOUR KEYBOARD."
```

shows that the program's author intended for you to type two spaces after the word *GAME*.

All Commodore Machines

Clear Screen	{CLEAR}	Cursor Left	{LEFT}
Home Cursor	{HOME}	Insert Character	{INST}
Cursor Up	{UP}	Delete Character	{DEL}
Cursor Down	{DOWN}	Reverse Field On	{RVS}
Cursor Right	{RIGHT}	Reverse Field Off	{OFF}

VIC/CBM 64 Conventions

Set Color To Black	{BLK}	Function Two	{F2}
Set Color To White	{WHT}	Function Three	{F3}
Set Color To Red	{RED}	Function Four	{F4}
Set Color To Cyan	{CYN}	Function Five	{F5}
Set Color To Purple	{PUR}	Function Six	{F6}
Set Color To Green	{GRN}	Function Seven	{F7}
Set Color To Blue	{BLU}	Function Eight	{F8}
Set Color To Yellow	{YEL}	Any Non-implemented Function	{NIM}
Function One	{F1}		

To enter any color code, hold down CTRL and press the appropriate color key. Use CTRL-9 for RVS on and CTRL-0 for RVS off.

8032/Fat 40 Conventions

Set Window Top	{SET TOP}	Erase To Beginning	{ERASE BEG}
Set Window Bottom	{SET BOT}	Erase To End	{ERASE END}
Scroll Up	{SCR UP}	Toggle Tab	{TGL TAB}
Scroll Down	{SCR DOWN}	Tab	{TAB}
Insert Line	{INST LINE}	Escape Key	{ESC}
Delete Line	{DEL LINE}		

When you see an underlined character in a PET/CBM/VIC program listing, you need to hold down SHIFT as you enter it. Since the VIC-20 and Commodore 64 have fewer keys than the PET/CBM, some graphics are grouped with other keys and have to be entered by holding down the Commodore key. If you see any of the symbols in the left column underlined in a listing, hold down the Commodore key and enter the symbol in the right column. Just use SHIFT to enter all other underlined characters.

!	K	←	*	1	E
"	I	↑	PI	2	R
#	T	.	S	3	W
$	@	-	Z	4	H
%	G	=	X	5	J
'	M	<	C	6	L
&	#	>	V	7	Y
\	-	,	D	8	U
;	F	/	P	9	I
?	B	*	N	@	SHIFT*
(	£	+	Q	[	SHIFT+
)	SHIFT-£	0	A	]	SHIFT−

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in brackets, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

TRS-80 Color Computer

No special characters are used, other than lowercase. When you see letters printed in inverse video (white on black), press SHIFT-0 to enter the characters, and then press SHIFT-0 again to return to normal uppercase typing.

Texas Instruments 99/4

No special control characters are used. Enter all programs with the ALPHA lock on (in the down position). Release the ALPHA lock to enter lowercase text.

Timex TS-1000, Sinclair ZX-81

Study your computer manual carefully to see how to enter programs. Do not type in the letters for each command, since your machine features single-keystroke entry of BASIC commands. You may want to switch to the FAST mode (where the screen blanks) while entering programs, since there will be less delay between lines. (If the blanking screen bothers you, switch to the SLOW mode.)

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in **COMPUTE!** are written in a computer language called BASIC. BASIC is easy to learn and is built into most computers (on some computers, you have to purchase an optional BASIC cartridge).

BASIC Programs

Each month, **COMPUTE!** publishes programs for many machines. To start out, type in only programs written for your machine, e.g., "TI Version" if you have a TI-99/4. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from one computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How to Type COMPUTE!'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always SAVE a copy of your program before you RUN it. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1) Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.

2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type COMPUTE!'s Programs" elsewhere in the magazine.)

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in **COMPUTE!** *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on this page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* **COMPUTE!**, *please send them to Ask The Readers, P.O. Box 5406, Greensboro, NC 27403.*

COMPUTE!'s First Book Of Atari

Author: **COMPUTE!** Magazine contributors
Price: $12.95
On Sale: Now

Since their introduction in late 1979, the Atari 400/800 microcomputers have proven to be among the most popular personal computers ever made. **COMPUTE!** Magazine, one of the top publications in personal computing, was among the first to recognize the potential of the Atari computers and started regularly covering them from the beginning. Since then, **COMPUTE!** has published hundreds of articles on the Ataris and has become an indispensable resource for thousands of Atari users.

Most of those Atari users, however, joined the magazine's readership months after those early issues appeared. Many of those issues are now out of print. To satisfy the demand for those early articles, the magazine's editors have compiled the best of them into *COMPUTE!'s First Book Of Atari.*

In 192 pages, spiral bound for easy access to program listings, *COMPUTE!'s First Book Of Atari* includes chapters such as "Getting To Know Your Atari," "Beyond The Basics," "Graphics," "Programming Hints," "Applications," and "Peripheral Information." Informative articles concisely edited for smooth reading describe how Atari users can design their own graphics modes, add voice tracks to programs, and debug programming errors. There's even the classic article on player/missile graphics by Atari's own Chris Crawford.

As a bonus, the book also includes previously unpublished information such as a memory map.

And like **COMPUTE!** Magazine itself, *COMPUTE!'s First Book Of Atari* is written and edited to be useful to all computer enthusiasts – beginners and experts alike.

At only $12.95, less than most computer manuals, *COMPUTE!'s First Book Of Atari* is among the best resources an Atari owner can buy.

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

COMPUTE!'s First Book Of VIC

Authors: **COMPUTE!** Magazine contributors
Price: $12.95
On Sale: Now

Finally, it's VIC's turn!

Users of other popular personal computers have been enjoying their **COMPUTE! Books**: *COMPUTE!'s First Book Of PET/CBM* ...the *First Book Of Atari* ...the *Second Book Of Atari* ... *Programming The PET/CBM* ... and others.

Now, there's a book devoted exclusively to the Commodore VIC-20 computer: *COMPUTE!'s First Book Of VIC*.

The editors of **COMPUTE!** Magazine – the leading resource for the VIC-20 – gathered together the best VIC-20 articles published since the summer of 1981 and added some new material. The result is more than 200 pages of valuable information – information that goes beyond the instruction manuals. In the **COMPUTE!** tradition, it is carefully edited to be easily understood and useful for beginners and experts alike.

COMPUTE!'s First Book Of VIC is spiral-bound to lie flat, and includes ready-to-type program listings and articles such as "The Joystick Connection: Meteor Maze," "STARFIGHT3," "Train Your PET To Run VIC Programs," "Renumber BASIC Lines The Easy Way," "High Resolution Plotting," "Custom Characters For The VIC," "VIC Memory – The Uncharted Adventure," and "A Simple Monitor For The VIC."

At only $12.95, less than most computer manuals, *COMPUTE!'s First Book Of VIC* is among the best resources a VIC user can own.

v Introduction .... Robert Lock

Chapter One: Getting Started.

3 The Story Of The VIC .... Michael S. Tomczyk
11 Computer Genesis:
From Sticks And Stones To VIC .... Dorothy Kunkin Heller / David Thornburg
20 Super Calculator .... Jim Butterfield
24 Large Alphabet .... Doug Ferguson
26 Using A Joystick .... David Malmberg
39 Extended Input Devices:
Paddles And The Keyboard .... Mike Bassman / Salomon Lederman
46 Game Paddles .... David Malmberg

Chapter Two: Diversions – Recreation And Education.

59 The Joystick Connection: Meteor Maze .... Paul L. Bupp / Stephen P. Drop
67 ZAP!! .... Dub Scroggin
72 STARFIGHT3 .... David R. Mizner
78 Alphabetizer .... Jim Wilcox
80 Count The Hearts .... Christopher J. Flynn

Chapter Three: Programming Techniques.

89 PRINTing With Style .... James P. McCallister
97 Train Your PET To Run VIC Programs .... Lyle Jordan
99 User Input .... Wayne Kozun
103 Amortize .... Amihai Glazer
106 Append .... Wayne Kozun
109 Printing The Screen .... C. D. Lane
113 The Confusing Quote .... Charles Brannon
115 Alternate Screens .... Jim Butterfield
119 Timekeeping .... Keith Schleiffer
125 Renumber BASIC Lines The Easy Way .... Charles H. Gould
127 Automatic Line Numbers .... Jim Wilcox
129 Putting The Squeeze On Your VIC-20:
Getting The Most Out Of 5000 Bytes .... Stanley M. Berlin
141 An Easy Way To Relocate VIC Programs
On Other Commodore Computers .... Greg and Ross Sherwood

Chapter Four: Color And Graphics.

147 Kaleidoscope And Variations .... Kenneth Knox
148 High Resolution Plotting .... Paul F. Schatz
154 VIC Color Tips .... Charles Brannon
157 The Window .... Charles Brannon
160 Custom Characters For The VIC .... David Malmberg

Chapter Five: Maps And Specifications.

173 How To Use The 6560 Video Interface Chip .... Dale Gilbert
179 Browsing The VIC Chip .... Jim Butterfield
186 VIC Memory – The Uncharted Adventure ... David Barron / Michael Kleinert
189 Memory Map Above Page Zero .... Jim Butterfield

Chapter Six: Machine Language.

195 TINYMON1: A Simple Monitor For The VIC .... Jim Butterfield
202 Entering TINYMON1 Directly Into Your VIC-20 .... Russell Kavanagh

211 Index

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

COMPUTE!'s Second Book Of Atari

After only three years on the market, the Atari 400/800 microcomputers have become among the most popular personal computers ever made. So it was no surprise when *COMPUTE!'s First Book of Atari*, a collection of the best Atari articles published during 1980-81 in **COMPUTE!** Magazine, also became a "bestseller" with Atari enthusiasts. The first printing sold out in just a few months.

That's why we've followed up with *COMPUTE!'s Second Book of Atari*. Available immediately, the *Second Book of Atari* continues **COMPUTE!**'s tradition for personal computer users.

But the *Second Book of Atari* differs from the *First Book* in one important respect – all the articles are totally new and previously unpublished. The *Second Book of Atari* includes such interesting articles as "Page Flipping," "Fun With Scrolling," "Perfect Pitch," "Player-Missile Drawing Editor," and "TextPlot Makes a Game." Whole chapters are devoted to subjects such as "Advanced Graphics and Game Utilities," "Programming Techniques," and "Beyond BASIC." With 250 pages – more than 25 percent thicker than the *First Book* at the same price – the *Second Book of Atari* is crammed with information and ready-to-type program listings. And the book is spiral-bound to lie flat and is fully indexed for quick reference.

Best of all, *COMPUTE!'s Second Book of Atari*, like **COMPUTE!** Magazine itself, is written and edited to appeal to all computer enthusiasts – beginners and experts alike. Priced at only $12.95.

iv Introduction . . . . Robert Lock
1 Chapter One. Utilities.
2 Atari BASIC Joystick Routine . . . . Kirk Gregg
5 Joystick Tester . . . . Robert Rochon
7 Keyboard Input Or Controlled Escape . . . . Brian Van Cleve
9 POKE TAB In BASIC . . . . Lawrence R. Stark
11 The 49 Second Screen Dump . . . . David Newcorn
15 Memory Test . . . . Ed Stewart
21 Chapter Two. Programming Techniques.
23 Atari BASIC String Manipulation Tricks . . . . David E. Carew
26 Using The Atari Forced Read Mode . . . . Frank C. Jones
33 A Simple Screen Editor For Atari Data Files . . . . Lawrence R. Stark
36 Plotting Made Easy . . . . John Scarborough
41 Graphics Generator . . . . Matthias M. Giwer
44 Analyze Your Program – An Atari BASIC Utility . . . . . Fred Pinho
51 Inside Atari Microsoft BASIC: A First Look . . . . Jim Butterfield
53 Chapter Three. Advanced Graphics And Games Utilities.
55 Player-Missile Drawing Editor . . . . E. H. Foerster
67 Point Set Graphics . . . . Douglas Winsand
76 Page Flipping . . . . Rick Williams
78 An Introduction To Display List Interrupts . . . . Alan Watson
85 Extending Atari High Resolution Graphics . . . . Phil Dunn
85 Part 1: The Polygon Fill Subroutine
92 Part 2: Textured Graphics
114 Part 3: Multi-colored Graphics In Mode 8
160 Textplot Makes A Game . . . . David Plotkin
169 Fun With Scrolling . . . . David Plotkin
183 Chapter Four. Applications.
185 A Simple Text Editor . . . . Osvaldo Ramirez
194 The Atari Keyboard Speaks Out . . . . Walter M. Lee
198 Atari Screen As Strip Chart Recorder . . . . Helmut Schmidt
209 Fast Banner . . . . Sol Guber
213 Perfect Pitch . . . . Fred Coffey
219 Chapter Five. Beyond BASIC.
221 Put Your USR Code Into A BASIC Program Automatically . . F. T. Meiere
225 Back Up Your Machine Language Programs With BASIC . . Ed Stewart
229 Loading Binary DOS Files From BASIC . . . . Robert E. Alleger
249 The Resident Disk Handler . . . . Frank Kastenholz
248 Listing Conventions
249 Index

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2.00 shipping and handling. Outside the U.S., add $5.00 for air mail, $2.00 for surface mail. All orders prepaid. U.S. funds only.

COMPUTE!'s First Book Of Atari Graphics

Authors: **COMPUTE!** Magazine editors and contributors
Price: $12.95
On Sale: Now

COMPUTE!, the leading magazine of home, educational, and recreational computing, has led the way for Atari owners since the computers were first introduced in 1979. **COMPUTE!** has published scores of articles on Atari graphics, and was the first to divulge many important details on such techniques as redefined characters, custom graphics modes, and player/missile graphics. But those articles are scattered across dozens of issues, many of which are scarce or out of print.

That's why the editors of **COMPUTE!** decided to gather the very best Atari graphics articles published over the past three years into *COMPUTE!'s First Book Of Atari Graphics*. From the fundamentals to advanced techniques, here are some of the most instructive articles ever published for the Atari.

But that's not all. *COMPUTE!'s First Book Of Atari Graphics* also presents articles never before published anywhere, and additional sections written especially for this book. These include "The Basics Of Atari Graphics," an introductory tutorial which prepares beginners for the rest of the book; "How To Design Custom Graphics Modes," which covers the fundamentals of mixing modes on a single screen; and "Introduction To Player/Missile Graphics," a guide to understanding one of the Atari's most advanced features, written by Bill Wilkinson, a **COMPUTE!** columnist and a creator of Atari BASIC and the Atari Disk Operating System.

Numerous other articles include "Designing Your Own Character Sets," a new and improved "SuperFont," "High Speed Animation With Character Graphics," "Animation And Player/Missile Graphics," "The Collision Registers," and "GRAPHICS 8 In Four Colors Using Artifacts." There's even a brand new article by Wilkinson, "The Priority Registers," which for the first time shows how to use player/missile graphics to create a *fifth* player.

In the **COMPUTE!** tradition, *Atari Graphics* is crisply written and edited to be useful to beginners and experts alike. And it's spiral-bound for easy access to its dozens of ready-to-type program listings.

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

64 ** ALL NEW!!! ** 64

———***———

SOFTWARE FOR COMMODORE 64

WORD-PAC $74.95
Print up to 99 pages of text.
Automatic tabbing/Centering/Underlining.
Copy Lines/Merge/Plus More!
Coded in Machine language.

CALC-PAC $74.95
Interface-Compatible with WORD-PAC & DATA-PAC.
Coded in our own Unique Spread-Sheet language.
User-Friendly Mathematical Applications.

DATA-PAC $39.95
Interface-Compatible with WORD-PAC & CALC-PAC.
User defined Formats/Search & Sorts.
Printer compatable.

EDITOR-PAC $69.95
Complete Programmer's Editor.
Auto-Number/Renumber including goto & gosub.
Program Merge/Global Search and Replace.
Plus Much More!

ASSEMBLER-PAC $59.95
Programmers take note!
Mnemonic format to Machine Language.
Link Modules/External references, More!

HOME-ACCOUNTANT $29.95
Checkbook with reconciliation routine.
Hard-Copy listing option.
Search and Review/Chart of Accounts.
Income and Expense.

ANNOUNCING . . .

The PCS/8064 Upgrade Module for the 64

On power-up the PCS/8064 provides:
- 80-column video output.
- WORD-PAC word processing.
- CALC-PAC spread sheet mathematics.
- DATA-PAC data base system.
- Exit to BASIC.
- All Applications Interface-Compatible.

Check local dealers or Call Pacific Coast Software
for retail pricing.

Plus Full line of Games/Home Software for 64
Free Catalog Offer.

PACIFIC COAST SOFTWARE

3220 S. Brea Canyon Rd.
Diamond Bar, CA 91765
(714) 594-8210

218 S. Main/Box 147
LeSueur, MN 56058
(612) 665-6724

Mid-Eastern Distribution:
PERIPHERALS PLUS .... (215) 687-8540
155 E. Lancaster Ave. - Wayne, Penn. 19087

New England Distribution:
OMICRON ....(617) 769-6867
1416 Providence Highway - Norwood, Mass. 02062

Dealer Inquires Encouraged.

Commodore 64 and 64 are trademarks of Commodore Business Machines.

Your Commodore 64 Deserves An Assistant

- Data Base Management
- Financial Planning
- Word Processing

The Personal Finance Assistant $59.95
The Spreadsheet Assistant $125.00
The Writer's Assistant $125.00
The Filing Assistant $125.00

RAINBOW COMPUTER CORPORATION

490 Lancaster Avenue
Frazer, PA 19355
(215) 296-3474

Dealer Inquiries Invited

ATARI
A Warner Communications Company

800 (48K)	CALL
400 16K	CALL
400 YOURS to 32K or 48K	CALL
410 RECORDER	79.00
810 DISK DRIVE	439.00
850 INTERFACE	165.00
830 MODEM	149.00
825 PRINTER	575.00
481 ENTERTAINER KIT	69.00
484 COMMUNICATOR KIT	309.00
PRINTERS — Atari, Epson, Smith Corona	CALL

**Prices subject to change without notice.
Shipping extra. No tax out of state.
Ca. residents add appropriate taxes.**

WE ARE AN AUTHORIZED ATARI SALES AND SERVICE CENTER

COMPUTERTIME, INC.

P.O. Box 216
Kentfield, CA 94914

CALL TOLL-FREE 800-227-2520
In California 800-772-4064

For product and price list: send $2.00 for shipping.

NEWS&PRODUCTS

Speech Synthesizer For The Atari

The I Talk II is a speech synthesizer designed specifically for Atari's 400 and 800 computers. It is a complete unit ready to plug in within seconds of unwrapping. The I Talk II has four voice frequencies and unlimited vocabulary capabilities. Each unit comes with either a diskette or a cassette.

The I Talk II has many features:

1. It will speak while action graphics and sound effects are being executed.

2. It uses a utility that leaves system memory free for program use.

3. Complete, easy-to-read documentation allows beginners to incorporate speech into all their programs.

4. *Word Blaster*, an arcade-style educational spelling game, is free with the unit. The game can be easily programmed to challenge all age groups.

5. New games and programs for the unit are currently under development.

6. Volume and tone controls as well as a power on indicator light are standard.

7. The I Talk II never has to be disconnected. It will operate with cassette, disk and other accessories while connected.

8. Carries a full 12-month limited warranty.

9. I Talk II gives a starter dictionary of some of the most used words in the English language. You can add all the words you want. (This feature is not available on cassette.)

10. A complete phonetic speech dictionary to help you make almost any word or sound also comes with the unit.

Greenbrier Marketing International, Inc.
8225 East Rovey Ave.
Scottsdale, AZ 85253
(602)948-0005

Business Application Software For Commodore 64, VIC, And TRS-80

Powerbyte Software has released its application software for business and home use on the Commodore 64, VIC-20, and TRS-80 color computers. Over 64 applications are available on cassette tapes, ranging in price from $8.95 to $34.95. Disc versions are also available. Special emphasis is made for novice programmers with all programs using BASIC.

Available programs include: *The Accountant, Accounts Receivable/Payable, Business Inventory, Order Tracker, My Profit Margin, Business Calendar, Billing Solver, Client Tickler, Cash Flow Model, Linear Regression, Bar Chart, P.E.R.T., Phone Directory, Stock Ticker Tape, Checkbook, Home Budget, Club*

Lister, Medical Records, Mother's Recipes, Grade My Kids, and many more business and home utility programs. An advanced word processor for the 64 and VIC-20 is also now available. A free catalog is available upon request.

Powerbyte Software
2 Chipley Run
West Berlin, NJ 08091
(609)346-3063

The price for Financial Wizard *from Computari was incorrectly stated in the December issue. The correct price is $59.95, which also includes the disk storage case. If there are any questions about the product, call (405)751-2783.*

Film Series For Computer Literacy

Indiana University Audio-Visual Center recently released *Adventure of the Mind*, a six-film series that provides a step toward computer literacy. The films are available in either a 16mm version or in three video formats – ¾" U-matic cassette, ½" Betamax, and ½" VHS. The 16mm version is available for purchase ($240 each) or for rental ($15 each). The video formats are available for $150 each.

The six titles in the series are:

The Personal Touch (#BSC-183) shows the use of computers as personal tools to extend logical functions normally accomplished by the brain. Illustrations range from simple applications such as computer games, to finance control and decision-making, to more complex applications such as the experimental use of micro-electronics to influence the human nervous system through surgically implanted "neuro-pacemakers."

Hardware and Software (#BSC-184) begins with a look at the historical origins of the computer. A personal computer is disassembled to show the five major components of modern computers: input, control, arithmetic logic, memory, and output.

Speaking the Language (#BSC-185) demonstrates how the user communicates with the computer using BASIC. A simple example shows instructions used to store, list, and average the statistics of a basketball team. The film also briefly mentions other means of communication, such as light pens and voice commands.

Data Processing, Control, Design (#BSC-186) defines and demonstrates computer applications in terms of the three major categories indicated in the title. Illustrations include data processing to keep track of inventory and customer billing; buildings using computers to distribute energy efficiently, and an airport using a computer to sense weather conditions and give landing instructions to incoming pilots; and a computer simulation of a complex vehicle traffic problem.

For Better Or For Worse (#BSC-187) examines possible advantages and disadvantages resulting from the use of computers. A grocer explores the computer's benefits in eliminating tedious jobs, yet he is concerned about his dependence on the computer and about the possible misuse of his customer file. Another observer discusses concerns about the computer's impact on privacy, the quickly multiplying consequences of errors, and the increased sense of responsibility needed to prevent problems.

Extending Your Reach (#BSC-188) emphasizes computer use for special individual needs. Illustrations inside computer-assisted devices for the handicapped and the use of information resources via telephone lines. There is also a demonstration by a poet who uses a computer to explore the structure of his poems.

Preview prints of the films are available to perspective buyers at no cost other than return postage. Those requesting

YOU'RE GONNA LOVE THESE ROCK BOTTOM PRICES— HONEST!

SOFTWARE

	RETAIL	SALE
Action Quest	29 95	21 95
Ali Baba and the 40 Thieves	32 95	22 95
Alien numbers	34 95	24 49
Anti-sub Patrol	29 95	21 95
Apple Panic	29 95	21 95
Astro Quotes	23 95	16 95
Atari Assem Ed cart	59 95	42 95
Atari Bookkeeper	149 95	108 95
Atari Macro Asm, Text Editor	89 95	64 49
Atari Microsoft Basic	89 95	64 49
Atari Home Filing Manager	49 95	36 95
Avalanche	27 95	16 95
Bandits	34 95	24 95
Battle of Shiloh	39 95	27 95
Beanie Bopper cart	34 95	24 49
Bomber Attack	16 00	10 95
Bug attack	29 95	21 95
Claim Jumper	34 95	24 49
Claims to Fame	19 95	14 95
Conversational Spanish	59 95	42 95
Cosmic Balance	39 95	27 95
Crossfire	29 95	21 95
Crossword Magic	49 95	34 49
Crush, Crumble & Chomp	29 95	21 95
Crypt of the Undead	29 95	21 95
Curse of the Ra	19 95	13 95
Cyborg	34 95	24 49
Cyclod	29 95	21 95
David's Midnight Magic	34 95	24 49
Deadline	49 95	34 49
Deadly Secrets #1	34 95	24 49
Deadly Duck — cart	29 95	21 95
Deluxe Invaders	34 95	24 49
Dog Daze	22 95	16 95
Downhill	22 95	16 95
Dr Goodcode's Cavern	29 95	21 95
Eastern Front (1941)	29 95	21 95
Embargo cart	49 95	34 49
Escape from Vulcan's Isle	29 95	21 95
Family Cash Flow	22 95	16 95
Fast Eddy — cart	29 95	21 95
Fathoms Forty	34 95	24 49
File Manager 800+	99 95	68 95
Firebird — cart	49 95	34 49
Gerry White's Music Lesson	29 95	21 95
Ghost Encounters	29 95	21 95
Ghost Hunter	34 95	24 49
Gold Rush	34 95	24 49
Gorf	39 95	27 95
Hi-Ho Balloon	34 95	24 49
Jawbreaker	29 95	21 95
K-razy Shootout — cart	49 95	34 49
King Arthur's Heir	29 95	21 95
Knockout	20 00	13 95
Letterman	22 95	16 95
Letter Perfect	149 95	106 95
Letter Perfect w Mail Merge	189 95	138 49
Lost Colony	29 95	21 95
Mad Netter	34 95	24 49
Master Type	39 95	27 95
Match Racers	29 95	21 95
Math Pak	34 95	24 49
Miner 2049 er — cart	49 95	34 49
Mission Asteroid	24 95	17 49
Moon Base Io	29 95	21 95
Mouskattack	34 95	24 49
My First Alphabet	34 95	26 49
Nautilus	34 95	24 49
Number Blast	15 95	11 95
O'Riley's Mine	34 95	24 49
Outlaw Howitzer	22 95	16 95
Pacific Coast Highway	29 95	21 95
Page 6	29 95	21 95
[illegible]	34 95	24 49
Pogoman	39 95	27 95
Pool 1 5	34 95	24 49
Pool 400 — cart	39 95	27 95
Protector	34 95	24 49
Raptillian	34 95	24 49
Rear Guard	24 95	17 95
Rescue at Rigel	29 95	21 95
Robbie the Robot Chaser	24 95	17 49
Rosen's Brigade	34 95	24 49
Saga Hi-res Adventures	39 95	27 95
Salmon Run	22 95	16 95
Sammy the Sea Serpent	23 95	16 95
Sands of Egypt	39 95	27 95
S C R A M	24 95	17 95
Seven Card Stud	15 95	11 95
747 Landing Simulator	22 95	16 95
Shattered Alliance	39 95	27 95
Shootout at the O K Galaxy	20 00	13 95
Snake Byte	29 95	21 95
Sneakers	29 95	21 95
S.A.M. (Software Auto-Mouth)	59 95	41 49
Space Eggs	29 95	21 95
Speedway Blast cart	39 95	27 95
Spell Wizard	79 95	55 49
Star Blazer	31 95	21 95
Star Raiders — cart	44 95	31 95
Stellar Shuttle	29 95	21 95
Syn Assembler	49 95	34 49
Tank Arcade	15 00	10 49
Temple of Apshai	39 95	27 95
The Next Step	39 95	27 95
The Nightmare	29 95	21 95
Threshold	39 95	27 95
Tigers in the Snow	39 95	27 95
Track Attack	29 95	21 95
Ultima I	39 95	27 95
Ulysses and the Golden Fleece	34 95	24 49
Upper Reaches of Apshai	19 95	13.95
Video Math Flash Cards	15 95	11 95
Visicalc	250 00	183 95
War	24 95	17 49
Warlock's Revenge	34 95	24 49
Way Out	39 95	27 95
Wizard & the Princess Hi-res Adv	32 95	22 95
Worm War I cart	34 95	24 49

ATARI

TOP SELLERS

CANYON CLIMBER	29.95	21.95
CENTIPEDE — CART	44 95	31 95
CHOPLIFTER	34 95	24.95
COMMBAT	24 95	17 95
DATA PERFECT	99 95	74 95
FROGGER	34 95	24 49
GRAPHIC GENERATOR	24 95	17 49
PAC MAN — CART	44 95	31 95
PREPPIE	29 95	21 95
RASTER BLASTER	29 95	21 95
SHAMUS	34 95	24 49
SLIME	34.95	24 49
TEXT WIZARD II	99 95	68 95
WIZARD OF WOR	39 95	27 95
ZORK I, II, OR III	39.95	27 95
AXLON 128K RAMDISK	699 00	464 95
MPC 32K MEM MODULE	199.60	109.95
PROWRITER I PRINTER	795.00	449 95
WICO JOYSTICK	29 95	21.95
WICO REDBALL STICK	34.95	24 49

HARDWARE

Atari 800 Home Computer 48K	899 00	624 95
Atari 810 Disk Drive	599 95	424 95
Atari 825 80 Column Printer	799 95	579 95
Atari 830 Acoustic Modem	199 95	149 95
Atari 850 Interface Module	219 95	169 95
Atari Numerical Keypad	124 95	94 95
Epson MX80FT w Graphics	945 00	699 95
Hayes Smartmodem 300 Baud	289 00	194 95
NEC 12" Hi-res Green Screen	285 00	149 95
NEC 8023 Printer	895 00	459 95
Printmaster (Daisy Wheel)	2595 00	1599 95
Prowriter II Printer	995 00	649 95
Starwriter (Daisy Wheel)	1995 00	1375 95
Percom Dbl Sgl Density Drive	799 00	599 95
Elephant Brand Diskettes	10/Box	18 95
Verbatim Datalife Diskettes	10 Box	25 00

CALL US ... WE CAN HELP!

APPLE COUNTRY LTD.®

(619) 765-0239

TERMS WE ACCEPT VISA/MASTERCARD (please include name, address, phone number, card number & expiration date) cashier's check, personal check (allow 10 working days to clear) or C O D (add $2 C O D charge) Unless otherwise requested we ship U P S surface (street address required) Please include $5 or 5% (whichever is greater) for shipping & handling U P S blue label slightly higher please call Please add $10 or 5% (whichever is greater) for shipping & handling of monitors due to their excessive weight Foreign orders please include $10 or 10% (whichever is greater) for shipping & handling Please **INCLUDE PHONE NUMBER WITH ALL ORDERS** All items are new and carry manufacturer's warranty Apple Country, Ltd cannot guarantee the merchantability of any product Prices are subject to availability and change without notice Call before returning goods for repair or replacement, RMA number required California residents add 6% tax Please send S.A.S.E for free catalog WE CARRY A FULL LINE OF SOFTWARE FOR APPLE, ATARI TRS-80, VIC AND IBM

11 1 82

P.O. Box 1099, 2225 Main Street, Julian, Calif. 92036

Apple Country, Ltd is A DISCOUNT MAIL ORDER HOUSE for the micro computer industry

and is a California corporation not affiliated with Apple Computer Inc Apple is a trademark of Apple Computer Inc Atari is a trademark of Atari Inc

---

VIC-20 CLUB

SOFTWARE LOAN LIBRARY

Join our unique VIC-20 users club and get unlimited use of our extensive loan library of major VIC-20 software. Borrow any program for up to one month for only 10% of the list price (plus shipping and handling).

TRY BEFORE YOU BUY

Software loan fee may be applied to later purchase if you want to keep a loaned program.

SPECIAL PRICES

Members also get a free subscription to 20/20, the VIC-20 newsletter, and special purchase prices on all VIC-20 hardware and software from our huge catalog featuring all major producers. Membership fee only $15 to join, plus $10 per year dues (total of $25 first year). Call or write for detailed information.

SOFTWARE TO GO

1964 Oak Ridge Turnpike
Four Oaks Shopping Center
Oak Ridge, Tn 37830 • (615) 482-9592

Visa and Mastercard Accepted
Commodore-64 Support Too!

DISCOUNT SOFTWARE COUPON WITH EACH ORDER

TOTAL CONTROL

COMMAND CONTROL JOYSTICK

BY WICO

- ARCADE QUALITY CONSTRUCTION
- TWO FIRE BUTTONS (TOP & BASE)
- ADAPTERS TO OTHER COMPUTERS AVAILABLE
- FULL ONE YEAR WARRANTY

FOR ATARI 29.95*
FOR APPLE ...... 49.95* INCL. ADAPTOR
FOR TRS-80 ...... 39.95* INCL. ADAPTOR

*ADD $3 PER ORDER FOR POSTAGE AND HANDLING • CHECK, MONEY ORDER, MASTERCARD OR VISA. C.O.D. (C.O.D. CHARGES ADDED) • FLA RESIDENTS ADD 5% SALES TAX • FOREIGN ORDERS MUST BE PREPAID

GATOR MARKETING ENTERPRIZES, INC.
P.O. BOX 296 • CASSELBERRY, FL 32707
(305)699-5848

DEALER INQUIRIES INVITED — PRICES SUBJECT TO CHANGE.

preview should give a specific date, as well as two alternative dates.

Audio-Visual Center
Indiana University
Bloomington, IN 47405
(812)335-8087

Math Packages For The TRS-80

Bertamax Inc. has converted its math game package *Math Facts Games* I to run on the TRS-80 Color Computer, with 32K of memory. The game package provides practice in addition, subtraction, multiplication, or division, as the user chooses. The user can also select any one of four games to play: Count Down, Mystery Word, Tic-Tac-Toe, and Great Computer Challenge.

The player must correctly respond to each fact in order to take his turn at each game. Speed is important in some of the games, but the user may select the speed.

Each game provides immediate reinforcement of the user's input through the use of high-resolution color graphics, sound, or a combination of the two.

The package requires Extended BASIC, 32K of memory; price for tape is $39.50, for disk, $39.80.

This package is also available for the TRS-80 Model III, Apple II, and the Atari 800. Each program includes an extensive teacher's manual.

Also *Essential Mathematics Series* for grades 6 to 8 has been converted to run on the TRS-80 Color Computer. Already available for Apple and TRS-80 Model III computers, this drill-and-practice program contains lessons in addition, subtraction, multiplication, division, number concepts, fractions, decimals and percent, and pre-algebra skills.

This series features immediate reinforcement, a graded sequence of lessons, the use of skill-building techniques, on-screen directions and examples in key lessons, and sound and color reinforcers.

The series may be purchased as a complete set, or by concept strand. The price of the complete set is $225 for disk, $245 for tape. Each of the four concept strands – fractions, decimals and percent, number concepts, pre-algebra – is priced at $59.80 for the disk, $89.50 for the tape. Prices include the teacher's manual.

Bertamax Inc.
101 Nickerson, Suite 202
Seattle, WA 98109
(206)282-6249

Art Generation For The Apple

Visual Horizons has introduced *Computer Slide Express*, a service to turn any Apple computer into an art generating machine. With this new service, Apple computer owners can convert computerized charts, designs, graphs and graphics to 35mm color slides, standard size or enlarged color or black and white prints, or overhead transparencies.

The information can be transmitted over ordinary telephone lines or mailed to Visual Horizons in the form of a floppy disk which can hold material for up to 35 slides. All material is delivered through the mail.

It is a perfect system for someone who is writing a book and wants black and white or color charts. You can also word process material on your Apple computer, punch in *Computer Slide Express*, and get all the charts and graphs you need in color slide form.

Visual Horizon's Computer Slide Express.

Visual Horizons
180 Metro Park
Rochester, NY 14623

Word Processor For The VIC And Commodore 64

H. D. Manufacturing recently released the *Rapidwriter*, a word processor for the VIC and Commodore 64 computers. *Rapidwriter* gives flexibility to write, save, recall, edit, format, and print any kind of text. There are no limits to document length, or the variety of ways that texts may be mixed and recombined to produce labels, letters, reports, newsletters, scripts, or books.

Screen features. VIC-20 screen shows three full lines of text, plus line number and memory still available. CONTROL and OPTION menus display the full selection of control keys. Shows seven full lines of text on the 64, and 15 lines on the VIC with an 80-column board.

Editing features. Scrolling up and down; "goto line" to instantly position a line for editing. Uses cursor keys to position the cursor. Line gluing and single key formatting speed editing chores. Holds a full page of text in VIC with 8K expander, two more pages for each 8K, ten pages in the 64. Write, store, recall, move, edit, and print text in any order, at any time, in any quantity. Automatic word wraparound, line-length cut-off, and line feed, at typing speeds to 80 wpm.

Printing features. Versions avoidable for the VIC-1515 printer, and choice of serial or parallel interfacing. Headings centered

Lyco Computer Marketing & Consultants

TO ORDER
CALL US

TOLL FREE 800-233-8760
In PA 1-717-398-4079

ATARI February SPECIALS

810 Disk Drive	$ 429.00
32K RAM	$ 79.00
400 32K RAM	$ CALL

800 48K... $519.00

ATARI®
A Warner Communications Company

PERCOM : In Stock

SINGLE DRIVE (SD)	$399.00
SINGLE DRIVE (DD)	$549.00
DUAL DRIVE (DD)	$869.00
DUAL HEAD (DD)	$669.00

(Read all Atari Disks)

PRINTERS : In Stock

Okidata 82A	$479.00
Okidata 83A	$719.00
Okidata 84	$1089.00
Prowriter I	$499.00
Prowriter II	CALL
SMITH CORONA TP-1	$599.00
NEC 8023	$499.00

(Interfacing Available)

JOYSTICKS : In Stock

Atari CX-40	$18.00
LeStick	$34.00
WICO TRACKBALL	$ 54.95
WICO COMMAND CONTROL	$ 22.75
WICO RED BALL	$ 23.75
STICK STAND	$ 6.75

Computer Covers

800	$6.99
400	$6.99
810	$6.99
410	$ 6.99

DISKETTES : In Stock

Maxell MD1 . . .(10)	$34.00
Maxell MD2 . . .(10)	$44.00
Elephant . . .(10)	$21.00

THIRD PARTY SOFTWARE
ATARI PROGRAM EXCHANGE

Eastern Front 1941	$25.50
Avalanche	$15.50
Outlaw/Howitzer	$15.50
Dog Daze	$15.50
Wizard of War	$31.00
Gorf	$31.00
Frogger	$26.00

BUSINESS SOFTWARE : In Stock

Atari Word Processing	$109.00
Letter Perfect	$129.00
Test Wizzard	$ 89.00
Datasam/65	$125.00
Interlisp	$125.00
DATA PERFECT	$ 75.00
VISICALC	$169.75

ATARI HARDWARE

410 Cassette Recorder	$75.00
825 Printer	$585.00
830 Phone Modem	$149.00
850 Interface	$164.00

PACKAGES

CX481 Entertainer	$69.00
CX482 Educator	$125.00
CX483 Programmer	$49.00
CX494 Communicator	$325.00

SOFTWARE

CXL4012	MISSILE COMMAND	$28.75
CXL4013	ASTEROID	$28.75
CXL4020	CENTIPEDE	$32.75
CXL4022	PACMAN	$32.75
CXL4011	STAR RAIDER	$34.75
CXL4004	BASKETBALL	$26.75
CXL4006	SUPER BREAKOUT	$28.75
CXL4008	SPACE INVADER	$28.75
CX8130	CAVERNS OF MARS	$31.75
CX4108	HANGMAN	$12.75
CX4102	KINGDOM	$12.75
CX4112	STATES & CAPITALS	$12.75
CX4114	EUROPEAN COUNTRIES	$12.75
CX4109	GRAPHIT	$16.75
CX4121	ENERGY CZAR	$12.75
CX4123	SCRAM	$19.75
CX4101	PROGRAMMING I	$19.75
CX4106	PROGRAMMING II	$22.75
CX4117	PROGRAMMING III	$22.75
CXL4015	TELELINK	$21.75
CX4119	FRENCH	$39.75
CX4118	GERMAN	$39.75
CX4120	SPANISH	$39.75
CX4120	SPANISH	$39.75
CXL4007	MUSIC COMPOSER	$33.75
CXL4002	ATARI BASIC	$45.75
CX8126	MICROSOFT BASIC	$65.75
CXL4003	ASSEMBLER EDITOR	$45.75
CX8126	MACROASSEMBLER	$69.75
CXL4018	PILOT HOME	$65.75
CX405	PILOT EDUCATOR	$99.75
CX415	HOME FILING MANAGER	$ 37.50
CX414	BOOKEEPER	$109.75
NEW DEFENDER		$ CALL

NEW RELEASES

CHOP LIFTER	$27.75
APPLE PANIC	$23.75
PREPPIE	$19.95

THIRD PARTY SOFTWARE
for atari 800 or 400

K-BYTE

KRAZY SHOOTOUT	$35 00
K-DOS	$65 00
K-STAR PATROL	$37.75
K-RAZY ANTICS	$37.75
K-RAZY KRITTERS	$37.75
Q-BALL JOYSTICK KIT	$6 75
BAHA BUGGIES	$ 24.75
S.A.M. SYNTHESIZER	$ 44.75
NAUTILUS	$ 24.75
SHAMUS	$ 24.75
POOL 400 ROM	$ 29.75
SUB COMMANDER	$ 36.75
JUMBO JET PILOT	$ 36.75
Monkey Wrench	$ 42.00
Utility Disk	$ 36.50
Ultimate Renumber	$ 15.50
Star Warrior	$28.00
Crush. Crumble & Chomp	$23 00

WE CARRY MANY OTHER THIRD PARTY PRODUCTS YOU CAN CALL FOR PRICES ON AND ASK FOR YOUR FREE ATARI PRODUCT CATALOG

commodore

VIC1212 PROGRAMMER AID	$45 00
VIC1213 VICMON	$45.00
VIC 1906 SUPER ALIEN	$ 21.75
VIC 1914 ADVENTURE LAND	$ 29.75
VIC 1915 PIRATE COVE	$ 29.75
VIC1916 MISSION IMPOSSIBLE	$ 29.75
VIC1917 THE COUNT ADVENTURE	$ 29.75
VIC1919 SARGON II CHESS	$ 29.75

THIRD PARTY SOFTWARE

ALIEN BLITZ	$21 00
Omega Race	$35.00
Gorf	$32.00
16K RAM/ROM	$99.00
AMOK	$21 00
SUPER HANGMAN	$16 00
SPIDERS OF MARS	$45.00

POLICY

In-Stock items shipped within 24 hours of order Personal checks require four weeks clearance before shipping. PA residents add sales tax. All products subject to availability and price change. Add 4 % for Mastercard and Visa.

TO ORDER
CALL TOLL FREE
800-233-8760
In PA 1-717-398-4079
or send order to
Lyco Computer
P.O. Box 5088
Jersey Shore, PA 17740

automatically; automatic "top of form" function formats and numbers pages. User sets margins, type style and size, and page length. Supports underlining, sub and superscripts, and proportional spacing.

Tape and disk features. Standard CBM file format. Provides on-screen prompts and advisories for error-free tape and disk handling. Eliminates need for tape footage counter by using fast forward under program control. Disk version uses named files for quick access and overwrite protection.

Rapidwriter is written in BASIC, can be used as a data-entry module with other programs and to format printout for other programs, and has a built-in programmable calculator function. The program comes with a complete reference manual and an easy-to-follow tutorial. Ongoing support (newsletter, new add-on programs, etc.) is provided. The cost is $39.95, tape or disk.

H. D. Manufacturing Inc.
91 Long Hill Road
Leverett, MA 01054
(413) 549-3744

Microcomputer Materials Catalog For 1982-83

The 1982-83 edition of the Scholastic Microcomputer materials Catalog has 100 new programs, including 24 new titles produced by the Minnesota Educational Computing Consortium (MECC), as well as top-selling programs like VisiCalc.

In addition to subject areas such as math, science, language arts, computer literacy, and social studies, software is offered in the new subject areas of music, art, and driver's education. A total of more than 300 titles is offered for the Apple, PET, TRS-80, Atari, and Texas Instruments microcomputers.

Scholastic Inc.
50 West 44th Street
New York, NY 10036
(212)944-7700

Maze Game For The Atari

Island Graphics has released *Tax Dodge*, a scrolling maze game for the Atari 400/800. *Tax Dodge*, designed and developed by Jon Freeman and Anne Westfall of Free Fall Associates, has vertical and horizontal scrolling, which allows the maze to be larger than the screen. *Tax Dodge* is written in assembly language.

Tax Dodge comes with diskette, manual, and product registration card. It is a 16K program and retails at $39.95 on diskette.

Island Graphics
Box V
Bethel Island, CA 94511
(415) 684-2664

THE MONKEY WRENCH

A PROGRAMMER'S AID FOR ATARI 800

If you are a person who likes to monkey around with the ATARI 800 — Then THE MONKEY WRENCH is for you! Make programming tasks easier, less time consuming and more fun. Why spend extra hours working on a BASIC program when the MONKEY can do it for you. Plugs in the RIGHT cartridge slot and works with ATARI BASIC.

The Monkey Wrench provides 9 new BASIC direct mode commands. They include: AUTO LINE NUMBERING, DELETE LINE NUMBERS, CHANGE MARGINS, MEMORY TEST RENUMBER CURSOR EXCHANGE, HEX & DECIMAL CONVERSION, and MONITOR. The monitor command gives access to a machine language monitor with 15 commands used to interact with the powerful features of the 6502 microprocessor.

$49.95

ATARI AND PET EPROM PROGRAMMER

Programs 2716 and 2532 EPROMs. Includes hardware and software. PET = $75.00 — ATARI (includes sophisticated machine language monitor) = $119.95

VIC RABBIT CARTRIDGE

"High-Speed Cassette Load and Save!"

$39.95 (includes Cartridge and Manual)

Expansion Connector

"Don't waste your Life away waiting to LOAD and SAVE programs on Cassete Deck."

Load or Save 8K in approximately 30 seconds! Try it — your Un-Rabbitized VIC takes almost 3 minutes. It's not only Fast but VERY RELIABLE.

Almost as fast as VIC Disk Drive! Don't be foolish — Why buy the disk when you can get the VIC Rabbit for much, much less!

Easy to install — it just plugs in.
Expansion Connector on rear.
Works with or without Expansion Memory.
Works with VIC Cassette Deck.
12 Commands provide other neat features.

Also Available for 2001, 4001, and 8032

More than just an Assembler/Editor!

It's a Professionally Designed Software Development System

MAE

for
PET
APPLE
ATARI
~~$169.95~~
#99 95

Blast off with the software used on the space shuttle project!

- Designed to improve Programmer Productivity
- Similar syntax and commands - No need to relearn peculiar syntaxes and commands when you go from PET to APPLE to ATARI
- Coresident Assembler/Editor - No need to load the Editor then the Assembler then the Editor, etc
- Also includes Word Processor, Relocating Loader, and much more
- Options EPROM Programmer, unimplemented opcode circuitry
- STILL NOT CONVINCED Send for free spec sheet!

PET TERMINAL SOFTWARE

A buy you RS-232 users can't pass-up. Includes RS-232 hardware with a sophisticated software package. May be controlled via keyboard or from BASIC. A super buy. $129.95

5¼ INCH SOFT SECTORED DISKETTES

Highest quality. We use them on our PETs, APPLEs, ATARIs, and other computers. $22.50/10 or $44.50/20

Prowriter Printer - Excellent dot matrix print Parallel = $489 00
Serial = $600 00 IEEE = $589 00

DC Hayes Smart Modem = $235 00
DC Hayes Micro Modem II = $289 00

Rana Disk Drive - 375
4 Drive Controller - 114

EPROMS 2716 = $6 50 2532 = $12 50
Over 40 Commodore Programs by Baker (on 4040) = $25 00

Eastern House

3239 Linda Dr.
Winston-Salem, N.C. 27106
(919) 924-2889 (919) 748-8446
Send for free catalog!

VISA
MasterCard

tele soft • inc.

P.O. BOX 3456, TROY, MICH 48099
Complete line of Computers . . . Software
Video Games and Accessories
CALL TODAY!

FREE! STICK STAND with FASTBALL (With purchase of $60.00 or more. A $6.99 value!)

REDUCES HAND & WRIST FATIGUE

NEW!

ATARI HOME COMPUTERS

	400	800
16K	$279.95	$659 00
48K	499.00	799 00

ACCESSORIES

410	Cassette Recorder	$ 89.95
810	Disk Drive	499 99
850	Interface Module	169.95
825	80 Column Printer	699 95
MOSAIC	32K Ram	113.00

Bell & Howell (Black Apple)

Apple II plus 48K	$1287 00
Disk Drive w/Controller	550.00
Disk Drive without Controller	475.00
ACE 16K Expansion	165 00
Parallel Interface	125 00

commodore

Commodore "64"	$525.00
Commodore Vic 20	215.00
Disk Drive	499 00
Datassette	69.00
8K Memory Expander	49 95
RS232 Interface	45.00
Vic 20 Cartridge Games	27 95

BUSINESS MACHINES

CBM 8032	$1100.00
CBM 8050 Dual Disk	1299.00
TRS 80 Model III	1650.00

TIMEX Home Computer	89 95
SANYO Small Business Computer	1700 00
NEC Computer 32K Ram	834 00
XEROX 820 System I	2600 00
TeleVideo 64K Computer	1500 00
Texas Instruments TI99 (with $100 00 rebate)	200 00
HAYES MODEM 1200	575.00

ACCESSORIES

Stick Stand	$ 6.99
2 For	12.00
Atari Joy Stick	6 20
Wico Joy Stick	22.50
Wico Red Ball Joy Stick	24 80
Wico Track Ball Atari/Commandor	52.00
Many More Accessories	CALL

SOFTWARE FOR ATARI

Centipede	$34 75
Pac Man	34.75
Super Breakout	28.50
Missile Command	28 50
Star Raiders	34.75

CBS Software

Krazy Shootout	$36 00
Krazy Kritters	36 00
K-Star Patrol	36 00
Krazy Antiks	36 00

EDYX

Crush, Crumble, Chomp	$23 00
Ricochet	15 50
Star Warrior	30 50
Rescue at Rigel	23 00

Broderbund

Choplifter	$29 95
Apple Panic	23 00
Star Blazer	24 50
David's Midnightmagic	27 00
Stellar Shuttle	29 95

synapse

Nautilus	23 00
Slime	23 00
Dodge Racer	23 00
Protector	23.00
Chicken	23.00

IDSI.

Pool 1 5	27.00

Adventure

Preppie	23.00
Rear Guard	15.50
Treasure Quest	23.00
3D Tic Tac Toe	12.00
Adventure Series	15.50
War	19.50
Diskey	37.00

ON-LINE systems

Ultima I	30 50
Ultima II	47.50
Frogger	27.00
Jaw Breaker	23.00
Crossfire	23.00

Data

Shooting Arcade	23.00
Pacific Coast Highway	23.00
Clowns and Balloons	23.00
Atari Character Generator	15.50

Andromeda	27.00
Doctor Goodcode's Cavern	24 00
Pathfinder	27.00
Match Racers	24.00

VISICALC

(For Apple, Atari, Commodore, and IBM) 200.00

VISA & MASTERCARD ACCEPTED

ORDERING INFORMATION

Check, Money Order, MasterCard, Visa and C.O.D. Orders accepted. Add $2.00 for C.O.D. All other orders shipped U.P.S collect. Michigan residents add 4% sales tax. **Hours 9 a.m. to 8 p.m. daily.**

CALL FREE 1-800-255-2000
IN MICHIGAN 1-800-742-4242
IN CANADA 1-313-524-1030

New Marketing For CompuServe

Computer retailers, software stores and major retail chains can now sell the CompuServe Information Service (CIS) through a new retail marketing program.

CIS can be used by all personal computers and by many computer terminals.

The CIS "starter kit" contains a three-ring vinyl binder, a user ID number and password for five free connect time hours on CIS, an easy to read *User's Guide*, and an introductory subscription to *Today* magazine. The starter kit also contains local phone numbers for connecting a personal computer to CIS, access instructions, a dictionary of computer terms, commonly asked questions and answers about CIS and rate information.

The starter kit has a suggested retail price of $39.95.

CIS offers shopping and banking at home, electronic mail and realtime communications, current and historical stock market and commodities information, family information and education, up-to-the-minute news and weather, electronic games, bulletin boards, private user groups and computing power for programming activities.

CompuServe Incorporated
5000 Arlington Centre Boulevard
Columbus, OH 43220
(614)457-8600

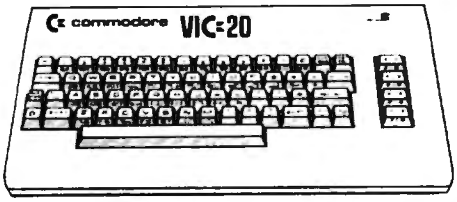
Mass Storage Peripheral For Commodore 64 And VIC-20

Exatron has announced its Commodore 64 and VIC-20 compatible Stringy Floppy mass storage peripheral. The new system, named ESF-20/64, consists of two units: a miniature endless-loop tape cartridge and a precise electronically direct-drive transport mechanism which plugs into the serial bus connector on the Commodore 64 and VIC-20.

Major features include reliability, speed, compact size, and easy interfacing with no changes to the hardware or software of either computer. The commands used to operate the ESF-20/64 are incorporated into the Commodore 64 and VIC-20 and are fully explained in the *VIC-20 Computer Guide.*

The tape transport operates at a speed of five inches per second and has memory capacity of up to 64K bytes. Previously stored data is transferable to the ESF-20/64 storage via BASIC programming.

The end-user, single-unit price is $199.50. Starter kits, available for an additional $25, include the user's manual and ten 20-foot wafers (tape car-



commodore VIC-20

Exatron's stringy floppy mass storage peripheral for Commodore 64 and VIC.

tridges). The cost of individual wafers is about $3.

Exatron
181 Commercial Street
Sunnyvale, CA 94086
(408)737-7111
or outside CA (800)538-8559

Full-stroke Keyboard For The Atari 400

Inhome Software Incorporated has announced the B Key 400 full-stroke keyboard for the Atari 400 computer as an option to the existing membrane keyboard.

This new keyboard for the Atari 400 computer provides home computer users with all of the features of the full-stroke keyboard.

Inhome Software
2485 Dunwin Drive
Mississauga, Ontario L5L 1T1, Canada
(416) 828-0775

Inhome Software's B Key 400.

DB Master Accessory For The Apple

A statistical software package for *DB Master* users is being introduced by Stoneware, Inc. *DB Master Stat Pak* is an accessory for the *DB Master* data base management program for the Apple II or Apple II Plus.

The *Stat Pak* permits statistical analysis of data contained in *DB Master* files. *Stat Pak* is compatible with both the *DB Master* standard and Special Edition for hard disk systems.

DB Master uses values from any numeric, dollar/cents or computed fields. It also performs tests on selected records in a file, including: mean, standard deviation and standard error, co-efficient of variation, frequency of distribution, un-paired t-test, Mann Whitney U-test, Wilcoxen Paired Sample Test, linear regression, correlation and one-way analysis of variation (ANOVA) with Newman-Keuls Test and Chi Square Test (Chi Square can use alphanumeric data).

The hardware requirements are a 48K Apple or Apple II Plus with a minimum of one disk drive. The introductory price for the new *DB Master Stat Pak* is $99.

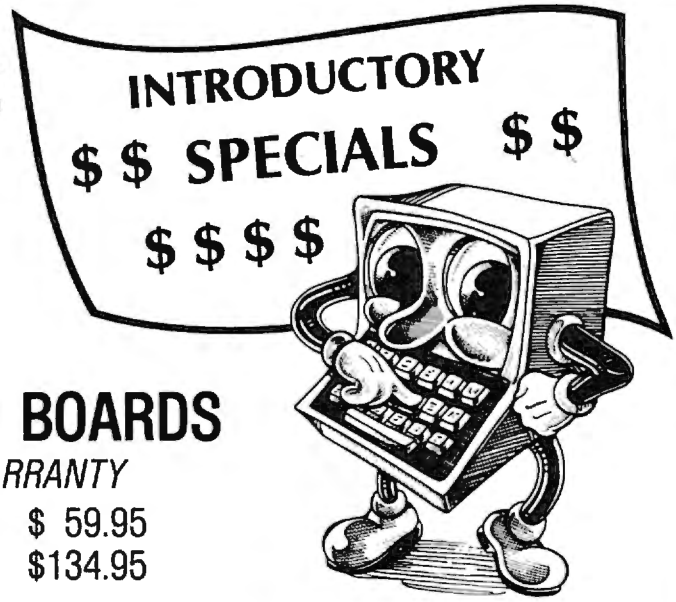
Stoneware, Inc.
50 Belvedere Street
San Rafael, CA 94901
(415)454-6500

Shapes In Color For The Apple

Shapes in Color is a BASIC precision shape-drawing program for the Apple II that can be used by

Order TOLL FREE
800-652-8391

California or Inquiries Call
(714) 824-5555



INTEC RAM BOARDS

LIFETIME WARRANTY

32K	400/800	$ 59.95
48K	400	$134.95

25% OFF Apple & Atari Software

PACKAGE DEAL!!!!

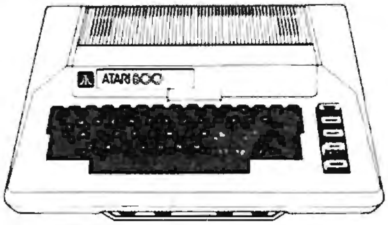
	LIST
NEC 8023 PRINTER or EPSON MX 80FT	$\$695^{00}$
Printer Cable	$\$ 40^{00}$
ATARI 850 Interface	$\$219^{95}$

Your Cost $669.95

HAYES SMART MODEM *300 Baud*		$\$209^{95}$
PERCOM DRIVES		
Double Density	1st	$\$579^{95}$
	2nd	$\$359^{95}$
Single Density	1st	$\$425^{00}$
	2nd	$\$320^{00}$

Send for FREE MICRO MERCHANT HOT SHEET.

ATARI 800 48K
$499.95



810 DISK DRIVE	419^{95}
EPSON MX 80 FT	449^{95}
MX 100	639^{95}

PRICES SUBJECT TO CHANGE.

$ BARGAIN BOX $

ZAXXON (D)	29.95
Dig-Dug Cart	33.70
ET Phone Home Cart	33.70
QIX Cart	33.70
Wizard of Wor (D)	29.95
Choplifter 48K	26.20
Frogger Tape or Disk	26.20
Defender Cart	33.70
Text Wizard (D)	74.95
Galaxian Cart	33.70

BLANK DISKETTES 5¼" S.S., S.D.

ELEPHANT DISKS (Box of 10)	21.95
VERBATIUM (Box of 10)	28.95

MICRO MERCHANT

290 North 10th Street, P.O. Box 1516, Colton, CA 92324-0821

CA Residents add 6% Sales Tax. Credit Card orders add 3%.
UPS Shipping: 3% for Hardware, $3 for Software.

MasterCard
VISA

anyone. Designed by Harry Moneyhun, the program enables the user to create and compile shapes that can be drawn on a medium-res grid in various colors, sizes, and angles. *Shapes in Color* (#13509) can be used to design shapes ranging from unique typography to animation. Shapes can be designed in the high resolution colors of green, violet, white, orange, blue, and black.

Graphic backgrounds can be "painted" with free-hand brushstrokes and then used with moving shapes to generate striking effects. Completed backgrounds and shapes are saved on disk to be reloaded for use in other programs. Detailed documentation describes techniques for writing original programs with the shapes and backgrounds created by the user.

The program requires Apple II disk and 48K, and costs $49.95.

Hayden Software Company
600 Suffolk Street
Lowell, MA 01853
(617)937-0200

CALENDAR

February 5, 1983, 10 AM-6 PM, Santa Clara County Fairgrounds, San Jose, California. Computer Swap America show, the first of three scheduled for 1983. Features sellers and buyers, both companies and individuals, from all over America, and from Mexico and Canada. Items sold: computers, consumer electronics, peripherals, software, books, magazines, etc. Admission is $5. Call (415) 494-6862 for Seller's Information Package.

March 18-20, 1983, Brooks Hall, San Francisco Civic Auditorium. The West Coast Computer Faire, a personal computing show for vendors and users. Admission is $15.

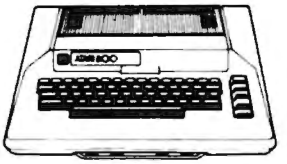
March 18-19, 1983, Seattle Pacific University (SPU) campus, Seattle, Washington. Sixth Annual Computers in Education Conference, designed for elementary and secondary educators and administrators interested in the changing role of the microcomputer in education. Co-sponsors: Pacific Northwest Associates for Computers in Education and SPU. For information or pre-registration forms, contact: Tony Jongejan, Everett High School, 2416 Colby, Everett, WA 98201; (206) 334-6965.

March 28-30, 1983, Tampa. Florida Instructional Computing Conference, for administrators and teachers. Conference includes exhibits of hardware and software, workshops on computer literacy, graphics, Logo, courseware evaluation, administrative uses of computers, etc., and program sessions (about 60). Each of the 14 workshops costs $15 in addition to the registration fee. Conference registration fee: $20 before March 15; $25 after March 15. Single day registration, $15. Registration packet includes a resources booklet. For special rates at the new Hyatt Regency Hotel call (800)228-9000. For registration information, write: Dianne Cothran, Florida DOE, Educational Technology Section, Knott Building, Tallahassee, FL 32301. Or call (904)488-0980 or 487-3104 (SUNCOM 278-0980 or 277-3104). Exhibitors call (904)878-4178.

COMPUTE! *welcomes notices of upcoming events and requests that the sponsors send a short description, their name and phone number, and an address to which interested readers may write for further information. Please send notices at least three months before the date of the event, to: Calendar, P.O. Box 5406, Greensboro, NC 27403.*

New Product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

ATARI ™



800 48K . . $495

400 16K . . $209

410 Recorder	$ 75
810 Disk Drive	$419
825 Printer	$579
830 Modem	$155
850 Interface	$165
481 Entertainer	$ 79
482 Educator	$119
483 Programmer	$ 55
484 Communicator	$299
853 16K Ram	$ 75
The Bookkeeper Kit	$169

ATARI Software

CX4104 Mailing List	$ 19
CX404 Word Processor	$105
CXL4007 Music Composer	$ 45
Programming 2 & 3	$ 22
Conversational Languages	$ 45
CX4018 Pilot	$ 59
CX405 Pilot	$ 99
CXL4003 Assembler Editor	$ 45
CX8126 Microsoft Basic	$ 67
CXL4022 Pac-Man	$ 33
CX8130 Caverns of Mars	$ 29
CXL4020 Centipede	$ 33
CXL4006 Super Breakout	$ 28
CXL4008 Space Invaders	$ 28
CXL4009 Computer Chess	$ 28
CXL4011 Star Raiders	$ 33
CXL4012 Missile Command	$ 28
CXL4013 Asteroids	$ 28
The Bookeeper	$105
Home Filing Manager	$ 36
Atari Speed Reading	$ 54
My First Alphabet	$ 26

Business & Utilities

Visicalc	$169
Mail Merge	$ 20
Data Perfect	$ 75
Letter Perfect	$105
Text Wizard	$ 65
Disk Detective	$ 20
Datasm 65 2.0	$ 59
File Manager 800 +	$ 65
Syn Assembler	$ 34
Page 6	$ 20
Atari World	$ 39
K-Dos	$ 59
Micropainter	$ 23
Color Print	$ 27
Lisp Interpreter	$ 79
Bishops Square	$ 20
Graphic Master	$ 27
Graphic Generator	$ 17
Basic Compiler	$ 65

Programming Techniques

Display Lists	$ 17
Horiz/Vert Scroll	$ 17
Page Flipping	$ 17
Basics of Animation	$ 17
Player Missile Graphics	$ 24
Sound	$ 17
Data Files	$ 24

For Fast Delivery, send certified or cashier checks; money orders, or direct bank wire transfers. Personal checks allow 2 to 3 weeks to clear. Prices reflect a cash discount only and are subject to change Shipping—Software ($2.00 Minimum) Hardware—call. Foreign inquiries invited — add 15% for shipping. Nevada residents add sales tax

NEW LOWER PRICES

TOP SELLERS

Atari

Temple of Apshai	$ 27
Raster Blaster	$ 20
Apple Panic	$ 20
Crossfire	$ 20
Threshold	$ 27
Mousekattack	$ 23
Krazy Shootout	$ 34
Deadline	$ 34
Tumble Bugs	$ 20
Pool 1.5	$ 23
Crypts of Terror	$ 23
Richochet	$ 15
Empire of the Overmind	$ 23
Tanktics	$ 20
Match Racers	$ 20
Wiz & Princess	$ 22
Mission: Asteroid	$ 17
Ali Baba & the Forty Thieves	$ 22
The Shattered Alliance	$ 27
Bug Attack	$ 20
Canyon Climber	$ 20
Shooting Arcade	$ 20
Pacific Coast Highway	$ 20
Clowns & Balloons	$ 20
Ghost Hunter	$ 23
Preppie	$ 20

Rear Guard	$ 17
Lunar Lander	$ 17
War	$ 17
Star Warrior	$ 27
Invasion Orion	$ 17
Dragon's Eye	$ 20
Crush, Crumble & Chomp	$ 20
Jawbreaker	$ 20
Pathfinder	$ 23
Zork I	$ 27
Zork II	$ 27
Action Quest	$ 20
Softporn Adventure	$ 20
Deluxe Invaders	$ 23
Protector	$ 23
Dodge Racer	$ 23
Chicken	$ 23
Nautilus	$ 23
Alien Hell	$ 15
Mar Tesoro	$ 17
Galactic Chase	$ 20
Alien Swarm	$ 23
Intruder	$ 23
Lords of Karma	$ 15
B-1 Nuclear Bomber	$ 12
Rescue at Rigel	$ 20

COMPUTER OUTLET

*** SPECIALS OF THE MONTH ***

ELEPHANT DISKS (BOX)	$ 22
HAYES SMARTMODEM	$209
MOSAIC 32K RAM	$ 99
RAMDISK (128K)	$429
AMDEK COLOR I MONITOR	$309
PERCOM DOUBLE DENSITY DRIVE	$639
NEC 8023A PRINTER	$479
BASIC A +	$ 59
FLIP N' SORT DISKETTE BOX (Holds 50 Diskettes)	$ 21
FLIP-SORT CARTRIDGE BOX (Holds 10 Atari Computer Cartridges)	$ 21
AXIOM GP-100 GRAPHICS PRINTER	$299
AXIOM IMP-4 GRAPHICS PRINTER	$499
MOSAIC 64K RAM	$179
BIT 80 COLUMN BOARD	$289
ALL APX SOFTWARE	15% TO 20% OFF

Computer Outlet

Park Place — Upper Level
1095 E. Twain — (702) 796-0296
Las Vegas, Nevada 89109

Call Toll Free **800-634-6766**
We accept Major Credit Cards
Mon.-Fri. 8 A.M.-6 P.M.
Sat. 9 A.M.-5 P.M.

NEW
Atari

Automated Simulations

Upper Reaches of Apshai (D, C)	$ 15
Curse of Ra (D, C)	$ 15
King Arthur's Heir (D)	$ 20
Escape from Vulcan's Isle (D)	$ 20
Crypt of the Undead (D)	$ 20
The Nightmare (D)	$ 20
Danger in Drindisti (D, C)	$ 15
Armor Assault (D)	$ 27
Monster Maze (CT)	$ 27
Alien Garden (CT)	$ 27
Plattermania (CT)	$ 27

Broderbund

David's Midnight Magic (D)	$ 23
Track Attack (D)	$ 20
Star Blazer (D)	$ 22
Choplifter (D)	$ 23
Deadly Secrets (D)	$ 23
Stellar Shuttle (D, C)	$ 20
Genetic Drift (D, C)	$ 20
Labyrinth (D, C)	$ 20
Serpintine (D)	$ 23
Sea Fox (D)	$ 20

Datasoft

Spell Wizard (D)	$ 53
Sands of Egypt (D)	$ 27
O'Riley's Mine (D, C)	$ 23
Rosen's Brigade (D, C)	$ 23
Fathoms Forth (D)	$ 23

Gebelli

Doctor Goodcode's Cavern (D)	$ 20
Firebird (CT)	$ 34
Embargo (CT)	$ 34

Innovative Design

Pool 400 (CT)	$ 27
Speedway Blast (CT)	$ 27

JV Software

Ghost Encounters (D, C)	$ 20

K-Byte

K-razy Kritters (CT)	$ 34
K-Star Patrol (CT)	$ 34
K-Razy Antiks (CT)	$ 34

L & S Computerware

Crossword Magic (D)	$ 34

Lightning Software

Master Type	$ 27

On-Line

Frogger (D)	$ 23
Ulysses and The Golden Fleece (D)	$ 23
Ultima I (D)	$ 27
Ultima II (D)	$ 39

Roklan Corp.

Gorf	(D) $27, (CT) $30
Wizard of Wor	(D) $27, (CT) $30
Anti Sub Patrol	(D) $20, (C) $15

Sentient

Cyborg (D)	$ 23
Gold Rush (D)	$ 23

Sirius

Space Eggs (D)	$ 20
Sneakers (D)	$ 20
Cyclod (D)	$ 20
Snake Byte (D)	$ 20
Bandits (D)	$ 23
Way Out (D)	$ 27
Fast Eddy (CT)	$ 20
Deadly Duck (CT)	$ 20
World War I (CT)	$ 23
Beanie Bopper (CT)	$ 23

Strategic Simulations

Battle of Shiloh (D, C)	$ 27
Tigers in the Snow (D, C)	$ 27
The Cosmic Balance (D)	$ 27

Big Five Software

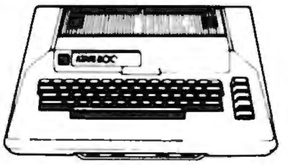
Miner 2049er (CT)	$ 34

Bram Inc.

Attack at EP-CYG-4	(D) $22, (C) $20

COMPUTER OUTLET'S EDUCATIONAL RECOMMENDATIONS

ATARI™



Pre-School

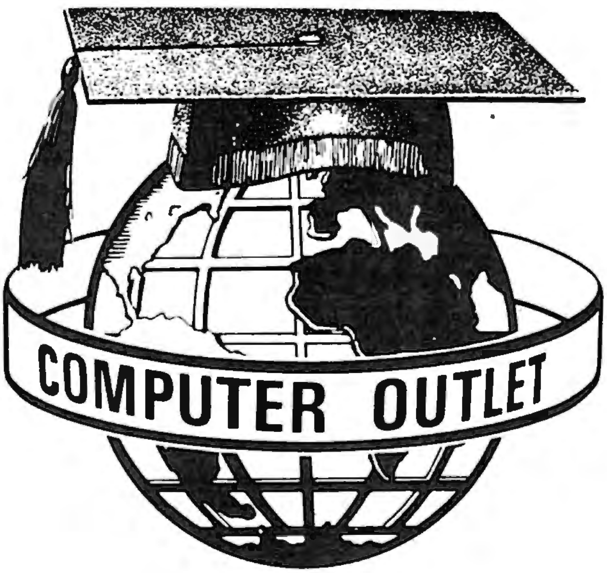
Sammy The Sea Serpent	(C) $13, (D) $19
Oswald and the Golden Key	(C) $13, (D) $19
Pre-School I.Q. Builder	(C) $13, (D) $24
Hodge Podge (D)	$16
My First Alphabet (D)	$26
Ten Little Robots	(C) $13, (D) $15
Basic Math (+, −, *, /) (D)	$19
Basic Math (Add., Sub.) or Mult., Div.) (C)	$10
Alien Counter/Face Flash (C, D)	$26
Jar Game/Chaos (C, D)	$26
Pre-School Fun (Color, Shape, etc.) (C)	$16
Hickory Dickory/ Baa Baa Black Sheep (C)	$25
Humpty Dumpty/Jack and Jill (C)	$25
Counters (C, D)	$19
Facemaker (D)	$23

Math

Video Math Flash Cards (C, D)	$13
Math-Tic-Tac-Toe (C, D)	$13
Calculus Demon (C, D)	$19
Cubbyholes (C, D)	$19
Metric and Problem Solving (D)	$26
Algicalc (C, D)	$19
Polycalc (C, D)	$19
Counters (Ages 3-6) (C, D)	$26
Basic Math (Add., Sub.) (C)	$10
Basic Mach (Mult., Div.) (C)	$10
Basic Math (+, −, *, /) (D)	$19
Ten Little Robots	(C) $13, (D) $15
Compumath-Fractions	(C) $23, (D) $29
Compumath-Decimals	(C) $23, (D) $29
Alien Numbers (C, D)	$23
Math Pak 1 (C, D)	$23
Alien Counter/Face Flash (C, D)	$26
Golf Classic/Compubar (Angles) (C, D)	$26
Jar Games/Chaos (Ages 6-10) (C, D)	$26
Gulp and Arrow Graphics (7-12) (C, D)	$26
Battling Bugs/Concentration (C, D)	$26
Addition With Carrying	(C) $13, (D) $19
Cash Register	(C) $13, (D) $19
Number Series	(C) $13, (D) $19
Quantitative Comparisons	(C) $15, (D) $19
Sky Rescue	(C) $15, (D) $19
Big Math Attack	(C) $17, (D) $22
Math Facts Level II Grade 1-3	(C) $13, (D) $15
Com*putation/ Concentration	(C) $13, (D) $15
Ship's Ahoy (D)	$20

Reading and Language Arts

Letterman (C, D)	$19
My First Alphabet (D)	$26
Wordmaker (C, D)	$19
Spelling Genie (C, D)	$19
Word Search Generator (D)	$19
Compuread	(C) $17, (D) $23
Astroquotes	(C) $13, (D) $19
Memory Builder/ Concentration	(C) $13, (D) $19
Let's Spell (C)	$13
Spelling Builder	(C) $16, (D) $20
Do-It-Yourself Spelling (C)	$16
S.A.T. College Board Prep. (C)	$89
Story Builder/ Word Master	(C) $13, (D) $19
What's Different	(C) $13, (D) $19
Analogies	(C) $13, (D) $19
Vocabulary Builder 1	(C) $13, (D) $19
Vocabulary Builder 2	(C) $13, (D) $19
Mini-Crosswords	(C) $13, (D) $19
Word Scramble Grades 1-4 (C)	$13
Fishing For Homonyms (C)	$13
Hidden Words 4 Levels (C)	$16
Snooper Troops #1 (D)	$32
Snooper Troops #2 (D)	$32
Story Machine (D)	$23
Word Race (D)	$17
Claim to Fame/Sports Derby	$15
Crossword Magic (D)	$34
Alphabet Arcade	(C) $15, (D) $19
Funbunch (D) Elem.	$25
Intermediate	$25
High School (SAT)	$25
Time Bomb	(C) $13, (D) $19



Music

Player Piano (C, D)	$19
Keyboard Organ (C, D)	$19
Musical Computer—Music Tutor (D)	$13
Music 1—Terms and Notation (D)	$26
Advanced Music System (D)	$25
Music Composer (CT)	$25
Jerry White's Music Lessons (C)	$20

Telling Time

Hickory Dickory (C, D)	$13

Social Studies and Geography

Flags of Europe (D)	$19
Presidents of the U.S. (C, D)	$13
Astro Word Search	(C) $13, (D) $19
States and Capitals (C)	$12
European Countries & Capitals (C)	$12
Computer Stocks and Bonds	(C) $12, (D) $15
Elementary Biology (D)	$26
Frogmaster (D)	$19
Starware (D)	$19
Mapware (D)	$19
British Heritage Jigsaw Puzzles	$22
European Scene Jigsaw Puzzles (C)	$22

Programming Techniques

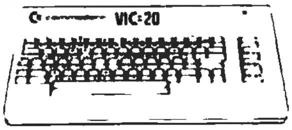
Pilot (Cons. or Educator)	(C) $59, (D) $99
Invitation to Prog. #2 (C)	$22
Invitation to Prog. #3 (C)	$22
Tricky Tutorials—Santa Cruz	
TT #1 Display Lists (C, D)	$17
TT #2 Horiz/Vert. Scrolling (C, D)	$17
TT #3 Page Flipping (C, D)	$17
TT #4 Basics of Animation (C, D)	$17
TT #5 Player Missile Graphics (C, D)	$24
TT #6 Sound and Music (C, D)	$17
TT #7 DOS Utilities (D)	$24

Typing

Master Type (D)	$27
Touch Typing (C)	$19

Foreign Languages

Atari Conversational Languages French, Spanish, German, Italian (C)	$45
Astro Word Search (Specify Spanish or French)	(C) $13, (D) $19



commodore

Pre-School

The Sky Is Falling (CT)	$23
Mole Attack (CT)	$23

Math

Sky Math (C)	$12
Space Division	$12
Bingo Speed Math (CT)	$23
Number Crunch (CT)	$27

*** BOOKS ***

KIDS AND THE ATARI	$18
KIDS AND THE VIC	$18
PROGRAMMERS REF. GUIDE (VIC)	$14
ATARI BASIC	$ 7
ATARI BASIC	$ 8
GAMES FOR THE ATARI	$ 8
DE RE ATARI	$19
ADVENTURE HINT BOOKS	$ 8
6502 ASSEM. LG. PROG.	$16
SOME COMMON BASIC BASIC PROGRAMS	$14
YOUR ATARI COMPUTER	$16
ATARI ASSEMBLER — INMAN	$12
ATARI GAMES AND RECREATION	$14
ATARI PILOT FOR BEGINNERS	$12
VISICALC BOOK — ATARI EDITION	$14
ATARI BASIC — R. L. ALBRECHT	$ 8

Music

VIC Music Composer (CT)	$29

Language Arts

Super Hangman (C)	$14
Simon/Hess (C)	$13
Concentration (C)	$13
Home Babysitting	$23

Social Studies/Science

Visible Solar System	$23
Reaganomics (CT)	$27

Programming Techniques

Intro to Basic Prog. I	$22
Intro to Basic Prog. II	$22
Programmers aid Cart.	$45
Turtle Graphics/Hess (CT)	$29

Computer Outlet

Park Place — Upper Level 1095 E. Twain — (702) 796-0296 Las Vegas, Nevada 89109

Call Toll Free **800-634-6766**

We accept Major Credit Cards Mon.-Fri. 8 A.M.-6 P.M. Sat. 9 A.M.-5 P.M.

NEW ATARI

Odesta Corporation

Chess (D)	$ 45
Checkers (D)	$ 34
Odin (D)	$ 34

Spectravision

Nexar (CT)	$ 24
Cave In (CT)	$ 27
Number Crunch (CT)	$ 27
Reaganomics (CT)	$ 27

Spinnaker

Snooper Troops #1 (D)	$ 30
Snooper Troops #2 (D)	$ 30
Story Machine (D)	$ 23
Face Maker (D)	$ 23

Swifty Software

Haunted Hill	(D) $20, (C) $ 17
Trivia Trek (D)	$ 20
Datalink (D)	$ 27
Space Shuttle (D)	$ 20
Jerry White's Music Lessons (D, C)	$ 20
Swifty Tach Master	(D) $20, (C) $ 17

Synapse

Projector II	(D) $23, (CT) $ 29
Chicken	(D) $23, (CT) $ 29
Slime	(D) $23, (CT) $ 29
Shamus	(D) $23, (CT) $ 29
Picknick Paranoia	(D) $23, (CT) $ 29
Claim Jumper	(D) $23, (CT) $ 25
Acocalypse (D, C)	$ 23
Raptillian (D, C)	$ 23

Tronix

Kid Grid (D, C)	$ 20

Milliken Publishing

Aliencounter (Face Flash (D, C)	$ 26
The Jar Game/Chaos (D, C)	$ 26
Gulp/Arrow Graphics (D, C)	$ 26
Golf Classic/Compubar	$ 26
Frenzy/Flip Flop (D, C)	$ 26
Battling Bugs/Concentration (D, C)	$ 26

Thorn EMI

Submarine Commander (CT)	$ 34
Jumbo Jet Pilot (CT)	$ 34
Soccer (CT)	$ 34
Kickback (CT)	$ 34
Darts (C)	$ 22
Snooker and Billiards (C)	$ 22
Pool (C)	$ 22
Dominoes and Cribbage (C)	$ 22
Humpty Dumpty and Jack and Jill (C)	$ 22
Hickory Dickory Dock and Baa Baa Black Sheep (C)	$ 22
British Heritage Jigsaw Puzzles (C)	$ 22
European Scene Jigsaw Puzzles (C)	$ 22
Owari and Bull and Cow (C)	$ 22

Avalon Hill

Andromeda Conquest	(D) $16, (C) $ 13
GFS Sorceress	(D) $23, (C) $ 21
VC (D)	$ 17
Legionnaire (C)	$ 23

Datamost

Pig Pen (D)	$ 20

Infocom

Starcross (D)	$ 27
Zork III (D)	$ 27

In-Home Software

The Guardian of Gorm	(D) $23, (C) $ 20
Sentinel I	(D) $23, (C) $ 20
Baseball	(D) $23, (C) $ 20

FRIENDLY SERVICE

COMMODORE VIC 20

NEW

Creative Software

Black Hole (CT)	$ 36
Trashman (CT)	$ 36
Astroblitz (CT)	$ 36
City Bomber & Minefield (CT)	$ 20
Apple Panic (CT)	$ 36
Choplifter (CT)	$ 36
Serpentine (CT)	$ 36
Videomania (CT)	$ 36
Terraguard (CT)	$ 36

Thorn EMI

River Rescue (CT)	$ 29
VIC Music Composer CT)	$ 29

Automated Simulations

Rescue at Rigel (C)	$ 20
Ricochet (C)	$ 15
Monster Maze (CT)	$ 27
Sword of Fargoal	$ 27

Spectravision

Cave In (CT)	$ 27
Number Crunch (CT)	$ 27
Reaganomics (CT)	$ 27

Tronix

Galactic Blitz (C)	$ 17
Swarm (C)	$ 20
Sidewinder (C)	$ 20

HES Software

VIC Forth (CT)	$ 45
HES Mon (CT)	$ 29
Turtle Graphics (CT)	$ 29
HES Writer (CT)	$ 29
Aggressor (CT)	$ 29
Shamus (CT)	$ 29
Protector (CT)	$ 33
Synthesound (Music Synthesizer) (CT)	$ 49
Skier (C)	$ 15
Maze of Mikor (C)	$ 15
Tank Wars (C)	$ 15
Victrek (C)	$ 15
Pinball (C)	$ 13
Simon (C)	$ 13
Fuel Pirates (C)	$ 13
Pak Bomber (C)	$ 13
Laser Blitz (C)	$ 15
Tank Trap (C)	$ 15
Concentration (C)	$13
Dam Bomber (C)	$13

COMPUTER OUTLET

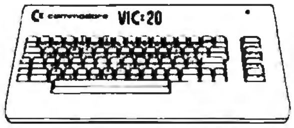
*** SPECIALS OF THE MONTH ***

SLAGH 24K MEMORY BOARD — VIC 20	$ 145
VERBATIM DISKS (BOX)	$ 27
HAYES SMARTMODEM 1200	$ 519
WICO TRACKBALL	$ 49
WICO JOYSTICK	$ 23
WICO JOYSTICK DELUXE	$ 26
WICO FAMOUS RED BALL JOYSTICK	$ 24
CARDCO 6 SLOT EXPANSION MOTHER BOARD	$ 79
CARDCO 3 SLOT EXPANSION MOTHER BOARD	$ 39
CARDRITER LIGHT PEN (VIC 20)	$ 29
USI AMBER MONITOR (12")	$ 169
KIDS AND THE VIC (BOOK)	$ 18
KIDS AND THE ATARI (BOOK)	$ 18
IN-HOME'S ATARI 400 KEYBOARD	$ 99

Computer Outlet

Park Place — Upper Level
1095 E. Twain — (702) 796-0296
Las Vegas, Nevada 89109

Call Toll Free **800-634-6766**
We accept Major Credit Cards
Mon.-Fri. 8 A.M.-6 P.M.
Sat. 9 A.M.-5 P.M.



commodore

VIC 20 . . . . . $179

VIC 1530 Datasette	$ 59
VIC 1540 Disk Drive	$299
VIC 1525 Graphics printer	$309
VIC 1210 3K Memory Expander	$ 34
VIC 1110 8K Memory Expander	$ 52
VIC 1111 16K Memory Expander	$ 92
VIC 1011 RS 232 Terminal Interface	$ 43
VIC 1211 Super Expander	$ 52
VIC 1212 Programmers Aid Cartridge	$ 45
VIC 1213 Vicmon Machine Language Monitor	$ 45
VL 102 Introduction to Basic Programming	$ 21
VT 106A Recreation Pack	$ 45
VT 107 A Home Calculation Pack	$ 45
VT 164 Programmable Character Set	$ 12
VIC 1600 Vicmodem	$ 89
VIC 1311 Joystick	$ 8
VIC 1312 Game Paddles	$ 16
VM Programmers Reference Guide	$ 14

VIC Software

Avenger	$ 23
Superslot	$ 23
Super Alien	$ 23
Jupiter Lander	$ 23
Draw Poker	$ 23
Midnight Drive	$ 23
Radar Rat Race	$ 23
Raid on Fort Knox	$ 23
Sargon II Chess	$ 29
Super Smash	$ 23
Cosmic Cruncher	$ 23
Gorf	$ 29
Omega Race	$ 29
Money Wars	$ 23
Menagerie	$ 23
Cosmic Jailbreak	$ 23
Clowns	$ 23
Garden Wars	$ 23
Sea Wolf	$ 23
Adventureland	$ 29
Pirate Cove	$ 29
Mission Impossible	$ 29
The Count	$ 29
Voodoo Castle	$ 29
The Sky is Falling	$ 23
Mole Attack	$ 23
Bingo Speed Math	$ 23
Home Babysitter	$ 23
Visible Solar System	$ 23
Personal Finance	$ 29

United Microwave

Spiders of Mars (CT)	$ 34
Meteor Run (CT)	$ 34
Amok (C)	$ 17
Alien Blitz (C)	$ 17
Skymath (C)	$ 12
Space Division (C)	$ 12
Super Hangman (C)	$ 14
The Alien (C)	$ 17
3D Maze (C)	$ 12
Kosmic Kamikaze (C)	$ 17
Sub Chase (C)	$ 17
Amok (CT)	$ 27
Renaissance (CT)	$ 34
Alien Blitz (CT)	$ 27
Cloud Burst (CT)	$ 27
Satellites and Meteorites (CT)	$ 34
Outworld (CT)	$ 34

The Computer Outlet is an associate of The Computer Learning Center For Children We are experts in educational technology and can customize educational software curriculums for school districts, individual schools, or for the child at home Please contact us about your software and equipment requirements and feel free to stop by our school in Las Vegas.

We have one of the world's largest educational software inventories featuring our own Computer Learning Center software

Ten Little Robots (ATARI)	$12 95
Pre-School Math (ATARI)	$19 95

PRODUCT MART

C64 FORTH
for the Commodore 64

Fig.-Forth implementation including:

- Full feature screen editor and assembler
- Forth 79 Standard Commands with extensions
- High resolution, 16 color character and sprite graphics
- Full I/O allowing IEEE cartridge and Basic data file compability
- Three voice tone and music synthesizer
- Detailed manual with examples and BASIC-FORTH conversions
- Trace feature for Debugging

$99.95 - Disk Version
(Works with 1540 or 1541 Disk)
or Cassette Version

(Commodore 64 is a trademark of Commodore)

PERFORMANCE MICRO PRODUCTS
770 Dedham Street, S-2
Canton, MA 02021
(617) 828-1209

ATARI® 810
DISK DRIVE ADJUSTMENT KIT

It takes more than a speed adjustment to properly set up an Atari* 810 Disk Drive.

DO IT RIGHT

STARTER KIT $29.00
Test Disk - Cleaner - Tools
Special Oil - Swabs and
Complete Instructions

REPLACEMENT KIT $6.95
Cleaner - Special Oil - Swabs

COD

The Programmers Workshop
5230 Clark Ave., Suite 23
Lakewood, CA 90712
Phone (213) 804-1475

ATARI* is a registered trademark of Warner Communications

UNIQUE & UNUSUAL

ATARI® /APPLE®

SOFTWARE – HARDWARE

You won't believe what the ATARI & APPLE computers can do! We handle some of most EXCITING ATARI-APPLE related products you have ever seen!

CALL OR WRITE FOR FREE CATALOGUE

THE PC & J GRAPHICS CO. INC.
P.O. BOX 108 DEER PARK, NY 11729
516-667-8076

VISA

FREE

Write for your free catalog of

Software and Books

for your
PET, VIC
and
Commodore 64

TIS, inc.
Box 921 Dept. C
Los Alamos, NM 87544

VIC-20

CASSETTE SOFTWARE
FOR THE STANDARD VIC

MODULAR MUSIC _ _ _ $20.00
Easy compose & edit.
Save to tape too!

MICRO-SYNTH_ _ _ _ _ _$15.00
Scales, octaves, envelopes

EL-CALC _ _ _ _ _ _ _ _$15.00
Simplify circuit design

DEMO-VIC _ _ _ _ _ _ _ $10.00
A useful program for
all VIC owners

(plus $1.50 postage & handling)
N.Y.S. Residents add 7% Sales Tax

Dealer Inquiries Invited.

Send check or money order to:

Suburban Electronics
6224 Transit Rd., Depew, N.Y. 14043

*VIC-20 is a reg. trademark of Commodore Business Machines, Inc.

ATARI* OWNERS

Two convenient utilities on a high quality Memorex diskette for only $14.95. And we'll pay postage

D: CAT Put this file on all your disks and you'll have an automatic catalog of all files on your disk, plus you'll be able to run, load, or enter any BASIC program at the push of a key.

D: RENUMBER This program will automatically renumber your BASIC programs at your selected increment. Automatically changes GOTO, GOSUB, and TRAP references, and gives warning on all nonnumeric line numbers.

Send check or money order for $14.95 to:
Family Computers
P.O. Box 1160
Stinnett, TX 79083
(806) 878-2139

*Trademark of Atari, Inc.

EXPANDER
for VIC : 20

***** 5 SLOTS *****

Use VIC MON, 8K Memory, 16K Memory, SUPEREXPANDER, PROGRAMMERS' AID, Other I/O Devices

$55.00

NOT FOR
MULTIPLE ROM GAMES

Ferris Associates
P.O. Box 68421
Indianapolis, IN 46268
(317) 297-0842

Dealer Inquiries Invited
Master Card & VISA accepted.

SOFTWARE SUPER SAVINGS

VIC-20

	TCE	LIST
RENAISSANCE ...	35.99	49.95
SPIDERS OF MARS	35.99	49.95
SATS & METS ...	34.99	49.95
METEOR RUN	34.99	49.95
OUTWORLD	34.99	49.95
MUSIC COMPOSER.	29.99	39.95
RIVER RESCUE ..	29.99	39.95
ALIEN BLITZ ...	26.99	39.95
AMOK	26.99	39.95
CAVE IN	26.99	39.95
MONSTER MAZE ..	26.99	39.95
NUMBER CRUNCH .	26.99	39.95
REGANOMICS	26.99	39.95
SWORD FARGOAL..	26.99	39.95
VICAT (TAPE)...	17.99	24.95
VICHECK (TAPE).	17.99	24.95
LOGICAL GAME(T)	10.99	14.95
VICALC (TAPE)..	10.99	14.95

ALL CARTRIDGE EXCEPT (TAPE)

DATA 20 16K RAM $74.99
EXPANSION CHASSIS $49.99

JOYSTICKS
WICO RED BALL 24.99
STARFIGHTER . 12.99

The Computer Express
☎ (313) 528–1554

P.O. Box 569 D-8
Troy, MI 48099
FREE Catalog

Master Charge/Visa/Checks/Money Orders/COD's Accepted.
Add $2.00 shipping. Michigan residents add 4% sales tax.

Intelligent Software for Commodore Computers

At last, an affordable electronic spreadsheet. **Copycalc** turns your video screen into a window on a matrix of numbers. Cursor around the matrix, enter numbers; the totals reflect the changes. You can save the matrix to disk or tape, or print it on your printer. For $20 ($15 with another program), this program can justify the cost of your Commodore. Requires 6k; version available for standard VIC.

Word Processor Plus was not designed to demonstrate what computers are capable of doing, to be an expensive toy, or to instill awe or fear or even admiration into its user; W/P+ was designed solely to facilitate correspondence, for a wide range of personal and business uses, quickly and easily, with a minimum of training and frustration on the part of its user, and at the least possible cost, both in hardware and software. The most thoroughly tested, useable word processor available at anywhere near the price, for all the Commodore computers (R8-232C version available for VIC and 64); $25 (10k RAM, printer req'd.). Upgrades for old W/P copies (below V3.9) $15.

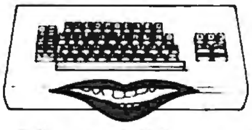
Prices include documentation and shipping; Calif. residents add 6%. Please specify hardware configuration when ordering. Other programs available (sorry, no games).

William Robbins, Box 3745, San Rafael, CA 94912

PERSONAL PERIPHERAL PRODUCTS *presents:*

SPEAKEASY

VIC-20 SPEECH



VIC-20 SPEECH

CARTRIDGE & "VOCAL CHORD" SOFTWARE $54.95

Watch major software houses for products which are decoded for SPEAKEASY

ALSO: BARE BONES BOARDS

16K Ram Expander For VIC-20	Kit	$54.95
	Assembled & Tested	$69.95
3 Slot Expansion Board for VIC-20 Switched and Fused	Kit	$29 95
	Assembled & Tested	$39 95

ADD $2 00 Total Order Handling/Ill Residents Add 6% Sales Tax

PERSONAL PERIPHERAL PRODUCTS
P O BOX 3423
FOX VALLEY MALL
AURORA. IL 60505 • (312) 961-2347

VIC IS A TRADEMARK OF COMMODORE

commodore 64 & Accessories

Write or Call for pricing and complimentary Commodore 64 Memory Map.

Also: C. Itoh, Hayes, Epson, Televideo, Diskettes, Cassettes, etc.

DUKE'S DIGITAL DEN
PO Box 158, Westland, MI 48185
(313)326-6488
5pm 8pm Mon Fri

✶ VIC-20 ✶ GAMEMASTER

4 games on **1** cassette for 5K VIC-20

BACKGAMMON
A great game! Our best seller.

BLACKJACK TUTOR
Not just a game! Teaches best strategy

MAZE-MAN
Munching action. Key or joystick.

CHECKERS
A defensive game.

$29.95

8K BACKGAMMON
4 Levels with Doubling.
$19.95

24hr **Order line: 1(313) 456-8581**
Send check or money order plus 50¢ to.

Visa — RAR-TECH — MC
Box 761, Rochester, Michigan 48063
*VIC-Registered Trademark of Commodore

VIC-20

VIC-20 INTERFACING BLUE BOOK

Did you know that your VIC can be used to control a 99¢ toy motor so effectively that it runs like a precision machine? Or that you can build an accurate digital thermometer using the VIC and four parts costing less than $5?

These and other 18 interfacing projects selected for usefulness, ease of construction and low cost are detailed in the VIC-20 Interfacing Blue Book, a veritable gold mine of practical information on how to build a variety of interfaces for your computer.

Projects include: Connecting VIC to your stereo; Pickproof digital lock; Capacitance meter, Liquid level sensor; Telephone dialer; Voice output; 8K/16K RAM/ROM expansion; 128K RAM expansion; 8-bit precision D/A; 8-bit A/D converter; MX-80 interface and more.

Written by a college professor in a friendly and informative style, the Blue Book gives you theory of operation, schematics, program listings, parts list, construction hints and sources of materials for each one of the 20 projects.

If you want to get the most out of your VIC this book is a must. Cost is $14.95 (less than 75¢ per project!). Price includes postage.

microsignal Dept C
P.O. BOX 22
MILLWOOD NY 10546

VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20

VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20

VIC-20

PROGRAMMING A **VIC-20?**
Beginner or Expert.

PAL®

Programmers Aids and Logs

Can Help YOU!

Look what you get!

- **EZ KEY** Quick Guide to all keys, pokes, reverses, CHR$, set 1 - set 2
- **FULL COLOR** color combination chart
- **EZ GRAPH** graphics programming aid
- **LOTS** of tear-out SCREEN LAYOUT forms and various programming forms and worksheets
- ***BASIC*-LY EZ** condensed basic dictionary
- **SOFTWARE & HINTS** Log Sheets
- **TAPE CASSETTE** Log Book and **MORE!**

EVERYTHING YOU NEED FOR EZ Programming!

Send **$9.95** + $1.50 shipping (CA res. add 6% tax)

Check, Money Order, Bankcard – no C.O.D.'s to:

PM PRODUCTS
4455 Torrance Blvd., #177, Torrance, CA 90503
☆ dealer inquiries invited ☆

Fantastic NEW Programs for your COMMODORE 64

MUSIC MAGIC: The easy and fun way to use your 64's marvelous sound system You can delay the tone, sustain or release it or change the pitch Sound generators in the form of triangle, sawtooth, square waves and white noise are all accessed directly from your keyboard

SPRITE WRITER. A simple means of creating sprite graphics Sprites are moveable, high resolution programmable objects that can be made into nearly any shape With the 64, up to 8 different Sprites can be created as moveable figures for simultaneous display on 3 separate screen levels

A-1 Services
7103 W. Clearwater, H-112
Kennewick, WA 99336
(509) 783-4980 or (509) 783 9566

(Full Service Authorized Commodore Dealer)

Name: ______

Address: ______

City: ______ St.: ____ Zip: ______

•••••• FREE ••••••
Software catalog included with your order.

Music Magic: ____ Tapes @ $19.95 or ____ Disks @ $24.95 ea.

Sprite Writer: ____ Tapes @ $19.95 or ____ Disks @ $24.95 ea.

Or see your Commodore Dealer (Dealer inquiries invited)

VIC-20

SNAKMAN (Just like your favorite arcade game)	$19.95
TUNNEL PATROL (Arcade game)	$12.95
HOME INVENTORY	$12.95
TAPEWORM (Keep track of your records & tapes)	$12.95
TICKERTAPE (Maintain profile of investments)	$16.95
HOME BUDGET (Profile personal income)	$12.95

EMBASSY COMPUTER PRODUCTS
P.O. Box 88
Little Neck, N.Y. 11363

Check or money order. No COD's. N.Y. Residents add 8.25% sales tax. Add. $1.50 for postage and handling.

— DEALER INQUIRIES INVITED —
— PROGRAMMERS WANTED —
VIC Trademark of Commodore

SOFTWARE SUPER SAVINGS
for
Apple-Atari-IBM

	TCE	LIST
DEADLINE	33.99	49.95
SNOOPER TROOPS	31.99	44.95
STARCROSS	26.99	39.95
ULTIMA*	26.99	39.95
WAYOUT*	26.99	39.95
ZORK 1,2 or 3	26.99	39.95
BANDITS*	22.99	34.95
CHOPLIFTER* ..	22.99	34.95
FACE MAKER ...	23.99	34.95
FROGGER	22.99	34.95
POOL 1.5	22.99	34.95
SARGON II* ...	22.99	34.95
STORY MACHINE	23.99	34.95
APPLE PANIC ..	$19.99	29.95
CROSSFIRE		29.95
RASTER BLASTER*		29.95
JAWBREAKER* ..		29.95
SNEAKERS*		29.95
TRACK ATTACK* .		29.95

* APPLE OR ATARI ONLY

JOYSTICKS
WICO RED BALL 24.99
STARFIGHTER . 12.99

ELEPHANT DISKS SSSD $19.99/10

The Computer Express
☎(313) 528–1554

P.O. Box 569 D-6
Troy, MI 48099
FREE Catalog

Master Charge/Visa/Checks/Money Orders/COD's Accepted
Add $2.00 shipping. Michigan residents add 4% sales tax.

Advertisers Index

COMPUTE!

For Fastest Service,
Call Our **Toll-Free**
US Order Line
800-334-0868
In NC call 919-275-9809

My Computer Is:

☐ PET ☐ Apple ☐ Atari ☐ OSI ☐ VIC-20 ☐ TI 99/4A ☐ Sinclair ZX-81
☐ Radio Shack Color Computer ☐ Other ________ ☐ Don't yet have one...

☐ $20.00 One Year US Subscription
☐ $36.00 Two Year US Subscription
☐ $54.00 Three Year US Subscription

(Readers outside of the US, please see our foreign readers subscription card or inquire for rates).

Name ____________________
Address ____________________
City ________ State ________ Zip ________
☐ Payment Enclosed ☐ VISA ☐ Bill me
☐ MasterCard ☐ American Express
Account No. ____________ Expires ____/____

332101

COMPUTE!

Foreign Readers

Subscription rates outside the US:

☐ $25.00 Canada
☐ $38.00 Europe, Australia/Air Delivery
☐ $48.00 Middle East/Air Delivery
☐ $68.00 Elsewhere/Air Delivery
☐ $25.00 International Surface Mail (lengthy, unreliable delivery)

Name ____________________
Address ____________________
City ________ Postal Code ________
Country ____________________

Payment must accompany this card.
Payment in US Funds drawn on a US Bank; International Money Order; or charge card: ☐ VISA ☐ MasterCard ☐ American Express
Account No. ____________ Expires ____/____

332101

COMPUTE! Books

Quan.	Title	Price		S/H	Total
____	The Beginner's Guide to Buying A Personal Computer	$3.95	+	$1.00*	____
____	COMPUTE!'s First Book of Atari	12.95	+	2.00*	
____	Inside Atari DOS	19.95	+	2.00*	____
____	COMPUTE!'s First Book of PET/CBM	12.95	+	2.00*	____
____	Programming the PET/CBM	24.95	+	3.00**	____
____	Every Kid's First Book of Robots and Computers	4.95	+	1.00*	____
____	COMPUTE!'s First Book of VIC	12.95	+	2.00*	
____	COMPUTE!'s Second Book of Atari	12.95	+	2.00*	
____	COMPUTE!'s First Book of Atari Graphics	12.95	+	2.00*	____
____	Mapping The Atari	14.95	+	2.00*	____

For air mail outside US: *$5.00 / **$10.00

For Fastest Service
Call Our **TOLL FREE**
US Order Line
800-334-0868
In NC call 919-275-9809

All orders must be prepaid (money order, check, or charge). All payments must be in US funds. NC residents add 4% sales tax.

☐ Payment enclosed
Please charge my: ☐ VISA ☐ MC ☐ Am. Express
Acc't No. ____________
Expires ____/____

Name ____________________
Address ____________________
City ________ State ________ Zip ________
Country ____________________
Allow 4-5 weeks for delivery.

2 3 4 5 6 7 8 9 10 11 12

The Editor's Feedback:

Computer: ☐ Pet ☐ Apple ☐ Atari ☐ OSI ☐ VIC-20 ☐ TI 99/4A ☐ Sinclair ZX-81
☐ Radio Shack Color Computer ☐ Other ________ ☐ Don't yet have one...

Are you a **COMPUTE!** Subscriber? ☐ Yes ☐ No I would like to see:

☐ More ☐ Fewer Specific applications programs.
☐ More ☐ Fewer BASIC programs.
☐ More ☐ Fewer Machine language programs.
☐ More ☐ Fewer Tutorials.
☐ More ☐ Fewer Educational articles.
☐ More ☐ Fewer Detailed explanations of programs.
☐ More ☐ Fewer Games.
☐ More ☐ Fewer Reviews of game software.
☐ More ☐ Fewer Reviews of business software.
☐ More ☐ Fewer Reviews of educational software.
☐ More ☐ Fewer Reviews of hardware.

What do you like best about **COMPUTE!**?

What do you like least?

2 3 4 5 6 7 8 9 10 11 12

Place
Stamp
Here

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

Place
Stamp
Here

COMPUTE! Magazine
Post Office Box 5406
Greensboro, NC 27403

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE! Books
Post Office Box 5406
Greensboro, NC 27403

COMPUTE!'s FREE Reader Information Service

Use these cards to request FREE information about the products advertised in this issue. Clearly print or type your full name and address. Only one card should be used per person. Circle the numbers that correspond to the key number appearing in the advertisers index.

Send in the card and the advertisers will receive your inquiry. Although every effort is made to insure that only advertisers wishing to provide product information have reader service numbers, **COMPUTE!** cannot be responsible if advertisers do not provide literature to readers.

Please use these cards *only* for subscribing or for requesting product information. Editorial and customer service inquiries should be addressed to: **COMPUTE!**, P.O. Box 5406, Greensboro, NC 27403. Check the expiration date on the card to insure proper handling.

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 4/30/83 C0283

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 4/30/83 C0283

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 4/30/83 C0283

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

Introduce A Friend To COMPUTE!
Save $10.00 Off The Newsstand Price

One year, 12 issue subscriptions are $20.00 in the U.S., $25.00 (U.S. funds) in Canada.

PLEASE PRINT.

Please charge my

☐ VISA ☐ MasterCard ☐ American Express

Acc't No

Exp.

YOUR NAME

ADDRESS

CITY

STATE ZIP

$ payment enclosed ☐ Bill me later

Please enter my ☐ RENEWAL ☐ NEW SUBSCRIPTION at the same time

GIFT TO

ADDRESS

CITY

STATE ZIP

☐ Renewal ☐ New subscription

SIGN CARD

GIFT TO

ADDRESS

CITY

STATE ZIP

☐ Renewal ☐ New subscription

SIGN CARD

632101

Introduce A Friend To COMPUTE!
Save $10.00 Off The Newsstand Price

One year, 12 issue subscriptions are $20.00 in the U.S., $25.00 (U.S. funds) in Canada.

PLEASE PRINT.

Please charge my

☐ VISA ☐ MasterCard ☐ American Express

Acc't No

Exp.

YOUR NAME

ADDRESS

CITY

STATE ZIP

$ payment enclosed ☐ Bill me later

Please enter my ☐ RENEWAL ☐ NEW SUBSCRIPTION at the same time

GIFT TO

ADDRESS

CITY

STATE ZIP

☐ Renewal ☐ New subscription

SIGN CARD

GIFT TO

ADDRESS

CITY

STATE ZIP

☐ Renewal ☐ New subscription

SIGN CARD

632101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 914
Farmingdale, NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 914
Farmingdale, NY 11737

BYTE BOOK CLUB

Membership Order Card

Please enroll me as a member and send me the three choices I have listed below. Bill me only $3.00, plus local tax, postage and handling. I agree to purchase a minimum of three additional books during my first year as outlined under the Club plan described in this ad. Membership in the club is cancellable by me any time after the three book purchase requirement has been fulfilled. A shipping and handling charge is added to all shipments.

Indicate below by number the books you want. A few expensive books (noted in the descriptions) count as more than one choice.

Name ______________________________

Address/Apt. # ______________________________

City, State, Zip ______________________________

Corporate Affiliation ______________________________

This order subject to acceptance by McGraw-Hill. All prices subject to change without notice. Offer good only to new members. Orders from outside the U.S. cannot be accepted.

PRINTED IN U.S.A. Compute! **P39618**

BYTE BOOK CLUB

Membership Order Card

Please enroll me as a member and send me the three choices I have listed below. Bill me only $3.00, plus local tax, postage and handling. I agree to purchase a minimum of three additional books during my first year as outlined under the Club plan described in this ad. Membership in the club is cancellable by me any time after the three book purchase requirement has been fulfilled. A shipping and handling charge is added to all shipments.

Indicate below by number the books you want. A few expensive books (noted in the descriptions) count as more than one choice.

Name ______________________________

Address/Apt. # ______________________________

City, State, Zip ______________________________

Corporate Affiliation ______________________________

This order subject to acceptance by McGraw-Hill. All prices subject to change without notice. Offer good only to new members. Orders from outside the U.S. cannot be accepted.

PRINTED IN U.S.A. Compute! P39619

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO 42 HIGHTSTOWN, N.J. 08520

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE BOOK CLUB
P.O. Box 582
Hightstown, New Jersey 08520

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO 42 HIGHTSTOWN, N.J. 08520

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE BOOK CLUB
P.O. Box 582
Hightstown, New Jersey 08520

WIDEN YOUR CHILD'S WORLD WITH THIS INTRODUCTORY OFFERING.

10 DAY MONEY-BACK GUARANTEE.

Now, until May 31, 1983, when ordering a lesson at $45.00, you may order additional lessons for just $35.00 each. (Additional disk is included with each lesson at no additional charge.)

Mail this form, or call toll-free 800/233-3784. (In California, call 800/233-3785.)

Apple* is a trademark of Apple Computer, Inc.
Atari* is a registered trademark of Atari, Inc.
TI* is a registered trademark of Texas Instruments.

Warranty available free from the Control Data Publishing Co., 4455 Eastgate Mall, San Diego, CA 92121.

BEFORE ORDERING: CHECK TO MAKE SURE YOUR EQUIPMENT MEETS THESE REQUIREMENTS.

	Apple II PLUS	Atari 800	TI 99/4A
Memory	48K	48K	48K
No. of drives required:	1 disk and controller	1 disk and controller	1 disk and controller
Operating System:	D.O.S. 3.3	D.O.S. 2	PLATO Interpreter Cartridge*
Will display on any color or b/w monitor or TV compatible with your microcomputer listed.			

*PLATO Interpreter Cartridge may be ordered directly with the order form below. Only one per TI 99/4A machine is needed.

CONTROL DATA PUBLISHING CO., P.O. Box 261127, San Diego, CA 92126

SHIP TO: (Please Print)

Name____________________________________

Address____________________________________

City____________________ State________ Zip________

☐ Payment enclosed (Check or money order only. Make payable to Control Data Publishing Co.).

☐ Mastercharge ☐ VISA ☐ American Express ☐ Diners Club

Card Number |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| Expiration Date________

Your signature____________________ Phone____________

INTRODUCTORY PRICES: One lesson $45.00. Each additional lesson $35.00.

Price for order . . . . $________

Calif. Residents: add 6% sales tax. . . . . $________

Add $2 shipping and handling. . . . . $ 2.00

TOTAL PRICE: . . . . $________

☐ Include PLATO Interpreter Cartridge for my TI 99/4A. Price $50.00.

☐ Please send information on ____________________ lesson(s).

☐ Please send ________ copies of your courseware catalog.

Please complete the following: (Indicate computer for which you are ordering courseware.)

APPLE II PLUS ☐ ATARI 800 ☐ TI 99/4A ☐

Quantity	Title (see course description for skill level)
	Basic Number Facts
	Whole Numbers
	Decimals
	Fractions
	Physics—Elementary Mechanics
	French Vocabulary Builder
	German Vocabulary Builder
	Spanish Vocabulary Builder
	Computer Literacy Introduction

Allow 3-5 weeks for delivery

Available on APPLE II PLUS only

Quantity	Title (see course description for skill level)
	French—Travel Words
	German—Travel Words
	Spanish—Travel Words
	French—Shopping Words
	German—Shopping Words
	Spanish—Shopping Words
	French—Classroom Words
	German—Classroom Words
	Spanish—Classroom Words

Available March 30. Allow 3-5 weeks for delivery

If not completely satisfied, you may return all lesson material within 10 days of receipt for a refund. All orders subject to acceptance. This introductory offering expires May 31, 1983.

Control Data Publishing Company supplies this courseware under a personal license agreement rather than for sale. Customers obtain the right to possess and use PLATO courseware by paying the prices specified and agreeing to the terms and conditions of the license agreement contained in the package.

PLATO WIDENS YOUR CHILD'S WORLD.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

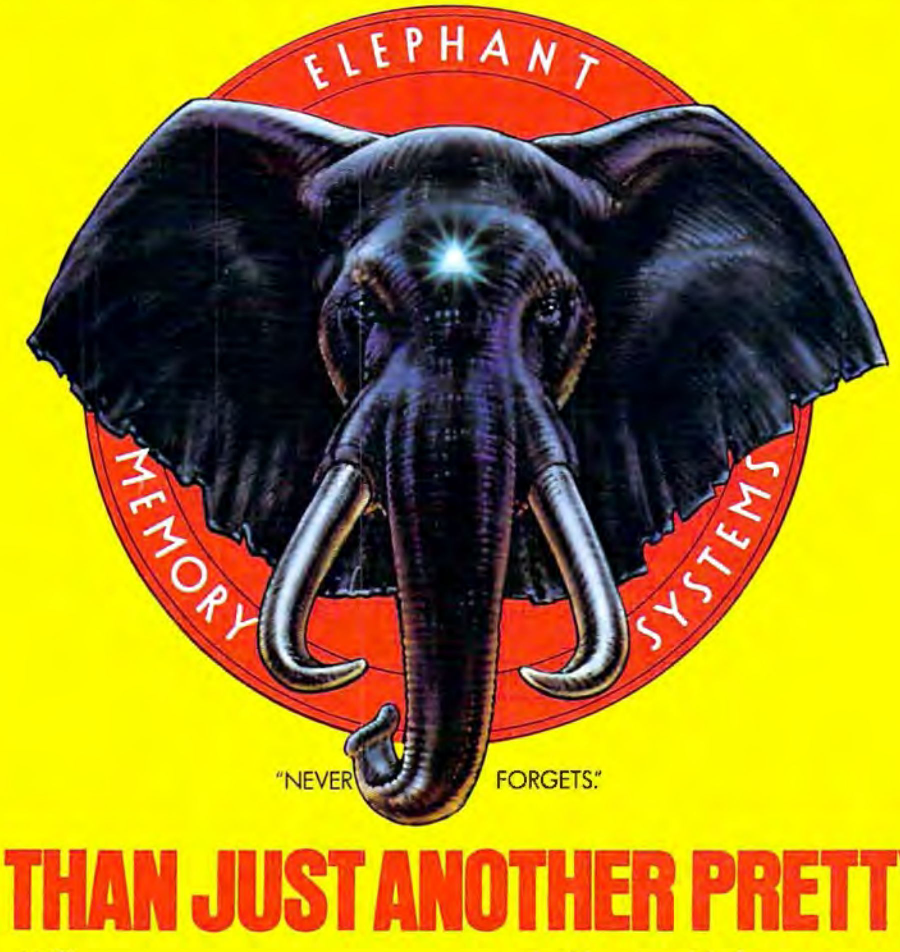
BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 200108 SAN DIEGO, CA

Postage will be paid by addressee

CONTROL DATA PUBLISHING CO.
P.O. Box 261127
San Diego, CA 92126

REMEMBER:



MORE THAN JUST ANOTHER PRETTY FACE.

Says who? Says ANSI.

Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

But just who is "subcommittee X3B8" to issue such pronouncements?

They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

In fact, if you'd like a copy of this formidable document, for free, just let us know and we'll send you one. Because once you know what it takes to make an Elephant for ANSI . . .

We think you'll want us to make some Elephants for you.

ELEPHANT.™ HEAVY DUTY DISKS.

For a free poster-size portrait of our powerful pachyderm, please write us.
Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

WHEN WE ANNOUNCED THE COMMODORE 64 FOR $595, OUR COMPETITORS SAID WE COULDN'T DO IT.

THAT'S BECAUSE THEY COULDN'T DO IT.

The reason is that, unlike our competitors, we make our own IC chips. *Plus* all the parts of the computer they go into.

So Commodore can get more advanced computers to market sooner than anybody else. And we can get them there for a lot less money.

WHAT PRICE POWER?

For your $595,* the Commodore 64™ gives you a built-in user memory of 64K. This is hundreds of dollars less than computers of comparable power.

Lest you think that the Commodore 64 is some stripped-down loss leader, a look at its available peripherals and interfaces will quickly convince you otherwise.

SOFTWARE THAT WORKS HARD.

The supply of software for the Commodore 64 will be extensive. And with the optional plug-in Z80 microprocessor, the Commodore 64 can accommodate the enormous amount of software available in CP/M.®

Add in the number of programs available in BASIC and you'll find that there are virtually no applications, from word processing to spreadsheets, that the Commodore 64 can't handle with the greatest of ease.

PERIPHERALS WITH VISION.

The Commodore 64 interfaces with all the peripherals you could want for total personal computing: disk drives, printers and a telephone modem that's about $100, including a free hour's access to some of the more popular computer information services. Including Commodore's own Information Network for users.

RUN YOUR BUSINESS BY DAY. SAVE THE EARTH BY NIGHT.

At the end of a business day, the Commodore 64 can go into your briefcase and ride home with you for an evening's fun and games.

Because of its superior video quality (320x200 pixel resolution, 16 available colors and 3D Sprite graphics), the Commodore 64 surpasses the best of the video game machines on the market. Yet, because it's such a powerful computer, it allows you to invent game programs that a game machine will never be able to play; as well as enjoy Commodore's own video game cartridges.

ATTACK, DECAY, SUSTAIN, RELEASE.

If you're a musicologist, you already know what an ADSR (attack, decay, sustain, release) envelope is. If you're not, you can learn this and much more about music with the Commodore 64's music synthesizing features.

It's a full-scale compositional tool. Besides a programmable ADSR envelope generator, it has 3 voices (each with a 9-octave range) and 4 waveforms for truly sophisticated composition and playback—through your home audio system, if you wish. It has sound quality you'll find only on separate, music-only synthesizers. And graphics and storage ability you won't find on any separate synthesizer.

DON'T WAIT.

The predictable effect of advanced technology is that it produces less expensive, more capable products the longer you wait.

If you've been waiting for this to happen to personal computers, your wait is over.

See the Commodore 64 soon at your local Commodore Computer dealer and compare it with the best the competition has to offer.

You can bet that's what the competition will be doing.

Commodore Business Machines
Personal Systems Division
P.O. Box 500, Conshohocken, Pennsylvania 19428

Please send me more information on the Commodore 64™

Name____________________Title____________

Company________________________________

Address________________________________

City____________________State____________

Zip________________Phone________________

commodore
COMPUTER

CPT-2

**Manufacturer's Suggested Retail Price July 1, 1982. Disk drives and printers are not included in prices. The 64's price may change without notice.*

CP/M® is a registered trademark of Digital Research, Inc.