How To Select Your First Home Computer

COMPUTE!

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The Leading Magazine Of Home, Educational, And Recreational Computing

Special Home Applications Issue

How COMPUTE! Readers Use Their Computers

Computers In The Home: 1990

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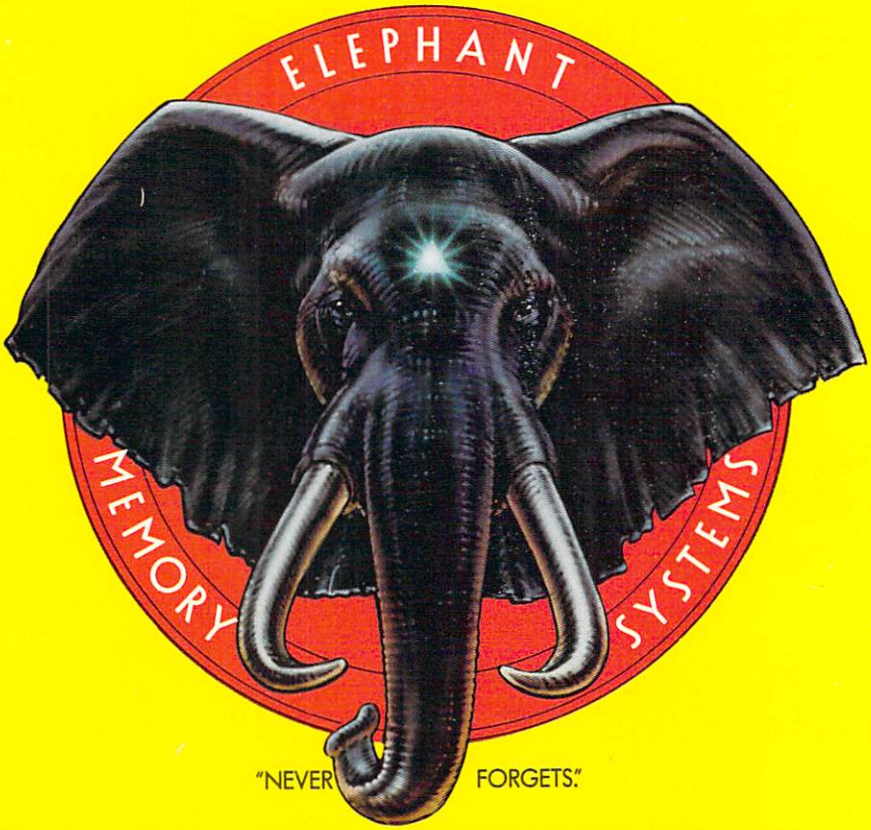

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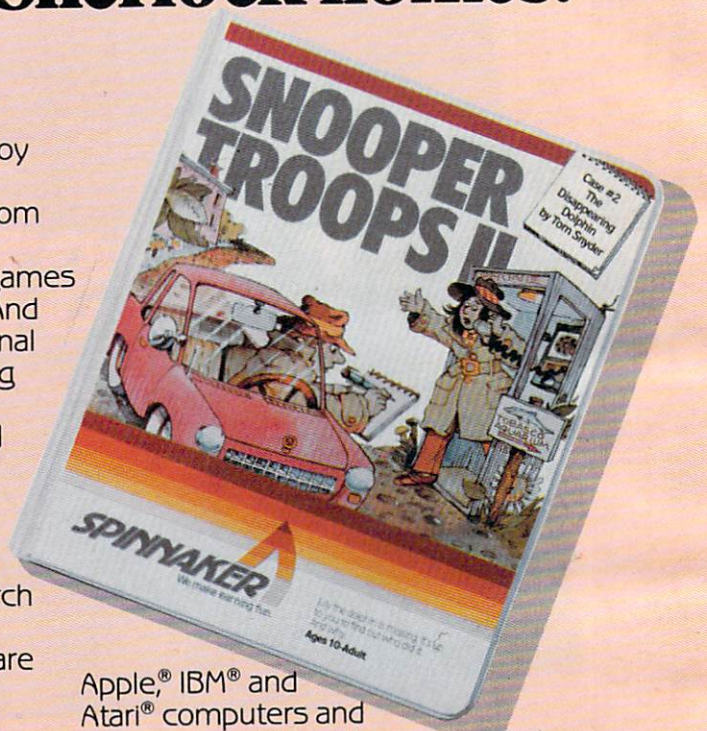
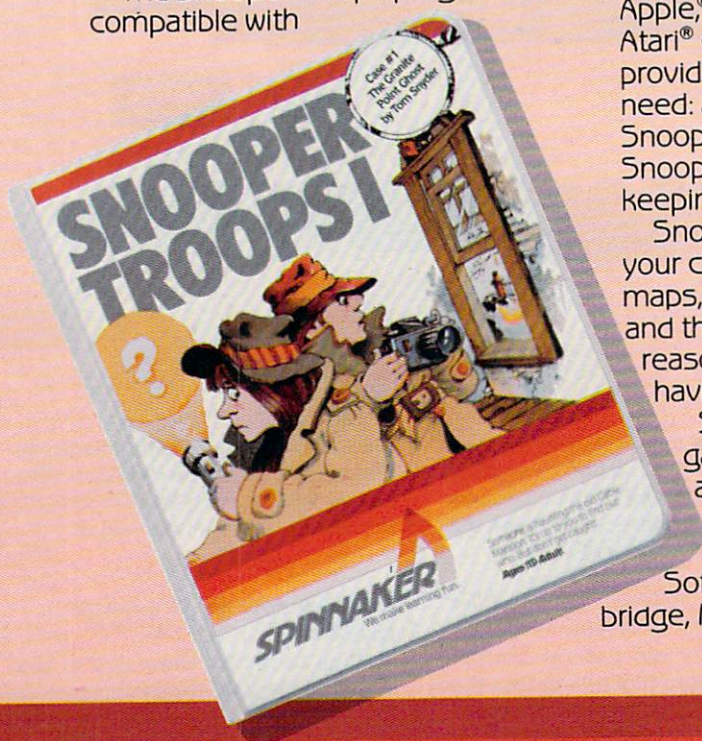
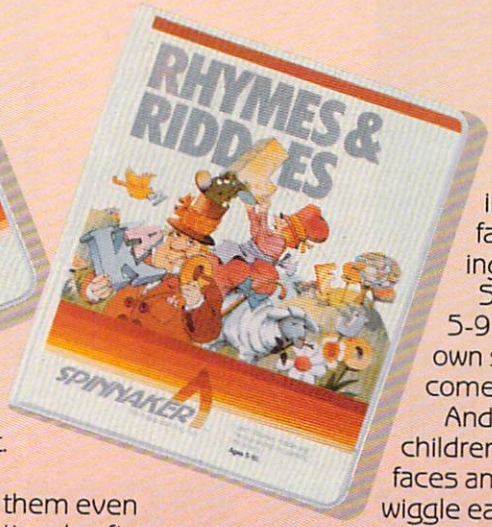




Snooper Troops detective games help your children learn to take notes, draw maps, organize and classify information and they help develop vocabulary and reasoning skills. All while your kids are having a good time.

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.



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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.

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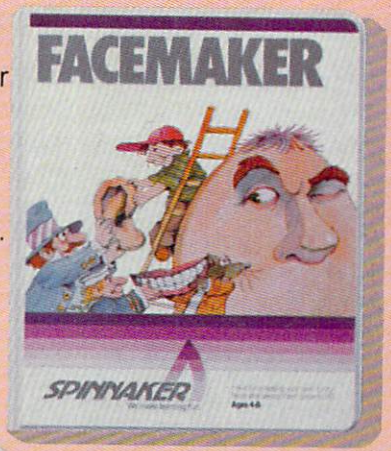

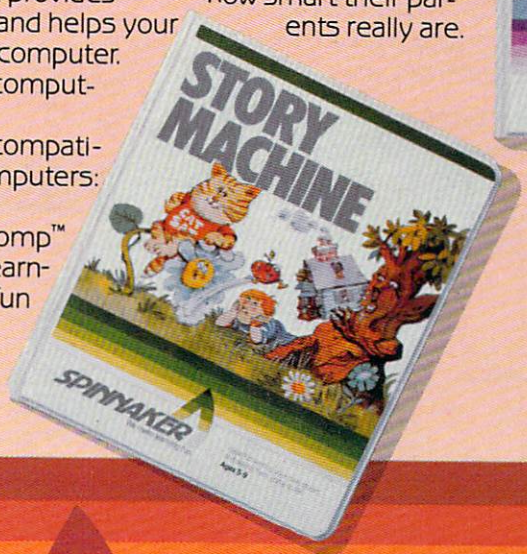

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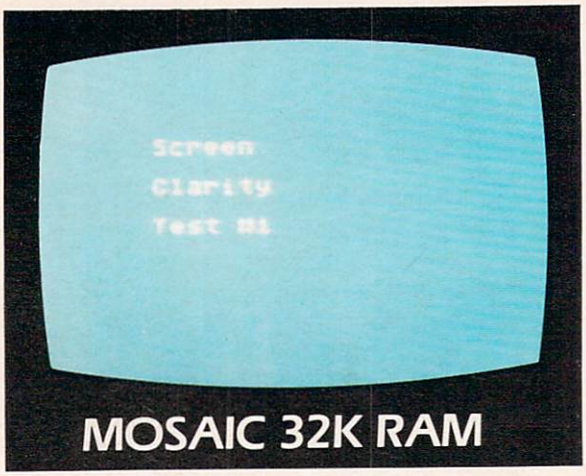

THE SCREEN CLARITY TEST

YOU CAN SEE THE MOSAIC DIFFERENCE

WHAT THE EXPERTS HAD TO SAY

A.N.A.L.O.G. 400/800 MAGAZINE said in a 32K RAM board comparison test: "The Mosaic 32K RAM showed no sign of interference and gave the best screen clarity" and "Mosaic uses what we feel are the highest quality components which may improve reliability".

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December 1982 Vol. 4, No. 12

FEATURES

EDUCATION AND RECREATION

REVIEWS

COLUMNS AND DEPARTMENTS

THE JOURNAL

NOTE: Consult Listing Conventions 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.

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The Editor's notes...

Robert Lock, Publisher/Editor-In-Chief

More On The IBM Personal/Home Computer

It appears, according to our sources, that IBM is preparing a $500 level entry into the home market. With the rumored introduction still at least six months away, the "Home Computer" is expected to have full color and graphics capability, as well as the ability to be upgraded to run IBM PC (Personal Computer) programs. Our impression is that now that IBM has had a successful taste of this market with their PC, they're anxious to move quickly into broadening their market share. The main thrust of the new computer, suggested one source, is to compete with both VIC-20 type graphics and the power of an Apple.

How COMPUTE! Readers Use Their Computers

"Those things aren't good for anything but playing games...," "What can you do with them if you're not a programmer?", "Etc...." We thought it appropriate, in this home applications issue, to find out how our readers use their computers. We randomly selected subscriber names from all over North America, and Tom Halfhill, our Features Editor, spent several days, nights, and a few weekends tracking down **COMPUTE!** readers. Many, not surprisingly, interrupted their computing to talk with Tom. The article makes interesting reading, and we welcome your thoughts on the use of your computer at home.

David Thornburg, our monthly author of "Friends of the Turtle" and "Computers and Society" columns, has been addressing philosophical problems in C&S in **COMPUTE!** since early 1980. Several points are raised in Tom's article that will be of increasing interest to parents and children using computers in the home. Let us know your feelings on the parent/child/computer interaction, and we'll pull in the comments of David, Tom, and Fred D'Ignazio and present a forum article in a few months. Another relevant topic is Fred's column in this issue, "The World Inside The Computer." We predict some thoughtful reader feedback on sex role stereotyping and children with computers.

A Bang And A (Small) Whimper

The Commodore 64, shipping 10,000 to 12,000 units in its first two weeks of production, was recently slowed down for some apparent ROM upgrades and other cosmetic fixes. We hear that several hundred of the very first ones were involved in a recall to fix a firmware bug. Sources indicate the 64 is now backlogged to the tune of tens of thousands of units, and that production won't be close to demand until capacity is drastically increased early in '83. The Commodore MAX Machine, originally scheduled for a fall introduction, will be released in early spring. The price for the game machine/computer will be revised from the original $180 or so to the low $100's. This change obviously reflects the fact that, since announcement of the MAX, the price of the VIC-20 has plunged from $299.95 to the level originally intended for the MAX.

Tooting Our Horn

You'll recall that our October issue, a scant two months ago, broke the magic 100,000 press run barrier. Not only did we break it, we literally crashed through it! For purposes of dealer reorders, we had to declare the October issue sold out on October 4. November press run bumped to 118,000, and this issue hits the 130,000 mark. 500,000, here we come. A recent survey of our new subscribers indicated that 87% of you have one or more friends you expect will purchase their first personal computers within six months. Introduce them to **COMPUTE!** while they're at it.

In the November Micro World Electronix advertisement, the price of the "System 310" appeared incorrectly. The actual price of the "System 310" is $1195. We apologize for any inconvenience this may have caused our readers or Micro World Electronix.

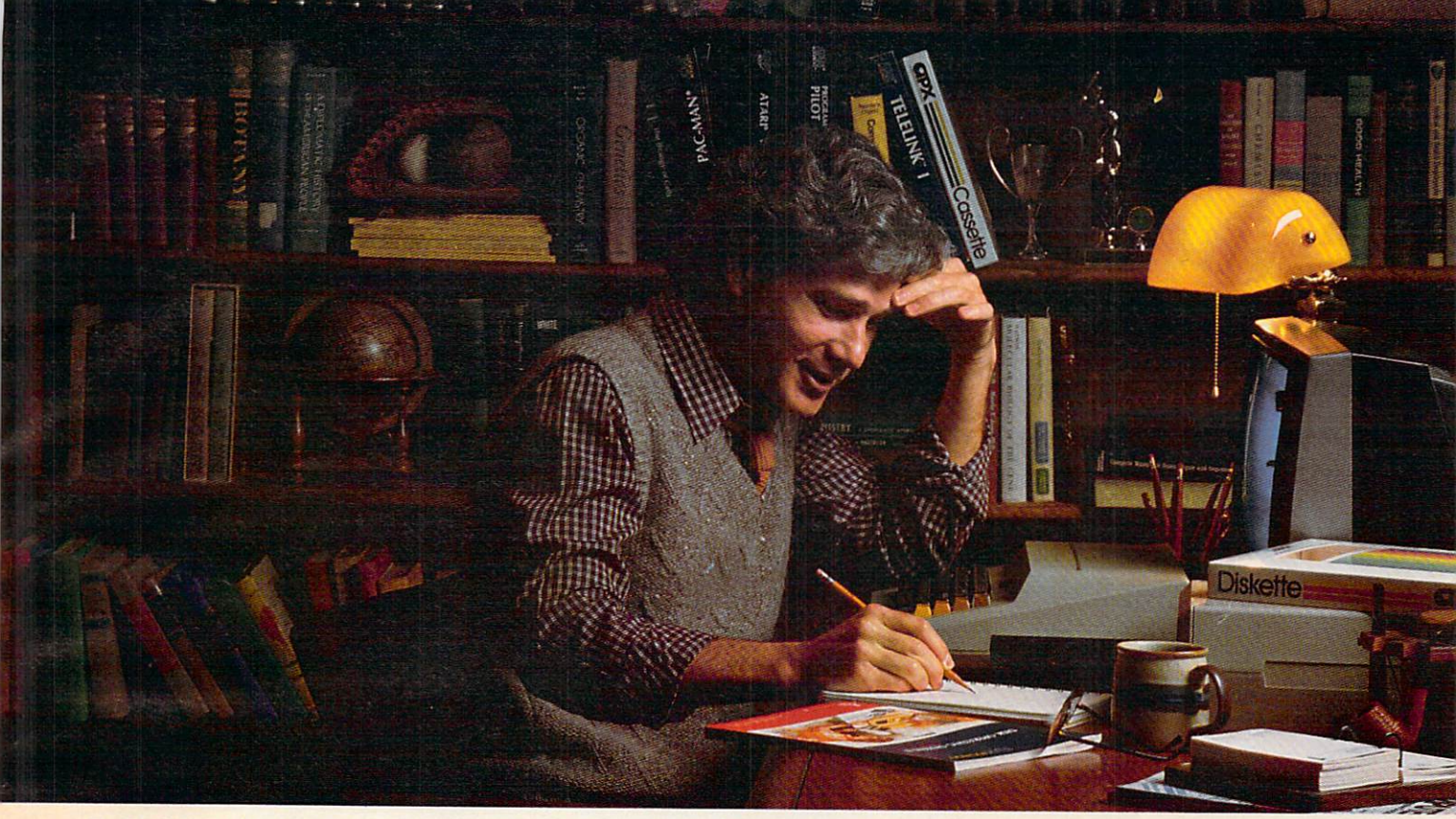

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Fig-FORTH*—For specialized programming needs, such as educational or game applications, ATARI Fig-FORTH is uniquely effective. Fig-FORTH combines power and simplicity in an efficient 10K size, with characteristics of an interpreter and the speed of machine language code.

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ATARI Assembler Editor—An excellent tool to assist the assembler-programmer in creating, editing and debugging assembly programs.

PILOT—ATARI PILOT is an exceptional learning language, with built-in "turtle" graphics to let you create spectacular designs and pictures with very short programs. Simple one or two-letter commands allow you to create a dialogue with the computer. And a single "match" command can perform complex text evaluation and pattern-matching instantly.

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ATARI is constantly developing new ways to help you get more out of your ATARI 800 Home Computer. So watch for more innovative and exciting programming languages from ATARI in the future.

For more information, write to ATARI, Inc., Dept. C4Z, P.O. Box 16525, Denver, CO 80216.

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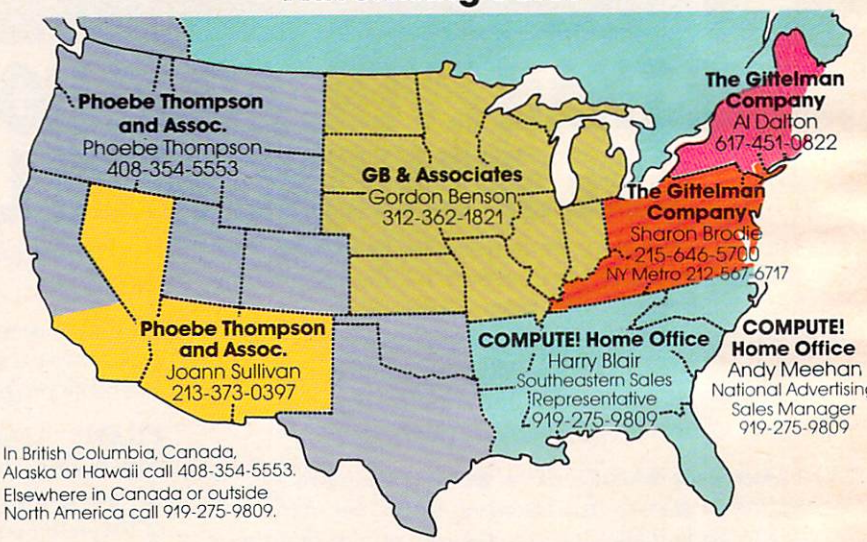

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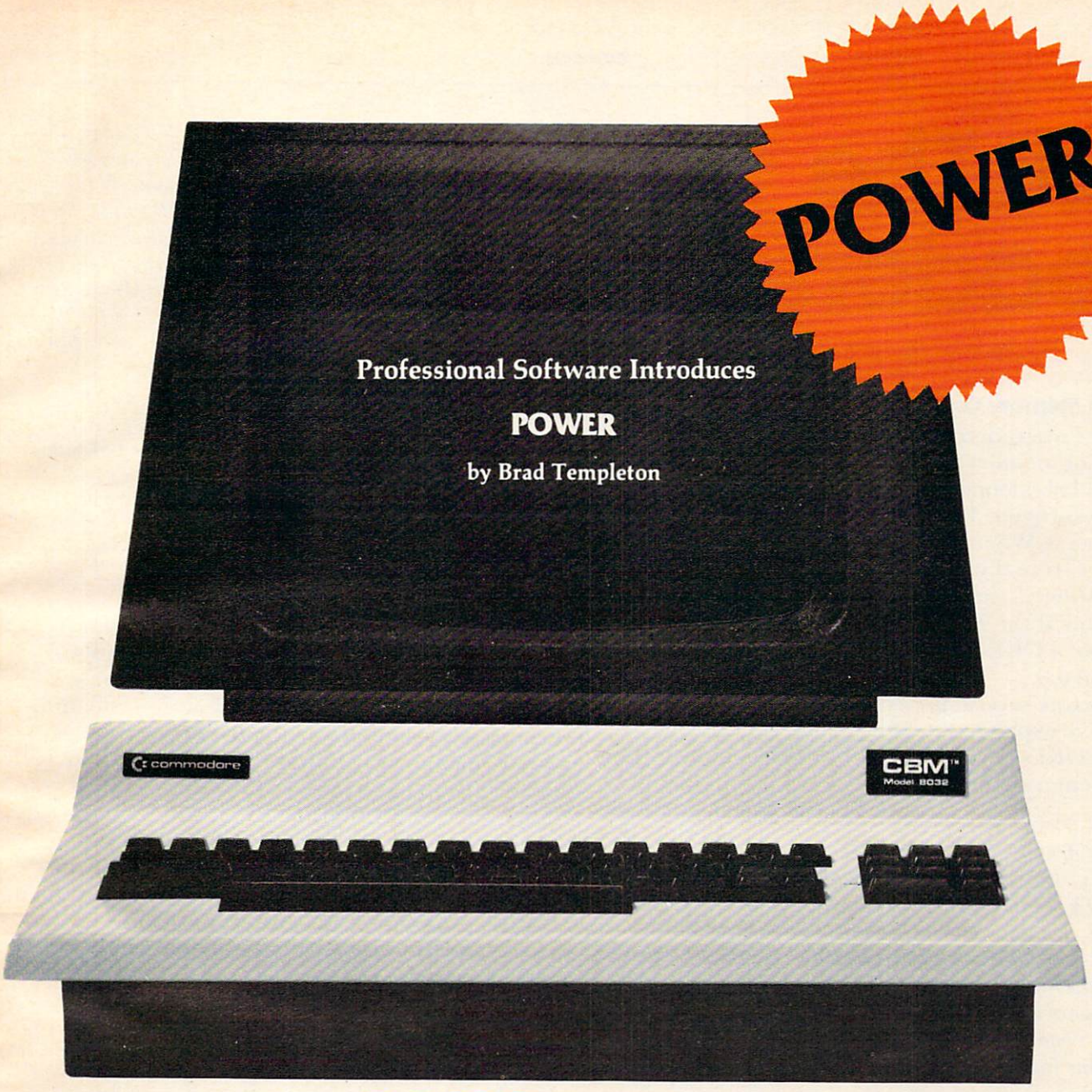

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Ask The Readers

The Editors And Readers of COMPUTE!

Screen Memory On The Atari

Before I upgraded my Atari 400 (I went from 16K to 48K of memory), I was able to use a whole set of POKEs I accidentally found one time: POKE 15424 to POKE 16383. These are X,Y positions in Graphics 0. When accompanied by the character number from the Internal Character Set, p. 55, *User's Manual*, they would produce the chosen character at the X,Y location on screen. For example, POKE 15424,64 would put a heart at position 0,0.

I wrote several programs which used this, but since I've expanded to 48K memory, I can't get these POKEs any more. Did I sacrifice them to the new memory somehow?

Richard Fleagle

You accidentally came upon screen memory. This section of your memory holds all the data necessary to display text on the TV. If you change the contents of this memory with POKEs, you automatically change the display.

Screen memory is always found at the "top" of memory, at the highest addresses. When you upgraded and added more memory, the screen memory zone relocated itself to remain on the top. Fortunately, you can always determine just where screen memory is on an Atari with:

```
SCREEN = PEEK (88) + 256 * PEEK (89)
```

On a 40 or 48K Atari, you should get back 40960 as the value for the variable SCREEN. Using that formula will insure that your programs will run correctly on any Atari.

Color Computer Maps

Possibly some of your readers can help me out. I purchased a TRS-80 Color Computer with Extended BASIC and an assembler, thinking I could come up with some simple game for myself and family. Then I found out that the addresses of even the most simple ROM subroutines are not available. A letter to TRS-80 customer service was not very fruitful either. They said they were not allowed to give that information out.

Such information is available to Atari owners, PET owners and others. Can someone help me out or tell me where to get the information?

John Gee

When a new computer comes out, it generally takes some time before a full map of its BASIC becomes available. **COMPUTE!** *has printed many such maps and will continue to be a source of these most useful guides. Because the Color Computer uses a version of the popular Microsoft BASIC, you can get an idea of what to expect by looking at a published map of Commodore or Apple Microsoft.*

Though the task of mapping BASIC is not for the novice or for the impatient, there are some BASIC programs which can assist in pointing to important subroutines and in identifying zero page usage. For a thorough discussion of these techniques, and the BASIC programs themselves, see "Mapping Machine Language," a two-part series, which began in the July 1982 issue of **COMPUTE!**.

VIC Soft Memory Recovery

Your "Ask The Readers" article on the Super Expander Cartridge for the VIC, in the August **COMPUTE!** issue, was great information for me.

Now I have some information for William D. Collins. He said in his article the only way to get "your" memory back after typing RUN/STOP and RESTORE is to type SYS 64802; this is fine if you don't want your program. But if you want to keep your program, all you have to do is PRESS the "F1" key then 4 and RETURN. Doing this you disable the S.E.C., which has 3K of RAM for use in BASIC programs if the graphics are not called too.

I hope this information will help him as much as it helped me.

John Cresswell

Reader Walter Dudek sent in an alternative way to recover memory non-destructively. He points out that Graphics mode 4 can be put at the end of a program, or in a short routine to use while writing or debugging a program:

```
2000 END
2001 GRAPHIC 2
2002 GRAPHIC 4
```

Then just RUN 2001 to return lost memory.

Autorun Atari

How can you put *Autorun* on a disk to run BASIC programs? Can a BASIC program be saved as an AUTORUN.SYS that will boot up into RAM when the power is turned on? Could you help with an explanation? Or cover this subject in an article?

Jim Givens

For a tutorial article and demonstration, see "Automate Your Atari" in next month's **COMPUTE!**.

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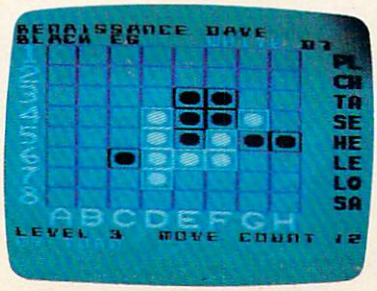

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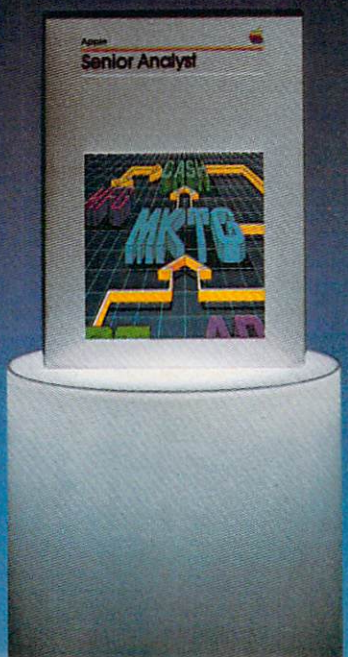

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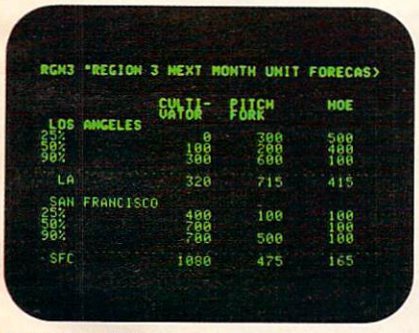

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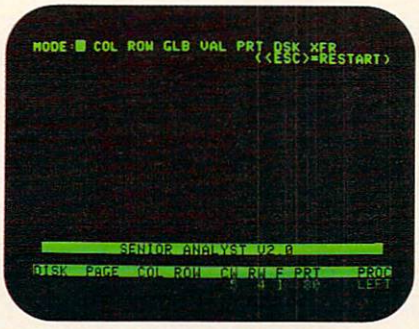

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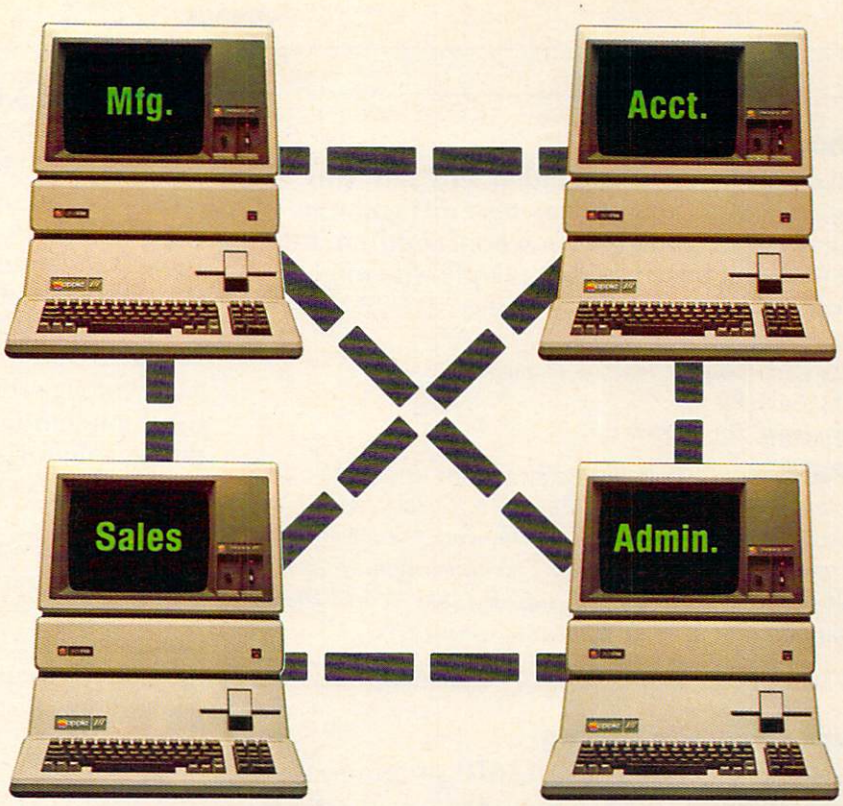

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Preschooler Programs

We have purchased unexpanded VIC's for two Headstart centers and are having a difficult time finding software aimed at preschool children. I'd be interested in hearing from people who might know of such sources.

Joan Haverson
Schuylkill County Child Development Program
P.O. Box 183
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COMPUTE! *regularly publishes programs and games for young computerists. See "Mathman" in October 1982, "An Atari for Christmas" last month, and "Name Play" in this issue. Also, the Computer Friend being built as a series of programs in Fred D'Ignazio's "The World Inside The Computer" is of great appeal to youngsters.*

Machine Language Printing

I have started to convert my BASIC programs to machine language (ML). The problem I am having is that I don't know how to print a character in ML. The other question is where can you load ML programs into memory which can be called from a BASIC program? I already know about the cassette buffers.

Aris Zakinthinos

There are several ways to print characters in ML. Perhaps the easiest is to load the accumulator with the character's code number and then JSR to the "output a byte" routine: LDA #$41 JSR $FFD2. This is BASIC's way of printing to the screen. The next time you JSR to $FFD2, the character will be printed in the space following the previous character. Alternatively, you could LDA + $41 and then STA $8000 or wherever your screen RAM is located. This is the equivalent of a BASIC POKE.

You don't mention which computer you use, but we are assuming that it's a Commodore model since you speak of the traditional cassette buffer location for hiding ML from BASIC. Because BASIC puts variables in RAM, it could overwrite an ML program which was unprotected. Before putting ML and BASIC together, you need to reset the "limit-of-memory" pointer ($34, 35 in 4.0 and Upgrade BASIC; consult a map of your computer's memory for other BASICs). This makes BASIC think that there is no more RAM beyond whatever address is indicated by these two bytes. It will perform its operations below the protected ML.

However, because ML is the machine's language, it is highly specific to each model. You need to work with a map of your version of BASIC and of your computer's memory usage. While $FFD2 means something in Commodore BASIC, it would be entirely different on an Atari or a TI.

Commodore 64 Peripherals

I plan on buying my first computer by Christmas of this year. The Commodore 64 seems to have the capability and memory I need. I have been looking forward to seeing the 64, but the more I read about it the more concerned I become about the peripheral connections.

I read that the VIC's RS-232 uses non-standard voltage (0 to 5 volts) rather than the standard (-12 to 12 volts) and that the signal levels are inverted from the standard. Since the 64 is compatible with the peripherals of the VIC, it would seem to me that the 64 also has non-standard voltage on its RS-232 port.

All this leads to my major concern. Will I be able to use other manufacturers' equipment on the Commodore 64's RS-232 port, or will I be limited to Commodore products? I also have two friends who have TRS-80 computers who want to upgrade to the 64, and now they are becoming concerned that their peripherals will not work on the 64.

Earl T. Jones

There is a cartridge from Commodore, currently available for $49.95, which converts the VIC and 64 ports to standard. With this, you can attach printers and other peripherals not specifically designed to be compatible with the VIC/64 RS-232C signal levels and voltages.

Versions Of Atari

I'm curious about some things that were written in *COMPUTE!'s First Book of Atari*. On pages 17 and 18, you listed some flaws in Atari BASIC. Do you know if Atari has made any changes to their models that would correct any of these flaws? If they have, how would I know if I were buying an older computer with the flaws or a newer one without them? Could I tell by its serial number?

I intend to purchase an Atari 800 and would hate to buy anything but the most recent model.

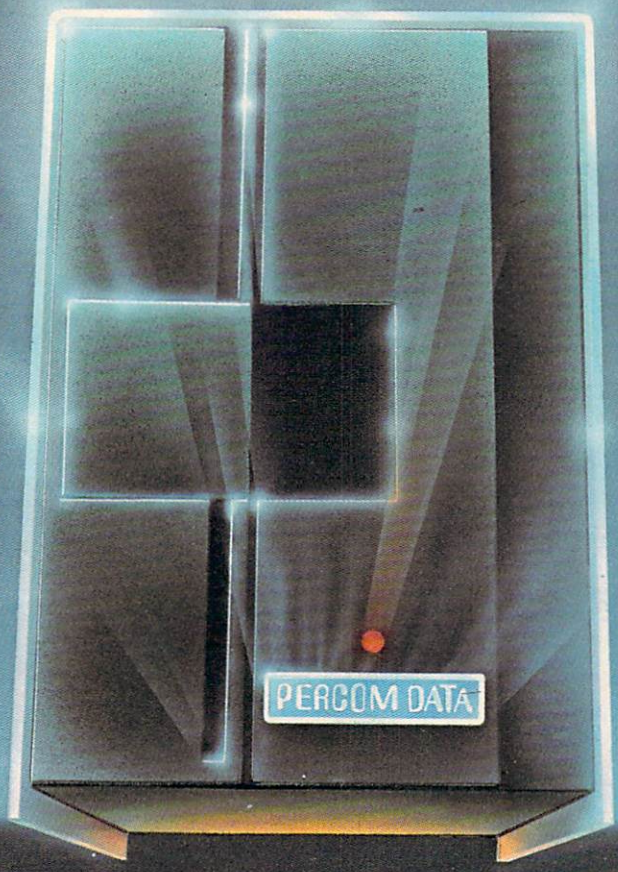
Scott Lapham

Most of the bugs in the 10K OS ROM (operating system) have been corrected in what is called the "Revision B Operating System." All Ataris shipped after January 1982 contain the new Revision B ROM chips. To check if a particular machine has the new ROMs, type:

```
PRINT PEEK (58383)
```

from BASIC. If you get a zero, that computer has Revision B.

COMPUTE! *welcomes questions, comments, or solutions to issues raised in this column. Write to: Ask The Readers,* **COMPUTE!** *Magazine, P.O. Box 5406, Greensboro, NC 27403.* **COMPUTE!** *reserves the right to edit or abridge published letters.* ©



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Microchips are turning up in all kinds of "smart" consumer products, not only in home computers. Here's a look at how microchips might be useful in the home of the near – and not-so-near – future.

Computers In The Home: 1990

Tom R. Halfhill, Features Editor

Remember the Jetsons? That Saturday morning cartoon family of the 21st century, the ones with the high tech house filled with fancy gadgets. They were the alter-egos of the Flintstones. Mr. Jetson commuted to work in his flying car. Mrs. Jetson kept a carefully coiffed wig handy in case someone called her early in the morning on the picturephone. Robots did all the housework.

Well, don't hold your breath. Flying Fords and home picturephones seem to be around the same corner as prosperity.

But equally exciting high-tech products *are* on the way, thanks to an invention the Jetsons never heard of: microprocessor chips. These tiny computers, etched on specks of silicon, are the heart of today's home and personal microcomputers. You could stack hundreds of them on a cornflake.

But although home computers are the glamour children of the microchip revolution, chips are turning up in a wide range of consumer electronic products as well: microwave ovens, tape decks, stereo receivers, turntables, video tape recorders, clock radios, cameras. Usually the "intelligence" added to these "smart appliances" comes in the form of relatively simple timers, sensors, or counters. However, research and development planners, engineers, and futurists foresee much greater possibilities.

Living In Xanadu

Architect Roy Mason is building his vision of the future out of plastic foam in Orlando, Florida.

Dubbed "Xanadu," it's a model home for the 1990s and beyond. Xanadu consists of domed pods built by spraying polyurethane foam onto removable molds. The quick-setting polyurethane hardens in a couple of days, forming perfect seals around the doors and windows which are set directly into the foam. The resulting structure is said to be so well insulated that it requires only a quarter of the energy for heating and cooling as a similar-sized conventional house. It also reduces construction time for the basic shell to only three days, and is claimed to be suitable for any type of climate.

But Xanadu's really revolutionary features will be tucked away inside the foam shell. It is being crammed with every electronic and computerized gadget imaginable. The point is not necessarily to show what *will* happen to homes in the near future, but what *could* happen. Xanadu will cost about $300,000, even though much of the equipment is being donated for promotional purposes. When completed late this year, Xanadu will open as a tourist attraction for people visiting nearby Disneyworld and Epcot Center.

Architect Mason believes Xanadu will alter the way we now tend to think of houses – as little more than inanimate, passive shelters against the elements. "No one's really looked at the house as a total organic system," says Mason, who is also the architecture editor of *The Futurist* magazine. "The house can have intelligence and each room can have intelligence."

Take Xanadu's kitchen, for example. It's equipped with a "family dietitian" consisting of four microcomputers. It plans well-balanced meals for family members depending on their height, weight, sex, age, and levels of activity. If you come home from a busy day and inform the computer-dietitian that you skipped lunch and nibbled on a candy bar instead, it calculates supper based on the nutrients you missed. An "auto-chef" can move food from the refrigerator to the microwave oven to the dining table, and the computers keep track of the grocery inventory so you know what to replace. The auto-chef can even regulate the ambience of the dining room to match your meals, adjusting the lighting and background music to

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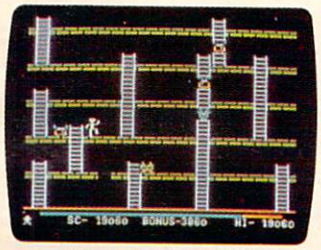

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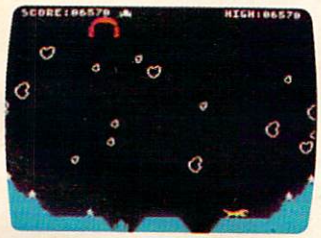
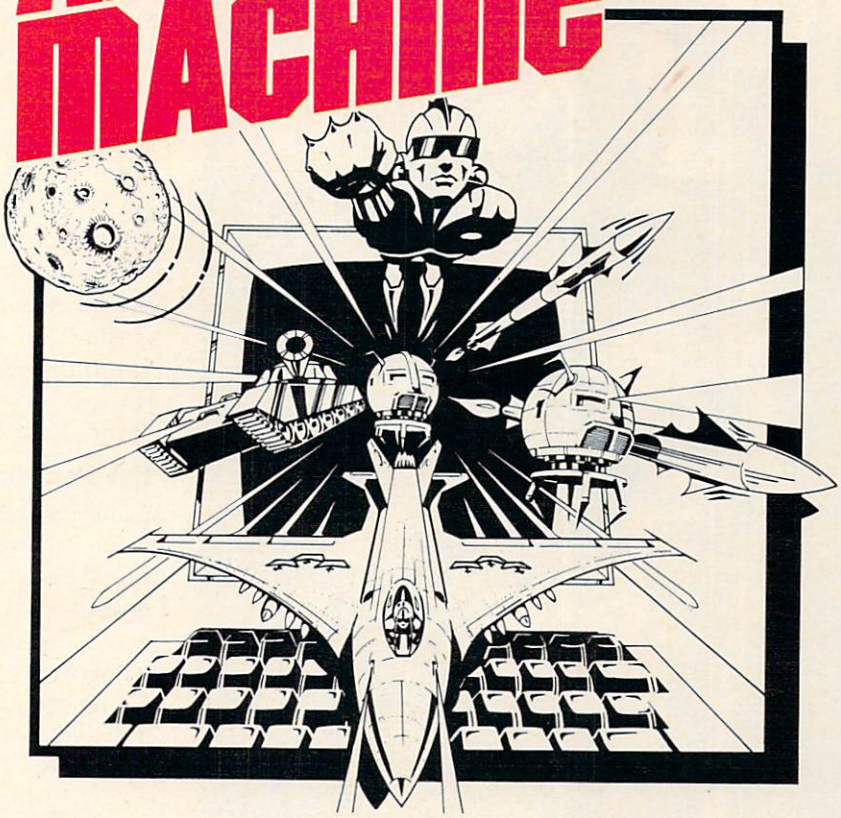
Apple disk, Atari cassette & disk



STELLAR SHUTTLE
Monsters and meteors
Atari cassette & disk

THE ARCADE MACHINE



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complement your Mexican dinner, for instance.

Some of that food is grown by the house itself. Xanadu has a built-in greenhouse. Naturally, a microcomputer monitors the watering of plants, artificial sunlight, ventilation, humidity, soil content, and the shutters and awnings.

The groceries you can't grow can be bought by tele-shopping at the household work station. The catalog is on a videodisc system hooked into the microcomputer, and the transaction is handled with the help of tele-banking. The work station computer also maintains a household calendar, records, and home bookkeeping.

Architect Roy Mason and a clay model of his concept house for the 1990s, "Xanadu." (Credit: Barry Fitzgerald)

Xanadu incorporates the latest "electronic cottage" concepts to reduce or eliminate daily commuting to and from work. A study/office shows how business could be conducted from the home, with electronic mail, access to stock and commodities trading, and news services.

Xanadu's other features include "AutoOasis," a computer-controlled party room; a health spa, where a computer suggests exercises based on your physical characteristics and diet; a family learning center with four talking microcomputers that run educational software and even an interactive psychoanalysis program; illusionary "windows" that display computer-generated images, just in case you get tired of staring at the laundry on the Joneses clothesline; a "Sensorium" with hologram projection and a computer-controlled bio-feedback device which regulates background music and abstract patterns on the walls in tune with your moods; and an electronic art gallery with ever-changing, laser-projected images.

With all this advanced electronics, you're probably wondering at this point about Xanadu's horrendous electric bills. Mason has an answer for that, too. A central microcomputrer monitors all energy consumption and eventually will be programmable as a watchdog. "You could program the house, 'I'm only going to spend $300 this month for utilities and that's that.' So you'd program that on the keyboard and the house would only use $300 worth of utilities. Of course, you might not get your laundry done for a few days, but that's your decision."

The central computer is part of the family media room, which also includes video games (of course), two-way cable TV, and a large-screen video projection system. But the central computer is the heart of the house, and comprises what Mason refers to as the "electronic hearth."

The Electronic Hearth

"The home of the future will be more like the home of the past than the home of the present," says Mason. "It used to be that the whole family gathered around the hearth for entertainment activities, meals, and so on. The home of the future will feature what I call an 'electronic hearth,' a home computer that is the center of the family's activities – entertainment, bookkeeping, meal-planning."

Although families today gather around TV sets, that form of entertainment is passive, with little or no interaction between the family members and the TV set or with each other. A home computer, on the other hand, allows interactive entertainment. Mason says the difference has yet to be fully appreciated.

"My feeling is that the home computer has never really been a home computer, it's been a personal computer. We haven't really seen home computers being used as home computers, as a house computer. [*At Xanadu*] we're using the home computer as a true house computer."

TomorrowHouse Via Apple

Surprisingly, most of the microchip devices in the Xanadu house are already available off-the-shelf

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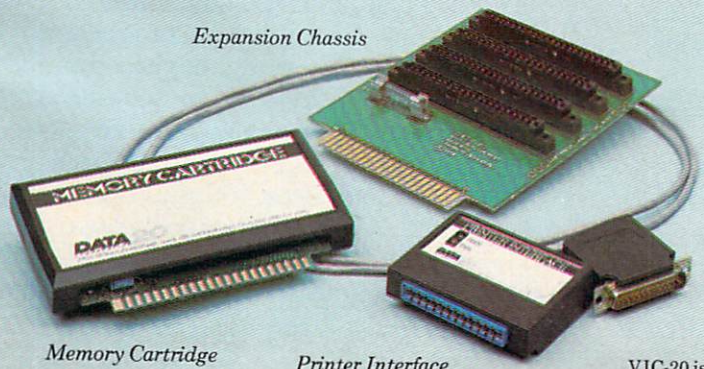

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items. Xanadu simply brings them all together in one place with little regard for expense. To demonstrate that the concepts are practical, Mason is planning a spin-off model of Xanadu, a less elaborate version that is relatively affordable. It, too, will be made of polyurethane foam, but will have less hardware.

"I don't want people walking through this house [*Xanadu*] and saying, 'Well, this is great, but who could afford it?' I want a version that is affordable," says Mason.

This version would have about 2,000 square feet – Xanadu has 5,000 – and would cost around $80,000, Mason hopes. "We'll probably have extras like you have when you buy a car – you can make the house as smart as you want. It's already a pretty smart house."

"We could do almost anything in the home right now ... but it's just a matter of getting people to accept it."

All the energy and security alarm monitoring at Xanadu will be handled by a commercially available program called *TomorrowHouse*, marketed since mid-summer by Compu-Home Systems, Inc. of Denver, Colorado. *TomorrowHouse* is a dramatic demonstration of the future possibilities for microcomputer-controlled homes. Running on an Apple II, it supervises the central heating and air-conditioning, monitors temperatures outdoors and in every room, and performs dozens of other tasks.

"For example, if you go off skiing for a weekend, which we do all the time here in Colorado, you can program your hot tub to heat up to 102 degrees at 7 o'clock on Sunday night to be ready when you get home," says designer Russ Coffman, vice president of Compu-Homes.

TomorrowHouse also enables the computer to talk. This adds some interesting features. "If anyone breaks into your house, the security system detects it and the computer turns on all the lights and starts talking," explains Coffman. The idea is to frighten the burglar into thinking the house is occupied. To that end, you might imagine that the computer says something like, "Whoever's out there, watch out for the cobra!" or "Honey, pass me the hand grenades!", but Coffman kept it simple: "It just says, 'Intruder alert at 7:03' or whatever time it is, just enough talking to make the intruder think that somebody is home."

For the future, Coffman wants to make it possible to monitor and reprogram the house from any touch-tone telephone. When you're on vacation, you could phone the computer and check if any break-ins have been detected, or if the freezer is still working. As microchip technology advances, other features will be added, too.

"Voice recognition we haven't started working on yet, but we're keeping our eyes on it," he says. "We eventually want to fix it so you can just holler at the computer and get it to do things."

Are We Ready?

Actually, some planners believe the biggest hurdle won't be microchip technology itself, but market resistance from people unaccustomed to delegating tasks to computers.

"Companies are waiting to see what people really want," says Dick Lane, project manager for Honeywell, Inc. "We could do almost anything in the home right now that you could imagine in the next 20 years, but it's just a matter of getting people to accept it."

As long as the housing market remains depressed, Lane explains, microprocessor controls won't be built into new homes, because builders already are trying to save every penny. Also, people would rather spend extra money elsewhere: "People want to start with a three-car garage, but they're a lot more cautious about the gee-whiz features.... There's a lot of competition right now for the consumer's discretionary income in the way of electronics products. Right now the pleasure products, such as video tape recorders and video games, are getting the bulk of that income."

When microchip-controlled homes do become common, Lane also doubts that the systems will be built around home computers, as *TomorrowHouse* is. "Our perception is that people don't really want to touch a keyboard to change the temperature of their home, or to activate security devices, and so on. We have to find another type of I/O device [input/output] before people will be more accepting of it. Voice recognition, of course, would be the ultimate."

Another problem with controlling houses with home computers is that the machines cannot be used for anything else while they're occupied. Today's home computers cannot handle *multitasking* – running more than one program simultaneously and independently. As microchip technology advances, tomorrow's home computers may have the capability to play video games or balance the checkbook while monitoring the furnace, but Lane predicts the functions will be handled by separate systems. He thinks this would also be more reliable,

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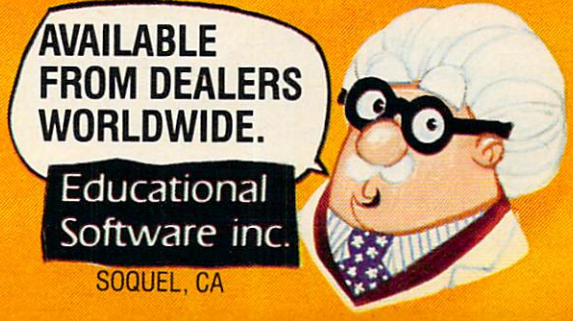

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since consumer computers aren't necessarily designed to run 24 hours a day, 365 days a year.

With the increasingly powerful microchips becoming available, the computer-controlled functions might be "invisible" to the consumer, since the devices could "program" themselves. "The chip could have some intelligence," describes Lane. "It could have a learning algorithm in it so it could know what's normal. If it's cold outside, the furnace would learn those conditions, such as how much it should be running. If you left your door open, the furnace would know it was running more than normal and would alert you to that fact. Or if the filter were clogged and the airflow were reduced, the furnace would notice that it was getting less air than usual and would tell you."

This would be a better approach than programming a single home computer to handle everything, Lane believes. A more important contribution of today's home computers, he says, might be simply acclimating consumers to the idea of computers in the home. "I certainly think the personal computer has made the most dramatic impact at this time.... As this set of people gets more familiar with computers and buys more personal computers, maybe we'll see a desire to involve computing devices in more broad applications."

Synthesizing The Beatles

If all this talk about computer-controlled homes and intelligent furnaces sounds rather mundane, be assured that microchips will be turning up more often in the fun products as well. Already, microchips are becoming common in video cassette recorders, cameras, TVs, and stereo components.

Last year, Sony showed prototypes of its filmless electronic camera. Instead of using film, the camera receives the image on a densely packed array of *charge-coupled devices* (CCDs), electronic circuits sensitive to light. This image, in turn, is stored on a tiny interchangeable magnetic disk, a lot like the mini-floppies used with home computers. Since the image is stored magnetically, no processing is required. The pictures are viewed on an ordinary TV set with a special disk player. A full-color printer might be available for hard copies. The disk can be duplicated, erased for re-use, or edited. A single cookie-sized disk might hold 50 pictures.

The Sony camera is a couple of years from production, and Sony engineers are working to overcome a few remaining problems. They've done a fantastic job of shrinking it to hand-holdable size; even with its built-in disk drive, the prototype is about the size of a 35-mm single lens reflex camera. The CCD arrays are expensive, however, and right now the camera would cost around $800, according to some estimates. Since the resolution of a TV picture is nowhere close to what professionals and advanced amateurs have come to expect from conventional photography, the Sony camera would have to be aimed at the mass consumer market – for which $800 is a steep price. But remember, it was only a few years ago that the least expensive home computers cost that much.

The computerization of sound holds even greater promise. For although it will be some time before video images surpass the quality of photographic images, digital sound is already clearly superior to today's analog recordings.

Sound is recorded digitally by a computer which "samples" the sound thousands of times per second, and then converts the tones into digital bits of information. The advantage is that the sound can be manipulated like any other digital information. Extraneous noise can be dropped out, weak sounds can be amplified, and overly loud sounds can be tempered. The results are amazingly distortion-free.

Some "digital" record albums are available today, but this means only that the music was recorded digitally in the studio. The sound is reconverted to analog when pressed onto the vinyl record, since the needle-and-groove system is an analog process. Even this hybrid digital-analog method is a noticeable improvement. But the audio industry is on the verge of a technological leap into a pure digital system.

A digital audio disc was introduced in Japan this fall by Pioneer Electronics, and may be introduced in the U.S. as early as next year. Music is recorded digitally on the four-inch disc in tiny pits which are read by a laser "stylus" on a special player. This is somewhat similar to the videodiscs already on the market, except that images on videodiscs are still analog reproductions. The digital audio disc will dramatically reduce record wear, and up to an hour's music can be recorded on a single side.

As with computer-controlled homes, though, the biggest roadblock for digital audio discs is not technology, but marketing considerations. The record industry doesn't seem as enthusiastic as the electronics industry. Still, few people doubt that digital audio discs will supplant analog discs eventually, and researchers are excited by the possibilities of computerized, digital sound systems.

For example, Verle Rader, product planner for Pioneer Electronics, thinks tomorrow's computerized stereos may allow listeners to modify recorded music far beyond the capabilities of today's tone controls and graphic equalizers.

"If you don't like the tempo of the Henry Mancini record you just bought, you could change it. If you want it to be a samba instead of a march,

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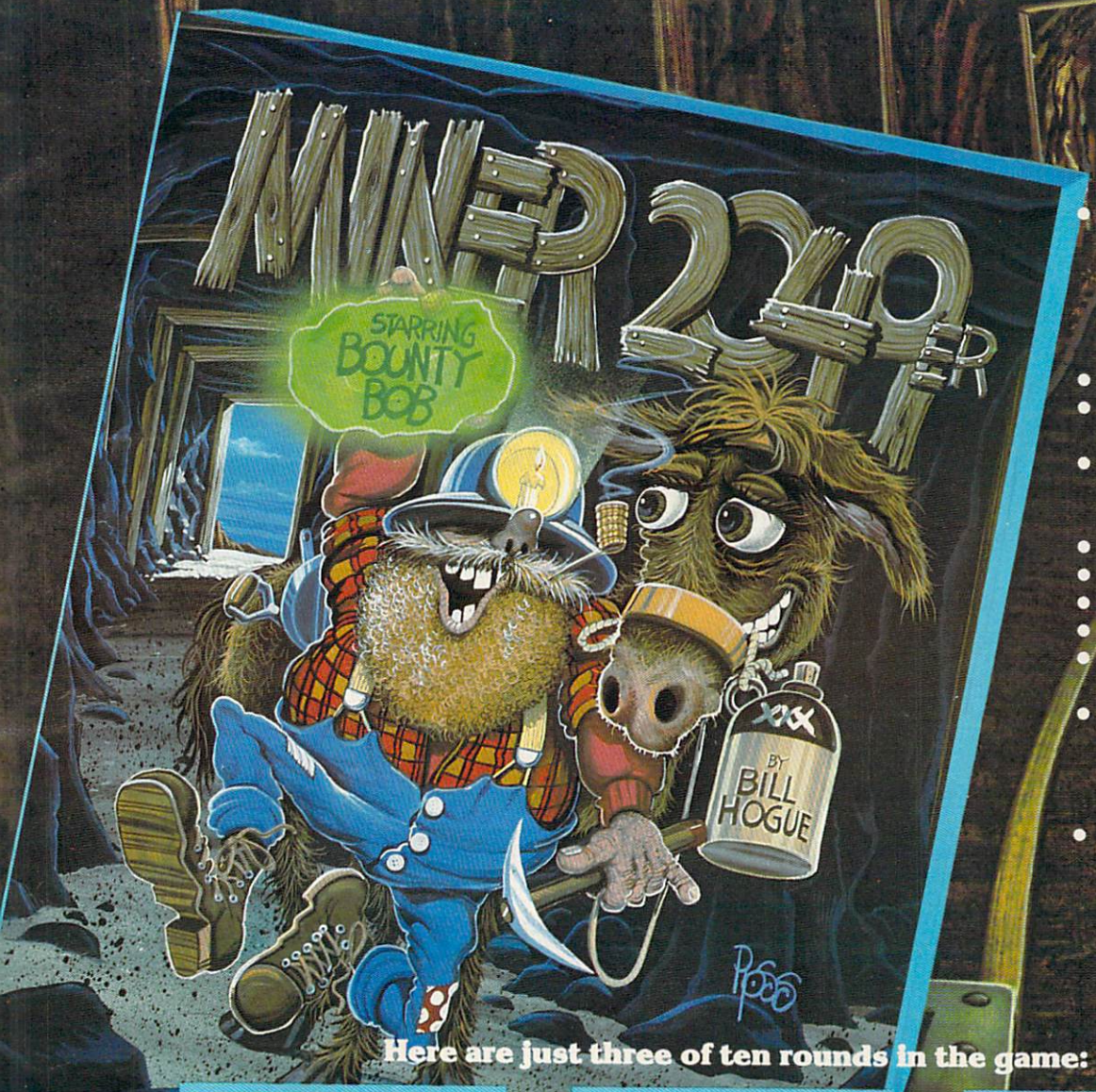

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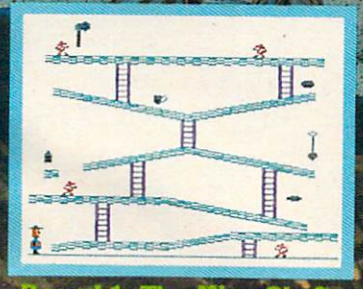

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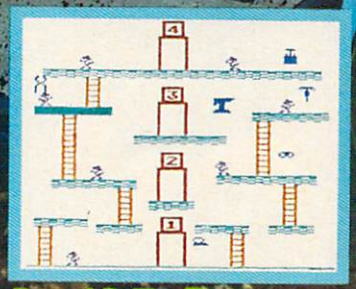

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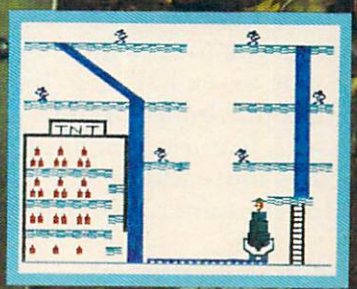

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you could change it to a samba. Or you can analyze by computer all the music written by Beethoven. You could sit down and compose a short melody line, feed that into the computer, and the computer could then generate a Beethoven symphony based on your melody line. Or you could feed all the vocals of all the Beatles' songs into the computer and let it analyze them. Then you could write your own song, feed that into the computer, and it would come back with your song performed by the synthesized voices of John, Paul, George, and Ringo, just as if they had recorded it originally."

Of course, these kinds of developments are further in the future. Closer to home, Rader says stereo manufacturers will use microchips to make their products easier to use. Up to now, it seems, manufacturers have been seizing every opportunity to transform their audio components into something out of a space shuttle cockpit. That's about to change.

"We're encountering a lot of consumer resistance to all these buttons on the front panel," says Rader. "The reason is that our market is changing somewhat. Up until now, we've been selling primarily to the 18 to 34, male, technically oriented, middle-class, affluent buyers. They like to push all the buttons. But we've pretty much saturated that market. Now we're finding more buyers who are not 18 to 34, male, technically oriented, middle-class, and affluent. They don't want to push a dozen buttons just to play a tape. So we have to make our products simpler to operate."

That's why some top-model stereo cassette decks now sense the type of tape inserted in them and automatically adjust the bias and equalization to fit the tape's makeup. Another new stereo system allows you to switch from playing a tape to the FM radio by pressing only one button. Look for more such features as microchips become more widely adopted for consumer products.

The Computerized Chariot

It seems strange that space-age devices such as microprocessors would be wedded to that huff-and-puff holdover from 19th century technology, the internal combustion engine, but the fact is that auto manufacturers are rapidly becoming the world's largest customers for microchips.

All the manufacturers are increasingly using microchips for such tasks as regulating fuel flow and ignition systems, computerizing instruments, diagnosing problems, and jazzing up accessories. The 1983 Thunderbird will use computerized voice synthesis to speak with a three-sentence vocabulary: "Your key is in the ignition," "Your headlights are on," and "Door is ajar."

Again, however, technology is taking a back seat to marketing considerations. Especially when it comes to innovations such as talking dashboards, the auto manufacturers are stepping softly and measuring consumer acceptance at every turn. Remember, even after two decades, most American drivers still refuse to accept seatbelts, and airbags are often regarded as an outrage.

Still, designers foresee tremendous possibilities for intelligent autos. "By 1985-1990, virtually every car in the world will have at least one microprocessor," predicts Robert F. Haase, technical planning manager for Ford Motor Company's Electrical/Electronics Division. "Our Continental today already has four or five microprocessors."

Haase says microchips will make possible the "personalized car": "You'll have a way to tell the car just what person is driving the car, so it can

Jerome G. Rivard, chief engineer for Ford's Electrical/Electronics Division, compares the size of the company's original Electronic Engine Control (right) with the latest version. The new controller can process a million commands per second.

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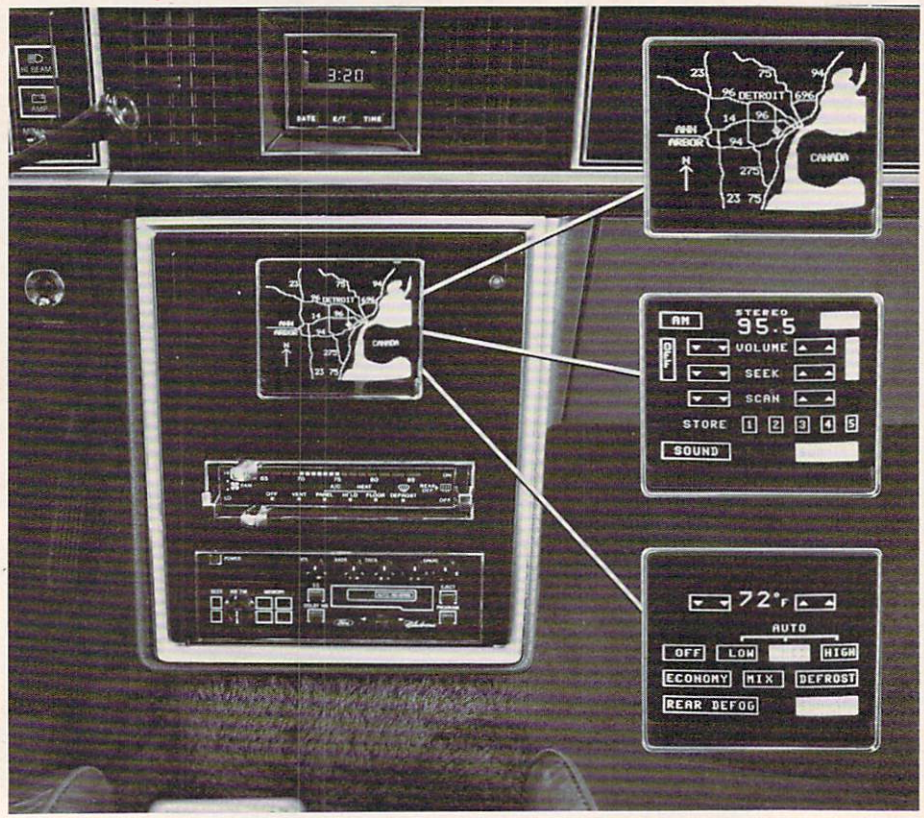

A Ford prototype of a multi-function dashboard CRT displays road maps, radio controls, and environmental readouts. Clock and calendar panels can also be called up.

'personalize' itself by adjusting the mirrors, the seats, and programming itself for your favorite radio stations," says Haase. "The car will personalize itself for the driver."

In a few years, dashboards may incorporate CRTs (cathode-ray tubes) or flat-panel LCD (liquid crystal display) screens for readouts. Tomorrow's road maps might even be in the form of computer graphics stored on floppy disks and displayed on the screen. "Of course, there you would have the possibility of bringing up maps of increasingly fine detail," suggests Haase. "You could have one map, perhaps, showing all of Michigan, another one showing just Detroit, and another showing maybe just one quadrant of Detroit."

A major advantage of this system would be that you wouldn't have to worry any more about folding up the map when you are done. But you'd still have to worry about the kids spilling jelly on the disks.

It might even be possible to pre-define your route by moving a cursor over the screen map. Then, like any good backseat driver, the car could alert you to wrong turns: "Hey, dummy, you shoulda hung a left on Elm Street...."

"Another thing you might see in the next few years is sonar devices to detect if you're backing up over your kid's tricycle or whatever," says Haase.

"Ten or 15 years down the road, the sky's the limit. You can envision radar systems, sonar, infrared, heads-up displays." Heads-up displays are projections of instruments or other information on the inside of windshields, much like the cockpit displays on the latest jet fighters.

The next big leap would be the logical extension of voice synthesis-voice recognition. Instead of pushing buttons, you just tell the car what you want. "If you attach the possibilities of speech recognition to the personalized car, you can envision walking up to your auto and saying, 'Good morning, car,' and it responds by unlocking its door for you and adjusting its mirrors and seats and turning on your favorite radio station," explains Haase.

Advanced systems might be able to distinguish between voices so you could program the car to respond only to your own voice and your spouse's (or maybe not your spouse's).

The Limits of Automation

Although some sort of computer-controlled, radar- or sonar-triggered collision-*warning* device seems a likely development, Haase expects stiff consumer resistance to any type of automatic collision-*avoidance* system. People would accept a warning light or buzzer, but would resist a device that slammed on the brakes for them, just as they are wary of airbags.

There seems to be a psychological limit to what humans are willing to delegate to machines. We perceive a fine line between contrivances which grant us more freedom by relieving us of certain tasks, and those which threaten to rob us of freedom by automating some things we want to control ourselves. Computers are bumping against this boundary more than other machines because they are capable of so much, and because they are the first machines with the power to automate not just muscle movements, but also brain functions.

This psychological boundary is becoming a bit more flexible as automation and computerization become more widely accepted, but in the end it may prove to be a limit more stubborn than the reach of our technology. ©

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Hundreds of thousands of people are buying home computers these days, but you still hear the remark, "A home computer! What can you do with one of those things?" **COMPUTE!** *sampled its subscribers to find out why people buy home computers and what they do with them.*

How COMPUTE! Readers Use Their Computers

Tom R. Halfhill
Features Editor

Bob Federer of Toronto, Ontario has used his to add sound effects to new wave records. William Wilbur of Kittery, Maine uses his to catalog more than 1700 model airplane kits. The Millers of Martinez, Georgia use theirs to educate their children and keep them out of the arcades. The McLain family of Reading, Pennsylvania plays games and writes programs. Clint Williams of Portage, Michigan produces an amateur radio newsletter. Roberto Huyke of Mayaguez, Puerto Rico prepares engineering programs for his college students. Malcolm F. Smith II of Beckley, West Virginia forecasts the costs of doing business. Linda Timmons of Leavenworth, Kansas keeps track of her high school students' grades. And 13-year-old Jason H. Rogers of La Mesa, California is teaching himself how to program.

All of these people – and thousands more like them – have found everyday uses for the newest everyday marvel, the home microcomputer. Uses that are practical, educational, fun. No longer merely accoutrements of electronics hobbyists, microcomputers are finally coming home to join the TV sets and stereos in family rooms everywhere.

But among the uninformed, the question still persists: *What is a home computer for?* Readers of this magazine probably already know the simple answer: Why, it's for the home, of course. But some people still wonder if home computers have a "practical" use. When you query them further, often they define a "practical use" as one that pays for the computer. Not many home computers are paying for themselves in a purely monetary sense, but then neither are many TV sets or stereos. **COMPUTE!** decided the best answer might be to pose the question to some of our readers. What do you use your home computer for? Why did you buy it? How did you get involved in personal computing?

Pulling names at random from our subscribers list, we contacted readers living all over this hemisphere, from British Columbia to Puerto Rico, and from Maine to Southern California. We talked to parents, single adults, youngsters, retirees. All of them were happy with their computers, and in many households the computer was rivaling the TV set as the most heavily used home appliance. Few of the uses we turned up were particularly unusual – although come to think of it, just a few years ago *any* use of a computer in the average home would have been considered unusual.

But generally, the typical uses we ran across fell into three main classes: education, entertainment, and efficiency. "Education" included everything from teaching toddlers the primary colors to exploring the intricacies of machine language programming. "Entertainment" mainly involved playing video games, of course, but also included the intellectual challenge of programming homegrown games in BASIC. And "efficiency" included everything from computing personal finances to using the computer as a tool at work.

In fact, almost all owners of home computers seem to use their machines for all three categories to some extent. Even the most "serious" user admitted to enjoying a crack at *Pac-Man* or *Space Invaders* now and then. Overall, entertainment and education surfaced again and again as the predominant applications, especially where children were involved. Whether or not everyone agrees the Computer Age has arrived, one thing is never doubted: if it's not already here, it's coming, and

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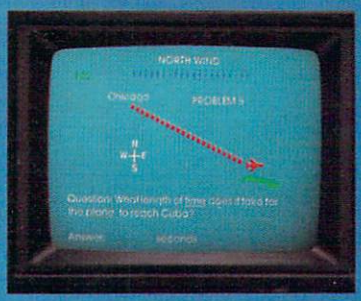

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COMPUTER-BASED EDUCATION

our children had better be prepared for it. That alone was reason enough for many parents to acquire a home computer.

All In The Family

The Crum family of Auburn, Washington is a representative home computer household. John Crum, 32, says he has always been interested in electronics and works with highly specialized controller computers in his job at Western Electric. He started off with a Sinclair ZX-81 for himself, but when he returned home from a business trip one day last March, his wife had a surprise for him – she had sold the Sinclair and bought an Atari 400. "And it was a surprise," he says.

Now the whole family is involved with the computer. "I've got a little boy who's two and a half years old, and I've got some educational programs for him," says Crum. "I think when he grows up that computers will be much more necessary in his society than in ours.

"I like to play games, even though they're frustrating and addictive – which I guess they're designed to be. Of course, my wife gets in there and plays the games, too. I'd rather play the games than watch TV, really, especially since most TV programs are pretty boring, usually. Like, I have another hobby which is just for me that my son might take over someday, I don't know. But the computer is something the whole family can sit down and enjoy together – me, my son, and my wife. It sounds sort of odd, but we can all get into it together.

"I was surprised," he says, "but even the grandparents get involved with it. We get a lot of rain here in Washington, of course, so on those rainy afternoons when they come over for a visit, often we'll play some Sunday golf, or one of those other games that are slower and don't require so much joystick action. It's better than playing cards, and everyone can get involved."

When he finds the time, Crum plans to work up a telephone dialer program and an inventory of household possessions for insurance purposes.

The Johnsons of Brandon, South Dakota also have made computing a family activity. "We bought it last winter," says Jan Johnson, referring to her family's Atari 400. "We had a really cold winter here last year, so it gave us something to do to keep warm."

But Johnson says she was a little reluctant at the outset when her programmer/analyst husband, Ken, decided to buy a home computer. "I wasn't all that gung-ho on it at first. It was my husband's idea and he uses it more than anyone else.... He tries out some things at home that he wants to do at work.

"But since then, I enjoy it myself, too," she says. "The games get kind of addictive. Our kids [ages four and six] use the computer for educational uses, with some programs that my husband and his friends wrote. They teach about shapes and colors and things like that. It was a toy at first, but it's working out better than I thought. My daughter has started working with some math problems on the computer, even though she's only six, and I think it's helping her a lot."

The Johnsons also use the computer to balance the household budget. And since a family friend also bought an Atari 400 at the same time, there are running battles to see who can get the highest scores on *Pac-Man* and *Missile Command*.

Education Versus Entertainment

The educational aspect of home computing was important to the Millers of Martinez, Georgia, too. "The children like the games and I like the educational part," says Diane Miller. "The kids are in there right now playing either *Canyon Climber* or *Gold Mine*, I don't know which. I wanted something to keep the kids out of the arcades. That can get pretty expensive, you know. We had the Atari game machine first, which is a pretty good little machine, I guess, but I was much more impressed with the computer for the additional things it could do."

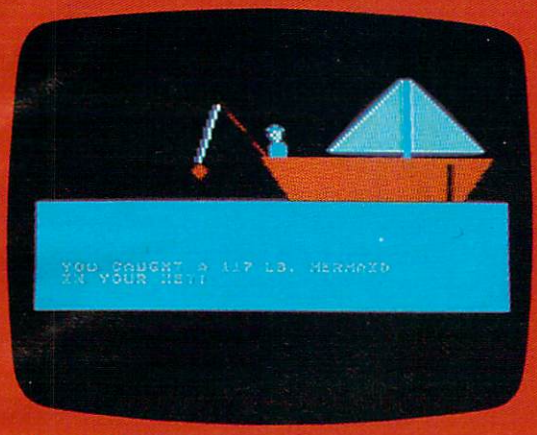
Miller says she first looked at home computers during a stopover in San Francisco when her husband, a U.S. Army captain, was assigned to Korea. She was interested, but thought the prices were too high. When they recently returned from Korea after a two-year tour, she was happy to see that prices had markedly dropped. Mindful of the educational possibilities for their children, ages nine and twelve, they bought an Atari 400 and programs such as *States And Capitals* and *European Capitals*.

"It was 50/50 educational and entertainment," says Miller. "That was my stipulation, that it not be used strictly as a game machine, that it be used for educational purposes, too."

The computer has more than lived up to their expectations, she says. In fact, the Millers got so hooked on computing that they've become a two-computer family. Diane and her husband, Gary, bought an Atari 800 and a disk drive for themselves because the children monopolize the Atari 400. The Millers are amateur radio operators and plan to use the 800 to control their ham station.

Now they are trying to convince other people of the educational uses of home computers. Gary Miller recently demonstrated one of their Ataris to a third-grade class at their children's public school, and another presentation to sixth-graders was

Good News for Kids...



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Diane Miller says their own children's contact with the machines has fired an interest in computing that may evolve beyond mere game-playing. Since they save money by typing in game listings from magazines instead of routinely buying commercial software, the children are learning something about BASIC programming. "The kids like typing in the programs and getting them to work almost as much as they like playing the games when they're done," she observes.

"I'd give up my stereo equipment before I'd give up my computer."

Joseph D. McLain of Reading, Pennsylvania has a Commodore PET which does double duty, too. The McLains have five children – ages three, seven, and eleven-year-old triplets. In 1979, McLain saw a good deal on a used original 8K PET and bought it with a small windfall ("When you've got five kids there usually isn't any extra money"). A programmer/analyst with experience in languages such as RPG and COBOL, McLain taught himself BASIC well enough to teach it at a local college. Meanwhile, his children play games and use educational programs.

"It helped me teach hand-eye coordination to my younger kids," says McLain. "My older ones use a math type of game that runs through a series of ten programs and then spits out the results.

"When we first get a new game, of course, the whole family gathers around and plays it, usually until my son Todd gets the best score, and then the rest of us get frustrated and quit."

Roger W. Leezer of Orangevale, California, who is the dean of arts and sciences at California State University-Sacramento, has three children between the ages of six and twelve. After shopping around and delving into hardware manuals, he bought an Atari 800 with a disk drive and printer. "Basically I bought it so the family would have it to use. I have more access to computer equipment at work than I know what to do with."

It, too, is used for both educational and entertainment purposes. Leezer's wife, who works at a medical laboratory which may soon computerize, wants to learn more about computers "so she can do more than just sit down and type on the keys." The Leezers, following the pattern of the Millers in Georgia, may buy a second computer just for the children.

Marcia Thompson of Owatonna, Minnesota, a former schoolteacher, and her husband, who teaches high school electronics, bought a Commodore VIC-20 nine months ago for their first-grade boy. They bought the VIC because they wanted some compatibility with the PETs they were accustomed to at school. "We do have a couple games," she says, "but our main purpose was educational. It's been working out very well for that."

But Alan Orr of Pineville, Louisiana believes that many parents – even among those interested in computers – remain unconvinced of the educational value of home computing. As manager of the House Of Electronics across the river in Alexandria, he sees more and more parents shopping for a home computer "to educate the children." He suspects the real motive might be something akin to the Toy Train Set Syndrome.

"I've talked to a lot of parents in my store about the educational aspect, and many of them use that to rationalize buying a computer," says Orr. "What they really want it for is to play games, but they say they want it because it's educational for the children. It's sort of like psychological warfare."

Orr, however, like the other parents surveyed, has no doubts himself. Nine months ago he bought an Atari 800, a disk drive, and a printer that he hopes his two-year-old son will learn to use in a couple of years. "I want my boy, by the time he's three or four, to be doing some simple programming maybe, or things like *My First Alphabet*."

Meanwhile, he and his wife use the Atari to play games, and he's trying to catalog his 1000-album record collection. "I'm really involved with computers now," says Orr. "I'd give up my stereo equipment before I'd give up my computer."

The Computer Kids

While some parents might be a little slow to accept the computer age, young people are not. Unlike practically anyone over 22, today's young people are increasingly coming into contact with computers by the time they reach high school. For example, Peter Lobl, a tenth grader in Lindenhurst, New York, was turned on to microcomputers by the Commodore PETs at his public school. He almost got a video game machine at home, but then decided to get a computer instead.

"I started with the Sinclair ZX-80, and then moved up to the Interact, a really rare computer sold by Protecto Enterprises. Then I got the VIC. If the price of the Sinclair kit comes down, I'd like to get one of those. I like to know what makes a computer work, not just type in something and sit

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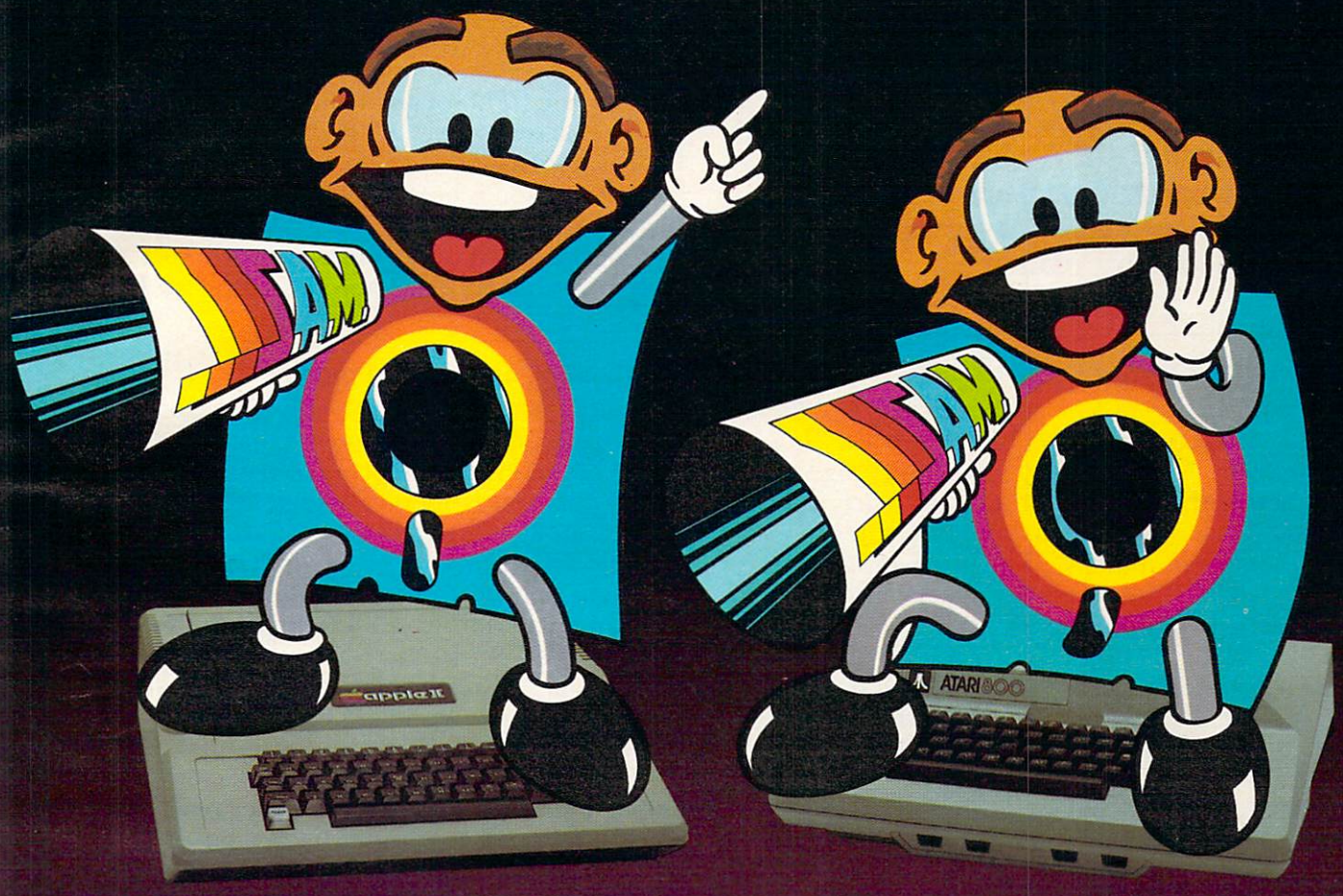

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back and say, 'Hey, this works.' "

Peter is trying to learn machine language and hopes to get a part-time job at a local computer store run by a teacher. "I might go to school for computers when I finish up high school, I don't know yet," he says. "It would be kinda nice to write a *Caverns Of Mars,* make a few grand, sit back and relax, maybe buy a yacht...."

"It started back in grade six.... Our class had a PET computer. Our teacher was very interested. We spent a lot of time after school talking about computers."

Craig Murray of Vancouver, British Columbia was introduced to computers at his private school. "It started back in grade six," explains Craig, 14. "Our class had a PET computer. Our teacher was very interested. We spent a lot of time after school talking about computers. Then in seventh grade we had two PETs and I got even more interested. Then when I got up to eighth grade we had Apples and PDP-11s."

Attracted by the color graphics and sound, and already familiar with Commodores, Craig soon got a VIC-20. Then his brother David, 15, got hooked.

"My brother got me involved in computing, I guess," says David. "He taught me the PRINT statement."

Now both of them are busy playing games, writing programs, and pushing the VIC to its limits. "I wrote a program that imitates the high-resolution screen of the Apple almost exactly," David says. "However, it also uses practically all of the memory in the machine. I think I used everything right up to the very last byte."

Mark Rees first got his hands on an Apple II when he was a high school junior in Washington, Illinois. Now a freshman engineering major at Illinois Central College, he pitched in with his brother Steve – a high school senior who also plans to major in engineering – to buy an Apple III. Why? Because the college uses Apple IIIs and the brothers can do their computer work at home instead of crowding into the school's lab.

"There's no doubt about it, that it's helped us out," says Mark. "If we couldn't do our schoolwork at home, we'd have to use the school's computers during their hours, and when you're working [part-time], it's not easy to get the same hours."

In La Mesa, California, 13-year-old Jason H. Rogers has been tinkering with his VIC-20 since March. Jason's school also uses PETs and has a computer club which he is joining this year. For Jason, computing was a logical extension of his interests. "Grandpa had wires and lightbulbs and stuff laying around, so I've always been fooling around with electronics. Then when computers came out, I started buying computer magazines and reading about them, and pretty soon I was wanting one. Then I got a letter from my uncle saying that he had got a VIC-20 for me, and I was really surprised."

Now Jason is burying himself in computer magazines and library books, teaching himself how to program. "I like to program music into it, to play tunes and stuff, because it's simple and it's fun."

Computing For Fun And Profit

But young people aren't the only ones curious about computers. Adults too old to have encountered computers in school are also discovering what all the fuss is about. Some of the adults surveyed bought computers for educational purposes – not for children, but for themselves.

"The main reason I bought it was because my education had nothing to do with computers," says John Swisher, 42, an Atari 400 owner in Bay Village, Ohio. "They didn't even have electronic calculators when I was in school, so I knew zero about computers. I tried taking some of those adult education classes at night, but they're always filled up. So mainly I got it just to learn what they're all about."

A runner, Swisher uses his machine to keep track of his times, distances, and averages, and to catalog his record collection. His two elementary-age children mostly play games. "It's mostly just for education and entertainment," he says. "But although I haven't found a way to make it pay for itself yet, I've still been very happy with it."

Some adults are exposed to computers at work – usually to large machines or highly specialized microprocessor controllers – and develop a curiosity about home computing. Charles Magruder of Jackson, Mississippi is a system technologist on IBM mainframes who bought a 32K Atari 800 with his income tax refund last winter. He was playing *Shoot*, an arcade-style game published in last October's issue, when contacted by **COMPUTE!** one Saturday.

"Mainly I am playing a lot of games, I'd say 60 percent of the time, which compares to about 95 percent of the time when I first got my computer," says Magruder. "But now I'm trying to do more programming."

Magruder, 27, is writing a program to catalog his foreign coin collection, and has already written

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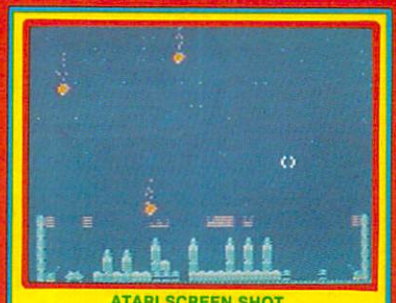

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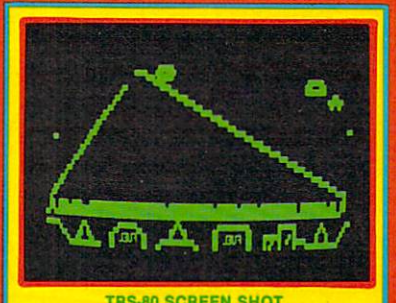

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a program indexing all the Atari articles in **COMPUTE!** since February 1981. He wants to write a program to keep track of expenditures for his church, and he'd also like to learn player/missile graphics well enough to program a game. "It's a great deal. The computer has more capabilities than I knew it had when I bought it. It's worth more than I paid for it."

Clint Williams, 28, an electronics technician

"I look at a computer as a tool that will help me make a living. ... I think they are a definite part of our future."

for Eaton Corporation in Portage, Michigan, uses TRS-80 Model IIIs at work. Williams started off three years ago with an Ohio Scientific C1P, moved up to an OSI C4P, and recently bought a TRS-80 Model III with two disk drives so his home programming would be compatible with his programs at work. He plays games, programs for self-education, compiled loan tables when he recently shopped around for a new car, and uses the Scripsit word processor to produce a monthly local newsletter for the National Amateur Radio Club.

"I don't know what I'd do without the microcomputer now that I've had one for a couple of years," says Williams. "I'm so used to having a word processor for writing letters and so forth. It's a funny thing, once you find out everything that computers can do, you quickly become dependent on them."

In Beaumont, Texas, 40-year-old Everett Davis also got into home computing because of his exposure to computers at work. He's a communications planner for a utility company, and he bought a 48K Atari 800 last February. "Of course, in my work everything is going microprocessors – our phone systems, everything. So it was a natural for me to get involved in computers."

He's written a few short home budget programs, and his wife and 18-year-old daughter also use the machine. "My daughter just graduated high school and has started college, majoring in business, so I'm sure she'll be using computers, too," says Davis.

"I'm planning on using it for word processing eventually, and also for some applications at work involving graphics," he adds. "Many of our friends are very interested in buying a computer, too. The only question is which one: that's the big debate."

Warren E. Walker of Peoria, Illinois bought his Ohio Scientific C8 two and a half years ago. "I've been in the computer business a long time, almost since it started, as a programmer and analyst. So when they finally became affordable, I bought one."

Writing almost all of his own software, Walker uses his C8 mainly to keep track of personal finances and to analyze the stock market.

Beyond Fun And Games

Walker was among several home computerists contacted who found profitable uses for their machines, or who use the computer for work as well as play. For example, Bob Federer of Toronto, Ontario, who owns an Atari 400 with 48K and a disk drive, occasionally brings his machine into the recording studio where he works. "There was a tune that I was working on when I needed a rhythm beat, and I actually worked out the rhythm part on the Atari," he explains. "I also used the Atari to create some sound effects for a new wave recording I was working on."

Federer is also an avid adventure game player, and has been struggling for months to program his own cribbage game. "I've got it to the point where it does just about everything but play the game."

William Wilbur of Kittery, Maine, retired from the U.S. Navy, is director for the New England region of the International Miniature Aircraft Association. He has a small mail-order business which involves printing out directories of kits for eight- to ten-foot radio-controlled model aircraft. Wilbur uses an original Commodore PET. It's been expanded to 32K, but what he really wants someday is a disk drive. "I'm running – and this sounds like a nightmare – a 1700-plus data base on cassette tape. It's a list of kits, plans, specifications, prices, and stuff like that for model aircraft. Would you believe 47 tape files? From where I sit I can see 16 boxes of cassette tapes."

Roberto Huyke of Mayaguez, Puerto Rico is a professor of civil enineering at the University of Puerto Rico. He put a VIC-20 in his home that would be compatible with the Commodore PET his students use at school. "I use it more as a professional computer than as a home computer. I use it for games, too, and so does my son, but he doesn't use it for anything else since he's only ten years old. Mainly I use my VIC for preparing programs for the Commodore PET here at school...we use programs for structural engineering and also some data management."

Another teacher who discovered the value of a computer in the home is Linda Timmons of Leavenworth, Kansas, who teaches high school computer science. She uses her PET to keep track of her

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students' attendance, grades, scores, and tests. Both Timmons and her husband have degrees in computer science and write all their own software. "The price came down so much, and they're so convenient, and they're so easy to use – anybody can program the things – that we just decided we couldn't do without one. It just makes so much sense to use a computer to keep track of grades and scores and so forth, because it saves so much time.

"Some people I know don't seem to be getting their money's worth out of their computers when it comes to personal use," says Timmons. "But I bought mine primarily for how it could help me on my job."

In Forest Hills, New York, Carol Klitzner's whole livelihood now revolves around personal computers. Back in 1977 she bought an original PET and a TRS-80 Model I. "I was working in educational publishing at the time, and this seemed like a natural to me, better than the workbooks and other materials I had been working with."

In 1980, Klitzner formed Computer Software Solutions, which develops educational software, and she has written a book on *VisiCalc* due in the Spring. She has added an Apple II, an Atari 800, a TRS-80 Color Computer, and a Monroe computer to her arsenal.

Malcolm F. Smith II of Beckley, West Virginia recently graduated with a master's degree in business administration from the University of West Virginia and is looking for a job. Meanwhile, he's using his VIC-20 to experiment with business forecasting. He recently used a program of his own design to forecast administrative costs for a friend's company. Previous forecasts had been about $1 million off. Smith's forecast was only about $150,000 off.

"Even though I bought my computer for rather unsophisticated reasons – I saw William Shatner advertising the VIC on TV and figured that if it was good enough for Captain Kirk it was good enough for me – I've become a more sophisticated user, and a very dedicated Commodore owner," he says.

"I look at a computer as a tool that will help me make a living," adds Smith. "I'm firmly committed to the computer age and Alvin Toffler's *Third Wave* and all of that. I think they are a definite part of our future."

If **COMPUTE!**'s informal survey is any indication, Smith is no exception. ©

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Perhaps the question we're most often asked is "which computer should I buy?" This article, excerpted from The Beginner's Guide to Buying a Personal Computer *(***COMPUTE! Books***, 1982), should be of help in answering that question.*

How To Select Your First Home Computer

As the microcomputer industry becomes more competitive, prices are dropping. It's likely that you or someone you know will want to buy a personal computer soon.

Buying a computer is something like buying a television *station* or a supersonic jet – assuming that these items suddenly became affordable. You are about to buy a very sophisticated machine. It is still essentially mysterious. That is, we do not easily understand computers on the same level that we understand automobiles or washing machines. We do have highly sophisticated items in our homes already (microwave ovens, televisions), but the main difference between the TV and the computer is level of knowledge required to purchase them.

It is quite a task to deal with the facts and figures you'll encounter in shopping for a microcomputer. You have to face a deluge of words: *bits* and *bytes*; *RAM* and *ROM*; *characters* and *interfaces*. This article, excerpted from *The Beginner's Guide to Buying a Personal Computer* (**COMPUTE! Books**, ISBN 0-942386-03-5), is designed to guide you towards making an intelligent decision. It is not just a consumer's guide to specific brands. It goes beyond that to help you match your expectations about personal computing to products that are currently available. And the specification charts at the end of this article should prove invaluable when you're ready to narrow the choices down to the computer that best suits your needs.

Choices And Options

Let's look at some of the considerations for choosing a machine. Keep in mind that some of the things we will look at will be highly subjective.

Memory

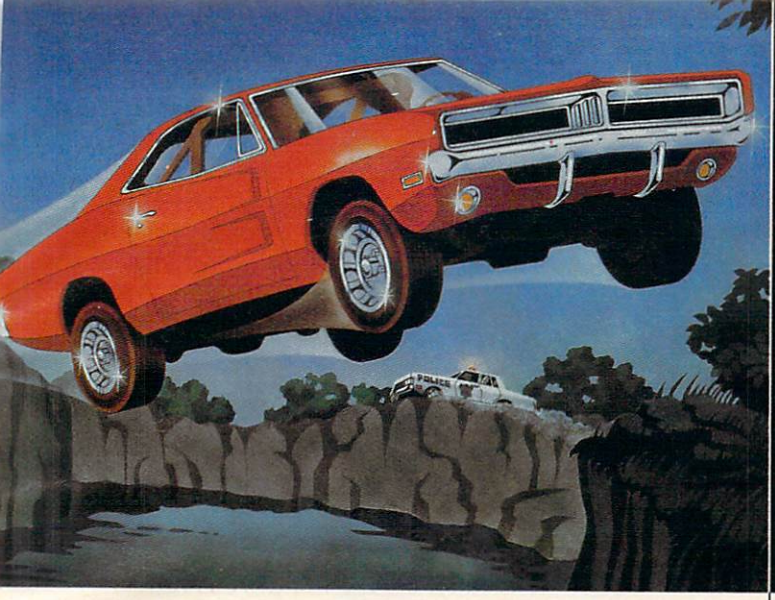
How much memory do you need? There are two basic rules regarding memory: 1. Larger memories can make complex programming more efficient, and allow you to do more sophisticated things with your computer. 2. Larger memories are generally more expensive. It's the familiar story: capability costs money.

First, let's take a quick look at memory and try to find out what memory is. Memory is a warehouse for the storage of instructions and data within the computer. The warehouse is divided into electronic bins or slots called "locations" or "addresses." Each location has a numerical identifier, unique to that location, called its *address*, a marvelous and surprisingly simple term in light of the industry's love for jargon. Each location can store one byte (1 byte = 8 bits, *bi*nary dig*its*) of information.

What can you find in one byte? A single alphanumeric or graphic character, part of a number, part of an address for another memory location, or a single instruction for the processor. As you can see, a byte is a very small parcel of information. Thus, we will need many memory locations. Due to the electronics involved, microcomputers are generally limited to 65,536 locations, thus we can potentially store 65,536 bytes of data in the memory. Although some microcomputers can access more memory, we'll treat 65,536 as our "ceiling" for the following discussion.

In order to be programmable and yet also automatically perform housekeeping chores (scanning the keyboard, loading or saving programs, displaying information on the screen, and other internal functions), the computer must have two types of memory, ROM and RAM. Both types reside in the 65,536 locations mentioned above.

ROM, *R*ead *O*nly *M*emory, is for permanent storage. RAM, *R*andom *A*ccess *M*emory, is temporary storage. Both ROM and RAM are random access memories. (*Random Access* – refers to the ability to access any specific location within the memory directly.) The contents of a ROM are written by the manufacturer and can never change. The computer can read the contents of a ROM, but cannot change these contents. ROMs are like a slab of granite with the information chiseled deep into the surface. RAMs are like a chalk board: the contents can be written, then read, then rewritten. This entire operation may occur in a few millionths of a second.



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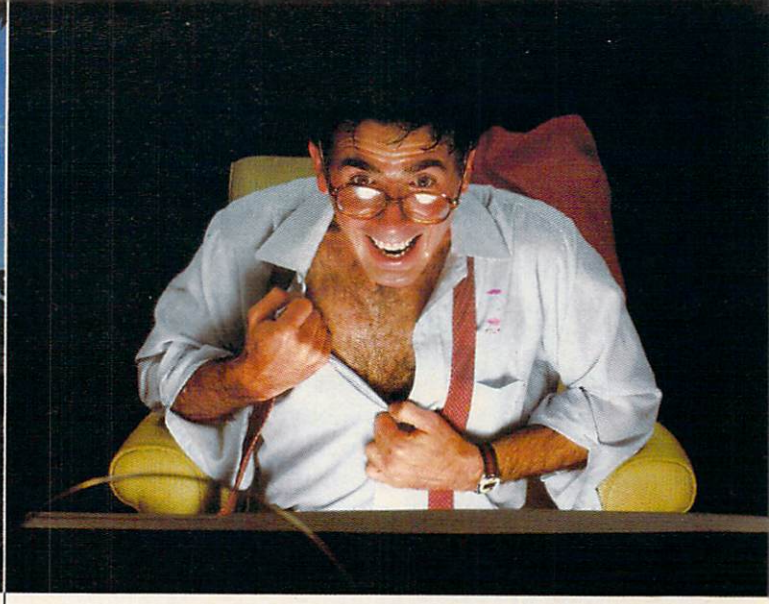

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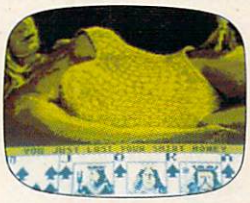

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ROM contains your computer's basic "personality"; when you type something on your computer keyboard, and it appears on the screen, you don't have to "tell" your computer to write to the screen. The computer's operating system programs, embedded in ROM, automatically handle this for you.

RAM (Random Access Memory)

This is memory that's available in your computer for "working" storage. You use this memory each time you work with your computer. When you type a program, or set of instructions, into your computer, this is where your computer saves them. You don't have to worry about how it saves them (your ROM based programs take care of this). What you do need to remember is that, unlike ROM, RAM is not permanent memory. Thus, when you turn your computer off, RAM is erased. That's the reason your computer has external storage devices available.

Buying Memory

Let's explore what to look for in memory when you are shopping for a computer. First ROM. You may notice that the amount of ROM is sometimes advertised. Which is better, 12K of ROM or 14K? That is a fairly meaningless question. The actual amount of ROM is not, in itself, important. You can't use ROM, only the machine can.

What is important are the functions that are packed into the ROM. The ideal is a great number of powerful functions packed into the smallest total number of memory locations. So you can't shop for numbers; you have to shop for performance. ROM is something like a book: you purchase a book for its information, not how many pages it contains.

Size of ROM is somewhat meaningless, but the numbers game is important in RAM. RAM stores your programs and data. The more RAM, the longer your programs can be. Greater RAM also allows larger blocks of data to be entered in a machine. This can speed up data file manipulations. The machine can process data much faster when it can process (manipulate) data directly (while it's in RAM) as opposed to loading small pieces, processing, then saving them back to tape or disk. Cassette tape drives move at a snail's pace compared to the speed of the computer working within its RAM. By loading an entire file into the RAM memory, you can proceed at *machine speeds* once the load is completed.

With a small RAM memory, you may be forced to load, process, load, process ... this can be tiresome. Larger RAM memories allow you to do more with your computer: write longer programs, and process faster. Another argument in favor of larger memories is the RAM requirements of commercially available software. Some programs *require* large memories. Most home applications programs will run on 8 or 16K, but there are some programs that require 32K or more depending on the model of the computer. (If you have more RAM than a program requires, it is no problem. However, if you attempt to run a program that exceeds the available RAM, the program will not run. The machine will *crash* (cease functioning) and display an error message indicating that you have run out of memory.) You can use special techniques, however, like "chaining" to run a program in several sections.

What are the disadvantages? There is only one: cost. Extra RAM costs more. This does not mean that you order any amount of RAM that comes to mind. Models offer a certain amount of RAM and you choose which model you want.

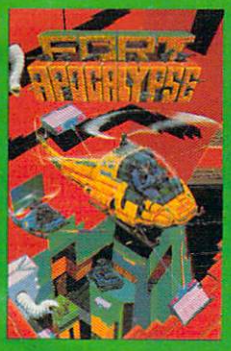
RAM Sizes

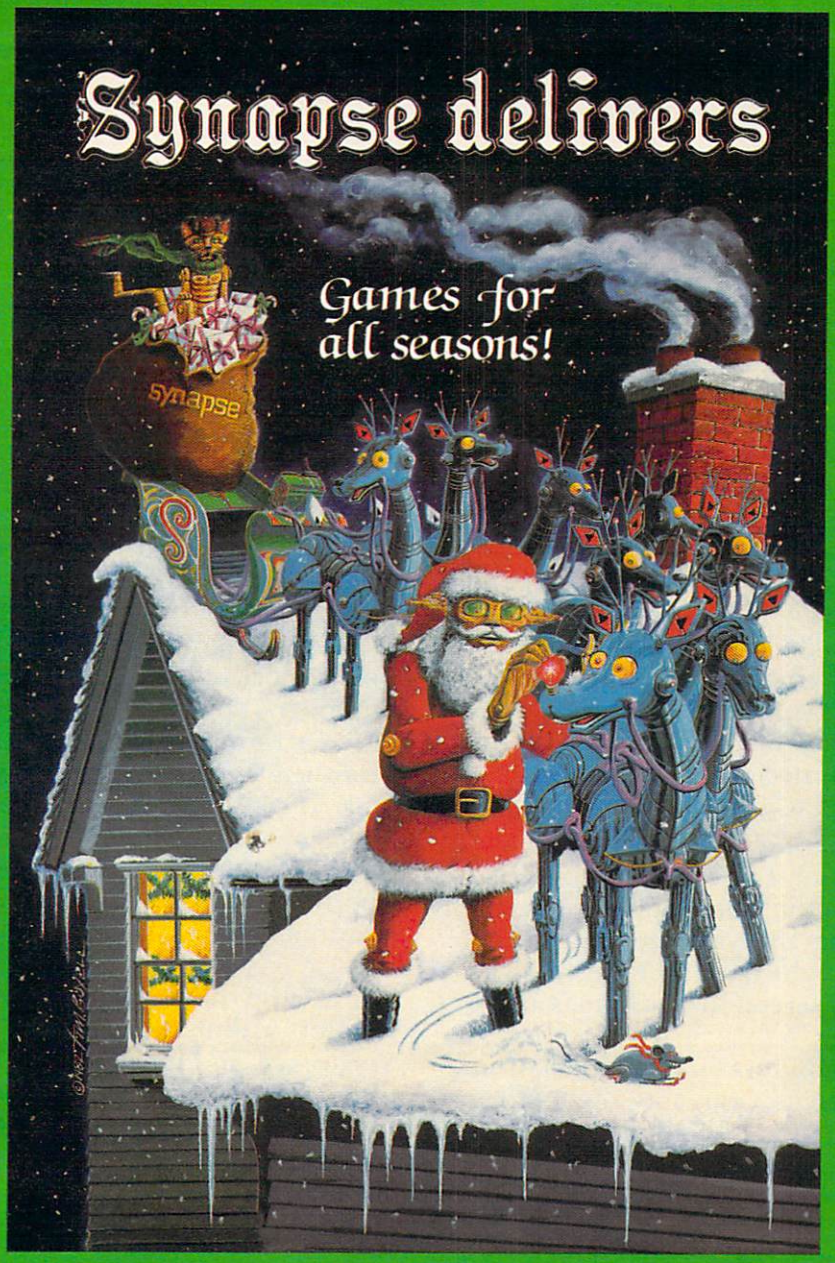
How do you buy RAM? The available memories are almost as numerous as the machines. Some manufacturers offer the same basic machine with several choices of memory sizes (e.g., 8K, 16K, or 32K). Other manufacturers offer one model with a given amount which can be expanded, and offer a better model with more. Each manufacturer has his own way of doing this. You have to buy some definite amount; that is, you can't order a "Data Cruncher Mark IV" with 19 ½K of RAM. You would have to buy either a 4K or a 16K or whatever "Data Crunchers" have available.

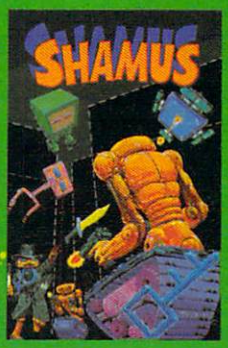
1, 2, 3, 5, 8, 16, 32, and 48K are the common amounts sold with computers. That represents a variety of machines, not one model. On some machines, with higher price tags, you may find 64K, 96K, 128K, 256K.

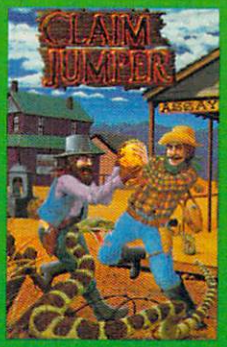
Another point about RAM. You can add additional RAM up to some maximum amount. That is, you can buy a computer with less than the ceiling on RAM, and add more RAM later up to that ceiling. The ceiling is defined by how many of the original 64K of memory locations are consumed by the operating system, the BASIC interpreter, and expansion ROM. If all of this added up to 16K, then the ceiling for RAM would be 48K.

What are the memory considerations? For RAM there are only two: 1. How much RAM do you need and can you afford on your initial purchase? 2. What is the maximum amount of RAM that the machine can handle, the ceiling mentioned above? A minimum of 8K is probably sufficient for most home applications. 16K should be more than sufficient, and possibly the best choice for a cost versus use consideration. Unless you have something quite specific in mind, perhaps you need not worry about getting more than 16K to begin with;









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Screen Considerations

Displays. Your display is your window into your computer. If you had no TV screen or monitor, using your computer would be like typing on a typewriter with no paper. The type of display you have is equally important. If your computer has color graphics capabilities, then you'll need to be considering a color television or monitor for it. Otherwise a less expensive black and white TV will do. We strongly recommend that you take a look at various displays with your computer. Buying an expensive personal computer system and then hooking it up to the cheapest TV you can find may be somewhat like buying $19 speakers for your $2000 stereo. After all, it is the display that you'll spend all of your working time looking at.

Some computers come with a built-in display monitor. This standard feature should be another consideration in your decision.

Screen Format. *Screen format* describes the physical presentation of information on the screen of the video monitor or TV. The format is decided by the computer, not the video monitor. The monitor only displays what the computer tells it to. There are two terms which must be defined in order to understand screen formats: lines and columns.

The various computers on the market offer a variety of screen formats. Common column formats are 22, 24, 32, 40, 64, and 80 columns. Common line formats are 1 (hand-held computers), 16, 24, and 25. The more exotic machines may exceed these figures.

Why are screen formats important? The larger the format (the more lines and columns you have), the greater the amount of information you can display at one time. Let's consider four different formats: a hand-held with 26 columns by 1 line, a desk-top with 32 columns by 16 lines, a second desk-top with 40 columns by 25 lines, a third desk-top with 80 columns by 25 lines. These are all common formats. How many total characters can each format display?

Simply multiply the columns by the lines. Thus we have 26 (1 X 26) for the hand-held, 512 (32 X 16) for the first desk-top, 1000 (40 X 25) for the second desk-top, and 2000 (80 X 25) for the third desk-top.

The more information that you can display at one time, the more useful and, unfortunately, the more expensive the computer is. The impact of screen format is determined by your main use for the computer. Again, you must balance cost against need.

Related to screen format is the *character matrix.* The character matrix is a block of Picture Elements, pixels, which is used to form the individual characters on the screen. Each pixel is like a light bulb: it may be on or off independently of the rest of the matrix. The matrix resembles a bank of light bulbs used on a scoreboard, or a time/temperature sign. By illuminating the proper pixels, any character (alphanumeric, graphics, punctuation, or symbols) can be displayed. For a period (.), only one pixel would need to be illuminated. For a flashing square, all of the pixels in the matrix would be illuminated, then off, then illuminated ....

The number of pixels in the character matrix is always given in terms of a horizontal dimension and a vertical dimension. Common dimensions for a character matrix are: 5 X 7, 7 X 9, and 8 X 8. In 5 X 7, the character matrix has a dimension of 5 pixels horizontally and 7 pixels vertically. The total number of pixels in the matrix is the product of the horizontal and vertical dimensions (e.g., 35 for the 5 X 7). The larger matrices provide a finer *font.* (*Font* – style and size of any form of printing.) The lowercase letters can have true "descenders" for the letters g, j, p, q, and y. Descenders are the portions of these letters that *descend* below the bottom line established by the remaining letters.

A 5 X 7 matrix cannot produce descenders due to the short vertical dimension of the matrix. Letters without descenders have an elevated appearance, and the font is coarse and harder to read. The larger the character matrix dimensions (i.e. the more pixels in the matrix), the more detailed the font can be. The display will have a better appearance.

Keyboards. The keyboard is not really part of the computer. It is an input peripheral. Due to the fact that most models of computers have a keyboard included, we will take a look at some of the aspects of a keyboard. Don't underestimate the importance of a keyboard. You will be spending hours pounding away on it, so it is a critical consideration. You will often see the term *human engineering* used in relation to keyboards. Human engineering is the concept of designing something that is practical and comfortable for human beings to use. You can have the most wonderfully designed keyboard in terms of electronics and, if it is uncomfortable to use, it's not worth buying. Shop for human engineering in keyboards.

Some manufacturers place all of the numbers and, in some units, the arithmetic operators (+,-,*,/) in a calculator-like keypad to the right of the main keyboard. (BASIC uses the * to denote multiplication, and the / to denote division.) This layout has two advantages: 1. The numerical keypad is very convenient for math operations. 2. Additional

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characters can be added to the empty keys normally used for the numbers and the shifted position of the extra numerical keys. The only disadvantage is that the keyboard has to be somewhat larger.

Also notice the location of special function keys, especially those that may have a devastating result if inadvertently struck (RESET key). Any command keys should be located so that it is difficult to accidentally strike them during normal use.

There are several types of keyboard construction. The two major categories are the flat panel, touch sensitive (membrane), and the mechanical switch (or contact) types. The flat panel can use the same layout, and can perform the same functions as any other keyboard. The keyboard is flat; there are no bumpy individual keys sticking up. Key placement is indicated by labeled blocks printed on a plastic sheet, which is glued or laminated to the surface of the board. The flat panel has the appearance of a diagram of a keyboard that one might find in an instruction manual. It is wafer thin, very light, cheap to manufacture, and, with no moving parts, it is very rugged. Flat panel keyboards are being used extensively by industry in hostile environments. Since it is flat, it is very easy to clean. The flat panel keyboard is less sensitive to peanut butter, jam, candy, soft drinks, and abusive pounding. It can be a wise choice for children.

With all of these advantages, you may wonder why the computer industry has relegated the flat panel to the low cost models only. The reason: there is no tactile feedback with a flat panel keyboard. You cannot feel the locations of the keys, nor can you feel a response to a keystroke. There *is* no keystroke. Typing on a flat panel keyboard is like typing on the top of a desk. Touch typists have nothing to touch; there is no feeling that the key has been actuated. So, for all of its advantages, which are considerable, the flat panel's failure to involve our sense of touch is its great weakness.

Everything that is advantageous about the flat panel is a disadvantage with the mechanical switch type. They are expensive, delicate, and difficult to clean. They use contacts which oxidize and get dirty. They cannot be used in hostile environments or by hostile people. Liquids and humidity are murderous to them. Because they have moving parts, they can wear out.

Watch Out For Bounce

With all of these disadvantages, the mechanical switch keyboard has its one very big advantage: you can feel the keys. You don't have to keep one eye on the keyboard (if you touch type). You can feel the key's response and know that the character has been entered.

Within the mechanical switch category, there are a variety of stroke depths, key sizes, and stroke pressures. Sizes range from tiny, on the hand-helds, to what is known as the full-size keyboard. The full-size is similar to a standard typewriter keyboard. Stroke depth (the distance the key travels during the stroke) and stroke pressure (the force required to strike a key) vary on the different models. Generally, an expensive keyboard will have a very positive response: a light, but even pressure and, perhaps, a slight snapping action at the bottom of the stroke called a detent. Cheap keyboards will usually have a very shallow stroke depth and a "mushy" feel. The feel of a keyboard, of course, is a very subjective matter. Your best test of a keyboard is to try it out.

A feature that you want on any keyboard is two or three key *rollover*. This is the ability of the keyboard to distinguish small nuances in time passing between two keys being struck almost simultaneously, and to keep the order correct. Without rollover, touch typists would have a terrible time with characters getting out of order or lost altogether. You want rollover.

You don't want *bounce*. Keyboard or switch bounce is the multiple entry of a character when only one character was desired (sswwiittcchh bboouunnccee). Keyboard bounce is caused by microscopic bouncing of the contacts during a keystroke. All mechanical switches have switch bounce, but special circuitry is implemented to eliminate the effect. However, a bad keyboard can overcome the circuitry and, on occasion, a character may be entered more than once. Keyboard bounce can be lived with, if it is not excessive, but it is always aggravating. Naturally, manufacturers are not going to advertise that their computers have bounce, so you have to ask experienced users or dealers about the problem. Get a number of opinions; people have been known to hint about bounce on a particular model they don't like. It's like saying a particular car has transmission trouble; it may or may not be true.

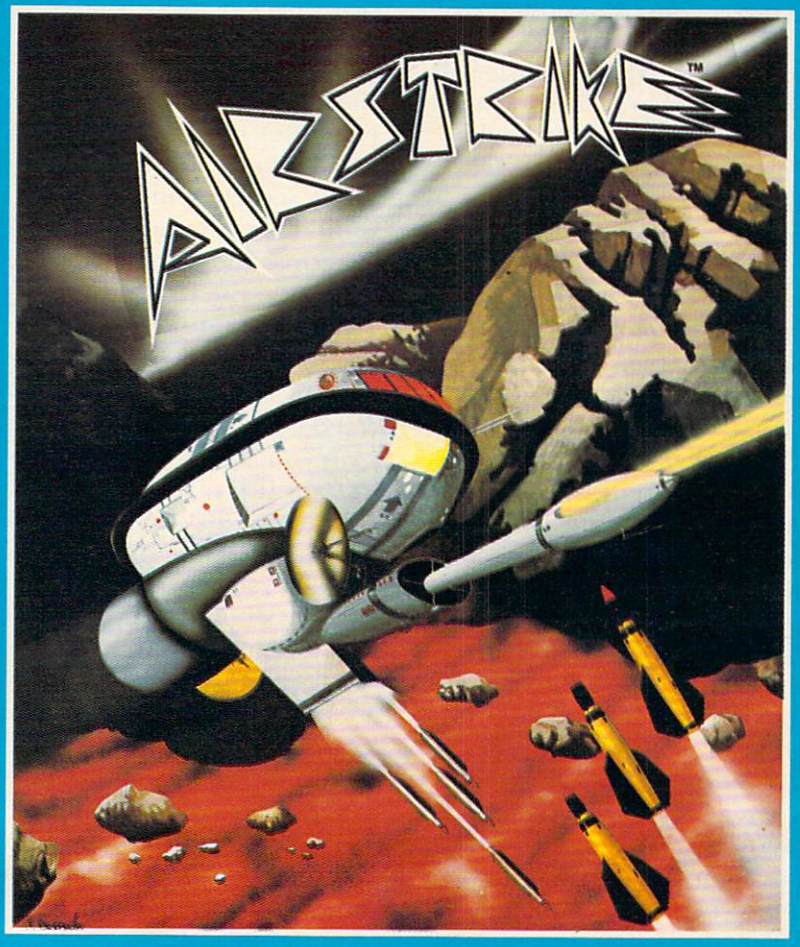
If you can touch type, or you intend to do a lot of programming, or you intend to use the computer for word processing, you need a good quality, mechanical switch type of keyboard. If the computer will be used mainly by young children, a flat panel, touch sensitive keyboard might be best. If you will be doing a lot of numerical work, look into a model with a separate numerical keypad.

Unfortunately, you don't get much of a choice on keyboards either. Don't underestimate the importance of a keyboard. It is your primary method of communicating with the computer.

Graphics And Character Sets

Graphics are computer-generated illustrations

Very, very difficult!



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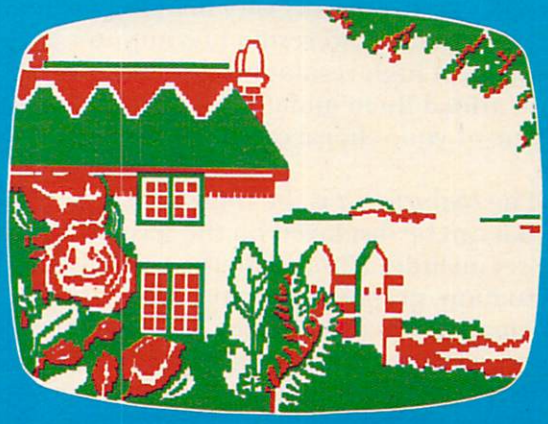

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and graphs. In essence, any nonverbal and nonnumerical information is considered graphics. There are two general categories: low resolution and high resolution. Most home computers feature graphics, but some models are limited to low resolution.

With low resolution graphics, the machine will have a given number of standard graphic characters. These characters are internally generated in the same manner as the alphanumeric characters. Each character is assigned a key on the keyboard, usually in the shifted mode, and they are typed or programmed on the screen in the same fashion as alphanumeric characters.

High resolution graphics illuminate the individual pixels of the character matrix anywhere on the screen. You can make very detailed drawings as the screen becomes a giant matrix of thousands of individual dots which can be illuminated independently of one another. You can draw curves, irregular angles, three dimensional figures, and those fascinating geometrical constructions which are graphic representations of mathematical functions. As a comparison, imagine two artists painting a picture. One uses a fine set of art brushes (high resolution), the other uses a two inch house brush (low resolution).

If your interest is in low resolution graphics, look for the greatest number of different characters and the largest screen format. This will give you a greater versatility and allow a more detailed image. If high resolution interests you, you want to look for the largest maximum screen resolution. You want many pixels: the more, the better. The number of pixels will determine the detail of your image. High resolution graphics are somewhat more expensive. Some machines have high resolution graphics as a standard feature. Others offer it as an option, and some models rely on add-on boards offered by separate, specialty manufacturers. If you are especially interested in computer graphics, you will want high resolution graphics. If you cannot afford them initially, make sure that the machine of your choice can be expanded to include them.

The *character set* is the total package of characters that can be displayed on the screen. The character set includes alphanumeric, symbols and punctuation, graphics, and special notation (e.g., mathematical notation, Greek letters for engineering, special punctuation used in foreign languages). Character sets differ from machine to machine, and, to some degree, are an indicator of price. The very low cost units may offer only uppercase letters, the minimum of punctuation and symbols, numbers, and perhaps a smattering of graphic characters. However, in many cases, additional specialized symbols can be added to the machine.

Related to the character set are special video effects. The most common is reverse video. In normal video, the character is illuminated on a black background. The only portion of the character matrix that is illuminated is that portion which is required to form the character. In reverse video, the character is black and the remainder of the character matrix is illuminated. If you had one word printed in reverse video on an otherwise blank screen, you would see a black screen with an illuminated stripe (one line high and the same length as the word), with the word printed in black letters on the stripe. Other special effects include flashing and underlining.

Color. Do you need color? The answer can only be determined by you. It is debatable that you need color, but it does add to games, graphs, etc. Can you afford color? Don't forget that, with color, you must pay more for your display. Some monochrome (one color, generally black and white or green and white display) models have their display already built in. So don't forget the price of the display when making your pricing comparisons. A color TV or monitor can be as expensive as the computer itself.

Where is color most useful? For games and educational programs. Educational programs, especially for younger children, are enhanced with color. Creative programming with color can be very conducive to maintaining attention. Another primary use of color is in graphics (using the computer to form images). Imagery in color is much more interesting to the eye. If one of your principal interests is computer graphics, the color machine becomes even more necessary. Color is less important in financial, word and information processing, unless you're interested in the more expensive systems that can generate color graphs and charts.

Assuming that you do want color, what should you look for? First, realize that you don't get every color in the rainbow. Most models offer 8 or 16 basic colors. Some will allow you to perform various intensity and shading tricks, bringing your number of available shades up as high as 128 different "colors." Check the number of available hues. Another issue is the versatility of the color functions. How many colors can be displayed simultaneously on the screen? How easy is the color to work with? How accessible are color "commands" in the computer's programming language? If color is an important factor in your choice, then it should be versatile and easy to program. We have a tendency to think of computers as either color or monochrome, as we think of a TV. Remember that each computer is capable of a great number of different tasks, and each model has a distinct set of features

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and limitations. Color should only be one factor. You shouldn't make a pass/fail screening test to eliminate 50% of the machines right away. You want the best total package to fit your requirements. It all goes back to knowing what you're doing. Take your time, and personally evaluate your options.

Software. If you have a specific job in mind, software availability may make the difference between a useful machine and a dust collector. For the general home user, there is a myraid of programs to choose from. The software ranges from backgammon to recipe costs, arithmetic for children to energy conservation calculations, etc. Think of any subject, and chances are that someone is selling a program related to it.

Some models of computers have a great amount of commercially available software. Others, for some reason, do not. Also, some software is available only for certain machines. If you will be dependent on commercially available software, (doing no programming yourself), choose a model with a large selection. Bear in mind however, that a recently introduced model will be lacking in software. Over time, software will be written for it.

You can find a lot of information about software availability in magazine advertisements. One thing to realize is that, in most cases, independent software houses will offer more software for a particular machine than does the manufacturer of the machine. Look beyond what the manufacturer offers. Dealers are also a good source of information on software availability. There are some software directories available, and many dealers have these on hand.

A word of caution: after you get your computer, choose your software carefully. Due to abuses of copyrighted software, dealers are becoming reluctant to refund or exchange purchased software.

Peripherals. Do you need peripherals? Yes, unless you only intend to use the computer as a space heater. Peripherals communicate with the computer.

We think of a computer as being a box with a keyboard and TV sitting on it. Actually, we have a computing system: the computer, an input peripheral (the keyboard), and an output peripheral (the TV or video monitor). If any one of the three items fails, the whole system becomes useless. If all three items are installed on a common chassis, you should still visualize them as a computer with two peripherals. You will be buying some peripherals whether you realize it or not.

What other peripherals do you need? It depends. Specialized uses require specialized peripherals (a printer for word processing). As a general statement, the more peripherals you have in a system, the more useful the system will be.

Buy peripherals as you need (and can afford) them. 1. If you decide that computing is not really for you, there is less equipment to sell off at a depreciated price. 2. You, as a beginner, have enough to learn for a while with the purchase of a minimal system. 3. After you have used your system and have become familiar with computing, you may redefine your needs. When you have some experience, you will be better able to make decisions on peripherals.

On the other hand, you might be offered a significant price cut in a package deal. Otherwise, you should buy a good minimum system. But don't cut corners on your basic system in order to throw in that flashy extra item. A good minimum system has far more potential than an ill-planned extensive system.

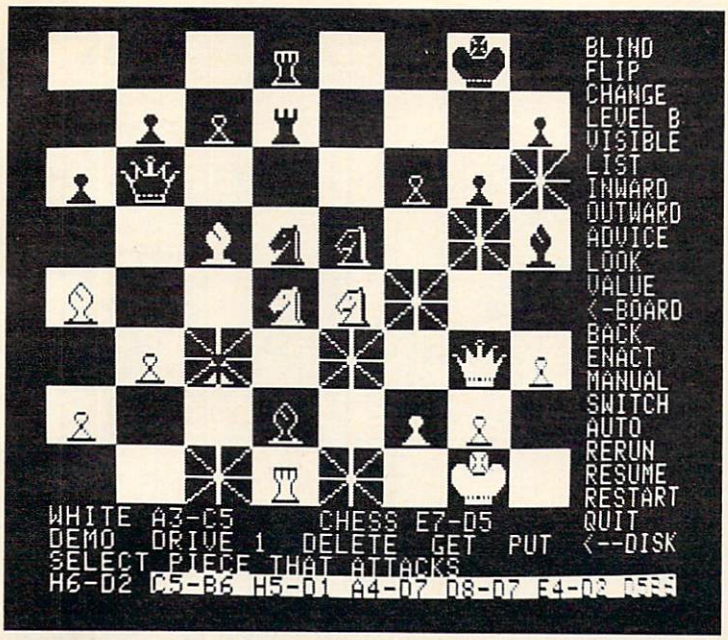
You may also want to consider joysticks, game paddles, or a light pen since these items are rather inexpensive ($20 to $50 per item). They can add to the pleasure of playing games.

Storage Devices. In our discussion of RAM, we concluded with the need to have something available for storing the contents of RAM when you turn the computer off. This isn't, of course, the only reason for storage. This is where you'll end up saving the hundreds of programs you'll acquire and develop for your computer. There are two major types of storage available. One is cassette tape, the other diskettes. The cassette tape type of storage is a medium we're all familiar with. You simply plug a tape into your recorder and tell your computer to save or load something.

Operation of a disk drive is equally simple. The major difference between these two technologies is cost. Your simple disk storage system will add at least $300-$400 to the cost of your system; your tape based storage will add less than $100. You'll have to weigh this cost disparity against your needs. Tape is much, much slower than disk, in its loading and saving operations. In some personal computer systems it is less reliable. Disks have the advantage of much greater storage capacity, a factor essential to some educational applications, and such business ones as data management, word processing, and so on. Again, as with the computer display you select, you'll be living with the storage medium you select. Evaluate carefully! Your initial choice isn't a one way street, of course. Many home users start off with tape storage, and "move-up" in several months to disk storage. This is an ideal way to spread out the costs of your initial personal computer system.

Documentation. *Documentation* refers to the instruction manuals, programming manuals, theory

Explore the Frontiers of Intelligence



- Variations of blind-fold play—camouflaged or invisible pieces
- Invert board to play black on bottom
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- Change between 15 levels of play, plus postal and mate-finder modes
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- Lines of force out: squares attacked and defended
- **Chess** suggests a move
- Show moves **Chess** thinks you will make, and its responses
- Evaluation of a position
- Return to board or switch to command menu
- Take back a move (repeatable)
- Play move suggested by look-ahead search
- **Chess** plays neither side
- Switch sides
- **Chess** plays against itself—one level against another
- Replay through most advanced position
- Skip to most advanced position
- Start new game
- Leave program
- Save, get, and delete games to and from disk

All features self-documented; all choices cursor-controlled
Screen shows "outward" and "look" features being used

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Larry Atkin & David Slate: Authors of the Northwestern University Chess 4.7 program—World Computer Chess Champion, 1977-1980

Peter Frey: Northwestern University professor
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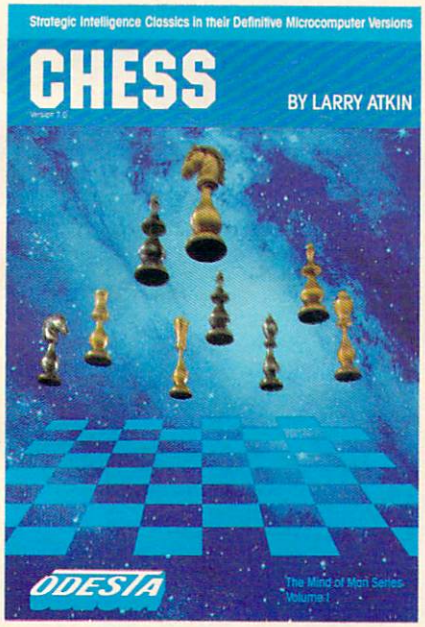
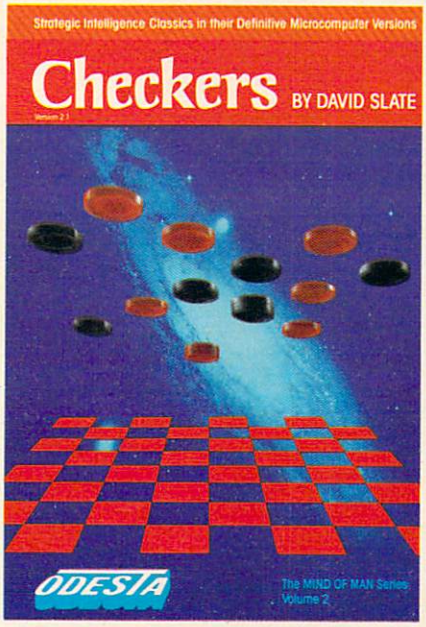
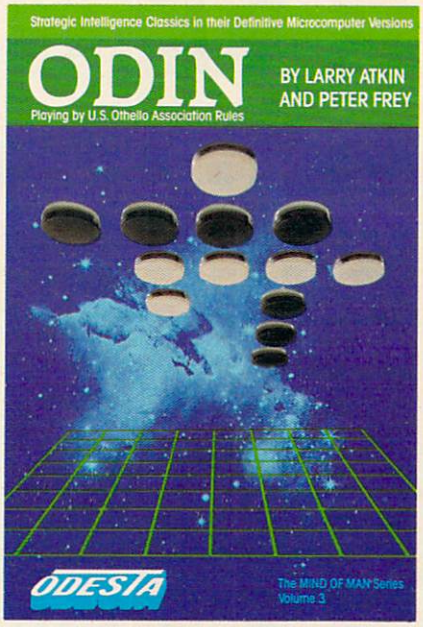
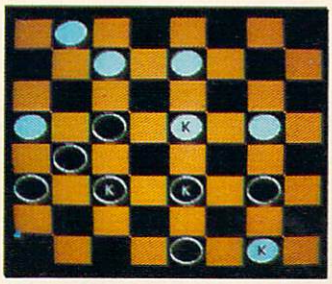


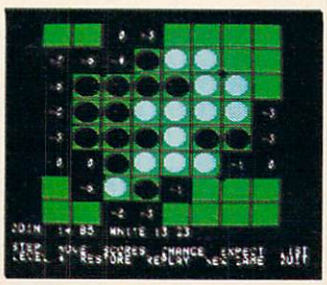




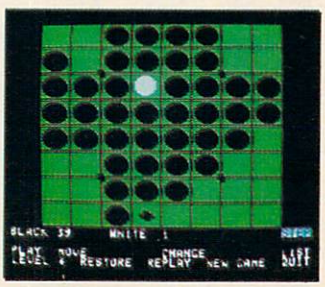
Checkers' features



Black to move and win
(From Checkers documentation)



"Scores" feature in Odin



A clue to the secret of Odin:
Black is destined to lose.

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For **Apple II, Apple II Plus** 48K disk systems, and **Atari** 48K disk systems. Odin is also available for **TRS-80 Model 1 & 3** 32K disk systems.

Charts and Analysis

The authors of this book have made every effort to insure the accuracy of the information presented in these tables. We assume no liability for error or omission in the information presented in this publication.

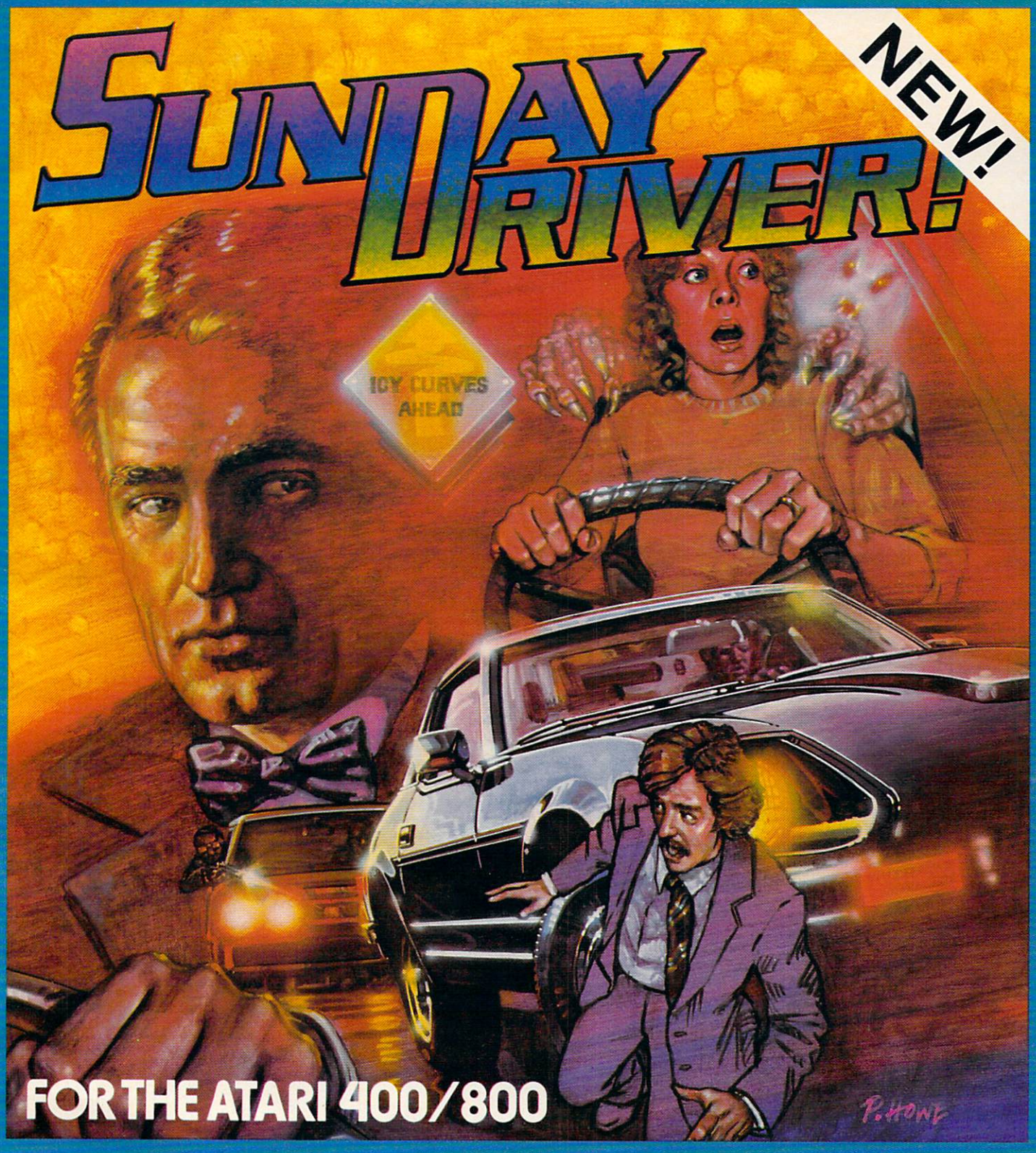
MEMORY

MASS MEMORY STORAGE

SCREEN FORMAT

	RAM Standard:	Expansion to:	ROM Expansion	Tape Drive	Disk Drive	Lines x Characters	Character Matrix	Upper-And Lowercase
Apple II & Apple II Plus	16K	48K	"Cards" inside unit	X	Up to six 143K per drive	24x40	5x7	No
Atari 400	16K	48K	ROM cartridges	X	Up to four 92K per drive	24x40	8x8	Yes
Atari 800	16K	48K	ROM cartridges	X	Same as Atari 400	24x40	8x8	Yes
Commodore 64	64K	N/A	"Cards" and cartridges	X	Up to five 170K per drive	25x40	8x8	Yes
Commodore PET/CBM	16 or 32K	32K	Internal sockets	X	Dual drive (up to four) 340K or one megabyte double density	25x40*	6x8	Yes
Commodore SuperPET	96K	N/A	Internal sockets	X	Same as PET	25x80	6x8	Yes
Commodore Max Machine	1K	N/A	Cartridges	X		25x40	8x8	Yes
Commodore VIC-20	5K	32K	Cartridges	X	Single 170K disk drive	22x23	8x8	Yes
Exidy Sorcerer	16K	48K	ROM "Paks"	X	Single 308K disk drive	30x64	8x8	—
Hewlett-Packard HP-85A	16K	32K	ROM "Drawer"	Built-in	Double density disk drives 286K	16x32	5x7	Yes
IBM Personal Computer	16K	512K	"Cards"	X	Up to two 320K disk drives	25x80	9x14	Yes
Mattel Intellivision	16K	N/A	—	X	—	24x40	4x8	Yes
NEC PC-8001A	32K	160K	One internal socket	X	Up to four 186K drives	25x80**	7x9	Yes
Osborne 1	64K	N/A	—		Built-in dual disk drives 160K each	24x52	9x10	Yes
Panasonic Hand Held Computer	2K	8K	ROM capsules	(Up to 8K non-volatile RAM capsules)	—	Single line, 26 character LCD display	8x6	No
Radio Shack Color Computer	4K	32K	Program "Paks"	X	Up to four 156K drives	16x32	6x16	No
Radio Shack Pocket Computer	1.9K	16K	—	X	—	Single line, 24 character LCD display	7x5	No
Radio Shack TRS 80 III	16K	48K	—	X	Up to four 175K disk drives	16x64	7x9	Yes
Sinclair ZX-81/ Timex TS-1000	1K/2K	16K	—	X	—	24x32	8x8	No
Texas Instruments TI-99/4A	16K	48K	Plug-in "Modules"	X	Up to three 90K disk drives	24x32	8x8	Yes
Xerox 820	64K	N/A	—	—	Up to two 300K disk drives	24x80	7x9	Yes
Zenith Z89	48K	N/A	—	—	One built-in 100K disk drive Up to three total disk drives allowed	25x80	5x7	Yes

*The CBM 8032 has 25 x 80.
**Can be varied.



SUNDAY DRIVER gives you four scenarios to choose from. You must beat the clock as you drive along while avoiding pedestrians, other cars, and obstacles. In other versions it's winter and you're on ice-slicked roads. In game three it's nighttime (don't hit the ghosts). If this sounds too easy try the 007 option — it's you against **them** on twisty roads.

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	Required Additional Devices*	Computer List Price**	Comments	Number Of Colors	Maximum Resolution	Sound	Special Notes
Apple II & Apple II Plus	B/W or color TV Audio cassette player	$1330	16K RAM	16	280h x 192v	Speaker generates clicks	High resolution 8 colors. Low resolution 16 colors. Some color inaccuracy.
Atari 400 Atari 800	Atari 410 tape recorder ($89.95) B/W or color TV	299.95 899.95	16K	256	320h x 192v	4-voice, 4-octave special effects	16 graphics modes from all text to high-resolution. Four animated "sprites," or player/missile graphics, keyboard graphics, custom character set.
Commodore 64	B/W or color TV Tape recorder ($75)***	595	64K	16	320h x 200v	3-voice programmable synthesizer	Graphics characters, custom characters, mixed text and graphics, 8 animated "sprites."
Commodore PET/CBM (4032/8032)	Tape recorder ($75)	995/1495	32K	Monochrome	80h x 50v or 160h x 50v (CBM 8032)	1 voice, 3 octaves	Graphics characters.
Commodore SuperPET	CBM 8050, 1 megabyte dual disk drive ($1795)	1995	96K	Monochrome	160h x 50v	1 voice, 3 octaves	Special APL character set.
Commodore Max Machine	Same as Commodore 64	179.95	1K	16	320h x 200v	3 octaves, programmable synthesizer	Graphics characters, custom characters, mixed text and graphics, 8 animated "sprites."
Commodore VIC-20	B/W or color TV Tape recorder ($75)	260	5K	16	176h x 184v	3 voices plus white noise	Graphics characters, custom characters, mixed text and graphics.
Exidy Sorcerer	Cassette player, B/W TV	1295	16K	Monochrome	512h x 240v	None	Graphics characters, custom characters.
Hewlett-Packard HP-85A	(This computer is sold with a built-in tape player and thermal printer.)	2750	16K	Monochrome	192h x 256 v	Beeper	Graphics commands from BASIC.
IBM Personal Computer	Tape recorder B/W or color TV	1265	16K	16	640h x 200v	1 voice	Graphics characters, high resolution color and B/W graphics.
Mattel Intellivision	(Cassette player built in) B/W or color TV	599	16K	16	160h x 192v	3 voices	Video-game processor.
NEC PC-8001A	Audio cassette player B/W or color TV	995	32K	8	640h x 230v	1 voice	Green characters. High-resolution graphics.
Osborne 1	(No additional devices required. Built-in disk drives and CRT.)	1795	60K	Monochrome	52h x 24v	None	32 graphics characters.
Panasonic Hand Held Computer	—	500	2K	LCD display	159h x 8v	None	Optional TV interface allows 48 x 64, 8-color graphics.
Radio Shack Color Computer	Color TV Tape recorder ($59.95)	399.95	16K	8	192h x 256v	1 voice	Optional enhancement allows high-resolution graphics.
Radio Shack Pocket Computer	Cassette player ($79.95) Cassette interface ($49)	159.95	2.6K	Monochrome	126h x 5v	Beeper	
Radio Shack TRS 80 III	Cassette player ($59.95)	699	4K	Monochrome	128h x 96v	Simple sound via cassette interface	Optional enhancements add upper/lowercase and graphics characters. High-resolution video board optional.
Sinclair ZX-81/ Timex TS-1000	Cassette player B/W TV	99.95	1K/2K	Monochrome	64h x 48v	None	22 graphics characters.
Texas Instruments TI-99/4A	Cassette player B/W or color TV	299	16K	16	256h x 192v	3 voices plus white noise	High-resolution. Custom characters. 256 animated "sprites."
Xerox 820	2 disk drives	3295*	64K	Monochrome	N/A	None	
Zenith Z89	—	2895	48K	Monochrome	N/A	None	33 graphics characters.

* To effectively use this system, these additional devices are necessary.

** This price does not include the cost of any required additional devices (such as TVs) listed above.

*** *Tape recorder* is distinguished in this chart from *audio cassette recorder*. The latter can be an ordinary portable cassette player; the former is optimized for data storage.

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of operation, and trouble-shooting information provided with the computer. Good documentation is essential. Your understanding and the ultimate usefulness of the computer depend on the quality of the documentation. Some documentation is excellent; most is adequate. Fortunately, when a manufacturer provides poor documentation someone will usually write a book on the machine. Sometimes, you can purchase the instruction manuals separately.

Good Luck!

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Now you can prevent this from happening to you with an AC Surge Protector from Electronic Protection Devices. Each Protector is a solid state clamping device with 6 outlets utilizing modern high speed semiconductor technology. Using our Protectors is as simple as plugging it into any standard three wire duplex outlet then plugging what needs protection into it. Each Protector exceeds the IEEE 587-1980 Guide for Surge Voltages in Low Voltage AC Power Circuits.

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For VIC (8K), Color Computer (Extended BASIC), Apple, Atari, OSI, and PET – set up any model on a spreadsheet and watch the changes when you revise the information. This can be one of the most valuable and easy-to-use programs in your computer's repertoire.

SIMULATOR:

"Tiny Plan," A Modeling Planner For Home Applications

Christopher J. Flynn
Herndon, VA

There seems to be a revolution occurring in corporate America. Microcomputers are increasingly appearing on desk tops. One of the reasons for this is the development of sophisticated business software. A prime example is the computerized spreadsheet. With this kind of software, managers can rapidly evaluate various business situations. The ability to react quickly may mean the difference between profit and loss (or worse).

What about the average household, however? Hasn't home financial planning become more necessary? Hasn't it also become more difficult? Consider, for example, the variety of investment opportunities that are now available. There are money market plans, CDs, IRA accounts, and so on. How can you tell which is best for your family's needs? Are you able to state what your assets and liabilities will be in, say, two years?

A Personal Computerized Spreadsheet

"Tiny Plan" is a computerized spreadsheet program for home computers. It is a tool that makes difficult calculations and projections much easier. Combine Tiny Plan with your good judgment, and you are well on the way to preparing sound financial plans.

Keep in mind, however, that Tiny Plan is only a tool. Tiny Plan does not make recommendations. It is not, nor is any other program, an electronic crystal ball.

Tiny Plan will work on most home computers. Your computer should have a minimum amount of RAM memory – 8K will do just fine. Tiny Plan will work without a disk or printer.

Tiny Plan was developed on a Commodore VIC-20. Since the VIC allows only 22 characters per line, you will notice that Tiny Plan's messages and instructions tend to be brief.

Tiny Plan can be adapted to your computer quite easily. VIC's color and sound capabilities were not used at all, to make the program more general. In fact, only one program line needed to be changed when Tiny Plan was tried on an expanded Rockwell AIM 65. That was line 50010, where the clear screen control character is defined.

Tiny Plan Models

The concept behind Tiny Plan is that of building a model. A model is a representation of reality. The representation may be a physical replica (like a model airplane) or a mathematical abstraction. Tiny Plan uses the language of mathematics.

In practice, the mathematics used by Tiny Plan are very simple. There are the familiar operations of addition, subtraction, multiplication, division, and a variety of percentage calculations. The power of Tiny Plan comes from its ability to perform these calculations on lots of numbers quickly and accurately.

Projection

We will use an example to illustrate Tiny Plan that will project the value of different financial assets for the next three years.

The first step is to develop a model. You don't need an algebra book or your neighborhood economist – neither will do much good. At this point all you need is a pencil and paper. We've mentioned that Tiny Plan can work on lots of numbers. However, we don't start with a jumbled list of numbers. Using a little thought and pencil and paper, we can start by developing a scheme for organizing the numbers. Let's agree to arrange the information in the form of a chart.

Suppose we have three savings plans – a CD, an All Savers certificate, and a passbook account. We know the amount of money in each account and the annual yield of each account. We want to project each account for three years. Our chart might look something like this:

	Principal	Yield	1983	1984	1985
CD					
All Savers					
Passbook					

The chart has three horizontal rows to represent the three savings plans. Five vertical columns represent various characteristics – some we already

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by James Albanese

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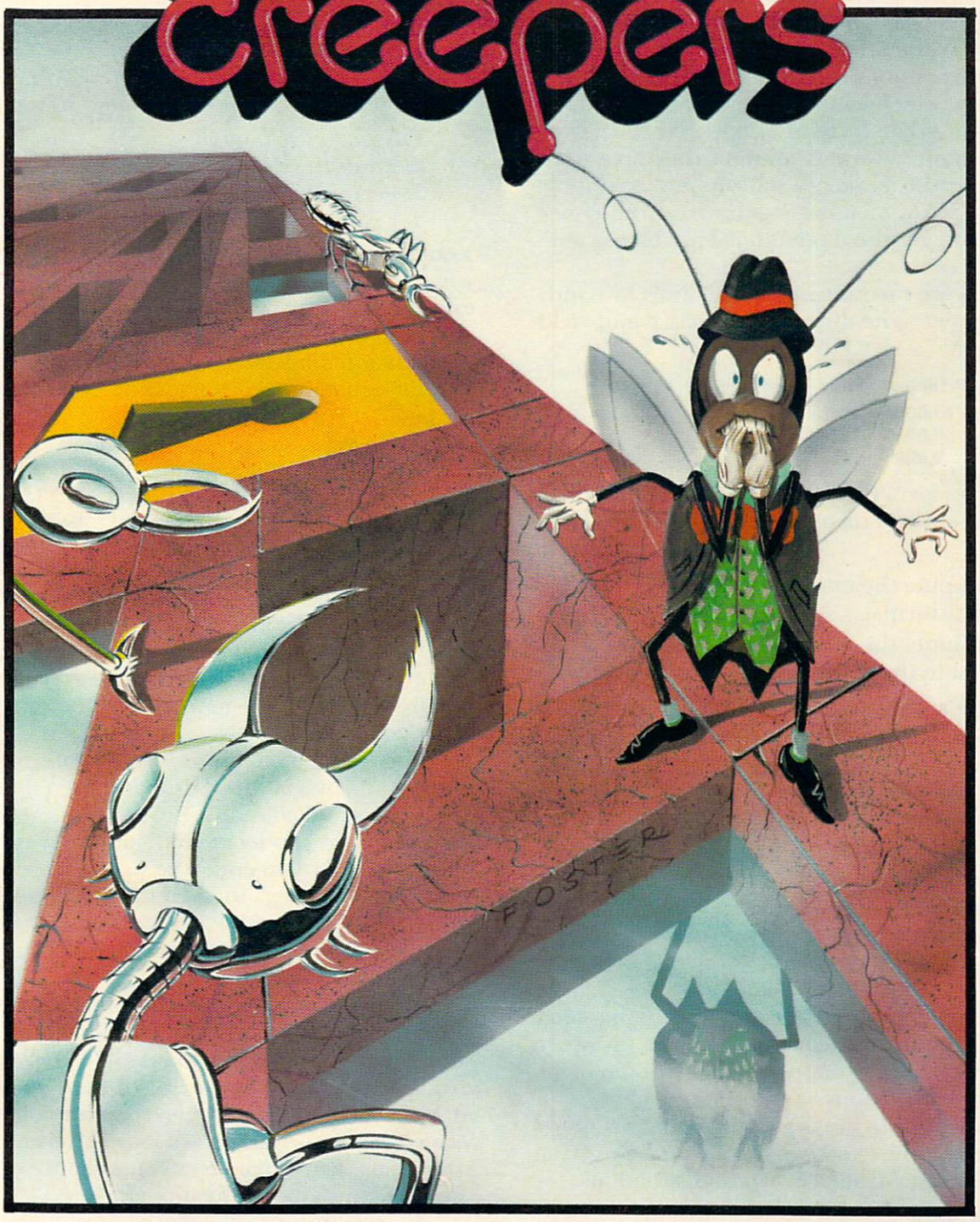

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know; some we wish to calculate.

We have just developed a model. The chart represents our understanding of what will happen to these accounts over the next few years. For the purposes of our example, let's assume that there will be no deposits or withdrawals and that the yield will stay the same for the next three years.

Not surprisingly, the first step in using Tiny Plan is specifying the model, which is then described to Tiny Plan in the form of a chart. We tell Tiny Plan how many rows and columns there are, and then we give the name of each row and column. (The more RAM memory you have in your computer, the bigger the model that Tiny Plan is able to manipulate.)

If we were carrying out the analysis by hand, we would next write down the principal and yield information.

	Principal	Yield	1983	1984	1985
CD	10,000	16%			
All Savers	8,000	12%			
Passbook	2,000	6%			

Then we perform the following calculations for each of the savings plans for each of the three years:

1. Compute the interest by applying the yield to the principal.
2. Compute the total dollars by adding the interest to the principal.

After a little work, our chart looks like this:

	Principal	Yield	1983	1984	1985
CD	10,000	16%	11,600	13,456	15,609
All Savers	8,000	12%	8,960	10,035	11,239
Passbook	2,000	6%	2,120	2,247	2,382

The figures have been rounded to the nearest dollar.

Suppose we want to see what happens if we change our investment mix. Out comes the pencil and paper again. We repeat the calculations on a different set of numbers.

In this example, we had to perform the calculations step by step for each of the three savings plans. What if we had enough money for ten savings plans? The calculations would be quite tedious indeed. Needless to say, we would probably not want to repeat the exercise, so we would be giving up our chance to evaluate different situations.

Rapid Analysis

Tiny Plan lets us perform analyses very rapidly. Once the initial data is entered, Tiny Plan calculates whole rows or columns of numbers at once. Using our example, we could tell Tiny Plan to multiply the yield times the principal. Tiny Plan would work out this calculation for each savings plan, whether we had three, ten, or thirty. If we wanted to see the effects of different yields, we could go back and change only the yield data. Then we could repeat the calculations. All of this can be done in a very short time. You can see how it would be useful for household planning.

A good tool must help its user solve the intended problem. Also, the tool must be easy to use. Tiny Plan satisfies both of these requirements.

Tiny Plan has four simple steps to follow:

1. Specify the model.
2. Enter the data for the model.
3. Perform the calculations.
4. Examine the results.

You may repeat steps 2, 3, and 4 as many times as you like for a given model. By doing this, you can evaluate the impact of changing conditions.

For each step, Tiny Plan will ask you for the information it needs. Most of Tiny Plan's messages are self-explanatory. Don't worry about making mistakes. Tiny Plan will let you know if it can't figure out what you're trying to tell it.

Step 1: Specify The Model

Before you even try to use Tiny Plan, sketch a picture of your model on a piece of paper. Recall how we worked our example. Give each row and column a name. Since you will use these row and column names in other steps, try to choose names that relate to the problem you're working on. Also, jot down the numbers that you wish to enter initially. Finally, have a pretty good idea of the calculations that need to be done.

Specifying a model consists of entering the number of rows and columns and then the names of the rows and columns. Bear in mind that Tiny Plan keeps the model in your computer's RAM memory. After you enter the size of your model, Tiny Plan will check to see if there is enough memory to hold your model. If not, you may want to point out the benefits of more memory to your home budget director.

People like myself often confuse simple concepts such as rows and columns. Tiny Plan will show you what your chart looks like. Tiny Plan displays a rectangle consisting of rows and columns of X's. So, if you've mistaken rows for columns and vice versa, the rectangle will look different from your chart. Tiny Plan gives you a chance to verify the size and shape of the model.

If everything is OK, you can put in the names for each row and column. Tiny Plan asks for the names one by one. You can enter a name that is from one to ten characters long. If a name is longer than ten characters, only the first ten will be kept. Do not use the same name twice; this would confuse you and your computer.

If you wish, Tiny Plan will make up its own

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row and column names. To do this, hit RETURN whenever Tiny Plan asks for a name. (This might not work on all computers. Try it on yours.) Tiny Plan names the rows R1, R2, R3, and so on. Similarly, it names the columns C1, C2, C3, etc. Notice that there is no space between the letter and number.

Step 2: Enter The Data For The Model

After you have specified the model, Tiny Plan sets all the rows and columns to zero. The data entry step is the way for you to put data in the model. You can also use the data entry step to change the data that may already be in the model.

You may enter data by rows or by columns or by a combination of the two. You do not need to enter all of the rows or columns, just the ones you want. Suppose we want to enter the column PRINCIPAL in our example. First, we would tell Tiny Plan the name of the column we want. Then Tiny Plan would ask us for the values of CD, ALL SAVERS, and PASSBOOK. On the other hand, suppose we wanted to enter the row PASSBOOK. Tiny Plan would ask for the values for PRINCIPAL, YIELD, 1983, 1984, and 1985. Since we are calculating 1983, 1984, and 1985, we could enter zero or just hit RETURN. The choice of row or column entry depends on your particular model. In our example, entering the columns turns out to be a little easier.

When Tiny Plan asks for a new value, it shows you the current value of the item in the model. To retain that value, just hit RETURN. (On some computers, though, you may have to retype the same number again even if you don't want to change it.) If you want to change the value, type in the new number.

Step 3: Perform The Calculations

Once you've entered your data, you'll probably want to do some calculations. Tiny Plan will perform calculations on entire rows or columns of numbers. Every number in the row or column will be included. The only time that Tiny Plan skips a calculation is when a division by zero is attempted.

Depending on your model, you will choose to do row or column calculations. Your model may even involve doing some row calculations and then some column calculations. The only restriction is that you cannot perform an operation involving a row and column. For example, you cannot add a row to a column. You can, of course, add one row to another row or multiply one column by another column.

Each time you do a calculation, Tiny Plan will ask you for four items of information:

1. A row or column name,
2. The type of calculation (such as addition),
3. A second row or column name, and
4. A third row or column name indicating where the answer will be kept.

The first and second row or column names indicate to Tiny Plan which numbers will be used in the calculation.

Trying Out The Example

An example will make this clearer. Our savings plan analysis uses column calculations. When Tiny Plan asks for names, we respond with column names. To compute 1983's results, we would respond to the four prompts with:

1. **PRINCIPAL** as the first column name,
2. **%+** as the type of calculation,
3. **YIELD** as the second column name, and
4. **1983** as the column which will hold the results.

This means that we want to increase all the numbers in the PRINCIPAL column by the percentages contained in the YIELD column. We want the results saved in the 1983 column. Tiny Plan does the calculation for each and every number in the indicated columns. In our example, there were just three numbers in each column. There could just as easily have been 30 numbers. Notice that "%+" is one of Tiny Plan's special percentage calculations.

Now, to obtain 1984's results we would use:

1. 1983
2. %+
3. YIELD
4. 1984

The same yield figures are used again. This time, however, 1983's calculated results are used as the base. As an exercise, how would you obtain 1985's results?

As we mentioned, "%+" is one of Tiny Plan's percentage calculations. Tiny Plan can perform a variety of calculations:

+	add the first row/column to the second row/column
-	subtract the second row/column from the first row/column
*	multiply the first row/column by the second row/column
/	divide the first row/column by the second row/column
%	compute the given percentage (second row/column) of the first row/column
%+	increase the first row/column by the percentage specified in the second row/column
%-	decrease the first row/column by the percentage specified in the second row/column

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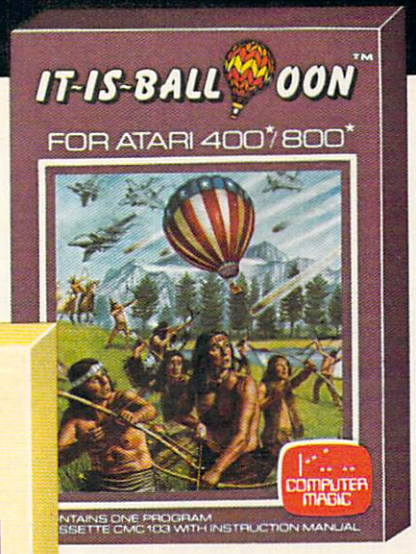

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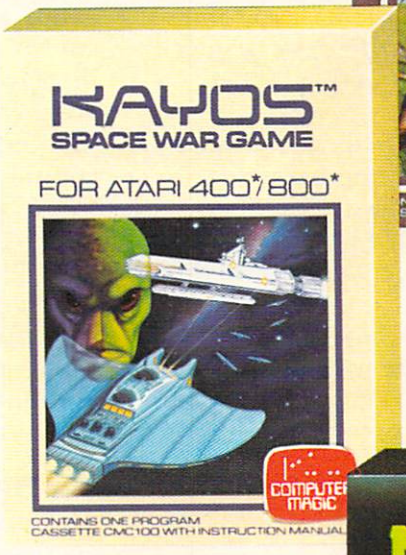

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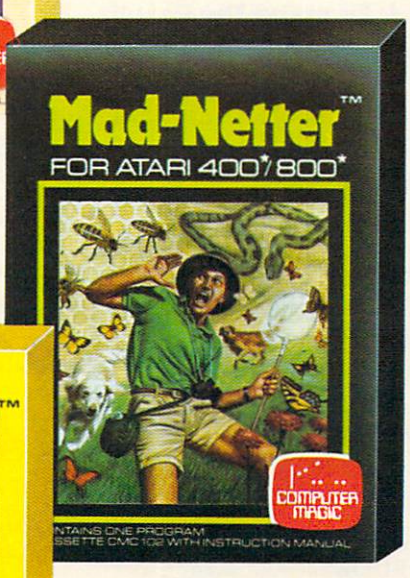

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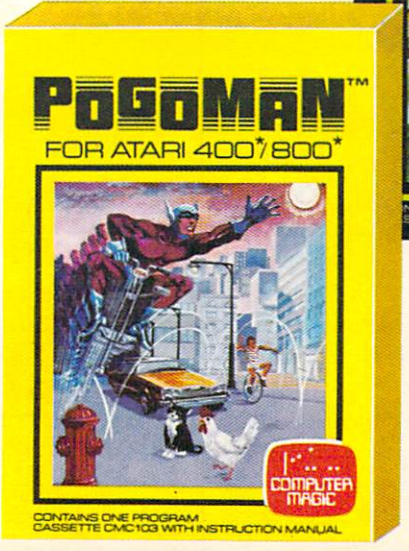

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%D compute the percent difference between the first row/column and the second row/column, using the first row/column as the base

With the exception of the "+" and "*" operations, the order of the rows and columns is very important. For example, if we tried to do:

1. YIELD
2. % +
3. PRINCIPAL
4. 1984

we would get strange and unpleasant results. This is because Tiny Plan assumed that the second column name entered (i.e., PRINCIPAL) will contain the percentage figures. In the case of the CD, Tiny Plan thinks that the intent was to increase 16 by 10,000 percent. The moral here is to be careful. When Tiny Plan asks for row or column names, be sure that you enter them in the proper order for the particular calculation that you are doing.

Important Note: when you use the percentage operations, make sure that your numbers are entered as percentages. In other words, enter 12.5% as 12.5, *not* as .125. When Tiny Plan computes a result that is a percentage (%D), it will do the same thing.

You may perform as many calculations as you like. Each calculation will require four items of information.

Step 4: Examine The Results

This is probably the most important step. Only after examining and analyzing the results can you start to carry out your plan.

As in the previous steps, Tiny Plan now gives you the choice of looking at rows or columns. You may examine one row or column at a time. Tell Tiny Plan the name of the particular row or column that you want to examine. It will respond by showing you all the numbers in that row or column. Furthermore, Tiny Plan will compute and display the row or column sum automatically.

If we wanted to examine the column for 1985, Tiny Plan would prepare the following display:

	1985
CD	15,609
ALLSAVERS	11,239
PASSBOOK	2,282
TOTAL	29,230

We get the column total without ever having to direct Tiny Plan to compute it. Be careful. Sometimes a column total is not really meaningful. If we displayed the YIELD column, we would see the three yield figures and a total figure. In this case, the total has no meaning – it is just the sum of numbers.

Rows are displayed in a similar manner. The numbers in the row are listed vertically. The appropriate column names are shown to the left of the numbers. A row total is also provided. The same caution concerning the total should be observed here.

Assume that your budget director has seen the benefits of additional memory. Now you are working on very large models. Let's say you have a model with 40 columns and 40 rows. What would happen if you wanted to examine a particular column? Can your computer display 40 lines of data? Ours can't.

Regardless of how many numbers are in a particular row or column, Tiny Plan will display at most ten numbers at a time. Tiny Plan will then pause. When you press the space bar, the next group of numbers will be displayed. This process continues until the entire row or column has been displayed. Note that the row or column total is always visible at the bottom of the screen. Just keep in mind that the total is the sum of the *entire* row or column and not the sum of the group of numbers that happens to be on the screen.

When you have finished examining the results, Tiny Plan will ask you if you want to model again. If you do, Tiny Plan will resume at the data entry step, Step 2. You can take the opportunity to change some or all of the numbers and then proceed with additional calculations. Finally, you can review the results again.

Tiny Plan On Your Computer

Although Tiny Plan was developed on a VIC-20, every effort was made to use standard BASIC commands. If your computer uses a version of Microsoft BASIC, you should have no trouble getting Tiny Plan to work. Other versions of BASIC may require some conversion.

There are very few comments in the program listing itself. Also, spaces have been omitted wherever possible. While the program may be hard to read, this does conserve memory space. The result is that Tiny Plan can handle bigger models.

There are a few areas in Tiny Plan that would need adjusting depending on the computer brand being used. Make the changes appropriate to your particular computer. Then save *two* copies (just in case) of the customized version of Tiny Plan.

1. *Clear screen code*
Line 2420 defines a variable CS$. CS$ is given a value of 147. This is the VIC control code for homing the cursor and clearing the screen. You should use the proper code for your computer. (The code is 12 for an AIM 65 equipped with an MTU Visible Memory.) Use HOME on the Apple in place of PRINTCS$.

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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. $24.95

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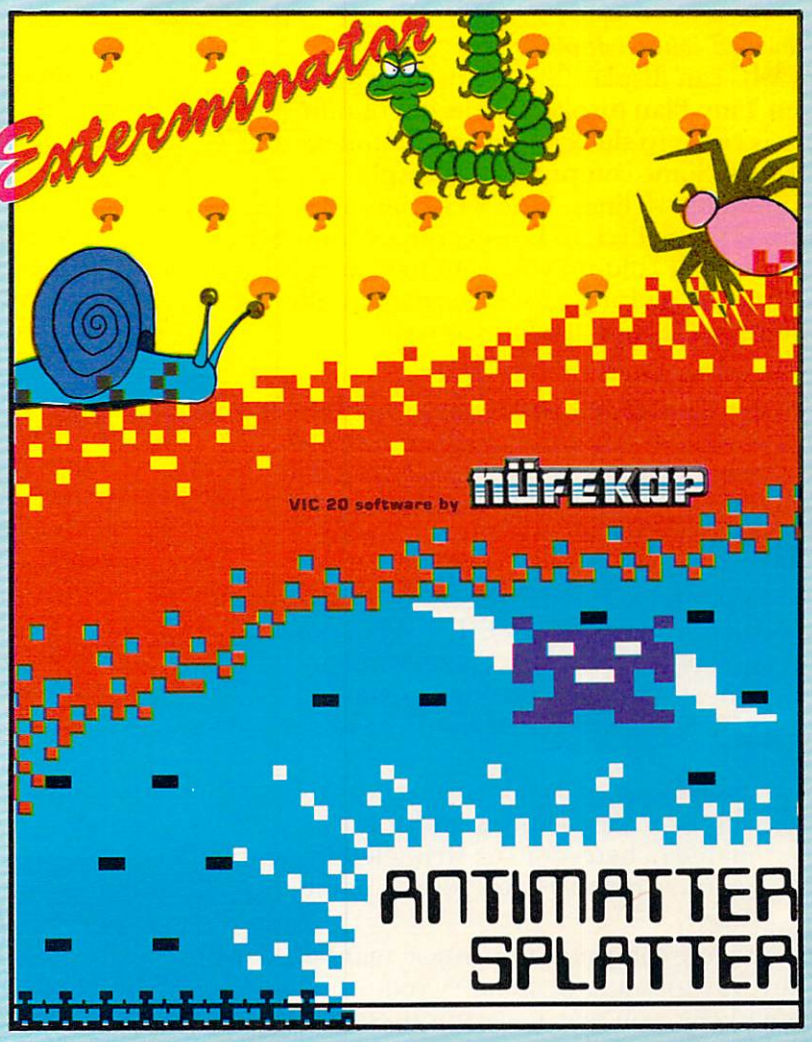

Rescue From Nufon This graphic adventure has five floors with 20 rooms apiece. Use the elevator to change levels and the N, S, E, W keys to move your characters around as you search for 30 hostages randomly scattered (differently every run) throughout. As there are three different monsters occupying Nufon, you are armed with a blaster, but unfortunately it uses energy pretty fast, forcing you to do some fancy dodging in order to make the supply last. Average game is twenty minutes. Standard 5K VIC 20—Keyboard $12.95

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2. *Row and column display size*
The VIC can display 23 lines of information. When Tiny Plan displays a row or column, there is room to show ten numbers and several messages. Some computers can display a maximum of 16 lines. Line 2430 defines a variable NL. Set NL to however many numbers from a row or column you want to display at one time. Don't forget to leave room on the display for the message lines as well.

3. *Memory size check*
Most computers have some way of letting you know when there is not enough memory to run a program or store additional data. The typical computer responds by stopping the program and returning to the command mode.

Right after you enter the number of rows and columns in your model, Tiny Plan does its own check to see if there is enough memory. Lines 290, 300, and 2530 are used in this check. Line 290 estimates memory requirements based on:

a. 5 bytes for each numeric array element
b. 13 bytes for each row and column name (3 bytes for the string length and pointer plus 10 bytes for the name itself).

Consult your computer's technical manuals for the way to estimate memory requirements. Alternatively, you may leave out these three lines entirely.

4. *INPUT statement*
On the VIC, you can hit RETURN by itself in response to an INPUT statement. If you do this, the contents of the variables in the INPUT statement will remain unchanged. The VIC acts in this case as if the INPUT statement had never even been executed. Tiny Plan makes use of this VIC feature when it asks you to enter data values.

Some computers, however, respond a little differently. The TRS-80, for example, will set the variables in the INPUT statement to zero (or to a null string) if only the RETURN key is hit. If your computer works this way, make these two changes to Tiny Plan:

```
14070 R$="": INPUT R$: IF R$<>"" THEN DA(R,I)
      =VAL(R$)
18070 R$="": INPUT R$: IF R$<>"" THEN DA(I,C)
      =VAL(R$)
```

There is a slight price to be paid. The VAL function does not let you know if it encounters non-numeric data. So, if you typed U123 instead of .123, VAL would convert the input to zero. This is not what you intended, but there would be no error message. These two modifications should work well for most applications. Just be advised that extra attention is required when typing in numbers.

There is yet another variation in computer behavior. The AIM 65 and Commodore PET/CBM simply stop if just a RETURN is keyed after an INPUT statement. The program can be resumed by typing CONT. For this type of computer, you have to use slightly different operating procedures. Never hit RETURN without first entering something.

5. *Decimal Places*
Tiny Plan normally rounds all calculated results to two decimal places. This is quite appropriate if you work most often in units of dollars and cents. A variable DP (for decimal places) is defined in line 2490. You may set DP to zero if you want all calculated results to be integers (no decimal fractions shown). Also, DP may be set to round calculated results to a different number of decimal places.

Experiment with Tiny Plan. Start by setting up very simple models. Expand on the simple models. Compare your projections with reality. Try to account for any differences. Then go back and add additional terms to your models. And let us know of your results. What modifications did you make to Tiny Plan to get it to work on your computer? What models have you developed? What have the results been?

Program 1: Microsoft Version: VIC, PET, Apple, OSI, Color Computer (Extended BASIC)

```
100 REM TINY PLAN
110 GOSUB160
120 GOSUB510
130 IFR$="Y"THEN120
140 PRINTCS$:PRINT"THANK YOU.":PRINT
150 END
160 REM BEGIN
170 GOSUB2410
180 GOSUB240
190 IFR$="N"THEN180
200 DIMDA(NR,NC)
210 DIMCN$(NC),RN$(NR)
220 GOSUB350
230 RETURN
240 REM CONFIGURE
250 PRINTCS$;:PRINT"HOW MANY ROWS AND"
260 PRINT:PRINT"COLUMNS IN THE MODEL ?":PRINT:
    PRINT
270 NR=0:PRINT"# ROWS (ACROSS)";:INPUTNR:IFNR<
    =0THENPRINT"WHAT?":GOTO270
280 NC=0:PRINT"# COLS (UP&DOWN)";:INPUTNC:IFNC
    <=0THENPRINT"WHAT?":GOTO280
290 MS=(NC+1)*(NR+1)*5+(NC+1)*13+(NR+1)*13
300 IFMS>SZTHENPRINT"NOT ENOUGH MEMORY":PRINT:
    GOTO270
310 PRINT:FORI=1TONR:FORJ=1TONC:PRINT"X";:NEXT
    :PRINT:NEXT
320 PRINT:PRINT"SHAPE OK (Y OR N) ?";
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A Sample RUN

Here is a sample RUN of the Modeling Planner using Mr. Flynn's example. Try it on your computer, and you will get a feel for how to use the Modeling Planner. Most helpful is the "worksheet" that you develop before you run the program. You'll need to refer to it often. Here is Mr. Flynn's worksheet:

	Principal	Yield	1983	1984	1985
CD					
All Savers					
Passbook					

First, we'll set up this worksheet on the computer. User input is shown in boldface. Comments are enclosed in brackets.

```
RUN
TINY PLAN
VERSION 1.0 JULY 1982
ELECTRONIC
SPREADSHEET

HOW MANY ROWS AND
COLUMNS IN THE MODEL ?

#ROWS (ACROSS)? 3
[Three rows: CD, All Savers, and Passbook]
# COLS (UP&DOWN)? 5
[5 columns: Principal, Yield, 1983, 1984, and 1985]

XXXXX
XXXXX
XXXXX

SHAPE OK (Y OR N) ? Y
[This resembles the worksheet]

WHAT IS THE NAME OF
EACH ROW AND COLUMN?
NAMES CAN BE UP TO
10 CHARACTERS LONG
[We'll probably have to abbreviate]

ROWS (ACROSS) FIRST.

1 OF 3? CD
2 OF 3? ALL SAVERS
3 OF 3? PASSBOOK

COLUMNS (UP AND DOWN).

1 OF 5 ? PRINCIPAL
2 OF 5 ? YIELD
3 OF 5 ? 1983
4 OF 5 ? 1984
5 OF 5 ? 1985

* DATA ENTRY STEP *

[This is the second step, where we can enter as much
data as we please, in either rows or columns. We'll enter
the principal and the yield, which are columns. Using
Mr. Flynn's table, it would look like:
```

	Principal	Yield	1983	1984	1985
CD	10,000	16%			
All Savers	8,000	12%			
Passbook	2,000	6%			

```
Now we'll enter the first two columns into the computer]
ENTER DATA (Y/N)? Y

ENTER ROWS (Y/N)? N

[We entered "N" because we'll enter data by columns:]

ENTER COLS. (Y/N)? Y

COL NAME OR 'END'
? PRINCIPAL
[First, we'll enter the principal]

ENTER 3 VALUES -
1 FOR EACH ROW

** COL PRINCIPAL **

[Note that the column names are abbreviated to five
characters here:]

ROW          VALUE
PRINC     0 ? 10000
ALLS      0 ? 8000
PASSB     0 ? 2000

COL NAME OR 'END'
? YIELD

ENTER 3 VALUES -
1 FOR EACH ROW

*** COL YIELD ***

[Note the "0". It is the previous value of the row element.]

ROW          VALUE
PRINC     0 ? 16
ALLS      0 ? 12
PASSB     0 ? 6

COL NAME OR 'END'
? END
[Because we're through entering data]

* CALCULATE STEP *

CALCULATE (Y/N)? Y

WORK ON ROWS (Y/N)?N
[We'll be calculating columns (1983-1985) from the first
two columns. We won't be working on rows.]

WORK ON COLS. (Y/N)? Y

[Each calculation will be a percentage calculation on a
column against the yield.]

1ST COL NAME OR 'END'
? PRINCIPAL

+, -, *, /, %, %+, %-, %D
? %+

2ND COL NAME OR 'END'
? YIELD

ANS COL NAME OR 'END'
? 1983
[The answer will be put in column 1983]

WORKING...

[Now let's calculate 1984 from 1983]

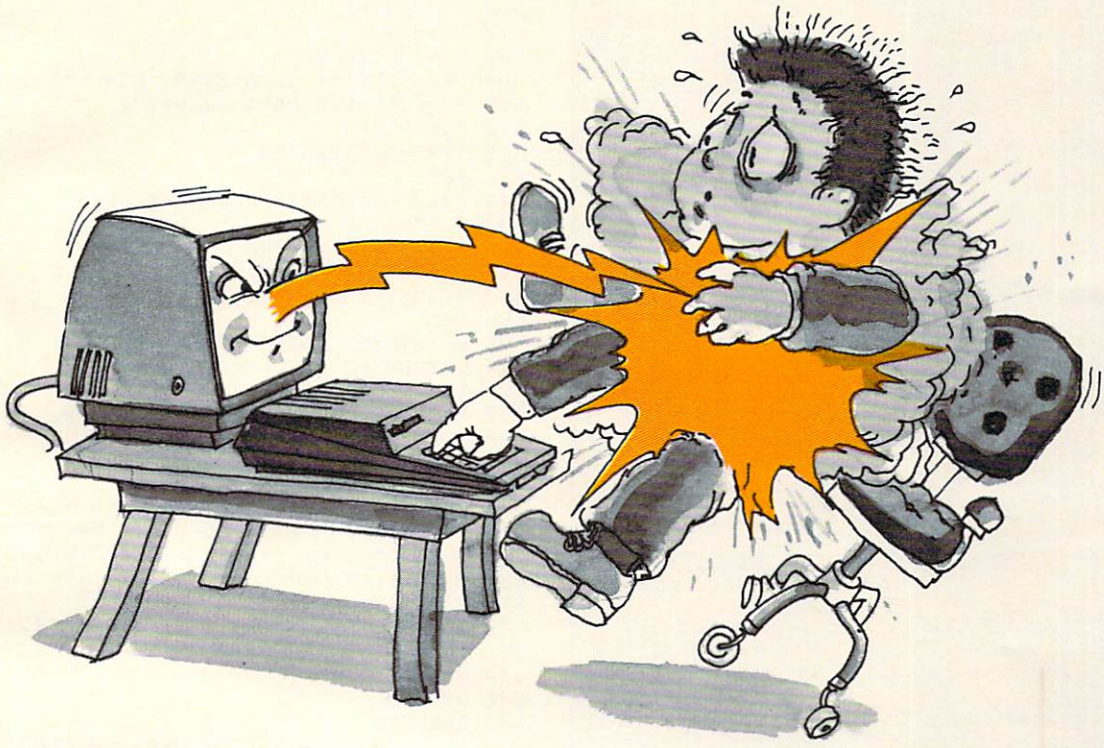
1ST COL NAME OR 'END'
? 1983

+, -, *, /, %, %+, %-, %D
? % +

2ND COL NAME OR 'END'
? YIELD
```

(continued)

LEARN TO TYPE OR GET BLOWN TO BITS.



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Now anyone can learn to type and have hours of fun at the same time. With MasterType. We've combined the fast-action of blow 'em up video games with the best instructional program available. You either learn to type or the aliens ZAP your spaceship into oblivion. The results? Highly motivated and enjoyable learning.

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$39.95. Requires disk drive 32k and basic.

MasterType

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(continued from page 72)

```
ANS COL NAME OR 'END'
? 1984

WORKING...
[We now have values for 1983 and 1984. Try to
continue here and calculate 1985. We'll just stop
calculating and look at some data now.]

1ST COL NAME OR 'END'
? END

* DATA DISPLAY STEP *

DISPLAY DATA (Y/N)?Y
DISPLAY ROWS (Y/N)?Y

ROW NAME OR 'END'
? ALL SAVERS
COLUMN          ALL SAVERS
 0
PRINCIPAL       8000
YIELD           12
1983            8960
1984            10035.2
1985            0

ROW TOTAL 27007.2

SPACE TO CONTINUE

ROW NAME OR 'END'
? END

DISPLAY COLS (Y/N)? Y
[Let's display 1984]
COL NAME OR 'END'
? 1984

ROW             1984
 0
CD              13456
ALL SAVERS      10035.2
PASSBOOK        2247.2

COL TOTAL 25738.4

SPACE TO CONTINUE

COL NAME OR 'END'
? END
[We're finished displaying data]

MODEL AGAIN (Y/N)? N

[At this point, you could enter "Y". You could enter or
edit the data, re-do the calculations, and display. This is
the "what-if" power of a microcomputer. You can just
change a few values and re-calculate dozens of others.]

THANK YOU.

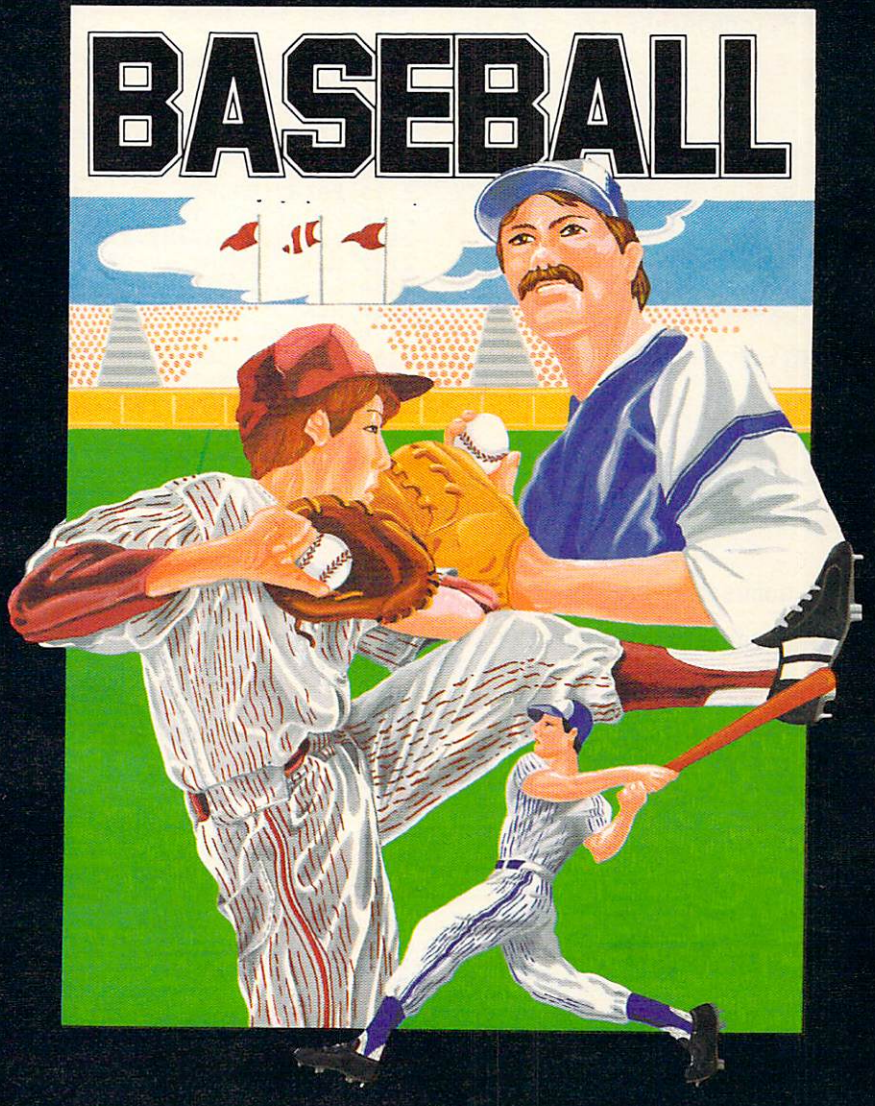
READY.
```

```
330 GOSUB2260
340 RETURN
350 REM SYMBOL TABLE
360 PRINTCS$;"WHAT IS THE NAME OF":PRINT:PRINT
    "EACH ROW AND COLUMN?"
370 PRINT: PRINT"NAMES CAN BE UP TO":PRINT:PRI
    NT"10 CHARACTERS LONG."
380 PRINT:PRINT:PRINT"ROWS (ACROSS) FIRST.":PR
    INT
390 FORI=1TONR
400 R$="":PRINTI;"OF";NR;
410 RN$(I)=LEFT$("R"+MID$(STR$(I),2)+BL$,10)
420 INPUTR$:IFR$<>""THENRN$(I)=LEFT$(R$+BL$,10
    )
430 NEXT
440 PRINT:PRINT:PRINT"COLUMNS (UP AND DOWN).":
    PRINT
450 FORI=1TONC
460 R$="":PRINTI;"OF";NC;
470 CN$(I)=LEFT$("C"+MID$(STR$(I),2)+BL$,10)
480 INPUTR$:IFR$<>""THENCN$(I)=LEFT$(R$+BL$,10
    )
490 NEXT
500 RETURN
510 REM BUILD MODELS
520 GOSUB580
530 GOSUB1140
540 GOSUB1660
550 PRINTCS$;"MODEL AGAIN (Y/N)?";
560 GOSUB2260
570 RETURN
580 REM ENTER DATA
590 PRINTCS$;"* DATA ENTRY STEP *":PRINT
600 PRINT"ENTER DATA (Y/N)?";
610 GOSUB2260
620 IFR$="N"THEN750
630 REM
640 PRINTCS$;"ENTER ROWS (Y/N)?";
650 GOSUB2260
660 IFR$="N"THEN690
670 PRINTCS$:GOSUB860:IFETHEN690
680 GOSUB760:GOTO670
690 REM
700 PRINTCS$;"ENTER COLS. (Y/N)?";
710 GOSUB2260
720 IFR$="N"THEN750
730 PRINTCS$:GOSUB1050:IFETHEN750
740 GOSUB950:GOTO730
750 RETURN
760 REM ENTER ROW
770 PRINTCS$;"ENTER";NC;"VALUES -"
780 PRINT"1 FOR EACH COLUMN.":PRINT
790 PRINT"** ROW ";RN$(R);" **":PRINT
800 PRINT:PRINT"COLUMN";TAB(11);"VALUE"
810 FORI=1TONC
820 PRINTLEFT$(CN$(I),5);:PRINTDA(R,I);
830 INPUTDA(R,I)
840 NEXT
850 RETURN
860 REM GET ROW #
870 E=0:N$="":PRINT"ROW NAME OR 'END'"
880 INPUTN$:IFN$="END"THENE=1:RETURN
890 N$=LEFT$(N$+BL$,10)
900 FORI=0TONR
910 IFRN$(I)=N$THENR=I:I=1E6
920 NEXT
930 IFI=NR+1THENPRINT"? ";:GOTO870
940 RETURN
950 REM ENTER COL
960 PRINTCS$;"ENTER";NR;"VALUES -"
970 PRINT"1 FOR EACH ROW":PRINT
980 PRINT"** COL ";CN$(C);" **":PRINT
990 PRINT:PRINT"ROW";TAB(11);"VALUE"
1000 FORI=1TONR
1010 PRINTLEFT$(RN$(I),5);:PRINTDA(I,C);
1020 INPUTDA(I,C)
1030 NEXT
1040 RETURN
1050 REM GET COL #
1060 E=0:N$="":PRINT"COL NAME OR 'END'"
1070 INPUTN$:IFN$="END"THENE=1:RETURN
1080 N$=LEFT$(N$+BL$,10)
1090 FORI=0TONC
1100 IFCN$(I)=N$THENC=I:I=1E6
1110 NEXT
1120 IFI=NC+1THENPRINT"? ";:GOTO1060
1130 RETURN
1140 REM CALCULATE
```

BASEBALL

FOR YOUR

ATARI 400/800



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- Hysterical crowd scenes
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- Joystick control
- Requires minimum 16K

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```
1150 PRINTCS$;"* CALCULATE STEP *":PRINT
1160 PRINT"CALCULATE (Y/N)?";
1170 GOSUB2260
1180 IFR$="N"THEN1310
1190 REM
1200 PRINTCS$;"WORK ON ROWS (Y/N)?";
1210 GOSUB2260
1220 IFR$="N"THEN1250
1230 PRINTCS$:PRINT"1ST ";:GOSUB860:IFETHEN1250
1240 GOSUB1320:GOTO1230
1250 REM
1260 PRINTCS$;"WORK ON COLS. (Y/N)?";
1270 GOSUB2260
1280 IFR$="N"THEN1310
1290 PRINTCS$:PRINT"1ST ";:GOSUB1050:IFETHEN131
     0
1300 GOSUB1490:GOTO1290
1310 RETURN
1320 REM WORK ON ROWS
1330 R1=R
1340 GOSUB2180
1350 PRINT:PRINT"2ND ";:GOSUB860:IFETHEN1400
1360 R2=R
1370 PRINT:PRINT"ANS ";:GOSUB860:IFETHEN1400
1380 R3=R
1390 GOSUB1410
1400 RETURN
1410 REM DO ROW
1420 PRINT:PRINT"WORKING..."
1430 FORI=1TONC
1440 C3=I:C2=I:C1=I
1450 GOSUB2300
1460 NEXT
1470 PRINT:PRINT"COMPLETED"
1480 RETURN
1490 REM WORK ON COLS
1500 C1=C
1510 GOSUB2180
1520 PRINT:PRINT"2ND ";:GOSUB1050:IFETHEN1570
1530 C2=C
1540 PRINT:PRINT"ANS ";:GOSUB1050:IFETHEN1570
1550 C3=C
1560 GOSUB1580
1570 RETURN
1580 REM DO COL
1590 PRINT:PRINT"WORKING..."
1600 FORI=1TONR
1610 R3=I:R2=I:R1=I
1620 GOSUB2300
1630 NEXT
1640 PRINT:PRINT"COMPLETED"
1650 RETURN
1660 REM DISPLAY
1670 PRINTCS$;"* DATA DISPLAY STEP *"
1680 PRINT: PRINT"DISPLAY DATA (Y/N)?";
1690 GOSUB2260
1700 IFR$="N"THEN1890
1710 PRINT:REM ROWS
1720 PRINT:PRINT"DISPLAY ROWS (Y/N)?";
1730 GOSUB2260
1740 IFR$="N"THEN1800
1750 PRINT:GOSUB860:IFETHEN1800
1760 RT=0:FORI=0TONC:RT=RT+DA(R,I):NEXT
1770 N=INT((NC+1)/NL):IF(NC+1)-NL*N>0THENN=N+1
1780 C=0:GOSUB1900
1790 GOTO1750
1800 REM
1810 PRINT:PRINT"DISPLAY COLS (Y/N)?";
1820 GOSUB2260
1830 IFR$="N"THEN1890
1840 PRINT:GOSUB1050:IFETHEN1890
1850 CT=0:FORI=0TONR:CT=CT+DA(I,C):NEXT
1860 N=INT((NR+1)/NL):IF(NR+1)-NL*N>0THENN=N+1
1870 R=0:GOSUB2040
1880 GOTO1840
1890 RETURN
1900 REM ROW PANEL
1910 FORI=1TON
1920 PRINTCS$:PRINT"COLUMN    ";RN$(R):PRINT
1930 FORJ=1TO10
1940 IFC>NCTHENPRINT
1950 IFC<=NCTHENPRINTCN$(C);DA(R,C):C=C+1
1960 NEXT
1970 PRINT:PRINT
1980 PRINT"ROW TOTAL ";RT
1990 IFI<NTHENPRINT:PRINT"MORE ..."
2000 PRINT:PRINT"SPACE TO CONTINUE"
2010 GETR$:IFR$<>" " THEN2010
2020 NEXT
2030 RETURN
2040 REM COL PANEL
2050 FORI=1TON
2060 PRINTCS$:PRINT"ROW       ";CN$(C):PRINT
2070 FORJ=1TO10
2080 IFR>NRTHENPRINT
2090 IFR<=NRTHENPRINTRN$(R);DA(R,C):R=R+1
2100 NEXT
2110 PRINT:PRINT
2120 PRINT"COL TOTAL ";CT
2130 IFI<NTHENPRINT:PRINT"MORE ..."
2140 PRINT:PRINT"SPACE TO CONTINUE"
2150 GETR$:IFR$<>" "THEN2150
2160 NEXT
2170 RETURN
2180 REM GET OPERATOR
2190 PRINT:OP$=""
2200 FORI=1TONP:PRINTOP$(I);", ";:NEXT:PRINT
2210 INPUTOP$
2220 FORI=1TONP:IFOP$(I)=OP$THENI=1E6
2230 NEXT
2240 IFI=NP+1THENPRINT"TRY AGAIN":GOTO2190
2250 RETURN
2260 REM GET Y OR N
2270 GETR$:IFR$=""THEN2270
2280 IFR$<>"Y"ANDR$<>"N"THENPRINT:PRINT"KEY 'Y'
     OR 'N'";:GOTO2270
2290 RETURN
2300 REM CALCULATIONS
2310 IFOP$="+"THENDA(R3,C3)=DA(R1,C1)+DA(R2,C2)
2320 IFOP$="-"THENDA(R3,C3)=DA(R1,C1)-DA(R2,C2)
2330 IFOP$="*"THENDA(R3,C3)=DA(R1,C1)*DA(R2,C2)
2340 IFOP$="/"ANDDA(R2,C2)<>0THENDA(R3,C3)=DA(R
     1,C1)/DA(R2,C2)
2350 IFOP$="%"THENDA(R3,C3)=DA(R1,C1)*DA(R2,C2)
     /100
2360 IFOP$="%+"THENDA(R3,C3)=DA(R1,C1)+(DA(R1,C
     1)*DA(R2,C2)/100)
2370 IFOP$="%-"THENDA(R3,C3)=DA(R1,C1)-(DA(R1,C
     1)*DA(R2,C2)/100)
2380 IFOP$="%D"ANDDA(R1,C1)<>0THENDA(R3,C3)=((D
     A(R2,C2)-DA(R1,C1))/DA(R1,C1))*100
2390 DA(R3,C3)=INT((DA(R3,C3)*D2+5)/10)/D1
2400 RETURN
2410 REM INITIALIZE
2420 CS$=CHR$(147):REM CLEAR SCREEN
2430 NL=10
2440 NR=0:NC=0
2450 BL$="                "
2460 NP=8:DIM OP$(NP)
2470 FORI=1TONP:READOP$(I):NEXT
2480 DATA+,-,*,/,%,%+,%-,%D
2490 DP=2:D1=10^DP:D2=10^(DP+1)
2500 PRINTCS$;"TINY PLAN":PRINT:PRINT"VERSION 1
     .0 JULY 1982"
2510 PRINT:PRINT:PRINT"ELECTRONIC":PRINT:PRINT"
     SPREADSHEET"
2520 FORI=1TO8000:NEXT
2530 SZ=FRE(0)-150
2540 RETURN
```

For the Atari 400/800 Home Computer

You are Sentinel I, the latest in highly maneuverable strike aircraft, and you have a mission, to protect the metropolis, but the alien attack will stop at nothing to destroy your very last lines of defense. Your senses are tuned for battle and the attack begins.

Aliens will block your path, destroy your ship, deplete your fuel and sacrifice their lives to stop your mission. You must destroy the aliens with your rapid fire lasers before they home in and destroy you. There is no escape — you must destroy them all for they will stop at nothing.

- 100% machine language
- 1 or 2 player option
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Program 2: Atari Version

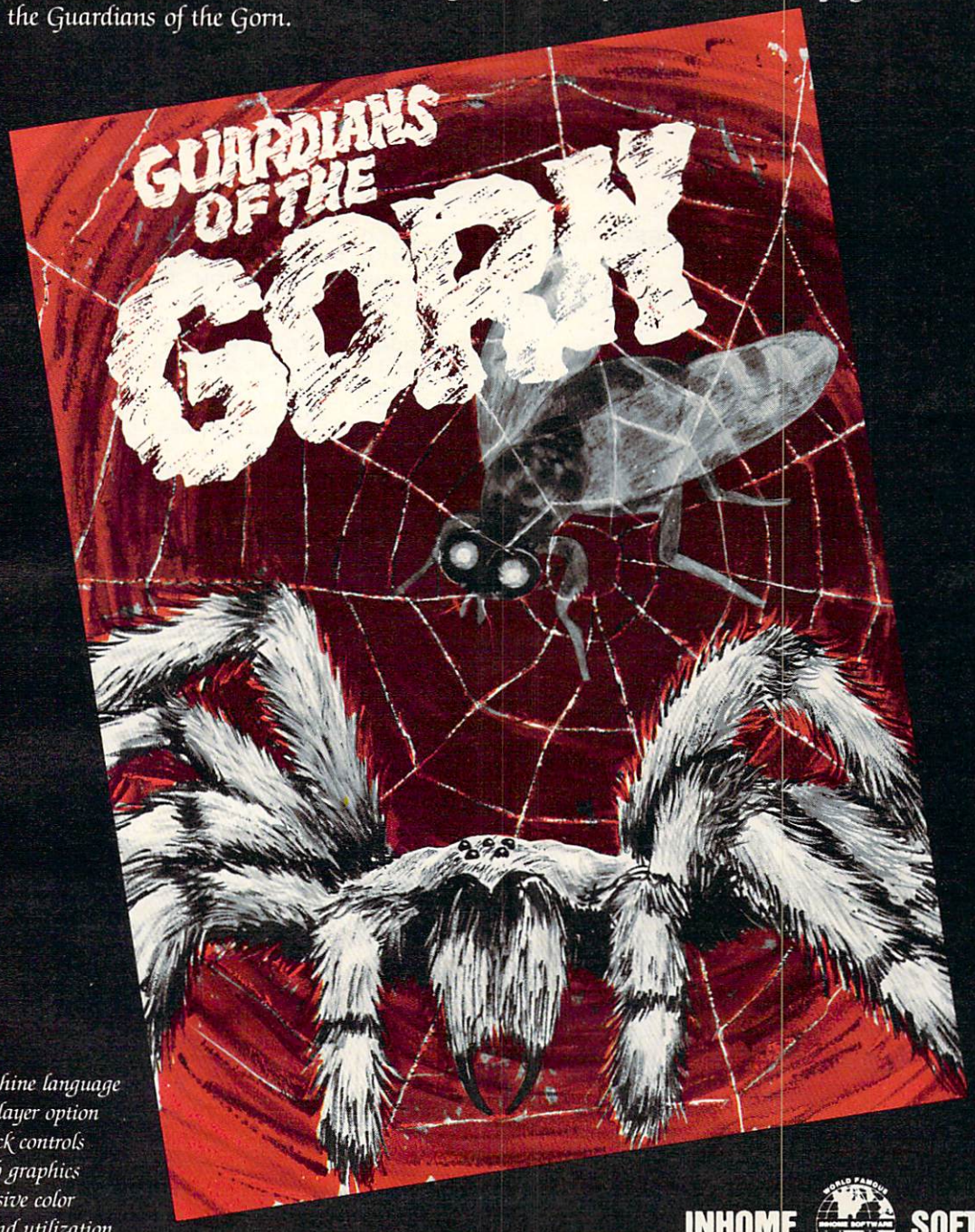
```
100 REM TINY PLAN
110 GOSUB 160
120 GOSUB 510
130 IF R$="Y" THEN 120
140 PRINT CS$:PRINT "THANK YOU.":PRIN
    T
150 END
160 REM BEGIN
170 GOSUB 2410
180 GOSUB 240
190 IF R$="N" THEN 180
200 DIM DA(NR,NC)
205 FOR I=0 TO NR:FOR J=0 TO NC:DA(I,
    J)=0:NEXT J:NEXT I
210 DIM CN$(NC*10),RN$(NR*10),N$(10)
220 GOSUB 350
230 RETURN
240 REM CONFIGURE
250 PRINT CS$;:PRINT "HOW MANY ROWS A
    ND"
260 PRINT :PRINT "COLUMNS IN THE MODE
    L ?":PRINT :PRINT
270 NR=0:PRINT "# ROWS (ACROSS)";:INP
    UT NR:IF NR<=0 THEN PRINT "WHAT?"
    :GOTO 270
280 NC=0:PRINT "# COLS (UP&DOWN)";:IN
    PUT NC:IF NC<=0 THEN PRINT "WHAT?
    ":GOTO 280
290 MS=(NC+1)*(NR+1)*6+(NC+1)*10+(NR+
    1)*10
300 IF MS>SZ THEN PRINT "NOT ENOUGH M
    EMORY":PRINT :GOTO 270
310 PRINT :FOR I=1 TO NR:FOR J=1 TO N
    C:PRINT "X";:NEXT J:PRINT :NEXT I
320 PRINT :PRINT "SHAPE OK (Y OR N) ?
    ";
330 GOSUB 2260
340 RETURN
350 REM SYMBOL TABLE
360 PRINT CS$;"WHAT IS THE NAME OF":P
    RINT :PRINT "EACH ROW AND COLUMN?
    "
370 PRINT :PRINT "NAMES CAN BE UP TO"
    :PRINT :PRINT "10 CHARACTERS LONG
    ."
380 PRINT :PRINT :PRINT "ROWS (ACROSS
    ) FIRST.":PRINT
390 FOR I=1 TO NR
400 PRINT I;" OF ";NR;
410 T$="R":T$(2)=STR$(I):T$(LEN(T$)+1
    )=BL$
420 INPUT R$:IF R$<>"" THEN T$=R$:IF
    LEN(T$)<10 THEN T$(LEN(T$)+1)=BL$
425 RN$(10*I-9,10*I)=T$
430 NEXT I
440 PRINT :PRINT :PRINT "COLUMNS (UP
    AND DOWN).":PRINT
450 FOR I=1 TO NC
460 PRINT I;" OF ";NC;
470 T$="C":T$(2)=STR$(I):T$(LEN(T$)+1
    )=BL$
480 INPUT R$:IF R$<>"" THEN T$=R$:IF
    LEN(T$)<10 THEN T$(LEN(T$)+1)=BL$
485 CN$(10*I-9,10*I)=T$
490 NEXT I
500 RETURN
510 REM BUILD MODELS
520 GOSUB 580
530 GOSUB 1140
540 GOSUB 1660
550 PRINT CS$;"MODEL AGAIN (Y/N)?";
560 GOSUB 2260
570 RETURN
580 REM ENTER DATA
590 PRINT CS$;"* DATA ENTRY STEP *":P
    RINT
600 PRINT "ENTER DATA (Y/N)?";
610 GOSUB 2260
620 IF R$="N" THEN 750
630 REM
640 PRINT CS$;"ENTER ROWS (Y/N)?";
650 GOSUB 2260
660 IF R$="N" THEN 690
670 PRINT CS$:GOSUB 860:IF E THEN 690
680 GOSUB 760:GOTO 670
690 REM
700 PRINT CS$;"ENTER COLS. (Y/N)?";
710 GOSUB 2260
720 IF R$="N" THEN 750
730 PRINT CS$:GOSUB 1050:IF E THEN 75
    0
740 GOSUB 950:GOTO 730
750 RETURN
760 REM ENTER ROW
770 PRINT CS$;"ENTER ";NC;" VALUES -"
780 PRINT "1 FOR EACH COLUMN.":PRINT
790 PRINT "** ROW ";RN$(R*10-9,R*10);
    " **":PRINT
800 PRINT :PRINT "COLUMN(5 SPACES)VAL
    UE"
810 FOR I=1 TO NC
820 PRINT CN$(I*10-9,I*10);"  ";DA(R,
    I),
830 TRAP 840:INPUT TT:DA(R,I)=TT
840 TRAP 40000:NEXT I
850 RETURN
860 REM GET ROW #
870 E=0:N$="":PRINT "ROW NAME OR 'END
    '"
880 INPUT N$:IF N$="END" THEN E=1:RET
    URN
890 IF LEN(N$)<10 THEN N$(LEN(N$)+1)=
    BL$
900 FOR I=1 TO NR
910 IF RN$(I*10-9,I*10)=N$ THEN R=I:I
    =1000000
920 NEXT I
930 IF I=NR+1 THEN PRINT "? ";:GOTO 8
    70
940 RETURN
950 REM ENTER COL
960 PRINT CS$;"ENTER ";NR;" VALUES -"
970 PRINT "1 FOR EACH ROW":PRINT
980 PRINT "** COL ";CN$(C*10-9,C*10);
    " **":PRINT
990 PRINT :PRINT "ROW(7 SPACES)VALUE"
1000 FOR I=1 TO NR
1010 PRINT RN$(I*10-9,I*10);"  ";DA(I
     ,C),
1020 TRAP 1030:INPUT TT:DA(I,C)=TT
1030 TRAP 40000:NEXT I
1040 RETURN
1050 REM GET COL #
1060 E=0:N$="":PRINT "COL NAME OR 'EN
     D'"
1070 INPUT N$:IF N$="END" THEN E=1:RE
     TURN
1080 IF LEN(N$)<10 THEN N$(LEN(N$)+1)
     =BL$
1090 FOR I=1 TO NC
1100 IF CN$(I*10-9,I*10)=N$ THEN C=I:
     I=1000000
1110 NEXT I
1120 IF I=NC+1 THEN PRINT "? ";:GOTO
     1060
1130 RETURN
1140 REM CALCULATE
1150 PRINT CS$;"* CALCULATE STEP *":P
     RINT
1160 PRINT "CALCULATE (Y/N)?";
```

For the Atari 400/800 Home Computer

As their only hope for survival, you must rescue allied space ships and aliens from the grasp of the deadly Gorn and his Guardians.

The Guardians of The Gorn are hideous spiders waiting to catch and feed you to the master of the web, the Gorn. But even worse, the Gorn will suddenly appear without warning to do his own dirty work.

Your only chance is to rescue the ships and aliens, and return them to the safety of their home base while dismantling the tendrils of the web and destroying the Guardians of the Gorn.



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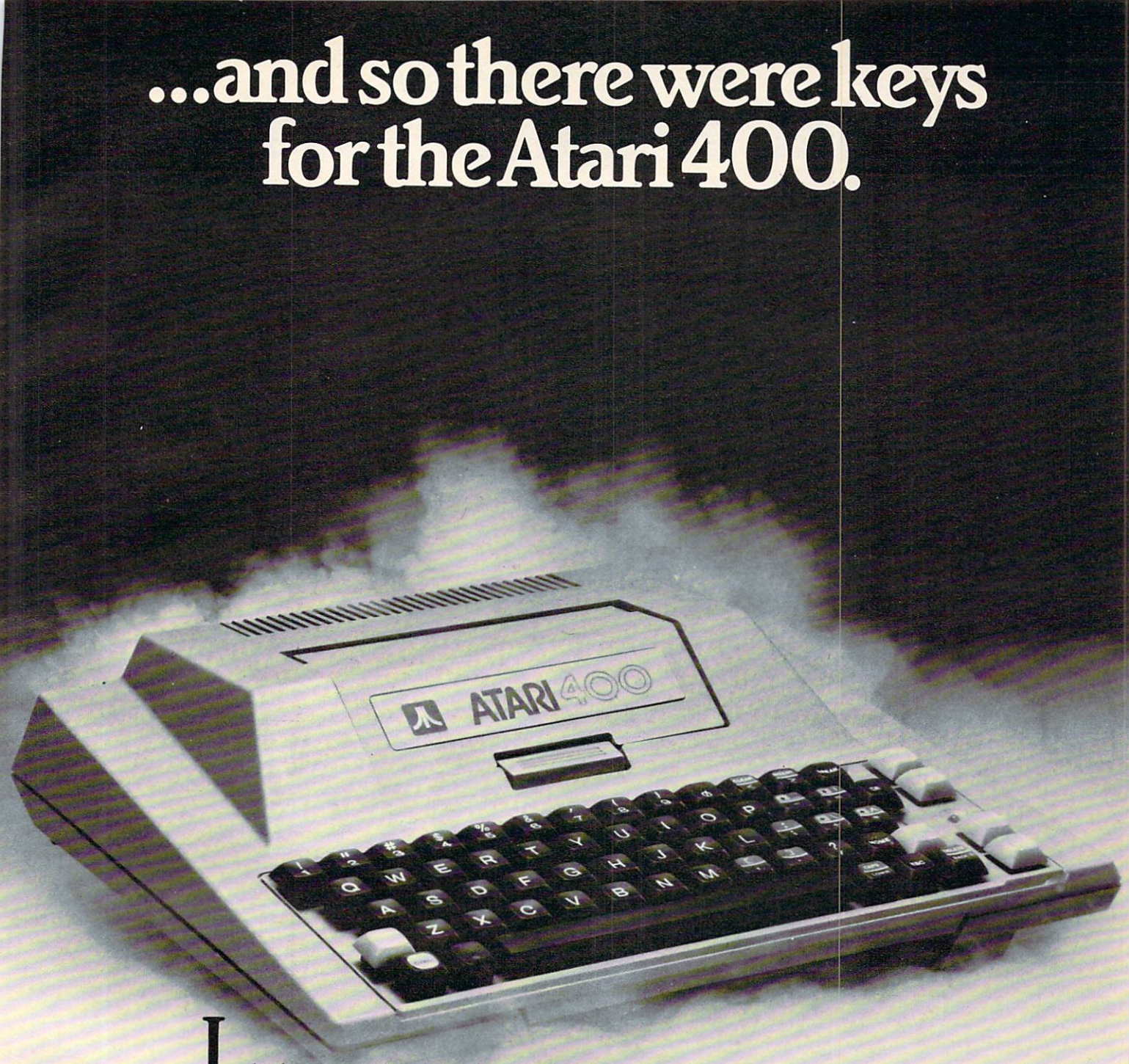
```
1170 GOSUB 2260
1180 IF R$="N" THEN 1310
1190 REM
1200 PRINT CS$;"WORK ON ROWS (Y/N)?";
1210 GOSUB 2260
1220 IF R$="N" THEN 1250
1230 PRINT CS$:PRINT "1ST ";:GOSUB 86
     0:IF E THEN 1250
1240 GOSUB 1320:GOTO 1230
1250 REM
1260 PRINT CS$;"WORK ON COLS. (Y/N)?"
     ;
1270 GOSUB 2260
1280 IF R$="N" THEN 1310
1290 PRINT CS$:PRINT "1ST ";:GOSUB 10
     50:IF E THEN 1310
1300 GOSUB 1490:GOTO 1290
1310 RETURN
1320 REM WORK ON ROWS
1330 R1=R
1340 GOSUB 2180
1350 PRINT :PRINT "2ND ";:GOSUB 860:I
     F E THEN 1400
1360 R2=R
1370 PRINT :PRINT "ANS ";:GOSUB 860:I
     F E THEN 1400
1380 R3=R
1390 GOSUB 1410
1400 RETURN
1410 REM DO ROW
1420 PRINT :PRINT "WORKING..."
1430 FOR I=1 TO NC
1440 C3=I:C2=I:C1=I
1450 GOSUB 2300
1460 NEXT I
1470 PRINT :PRINT "COMPLETED"
1480 RETURN
1490 REM WORK ON COLS
1500 C1=C
1510 GOSUB 2180
1520 PRINT :PRINT "2ND ";:GOSUB 1050:
     IF E THEN 1570
1530 C2=C
1540 PRINT :PRINT "ANS ";:GOSUB 1050:
     IF E THEN 1570
1550 C3=C
1560 GOSUB 1580
1570 RETURN
1580 REM DO COL
1590 PRINT :PRINT "WORKING..."
1600 FOR I=1 TO NR
1610 R3=I:R2=I:R1=I
1620 GOSUB 2300
1630 NEXT I
1640 PRINT :PRINT "COMPLETED"
1650 RETURN
1660 REM DISPLAY
1670 PRINT CS$;"* DATA DISPLAY STEP *
     "
1680 PRINT :PRINT "DISPLAY DATA (Y/N)
     ?";
1690 GOSUB 2260
1700 IF R$="N" THEN 1890
1710 PRINT :REM ROWS
1720 PRINT :PRINT "DISPLAY ROWS (Y/N)
     ?";
1730 GOSUB 2260
1740 IF R$="N" THEN 1800
1750 PRINT :GOSUB 860:IF E THEN 1800
1760 RT=0:FOR I=0 TO NC:RT=RT+DA(R,I)
     :NEXT I
1770 N=INT((NC+1)/NL):IF (NC+1)-NL*N>
     0 THEN N=N+1
1780 C=1:GOSUB 1900
1790 GOTO 1750
1800 REM
1810 PRINT :PRINT "DISPLAY COLS (Y/N)
     ?";
1820 GOSUB 2260
1830 IF R$="N" THEN 1890
1840 PRINT :GOSUB 1050:IF E THEN 1890
1850 CT=0:FOR I=0 TO NR:CT=CT+DA(I,C)
     :NEXT I
1860 N=INT((NR+1)/NL):IF (NR+1)-NL*N>
     0 THEN N=N+1
1870 R=1:GOSUB 2040
1880 GOTO 1840
1890 RETURN
1900 REM ROW PANEL
1910 FOR I=1 TO N
1920 PRINT CS$:PRINT "COLUMN
     {4 SPACES}";RN$(R*10-9,R*10):PRI
     NT
1930 FOR J=1 TO 10
1940 IF C>NC THEN PRINT
1950 IF C<=NC THEN PRINT CN$(C*10-9,C
     *10);" ";DA(R,C):C=C+1
1960 NEXT J
1970 PRINT :PRINT
1980 PRINT "ROW TOTAL ";RT
1990 IF I<N THEN PRINT :PRINT "MORE .
     .."
2000 PRINT :PRINT "SPACE TO CONTINUE"
2010 GET #1,A:IF A<>32 THEN 2010
2020 NEXT I
2030 RETURN
2040 REM COL PANEL
2050 FOR I=1 TO N
2060 PRINT CS$:PRINT "ROW{7 SPACES}";
     CN$(C*10-9,C*10):PRINT
2070 FOR J=1 TO 10
2080 IF R>NR THEN PRINT
2090 IF R<=NR THEN PRINT RN$(R*10-9,R
     *10);" ";DA(R,C):R=R+1
2100 NEXT J
2110 PRINT :PRINT
2120 PRINT "COL TOTAL ";CT
2130 IF I<N THEN PRINT :PRINT "MORE .
     .."
2140 PRINT :PRINT "SPACE TO CONTINUE"
2150 GET #1,A:IF A<>32 THEN 2150
2160 NEXT I
2170 RETURN
2180 REM GET OPERATOR
2190 PRINT
2200 FOR I=1 TO NP*2 STEP 2:PRINT OP$
     (I,I+1);", ";:NEXT I:PRINT
2210 TRAP 2210:INPUT T$:T$(LEN(T$)+1)
     =" ":T$=T$(1,2):TRAP 40000
2220 FOR I=1 TO NP*2 STEP 2:IF OP$(I,
     I+1)=T$ THEN I=1000000
2230 NEXT I
2240 IF I=NP*2+1 THEN PRINT "TRY AGAI
     N":GOTO 2190
2250 RETURN
2260 REM GET Y OR N
2270 GET #1,A:R$=CHR$(A)
2280 IF R$<>"Y" AND R$<>"N" THEN PRIN
     T :PRINT "KEY 'Y' OR 'N'";:GOTO
     2270
2290 RETURN
2300 REM CALCULATIONS
2310 IF T$="+" THEN DA(R3,C3)=DA(R1,C
     1)+DA(R2,C2)
2320 IF T$="-" THEN DA(R3,C3)=DA(R1,C
     1)-DA(R2,C2)
2330 IF T$="*" THEN DA(R3,C3)=DA(R1,C
     1)*DA(R2,C2)
2340 IF T$="/" AND DA(R2,C2)<>0 THEN
     DA(R3,C3)=DA(R1,C1)/DA(R2,C2)
2350 IF T$="%" THEN DA(R3,C3)=DA(R1,C
     1)*DA(R2,C2)/100
```

...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.

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```
2360 IF T$="%+" THEN DA(R3,C3)=DA(R1,
     C1)+(DA(R1,C1)*DA(R2,C2)/100)
2370 IF T$="%-" THEN DA(R3,C3)=DA(R1,
     C1)-(DA(R1,C1)*DA(R2,C2)/100)
2380 IF T$="%D" AND DA(R1,C1)<>0 THEN
      DA(R3,C3)=((DA(R2,C2)-DA(R1,C1)
     )/DA(R1,C1))*100
2390 DA(R3,C3)=INT((DA(R3,C3)*D2+5)/1
     0)/D1
2400 RETURN
2410 REM INITIALIZE
2415 OPEN #1,4,0,"K"
2420 DIM CS$(1):CS$=CHR$(125):REM CLE
     AR SCREEN
2430 NL=10
2440 NR=0:NC=0
2450 DIM BL$(10):BL$="{11 SPACES}"
2460 NP=8:DIM OP$(NP*2),T$(10),R$(10)
     :OP$=" ":OP$(NP*2)=" ":OP$(2)=OP
     $
2470 FOR I=1 TO NP*2 STEP 2:READ T$:O
     P$(I)=T$:NEXT I
2480 DATA +,-,*,/,%,%+,%-,%D
2490 DP=2:D1=INT(10^DP+0.1):D2=INT(10
     ^(DP+1)+0.1)
2500 PRINT CS$;"TINY PLAN":PRINT :PRI
     NT "VERSION 1.0 JULY 1982"
2510 PRINT :PRINT :PRINT "ELECTRONIC"
     :PRINT :PRINT "SPREADSHEET"
2520 ? :? :? "PRESS [START]";
2521 IF PEEK(53279)<>6 THEN 2521
2530 SZ=FRE(0)-150
2540 RETURN
```

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This program, with both Microsoft and Atari versions, can help you to lose weight by cutting calories. Be sure to consult with your doctor before using this program or any other weight-loss technique.

CalCalc: Computerize Your Diet

Charles Brannon
Editorial Assistant

Calorie counting is important in most diet plans. Unfortunately, the process of looking up every item of food you eat is discouragingly tedious. And even if you conscientiously keep track of calories, how do you know how much progress you're making?

Your body burns a certain number of calories per day. This depends on your sex, build, and activities. In order to lose weight, you must eat fewer calories than your body needs, forcing it to convert fat tissue into carbohydrates. On the other hand, if you eat more calories than your body "burns" in one day, the excess is converted into fat.

3500 Calories = 1 Pound

In order to lose one pound of fat, you have to miss 3500 calories. In order to gain a pound, you have to have an excess of 3500 calories. This is not on a daily basis; calories accumulate. So, if you ate 1000 more calories each day than your body used, you would gain one pound in about three and a half days.

Since any calculation is spread over many days, it can be hard to see progress, or to predict how long it will take to shed that "excess baggage." The computer is of great aid here.

CalCalc asks you a number of questions, such as your sex and age, to determine how many calories you need each day. You then enter everything you've eaten at the end of the day, selecting foods and quantities from a list (a *menu*, appropriately enough!). Just press the letter corresponding to the food you ate. If you don't see a certain food, press RETURN to see more items.

Adding To The Menu

What if you ate a food not on the list? This is not too hard, since we've included only a sample selection of foods, found in the DATA statements from lines 1140 and up. To customize this list to your preferences and habits, just purchase a pocket-sized calorie-counter (available at most grocery-store checkout counters). Then add to or change the DATA statements.

There is one DATA statement for each food. The first item on the line (after the word DATA) is the name of the food. Make the name less than 20 letters long. The next item, preceded with a comma, is the number of calories in an average serving, followed by a comma, and the description of the average serving, such as a "1 CUP" or "1 8" EAR." The last DATA statement (line 1500 here) should be END,0,0 which marks the end of the list.

After you've pressed the letter corresponding to the food you've eaten, the computer will display the quantity (such as one cup) and calories of an average serving. You enter the multiple or fraction in decimal of the quantity given. For example, if you drank two glasses of milk for breakfast, enter a 2, for two one-cup portions. If you had half of a medium orange, enter 0.5. CalCalc then displays the calories for the food consumed, and the cumulative total of calories. You continue to enter foods for everything you've eaten.

Guesstimating

You can also approximate calories. For example, if you ate a chicken-filet sandwich, you could select "T", chicken (one four oz. serving), and "K", two one-slice portions of white bread. Or, if you can look on the wrapper of the product, you can enter the calories directly. Just press the number sign, "#", instead of a letter, and enter the calories literally.

The Moment Of Truth

After you've finished entering all the foods, the computer is ready to predict weight loss. It bases this prediction on the assumption that you will eat about the same number of calories each day. Just enter the number of days you want to "look ahead," and CalCalc will tell you how much weight you will have lost. If you're eating too much, it will, with equal placidity, show you how much you'll gain.

CalCalc makes dieting much easier. It goes beyond mere automation of a calorie counter by letting you see the *effect* of changes. By only cutting down on meals and checking your total calories with CalCalc, you can see if you'll lose weight.

Program 1: Microsoft Version

```
100 POKE59468,12:PRINTCHR$(142):GOSUB1020
110 PRINT"{DOWN}{REV}WARNING{OFF}: CONSULT YOU
    R DOCTOR BEFORE
120 PRINT"          USING THIS PROGRAM OR ANY"
130 PRINT"          OTHER WEIGHT-LOSS TECHNIQUE
    ."
140 PRINT"{DOWN}ARE YOU {REV}M{OFF}ALE OR {REV
    REV}F{OFF}EMALE?"
150 GETA$:IFA$<>"M"ANDA$<>"F"THEN150
160 SX=0:IF A$="F" THEN SX=1
170 IF SX=0 THEN 200
```

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cardboard 6

The CARDBOARD 6 is a fuse protected expansion interface designed to allow the user to access more than one of the plug-in-type memory or utility cartridges now available. Additionally it allows switch selection of games and other programs now available in the cartridge format, without the necessity of turning the computer off and on again, thereby saving a great deal of stress on your VIC-20 and on your television or monitor.
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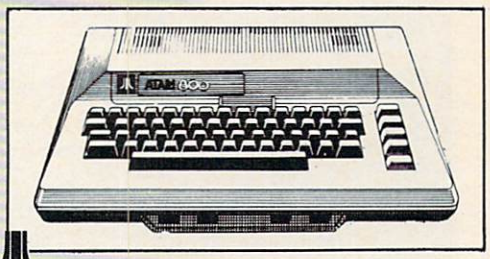

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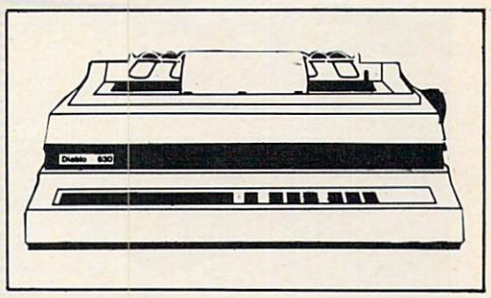

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Conversion Notes For Apple, OSI, VIC, Color Computer, etc.

Program 1 is designed to run on all computers with MicroSoft BASIC (called Extended BASIC on some computers). Because it was programmed on a PET/CBM, some changes in screen display and format are necessary.

Most obvious are lines 1030-1100, which display the CalCalc logo. You can use your system's graphics capabilities to do this, or just delete lines 1040-1100, and change line 1030 to:

```
1030 REM
```

(since it's a target line of a GOSUB).

All statements preceded with [REV] should be entered in inverse video, or preceded with INVERSE, and end with NORMAL. All statements using the [DOWN] cursor control can be changed from:

```
610 PRINT"[DOWN]ENTER..."
```

to

```
610 PRINT:PRINT"ENTER...
```

The [BELL] character should be entered as CTRL-G. [CLEAR], or clear screen, should be changed to HOME on the Apple (outside quotes).

The statements that provide a "default" answer, such as line 520, which positions the cursor on the "0", can be changed to delete the "0" and the three cursor-lefts, or altered to provide a default answer on your computer.

Since the PET lacks absolute X,Y cursor positioning (using relative cursor controls instead), Apple owners need to use HTAB and VTAB statements instead:

```
260 PX=0:PY=5:GOSUB 1020
300 HTAB PX:VTAB PY:INVERSE:PRINT
    CHR$(I+64):NORMAL:PRINT ":";LEFT$
    (FOOD$,19)
305 PY=PY+1
310 IF I=13 THEN PX=20:PY=5
```

Also, remove the IF/THEN qualifiers from lines 340-360 (since the Apple doesn't have a realtime clock), and use:

```
330 VTAB 20
```

These suggestions are a good general guide to follow when converting any PET/CBM program. Since the VIC has a 22-column display, VIC owners should change line 270 to read:

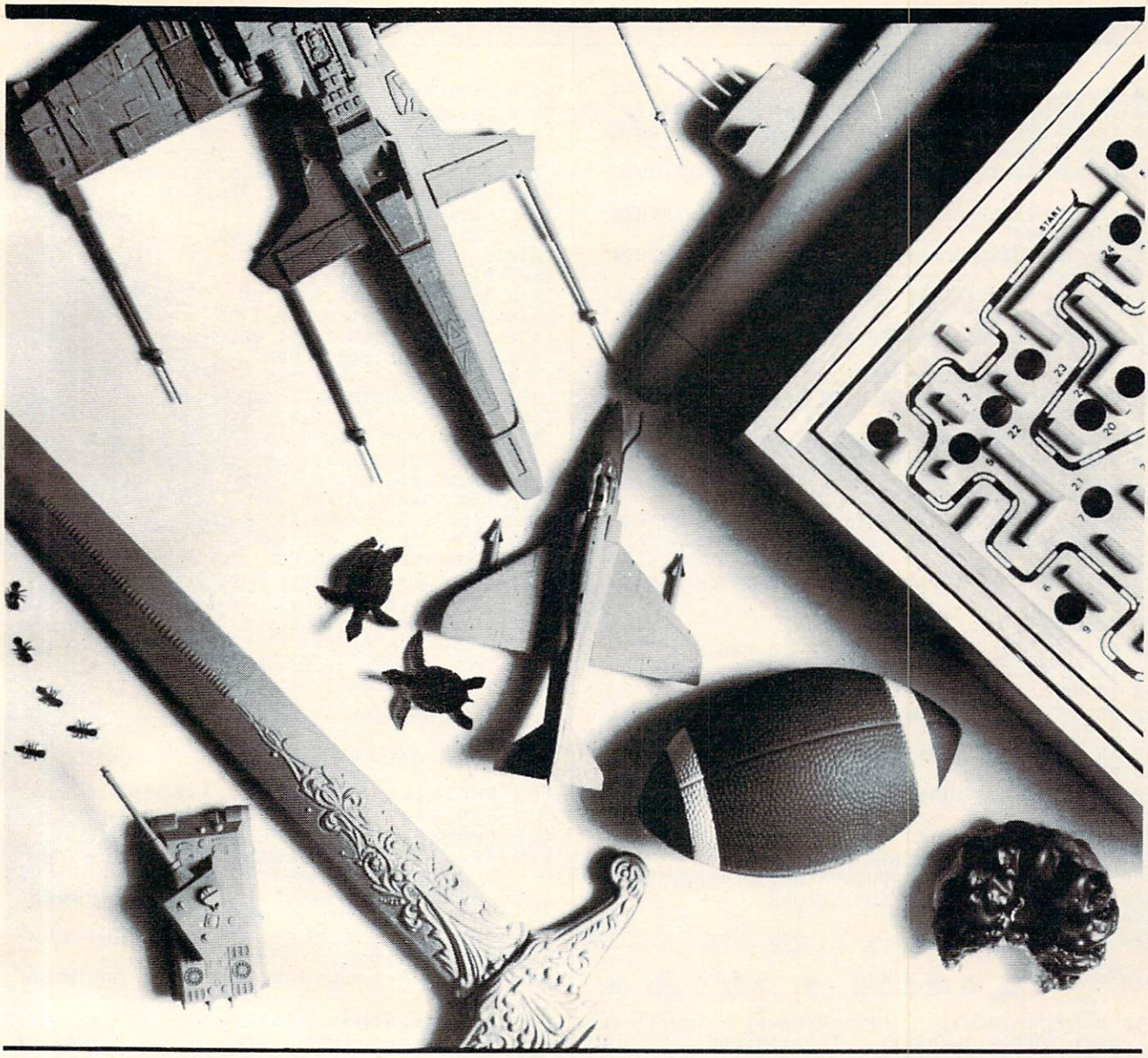
```
270 FOR I=1 TO 10
```

and line 330 to:

```
330 CP$="[HOME][22 DOWN]"
```

```
180 PRINT"{DOWN}ARE YOU PREGNANT";:GOSUB980:IF
    YES THEN PREG=1
190 PRINT"{DOWN}ARE YOU NURSING";:GOSUB980:IF
    YES THEN NU=1
200 GOSUB1020
210 PRINT"ENTER 0 IF NOT KNOWN:"
220 INPUT"NUMBER OF CALORIES CONSUMED? 0{03 LE
    LEFT}";CAL
230 IF CAL<0 THEN PRINT"{DOWN}{BELL}{REV}IMPOS
    SIBLE":FORW=1TO500:NEXT:GOTO200
240 IFCAL>=4500THENPRINT"{DOWN}";CAL;" CALORIE
    S?  ARE YOU SURE";:GOSUB980:IF1-YES T
    HEN200
250 IF CAL THEN 730
260 PX=0:GOSUB 1020
270 FOR I=1 TO 26
280 READ FOOD$,CL,AMOUNT$
290 IF FOOD$="END" THEN 330
300 PRINT TAB(PX);"{REV}";CHR$(I+64);"{OFF}:";
    LEFT$(FOOD$,19)
310 IF I=13 THEN PX=20:PRINT"{13 UP}";
320 NEXT I
330 CP$="{HOME}{24 DOWN}"
340 IF TI-T>60 AND TI-T<120 THEN PRINTCP$;"ENT
    ER {REV}#{OFF} OR {REV}LETTER{OFF} OF
     FOOD";
350 IF TI-T>120 AND TI-T<180 THEN PRINTCP$;"PR
    ESS {REV}RETURN{OFF} TO GO ON      ";
360 IF TI-T>180 THEN PRINTCP$;"PRESS {REV}*{OF
    OFF} WHEN DONE     ";:T=TI
370 GETA$:IF(A$<"A"ORA$>"Z")ANDA$<>CHR$(13)AND
    A$<>"*"ANDA$<>"#"THEN340
380 IFA$<>CHR$(13)THEN410
390 NX=NX+1:IF FOOD$="END" THEN RESTORE:NX=0
400 GOTO 260
410 RESTORE
420 IFA$="#"THEN600
430 IFA$="*"THEN660
440 FOR I=1 TO NX*26+ASC(A$)-64
450 READ FOOD$,CL,AMOUNT$
460 NEXT
470 GOSUB1020
480 PRINT"FOOD: ";FOOD$
490 PRINT"CALORIES PER ";AMOUNT$;": ";CL
500 PRINT"{DOWN}ENTER QUANTITY OF ABOVE FOOD
510 PRINT"CONSUMED, USING A MULTIPLE OR
520 PRINT"A DECIMAL FRACTION? 0{03 LEFT}";:INP
    UT QU
530 IF QU=0 THEN 590
540 IF QU<0 THEN PRINT"{REV}{DOWN}{BELL}IMPOSS
    IBLE":FORW=1TO500:GOTO470
550 PRINT"{DOWN}CALORIES OF ";FOOD$;":";CL*QU
560 PRINT"{DOWN}CALORIES CONSUMED SO FAR:";:CA
    L=CAL+CL*QU:PRINTCAL
570 PRINT"{02 DOWN}PRESS {REV}RETURN{OFF} TO C
    ONTINUE..."
580 GETA$:IFA$<>CHR$(13)THEN580
590 RESTORE:NX=0:GOTO 260
600 GOSUB1020:PRINT"{DOWN}ENTER ABSOLUTE QUANT
    ITY"
610 PRINT"{DOWN}OF CALORIES FOR FOOD NOT ON LI
    ST:"
620 PRINT"{02 DOWN}? 0{03 LEFT}";:INPUT CL
630 IF CL=0 THEN NX=0:GOTO 260
640 IF CL<0 THEN PRINT"{DOWN}{REV}{BELL}IMPOSS
    IBLE":FORW=1TO500:NEXTW:GOTO600
650 QU=1:GOTO560
660 GOSUB1020
670 PRINT"TOTAL CALORIES CONSUMED:";CAL
680 PRINT"{02 DOWN}DOES THAT SOUND REASONABLE"
    ;:GOSUB980
690 IF YES THEN 730
700 PRINT"{DOWN}DO YOU WANT TO":PRINT"RE-ENTER
     THE CALORIES";:GOSUB980
710 IF YES THEN CAL=0:GOTO260
720 PRINT"{CLEAR}":END
```

(continued on p. 90)



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(64K Apple II w/DOS 3.3)

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(Atari 400/800 w/48K & IBM PC)

ADVENTURES OF THE BABY SEA TURTLE will make the animal and arcade game lover happy. In this game, you must guide a sea turtle through a dangerous trail braving predators and the elements, until you reach a safe haven.
(Atari 400/800 w/48K)

DELTA SQUADRON will make the super war strategist happy. Your mission is to penetrate the defense system of vast battle station with 50 fighters under your control.
(64K Apple II w/DOS 3.3)

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(Atari 400/800 w/48K)

MAZE MASTER will make the maze fanatic happy with three different challenging levels of play. We dare you to try our maze game.
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CAPTAIN COSMOS will make the young at heart happy. It gives you the satisfaction of destroying The Munchies with Somanizer rays (arcade fashion) before your very eyes.
(Atari 400/800 w/32K)

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San Francisco, CA 94126-6468
(415) 387-5800

```
730 GOSUB1020
740 INPUT"WHAT IS YOUR AGE? 20{04 LEFT}";AGE
750 IFAGE<20ORAGE>70THENPRINT"{DOWN}{REV}YOU M
    UST BE BETWEEN 20 AND 70"
760 IFAGE<20ORAGE>70THENFORW=1TO1000:NEXT:GOTO
    730
770 IFAGE>=20ANDAGE<=30THENCPD=3200:IF SX THEN
     CPD=2300
780 IFAGE>=30ANDAGE<=40THENCPD=3104:IF SX THEN
     CPD=2231
790 IFAGE>=50ANDAGE<=60THENCPD=2768:IF SX THEN
     CPD=1990
800 IFAGE>=60ANDAGE<=70THENCPD=2528:IF SX THEN
     CPD=1587
810 CPD=CPD+1000*NU+450*PREG
820 PRINT"{DOWN}ON A SCALE OF {REV}1{OFF}-{REV
    REV}5{OFF}"
830 PRINT"(1=MODERATELY ACTIVE, 5=VERY ACTIVE"
840 PRINT"HOW ACTIVE ARE YOU?"
850 GETA$:IFA$<"1"ORA$>"5"THEN850
860 CPD=CPD+VAL(A$)*200
870 GOSUB1020:PRINT"{DOWN}ESTIMATED ENERGY EXP
    ENDITURE":PRINT"IN CALORIES IN ONE DA
    Y:";CPD
880 PRINT"{DOWN}TOTAL CALORIC INTAKE IN ONE DA
    Y:";CAL
890 DF=CAL-CPD
900 PRINT"{DOWN}NUMBER OF DAYS TO PROJECT"
910 INPUT"WEIGHT LOSS/GAIN? 1{03 LEFT}";ND
920 IF ND<1 THEN 910
930 PRINT"{DOWN}AT THE CURRENT CONSUMPTION, YO
    U SHOULD"
940 IF DF<0 THEN PRINT"LOSE ";:GOTO 960
950 PRINT"GAIN ";
960 PRINTINT(ABS(DF*ND)/3500);" POUNDS."
970 END
980 PRINT"? (Y/N):";
990 GETA$:IFA$<>"Y"ANDA$<>"N"THEN990
1000 YES=0:IFA$="N"THENPRINT"{REV}NO":RETURN
1010 YES=1:PRINT"{REV}YES":RETURN
1020 PRINT"{CLEAR}";
1030 PRINT"  $$$   $$   $     $$$   $$   $    $
    $$
1040 PRINT" NM   M NM M 'MM   NM   M NM M 'MM   NM
      M
1050 PRINT"'M{REV})   {OFF}'M{REV})   {OFF}' {R
    REV} {OFF}  'M{REV})   {OFF}'M{REV})  ~
      {OFF}' {REV} {OFF} 'M{REV})   "
1060 PRINT"' {REV} {OFF}   ' {REV} {OFF}: {REV}
     {OFF}' {REV} {OFF}  ' {REV} {OFF}    ~
    ' {REV} {OFF}: {REV} {OFF}' {REV} {OF
    OFF} ' {REV} {OFF}
1070 PRINT"' {REV} {OFF}   ' {REV} {OFF} M{REV}
     {OFF}' {REV} {OFF}  ' {REV} {OFF}    ~
    ' {REV} {OFF} M{REV} {OFF}' {REV} {OF
    OFF} ' {REV} {OFF}
1080 PRINT" M{REV} {OFF}##M' {REV}    {OFF}' {R
    REV} {OFF}#M M{REV} {OFF}##M' {REV}  ~
      {OFF}' {REV} {OFF}#MM{REV} {OFF}##M

1090 PRINT"   {REV}   {OFF} M{REV} {OFF} M{REV}
     {OFF} M{REV}   {OFF}   {REV}   {OFF}
     M{REV} {OFF} M{REV} {OFF} M{REV}   {
    OFF}  {REV}   ~
1100 PRINTTAB(11);"$$$$$$$$$$$$$$$$$"
1110 PRINTTAB(11);"{REV}CALORIE CALCULATOR"
1120 PRINT"@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
    @@"
1130 RETURN
1140 DATA CHEDDAR CHEESE,113,1'' CUBE
1150 DATA COTTAGE CHEESE,27, 1 OZ
1160 DATA WHOLE MILK,166,1 CUP
1170 DATA NONFAT MILK,87,1 CUP
1180 DATA GRAPEFRUIT,77,1 CUP
1190 DATA ORANGES,70,1 MED.
1200 DATA CANTALOUPES,37,1/2 MELON
1210 DATA APPLES,87,1 MED.
1220 DATA ORANGE JUICE,108,1 CUP
1230 DATA CORN FLAKES,96,1 CUP
1240 DATA WHITE BREAD,63,1 SLICE
1250 DATA WHOLE WHEAT BREAD,55,1 SLICE
1260 DATA HAMBURGER MEAT,316,3 OZ
1270 DATA STEAK,293,3 OZ
1280 DATA LAMB CHOP,480,4 OZ
1290 DATA BACON,48,1 SLICE
1300 DATA HAM,340,3 OZ
1310 DATA FLOUNDER,78,4 OZ
1320 DATA TUNA FISH,170,3 OZ
1330 DATA CHICKEN,227,4 OZ
1340 DATA EGGS,640,1 CUP
1350 DATA SUGAR,48,1 TBS
1360 DATA CARROTS,68,1 CUP
1370 DATA POTATOES,120,1 MED.
1380 DATA BEET GREENS,39,1 CUP
1390 DATA LETTUCE,7,4 SM. LEAVES
1400 DATA SPINACH,46,1 CUP
1410 DATA BAKED BEANS,295,1 CUP
1420 DATA LIMA BEANS,152,1 CUP
1430 DATA CORN,92,8'' EAR
1440 DATA PEAS,74,.5 CUP
1450 DATA TOMATOES,30,1 MED.
1460 DATA 4% BEER,150,12 OZ.
1470 DATA BLACK COFFEE,9,1 CUP
1480 DATA COLA BEVERAGES,83,6 OZ
1490 DATA POTATO CHIPS,108,10 2'' CHIPS
1500 DATA END,0,0
```

Program 2: Atari Version

```
100 GRAPHICS 0:POKE 752,1:GOSUB 1020:
    DIM A$(1),FOOD$(19),AMOUNT$(10)
105 OPEN #1,4,0,"K":POKE 82,0
110 PRINT "{DOWN}WARNING: CONSULT YOU
    R DOCTOR BEFORE"
120 PRINT "{9 SPACES}USING THIS PROGR
    AM OR ANY"
130 PRINT "{9 SPACES}OTHER WEIGHT-LOS
    S TECHNIQUE."
140 PRINT "{DOWN}ARE YOU MALE OR FEMA
    LE?"
150 GET #1,A:A$=CHR$(A):IF A$<>"M" AN
    D A$<>"F" THEN 150
160 SX=0:IF A$="F" THEN SX=1
170 IF SX=0 THEN 200
180 PRINT "{DOWN}ARE YOU PREGNANT";:G
    OSUB 980:IF YES THEN PREG=1
190 PRINT "{DOWN}ARE YOU NURSING";:GO
    SUB 980:IF YES THEN NU=1
200 GOSUB 1020
210 PRINT "ENTER 0 IF NOT KNOWN:":?
220 TRAP 220:PRINT "{UP}{DEL LINE}NUM
    BER OF CALORIES CONSUMED?0{2 LEFT}
    ";:POKE 752,0:INPUT CAL:POKE 752,
    1:TRAP 40000
230 IF CAL<0 THEN PRINT "{DOWN}{BELL}
    IMPOSSIBLE":FOR W=1 TO 500:NEXT W
    :GOTO 200
240 IF CAL>=4500 THEN PRINT "{DOWN}";
    CAL;" CALORIES?  ARE YOU SURE";:G
    OSUB 980:IF 1-YES THEN 200
250 IF CAL THEN 730
260 PX=0:PY=10:GOSUB 1020
270 FOR I=1 TO 26
280 READ FOOD$,CL,AMOUNT$
290 IF FOOD$="END" THEN 330
300 POSITION PX,PY:PRINT CHR$(I+192);
    ":";FOOD$:PY=PY+1
310 IF I=13 THEN PX=20:PY=10
320 NEXT I
330 REM
340 IF PEEK(20)>60 AND PEEK(20)<120 T
```

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FILE-IT 2 by Jerry White
A powerful financial database management system. 6 user defined fields are created with up to 5 sub-fields beneath each main field. Alphabetically handles data and also does math computation on any selected fields. Data files are stored on separate disks with full field and sub-field sorting with file merging. Supports up to 4 drives including the 128K Axlon Ramdisk. The "alternative" to more costly database management systems.
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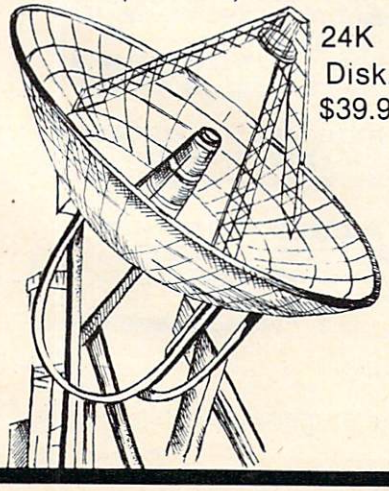

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Jerry White's MUSIC LESSONS
MUSIC LESSONS has everything you need to know to create your own beautiful music and a wide range of sound effects on your ATARI computer. This comprehensive tutorial contains 13 separate programs and PLAYER PIANO on 2 cassettes or 1 double sided disk and includes extensive documentation complete with program listings. 32K DISK 16K CASSETTE (24K required for PLAYER PIANO). $29.95

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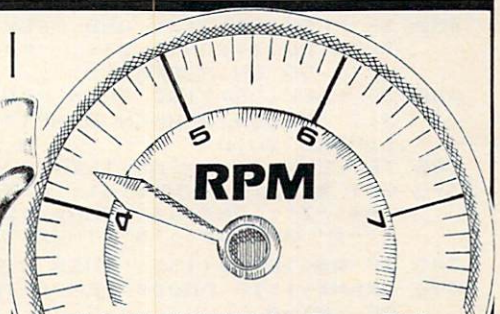

TACHMASTER by Tony Dobre
This highly accurate Disk Drive speed diagnostic utility program has been designed specifically for the Atari 810 Disk Drive by the author of the original *"RPM"* program. *TACHMASTER,* using 100 percent machine language routines, displays RPM readings, updated five time per second, in digital and analog form on your screen. Reliability to within one quarter RPM is assured. With *TACHMASTER,* Drive speed adjustment to factory specifications can be easily accomplished without any special equipment. Comes complete with step by step user's instruction manual. Disk Only. $29.95.

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```
    HEN POSITION 2,23:? "ENTER # OR L
    ETTER OF FOOD";
350 IF PEEK(20)>120 AND PEEK(20)<180
    THEN POSITION 2,23:? "PRESS RETUR
    N TO GO ON{5 SPACES}";
360 IF PEEK(20)>180 THEN POSITION 2,2
    3:? "PRESS # WHEN DONE{4 SPACES}"
    ;:POKE 20,0
365 IF PEEK(764)=255 THEN 340
370 GET #1,A:A$=CHR$(A):IF (A$<"A" OR
     A$>"Z") AND A$<>CHR$(155) AND A$
    <>"*" AND A$<>"#" THEN 340
380 IF A$<>CHR$(155) THEN 410
390 NX=NX+1:IF FOOD$="END" THEN RESTO
    RE :NX=0
400 GOTO 260
410 RESTORE
420 IF A$="#" THEN 600
430 IF A$="*" THEN 660
440 FOR I=1 TO NX*26+ASC(A$)-64
450 READ FOOD$,CL,AMOUNT$
460 NEXT I
470 GOSUB 1020
480 PRINT "FOOD: ";FOOD$
490 PRINT "CALORIES PER ";AMOUNT$;":
    ";CL
500 PRINT "{DOWN}ENTER QUANTITY OF AB
    OVE FOOD"
510 PRINT "CONSUMED, USING A MULTIPLE
     OR":?
520 TRAP 520:PRINT "{UP}{DEL LINE}A D
    ECIMAL FRACTION?0{2 LEFT}";:POKE
    752,0:INPUT QU:POKE 752,1:TRAP 40
    000
530 IF QU=0 THEN 590
540 IF QU<0 THEN PRINT "{DOWN}{BELL}I
    MPOSSIBLE":FOR W=1 TO 500:GOTO 47
    0
550 PRINT "{DOWN}CALORIES OF ";FOOD$;
    ":";CL*QU
560 PRINT "{DOWN}CALORIES CONSUMED SO
     FAR:";:CAL=CAL+CL*QU:PRINT CAL
570 PRINT "{2 DOWN}PRESS RETURN TO CO
    NTINUE..."
580 GET #1,A:A$=CHR$(A):IF A$<>CHR$(1
    55) THEN 580
590 RESTORE :NX=0:GOTO 260
600 GOSUB 1020:PRINT "{DOWN}ENTER ABS
    OLUTE QUANTITY"
610 PRINT "{DOWN}OF CALORIES FOR FOOD
     NOT ON LIST:":?
620 TRAP 620:PRINT "{UP}{DEL LINE}?0
    {2 LEFT}";:POKE 752,0:INPUT CL:PO
    KE 752,1:TRAP 40000
630 IF CL=0 THEN NX=0:GOTO 260
640 IF CL<0 THEN PRINT "{DOWN}{BELL}I
    MPOSSIBLE":FOR W=1 TO 500:NEXT W:
    GOTO 600
650 QU=1:GOTO 560
660 GOSUB 1020
670 PRINT "TOTAL CALORIES CONSUMED:";
    CAL
680 PRINT "{2 DOWN}DOES THAT SOUND RE
    ASONABLE";:GOSUB 980
690 IF YES THEN 730
700 PRINT "{DOWN}DO YOU WANT TO":PRIN
    T "RE-ENTER THE CALORIES";:GOSUB
    980
710 IF YES THEN CAL=0:GOTO 260
720 PRINT "{CLEAR}":END
730 GOSUB 1020:? :?
740 TRAP 740:PRINT "{UP}{DEL LINE}WHA
    T IS YOUR AGE?20{3 LEFT}";:POKE 7
    52,0:INPUT AGE:POKE 752,1:TRAP 40
    000
750 IF AGE<20 OR AGE>70 THEN PRINT "
    {DOWN}YOU MUST BE BETWEEN 20 AND
    70"
760 IF AGE<20 OR AGE>70 THEN FOR W=1
    TO 300:NEXT W:GOTO 730
770 IF AGE>=20 AND AGE<=30 THEN CPD=3
    200:IF SX THEN CPD=2300
780 IF AGE>=30 AND AGE<=40 THEN CPD=3
    104:IF SX THEN CPD=2231
790 IF AGE>=50 AND AGE<=60 THEN CPD=2
    768:IF SX THEN CPD=1990
800 IF AGE>=60 AND AGE<=70 THEN CPD=2
    528:IF SX THEN CPD=1587
810 CPD=CPD+1000*NU+450*PREG
820 PRINT "{DOWN}ON A SCALE OF 1-5"
830 PRINT "(1=MODERATELY ACTIVE, 5=VE
    RY ACTIVE"
840 PRINT "HOW ACTIVE ARE YOU?"
850 GET #1,A:A$=CHR$(A):IF A$<"1" OR
    A$>"5" THEN 850
860 CPD=CPD+VAL(A$)*200
870 GOSUB 1020:PRINT "{DOWN}ESTIMATED
     ENERGY EXPENDITURE":PRINT "IN CA
    LORIES IN ONE DAY:";CPD
880 PRINT "{DOWN}TOTAL CALORIC INTAKE
     IN ONE DAY:";CAL
890 DF=CAL-CPD
900 PRINT "{DOWN}NUMBER OF DAYS TO PR
    OJECT"
910 PRINT "WEIGHT LOSS/GAIN?1{2 LEFT}
    ";:POKE 752,0:INPUT ND:POKE 752,1
920 IF ND<1 THEN 910
930 PRINT "{DOWN}AT THE CURRENT CONSU
    MPTION, YOU SHOULD"
940 IF DF<0 THEN PRINT "LOSE ";:GOTO
    960
950 PRINT "GAIN ";
960 PRINT INT(ABS(DF*ND)/3500);" POUN
    DS."
970 END
980 PRINT "? (Y/N):";
990 GET #1,A:A$=CHR$(A):IF A$<>"Y" AN
    D A$<>"N" THEN 990
1000 YES=0:IF A$="N" THEN PRINT "NO":
    RETURN
1010 YES=1:PRINT "YES":RETURN
1020 PRINT "{CLEAR}";
1030 ? "  {3 N}{3 SPACES}{2 N}
    {3 SPACES}{N}{5 SPACES}{3 N}
    {3 SPACES}{2 N}{3 SPACES}{N}
    {4 SPACES}{3 N}"
1040 ? " {F}{G}  {G} {F}{G} {G} {B}
    {2 G}{3 SPACES}{F}{G}  {G} {F}
    {G} {G} {B}{2 G}  {F}{G}  {G}"
1050 ? "{B}{G}{H}{3 SPACES}{B}{G}{H}■
    ■{J}{B} ■  {B}{G}{H}{3 SPACES}
    {B}{G}{H}■■{J}{B} ■ {B}{G}{H}
    {3 SPACES}"
1060 ? "{B} ■{3 SPACES}{B} ■{N}{V}■
    {B} ■  {B} ■{3 SPACES}{B} ■{N}
    {V}■{B} ■ {B} ■"
1070 ? "{B} ■{3 SPACES}{B} ■ {G}■{B}
    ■  {B} ■{3 SPACES}{B} ■ {G}■{B}
    ■ {B} ■"
1080 ? " {G}■{2 M}{G}{B} {4 SPACES}
    {B} ■{M}{G} {G}■{2 M}{G}{B}
    {4 SPACES}{B} ■{M}{2 G}■{2 M}
    {G}"
1090 ? "  {J}{3 SPACES} {G}■ {G}■
    {G}{3 SPACES}  {J}{3 SPACES}
    {G}■ {G}■ {G}{3 SPACES} {J}
    {3 SPACES}"
1110 ? :POKE 85,11:? "CALORIE CALCULA
    TOR"
1120 PRINT "{40 R}"
1130 RETURN
1140 DATA CHEDDAR CHEESE,113,1'' CUBE
```

(continued on p. 94)

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1150 DATA COTTAGE CHEESE,27, 1 OZ
1160 DATA WHOLE MILK,166,1 CUP
1170 DATA NONFAT MILK,87,1 CUP
1180 DATA GRAPEFRUIT,77,1 CUP
1190 DATA ORANGES,70,1 MED.
1200 DATA CANTALOUPES,37,1/2 MELON
1210 DATA APPLES,87,1 MED.
1220 DATA ORANGE JUICE,108,1 CUP
1230 DATA CORN FLAKES,96,1 CUP
1240 DATA WHITE BREAD,63,1 SLICE
1250 DATA WHOLE WHEAT BREAD,55,1 SLICE
1260 DATA HAMBURGER MEAT,316,3 OZ
1270 DATA STEAK,293,3 OZ
1280 DATA LAMB CHOP,480,4 OZ
1290 DATA BACON,48,1 SLICE
1300 DATA HAM,340,3 OZ
1310 DATA FLOUNDER,78,4 OZ
1320 DATA TUNA FISH,170,3 OZ
1330 DATA CHICKEN,227,4 OZ
1340 DATA EGGS,640,1 CUP
1350 DATA SUGAR,48,1 TBS
1360 DATA CARROTS,68,1 CUP
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1380 DATA BEET GREENS,39,1 CUP
1390 DATA LETTUCE,7,4 SM. LEAVES
1400 DATA SPINACH,46,1 CUP
1410 DATA BAKED BEANS,295,1 CUP
1420 DATA LIMA BEANS,152,1 CUP
1430 DATA CORN,92,8'' EAR
1440 DATA PEAS,74,.5 CUP
1450 DATA TOMATOES,30,1 MED.
1460 DATA 4% BEER,150,12 OZ.
1470 DATA BLACK COFFEE,9,1 CUP
1480 DATA COLA BEVERAGES,83,6 OZ
1490 DATA POTATO CHIPS.108,10 2'' CHIPS
1500 DATA END,0,0
```

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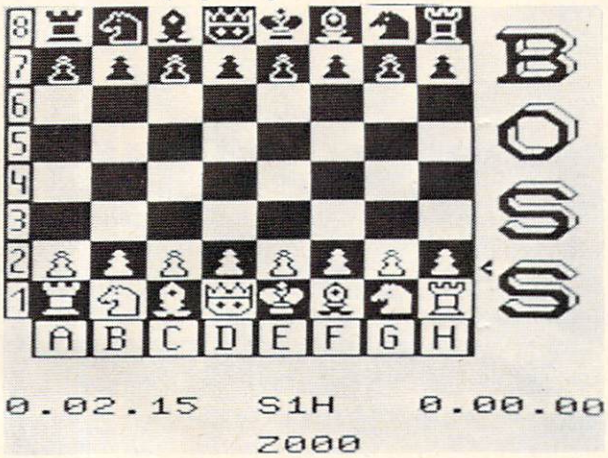

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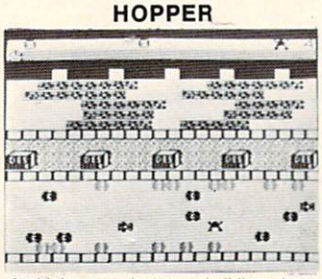

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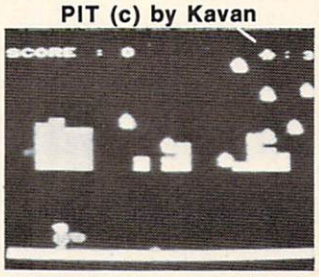

BONZO strikes again as he takes money bags out of the pit. Avoid the alien rain by standing under the shields. Every successfully removed bag of money reinforces your sheilds. 100% machine language, cassette based. Joystick or keyboard, standard VIC. **$18.00**

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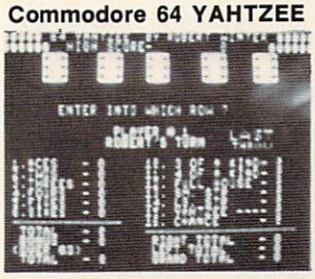

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All Sorts Of BASIC Sorts

C. Regena
Cedar City, UT

One of the functions of a computer is to organize data. There are all kinds of sort routines or algorithms to arrange your data. You may want to alphabetize lists or arrange events by date or list a class in order by test scores. You'll need a sort routine to take your raw data and arrange it in ascending or descending order (from A to Z or Z to A).

Computer programmers and analysts often enjoy looking at sort routines and comparing speed and efficiency. Usually the amount of time it takes a computer to sort depends on how many items are in the list and how out-of-order the items are. Different computers vary in speed also. (*Note:* Although the TI-99/4A computer is slower than other microcomputers in PRINTing or LISTing, it is just as fast or faster in calculations and comparisons. The sort routines presented here were not significantly slower on any particular microcomputer.)

Here are four different sort routines written in BASIC for you to try, and to implement in your own programs. The computers and languages used are TI-99/4A (or TI-99/4), TI-99/4A Extended BASIC, VIC-20, and TRS-80 Color Computer with 16K Extended BASIC. Only BASIC programs are presented here; machine language routines are also available for some computers and are, of course, faster.

In the listings, Line 100 tells which computer and which sort is used. Lines 100-190 randomly choose 50 integers from 1 to 100. Ordinarily, you would INPUT, READ, or calculate the numbers used. The actual sorting starts at Line 200. Lines 500 to the end print the final sorted list of numbers in the example.

Bubble Sort

The Bubble Sort (or simple interchange sort) is probably the most common and easy to understand sort. It is fine for small numbers of items or for a list of items that is not much out of order. The program compares each number to the next number and exchanges numbers where necessary.

If one switch has been made during a pass through all the numbers, the loop of comparisons starts over. In this example, if the 50 numbers happened to be in exact opposite order, the maximum number of passes would be necessary, and the process would take longer than if only a few numbers were out of place. For larger numbers of items, this sort can seem to take forever.

Shell Sort

The Shell Sort is considerably faster than the Bubble Sort. In general, for a random order of 50 numbers, the shell sort is about two or three times as fast as the Bubble Sort. The Shell Sort speeds up execution because the number of comparisons that need to be made is reduced.

In an array of N numbers, it first determines B so that $2^B<N<2^{B+1}$ and then the variable B is initialized to 2^{B-1}. The loop varies the counter I from 1 to N-B. First, it checks if $A(I)\leq A(I+B)$. If so, it increments I and continues with the comparisons. If not, it exchanges A(I) and A(I + B) and changes the subscript.

When I reaches the value of N, it reduces B by a factor of two and starts the loop again. When B = 0 the sort is complete. I've used a couple of extra variables in the example for clarity.

Sort C

The third kind of sort routine offered here is also faster than the Bubble Sort if the numbers are quite mixed up. The program goes through all the numbers and places the minimum value in the first spot of the array. The loop keeps finding the minimum of the numbers remaining and replaces it in order.

Sort D

This sort is similar to the previous one, except that with each pass through the numbers, both the minimum and the maximum numbers are found and placed at the appropriate end spots.

The way these sorts are listed, the given numbers will be arranged in ascending order. To change to descending order, simply exchange the less than

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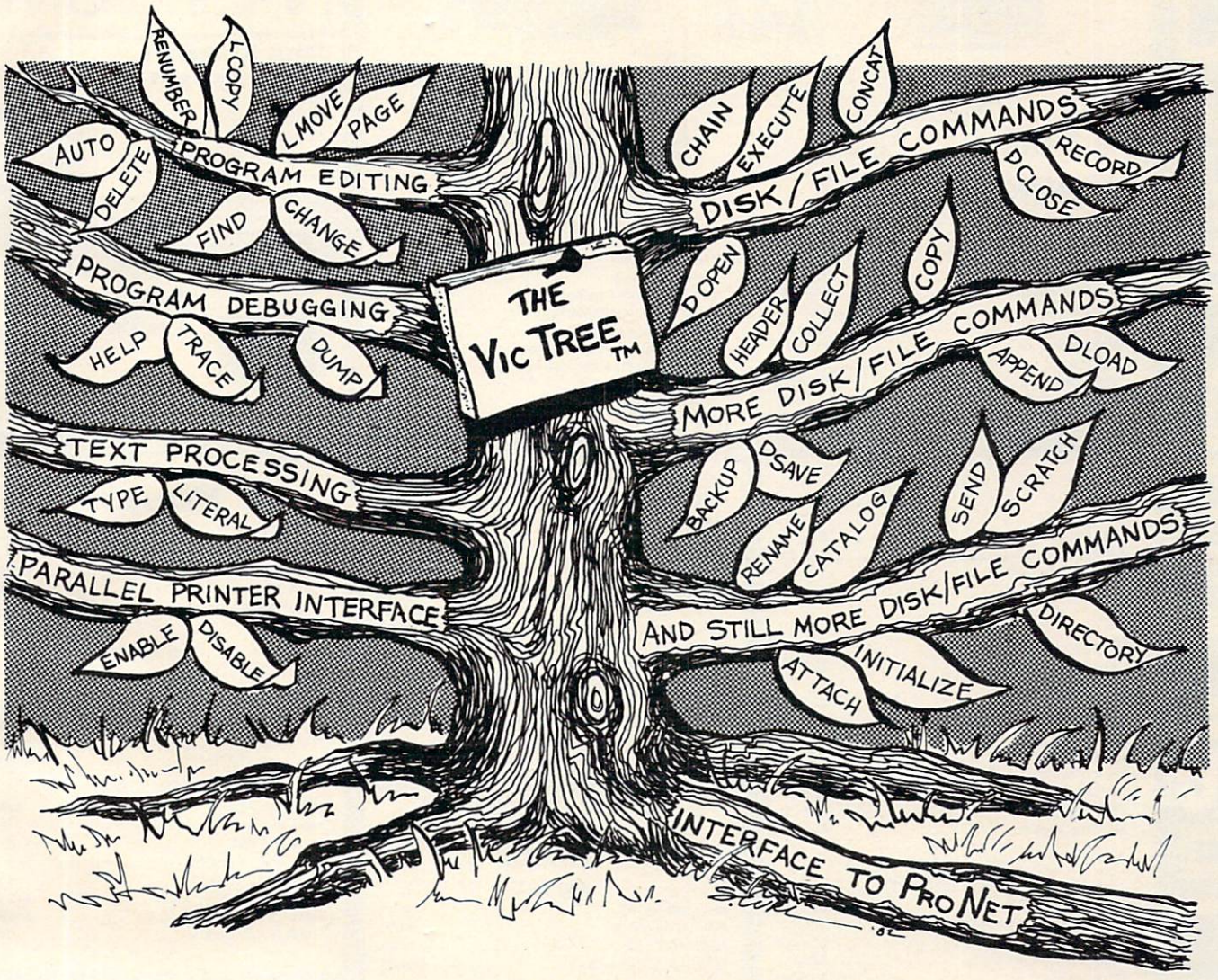

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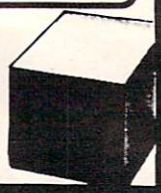

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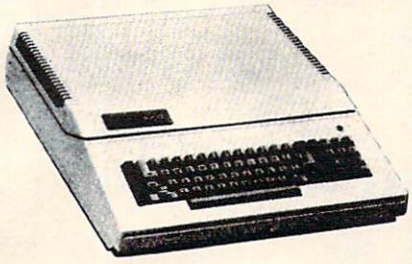

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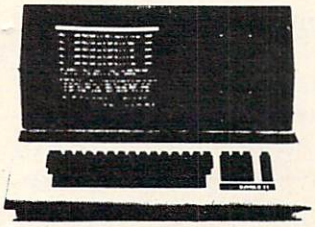

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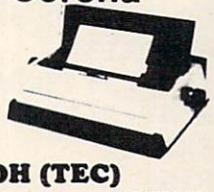

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or greater than signs in the sort comparisons.

If you are alphabetizing, the variable terms will be string variables, such as A$(I).

You may have several items which need to be associated as they are sorted. For example, suppose you have names and scores to be arranged by score. The names and scores are first arranged as N$(1), S(1); N$(2), S(2); etc. In the interchange you would need to sort the S values, and then switch both terms, such as:

```
SS=S(I)
NN$=N$(I)
S(I)=S(I+1)
N$(I)=N$(I+1)
S(I+1)=SS
N$(I+1)=NN$
```

Keep in mind that for sorts for the TRS-80 Color Computer and the VIC-20, you should use lower line numbers and leave out spaces to conserve memory. You may also save memory by naming your variables with only one letter. Too, you could combine a few more lines than I did in these examples. You should, of course, use the VIC-20 abbreviations wherever possible (such as D-shift-I for DIM).

TI-99/4 BASIC Sorts

```
100 REM  TI BASIC BUBBLE SORT
110 DIM A(50)
120 FOR I=1 TO 50
130 RANDOMIZE
140 A(I)=INT(RND*100+1)
150 PRINT A(I);
160 NEXT I
170 PRINT ::
200 LIM=49
210 SW=0
220 FOR I=1 TO LIM
230 IF A(I)<=A(I+1)THEN290
240 AA=A(I)
250 A(I)=A(I+1)
260 A(I+1)=AA
270 SW=1
280 LIM=I
290 NEXT I
300 IF SW=1 THEN 210
500 FOR I=1 TO 50
510 PRINT A(I);
520 NEXT I
530 END
```

```
100 REM  TI BASIC SHELL SORT
110 DIM A(50)
120 FOR I=1 TO 50
130 RANDOMIZE
140 A(I)=INT(RND*100+1)
150 PRINT A(I);
160 NEXT I
170 PRINT ::
200 B=1
210 B=2*B
220 IF B<=50 THEN 210
230 B=INT(B/2)
240 IF B=0 THEN 500
250 FOR I=1 TO 50-B
260 C=I
270 D=C+B
280 IF A(C)<=A(D)THEN 340
290 AA=A(C)
300 A(C)=A(D)
310 A(D)=AA
320 C=C-B
330 IF C>0 THEN 270
340 NEXT I
350 GOTO 230
500 FOR I=1 TO 50
510 PRINT A(I);
520 NEXT I
530 END
```

```
100 REM  TI BASIC SORT C
110 DIM A(50)
120 N=50
130 FOR I=1 TO N
140 RANDOMIZE
150 A(I)=INT(RND*100+1)
160 PRINT A(I);
170 NEXT I
180 PRINT ::
200 M=A(1)
210 IM=1
220 FOR I=2 TO N
230 IF A(I)<M THEN 260
240 M=A(I)
250 IM=I
260 NEXT I
270 AA=A(N)
280 A(N)=A(IM)
290 A(IM)=AA
300 N=N-1
310 IF N>1 THEN 200
500 FOR I=1 TO 50
510 PRINT A(I);
520 NEXT I
530 END
```

```
100 REM  TI BASIC SORT D
110 DIM A(50)
120 N=50
130 FOR I=1 TO 50
```

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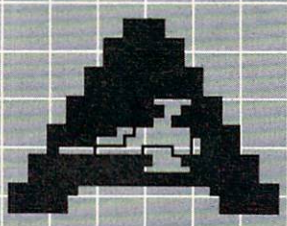
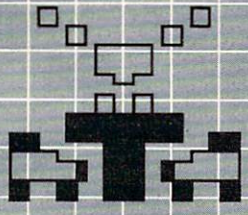
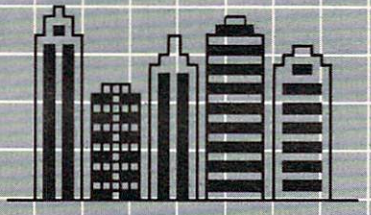


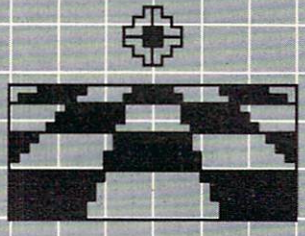
ASTROBLITZ
Protect your planet by destroying enemy saucers.



TRASHMAN
Drive the garbage truck and empty the city's trash cans. But watch out for the flies.

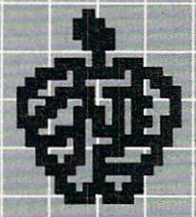


CITY BOMBER
Level a city to make it easy to land. Take off and do it again.

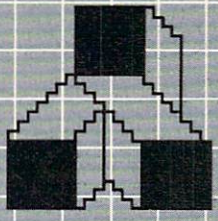


ACTION GAMES
SEAWOLF, BOUNCEOUT, or VIC TRAP. You'll need sharp eyes and quick hands for these.

Education



EDUCATIONAL/RECREATIONAL (I & II)
Put fun into learning math, spelling, and spatial relationships.



LOGIC GAMES
The computer is thinking. You should be, too.

Choose an Entree:

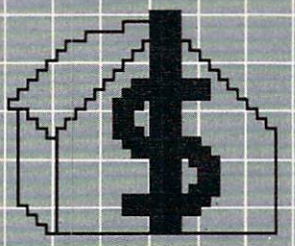
Maybe it's a colorful and challenging game like ASTROBLITZ, TRASHMAN, or CITY BOMBER; perhaps an educational game like HANGMAN or MATH HURDLER; maybe a basic diet of household concerns like HOME INVENTORY, HOUSEHOLD FINANCE, or DECISION MAKER.

Take your pick. All you have to supply is your VIC™ 20 or ATARI® 400/800 and your own ideas about how to put our software to use. We supply the rest: competitive games, educational games, down-to-earth personal programs, and simple instructions that make everything easy to digest.

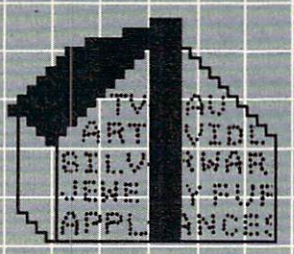
What you see here is part of the menu for today. We'll be adding more, so check our menu from time to time. It's growing, and it's all take home.

Contact your local outlet.

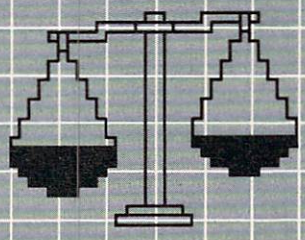
Personal



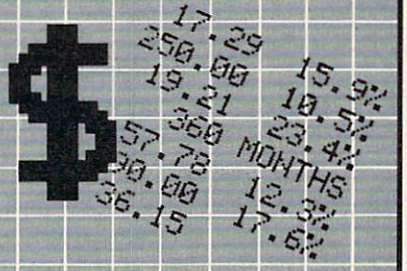
HOUSEHOLD FINANCE
Schedule the family budget, account for expenditures, and face the tax man with a smile.



HOME INVENTORY
Make a record of what you own and revise it as you go. Find out what you've got in seconds.



DECISION MAKER
What should you do about virtually anything? Here's help.



LOAN ANALYZER
Home, car, boat . . . whatever. How much can you afford? Find out.

CREATIVE SOFTWARE
A Division of ASCI, Inc.

201 San Antonio Circle, Mountain View, CA 94040 U.S.A. (415) 948-9595

```
140 RANDOMIZE
150 A(I)=INT(RND*100+1)
160 PRINT A(I);
170 NEXT I
180 PRINT ::
200 S=1
210 MN=A(S)
220 IMIN=S
230 MX=MN
240 IMAX=S
250 FOR I=S TO N
260 IF A(I)<=MX THEN 290
270 MX=A(I)
280 IMAX=I
290 IF A(I)>=MN THEN 320
300 MN=A(I)
310 IMIN=I
320 NEXT I
330 IF IMIN<>N THEN 350
340 IMIN=IMAX
350 AA=A(N)
360 A(N)=A(IMAX)
370 A(IMAX)=AA
380 N=N-1
390 AA=A(S)
400 A(S)=A(IMIN)
410 A(IMIN)=AA
420 S=S+1
430 IF N>S THEN 210
500 FOR I=1 TO 50
510 PRINT A(I);
520 NEXT I
530 END
```

TI-99/4 Extended BASIC Sorts

```
100 REM TI EXTENDED BASIC BUBBLE SO
    RT
110 DIM A(50)
120 FOR I=1 TO 50:: RANDOMIZE:: A(I
    )=INT(RND*100+1):: PRINT A
    (I);:: NEXT I :: PRINT : :
200 LIM=49
210 SW=0 :: FOR I=1 TO LIM :: IF A(
    I)<=A(I+1)THEN 230
220 AA=A(I):: A(I)=A(I+1):: A(I+1)=
    AA :: SW=1 :: LIM=I
230 NEXT I
240 IF SW=1 THEN 210
500 FOR I=1 TO 50 :: PRINT A(I);:: ~
    NEXT I
510 END
```

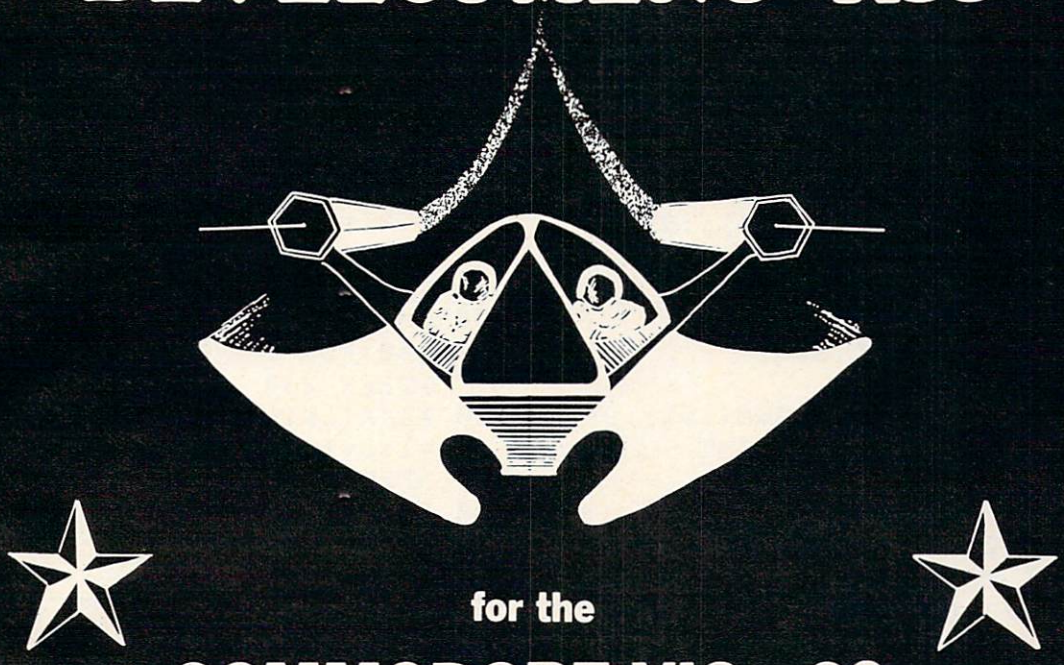
```
100 REM TI EXTENDED BASIC SHELL SOR
    T
110 DIM A(50)
120 FOR I=1 TO 50::RANDOMIZE::A(I)=
    INT(RND*100+1)::PRINTA(I);
    ::NEXT I::PRINT : :
200 B=1
210 B=2*B :: IF B<=50 THEN 210
220 B=INT(B/2):: IF B=0 THEN 500
230 FOR I=1 TO 50-B :: C=I
240 D=C+B :: IF A(C)<=A(D)THEN260
250 AA=A(C):: A(C)=A(D):: A(D)=AA :
    : C=C-B :: IF C>0 THEN 240
260 NEXT I :: GOTO 220
500 FOR I=1 TO 50 :: PRINT A(I);:: ~
    NEXT I
510 END
```

```
100 REM TI EXTENDED BASIC SORT C
110 DIM A(50):: N=50
120 FOR I=1 TO N::RANDOMIZE::A(I)=I
    NT(RND*100+1)::PRINT A(I);
    ::NEXT I::PRINT : :
200 M=A(1):: IM=1
210 FOR I=2 TO N
220 IF A(I)>=M THEN M=A(I):: IM=I
230 NEXT I
240 AA=A(N):: A(N)=A(IM):: A(IM)=AA
     :: N=N-1 :: IF N>1 THEN 2
    00
500 FOR I=1 TO 50 :: PRINT A(I);:: ~
    NEXT I
510 END
```

```
100 REM TI EXTENDED BASIC SORT D
110 DIM A(50):: N=50 :: S=1
120 FOR I=1 TO 50::RANDOMIZE::A(I)=
    INT(RND*100+1):: PRINT A(I
    );:: NEXT I::PRINT : :
200 MN=A(S):: IMIN=S :: MX=MN :: IM
    AX=S
210 FOR I=S TO N
220 IF A(I)>MX THEN MX=A(I):: IMAX=
    I
230 IF A(I)<MN THEN MN=A(I):: IMIN=
    I
240 NEXT I
250 IF IMIN=N THEN IMIN=IMAX
260 AA=A(N):: A(N)=A(IMAX):: A(IMAX
    )=AA :: N=N-1
270 AA=A(S):: A(S)=A(IMIN):: A(IMIN
    )=AA :: S=S+1
280 IF N>S THEN 200
500 FOR I=1 TO 50 :: PRINT A(I);:: ~
    NEXT I
510 END
```

continued on p. 104

GAME PROGRAM DEVELOPMENT KIT



for the

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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!!!

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507-263-4821

TRS-80 Color Computer Sorts

```
100 REM TRS80C BUBBLE SORT
110 DIM A(50)
120 FOR I=1 TO 50:A(I)=RND(100):PRI
    NTA(I);:NEXT:PRINT:PRINT
200 LIM=49
210 SW=0:FOR I=1 TO LIM:IF A(I)<=A(
    I+1)THEN 230
220 AA=A(I):A(I)=A(I+1):A(I+1)=AA:S
    W=1:LIM=I
230 NEXT
240 IF SW=1 THEN 210
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

```
100 REM TRS80C SHELL SORT
110 DIM A(50)
120 FOR I=1 TO 50:A(I)=RND(100):PRI
    NTA(I);:NEXT:PRINT:PRINT
200 B=1
210 B=2*B:IF B<=50 THEN 210
220 B=INT(B/2):IF B=0 THEN 500
230 FOR I=1 TO 50-B:C=I
240 D=C+B:IF A(C)<=A(D)THEN 260
250 AA=A(C):A(C)=A(D):A(D)=AA:C=C-B
    :IF C>0 THEN 240
260 NEXT:GOTO 220
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

```
100 REM TRS80C SORT C
110 DIM A(50):N=50
120 FOR I=1 TO N:A(I)=RND(100):PRIN
    TA(I);:NEXT:PRINT:PRINT
200 M=A(1):IM=1
210 FOR I=2 TO N
220 IF A(I)>=M THEN M=A(I):IM=I
230 NEXT
240 AA=A(N):A(N)=A(IM):A(IM)=AA:N=N
    -1:IF N>1 THEN 200
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

```
100 REM TRS80C SORT D
110 DIM A(50):N=50:S=1
120 FOR I=1 TO N:A(I)=RND(100):PRIN
    TA(I);:NEXT:PRINT:PRINT
200 MN=A(S):IM=S:MX=MN:IX=S
210 FOR I=S TO N
220 IF A(I)>MX THEN MX=A(I):IX=I
230 IF A(I)<MN THEN MN=A(I):IM=I
240 NEXT
250 IF IM=N THEN IM=IX
260 AA=A(N):A(N)=A(IX):A(IX)=AA:N=N
    -1
270 AA=A(S):A(S)=A(IM):A(IM)=AA:S=S
    +1
280 IF N>S THEN 200
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

VIC-20 Sorts

```
100 REM VIC 20 BUBBLE SORT
110 DIM A(50)
120 FORI=1 TO 50:A(I)=INT(RND(X)*10
    0+1):PRINTA(I);:NEXT:PRINT
    :PRINT
200 L=49
210 S=0:FOR I=1 TO L:IF A(I)<=A(I+1
    )THEN 230
220 AA=A(I):A(I)=A(I+1):A(I+1)=AA:S
    =1:L=I
230 NEXT:IF S=1 THEN 210
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

```
100 REM VIC 20 SHELL SORT
110 DIMA(50)
120 FORI=1 TO 50:A(I)=INT(RND(X)*10
    0+1):PRINTA(I);:NEXT:PRINT
    :PRINT
200 B=1
210 B=2*B:IF B<=50 THEN 210
220 B=INT(B/2):IF B=0 THEN 500
230 FOR I=1 TO 50-B:C=I
240 D=C+B:IF A(C)<=A(D) THEN 260
250 AA=A(C):A(C)=A(D):A(D)=AA:C=C-B
    :IFC>0 THEN 240
260 NEXT:GOTO220
500 FOR I=1 TO 50:PRINTA(I);:NEXT
510 END
```

```
100 REM VIC 20 SORT C
110 DIM A(50):N=50
120 FOR I=1 TO N:A(I)=INT(RND(X)*10
    0+1):PRINTA(I);:NEXT:PRINT
    :PRINT
200 M=A(1):IM=1
210 FORI=2 TO N
220 IF A(I)>=M THEN M=A(I):IM=I
230 NEXT
240 AA=A(N):A(N)=A(IM):A(IM)=AA:N=N
    -1:IF N>1 THEN 200
500 FORI=1 TO 50:PRINTA(I);:NEXT
510 END
```

continued on p. 106

VIC-20
CASSETTE SOFTWARE

SOFTWARE INC.

THE GAMES PEOPLE PLAY **NOW!**

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.

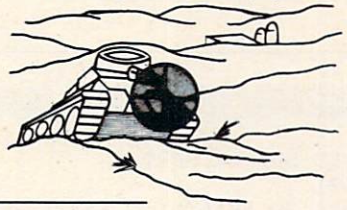
But beware! With the passing of time your presence becomes increasingly aggravating to the KILLER crabs who lurk within, improving the accuracy of their menacing sonic waves.

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.

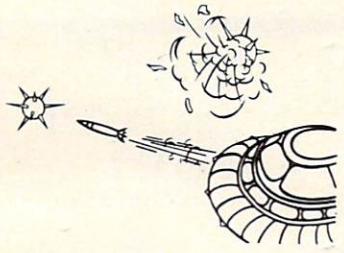
One of three skill levels, with a new battlefield created for each game, provides a new challenge for both players every time.

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.

Check for availability with your local dealer, or use the order form provided.
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```
100 REM VIC 20 SORT D
110 DIM A(50):N=50:S=1
120 FOR I=1 TO 50:A(I)=INT(RND(X)*1
    00+1):PRINTA(I);:NEXT:PRIN
    T:PRINT
200 MN=A(S):IM=S:MX=MN:IX=S
210 FOR I=S TO N
220 IF A(I)>MX THEN MX=A(I):IX=I
230 IF A(I)<MN THEN MN=A(I):IM=I
240 NEXT
250 IF IM=N THEN IM=IX
260 AA=A(N):A(N)=A(IX):A(IX)=AA:N=N
    -1
270 AA=A(S):A(S)=A(IM):A(IM)=AA:S=S
    +1
280 IF N>S THEN 200
500 FORI=1 TO 50:PRINTA(I);:NEXT
510 END
```

Apple Sorts

```
100 REM APPLE BUBBLE SORT
110 DIM A(50)
120 FOR I = 1 TO 50:A(I) = INT ( RND (1) * 100
    + 1): PRINT A(I);" ";: NEXT :PRINT:P
    RINT
200 L = 49
210 S = 0: FOR I = 1 TO L: IF A(I) < = A(I + 1
    ) THEN 230
220 AA = A(I):A(I) = A(I + 1):A(I + 1) = AA:S ~
    = 1:L = I
230 NEXT : IF S = 1 THEN 210
500 FOR I = 1 TO 50: PRINT A(I); " ";: NEXT
510 END
```

```
100 REM APPLE SHELL SORT
110 DIM A(50)
120 FOR I=1 TO 50:A(I) = INT ( RND (1) * 100 +
    1): PRINT A(I);" ";: NEXT :PRINT:PRI
    NT
200 B = 1
210 B = 2 * B: IF B < = 50 THEN 210
220 B = INT (B / 2): IF B = 0 THEN 500
230 FOR I = 1 TO 50 - B:C = I
240 D = C + B: IF A(C) < = A(D) THEN 260
250 AA = A(C):A(C) = A(D):A(D) = AA:C = C - B:
    IF C > 0 THEN 240
260 NEXT : GOTO 220
500 FOR I = 1 TO 50: PRINT A(I); " ";:  NEXT
510 END
```

```
100 REM APPLE SORT C
110 DIM A(50):N = 50
120 FOR I = 1 TO N:A(I) = INT ( RND (1) * 100 ~
    + 1): PRINT A(I);" ";:NEXT:PRINT:PRIN
    T
200 M = A(1):IM = 1
210 FOR I = 2 TO N
220 IF A(I) > = M THEN M = A(I) :IM = I
230 NEXT
240 AA = A(N):A(N) = A(IM):A(IM) = AA:N = N - ~
    1: IF N > 1 THEN 200
500 FOR I = 1 TO 50: PRINT A(I); " ";: NEXT
510 END
```

```
100 REM APPLE SORT D
110 DIM A(50):N = 50:S = 1
120 FOR I = 1 TO N:A(I) = INT ( RND (1) * 100 ~
    + 1): PRINT A(I);" ";:NEXT:PRINT:PRIN
    T
200 MN = A(S):IM = S:MX = MN:IX = S
210 FOR I = S TO N
220 IF A(I) > MX THEN MX = A(I): IX = I
230 IF A(I) < MN THEN MN = A(I): IM = I
240 NEXT
250 IF IM = N THEN IM = IX
260 AA = A(N):A(N) = A(IX):A(IX) = AA:N = N - ~
    1
270 AA = A(S):A(S) = A(IM):A(IM) = AA:S = S + ~
    1
280 IF N > S THEN 200
500 FOR I = 1 TO 50: PRINT A(I);" ";: NEXT
510 END
```

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SAVE ON MEMOREX FLEXIBLE DISCS Product Description	Part #	CE quant. 100 price per disc ($)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	**3062**	2.09
8" SSSD Shugart Compatible, 32 Hard Sector	**3015**	2.09
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8" SSDD IBM Compatible (128 B/S, 26 Sectors)	**3090**	2.74
8" DSDD Soft Sector (Unformatted)	**3102**	3.34
8" DSDD Soft Sector (128 B/S, 26 Sectors)	**3115**	3.34
8" DSDD Soft Sector (256 B/S, 26 Sectors)	**3103**	3.34
8" DSDD Soft Sector (512 B/S, 15 Sectors)	**3114**	3.34
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	**3104**	3.34
5¼" SSDD Soft Sector w/Hub Ring	**3481**	2.34
5¼" SSDD 10 Hard Sector w/Hub Ring	**3483**	2.34
5¼" SSDD 16 Hard Sector w/Hub Ring	**3485**	2.34
5¼" DSDD Soft Sector w/Hub Ring	**3491**	3.09
5¼" DSDD 10 Hard Sector w/Hub Ring	**3493**	3.09
5¼" DSDD 16 Hard Sector w/Hub Ring	**3495**	3.09
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5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	**3501**	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.

Special offer on Memorex computer tape.
If you mail your order to us and enclose prepayment, deduct $1.00 per reel from our quantity 100 prices. This means Memorex 25JW can be as low as $12.99 in 100 quantities. Memorex Computer Tapes are packed 10 tapes to a carton. Please order only in increments of 100 units for quantity 100 pricing. 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 tapes at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 3,000 or more saves you 4%; 4,000 or more saves you 5% and 5,000 or more tapes earns you a 6% discount off our super low quantity 100 price. If you need further assistance or information to find the tape that's right for you, call the Memorex Computer Tape Technical Support Group at (408) 987-2937.

SAVE ON MEMOREX COMPUTER TAPE Product Description	Part #	CE quant. 100 price per reel ($)
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It hit the national news wires and was quickly picked up by local media: a letter in October's New England Journal of Medicine *suggested that home computers and video game machines used with old color TV sets could expose people to potentially hazardous doses of radiation.*

Is Your TV A Radiation Hazard?

Tom R. Halfhill
Features Editor

It might be considered a flattering measure of the exploding popularity of home computing that a small item in a medical journal could attract so much attention. Could an old color TV hooked up to your computer or video game really create a radiation hazard? Or was all the fuss just a rerun of the color TV "radiation scare" of the late 1960s? What does it really mean to home computerists and video game addicts?

First, in case you missed the story – or more likely, in case your local media carried a frustratingly abbreviated version – here are the details.

The *New England Journal of Medicine*, a respected medical publication closely watched by the general news media, published a letter from two doctors at the Veterans Administration Medical Center in Washington, D.C. The letter warned that pre-1970 color TVs emit more X-radiation than sets built later. This could pose a danger, especially to young people, when these TVs are hooked up to home computers and video game machines. The doctors reasoned that many families plug their computers and game machines into "spare" color TVs to avoid tying up the household's main set. Also, they noted that people playing video games or involved in programming tend to sit much closer to the screen than they do when watching TV shows. They also tend to become engrossed for hours.

Doctors Suggest Caution

Close exposure over prolonged periods to older-model color TVs raises the possibility of radiation doses larger than recommended limits, suggested the doctors. Specifically, a young person using a computer or video game for two hours a day over one year would receive about eight times the government's recommended limit – which is 100 millirems per year for a person under 18. The two-hour-a-day game addict would absorb 780 millirems in the eyes and 890 millirems in the thyroid gland. (The radiation limits are different for adults, and some adults get higher doses because of their occupations; a typical flight attendant, for example, might get 500 millirems per year due to exposure in the upper atmosphere.)

Now, before you panic and start worrying about acquiring a permanent glow from playing *Space Invaders*, there are several things to keep in mind. First, the doctors' caution covers only *color* TVs made *before 1970* which are used at *closer than average* viewing distances. (The doctors defined the average viewing distances as roughly five feet for children and eight feet for adults.)

Second, the doctors did not actually measure radiation levels or perform any primary research. Instead, they took data published in the late 1960s on TV radiation emissions and used standard formulas to estimate the radiation absorption at closer distances. It was not a formal study.

"It was a lark," says Dr. Louis Korman, one of the letter's authors. "I am not a radiation expert. We were just sitting around one day talking about buying microcomputers, and the subject came up that most people who buy home micros tend to hook them up to older color TVs to avoid tying up the newer set. They'll get this TV from the attic, or buy it used at a shop.... We were aware of the radiation scare in the late sixties and just wanted to caution that these sets should be used with prudence.

"You'll probably see a lot of letters next month from people who'll say we don't know what we're talking about."

One of those letters may well be written by someone from the Electronic Instrument Association. A trade group representing TV manufacturers, the EIA did not take kindly to all the fuss. "We want to make two main points," says Alan Schlosser, EIA public relations director. "There are a statistically insignificant number of pre-1970 color TV sets out there. And also, we believe the people who use home microcomputers tend to use these state-of-the-art devices on up-to-date TV equipment. We don't want to pooh-pooh all this,

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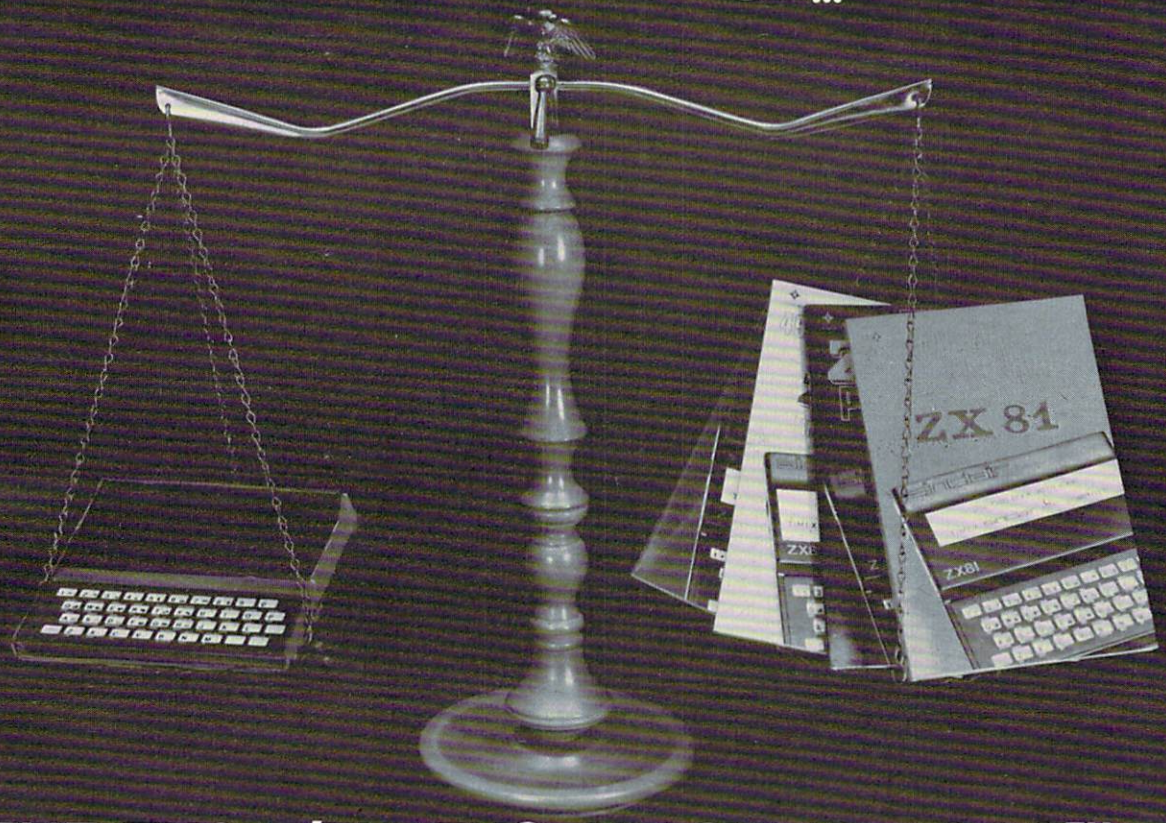

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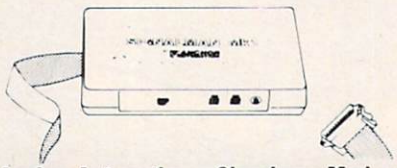

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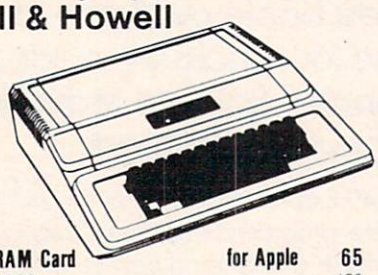

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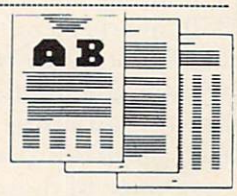

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For writing text, Paper-Mate has a definable keyboard so you can use with either Business or Graphics machines. Shift lock on letters only, or use keyboard shift lock. All keys repeat.

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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.

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but we don't think the body of evidence supports it."

Solid State Is Safer

Congress passed radiation standards for color TVs in the late 1960s, but the standards applied only to new models. Models then in use were not required to be modified because it was never actually proven that they emitted dangerous radiation, says the EIA. The whole scare was triggered when one manufacturer recalled one model which leaked radiation through a small vent-hole in the bottom of the set.

Before Congress passed the regulations, about 25 million color TVs were made between 1960 and 1970, nearly all in the late 1960s. It has been estimated that 1.3 to 16 percent of these sets exceeded the radiation limits set by the Food and Drug Administration's Bureau of Radiologic Health in 1971. Since the average life of a tube-type TV is 11 years, most of these sets are no longer in use.

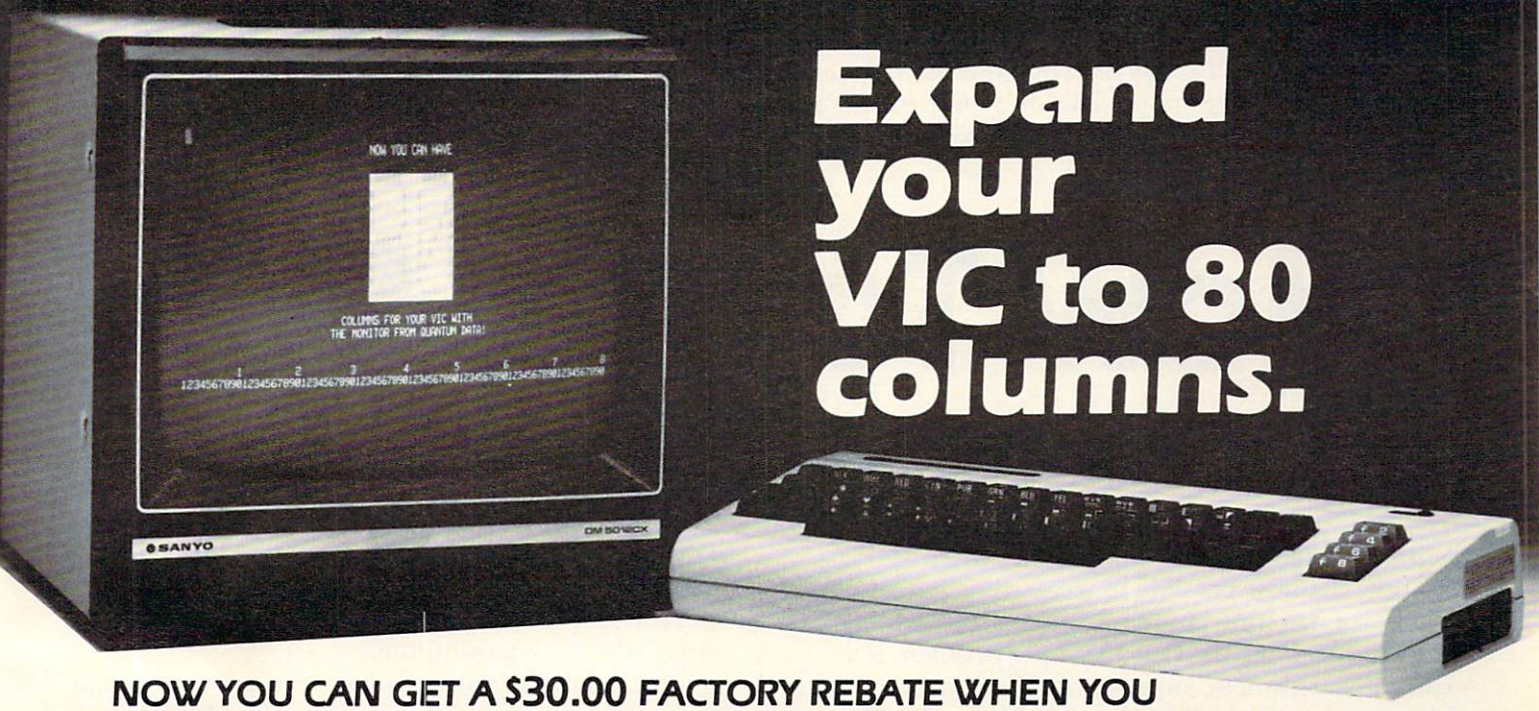
Nearly all the radiation is emitted from the vacuum tubes, not the picture tube. After the scare, manufacturers beefed up the shielding and turned toward safer solid-state circuitry. By 1972, virtually all TVs were solid-state. The greatest hazard is from older TVs which were improperly serviced, says Gene Koschella, who heads the EIA's technical training program. If a serviceman did not replace the tube shielding, or jacked up the voltage to prolong the life of a fading set, more radiation than normal may be leaking from the TV. Due to the nature of the radiation, the dosage is more acute at close range.

"The radiation decreases rapidly as you back away from the set," explains Koschella. "We've taken measurements and found that at four or five feet there's practically no radiation at all. At any rate, the radiation we're talking about is very soft. It's not anything like the radiation you'd get from an atomic bomb or something. In fact, it will be absorbed by clothing or glasses."

(That's why the VA doctors calculated radiation absorption in the eyes and thyroid, areas normally unprotected by clothing – unless the computerist is wearing glasses and a neck scarf.)

If you are using a pre-1970 set for prolonged periods at close range, and are still worried about radiation exposure, Koschella suggests having the TV checked out to insure that no shielding was removed and that the picture tube voltage was not cranked up. But he emphatically warns against checking the voltage yourself – the voltage is very high and probably a lot more dangerous than the radiation. ©

22-40-80 HIKE!



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40/80 VIDEO CARTRIDGE 0-K memory: $219.95
40/80 VIDEO COMBO CARTRIDGE w/16-K RAM: $319.95

- Features a high quality 8 x 8 dot matrix.
- Character-by-character reverse video attributes allowing adjacent characters to have different attributes.
- All features are accessible through BASIC using POKE commands.
- Black & White composite video.
- Plugs directly into the VIC-20 memory expansion slot or the QDI Mini-Mother and Maxi-Mother boards.
- Contains 2K of CMOS internal video RAM; no system RAM is used by the Video Cartridge.
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Offer expires 12:00 midnight US, pacific standard time, December 31, 1982.

QDI Maxi-Mother: $99.95

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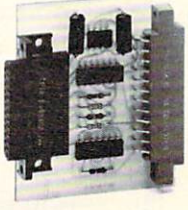
- Simple plug-in installation.
- Small size 5 x 8 inches encased.



QDI RS-232C interface: $49.95

- Provides RS-232 voltage conversion for VIC serial port
- Allows use of a wide variety of RS-232 peripherals including printers, modems and voice synthesizers
- Low power CMOS circuitry requires no external power supply
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QDI Mini-Mother: $59.95

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Shipping cost not included — VISA & MASTERCARD accepted. Dealer inquiries are welcomed. For further information please contact your local Commodore dealer or QUANTUM DATA for a listing of dealers near you. All the above prices retail in US dollars

Part II:

This is the conslusion of a tutorial begun last month. Part II demonstrates how to handle complex multiplication in machine language. Though specific to Commodore machines, the techniques can apply to any microcomputer. In addition to providing an introduction to the use of SYS which allows you to take advantage of the machine language routines in your BASIC's ROM chips – this article also demonstrates a way to pass information between BASIC and machine language.

How To Use SYS

John C. Johnson
McKinney, TX

With knowledge of the subroutines discussed last month, it is now possible to write some extremely powerful machine language extensions to BASIC with reduced effort. Our example problem is a complex arithmetic subroutine; the complex multiplication portion will be discussed in detail. This problem was selected both because it is useful and because it illustrates the concepts of multiple inputs and outputs. (A discussion of the rules for complex arithmetic is given in Ruel V. Churchill's *Complex Variables and Applications*, McGraw-Hill, 1960.) The format for the statement is that given last month in line 200. A and B are the outputs, and C, D, E, and F are inputs; the asterisk (*) signals complex multiplication. The sequence of steps required to produce the result is given below.

1. Fetch the operation character (* or /) and save it.

2. Save the line scanner address for later use.

3. Scan past the output variables.

4. Evaluate each input expression and save it.

5. Save the line scanner position onto the stack, and reset the line scanner to locate the output variables.

6. Test for operation character.

7. Perform the multiplication operation for the real part.

8. Save the result in the output variable #1.

9. Perform the multiplication operation for the imaginary part.

10. Save the result in output variable #2.

11. Fix up the stack and CHRGET address.

A description of the program operation tied to the above description follows. The initialization portion is contained in lines 52 to 64. The purpose of this section is to change the USR vector to point to the start of the subroutine to allow a call with SYS 0. This is important because the conversion time for ASCII 0 is quite efficient, but the time to convert 30747 is substantial.

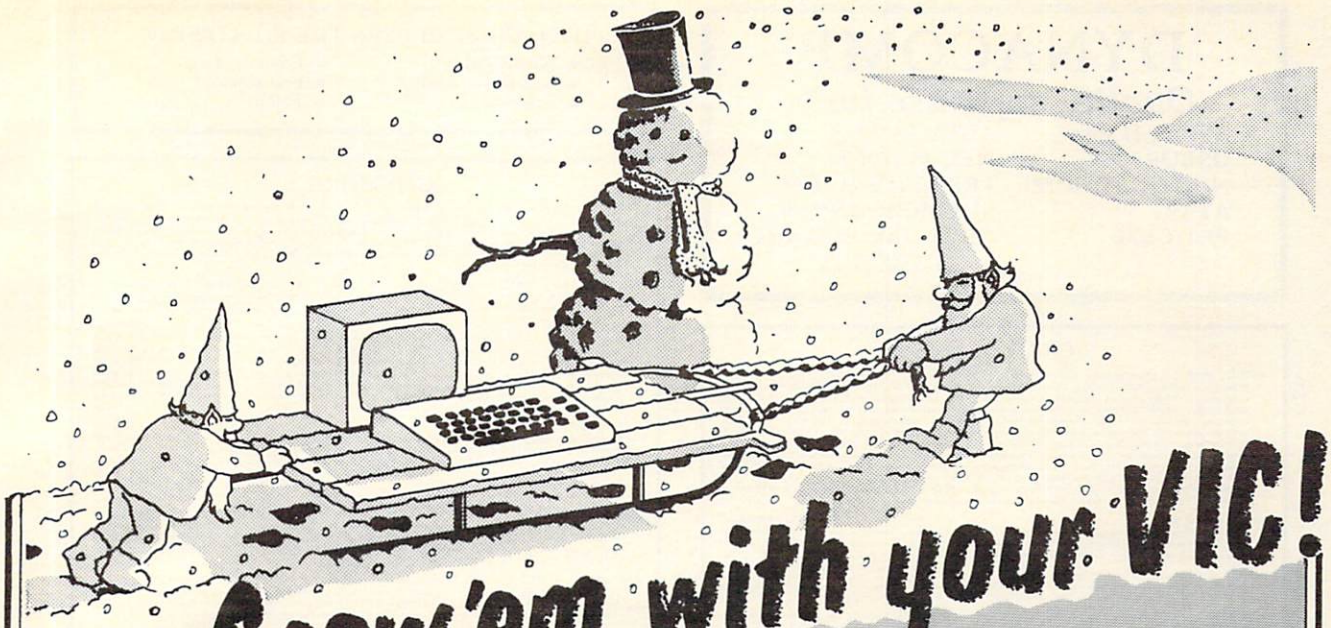
For example, you could avoid this by assigning 30747 to some variable and call by SYS A1. The efficiency of this approach is slightly better than SYS 0, but lacks the programming convenience. The initialization also sets the top of memory to protect the machine code from BASIC strings. Type SYS 30720 to initialize; the screen will clear and show READY.

The first two steps are accomplished by lines 68-73 and 77-80, respectively. The line scanner is operated to retrieve the operation character, * or /, to determine which of two subroutines will be active. Some error checking is accomplished, and the address of the line scanner is saved.

Accommodating Commodore BASIC

Step 3 is accomplished by lines 84-89. This section merely scans the line for all items between the commas so the line scanner will be positioned for accessing the inputs. One may ask, "Why omit picking up the output addresses at this point?" The reason is strategic and involves the way in which Commodore BASIC handles variables that are subscripted.

The subroutine as written allows subscripted variables as inputs and outputs. If an array element's address is determined before computing the inputs, then the output variable's location may change. This will occur only when a variable is used as an input before it has been defined. The BASIC interpreter will put the variable into the variable list and move array elements as necessary. If the destination variables are skipped at this point and all inputs are evaluated first, this problem will not exist.



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We've been waiting for this one: an arcade-quality game worthy of our reputation! This frenzied insect attack threatens *even* the jaded arcade junkie. Swarming screen action intensifies through 5 dare-proof skill levels — a **simmering cauldron of color and sound!**

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*Parallel printers require an interface. See SMART ASCII.

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Now with **hi-rez draw routine** for your joystick *PLUS* hi-rez **dump to VIC printer.** Features 19 fascinating hi-rez *digitized* pictures. Capture *your* creativity, or ours, on paper. Amazing fun!

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CARD GAMES

NEW

BRIDGE MASTER (Available for all computers) Price: $21.95 Diskette
If you liked DYNACOMP'S BRIDGE 2.0, you will absolutely love BRIDGE MASTER. BRIDGE MASTER is a comprehensive bridge program designed to provide hours of challenging competition. Bidding features include the Blackwood convention, Stayman convention, pre-emptive openings, and recognition of demand bids and jump-shift responses. After playing a specific hand, you may replay the same hand, with the option of switching cards with your computer opponents. This feature allows you to compare your bidding and playing skills to BRIDGE MASTER. Bonuses for game contracts and slams are awarded as in duplicate bridge. Doubled contracts are scored based upon a computer assigned vulnerability. A score card is displayed at the conclusion of each hand. The score card displays a summary of total hands played, total points scored, number of contracts made and set, and % bids made. BRIDGE MASTER is clearly the best computer bridge program available.
DYNACOMP'S previous BRIDGE 2.0 customers may upgrade to BRIDGEMASTER for a nominal charge of $5.00 plus postage and handling (see ordering information box). Original cassette/diskette must be returned.

BACCARAT (Atari only) Price: $18.95 Cassette/$22.95 Diskette
This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

GIN RUMMY (Apple diskette only) Price: $22.95 Diskette
This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

POKER PARTY (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32K (or larger) Apple II.

GO FISH (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children! Runs in 16K.

NEW

BLACKJACK COACH (32K TRS-80 only) Price: $29.95 Cassette/$33.95 Diskette
BLACKJACK COACH teaches and evaluates professional playing methods. This program will coach you using the Basic and the Complete Card Counting Methods. The BLACKJACK COACH can be used in automatic, unattended play to test the playing and betting strategies you select. Extensive summary reports pinpoint the strengths and weaknesses of various methods of play. All the standard player choices are included: Insurance, splitting pairs, double downs and surrender (optional). A line printer may be used to collect data. If you risk money at the tables, increase your skills with the BLACKJACK COACH!

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Available for all computers) Price: $25.95 Cassette/$29.95 Diskette
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) Price: $19.95/Cassette/$23.95 Diskette
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) Price: $17.95 Cassette/$21.95 Diskette
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 x 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique, Personal Computing and Creative Computing.

BACKGAMMON 2.0 (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

NEW

FROG MASTER (Atari only) Price: $17.95 Cassette/$21.95 Diskette
The Atari APEX first prize winner, FROG MASTER contains exciting arcade features in addition to being a highly educational program. It is a fast-moving high-concentration game for 1-4 players. You score by making touchdowns on the opponents' goal line – if his goalie doesn't get there first. But your players (tadpoles and frogs) must be trained. This is accomplished by giving them a reward at just the right moment when they do something right. This takes precise timing and judgement. Your critters must penetrate barriers and avoid evil line backs if they are to score. Many will fall by the wayside, but some will get through. As they learn you can look inside their heads to see how they think. As you reward them, they reward you (the "thought processes" simulated demonstrate the basic type of animal learning - operant conditioning - widely studied in high school and college courses). As you teach them they teach you how learning takes place! Great graphics! Runs in 16K. Requires two joysticks.

FOREST FIRE! (Atari only) Price: $14.95 Cassette/$18.95 Diskette
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalities. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

CRANSTON MANOR ADVENTURE (North Star, SuperBrain and CP/M only) Price: $19.95 Diskette
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette.

SPACE EVACUATION! (Available for all computers) Price: $15.95 Cassette/$19.95 Diskette
Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) Price: $14.95 Cassette/$18.95 Diskette
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

NEW

RUBIK'S CUBE SOLVER (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette/$21.45 Disk
Solving the Rubik's cube puzzle is an exercise in algorithimic logic, and is a "natural" for computer calculation. The RUBIK'S CUBE SOLVER permits you to input the starting state of the 24 facing elements of the cube. It then solves the problem one step at a time, with each step shown as a unfolded view of the cube. Can you solve the cube in fewer steps. In any case, it sure beats disassembling the cube or peeling off and replacing the colors! Requires 16K.

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II), NEC and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density, double density, compatible format) 8" CP/M floppy disks for systems running under MBASIC or CBASIC (for example, Altos, Xerox 820, Heath/Zenith and many others). 5¼" CP/M diskettes are available for the North Star, Superbrain and Osborne computer systems.

*ATARI, PET, CBM, NORTH STAR, CP/M, IBM, OSBORNE, SUPERBRAIN, NEC PC-8000 and XEROX are registered tradenames and or trademarks.
**Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.
***For most North Star disk-based systems.
****For Altair systems having Microsoft BASIC.
*****For SUPERBRAIN systems running under MBASIC or CBASIC (state which).

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STARBASE 3.2 (Available for all computers) Price: $13.95 Cassette/$17.95 Diskette
This is the classic space simulation, but with several new features. For example, the Croylins now shoot at the Invincible without warning while also attacking starbases in other quadrants. The Croylins also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Invincible is besieged by three heavy cruisers and a starbase S.O.S. is received! The Croylins get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

LIL' MEN FROM MARS (Atari only) Price: $19.95 Cassette/$23.95 Diskette
Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

ALVIN (Atari only) Price: $17.95 Cassette/$21.95 Diskette
ALVIN is a great arcade game. You are commanding a highly maneuverable ship seeking to destroy several enemy cities. You are attempting to bomb these cities while at the same time trying to avoid their defensive fire (MISSILE COMMAND" in reverse?). Also, your radar has been damaged so that you can only see downwards. This would normally not be much of a problem except that you also have to contend with high-flying enemy aircraft. As long as you are above these aircraft you have the advantage and are safe. However, high level bombing takes considerable skill. Therefore to achieve your goal the best strategy is to swoop down for a bombing run while the enemy craft is out of range, and quickly retreat to the skies. A fun game. Requires 16K.

ESCAPE FROM VOLANTIUM (Atari only) Price: $15.95 Cassette/$19.95 Diskette
Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the guardian (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new guardian appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and guardians appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) Price: $13.95 Cassette/$17.95 Diskette
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) Price: $14.95 Cassette/$18.95 Diskette
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) Price: $15.95 Cassette/$19.95 Diskette
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

MIDWAY (Atari 32K only) Price: $14.95 Cassette/$18.95 Diskette
MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

NEW

GOLF PRO (Atari only) Price: $17.95 Cassette/$21.95 Diskette
Both realism and beautiful graphics are joined together in GOLF PRO to produce the best golf simulation available. To really appreciate this game, you should have a color TV so that you can see the green of the fairway, the blue of the water hazards, and the white sand of the traps. You tee off with a wood, use your wedge in the sand trap, and putt on the green just as would be done on the course. Show off the Atari to your friends with GOLF PRO. Requires 16K and one joystick.

GAMES PACK I (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.
Why pay $9.95 or more per program when you can buy a DYNACOMP collection for just $14.95?

MOON PROBE (Available for all computers) Price: $12.95 Cassette/$16.95 Diskette
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) Price: $14.95 Cassette/$18.95 Diskette
This galactic "shoot 'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

SUPER SUB CHASE (Atari only) Price: $19.95 Cassette/$23.95 Diskette
SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the sub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

TWO PLAYER GAMES

NEW

TWO PLAYER GAMES (Available for all computers; 32K disk/diskette only)
DYNACOMP has acquired the distribution rights to the best eight of Xitron's war games. These two-player games were originally written for the North Star computer, but have since been converted to play on all of the computers currently supported by DYNACOMP. Because our licensing and development costs were so low, DYNACOMP offers these programs two to a disk(ette) for only $19.95/diskette, $23.95/disk. If you like war games, then this is a bargain you can not pass up.

Set #1: PANZER and BLITZKRIEG
PANZER
Date: 23 Nov. 1943 Place: Several miles west of Kiev, Russia. The Russians have just liberated Kiev and are moving quickly to reach the German forces which are preparing for a last desperate attempt to halt the Russian advance.
BLITZKRIEG
Date: Spring 1940 Place: Northern France. The German blitzkrieg in the east was complete. Germany had turned its attention to the west: France. The German forces has penetrated the Ardennes and Meuse. The heroism of Dunkirk, the defense of the Aisne-Somme position, and the final collapse of the French armies in the south has all passed. And, now, the drive on Paris . . .

Set #2: STARSHIP TROOPERS and INVASION OF THE MUD PEOPLE
STARSHIP TROOPERS
Date: Fortieth Century Place: Arachnid planet of Sheol. The first all-out battle on the planet Sheol which will match equal forces of Terran and alien units. The outcome will set the course of the conflict, for the planet of Sheol is a key position in the solar war.
INVASION OF THE MUD PEOPLE
A Peruvian army battalion has been dispatched to a remote village area to investigate the destruction of many local dwellings and the disappearance of most of the villagers. Eye-witnesses have reported strange creatures appearing from scores of slimy mud holes which have oddly begun forming across the terrain.

Set #3: FALL OF THE THIRD REICH and ARMORCAR
FALL OF THE THIRD REICH
Date: March, 1945 Place: Remagen, Germany. The allies under General Eisenhower had reached the Rhine. The Germans had failed in destroying the Ludendorff railroad bridge, allowing several allied divisions to cross before it finally collapsed on March 17 ... and so, the allies began their drive on Berlin.
ARMORCAR
Date: 2 Feb. 1944 Place: Minsk, Russia. A German front-line unit is hard pressed for radio equipment and medical supplies. A relief convoy of armored cars must reach them through partisan-infested territory.

Set #4: MOUNT SURIBACHI and MIDDLE EARTH
MOUNT SURIBACHI
Date: 16 Feb. 1945 Place: Iwo Jima. The Japanese opened fire from Mount Suribachi as the marines landed on the porkchop-shaped island. Gunfire from the hill could cover the entire island, thus it was a critical objective if the Americans were to capture and utilize the all-important air field. Mount Suribachi proved to be one of the most strongly defended positions in the Japanese theatre of war.
MIDDLE EARTH
Date: 1997 Place: MIDDLE EARTH. Through a maze of tunnels, crevices, and rocky passageways discovered leading from an inactive volcano in South America, a team of United Nations' researchers have undertaken a mission to an uncharted frontier: the center of the Earth. After a perilous journey spanning a period of several months, the mission has arrived at the Earth's core, a land of flames, steam, oceans, and unforeseen vegetation. And then the creatures of MIDDLE EARTH appeared . . . unmatched by the most frightening horror stories created by man . . .

MISCELLANEOUS

CRYSTALS (Atari only) Price: $14.95 Cassette/$18.95 Diskette
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.
Price: $9.95 each/$8.95 each (4 or more)
The complete collection may be purchased for $159.95.

NEW

5¼" DISKETTES (soft sectored/ten sectored) Price: $39.95/20 Diskettes
As you might imagine, DYNACOMP purchases diskettes in large quantities and at wholesale prices. We want to pass the savings along to you!

BUSINESS and UTILITIES

NEW

PORTFOLIO MANAGEMENT (Apple only) — Price: $69.95 two Diskettes

The PORTFOLIO MANAGEMENT package was written by a stock broker to help manage portfolios for individual customers. With this program data files can be easily created and kept up to date. A variety of reports can be generated for clients which are attractively and professionally laid out. The user may define his/her own investment catagories. PORTFOLIO MANAGEMENT is a top quality, professional tool which will not only provide you with new conveniences but will also serve to enhance your appearance as an efficient and up to date advisor to your clients. Comes complete on two diskettes along with a 30 page instruction manual.

NEW

PERSONAL FINANCE SYSTEM (Available for all computers) — Price: $39.95 Diskette

PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) — Price: $34.95 Diskette

FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

NEW

TEXT MASTER (Apple 32K, diskette only) — Price: $49.95 Diskette

TEXT MASTER is a general purpose text editor for the Apple II computer. It features powerful, English-oriented commands which permit the complete manipulation of textural information. The information treated may be correspondence, computer programs, data to be used by other programs, and more. TEXT MASTER also interfaces with any printer connected to your Apple. The minimum system requirements are 32K of RAM, Applesoft on ROM, at least one disk, and a lower case adapter. TEXT MASTER can process any length file segment by segment. Thus it is possible to process files as large as a diskette. Comes complete with an efficient 16 page manual. TEXT MASTER is equivalent in capability to many word processing systems costing 3 x or more in price. The commands available in TEXT MASTER are: COLLECT, USE, EXECUTE, NONUM, INSERT, MERGE, STOP, RENUM, DELETE, SAVE, COPY, FREE, REPLACE, WAIT, MOVE, LENGTH, LIST, RESAVE, CLEAR, AUTO, RETRY, APPEND, SET, MANUAL, CHANGE, SCRATCH, SHOW, CATALOG, MODIFY, COMPARE, NUM, DISPLAY, HELP.

INTELINK (Atari only) — Price: $49.95 Diskette

This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a very smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

NEW

PAYFIVE (Apple II plus diskette, two drives required) — Price: $149.95

This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) — Price: $12.95 Cassette/$16.95 Diskette

SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

NEW

TAX OPTIMIZER (Available for all computers) — Price: $59.95 Diskette

The TAX OPTIMIZER is an easy-to-use, menu-oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

STOCK MASTER/STOCK PLOT (Apple 48K) — Price: $59.95 Diskette

This is a full-featured stock portfolio management and analysis system. Ten years of records on up to thirty stocks may be maintained. You may record prices, revenue, earnings/share, ROE, quarterly earnings and dividends, transactions, long/short term gains, P/E, indexes (DJ, S & P, NASDAQ) and MORE! You may plot (HIRES) the price history of any stock against any other, time, or the indexes. Portfolio value may be evaluated at any time. Comes complete with superbly written instructions and sample files on a second diskette.

TURNKEY AND MENU (Atari only) — Price: $17.95 Diskette

TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

STOCKAID (Atari only) — Price: $29.95 Diskette

STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days x 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW

NYINDEX (Atari only) — Price: $29.95 Diskette

NYINDEX is a comprehensive software package for storing, retrieving and plotting New York Stock Exchange information. The daily data treated includes the composite index, advances, declines, new highs and new lows. Graphical displays include the above plus the index oscillator, cumulative advances/declines and moving averages. Data entry and editing is easy. The diskette includes more than two years of daily data. NYINDEX is an excellent companion to STOCKAID.

PLAYER-MISSILE GRAPHICS TABLET (Atari only) — Price: $19.95 Diskette

The PLAYER-MISSILE GRAPHICS TABLET was designed to take the drudgery out of developing four color displays in GRAPHICS MODE 7. No longer will you have to read the locations of those tiny blocks on your graph paper and calculate PLOTs and DRAWTOs. With PMG you will be able to easily design colorful graphic displays with your joystick and save them on diskette for later recall.

LIFE CYCLE ANALYSIS AND DEPRECIATION (Apple diskette only) — Price: $39.95 Diskette

This software package creates a data file of business expenses for equipment which can later be used to calculate and display a variety of reports. You may project annual costs, find the present worth, create depreciation schedules and justify tax deductions. The evaluation techniques conform to standards set by federal agencies. This is an invaluable package for any businessman who has invested in equipment. LIFE CYCLE ANALYSIS features an easy to use data file creation section and provides formatted hardcopy reports for use in presentations or for tax record keeping purposes. When used for generating tax information, this package is tax deductible! Requires 48K. Comes on two diskettes.

NEW

MICROMAGIC (Apple diskette only) — Price: $39.95 Diskette

The emphasis of this program is clearly the MAGIC! MICROMAGIC offers outstanding versatility in its ability to function as a stand alone entertainment package or as a utility program to create stunning *animated* graphics for use in other programs. The secret lies in MICROMAGIC's special on screen graphics editor. You control a graphics cursor directly from the keyboard, creating high resolution images using all 16 available colors. When you are done with a picture, it can be saved on disk with a single key command. Up to 24 images can be saved as "frames" of a movie, and then played back at high speed to creat short animated sequences. The effects are truly stunning.

This package comes complete with demonstration programs so that even novice users can get immediate results. No programming skills are necessary to use MICROMAGIC. If you have been frustrated by the effort required to create graphics images with your computer, MICROMAGIC will delight you.

SHAPE MAGICIAN (Apple II, 48K, diskette only) — Price: $29.95

At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

Shipping and Handling Charges
Within North America: Add $2.00
Outside North America: Add 15% (Air Mail)

Delivery
All orders (excluding books) are sent First Class.

Quantity Discounts
Deduct 10% when ordering 3 or more programs; 20% when ordering 5 or more. Dealer discount schedules available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star, Osborne, Superbrain and NEC format.

Ask for DYNACOMP programs at your local software dealer. Write for detailed descriptions of these and other programs from DYNACOMP.

DYNACOMP, Inc. (Dept. E)
1427 Monroe Avenue
Rochester, New York 14618
24 hour message and order phone: (716) 442-8731
Toll free order phones: (800) 828-6772
(800) 828-6773
Office phone (9AM-5PM EST): (716) 442-8960

New York State residents please add 7% NYS sales tax.

EDUCATION

HODGE PODGE (Apple 48K only) — Price: $14.95 Cassette/$18.95 Diskette

Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

TEACHER'S AIDE (Atari and PET only) — Price: $13.95 Cassette/$17.95 Diskette

TEACHER'S AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) — Price: $39.95 Cassette/$43.95 Diskette

DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) — Price: $19.95 Cassette/$23.95 Diskette

This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) — Price: $19.95 Cassette/$23.95 Diskette

Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) — Price: $19.95/$23.95 Diskette

This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) — Price: $24.95 Cassette/$28.95 Diskette

HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage; retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $51.95 (three cassettes) and $63.95 (three diskettes).

REGRESSION I (Available for all computers) — Price: $19.95 Cassette/$23.95 Diskette

REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (e.g.: standard deviation, correlation, coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (Available for all computers) — Price: $19.95 Cassette/$23.95 Diskette

PARAFIT is designed to handle those cases in which the parameters a imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) — Price: $24.95 Cassette/$28.95 Diskette

MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari casssette or for PET/CBM) — Price: $39.95 Cassette/$43.95 Diskette

In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)

DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1
- Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
- Collection #2: Chapter 4 - Extended matrix and vector operations.
- Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.

Price per collection: $16.95 Cassette/$20.95 Diskette
All three collections are available for $44.95 (three cassettes) and $53.95 (three diskettes).

Volume 2
- Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
- Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.)
- Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
- Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
- Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
- Collection #6: Chapter 6 - Methods for finding the real roots of functions.
- Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
- Collection #8: Chapter 8 - Optimization by steepest descent.

Price per collection: $14.95 Cassette/$18.95 Diskette
All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:
BASIC SCIENTIFIC SUBROUTINES, Vol. 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol. 2 (790 pages): $23.95 + $1.50 postage
See reviews in KILOBAUD, Dr. Dobbs, and ACCESS.

NEW

SOFTNET (Apple II and TRS-80 48K diskette only) — Price: $129.95

SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

NEW

FILTER ANALYSIS (Apple only) — Price: $19.95 Cassette/$23.95 Diskette

FILTER ANALYSIS is the ideal program for determining the frequency response of passive filters. Any number of RLC components may be included, and any number of poles treated. FILTER ANALYSIS features its own mini-language which makes circuit description simple. Results may be printed in tabular form or plotted in HIRES graphics (decibels versus log-frequency).

ACTIVE CIRCUIT ANALYSIS (Available for all computers) — Price: $35.95 Cassette/$39.95 Diskette

With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal steps in frequency, and the resulting complex voltages at each component juncture examined; the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library. Requires 48K.

LOGIC SIMULATOR (Available for all computers) — Price: $35.95 Cassette/$39.95 Diskette

Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths, displacements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR. Requires 48K.

NEW

BEAM DEFLECTION (Available for all computers) (disk/diskette only) — Price: $29.95 Diskette/$32.45 Disk

BEAM DEFLECTION is the first in DYNACOMP's new series of structural analysis software packages. It consists of two programs. The first program permits the development of data files which describe the problem. For example, the ends of the beam may be pinned, clamped or free. The beam may be uniformly supported by an elastic bed, or held up by springs variously placed and having differing spring constants. The elasticity and cross section of the beam may vary along its length. The load may be uniformly distributed or it may include discrete forces. The beam may be pinned at various points along its length. And so on. All this information may be easily entered and edited using the data input program.

Following this the analysis program is called. The calculated results are the stress and deflections of the beam, both in numerical and graphical form, since the input data is saved, cases may be easily re-run with modification, thereby permitting iterative design.

The documentation which comes with BEAM DEFLECTION clearly shows how to use the software. In addition, three text problems are described and demonstrated to ensure that you understand how to use the program. Also, helpful theoretical information is supplied in the appendix.

STATTEST (Not available on Atari cassette or for PET/CBM) — Price: $19.95 Cassette/$23.95 Diskette

This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique, A.N.A.L.O.G., Softalk, Creative Computing and Kilobaud. DYNACOMP software has also been chosen for demonstration on network television. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

Step 4 activates the expression evaluator and computes input expressions. This is done by lines 93-107. The program sets the number of inputs to four (line 93), and a loop evaluates the input expressions and stores them in memory locations labeled V1 to V4. Some error checking is also employed. When this loop is finished, the last input will be in V4 and will also remain in the floating accumulator.

Step 5 is accomplished by lines 111-118. This step saves the line scanner address onto the 6502 stack. It will be necessary to restore it before returning to BASIC. The line scanner position is reset so that the subroutine is left in a position to scan for the output variables.

Step 6, lines 122-127, is required to direct the subroutine to the proper segment of code. This method is adequate for small table sizes like this example, but for larger table sizes this technique would certainly not be optimum. An alternate technique can be found in the MONITOR listing in the PET manual.

Steps 7 and 9 (lines 160-173 and 181-196, respectively) begin the actual computation for a complex multiply. The real part is computed first, and the result in line 173 is incorrect by a sign which subroutine NEGATE corrects. Step 9 does much the same thing for the imaginary part.

Steps 8 and 10 are identical in code allowing the use of a subroutine. DEST, lines 217-260, activates the variable lookup for each output variable and stores the contents of the FACC there. This subroutine could be used for any number of numerical outputs. Lines 250-256 handle the special case when the output variable is INTEGER.

Lines 217-227 handle the divide option and cause the FACC to be divided by the magnitude of the complex divisor which was calculated in lines 131-154 if a divide was specified. In this way the complex multiply section is common to both and saves memory. Lines 228-233 saves the FACC temporarily onto the stack, and lines 235-241 restore the FACC to allow the use of subscripted variables as outputs.

Step 11, lines 204-208, concludes the subroutine by retrieving the line scanner address from the stack and placing it into TXTPTR. When BASIC resumes control, the line scanner will be positioned at the end of the calling statement either on a colon or null character to allow BASIC to continue normally.

Speed Increases

The above technique for creating machine language subroutine linkages with BASIC offers considerable flexibility in passing information between the BASIC program and the subroutine. It avoids the problem of having to POKE and PEEK the transferred information.

The program, as written, incorporates a few optimizing decisions both from the standpoint of conserving memory and speeding execution. No claims are made that the program is optimum in either respect. Optimizing in either case is frequently accomplished at the expense of the other. The program was written, however, in a manner that would make the linking concepts described easy to understand.

Ultimately, the results will be put to the test with timing comparisons and with as many different results as there are people trying them. My results, which may not be optimum, show about an eight percent faster execution for a complex multiply and about 30 percent for a complex divide. These results were obtained by carefully allocating the variables for BASIC so that the variable lookup times would be minimized; however, in actual programs the machine language version could show even greter improvement.

The algorithm for the BASIC and machine language versions are the same; they even use the same arithmetic subroutines in ROM. The only saving comes from the variable lookup, which must be done twice for a BASIC program and only once for the machine language version. More complicated subroutines could save considerably more time than this.

Mr. Johnson has offered to supply tape or disk copies of the program for Commodore computers. Send tape (or

Expression Evaluator Summary

1. Uses the line scanner, CHRGET, to obtain input.

2. Starts with the current position of the line scanner.

3. Alternate entry point $CC9F causes the line scanner to back up one address location before evaluating an expression.

4. Uses any valid format for a BASIC statement that can be used on the right-hand side of an equals sign.

5. Leaves evaluated numeric results in the floating accumulator, FACC.

6. Leaves the line scanner on the separator character (comma, colon, or null).

7. Leaves pointers to the location of the string's length and address in the table at $14 and $15.

8. Leaves $7 set to the type of result.

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2. Butterfield, Jim. "Machine Language Scanning the Stack." **COMPUTE!**, January 1981, #8, pp. 102-106.

3. Churchill, Ruel V. *Complex Variables and Applications.* New York: McGraw-Hill, 1960.

```
LINE# LOC   CODE       LINE
0009  0000             ;SYSTEM EQUATES

0011  0000             USRVEC=0                ;USR VECTOR JUMP
INSTRUCTION
0012  0000             INTFLG=8                ;INTEGER FLAG
0013  0000             STRFLG=7                ;STRING FLAG
0014  0000             INDEX1=$1E              ;INDIRECT INDEX #1
0015  0000             MEMSIZ=34               ;TOP OF RAM POINTER
0016  0000             FACC=$5E                ;FLOATING ACCUMULATOR
#1
0017  0000             FSIGN=FACC+5            ;SIGN OF FACC
0018  0000             VARADR=$44              ;LOCATION OF VARIABLE
IN TABLE
0019  0000             CHRGET=$70              ;GET NEXT CHARACTER
0020  0000             CHRGOT=$76              ;GET LAST CHARACTER
0021  0000             TXTPTR=$77              ;CHRGET ADDRESS
0022  0000             NEGATE=$DEA1            ;CHANGE SIGN OF FACC
0023  0000             FACALT=$DB18            ;TRANSFER FACC TO AFAC
0024  0000             LDFACC=$DAAE            ;LOAD FACC FROM MEMORY
0025  0000             STFACC=$DAE8            ;STORE FACC INTO MEMORY
0026  0000             FLPINT=$D09A            ;FLOAT TI INT
CONVERSION
0027  0000             LOOKUP=$CF6D            ;LOCATE VARIABLE IN
TABLE
0028  0000             EXEVAL=$CCA7            ;EVALUATE EXPRESSIONS
0029  0000             STXERR=$CE03            ;PRINT 'SYNTAX ERROR'
0030  0000             PRTERR=$C357            ;PRINT ERROR MESSAGE
0031  0000             FADD=$D773              ;FLOATING ADDITION
0032  0000             FSUB=$D733              ;FLOATING SUBTRACTION
0033  0000             FMUL=$D934              ;FLOATING
MULTIPLICATION
0034  0000             FMUL1=FMUL+3            ;FACC=AFAC*FACC
0035  0000             FDIV=$DA1B              ;FLOATING DIVISION
MEM/AFAC
0036  0000             FDIV1=$DA11             ;AFAC/MEM WITHOUT SIGN
0037  0000             FDIV2=$DA1E             ;DIVIDE AFAC BY FACC
WITH /0 CK
0038  0000             WRT=$FFD2               ;OUTPUT CHARACTER



0040  0000                   *=30720           ;$7800 STARTING ADDRESS

0042  7800             ;COMPLEX ARITHMETIC

0044  7800             ;SYNTAX FORMAT:  SYS 0,*,A,B,C,D,E,F
0045  7800             ;
0046  7800             ;* IS OP CHARACTER * OR /, A & B ARE OUTPUTS
0047  7800             ;
0048  7800             ;C, D, E, AND F ARE INPUTS
0049  7800             ;
0050  7800             ;INPUTS CAN BE ANY VALID BASIC NUMERIC
EXPRESSION

0052  7800  A9 78      INIT   LDA #>INIT       ;SET TOP OF MEMORY
0053  7802  30 06             BMI B1           ;IF < $8000
0054  7804  A2 00             LDX #<INIT       ;TO PROTECT THIS
PROGRAM
0055  7806  85 23             STA MEMSIZ+1     ;FROM BASIC
0056  7808  86 22             STX MEMSIZ
0057  780A  A9 4C      B1     LDA #$4C         ;JUMP INSTRUCTION
0058  780C  A0 78             LDY #>CARITH     ;PATCH IN THE USR
VECTOR
0059  780E  A2 1B             LDX #<CARITH     ;TO ALLOW CALL WITH
SYS0,...
0060  7810  85 00             STA USRVEC       ;JMP
0061  7812  86 01             STX USRVEC+1     ;LO
0062  7814  84 02             STY USRVEC+2     ;HI
0063  7816  A9 93             LDA #147         ;CLEAR SCREEN
0064  7818  4C D2 FF          JMP WRT

0066  781B             ;1. FETCH THE OPERATION CHARACTER AND SAVE IT

0068  781B  20 70 00   CARITH JSR CHRGET        ;GET THE OP CHAR
0069  781E  F0 5E             BEQ ER1          ;EXIT IF : OR NULL
0070  7820  8D 70 79          STA OPCHAR       ;AND SAVE IT
0071  7823  20 70 00          JSR CHRGET       ;GET COMMA SEPARATOR
0072  7826  C9 2C             CMP #',          ;CHECK IT
0073  7828  D0 54             BNE ER1

0075  782A             ;2. SAVE LINE SCAN ADDRESS

0077  782A  A5 77              LDA TXTPTR       ;GET AND SAVE
0078  782C  8D 72 79          STA ASAVE        ;THE ADDRESS OF
0079  782F  A5 78              LDA TXTPTR+1     ;THE LINE SCAN
0080  7831  8D 73 79          STA ASAVE+1      ;FOR FUTURE REFERENCE

0082  7834             ;3. SCAN PAST 2 OUTPUT VARIABLES

0084  7834  A2 02              LDX #2           ;SET UP FOR 2 OUTPUTS
0085  7836  20 70 00   SC1     JSR CHRGET       ;GET A CHARACTER
0086  7839  C9 2C             CMP #',          ;CHECK FOR COMMA
0087  783B  D0 F9             BNE SC1          ;LOOP UNTIL COMMA
0088  783D  CA                DEX
0089  783E  D0 F6             BNE SC1          ;LOOP FOR 2 OUTPUT
VARIABLES

0091  7840             ;4. EVALUATE 4 INPUT EXPRESSIONS

0093  7840  A9 04              LDA #4           ;SET FOR 4 PARAMETERS
0094  7842  8D 71 79          STA PARMS        ;SAVE COUNT
0095  7845  20 A7 CC   EV1     JSR EXEVAL       ;EVALUATE EXPRESSION
0096  7848  A5 07              LDA STRFLG       ;CHECK FOR STRING
0097  784A  F0 03             BEQ EV2          ;NOT STRING
0098  784C  4C 14 79          JMP TYPMIS       ;PRINT 'TYPE MISMATCH'
0099  784F  AD 71 79   EV2     LDA PARMS        ;SET UP DESTINATION
ADDRESS
0100  7852  0A                ASL A            ;FOR A FACC STORE OUT
OF
0101  7853  AA                TAX              ;THE VARIABLE TABLE
0102  7854  BC 93 79          LDY VTAB+1,X     ;GET ADDRESS
0103  7857  BD 92 79          LDA VTAB,X       ;MSB IN Y
0104  785A  AA                TAX              ;LSB IN X
0105  785B  20 E0 DA          JSR STFACC       ;STORE #
0106  785E  CE 71 79          DEC PARMS        ;DECREMENT COUNT
0107  7861  D0 E2             BNE EV1          ;CONTINUE UNTIL 0

0109  7863             ;5. ADJUST LINE SCAN

0111  7863  A5 77              LDA TXTPTR       ;GET LINE SCAN ADDRESS
0112  7865  48                PHA              ;AND SAVE IT ON STACK
0113  7866  A5 78              LDA TXTPTR+1
0114  7868  48                PHA
0115  7869  AD 72 79          LDA ASAVE        ;GET PREVIOUS LINE SCAN
0116  786C  85 77             STA TXTPTR       ;AND RESTORE IT
0117  786E  AD 73 79          LDA ASAVE+1
0118  7871  85 78             STA TXTPTR+1

0120  7873             ;6. TEST FOR OPERATION CHARACTER

0122  7873  AD 70 79          LDA OPCHAR       ;CHECK ARITHMETIC
                               ;'TOKENS'
0123  7876  C9 AC             CMP #172         ;MULTIPLY?
0124  7878  F0 42             BEQ CMUL         ;YES
0125  787A  C9 AD             CMP #173         ;DIVIDE?
0126  787C  F0 03             BEQ CDIV         ;YES
0127  787E  4C 11 79   ER1     JMP ERR          ;WRONG SYMBOL

0129  7881             ;COMPLEX DIVIDE

0131  7881  AD 84 79   CDIV    LDA V4+1         ;CONJUGATE THE DIVISOR
0132  7884  49 80             EOR #$80
0133  7886  8D 84 79          STA V4+1
0134  7889  20 18 DB          JSR FACALT       ;PUT INTO AFAC
0135  788C  A5 5E             LDA FACC         ;SET Z-FLAG
0136  788E  20 37 D9          JSR FMUL1        ;SQUARE IT
0137  7891  A0 79             LDY #>V6         ;SET UP V6 ADDRESS
0138  7893  A2 8D             LDX #<V6
0139  7895  20 E0 DA          JSR STFACC       ;SAVE N V6
0140  7898  A0 79             LDY #>V3         ;SET UP V3 ADDRESS
0141  789A  A9 7E             LDA #<V3
0142  789C  20 AE DA          JSR LDFACC       ;LOAD V3 INTO FACC
0143  789F  20 18 DB          JSR FACALT       ;PUT INTO AFAC
0144  78A2  A5 5E             LDA FACC         ;SET Z-FLAG
0145  78A4  20 37 D9          JSR FMUL1        ;SQUARE IT
0146  78A7  A0 79             LDY #>V6         ;SET UP V6 ADDRESS
0147  78A9  A9 8D             LDA #<V6
0148  78AB  20 73 D7          JSR FADD         ;ADD PREVIOUS RESULT
0149  78AE  A0 79             LDY #>V6         ;SET UP V6 ADDRESS
0150  78B0  A2 8D             LDX #<V6
0151  78B2  20 E0 DA          JSR STFACC       ;SAVE IN V6
0152  78B5  A0 79             LDY #>V4         ;SET UP V4 ADDRESS
0153  78B7  A9 83             LDA #<V4
0154  78B9  20 AE DA          JSR LDFACC       ;RETRIEVE LAST
                               ; PARAMETER

0156  78BC             ;COMPLEX MULTIPLY

0158  78BC             ;7. FIND REAL PART

0160  78BC  A0 79      CMUL    LDY #>V2         ;SET UP MULTIPLY
0161  78BE  A9 79              LDA #<V2         ;BY MEMORY V2
0162  78C0  20 34 D9          JSR FMUL         ;MULTIPLY
0163  78C3  20 69 79          JSR SAVTMP       ;SAVE FACC IN
                               ; TEMPORARY V5
0164  78C6  A0 79             LDY #>V1         ;GET ARGUMENT 1
0165  78C8  A9 74             LDA #<V1         ;THE REAL PART
0166  78CA  20 AE DA          JSR LDFACC       ;INTO FACC
0167  78CD  A0 79             LDY #>V3         ;GET ARGUMENT 3
0168  78CF  A9 7E             LDA #<V3         ;THE REAL PART
0169  78D1  20 34 D9          JSR FMUL         ;AND MULTIPLY
0170  78D4  A0 79             LDY #>V5         ;GET TEMPORARY
0171  78D6  A9 88             LDA #<V5         ;RESULT ADDRESS
0172  78D8  20 33 D7   CM1     JSR FSUB         ;SUBTRACT IF
                               ; MULTIPLICATION
0173  78DB  20 A1 DE          JSR NEGATE       ;FACC=-FACC

0175  78DE             ;8. SAVE RESULT IN FIRST OUTPUT VARIABLE

0177  78DE  20 19 79   CM2     JSR DEST         ;LOOK UP & SAVE RESULT

0179  78E1             ;9. FIND IMAGINARY PART

0181  78E1  A0 79              LDY #>V2         ;GET ADDRESS
0182  78E3  A9 79              LDA #<V2         ;OF V2 AND
0183  78E5  20 AE DA          JSR LDFACC       ;LOAD IT
0184  78E8  A0 79             LDY #>V3         ;DO SAME
0185  78EA  A9 7E             LDA #<V3         ;FOR V3
1086  78EC  20 34 D9          JSR FMUL         ;AND MULTIPLY
1087  78EF  20 69 79          JSR SAVTMP       ;SAVE FACC IN TEMP V5
0188  78F2  A0 79             LDY #>V1         ;LOAD V1
0189  78F4  A9 74             LDA #<V1         ;INTO FACC
0190  78F6  20 AE DA          JSR LDFACC
0191  78F9  A0 79             LDY #>V4         ;AND MULTIPLY
0192  78FB  A9 83             LDA #<V4         ;BY V4
0193  78FD  20 34 D9          JSR FMUL
0194  7900  A0 79             LDY #>V5         ;GET TEMPORARY
```

```
0195  7902  A9 88           LDA #<V5          ;RESULT AND
0196  7904  20 73 D7  CM4   JSR FADD          ;ADD IT

0198  7907                 ;10. SAVE RESULT IN SECOND OUTPUT VARIABLE

0200  7907  20 19 79  TERM  JSR DEST          ;LOOK UP,SAVE RESULT

0202  790A                 ;11. FIX UP THE STACK AND CHRGET ADDRESS

0204  790A  68             PLA
0205  790B  85 78           STA TXTPTR+1
0206  790D  68             PLA
0207  790E  85 77           STA TXTPTR
0208  7910  60             RTS

0210  7911  4C 03 CE  ERR   JMP STXERR        ;PRINT 'SYNTAX' & EXIT
0211  7914  A2 A3     TYPMIS LDX #$A3         ;PRINT 'TYPE MISMATCH'
0212  7916  4C 57 C3        JMP PRTERR        ;AND EXIT

0215  7919                 ;LOOK UP DESTINATION AND STORE FACC THERE

0217  7919  AD 70 79  DEST  LDA OPCHAR        ;SEE IF MULTIPLY
0218  791C  C9 AC           CMP #172          ;TOKEN FOr '*'
0219  791E  F0 10           BEQ D1            ;SKIP NORMLZ.IF MULTIPLY
0220  7920  20 18 DB        JSR FACALT        ;PUT FACC INTO AFAC
0221  7923  A5 63           LDA FSIGN         ;SAVE FACC SIGN
0222  7925  48              PHA
0223  7926  A0 79           LDY #>V6          ;IF DIVIDE THEN
0224  7928  A9 8D           LDA #<V6          ;NORMLZ BY MAG SQUARED
0225  792A  20 11 DA        JSR FDIV1         ;OF DIVISOR
0226  792D  68              PLA               ;RESTORE FACC SIGN
0226  792D  68              PLA               ;RESTORE FACC SIGN
0227  792E  85 63           STA FSIGN
0228  7930  20 70 00  D1    JSR CHRGET        ;MOVE PAST COMMA
0229  7933  A0 05           LDY #5            ;SAVE FACC IN CASE OF
0230  7935  B9 5E 00  D1A   LDA FACC,Y        ;SUBSCRIPTED VARIABLES
0231  7938  48              PHA
0232  7939  88              DEY
0233  793A  10 F9           BPL D1A
0234  793C  20 6D CF        JSR LOOKUP        ;GET DESTINATION ADDR
0235  793F  A0 00           LDY #0            ;RESTORE THE FACC
0236  7941  A2 05           LDX #5
0237  7943  68        D1B   PLA
0238  7944  99 5E 00        STA FACC,Y
0239  7947  C8              INY
0240  7948  CA              DEX
0241  7949  10 F8           BPL D1B
0242  794B  A5 07           LDA STRFLG        ;CHECK FOR STRING TYPE
0243  794D  D0 C5           BNE TYPMIS        ;AND BRANCH IF IT IS
0244  794F  A5 08           LDA INTFLG        ;CHECK FOR INTEGER
0245  7951  F0 0E           BEQ D2

0247  7953                 ;CONVERT TO INTEGER FORMAT IF THE
0248  7953                 ;DESTINATION VARIABLES IS INTEGER

0250  7953  20 9A D0        JSR FLPINT        ;CONVERT RESULT
0251  7956  A0 01           LDY #1
0252  7958  B9 61 00  D3    LDA FACC+3,Y      ;TRANSFER 2 BYTES
0253  795B  91 44           STA (VARADR),Y    ;FROM FACC TO MEMORY
0254  795D  88              DEY
0255  795E  10 F8           BPL D3
0256  7960  60              RTS
0257  7961  A4 45     D2    LDY VARADR+1      ;FETCH
0258  7963  A6 44           LDX VARADR        ;ADDRESS
0259  7965  20 E0 DA        JSR STFACC        ;AND SAVE RESULT
0260  7968  60              RTS
0261  7969                 ;SAVE FACC INTO TEMPORARY V5

0263  7969  A0 79     SAVTMP LDY #>V5         ;SET UP V5 ADDRESS
0264  796B  A2 88           LDX #<V5          ;FOR TRANSFER
0265  796D  4C E0 DA        JMP STFACC

0267  7970                 ;STORAGE FOR VARIABLES AND CONSTANTS

0269  7970                 OPCHAR *=*+1      ;OPERATION CHAR. + - * /
0270  7971                 PARMS  *=*+1      ;# OF PARAMETERS TO GO
0271  7972                 ASAVE  *=*+2      ;LINE SCAN ADDRESS
0272  7974                 V1     *=*+5      ;FIRST ARGUMENT
0273  7979                 V2     *=*+5      ;SECOND ARGUMENT
0274  797E                 V3     *=*+5      ;THIRD ARGUMENT
0275  7983                 V4     *=*+5      ;FOURTH ARGUMENT
0276  7988                 V5     *=*+5      ;TEMPORARY REGISTER #1
0277  798D                 V6     *=*+5      ;TEMPORARY REGISTER #2

0279  7992                 ;VARIABLE TABLE

0281  7992  88 79      VTAB   .WORD V5,V4,V3,V2,V1,V6
0281  7994  83 79
0281  7996  7E 79
0281  7998  79 79
0281  799A  74 79
0281  799C  8D 79
0282  799E                       .END
```

A Monthly Column

The Beginner's Page

An all-purpose learning game for children illustrates how easy it is to make major changes to programs.

Easy Changes

Richard Mansfield
Senior Editor

A program is really two things working together: data and instructions. The instructions are in a numbered list and they are the jobs for the computer to do. The data is the information that gets worked on. That's why computing is sometimes called *data processing*. Your list of instructions to the computer (your program) will process information the way a food processor transforms food. You put in a potato and it comes out french fries.

"Processors" have several advantages over conventional tools. For instance, they are quite versatile. By slipping different cutting disks into a food processor, you instantly change the process. The potato can come out as hash browns, slices, or even soup. A similarly simple adjustment will change a program which calculates home mortgages into one which analyzes inflation or general investment strategy.

Data, the other part of a computing process, is even simpler to change. Change one number and a mortgage-calculating program will print out the payment schedule for a different interest rate. Change another number and you can see the effects of a 20-year instead of a 30-year mortgage. To see how instructions and data interact, and how easily one program can serve many purposes, let's make a general-purpose educational game.

Easy Transformations

One of the most valuable uses for a computer in the home is computer assisted instruction, often called CAI. Using the little program below, you can bring your child's textbooks to life. And if you add color, sound, or animation to this program, you'll have made learning into an exciting game. Good CAI can bring a child the best possible kind of education: joy in learning. Don't be surprised if your child heads for the computer instead of Saturday morning cartoons.

If you type in Program 1, your child can play a short, personalized vocabulary game. You'll want to change the name in lines 100, 190, and 210. Line 130 contains the answers and lines 230 and 240 contain the questions, each followed by the number of the correct answer. The BASIC instruction "READ" will go down these DATA lists, picking each one in order and keeping track of where it left off. To make a much larger game, just add more questions and answers in the same fashion. And be sure to change the number in line 10 to equal the total number of questions in the quiz. To print more answers on the screen, just add more PRINT statements anywhere between lines 130-150.

To easily transform this game into a test of world capitals, just replace the DATA and change the messages in lines 100 and 150. Program 2 demonstrates how little effort it takes to change this into CAI on another topic. Take any textbook and make a list of the facts being taught in it and enter them into the DATA of this program. You could even use numbers like "1 + 5" in place of word answers.

If you make the screen change colors, or add music, or design some graphics characters which dance around ecstatically after a correct answer – you'll add to the attractiveness of this learning game. Perhaps have a little figure put a picture puzzle together, adding new pieces each time the child makes the right guess in the quiz. Or you could construct a game around your child's favorite cartoon character. Have the "hero" of the game climb stairs. A perfect score puts the character at the top where he can open the treasure chest.

Whatever special touches you decide to add, your child is sure to respond to this personalized, interactive, and very patient teacher. And no matter how elaborate the game becomes, it can always be quickly transformed with new questions and answers in the DATA lines.

(continued on p. 124)

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Program 1: Vocabulary Game

```
10 NUMBER = 5
100 PRINT "HELLO, SUSAN, LET'S PLAY THE VOCABU
    LARY GAME."
110 FOR T = 1 TO 1000: NEXT T: PRINT
120 FOR I = 1 TO NUMBER
130 PRINT "1.SILENT  2.HOPE  3.PERFECT  4.DENT
    IST  5.PRETTY
140 PRINT
150 READ QU$: PRINT QU$ "  -- MEANS THE SAME A
    S WHAT NUMBER ABOVE?"
160 INPUT GUESS: IF GUESS < 1 OR GUESS > NUMBE
    R THEN GOTO 160
170 READ KEY
180 IF KEY <> GUESS THEN PRINT " SORRY, THE RI
    GHT ANSWER IS " KEY: GOTO 200
190 PRINT " GOOD!  YOU GOT IT RIGHT, SUSAN!": ~
    S = S + 1
200 PRINT:NEXT I
210 PRINT: PRINT "SUSAN'S FINAL SCORE IS " S
220 PRINT " TO PLAY AGAIN, JUST TYPE  RUN AND ~
    PRESS THE RETURN KEY"
230 DATA COULDN'T BE BETTER, 3, EXPECT, 2, LOO
    KS NICE, 5
240 DATA FIXES TEETH, 4, MAKES NO NOISE, 1
```

Program 2: Capitals Game

```
100 PRINT "HELLO, SUSAN, LET'S PLAY THE CAPITA
    LS GAME."
130 PRINT "1.ENGLAND 2.FRANCE 3.CHINA 4.EGYPT ~
    5.RUSSIA
150 READ QU$: PRINT QU$ "  -- IS THE CAPITAL O
    F WHICH COUNTRY ABOVE?"
230 DATA PEKING, 3, PARIS, 2, CAIRO, 4
240 DATA MOSCOW, 5, LONDON, 1                  ©
```


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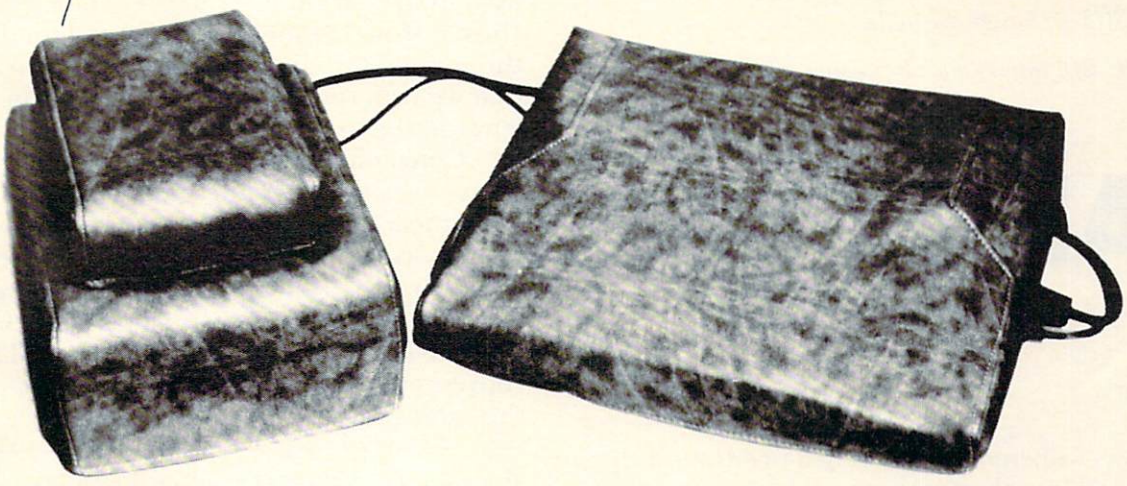

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For PET, VIC, and Atari, "Name Play" is a user-friendly program aimed at preschoolers. Children who are just learning to recognize letters will be able to take pride in their ability to write the names of their favorite people. Up to nine different names may be included. A printer is required for program output.

To run the PET/CBM version on the VIC-20 the following changes must be made:

line 120 – change PRINTTAB(12) to PRINT
line 305 – change 44 to 22

On the VIC-20, names must be no more than 15 characters long.

NAME PLAY

Bob Sullivan
Oak Park, IL

Youngsters will enjoy producing a printout of the names typed into the computer. These printouts are great for copying with crayons.

After the REM statements are removed, the program uses less than 1K and takes only a few minutes to type into the computer. First, personalize the data list in lines 1000-1080 with the names of family members, pets, friends, and close relatives. Next, assist your neophyte computerist with the following commands:

1) Press 1-9 for the desired name.
2) Press the correct sequence of letters.
3) Press @ for a printout of copied names.
4) Press the home key to turn the screen off or on.

To break into the program, make sure that the screen is off, and then press the STOP key.

This program works well with the QUADRA-PET techniques that were outlined in the July 1981 issue of **COMPUTE!**:

1) Load and run QUADRA-PET.
2) SYS926 and NEW each PET.
3) Append NAME SUCCESS into PET 4.
4) SYS926 to PET 1.

If you avoid machine language and greater than (>) DOS commands, PET 1 will operate, load, and save as an ordinary 8K PET. Additionally, you will be able to switch from PET 1 to PET 2 in less than six seconds, thus allowing yourself a short break while the young ones are in the mood for *their* program.

Beginner's Note

The key to this program is in line 400:

```
CL$=MID$(D$(A),I,1)
```

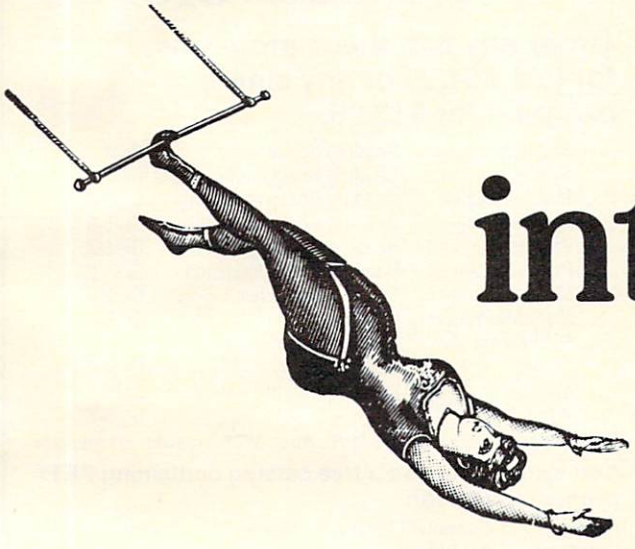
A MID$ function is used to look at each letter in the name. The instruction is set up to take the letters one at a time from left to right. The first item in the parentheses, D$(A), indicates the word chosen from the menu. The next item, I, refers to the current number in the for-next loop and insures that we progress from letter number one to the last letter in the word.

Conveniently, the MID$ function uses this center area to designate the number of spaces in from the left side of the string to start identifying characters. The 1 at the right in the parentheses shows that the function is to use only one letter at a time. Finally, we let this function equal CL$. After this line in the program instructions, CL$ is used to represent the next letter that should be pressed by the user.

Program 1: PET/CBM Version

```
0 CLR:PRINT"{CLEAR}":POKE59468,12
1 POKE144,49:REM ### DISABLE STOP KEY (UPGRA
    DE ROM) ########
110 N=9:DIMD$(N),P$(20)
120 FORI=1TON:READD$:D$(I)=D$:PRINT:PRINTTAB(1
    2)I")  "D$(I):NEXT
199 :
200 REM *** MENU COMMANDS ******************
    **************
210 GOSUB63998:IFA$="@"THENGOSUB600:GOTO0
220 IFA$="{HOME}"THENPRINT"{CLEAR}":GOSUB63997
    :GOTO0
230 A=VAL(A$):L=LEN(D$(A)):IFA>NORA<1THEN210
240 V=V+1:P$(V)=D$(A):REM *** LOAD PRINTOUT LI
    ST ***
299 :
300 REM *** DISPLAY NAME AND GET READY FOR COP
    Y ***********
305 L2=(40-L)/2
310 PRINT"{CLEAR}{07 DOWN}":GOSUB380:PRINTD$(A
    ):PRINT"{04 DOWN}":GOSUB380
320 GOTO400
380 FORI=1TOL2:PRINT"{RIGHT}";:NEXT:RETURN:REM
     *** MOVE CURSOR TO CENTERING POSITION
399 :
400 REM *** ACCEPT ONLY CORRECT RESPONSES ****
    **************
410 FORI=1TOL:CL$=MID$(D$(A),I,1)
420 GOSUB63998:IFA$=CL$THENPRINTCL$;:GOTO440
430 GOTO420
440 NEXT
499 :
500 REM *** RETURN TO MENU ******************
    **************
510 GOSUB63998:PRINT"{CLEAR}":RESTORE:GOTO120
599 :
600 REM *** PRINTOUT THE NAMES ***************
    **************
610 OPEN4,4:PRINT#4:FORI=1TOV:PRINT#4:PRINT#4,
    P$(I):NEXT:PRINT#4:CLOSE4:RETURN
699 :
```

Things fall



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```
1000 REM *** DATA LIST OF NAMES ***************
     *************
1010 DATAMOM
1020 DATAPRETZEL
1030 DATADAD
1040 DATAMELISSA
1050 DATABETH
1060 DATAGRANDMA
1070 DATAAUNT DENISE
1080 DATAGRANDPA
1090 DATAGRANDMA SULLIVAN
63995 :
63996 REM *** WAIT & GET SUBROUTINE ************
     ************
63997 POKE144,46:REM ### ENABLE STOP KEY (UPGRAD
     E ROM) #####
63998 GETA$:IFA$=""THEN63998
63999 RETURN
```

Program 2: Atari Version

```
110 DIM N$(20),P(9)
115 OPEN #1,4,0,"K:"
120 GRAPHICS 2+16:RESTORE
130 FOR I=1 TO 9:SOUND 0,I*20,10,8
140 READ N$:? #6;CHR$(I+176);CHR$(169
    );" ";N$
150 NEXT I:SOUND 0,0,0,0
170 GET #1,A
180 IF A=64 THEN 500
190 IF A=27 THEN GRAPHICS 2+16:GET #1
    ,A:GOTO 120
200 A=A-48:IF A<1 OR A>9 THEN 170
210 FOR I=1 TO V:IF P(I)<>A THEN NEXT
     I:V=V+1:P(V)=A
220 RESTORE
230 FOR I=1 TO A:READ N$:NEXT I
240 GRAPHICS 2+16
250 POSITION 9-LEN(N$)/2,5:? #6;N$
260 FOR I=1 TO LEN(N$)
270 GET #1,A:IF A<>ASC(N$(I)) THEN 27
    0
280 POSITION 9-LEN(N$)/2-1+I,6
290 PUT #6,A+128
295 FOR W=15 TO 0 STEP -1:SOUND 0,A,1
    0,W:NEXT W
300 NEXT I
310 FOR W=1 TO 50:POKE 710,PEEK(53770
    ):SOUND 0,PEEK(53770),10,8:NEXT W
    :SOUND 0,0,0,0
320 GOTO 120
500 REM PRINT OUT
505 TRAP 580
510 GRAPHICS 2+16:? #6;"Printing Name
    S(3 X)"
520 FOR I=1 TO V
530 RESTORE
540 FOR J=1 TO P(I):READ N$:NEXT J
545 FOR W=15 TO 0 STEP -1:SOUND 0,W,0
    ,W:NEXT W
550 ? #6;N$:LPRINT N$:LPRINT
560 NEXT I
570 RUN
580 GRAPHICS 2+16:? #6;"PRINTER NOT O
    N!"
590 FOR W=1 TO 500:NEXT W:GOTO 120
1000 REM LIST OF NAMES (9)
1010 DATA MOM
1020 DATA PRETZEL
1030 DATA DAD
1040 DATA MELISSA
1050 DATA BETH
1060 DATA GRANDMA
1070 DATA AUNT DENISE
1080 DATA GRANDPA
1090 DATA GRANDMA SULLIVAN
```

A Monthly Column

Being language literate is absolutely essential in our society. Being computer literate is a great advantage and is rapidly becoming a necessity. What is being done to meet the need for this new area of education? Getting computers into classrooms across the country is a start, but just a start. There is a great deal more involved.

Learning With Computers

Computer Literacy: Can We Get There From Here?

Mary Humphrey
Teaching tools: Microcomputer Services, Palo Alto, CA

literate / *adj. 1: educated, cultured 2: able to read and write*

Computer literacy is now a common term in education circles, and with it has come a growing demand to develop programs to teach it. For some educators, a new literacy is the chance to open additional avenues of thinking and communicating. For others, the mention of computer literacy causes reactions from deep sighs and "here-we-go-again" looks to near panic. Why the difference?

Language Literacy And Computer Literacy

An analogy between language literacy and computer literacy is often made, and there are many useful similarities. Just as one need not know how to physically make a book, but should be able to create and comprehend a written passage, one need not know how to build a computer, but should be able to successfully use one and to create at least a simple program. This analogy has been the basis for several recent articles proposing definitions or guidelines for computer literacy. The difference in reactions is not due to debate over what it is. The goals of computer literacy, like the goals of language literacy, are valuable skills that can be generally regarded as critical for members of our society.

Those who react to computer literacy with eager anticipation are thinking about the end product; those who dread it are thinking about delivering that product. Here the analogy between language literacy and computer literacy breaks down. Many education departments have been given a mandate to develop definitions of computer literacy, establish criteria for teacher certification, and begin pre-service and in-service teacher training programs.

Shortly thereafter, school districts and local boards are expected to create and implement student curricula. For these administrators and teachers, the concerns are not "Where are we going?" but rather "How are we going to get there?" For them, the differences between language literacy and computer literacy are glaring.

Becoming A Computer Teacher

Reading and writing competency criteria, instructional programs and standardized tests have been developed over many years with the support of much study. Computer literacy has been pondered for only a relatively short period of time. There has been little opportunity to test any of the guidelines offered, and many authors on the subject encourage educators to develop their own definitions.

Reading and language arts teachers have themselves received many years of training in these skills and in how to teach them. The criteria for teacher certification are quite explicit. Teachers charged with computer education have typically had little computer training and even less instruction in how to teach computer skills. Becoming a computer instructor is often more a matter of personal interest and initiative than of formal qualifications.

Support materials for teaching reading and language arts are big business. Teachers are accustomed to readily available, high quality textbooks, films and slides, classroom display materials, worksheets, and student activity kits for reading and writing. Currently there are few computer literacy materials. Publishers and software developers have had time to produce only a first generation of computer literacy materials, and as yet have had little feedback from educators.

The role of home-based education is also quite

different for these two types of literacy. There have always been some parents who have actively encouraged their children to learn to read and write, but reading or writing together as a family activity is usually limited to bedtime stories and thank you letters to Grandma.

Those parents who have personal computers at home seldom have to coax their children, no matter what age, to use the computer. There is a great deal of commercial promotion of various uses of computers as family activities. Teachers are realizing that this considerable amount of home learning is a welcome change, but also a challenge to the schools.

Added to these differences are two common misconceptions about computer literacy. First, it's a new and often unfamiliar area to many educators. Unfamiliarity can be confused with difficulty. This has been especially true of computing. The stereotype of high technology as a scientist's domain still lingers, despite the current efforts to promote personal and home computers as "user friendly." Because many educators have not been given adequate training in computer skills, they suspect that this new curriculum area may be beyond the capabilities of the schools, particularly the elementary schools.

There are also many educators who are confident computer-users, but who fall prey to a different intimidation. They are aware of the potential of computers in education and the amazing pace at which new developments are occurring. For them the implementation of a computer literacy program is a scramble to get it all done within the current school year. The pressure to catch up to the needs of business and industry for computer literate graduates can seem overwhelming if viewed from this perspective.

Getting There From Here

At this point it all sounds very discouraging, and you may be wondering whether schools can overcome these obstacles and go on to develop a new curriculum. There is lack of teacher training, lack of support materials, and pressure from outside the school. Do schools even want to try? The best answers to these questions come from the schools' own reports.

During the 1981-82 school year, many districts and local school boards began computer literacy programs. This year they were joined by more schools, and still others are laying the groundwork for programs in the 1983-84 school year. Several school districts, computer-education groups, and even individual teachers have written reports on their own computer literacy programs. Their enthusiasm is clear. The strongest encouragement can be found in evaluations of existing programs.

These "how-to" accounts are sincere attempts to help others through the first steps of implementing a computer literacy curriculum. Many are available for the asking or for a minimal charge to cover costs. I strongly recommend that those involved with a computer literacy project get these materials.

Several reports are of interest for those who are beginning a computer literacy program. They are particularly helpful in dealing with the difficulties of establishing a program of teacher training. "Instructional Uses of Microcomputers: A Report on British Columbia's Pilot Project" (research conducted by JEM Research) describes the planning and implementing stages, the training and other services provided, and a complete evaluation of the impact of these services. This report is also useful as a guide to planning for future evaluation. Requests for copies of the report should be sent to: Project Planning Centre, Ministry of Education, Legislative Building, Victoria, British Columbia, Canada V8V-1X4.

Computers in the Classroom is another especially thorough guide. This "booklet explaining the process of implementing computers into the elementary classroom" is written by Susan Burleson, an assistant principal in the San Ramon Valley Unified School District. It is a step-by-step account of what this district did and did not do and their recommendations to others.

Chapters cover setting goals in a district, identifying resources, computer awareness and readiness for in-service training, obtaining funds and budgeting, in-service training, school-wide use and home use of computers, anticipating problems, and evaluating progress. Copies cost $11 and are available from Susan Burleson, 599 Bridgewater Rd., Danville, CA 94526.

An energetic group of teachers and specialists in Utah is developing a kindergarten through high school computer curriculum. Their project provides plans for a three-year development cycle to train teachers, begin limited field testing, and then conduct a formal field test of several pilot projects. Curriculum objectives, teaching activities, information and materials resources, and evaluation criteria are detailed for each grade level across several "strands" of computer skills.

Other materials include such specific help as a principal's checklist for interviewing computer hardware dealers (a useful document for dealers too). Inquiries about cost and availability of part or all of their materials should be sent to: Curriculum Development Office, Jordan School District, 9361 South 400 East, Sandy, UT 84070.

A lighthearted but quite useful guide to over-

coming commonly encountered problems is "The Mother Quail Syndrome: Managing Micros on Site. 10 Sanity Savers for Educators." Write to Suzanne Powers-Bailey, Computer Coordinator, Solano County Office of Education, 655 Washington St., Fairfield, CA 94533, for information about cost and availability.

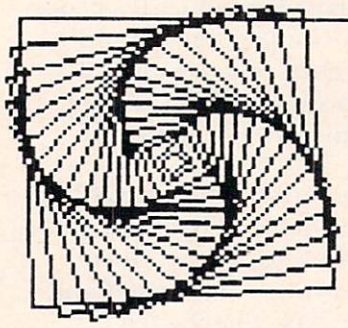
Developing A Curriculum

In addition to issues of teacher training, I discussed the need to develop a student curriculum and the lack of supporting teaching materials as difficulties in teaching computer literacy. Again, the response from those with experience is encouraging and enthusiastic. Many groups have committed a great deal of time and effort to developing curriculum guides complete with resource lists and bibliographies, tables of computing topics and their objectives, and descriptions of classroom activities and necessary materials.

An excellent example is the CLAS (Computer Literacy and Awareness for Students) package developed by the TRI-County Computer Consortium of Southeastern Michigan. Macomb County Intermediate School District, Oakland Schools, and Wayne City Intermediate School District combined efforts to produce a comprehensive and detailed computer curriculum. The cost is $10. Write to Tom Hartsig, Macomb County School District, 44001 Garfield Rd., Mt. Clemens, MI 48044.

The "home-made" materials developed by teachers and school groups may not have the glossy, typeset appearance of professionally produced materials, but they are carefully constructed and genuinely useful teaching aids. There aren't enough of them. Educators still have to search them out, and the schools are not prepared for mass distribution, but they are invaluable models. Publishers and software developers will also find them useful guides.

A quick look at the resources I've mentioned here is enough to demonstrate how much interest and effort is being generated. Schools are putting more into computer literacy than just computers. Even those who sigh or panic at the mention of computer literacy can see evidence of the payoff. It may be sooner than we think that we will be able to spend less time accomplishing computer literacy and more time enjoying the benefits of its new avenues of thinking and communicating. ©



A Monthly Column

Friends Of The Turtle

David D. Thornburg
Associate Editor

Recursion – Part 2

Last time, we explored recursion as a powerful programming tool. The basic elements of a recursive procedure include:

1. A conditional statement to tell when to stop the recursive process;
2. A series of commands to be executed at each recursive level; and,
3. The use of the procedure itself with, perhaps, new values for the procedure's variables.

The sequence and intermixing of these elements determine the type of recursive process being followed. Recursion can range from simple looping to the more complex forms we used for drawing fractals.

Because of the obvious visual relationship between certain fractals and the recursive procedures that generate them, we will examine some more of these this month.

Before doing that, however, let's make a small digression to examine the difference between the conditional branching commands commonly used with Logo programs for the Apple computer and the conditional branching command used by TI Logo.

The structure of the command we have been using is:

```
IF predicate instructionlist
```

This means that the structure of the command is the word IF followed by an operation whose result is either true or false (the predicate), followed by a list of instructions to be executed if the predicate is true. An alternate form of this command is:

```
IF predicate THEN instructionlist
```

This form of the command is common to most BASICs as well, and might be familiar to many of you.

TI Logo uses a different type of conditional command, one which is more reminiscent of PILOT. In TI Logo the IF ... THEN ... construction is replaced by:

```
TEST predicate
IFT instructionlist1
```

and also

```
IFF instructionlist2
```

This construction allows you to test a predicate in a line all by itself, and to then execute certain instructions selectively, based on the result of the test, anywhere after the TEST command. The command IFT will execute instructionlist if the result of the test was true, and the command IFF will execute the list if the result was false.

In Apple Logo our conditional command in the fractal procedure is:

```
IF :SIZE < :LIMIT [FORWARD :SIZE STOP]
```

In TI LOGO this would be replaced by:

```
TEST :SIZE < :LIMIT
IFT FORWARD :SIZE STOP
```

One other note for TI Logo users: you may find that your turtle's pen "runs out of ink" on the more complex curves. You might want to try drawing smaller versions of them to minimize this problem. Of course, you should be sure to clear the screen before drawing anything, just to be sure you have recovered as much "ink" as possible.

And now, on with the show!

One type of fractal that generates pretty pictures is the Koch curve we drew last time. In its most general form, we can define the motif for this type of curve as starting with a horizontal line, making some construction using line segments of the same length, and ending with a horizontal line on the same level as the first one. The following three fractals are particularly pleasing to me and to the people who have seen them exhibited at shows, so I am pleased to also share them with you. As in the past, all procedures will be shown in Apple Logo, and you can easily translate these to any other version of the language you might be using.

Before creating the curves, we will define a general setup procedure that puts the turtle in the correct starting position and orientation for each curve:

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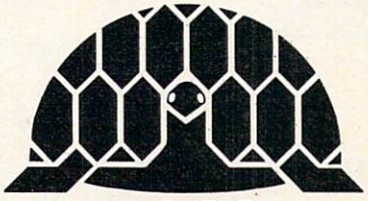

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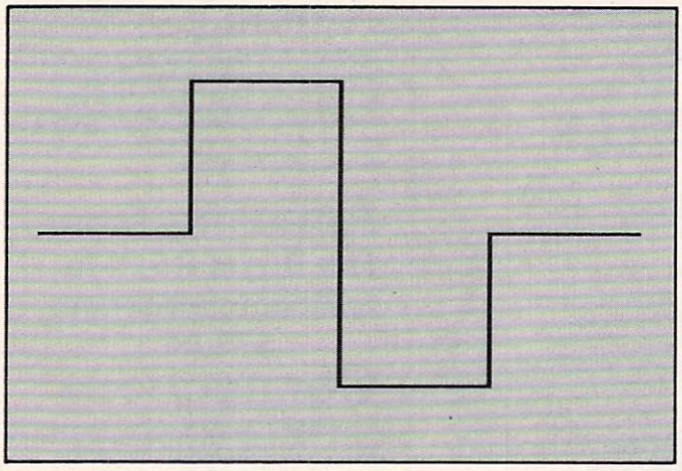
```
TO SETUP :LIST
PENUP
SETPOS :LIST
SETHEADING 90
PENDOWN
END
```

The first curve we will explore is a square meander.



The procedure for creating fractals based on this figure is the following:

```
TO MEANDER :SIZE :LIMIT
IF :SIZE < :LIMIT [FORWARD :SIZE STOP]
MEANDER :SIZE / 4 :LIMIT
LEFT 90
MEANDER :SIZE / 4 :LIMIT
RIGHT 90
MEANDER :SIZE / 4 :LIMIT
RIGHT 90
REPEAT 2 [MEANDER :SIZE / 4 :LIMIT]
LEFT 90
MEANDER :SIZE / 4 :LIMIT
LEFT 90
MEANDER :SIZE / 4 :LIMIT
RIGHT 90
MEANDER :SIZE / 4 :LIMIT
END
```

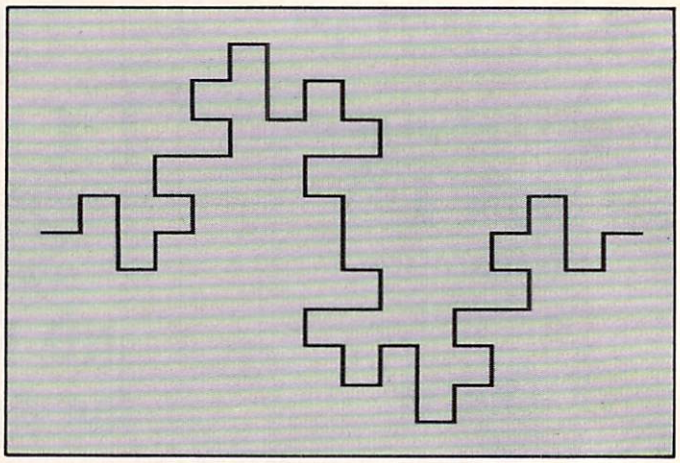
Before using this procedure, let's examine it. The first thing to notice is that the value of SIZE is reduced by a factor of four for each successive use of the procedure. The reason for this is that the total horizontal extent of the original motif is four times the length of the line segment. The second thing to notice is that the double length of line in the motif is created by a double repetition of the procedure. To see the motif, enter:

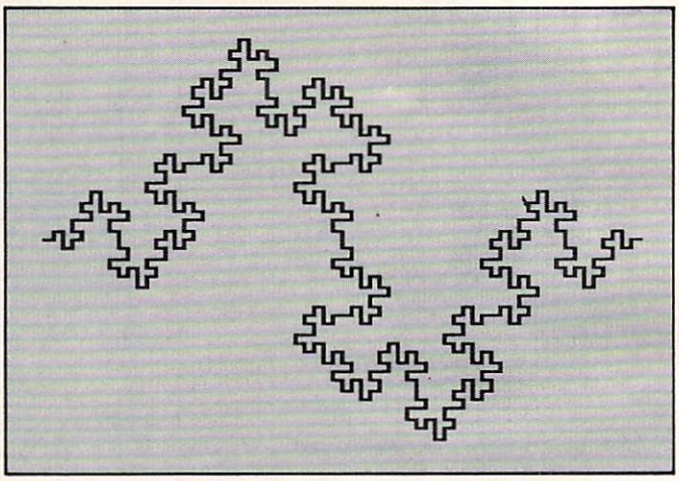
```
CLEARSCREEN
SETUP [-128 0]
MEANDER 256 256
```

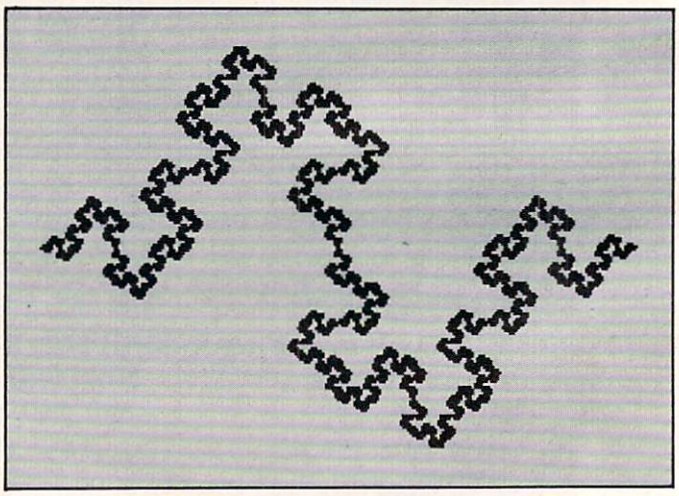
Successive generations can be seen by entering:

```
MEANDER 256 64
MEANDER 256 16
MEANDER 256 4
```

(Remember to clear the screen and use the SETUP procedure before drawing each curve.)

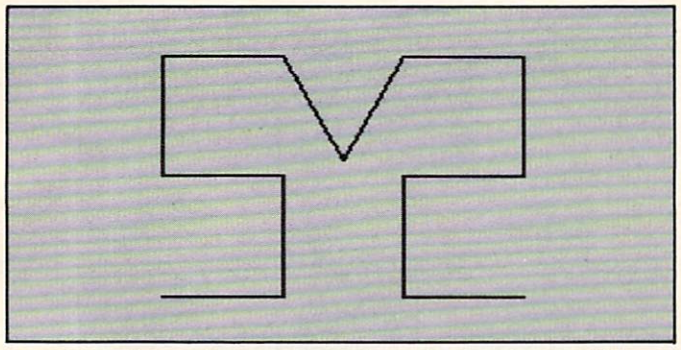






As you look at each successive generation of this figure, it is interesting to note the development of secondary meanders resulting in a final highly convoluted (but strangely symmetrical) form.

The second curve I want to share is called the T-shirt fractal, since it was designed for use on a T-shirt (write me at Friends of the Turtle for details). In making this design, I thought that a fractal T-shirt should use a T-shirt fractal, thus carrying the recursive process one step backwards to the overall shirt itself. The motif I designed looks like this:



The fractal procedure based on this motif is given by:

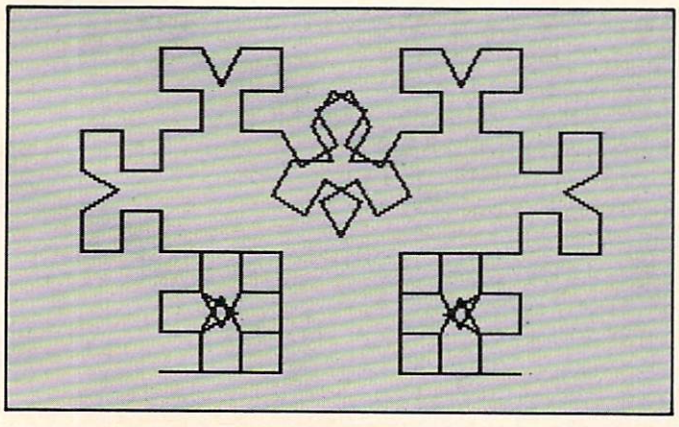
```
TO TSHIRT :SIZE :LIMIT
IF :SIZE < :LIMIT [FORWARD :SIZE STOP]
TSHIRT :SIZE / 3 :LIMIT
LEFT 90
TSHIRT :SIZE / 3 :LIMIT
LEFT 90
TSHIRT :SIZE / 3 :LIMIT
RIGHT 90
TSHIRT :SIZE / 3 :LIMIT
RIGHT 90
TSHIRT :SIZE / 3 :LIMIT
RIGHT 60
TSHIRT :SIZE / 3 :LIMIT
LEFT 120
TSHIRT :SIZE / 3 :LIMIT
RIGHT 60
TSHIRT :SIZE / 3 :LIMIT
RIGHT 90
TSHIRT :SIZE / 3 :LIMIT
RIGHT 90
TSHIRT :SIZE / 3 :LIMIT
LEFT 90
TSHIRT :SIZE / 3 :LIMIT
LEFT 90
TSHIRT :SIZE / 3 :LIMIT
END
```

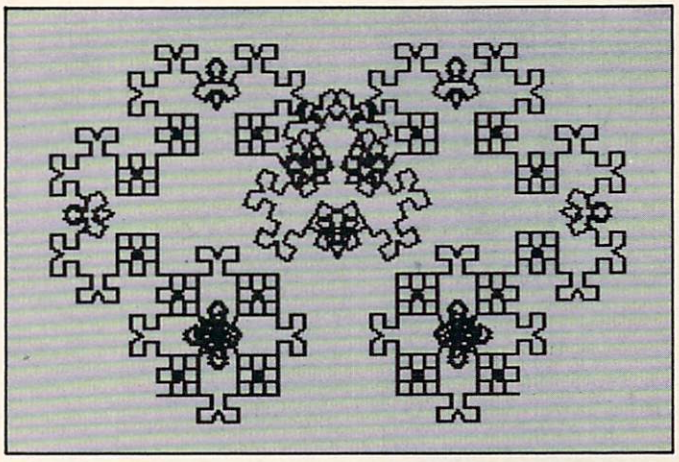
To generate the motif on the display, enter:

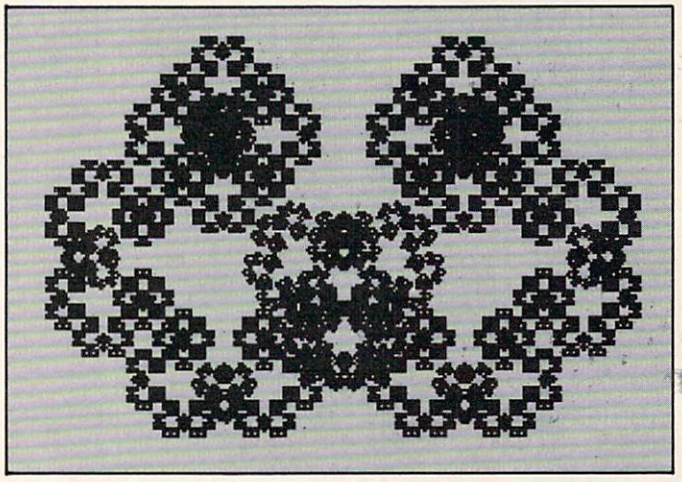
```
CLEARSCREEN
SETUP [-81 -60]
TSHIRT 162 162
```

Successive generations can be formed with the following commands:

```
TSHIRT 162 54
TSHIRT 162 18
```



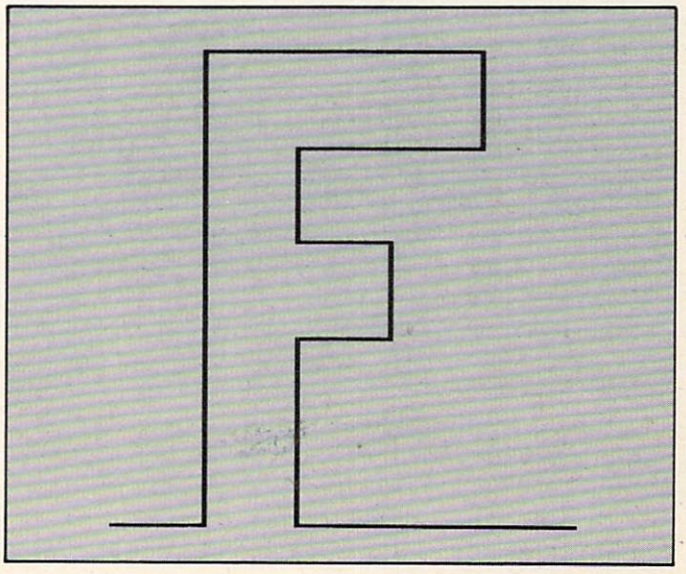




TSHIRT 162 6

Notice that, for this pattern, there is a lot of overlapping in successive generations that makes it harder to identify the original motif. But, if you look closely, you will be able to see the motif hidden (in full size) in each generation.

The last pattern I wanted to show is from a piece of artwork entitled *F is for Fractal*. The motif is quite simple:



The procedure for this curve is a bit on the lengthy side:

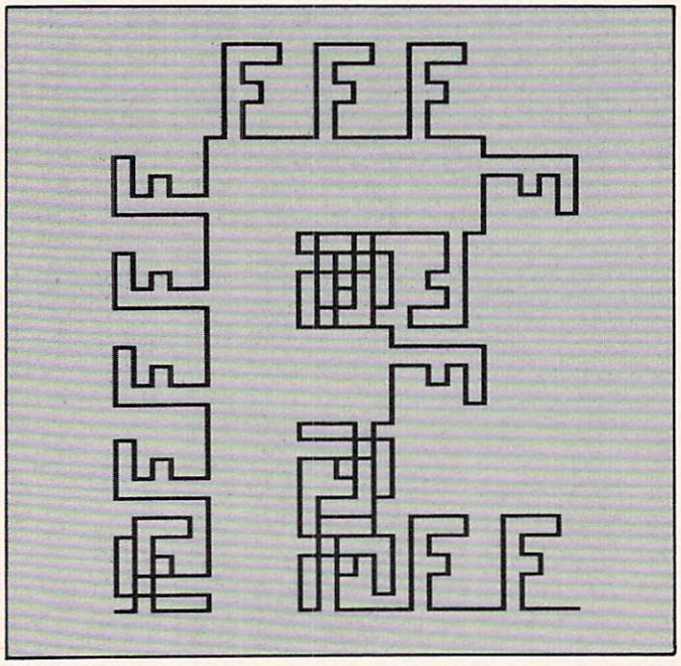
```
TO F :SIZE :LIMIT
IF :SIZE < :LIMIT [FORWARD :SIZE STOP]
F :SIZE / 5 :LIMIT
LEFT 90
REPEAT 5 [F :SIZE / 5 :LIMIT]
RIGHT 90
REPEAT 3 [F :SIZE / 5 :LIMIT]
RIGHT 90
F :SIZE / 5 :LIMIT
RIGHT 90
REPEAT 2 [F :SIZE / 5 :LIMIT]
LEFT 90
F :SIZE / 5 :LIMIT
LEFT 90
F :SIZE / 5 :LIMIT
RIGHT 90
F :SIZE / 5 :LIMIT
RIGHT 90
F :SIZE / 5 :LIMIT
LEFT 90
REPEAT 2 [IF :SIZE / 5 :LIMIT]
LEFT 90
REPEAT 3 [F :SIZE / 5 :LIMIT]
END
```

The motif can be generated by entering:

```
CLEARSCREEN
SETUP [-85 -110]
F 175 175
```

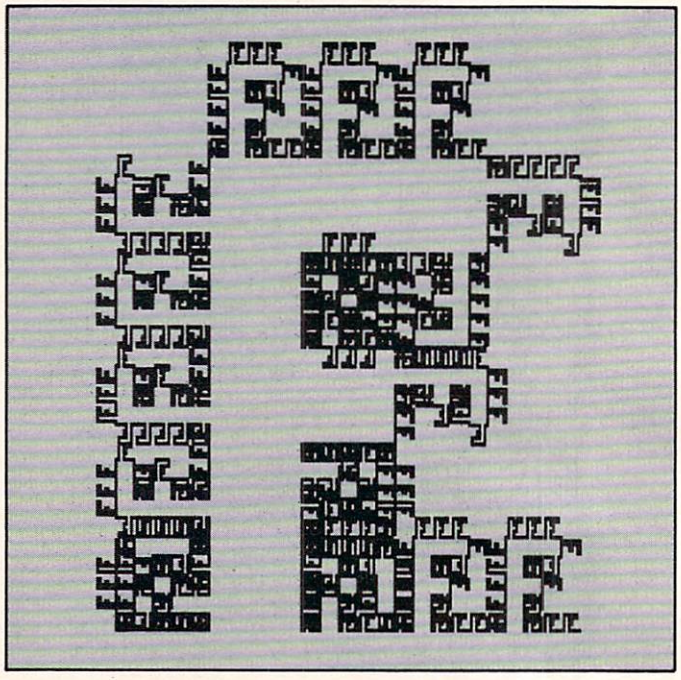
Further generations are created with the commands:

```
F 175 35
F 175 7
```



What I find particularly interesting is the manner in which the figure of the F in the motif becomes the background in the third generation.

By now, you probably have recursive programming firmly under control. You should continue to experiment on your own. The results may surprise you with their beauty!



Calling All Atari PILOTs

COMPUTE! reader Elliot Maggin sent me a delightful extension of a fractal program we described some months back. His program generates King Tut's Headdress. I think you will like the result.

```
2 R:*****************
3 R:*                *
4 R:*   90-DEGREE    *
5 R:*                *
6 R:*    FRACTAL     *
7 R:*                *
8 R:*****************
10 GR:PEN RED
20 GR:CLEAR
30 C:#A=54
40 GR:GOTO -79,-31
50 GR:TURNTO 90
60 U:*FO
70 GR:PEN BLUE
80 GR:GOTO -24,-32;TURN -90;FILL #A
90 GR:PEN RED
100 C:#A=#A/3
110 GR:GOTO -79,-31
120 GR:TURNTO 90
130 U:*F1
140 C:#A=#A/3
150 GR:GOTO -79,-31
160 GR:TURNTO 90
170 U:*F2
180 C:#A=#A/3
190 GR:GOTO -79,-33
200 GR:TURNTO 90
```

```
210 GR:PEN YELLOW
220 U:*F3
230 T:        KING TUT'S HEADDRESS
240 E:
250 *FO
260 GR:DRAW #A
270 GR:TURN -90
280 GR:DRAW #A
290 GR:TURN 90
300 GR:DRAW #A
310 GR:TURN 90
320 GR:DRAW #A
330 GR:TURN -90
340 GR:DRAW #A
350 E:
360 *F1
370 U:*FO
380 GR:TURN -90
390 U:*FO
400 GR:TURN 90
410 U:*FO
420 GR:TURN 90
430 U:*FO
440 GR:TURN -90
450 U:*FO
460 E:
470 *F2
480 U:*F1
490 GR:TURN -90
500 U:*F1
510 GR:TURN 90
520 U:*F1
530 GR:TURN 90
540 U:*F1
550 GR:TURN -90
560 U:*F1
570 E:
580 *F3
590 U:*F2
600 GR:TURN -90
610 U:*F2
620 GR:TURN 90
630 U:*F2
640 GR:TURN 90
650 U:*F2
660 GR:TURN -90
670 U:*F2
680 E:
```

A Year-end Note To All

Before leaving this year behind, I thought you should know some of the things we have in store for you in 1983. First, I have received the Turtle Graphics package for the VIC designed and manufactured by HES, and will report on it in January. Also, I am now using the Radio Shack Color Logo package and will be reporting on it in the same issue. Those of you who are interested in fractals may be interested in *The Fractal Geometry of Nature*, a new book by the father of this study, Benoit Mandelbrot. I will be reviewing this book and commenting on the controversy in this field in a forthcoming "Computers and Society" column.

In the meantime, let me know what *you* want to read, and I'll see what I can do to meet your needs.

Friends of the Turtle
P.O. Box 1317
Los Altos, CA 94022

This Commodore version of the language concludes the series on PILOT which began four issues ago and included Apple and Atari versions. This program needs at least 8K memory and works on tape or disk-based systems.

VIC And PET PILOT Interpreter

Michael Tinglof
Merrimack, NH

PILOT is an acronym for Programmed Instruction, Learning, or Teaching. Because it is a simple language, teachers can easily develop lesson programs, and beginning students can quickly learn how to program.

This version of PILOT contains all of the core commands used for displaying information and accepting responses. It also has some mathematical capabilities.

The interpreter is written in BASIC so that it is transportable between machines. There is, however, one machine language routine called by line 3 and loaded by the following statement in line 20:

```
20 ....:FORX=826 TO 831:READ Z:POKEX,Z:
   NEXT:.....
```

The routine can be loaded anywhere to suit your system needs by simply changing the 826 and 831 values. For the VIC, I would suggest changing the values to 820 and 825. Don't forget to change the SYS call in line 3 if you change the above values.

For computers other than Commodore, the routine must be replaced by an input routine which will accept colons and commas.

The next section describes the editor, the commands, and the implemented PILOT statements.

The Editor

The editor behaves just like the BASIC editor. To enter a line, type the line number, the PILOT statement, and hit RETURN. Any statement entered without a line number is assumed to be a command (see Commands) and is executed as such.

The screen editor is fully active during program entry. To correct an error in a statement or command, just move the cursor to it and enter the correction. Remember, the RETURN key must be pressed for it to be changed in memory.

When the editor is storing a PILOT program line in memory, it first removes the PILOT command and tokenizes it. Thus, if an illegal command is used, an error message will be generated before the program is run.

Commands

The following describes the editor's commands.

LIST xx-yy – Lists the specified lines from memory. xx, yy, or both can be removed.
RUN – Executes the PILOT program currently in memory.
SAVE 0:name – Saves the program in memory to disk on drive 0. No quotes are necessary.
LOAD name – Loads the program from disk. No quotes are necessary.
NEW – Clears the current program from memory.
BASIC – Exits the interpreter and returns to BASIC.
PLIST xx-yy – Same as the list command, except the output is sent to device 4.

PILOT Variables And Statements

PILOT variables consist of either a "$" for a string variable or a "#" for a numeric variable, followed by a single letter. For example, #N and $S are correct, whereas $NAME is not.

The PILOT statements implemented are:

T: Type

Outputs text and variables to the screen. For example:

```
1 T: VALUE #X
```

will type "VALUE xx".

If the statement is ended by a ";" no carriage return will be printed.

J: and U: Jump and Use

Transfer program execution to the specified routine. In the case of Use, the current line number is stored so it can be returned to (see End). For example:

```
2 J:*PRINT
```

jumps to the routine labeled PRINT. Labels are designated by beginning a line with an "*" sign. No statement should follow this label on the same line.

E: End

Transfers control back to the statement following the last Use statement executed.

M: Match

Match is the most complicated and powerful of the PILOT commands. It checks to see if certain keywords are present in a string variable or in the input buffer (see Accept). For example:

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Author of bestseller—*Katie and the Computer*

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```
10 M:YES,OK,ALRIGHT
```

checks to see if YES, OK, or ALRIGHT are present in the input buffer. To check a string for keywords:

```
15 M:$n YES,OK,...
```

If a match is found the Y flag is set; otherwise the N flag is set (see Modifiers).

I: If

If is a nonstandard command which allows for mathematical testing. It can check to see if a given variable is less than, greater than, or equal to a second given value or variable. For example:

```
20 I:#N<9
```

or

```
25 I:#C=#F
```

Only >, <, and = can be used.

C: Compute

Performs simple four-function calculations in a linear order (no parentheses) and assigns the value to a numeric variable. The calculations are performed in floating point mode so reasonable accuracy can be expected. For example:

```
30 C:#N=#G*10/#T+10
```

If a "#R" is encountered in the expression, a random number between 0 and 1 is substituted.

A: Accept

Inputs a response from the user. If no destination variable is given, the response is stored in a buffer which can be used by Match. For example:

```
40 A:#N   inputs a value into N
41 A:  inputs a response into the buffer
```

H: Home

Clears the screen and returns the cursor to home.

End

Stops the program execution and returns to the editor. This statement cannot be modified by a "Y" or "N". For example:

```
50 END
```

Modifiers

Any of the commands can be modified with either a "Y" or "N." If a command is modified, it will be executed only if the specified flag is set. For example:

```
1 TY:YES
```

will print YES only if the Y flag is set. The Y and N flags are set by either a Match or If statement.

Error Messages

The following are the error codes generated during program run:

1 – Illegal variable name
2 – Unknown label
3 – Stack overflow (too many Uses)
4 – Stack empty (an E: with no Use)
5 – Bad format
6 – Division by zero
7 – Numeric out of range (greater than 32767)

Notes On Program Operation

1. To stop a PILOT program run, hit the "@" key. To stop a list, hit any key.

2. If for some reason the program returns to BASIC level, just type GOTO 40 ‹RETURN› to re-enter without losing the current program.

3. If a NEW statement is not given before loading a new program, the current program and the new program will be merged in memory.

4. The maximum number of lines allowed is contained in the variable M and is set in line 10. This can be changed.

5. For cassette operation, make the following changes:

```
500 OPEN1,1,1,R$:PRINT"SAVING"R$
600 OPEN1,1,0,R$:PRINT"LOADING"R$
```

6. This interpreter is about 3K bytes long, and about 4K bytes are taken after system initialization. This still leaves 3K on an 8K PET!

This program gives the user access to a fairly complete set of PILOT commands, while at the same time leaving enough space for program development even on an 8K PET.

```
1 GOTO10:REM***PILOT***
2 I$=""
3 SYS826:IFPEEK(0)=13THENRETURN
4 I$=I$+CHR$(PEEK(0)):GOTO3
10 CLR:M=200:X=0:Y=0:A=0:P=0:Z=0:I$="":DIMS%(
    9),N%(26),S$(26),L$(M),C$(15):F%=0
20 PRINT"{CLEAR}**** PILOT V2.1 ****":FORX=82
    6TO831:READZ:POKEX,Z:NEXT:FORX=0TO15
25 READC$(X):NEXT:DATA32,207,255,133,0,96
30 DATALIST,RUN,SAVE,LOAD,NEW,BASIC,PLIST,T,J
    ,E,U,M,C,A,I,H
40 PRINT"{DOWN}PILOT."
50 GOSUB2:PRINT:IFASC(I$)=32ANDLEN(I$)=1THENG
    OTO50
60 IFLEFT$(I$,1)=" "THENI$=MID$(I$,2):GOTO60
70 L=VAL(I$):IFL<>0THENGOTO200
80 L=1:H=M:R$="":FORX=1TOLEN(I$):IFMID$(I$,X,
    1)<>" "THENNEXTX:GOTO140
90 R$=MID$(I$,X+1):I$=LEFT$(I$,X-1)
100 L=VAL(R$):H=L:FORX=1TOLEN(R$):IFMID$(R$,X,
    1)<>"-"THENNEXT:GOTO120
110 L=VAL(LEFT$(R$,X-1)):H=VAL(MID$(R$,X+1))
120 IFL=0THENL=1
130 IFH=0THENH=M
140 FORX=0TO6:IFI$<>LEFT$(C$(X),LEN(I$))THENNE
    XT:PRINT"UNKNOWN COMMAND.":GOTO40
150 ONX+1GOTO400,1000,500,600,700,800,390
200 IFL>MTHENPRINT"LINE NUMBER OUT OF RANGE.":
    GOTO40
210 X=LEN(STR$(L)):X$=MID$(I$,X):IFX$=""THENL$
    (L)="":GOTO50
220 IFLEFT$(X$,1)=" "THENX$=MID$(X$,2):GOTO220
230 X=3:IFMID$(X$,2,1)<>":"THENX=4:IFMID$(X$,3
    ,1)<>":"THENL$(L)=X$:GOTO50
```

```
240 FORZ=7TO15:IFLEFT$(X$,1)<>C$(Z)THENNEXT:PR
    INT"ILLEGAL COMMAND.":GOTO40
250 IFMID$(X$,2,1)="Y"THENZ=Z+10
260 IFMID$(X$,2,1)="N"THENZ=Z+20
270 L$(L)=CHR$(Z-6)+MID$(X$,X):GOTO50
390 OPEN1,4:GOTO410
400 OPEN1,3
410 FORX=LTOH:IFL$(X)=""THEN450
420 X$=":":Z=ASC(L$(X)):IFZ>30THENX$=LEFT$(L$(
    X),1):GOTO440
425 IFZ>20THENZ=Z-20:X$="N"+X$
430 IFZ>10THENZ=Z-10:X$="Y"+X$
435 X$=C$(Z+6)+X$
440 PRINT#1,X;X$;MID$(L$(X),2)
450 GETX$:IFX$<>""THENCLOSE1:GOTO40
460 NEXT:CLOSE1:GOTO40
500 OPEN1,8,2,R$+",S,W":PRINT"SAVING "R$
510 FORX=1TOM:IFL$(X)=""THEN530
520 PRINT#1,X;CHR$(13)CHR$(34)L$(X)CHR$(34)CHR
    $(13);
530 NEXTX:CLOSE1:GOTO40
600 OPEN1,8,2,R$+",S,R":PRINT"LOADING "R$
610 INPUT#1,X:IFSTGOTO630
620 INPUT#1,L$(X):IFST=0GOTO610
630 CLOSE1:GOTO40
700 GOTO10
800 PRINT"{DOWN}EXITING TO BASIC....":END
1000 L=0:FORX=1TO25:N%(X)=0:S$(X)="":NEXT:P=0:F
    %=0
1010 L=L+1:IFL=>MORL$(L)="END"THEN40
1011 GETX$:IFX$="@"THEN40
1015 IFL$(L)=""THEN1010
1020 X=ASC(L$(L)):IFX>40THEN1010
1030 IFX>20THENX=X-20:IFF%=1THEN1010
1040 IFX>10THENX=X-10:IFF%=0THEN1010
1050 C$=MID$(L$(L),2):ONXGOTO1100,1220,1300,120
    0,1500,1600,1700,1800,1900
1090 PRINT"ERROR #"E"IN LINE"L:GOTO40
1100 Z=0:IFRIGHT$(C$,1)=";"THENZ=1:C$=LEFT$(C$,
    LEN(C$)-1)
1105 FORX=1TOLEN(C$):X$=MID$(C$,X,1):IFX$="#"TH
    EN1150
1110 IFX$="$"THEN1160
1120 PRINTX$;:NEXT:IFZ=0THENPRINT
1130 GOTO1010
1150 GOSUB1190:X$=STR$(N%(Y)):GOTO1120
1160 GOSUB1190:X$=S$(Y):GOTO1120
1190 X=X+1:Y=ASC(MID$(C$,X,1))-64:IFY<1ORY>26TH
    ENE=1:GOTO1090
1195 RETURN
1200 IFP>8THENE=3:GOTO1090
1210 P=P+1:S%(P)=L
1220 IFVAL(C$)<>0THENL=VAL(C$)-1:GOTO1010
1230 FORX=1TOM:IFC$<>L$(X)THENNEXT:E=2:GOTO1090
1240 L=X:GOTO1010
1300 IFP=0THENE=4:GOTO1090
1310 L=S%(P):P=P-1:GOTO1010
1500 X=1:C$=C$+",":X$=AC$:IFLEFT$(C$,1)="$"THEN
    GOSUB1590
1510 FORZ=XTOLEN(C$):IFMID$(C$,Z,1)<>","THENNEX
    T
1520 Z$=MID$(C$,X,Z-X):FORY=1TOLEN(X$):IFMID$(X
    $,Y,LEN(Z$))=Z$THENF%=1:GOTO1010
1560 NEXT:IFZ<LEN(C$)THENX=Z+1:GOTO1510
1570 F%=0:GOTO1010
1590 Y=ASC(MID$(C$,2))-64:IFY<1ORY>26THENE=1:GO
    TO1090
1595 X$=S$(Y):X=4:RETURN
1600 A=3:Z=0:X$="":IFLEFT$(C$,1)<>"#"ORMID$(C$,
    3,1)<>"="THENE=5:GOTO1090
1610 Y=1:X$=MID$(C$,A,1):A=A+1:IFMID$(C$,A,1)="
    -"THENA=A+1:Y=-1
1620 IFMID$(C$,A,1)<>"#"THENY=Y*VAL(MID$(C$,A))
    :A=A+LEN(STR$(Y))-1:GOTO1650
1630 X=ASC(MID$(C$,A+1))-64:IFX<1ORX>26THENE=1:
    GOTO1090
1635 IFX=18THENY=Y*RND(1):GOTO1650
1640 Y=Y*N%(X):A=A+2
1650 IFX$="="THENZ=Y
1655 IFX$="-"THENZ=Z-Y
1660 IFX$="+"THENZ=Z+Y
1665 IFX$="/"ANDY=0THENE=6:GOTO1090
1670 IFX$="*"THENZ=Z*Y
1675 IFX$="/"THENZ=Z/Y
1680 IFA<=LEN(C$)GOTO1610
1685 Y=N%(X1):IFX-4>0THENIFMID$(C$,X-4)="-"ANDX
    -4<>ATHENZ=-Z
1690 X=ASC(MID$(C$,2))-64:IFX<1ORX>26THENE=1:GO
    TO1090
1692 IFZ>32767ORZ<-32767THENE=7:GOTO1090
1695 N%(X)=Z:GOTO1010
1700 IFC$=""THENGOSUB2:AC$=I$:PRINT:GOTO1010
1720 X=ASC(MID$(C$,2))-64:IFX<1ORX>26THENE=1:GO
    TO1090
1730 GOSUB2:Z=VAL(I$):PRINT:IFLEFT$(C$,1)="#"TH
    ENN%(X)=Z
1740 IFLEFT$(C$,1)="$"THENS$(X)=I$
1750 GOTO1010
1800 IFLEFT$(C$,1)<>"#"THENE=5:GOTO1090
1810 X=ASC(MID$(C$,2))-64:IFX<1ORX>26THENE=1:GO
    TO1090
1820 A=N%(X):X$=MID$(C$,3,1):IFMID$(C$,4,1)<>"#
    "THENX=VAL(MID$(C$,4)):GOTO1840
1830 X=ASC(MID$(C$,5))-64:IFX<1ORX>26THENE=1:GO
    TO1090
1835 X=N%(X)
1840 F%=0:IFX$="<"ANDA<XTHENF%=1
1850 IFX$=">"ANDA>XTHENF%=1
1860 IFX$="="ANDA=XTHENF%=1
1870 GOTO1010
1900 PRINT"{CLEAR}";:GOTO1010
```

20 Questions

```
1 H:
2 T:WELCOME TO THE GAME
  OF TWENTY QUESTIONS.
3 T:BY ASKING QUESTIONS
  WHICH HAVE YES OR
4 T:NO ANSWERS, TRY TO
  GUESS THE OBJECT
5 T:WHICH HAS BEEN SELECTED.
6 T:
7 T:BE SURE TO END EACH
  QUESTION WITH A '?'.
8 T:
9 T:
10 C:#C=0
11 *ROUND
12 C:#C=#C+1
13 *QUESTION
14 T:ENTER QUESTION #C
15 A:
16 M:?
17 TN:THAT ISN'T A QUESTION.
18 JN:*QUESTION
19 M:A?,E?,I?,O?,U?,Y?
20 TY:YES
21 TN:NO
22 T:
23 I:#C<20
24 JY:*ROUND
25 T:END OF TWENTY
   QUESTIONS. PRESS RETURN
26 T:TO START AGAIN.
27 A:
28 J:1
29 END
```

Guess

```
1 H:
2 T:THIS IS THE GAME OF
  GUESS.
3 T:TRY TO GUESS A NUMBER
  BETWEEN 1
4 T:AND 100.
5 C:#G=0
6 C:#N=#R*100
7 *GUESS
8 C:#G=#G+1
9 T:
10 T:GUESS NUMBER #G ?:
12 A:#Q
15 I:#Q<#N
16 TY:TO LOW.
17 I:#Q=#N
18 TY:RIGHT! IN #G GUESSES.
20 JY:*END
21 I:#Q>#N
22 TY:TO HIGH.
23 J:*GUESS
25 *END
26 T:
27 T:PLAY AGAIN ? ;
28 A:
29 M:YES,OK,ALRIGHT,GOOD,Y
30 JY:1
31 T:O.K., GOODBYE!
32 END
```


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

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Part II

Last month we featured the skeleton of the world's most intelligent Christmas card – an Atari program which would use several of the machine's special features to delight youngsters and involve them right away in using their computer Christmas present. The article concludes this issue with the spectacular music and animation version of the program. It requires 16K RAM.

An Atari For Christmas

Adding Music And Movement

Brenda Balch
Redondo Beach, CA

We completed the basic framework last month for the Christmas computer program. It should introduce my sister's family to computers in a most friendly way. Now I can think of something unique about each person who will be there Christmas day and turn that into a picture and melody. After a number of attempts my list looks like this:

Name	Picture	Song
Brenda	Renaissance instruments	*Battle Pavane* (this sounds good only in four parts)
Carolyn	Children	*It's a Small World*
Kathy	Dancer	*Dance of the Sugar Plum Fairy*
Ruth	Cake	*This is the Way We ...*

Making Melodies

First the music. All I want is short melodies. All these tunes are in my head, but how do I get them into my computer? I don't play by ear, but fortunately I have a friend who does. I watch his fingers and write down the notes as he plays.

Now I need to determine how long each note is. Out comes the Music Composer, and a lot of trial and error begins. Any mistakes left in these tunes are probably in my head, as well as in my Atari.

Since I think of music in terms of quarter notes, eighth notes, etc., I would like to enter each note as a pitch number (using the table in the *BASIC Reference Manual* is easy), followed by a 4, 8, etc. I also want to change the tempo easily until I like the speed. Thus the PNOTE (play note) subroutine is born. (Later I notice a dotted quarter becomes an awkward 2.66. Next time I'll try something different.)

The first time I wrote this subroutine, I tried to use the variable NOTE, which BASIC would stubbornly turn into NOT E. I finally decided to heed the advice to stay away from variables which start with keywords. (The use of INPUT$ can also give problems in certain contexts.)

The only four-part music I attempt is the Renaissance *Battle Pavane*. One interesting characteristic of this musical phrase is how the parts move at different times. This makes data entry difficult, and requires a different philosophy about when to turn off a note. I use zero as a flag to indicate that a note is not to be turned off (i.e., that it is to be held). I turn each note off just before the next note in that voice starts. If zero were needed to provide rests, one could be used as the flag to hold a note.

As I try various options, the code in the routine takes long enough that it affects the tempo. After several attempts I get a slow but regular beat (see lines 850-895). This involves using the subroutine to give a sixteenth note duration and using the main routine and hold flags to fill out quarter notes, etc. (I'll leave finding a better solution to a rainy day.)

Animation

I look through my list of pictures for required motion. Dancers certainly must dance, and I want to try simple player/missile graphics. Horizontal movement will be enough for me. I bring out my graph paper and discover my major problem is lack of artistic talent. How *do* dancers dance? Several tries (including walking around on my toes to watch what I do) produce the routine at lines 17000-17240.

A dancer should move in time to the music, so calls to PNOTE are alternated with changing the dancer's feet.

Nothing else in my list seems to require motion. But I find I can give the impression of something

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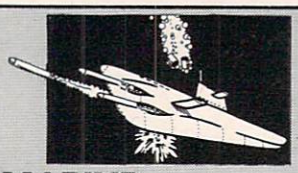

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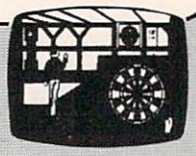

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The traditional pubroom game of darts, depicted in strikingly beautiful graphics and sound. Use your joystick to position the thrower's hand—10 skill levels allow for all ages of players. Once thrown, the dart either finds its mark or bounces off the wire separators (with a realistic "clink" sound).

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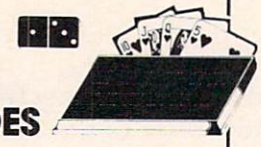

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From THORN EMI

Challenge your computer to a game of either of these favorites. At first, the computer may leave you far behind, but you'll even the score as you work out and try new strategies. Great way to practice and surprise your friends.

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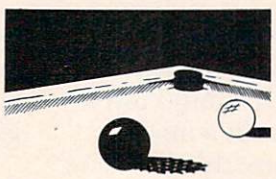

SNOOKER & BILLIARDS

From THORN EMI

Great way to learn or practice your technique with the computer. Then, when you're an "accomplished" player, challenge your friends to a few matches. Full joystick control for angle and strength of each shot. Fun for beginners and advanced players; 4 game variations. Requires joystick.

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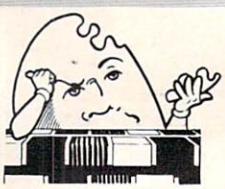

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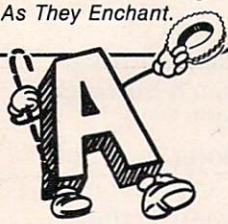

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By Poole, McNiff & Cook from Osborne/McGraw-Hill
Comprehensive, all-in-one guide for Atari 400/800 computers that is helpful to the beginning and advanced programmer. Complete operating instructions; detailed BASIC programming, including a handy alphabetical glossary of BASIC statements and functions; advanced BASIC; computer graphics; and tips on hardware, peripherals and compatible software.

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Part I: Learning Through Games. Part II: Games for the Atari. Part III: The Atari Special. Plus seven appendices.

Softcover, $14.95 **Hardcover, $19.95**

MASTER MEMORY MAP

From Santa Cruz Software
If you are serious about programming the Atari, this booklet could become one of your most important tools. A highly detailed map of the Atari's memory, it details thousands of locations and routines. Using this booklet makes easier the use of display list, player/missile, and interrupt graphics. The "Miscellaneous Notes" section contains a wealth of knowledge picked up by Santa Cruz in their explorations of the Atari. Also included are notes on the new GTIA graphics chip.

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By Castlewitz and Chisausky from Osborne/McGraw Hill
Fifty VisiCalc models for home and office, including: investments, inventory, sales forecasts, payroll, personal net worth, home budget planning, family insurance needs. Each comes with model listings, sample printed reports and narrative.

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6502 ASSEMBLY LANGUAGE SUBROUTINES

By Leventhal and Saville from Osborne/McGraw-Hill
If you're interested in using assembly language quickly, this book is ideal. It describes general 6502 programming methods, provides code for more than 40 subroutines to help you improve your programming skills, debug or revise an existing program; add instructions and addressing modes.

Softcover, $15.95

ATARI SOUND AND GRAPHICS

By Moore, Lower and Albrecht from John Wiley
This self-paced, self-teaching guide will have you seeing and hearing things on your Atari in no time—even if you're a complete beginner. You'll learn to compose and play melodies, draw cartoons, create sound effects and games. Each section teaches something new in BASIC, the most commonly used computer language.

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PICTURE THIS!
An Introduction to Computer Graphics for Kids of All Ages

By David D. Thornburg from Addison-Wesley
This book promises to become the "modern replacement for coloring books and crayons". It's a learn-by-doing manual that uses PILOT, a simpler language than BASIC, and Turtle Geometry to teach kids to create pictures in full color from simple lines to complex angles and curves. Recommended for use in conjunction with PILOT Cartridge.

Spiral-bound, $14.95

ATARI ASSEMBLER

By Don & Kurt Inman from Reston
While the Atari Assembler Cartridge comes with an operating manual, it assumes that you already know assembly language. If you're new to the Atari or its 6502 processor, this book is a must. The Inmans guide you through the rudiments of this fascinating type of programming in clear, easy steps. Includes full listing and description of 6502 mnemonics and addressing modes. Recommended for use in conjunction with Assembler Cartridge.

Softcover, $12.95

INSIDE ATARI DOS

By Bill Wilkinson from Compute
The comprehensive manual on the disk File Manager System (FMS), commonly known as Atari DOS 2.0S. Contains the only complete and official listing for the system, plus a full description of: the external view, charts & tables, various interfaces and functions of individual subroutines.

Spiral-bound, $19.95

DE RE ATARI

From APX
Translated from Latin, the title of this book is "All About Atari" and it means what it says! Used in combination with Atari's Technical Reference Manual, advanced programmers will be able to learn to exploit the many hardware and operating system features that make the Atari 400/800 so tremendously versatile. Includes a useful discussion of the new GTIA chip. Once you know Atari BASIC and assembler, this book is a must.

Loose leaf (binder not supplied), $19.95

COMPUTERS FOR KIDS

Atari Edition By Sally Larsen from Creative
The BASIC programming manual written for kids, from flowcharts to color graphics, including the sure-to-please program, "Scare Mom with an Elephant." Detailed instructions and sketches plus glossary of statements and commands. With lesson plans and tips for parents and teachers.

Softcover, $4.95

STIMULATING SIMULATIONS, Atari Version, 2nd Edition

By C.W. Engel from Hayden
A handbook of 12 simulation games including Art Auction, Starship Alpha, Monster Chase and Devil's Dungeon—each complete with listing, sample run, instructions and program documentation, including flowchart and ideas for variations.

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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, $49.95 16K Required

SPEEDWAY BLAST

By Dave Morock from IDSI

Racing game with a twist: you must guide your racer on an overland trip, dodging (or blasting) the asphalt-eating monsters that try to keep you from capturing their precious diamonds. Steer carefully! Requires joystick.

ROM Cartridge, $39.95 16K Required

DEADLY DUCK

From Sirius

The Crabs have taken to the air, armed with bricks and bombs, to drive our friend, DEADLY DUCK, out of his pond. But Deadly's gonna fight back, with a gun tucked into his bill. Lots of fun and action; 6 levels of play. Requires joystick.

ROM Cartridge

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From Roklan

All the fun, excitement and video quality of an arcade game in your home! If you **hate** Alien Invaders, you'll **love** this one! Battle the Invaders, and as your speed and defense skills improve, the aliens get meaner. With each successful defense you'll be challenged to an even tougher competition. Not for the timid! Requires joystick.

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FAST EDDIE

From Sirius

On your mark; get set; ***go Eddie!!*** FAST EDDIE's off and running, dashing up and down every ladder he can find, hunting for prizes. Quick, there's a heart floating on the 2nd floor! Ooops, look out—there's a Sneaker, sneaking up on you —***jump, Eddie!*** Great animation; 8 skill levels; lots of action. Requires joystick.

ROM Cartridge

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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.

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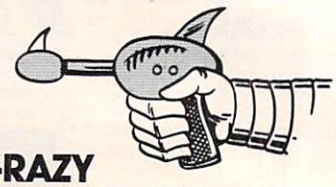
FISHES

From Epyx

You lead your school of fish through the pleasures and perils of oceanic life. As you find food, your school will grow. But hungry sharks and other predators also inhabit this tranquil world, so ***swim carefully***. Requires joystick.

ROM Cartridge, $39.95 16K Required



K-RAZY SHOOT-OUT

From K-Byte/CBS

The object of the game is to advance your Space Commander into the Alien Control Sector, eliminate the Alien Forces and escape to the next (more difficult) sector. **No two games are alike**, since the Alien Control Sectors are created at random, giving you **millions** of combinations of barriers and escape routes. Requires joystick.

ROM Cartridge, $49.95 8K Required

WORM WAR I

From Sirius

Hoards of gigantic worms are slithering around the city of Teriyaki . . . WORM WAR I has begun! Much of the city has been crushed under the weight of these mutant creatures, and the only thing that can stop them is the specially armed anti-worm tank. Are you brave enough to drive it, and make Teriyaki safe again? 9 play options; great color and sound; for 1 or 2 players. Requires joystick.

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EMBARGO

By Bill Hooper from Gebelli

There is a strict trade embargo on Zorel 6. The Council has ruled that all foodstuffs, materials, trade goods and fuel must pass the close scrutiny of the Orelian Guards. Only goods essential for galactic security are guarded; all others are disbursed to the Council's overflowing warehouses. Select from 9 levels of play. Requires joystick.

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From Epyx

If you've always wanted to juggle, here's your chance. Start with 3 spinning plates, and juggle your way up to expert status: keeping 18 plates going at once! You'll have to concentrate: spin too fast and they fly off the screen; spin too slowly and they fall. Requires joystick.

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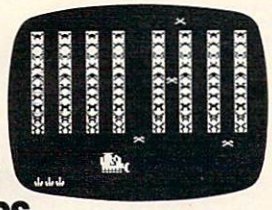

K-RAZY KRITTERS

From K-Byte/CBS

Your Command Ship is faced with ***eight columns*** of Alien Kritters. You have Regular or "Supermissiles" to eliminate the Kritters, descending on your Star Base at various speeds and frequencies. Ten levels of play—great fun for the nimble-fingered! Requires joystick.

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CROSSFIRE

From On-Line

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ROM Cartridge, $44.95 16K Required
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SOLDIERS OF SORCERY

From Epyx

A multi-player fantasy role-playing game in which you, as a warrior or wizard, search the land for wealth and experience. The game is ***different each time*** you enter the world of wolves, bats, dragons, and more! Requires joystick.

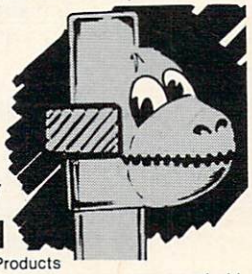
ROM Cartridge, $59.95 16K Required

FIREBIRD

From Gebelli

You are Piggo the Firefighter in this fast-action game. The firebird drops fire on buildings in your district. You must put out the fires; try to save the people who jump, and get them on rescue helicopters. Accumulate points for each successful action. Requires joystick.

ROM Cartridge, $39.95 4K Required

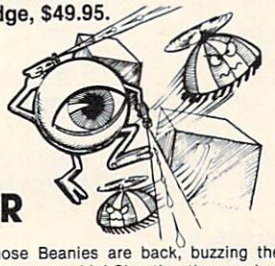


MONKEY WRENCH

From Eastern Data Products

A BASIC and machine language programmers' aid for the Atari 800. Works with BASIC, adding 9 new direct mode commands including: auto line numbering, delete lines, change margins, memory test, hex/dex conversion, renumber BASIC, cursor exchange and machine language monitor. Monitor contains 15 commands used to interact with the 6502.

ROM Cartridge, $49.95.



BEANY BOPPER

From Sirius

Watch out—those Beanies are back, buzzing the city, and that means ***trouble!*** Shooting them makes them meaner; poison doesn't work—what can we do? It's BEANY BOPPER to the rescue, with his pivotal laser and rapid-fire stunt gun. Fast action, exciting sound and color; 6 play options. Requires joystick. **Also available for VCS.**

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ALIEN GARDEN

From Epyx

This fantasy world is inhabited by a collection of "Incredible Edibles": some delicious, some poisonous, some explosive. You must discover the best way to eliminate them from the garden—without eliminating yourself! The faster you go, the more points you earn. Requires joystick.

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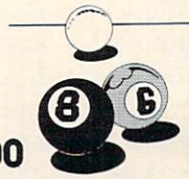

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From IDSI

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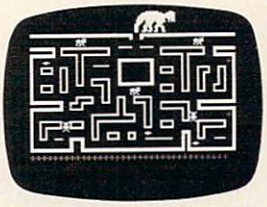
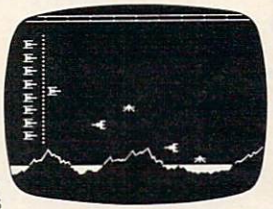


K-RAZY ANTIKS

From K-Byte/CBS

The White Ant needs all your help! You must guide it safely through the maze of tunnels in the Anthill; help it deposit and protect its White Eggs—while looking out for the Anteater and Enemy Ants who are trying to hatch their Enemy Eggs. Choice of 6 mazes and 99 levels of difficulty. Requires joystick.

ROM Cartridge, $49.95 8K Required



K-STAR PATROL

From K-Byte/CBS

Your lead Star Ship must destroy the Alien Attack Ships, and eliminate the Intergalactic Leeches that are invading your territory. You must also replenish your Force Field Energy periodically by diving between jagged mountains into the lakes below. 10 levels of difficulty. Requires joystick.

ROM Cartridge, $49.95 8K Required

WIZARD OF WOR

From Roklan

Can you defeat the WIZARD OF WOR? First you must descend into the ever-changing maze of Dungeons with your Worriors, and do battle with the monsters you encounter, like the Burwors, Garwors, Worluk and enemy Worriors. Only then can you turn your attention to the Wizard, who can teleport magically around the screen, hurtling lightning bolts as he moves. Simultaneous 1 or 2 player action.

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happening by building cakes in layers, and changing background colors for the children.

The Pictures

I draw all of my pictures on graph paper and then turn them into X,Y coordinates. I try to standardize colors, but end up with a sizable list anyway. The only color which gives me much trouble is yellow. I need two sets of parameters for yellow. The color I get seems to depend upon the context of the colors around it. (If the coconut cake looks green on your screen, try the other yellow.) The colors I used are:

SETCOLOR x,a,b

a	b	color
0	0	black
0	4	dark gray
0	8	gray
0	14	white
1	4	gold
1	14	yellow #1
2	14	light orange
3	4	red
4	12	pink
5	4	purple
9	6	light blue
12	2	green
13	12	yellow #2
14	2	brown

Common Subroutines

I need common subroutines in this program for four things: delays, plotting, sound, and checking input strings.

Delay Subroutines:

Name	Location	Function
SDELAY	900	Short delay
MDELAY	930	Medium delay
LDELAY	960	Long delay (to allow a first grader to read two lines)

The delay subroutines simply loop a fixed number of times.

Plotting Subroutines:

Name	Location	Function
HPLOT	100-110	Plot horizontal lines, reading start x,y values and length
VPLOT	150-160	Plot vertical lines and reflected vertical lines (around an x-axis of REFL) reading start x,y values and length
PPLOT	200	Plot points, reading the number of points, and then the x,y values
HPLOTT	250-260	Same as HPLOT, except lines are translated by (OFFX, OFFY)
HPLOTTRF	300-310	Same as HPLOTT except lines are reflected around an x-axis of REFL
SQPLOT	350	Plot 3x3 squares, reading the number of squares and the x,y values of the upper left corner of each square

The plotting subroutines are written as they are needed. For example, the only times I need vertical line segments to make my picture, the picture is symmetrical around an x-axis. Therefore, the only vertical plot routine plots the original and the reflected values.

Sound Subroutines:

Name	Location	Function
PNOTE	800-810	Reads a pitch and duration and plays a note; if it reaches the end it starts over
PCHORD	850-895	Plays the chord in ANOTE for one sixteenth duration (see earlier discussion)

Input Checking Subroutine:

Name	Location	Function
CHECKI	700-720	Described in Part I

Main Subroutines

The main subroutines are entered by using the GOSUB expression in line 3050. Therefore, each routine starts on a line number which is a multiple of 1000. Note that printing to the screen after graphics mode x + 16 returns to graphics mode 0. Therefore, the only explicit Graphics 0 commands are required after the Christmas tree which uses graphics mode 3. There is one main subroutine for each person on Christmas day:

Location	Picture
11000-11330	Renaissance instruments
15000-15440	Children
17000-17240	Dancer
19000-19210	Cake

One miscellaneous note: the Renaissance instruments pictured are krumhorns.

```
10 GOTO 1000
100 READ X,Y,NUM:IF NUM=0 THEN RETURN

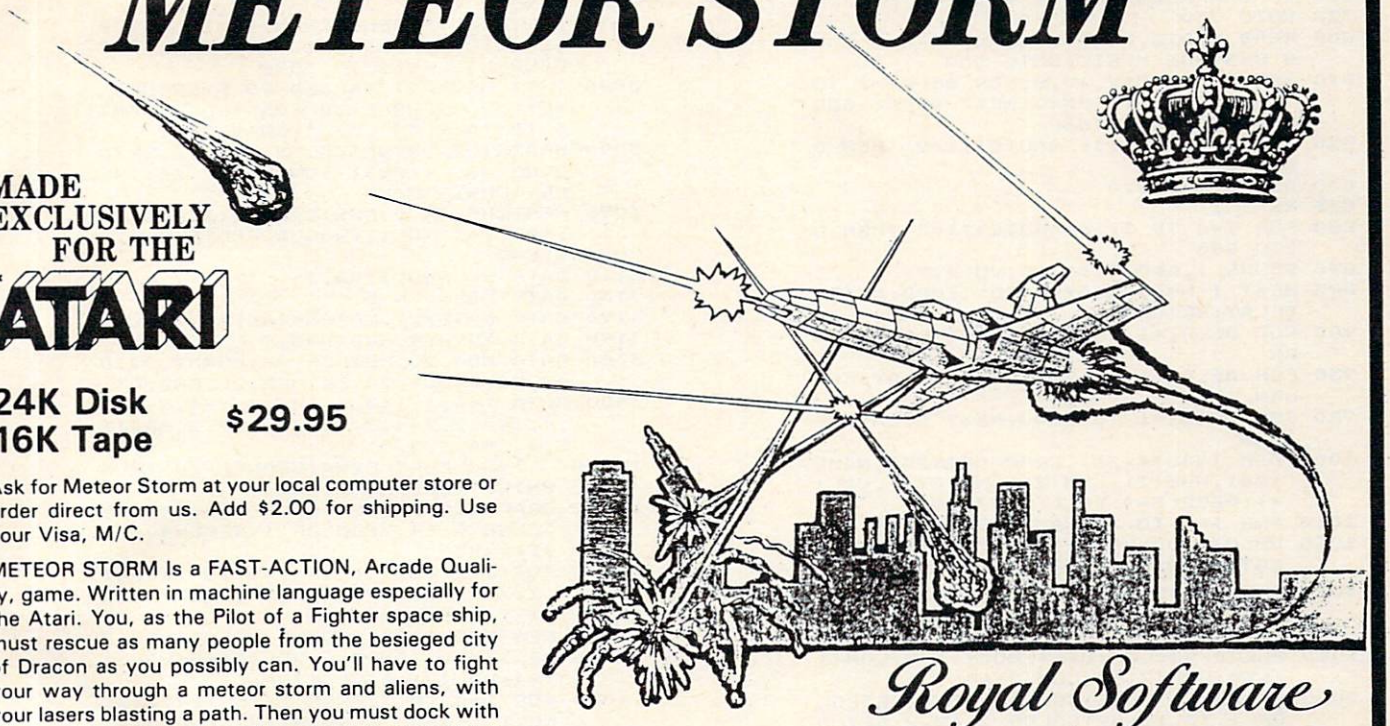
110 FOR CT=0 TO NUM-1:PLOT X+CT,Y:NEX
    T CT:GOTO 100
150 READ X,Y,NUM:IF NUM=0 THEN RETURN

160 FOR CT=0 TO NUM-1:PLOT X,Y+CT:PLO
    T REFL-X,Y+CT:NEXT CT:GOTO 150
200 READ NUM:FOR L=1 TO NUM:READ X,Y:
    PLOT X,Y:NEXT L:RETURN
250 READ X,Y,NUM:IF NUM=0 THEN RETURN

260 FOR CT=0 TO NUM-1:PLOT X+OFFX+CT,
    Y+OFFY:NEXT CT:GOTO 250
300 READ X,Y,NUM:IF NUM=0 THEN RETURN

310 FOR CT=0 TO NUM-1:PLOT REFL-X+OFF
    X-CT,Y+OFFY:NEXT CT:GOTO 300
350 READ NUM:FOR CT=1 TO NUM:READ X,Y
    :FOR SQCT=0 TO 2:PLOT X,Y+SQCT:DR
    AWTO X+2,Y+SQCT:NEXT SQCT:NEXT CT
    :RETURN
700 READ COMPARE$,INDEX:IF INDEX=0 TH
    EN RETURN
```

METEOR STORM



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```
710 IF COMPARE$=INPUT$ THEN RETURN
720 GOTO 700
800 READ MNOTE,LENGTH:IF LENGTH=0 THE
    N RESTORE MUSIC:GOTO 800
810 SOUND 0,MNOTE,10,8:FOR DELAY=1 TO
     (16/LENGTH)*TEMPO:NEXT DELAY:SOU
    ND 0,0,0,0:RETURN
850 FOR I=0 TO 3:IF ANOTE(I)=0 THEN G
    OTO 875
870 SOUND I,0,0,0
875 NEXT I
880 FOR I=0 TO 3:IF ANOTE(I)=0 THEN G
    OTO 895
890 SOUND I,ANOTE(I),10,VOL(I)
895 NEXT I:FOR DELAY=1 TO TEMPO:NEXT
    DELAY:RETURN
900 FOR DELAY=1 TO 20:NEXT DELAY:RETU
    RN
930 FOR DELAY=1 TO 200:NEXT DELAY:RET
    URN
960 FOR DELAY=1 TO 2000:NEXT DELAY:RE
    TURN
1000 DIM INPUT$(25),COMPARE$(25),NAME
     (20),HUE(2),LUM(2),ANOTE(3),VOL(
     4):PEOPLE=4:POKE 53277,0
1010 FOR I=1 TO 20:NAME(I)=0:NEXT I
1020 HPLOT=100:VPLOT=150:PPLOT=200:HP
     LOTT=250:HPLOTTRF=300:SQPLOT=350
1030 CHECKI=700:PNOTE=800:PCHORD=850:
     SDELAY=900:MDELAY=930:LDELAY=960
     :S11050=11050
1040 HUE(0)=3:LUM(0)=4:HUE(1)=0:LUM(1
     )=14:HUE(2)=8:LUM(2)=4
2000 GRAPHICS 3:SETCOLOR 0,3,4:SETCOL
     OR 1,13,12:SETCOLOR 2,12,2:SETCO
     LOR 4,0,0
2010 ? "MERRY CHRISTMAS!":? "I AM YOU
     R FRIENDLY COMPUTER"
2020 ? "WILL YOU TALK TO ME?";
2030 COLOR 3:PLOT 26,15:DRAWTO 18,0:P
     OSITION 10,15
2040 POKE 765,3:XIO 18,#6,0,0,"S:"
2050 PLOT 19,18:DRAWTO 19,16:DRAWTO 1
     7,16:POSITION 17,18
2060 XIO 18,#6,0,0,"S:"
2070 RESTORE 2200:COLOR 2:GOSUB PPLOT
2080 RESTORE 2300:COLOR 1:GOSUB PPLOT
2090 POKE 764,255
2100 IF PEEK(764)<>255 THEN 2900
2110 FOR L=1 TO 100:NEXT L:SETCOLOR 0
     ,12,2
2120 FOR L=1 TO 100:NEXT L:SETCOLOR 0
     ,3,4:GOTO 2100
2200 DATA 11,18,0,19,3,17,5,20,7,16,8
     ,19,10,23,11,17,12,12,13,22,14,1
     5,15
2300 DATA 5,20,5,15,10,20,12,19,14,12
     ,15
2900 GRAPHICS 0:INPUT INPUT$:RESTORE
     2960:GOSUB CHECKI
2910 IF INDEX=0 THEN ? "ANY ANSWER IS
      A GOOD SIGN":GOTO 2950
2920 IF INDEX=1 THEN ? "I'M GLAD":GOT
     O 2950
2930 ? "YOU MUST HAVE GOTTEN OUT OF T
     HE WRONG SIDE OF BED THIS MORNIN
     G"
2940 ? "ANYWAY, ";:GOTO 2950
2950 ? "MY NAME IS ATARI":GOTO 3000
2960 DATA YES,1,Y,1,YEAH,1,NO,2,N,2,E
     ND,0
3000 ? "WHAT IS YOUR NAME";:INPUT INP
     UT$
3010 RESTORE 3110:GOSUB CHECKI
3020 IF INDEX=0 THEN ? "HMM ... I DON
     'T KNOW YOU.":? "ARE YOU SURE YO
     U SPELLED YOUR NAME(4 SPACES)RIG
     HT?":GOTO 3000
3030 IF INDEX=20 THEN ? "THERE ARE TO
     O MANY ";:? INPUT$;:? "'S HERE":
     ? "TRY AGAIN":GOTO 3000
3040 NAME(INDEX)=1:? :? INPUT$;:? ",
     I KNOW SOMETHING ABOUT YOU.":?
3050 GOSUB 10000+INDEX*1000:TOTAL=0
3060 FOR I=1 TO 10:TOTAL=TOTAL+NAME(I
     ):NEXT I
3070 IF TOTAL=PEOPLE THEN ? "IT HAS B
     EEN NICE TALKING TO EVERYONE.":G
     OSUB LDELAY:GOTO 3090
3080 ? "I HAVEN'T TALKED TO EVERYONE
     YET":? "I HOPE SOMEONE ELSE WANT
     S TO TALK TO  ME.":GOTO 3000
3090 GRAPHICS 18:SETCOLOR 4,12,2:SETC
     OLOR 0,3,4:POSITION 2,5:? #6;"ME
     RRY CHRISTMAS"
3095 RESTORE 3400:MUSIC=3400:TEMPO=30
     :FOR I=1 TO 11:GOSUB PNOTE:NEXT
     I:END
3110 DATA BRENDA,1,BB,1
3150 DATA CAROLYN,5
3170 DATA KATHY,7,KATHERINE,7
3190 DATA RUTH,9,GRANDMA,9
3300 DATA MOM,20,MOTHER,20,MOMMY,20,D
     AD,20,DADDY,20,FATHER,20,END,0
3400 DATA 144,4,144,4,144,2,144,4,144
     ,4,144,2,144,3,121,4,182,2.66,16
     2,8,144,1,0,0
11000 ? "YOU PLAY RENAISSANCE INSTRUM
      ENTS.":GOSUB LDELAY
11010 GRAPHICS 19:SETCOLOR 4,1,14:SET
      COLOR 0,14,2:COLOR 1:REFL=40:X=
      12:Y=23
11020 FOR J=1 TO 15:FOR I=0 TO 2:PLOT
       X,Y-I:PLOT REFL-X,Y-I:NEXT I:X
      =X+1:Y=Y-1:NEXT J
11040 RESTORE 11200:GOSUB VPLOT:RESTO
      RE 11300:TEMPO=2:VOL(0)=8:VOL(1
      )=4:VOL(2)=4:VOL(3)=6
11050 FOR I=0 TO 3:READ X:ANOTE(I)=X:
      NEXT I:READ LENGTH:IF LENGTH=0
      THEN 11110
11055 COUNT=16/LENGTH-1
11060 GOSUB PCHORD:FOR I=0 TO 3:ANOTE
      (I)=0:NEXT I:FOR CT=1 TO COUNT:
      GOSUB PCHORD:NEXT CT:GOTO S1105
      0
11110 SOUND 0,0,0,0:SOUND 1,0,0,0:SOU
      ND 2,0,0,0:SOUND 3,0,0,0:RETURN

11200 DATA 11,22,2,10,22,2,9,19,5,8,1
      6,7,7,15,5,6,14,3,27,4,5,28,3,5
      ,29,2,6,30,1,7,31,0,7,32,1,5,33
      ,2,3,34,3,1
11210 DATA 0,0,0
11300 DATA 53,64,81,162,4,47,60,0,121
      ,8,60,60,96,121,8,53,64,81,162,
      8,53,64,0,162,8,47,60,0,121,8,6
      0,60,96,121,8
11310 DATA 53,64,81,162,8,53,64,0,162
      ,8,47,60,0,121,8,60,60,96,121,8
      ,53,64,81,162,8,0,81,0,162,8,47
      ,60,0,121,8
11320 DATA 0,0,91,0,8,0,81,96,121,8,5
      3,0,0,0,8,60,72,91,182,4,0,81,1
      08,162,4,64,0,0,0,4,60,96,121,2
      43,1
11330 DATA 0,0,0,0,1,0,0,0,0,0
15000 ? "YOU TEACH CHILDREN.":GOSUB L
      DELAY
15010 GRAPHICS 21:SETCOLOR 4,1,4:SETC
      OLOR 0,2,14:SETCOLOR 1,12,2:SET
      COLOR 2,3,4:REFL=13
15020 OFFX=10:OFFY=0:RESTORE 15200:CO
      LOR 3:GOSUB HPLOTT:RESTORE 1521
      0:COLOR 1:GOSUB HPLOTT
15030 OFFX=54:OFFY=26:RESTORE 15200:C
      OLOR 2:GOSUB HPLOTTRF:RESTORE 1
      5210:COLOR 1:GOSUB HPLOTTRF
15040 OFFX=32:OFFY=26:RESTORE 15250:C
      OLOR 3:GOSUB HPLOTT:RESTORE 152
      60:COLOR 1:GOSUB HPLOTT
15050 OFFX=54:OFFY=0:RESTORE 15200:CO
      LOR 2:GOSUB HPLOTTRF:RESTORE 15
      210:COLOR 1:GOSUB HPLOTTRF
15060 OFFX=32:OFFY=0:RESTORE 15250:CO
      LOR 3:GOSUB HPLOTT:RESTORE 1526
      0:COLOR 1:GOSUB HPLOTT
15070 OFFX=10:OFFY=26:RESTORE 15250:C
      OLOR 2:GOSUB HPLOTT:RESTORE 152
      60:COLOR 1:GOSUB HPLOTT
15080 RESTORE 15400:MUSIC=15400:TEMPO
```

```
      =50:FOR CT=1 TO 21:GOSUB PNOTE:
      NEXT CT
15090 FOR CT=6 TO 14 STEP 2:SETCOLOR
      4,1,CT:GOSUB PNOTE:NEXT CT:RETU
      RN
15200 DATA 4,7,5,4,8,6,4,9,10,4,10,10
      ,4,11,6,3,12,8,2,13,10,1,14,12,
      0,15,14,0,0,0
15210 DATA 5,0,4,4,1,6,4,2,3,8,2,2,4,
      3,6,4,4,6,4,5,6,5,6,4,4,16,2,4,
      17,2,4,18,2,4,19,2,4,20,2,4,21,
      2
15220 DATA 8,16,2,8,17,2,8,18,2,9,19,
      2,10,20,2,11,21,2,0,0,0
15250 DATA 4,8,6,0,9,14,0,10,14,4,11,
      6,4,12,6,4,13,6,4,14,6,4,15,6,4
      ,16,2,8,16,2,4,17,2,8,17,2,0,0,
      0
15260 DATA 5,0,4,4,1,6,4,2,1,6,2,2,9,
      2,1,4,3,6,4,4,6,4,5,6,5,6,4,5,7
      ,4,4,18,2,4,19,2,3,20,2,3,21,2,
      8,18,2,8,19,2
15270 DATA 9,20,2,9,21,2,0,0,0
15400 DATA 121,2.66,121,8,96,4,121,4
15410 DATA 108,2.66,108,8,108,2
15420 DATA 108,2.66,108,8,91,4,108,4,
      96,2.66,96,8,96,2
15430 DATA 96,2.66,96,8,81,4,96,4,91,
      2.66,92,8,91,4
15440 DATA 96,8,108,8,162,2,128,2,121
      ,2,0,0
17000 ? "YOU LIKE TO DANCE.":GOSUB LD
      ELAY
17010 GRAPHICS 19:SETCOLOR 4,2,14
17020 POKE 559,46:A=PEEK(106)-8:POKE
      54279,A:PMBASE=A*256:Y=52
17030 RESTORE 17200:FOR I=PMBASE+512
      TO PMBASE+639:POKE I,0:NEXT I
17040 FOR I=PMBASE+512+Y TO PMBASE+51
      9+Y:READ V:POKE I,V:NEXT I
17050 POKE 704,132:POKE 53277,3:MUSIC
      =17210:TEMPO=30
17060 FOR X=192 TO 49 STEP -2:POKE 53
      248,X:GOSUB PNOTE
17070 POKE PMBASE+519+Y,48:POKE 53248
      ,X-1:GOSUB PNOTE
17080 POKE PMBASE+519+Y,72:NEXT X
17090 POKE 53277,0:RETURN
17200 DATA 152,88,56,24,60,126,40,72
17210 DATA 121,8,128,8,121,8,128,8,12
      1,16,0,16,0,8,128,4,108,4,121,4
      ,96,2
17220 DATA 91,8,96,8,91,8,96,8,108,8,
      121,8,144,8,162,8,162,4,0,8,121
      ,8,128,2
17230 DATA 144,8,144,8,144,8,144,8,14
      4,8,0,8,162,4,144,8,144,8,144,8
      ,144,8,144,8,0,8,162,4
17240 DATA 121,8,121,8,121,8,121,8,12
      1,8,128,8,108,8,121,8,121,8,128
      ,8,144,8,162,8,91,2,0,0
19000 ? "YOU LIKE TO BAKE -":? :? "CO
      CONUT CAKE.":GOSUB LDELAY
19010 GRAPHICS 19:RESTORE 19200:SETCO
      LOR 0,13,12:SETCOLOR 1,0,14:MUS
      IC=19200:TEMPO=30
19020 COLOR 1:PLOT 10,17:DRAWTO 29,17
      :PLOT 10,16:DRAWTO 29,16:FOR CT
      =1 TO 4:GOSUB PNOTE:NEXT CT
19030 COLOR 2:PLOT 10,15:DRAWTO 29,15
      :FOR CT=1 TO 4:GOSUB PNOTE:NEXT
       CT
19040 COLOR 1:PLOT 10,14:DRAWTO 29,14
      :PLOT 10,13:DRAWTO 29,13:FOR CT
      =1 TO 3:GOSUB PNOTE:NEXT CT
19050 COLOR 2:PLOT 10,12:DRAWTO 29,12
      :FOR CT=1 TO 3:GOSUB PNOTE:NEXT
       CT
19060 COLOR 1:PLOT 10,11:DRAWTO 29,11
      :PLOT 10,10:DRAWTO 29,10:FOR CT
      =1 TO 4:GOSUB PNOTE:NEXT CT
19070 COLOR 2:PLOT 10,9:DRAWTO 29,9:F
      OR CT=1 TO 4:GOSUB PNOTE:NEXT C
      T
19080 COLOR 1:PLOT 10,8:DRAWTO 29,8:P
      LOT 10,7:DRAWTO 29,7:FOR CT=1 T
      O 5:GOSUB PNOTE:NEXT CT
19090 COLOR 2:PLOT 10,6:DRAWTO 29,6:S
      ETCOLOR 0,0,14:FOR CT=1 TO 2:GO
      SUB PNOTE:NEXT CT:RETURN
19200 DATA 162,8,162,8,162,8,162,4,12
      8,8,108,4,128,8,162,2.66,144,4,
      144,8,144,2.66,173,4,193,8,217,
      2.66
19210 DATA 162,8,162,8,162,8,162,4,12
      8,8,108,4,128,8,162,4,162,8,144
      ,4,144,8,217,4,173,8,162,2.66,1
      62,2.66,0,0,0
```

You are trapped inside a maze, and you can see only a short distance along its dark corridors as you try to find your way out. A challenging game for the OSI, PET/CBM, Atari, VIC-20, and Apple.

Hidden Maze

Gary Boden
Narragansett, RI

Mazes present a challenge different from arcade-type "shootout" games, but the appeal of a maze can quickly fade once it has been solved. A special program, "Maze Generator" (**COMPUTE!**, December 1981, #19), remedies that problem by drawing a different maze on each run. I have enhanced its challenge by hiding the complete maze from the player and showing only a realistically limited view from any position inside it. Although the view is from above rather than ground level, the player still gets a claustrophobic feeling similar to that of actually being inside the maze and groping along the corridors.

The objective is simply to find a way out of the maze in the least amount of time. Realism is added by showing at most only seven cells in any of the four possible directions of movement. This simulates holding up a lantern and peering down various avenues of escape – at a certain point the light either illuminates a wall or disappears into the gloom.

Moves are made by pressing a key for a particular direction. If no wall obstructs, the player's token advances one cell and a new limited view is displayed. Time ticks on relentlessly whether the player is moving or thinking. Hitting a "panic button" reveals a quick glimpse of the whole maze, but at a high price – 500 time units.

After instructions are given, a seed number is typed in to start the game and feed a random number generator used for drawing the maze and placing the exit. Because the original maze generator results in a maze with only one possible path to the exit, I use the RND function to knock out some interior walls randomly to produce more pathways and more choices for the player. A greater value for the seed removes more walls.

Next the maze is generated, but in memory rather than on the screen. Starting and finishing locations are established, the player's token is moved to the start, and play begins with display of the first limited view. The start, determined in line 660, is at the center of the maze, and the exit is placed at a randomly selected point on either the left or right wall (lines 360-370). The updated score is given with each new limited view, and play continues until the exit is reached.

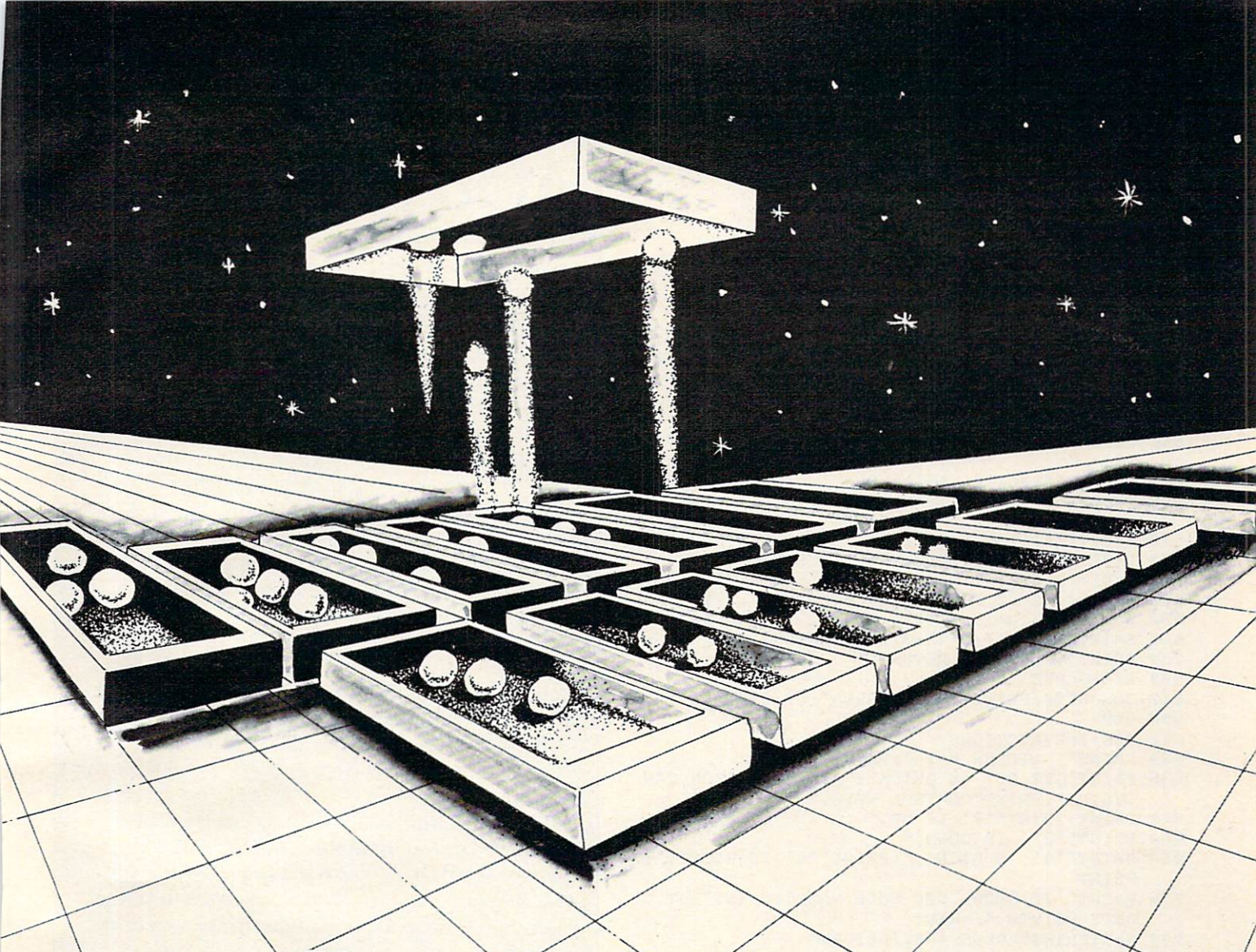
Three final notes: 1) The program requires about 30 seconds to set up the maze. To indicate all is working well, a POKE S2,J in lines 210 and 320 produces a rapidly changing character in the center of the screen. 2) The maze size given in this listing is 23 x 23 cells, but smaller sizes can be created by changing the values of H in line 605 according to this table:

7 x 7 cells	**H= 7**
11 x 11 cells	**H=11**
15 x 15 cells	**H=15**
19 x 19 cells	**H=19**

Other sizes do not work. Centering of the whole view is done by line 650. 3) Several OSI-specific items were changed to convert the program for other machines. The video display on the C1P is 32 characters/line; in line 605 change VL to an appropriate value. Also, variables WL, HL, S2, and symbol numbers for the token (240 in line 160) and the exit (69 in lines 370, 440) were changed to something meaningful in each computer's graphic character set.

Program 1: PET Version

```
10 GOTO400
100 REM-LIMITED VIEW
110 GOSUB730:PRINTCT:FORJ=0TO3:D=A:C=S2
120 FORI=1TO7:POKEC,M(D)
130 POKEC-E(J),M(D-D(J)):POKEC+E(J),M(D+D(J))
140 IFM(D)=WLTHEN160
150 D=D+A(J)/2:C=C+E(J+1):NEXTI
160 NEXTJ:POKES2,240:M(A)=240:RETURN
200 REM-LAYOUT FIELD
210 FORI=1TOH:FORJ=2TOH+1:POKES2,J
220 M((I*(H+2))+J)=WL:NEXTJ:NEXTI
300 REM-GENERATE MAZE
310 M(A)=4
320 J=INT(RND(R)*4):Z=J:POKES2,J
330 B=A+A(J):IFM(B)=WLTHENM(B)=J:M(A+A(J)/2)=H
    L:A=B:GOTO320
340 J=(J+1)*-(J<3):IFJ<>ZTHEN330
350 J=M(A):M(A)=HL:IFJ<4THENA=A-A(J):GOTO320
360 T1=(3*H)+5:T2=INT(RND(R)*2):IFINT(T2/2)*2=
    T2THENT1=(2*H)+6
362 Q1=-1:Q2=-(H+1):Q3=H+3
364 IFT1=(2*H)+6THENQ1=-Q1:Q2=-Q2:Q3=-Q3
366 Z=INT(RND(R)*(H-3))*(H+2)+T1:IFM(Z+Q1)<>HL
    THEN366
370 M(Z)=69:M(Z+Q2)=WL:M(Z-Q1)=WL:M(Z+Q3)=WL
380 FORI=1TOH
382 M(3*(H+2)+4+INT(RND(R)*(H-5))*(H+2)+INT(RN
    D(R)*(H-5)))=HL
384 NEXTI:RETURN
```



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```
400 REM
410 GOSUB600:GOSUB900:GOSUB730:GOSUB200:GOSUB1
    00
415 GETA$:IFA$=""THENCT=CT+1:GOTO415
420 J=-( (A$="8")+2*(A$="4")+3*(A$="2") )
425 IFA$="?"THEN500
435 A2=A+A(J)/2
440 IFM(A2)=69THEN800
445 IFM(A2)<>HLTHEN415
450 M(A)=HL:A=A2:GOSUB100:GOTO415
500 REM-DISPLAY WHOLE MAZE
510 GOSUB730:F=0:FORI=1TOH:FORJ=2TOH+1:L=(I*(H
    +2))+J
520 POKES+J+F,M(L):NEXTJ
530 F=F+FF:NEXTI
540 FORI=1TO200:NEXTI:CT=CT+500:GOSUB100:GOTO4
    15
600 REM-INITIALIZE VARIABLES
605 VL=40:H=23:FF=VL:REM  FOR 80 COLS., CHANGE
     VL TO 80.
610 A(0)=2:A(1)=-(H+2)*2:A(2)=-2:A(3)=(H+2)*2
620 D(0)=H+2:D(1)=1:D(2)=-(H+2):D(3)=-1
630 E(0)=VL:E(1)=1:E(2)=-VL:E(3)=-1:E(4)=VL
640 WL=160:HL=32:S2=32768+VL*12+INT(VL/2):CT=0
650 S=S2-VL*((H+1)/2)+FF-(H+3)/2
660 A=(H+2)*(H+1)/2+(H+3)/2:DIMM(630)
730 PRINT"{CLEAR}";:RETURN
800 REM-SCORE
810 GOSUB730:PRINT"YOUR SCORE=";CT:END
900 REM
910 REM-INSTRUCTIONS
920 PRINT"  HIDDEN MAZE":PRINT
930 PRINT"GET OUT AS QUICKLY AS":PRINT"YOU CAN
     USING":PRINT"CONTROL KEYS."
940 PRINT:PRINT"'8' IS UP,"
950 PRINT"'2'  IS DOWN,"
960 PRINT"'4' IS RIGHT,":PRINT"'6' IS RIGHT,":
    PRINT
970 PRINT"'?' SHOWS THE FULL MAZE":PRINT"BUT C
    OSTS POINTS.":PRINT
980 R=0:PRINT"PRESS {REV}RETURN"
985 GETA$:IFA$=""THEN985
990 RETURN
```

Program 2: OSI Version
Make these changes to Program 1.

```
415 K=PEEK(57100):CT=CT+1
420 J=-(((K=252)*0)OR((K=222)*1)OR((K=250)*2)O
    R((K=255)*3))
425 IFK=126THEN500
430 IFK=254THEN415
520 POKES+L+F,M(L):NEXTJ
605 VL=32:H=23:FF=VL-(H+2)
640 WL=187:HL=32:S2=53776:CT=0
710 POKE11,34:POKE12,2:POKE574,96
720 FORX=0TO27:Y=PEEK(65036+X):POKE546+X,Y:NEX
    TX
730 X=USR(X):RETURN
940 PRINT:PRINT"'ESC' IS UP,"
950 PRINT"'CTRL' IS DOWN,"
960 PRINT"LEFT & RIGHT USE SHIFTS,":PRINT
970 PRINT"'REPEAT' SHOWS THE FULL MAZE BUT COS
    TS POINTS.":PRINT
980 INPUT"ENTER SEED NUMBER       (1 TO 9)";R:
    IFR<1ORR>9THEN980
```

Program 3: Atari Version

```
100 REM  HIDDEN MAZE: ATARI VERSION
110 GRAPHICS 17:GOSUB 360:GOSUB 480
120 PPOS=SC+230
130 POKE PPOS,5
140 DIM DIR(3)
150 DIR(0)=20:DIR(1)=21:DIR(2)=19:DIR
    (3)=1
160 POKE 20,0:POKE 19,0
170 FOR I=0 TO 3
180 ZP=PPOS+DIR(I):PK=PEEK(ZP):POKE Z
```

Atari Notes

Charles Brannon
Editorial Assistant

For the OSI and PET versions, the maze is constructed inside an array, rather than directly in screen memory, as with the original maze-generator. This is necessary to allow an "invisible maze" which only gradually opens up as the player travels.

With the Atari, we have another option. We can construct the maze directly on the screen (GRAPHICS 1 is used here, with custom characters for the walls and player). We make it invisible by setting its color equal to the background color (done here with SETCOLOR 2,0,0).

Then, to open up the maze, we just have to PEEK (into screen memory) the eight characters surrounding the player character, and if the PEEKed character is an "invisible wall," replace it with a visible wall.

Scoring is provided with RTCLOCK, Atari's realtime clock, which is found at locations 18,19, and 20. These are used in the opposite of the normal LSB/MSB order. Chaining all three locations together will give the current "jiffy time" since the machine was turned on, measured in sixtieths of a second:

```
JIFFY=PEEK(20)+PEEK(19)*256+PEEK(18)
    *65536
```

Since location 18 only ticks every once in a long while, you can leave it out for most measurements. Dividing the jiffy time by 60 gives you the time in seconds:

```
SEC=(PEEK(20)+256*PEEK(19))/60
```

Playing Hidden Maze

Use the joystick to move your ebullient little character around the maze, your goal being the upper-left-hand corner of the screen. The challenge is in how long it takes you to get there. You can take a "cheat peek" of the entire maze by pressing the fire button. This will display the maze for about three seconds, then turn to black and delay your movement for another three seconds as a penalty. If you want a really good score, don't use it!

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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

Shutterbug! This game was designed for kids but adults will find it hard to wait for their turn at the shutter! You are a passenger on a tourist bus. You have a camera and a roll of film. The object is to take pictures of houses, trees, and horses. Don't waste film on telephone poles! Shutterbug! is easy to learn (only one key to push) and has very nice graphics to keep kids entertained for hours (teaches eye/hand coordination). Plays from keyboard or joystick. For 5K VIC 20. 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 tail)! Snake! Keeps high score and requires a joystick. Cassette $9.95, Disk $12.95

Munchmaid 5K Due to popular demand, Munchmaid is here in a new 5K version for the unexpanded VIC 20. Fun to play with great graphics, of course! Munch dots, power dots, chase monsters and be chased. Munchmaid 5K! keeps high score and requires joystick. Cassette $10.95, Disk $13.95

Snailbait! Don't let the name fool you. This game is arcade action all the way! Your job is to protect a flower bed from an onslaught of killer snails. You are armed with a spraygun full of insecticide (environmentally approved, of course). As they zip across the field on their way to chomp down your flowers, the snails lay eggs which you'd better destroy, too! For one player, keeps high score and requires joystick, 5K VIC 20. Cassette $10.95, Disk $13.95

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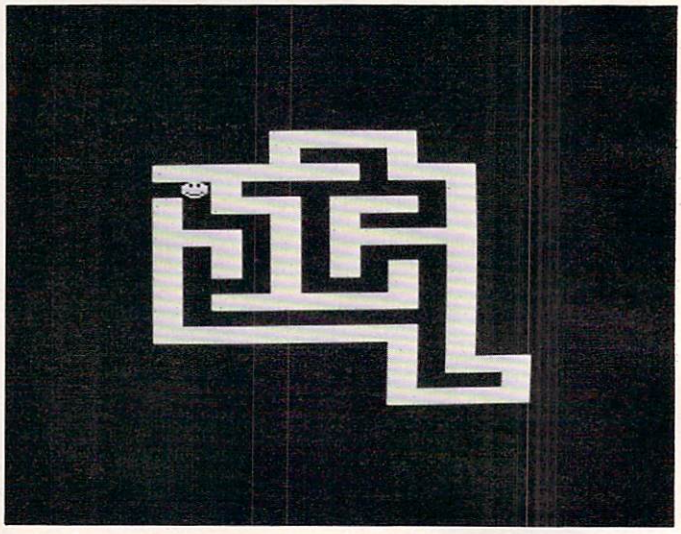
```
    P,PK-64*(PK=129)
190 ZP=PPOS-DIR(I):PK=PEEK(ZP):POKE Z
    P,PK-64*(PK=129)
200 NEXT I
210 ST=STICK(0):TPOS=PPOS+20*(ST=13)-
    20*(ST=14)+(ST=7)-(ST=11)
220 CHR=3*(ST=11)+4*(ST=7)+5*(ST=14)+
    6*(ST=13)
230 IF STRIG(0)=0 THEN SETCOLOR 2,0,1
    4:FOR W=1 TO 500:NEXT W:SETCOLOR
    2,0,0:FOR W=1 TO 500:NEXT W
240 IF STRIG(0)=0 THEN 240
250 IF PEEK(TPOS) THEN 270
260 POKE PPOS,0:POKE TPOS,CHR:PPOS=TP
    OS
270 IF PPOS<>SC+21 THEN 170
280 FOR I=1 TO 50:FOR J=0 TO 3:POKE 7
    08+J,PEEK(53770):NEXT J:NEXT I
290 GRAPHICS 18:? #6;"you did it(2)"
300 SEC=INT((PEEK(20)+256*PEEK(19))/6
    0)
310 ? #6;"IN ";SEC;" SECONDS."
320 ? #6:? #6;"press FIRE to"
330 ? #6;"play again(N)"
340 IF STRIG(0) THEN POKE 711,PEEK(53
    770):GOTO 340
350 RUN
360 CHSET=(PEEK(106)-8)*256:FOR I=0 T
    O 7:POKE CHSET+I,0:NEXT I
370 RESTORE 410
380 READ A:IF A=-1 THEN RETURN
390 FOR J=0 TO 7:READ B:POKE CHSET+A*
    8+J,B:NEXT J
400 GOTO 380
410 DATA 3,56,124,174,174,254,186,68,
    56
420 DATA 4,56,124,234,234,254,186,68,
    56
430 DATA 5,56,84,214,254,254,186,68,5
    6
440 DATA 6,56,124,254,214,214,186,68,
    56
450 DATA 1,255,255,255,255,255,255,25
    5,255
470 DATA -1
480 GRAPHICS 17:POKE 756,CHSET/256
490 SC=PEEK(88)+256*PEEK(89):SETCOLOR
     2,0,0
500 DIM A(3):A(0)=2:A(1)=-40:A(2)=-2:
    A(3)=40:WL=129:HL=0:TRAP 32767
510 A=SC+21
520 FOR I=1 TO 21:? #6;"
    ":NEXT I:POKE A,5
530 J=INT(RND(1)*4):X=J
540 B=A+A(J)
550 IF PEEK(B)=WL THEN POKE B,J+1:POK
    E A+A(J)/2,HL:A=B:GOTO 530
560 J=(J+1)*(J<3):IF J<>X THEN 540
570 J=PEEK(A):POKE A,HL:IF J<5 THEN A
    =A-A(J-1):GOTO 530
580 RETURN
```

Program 4: VIC-20 Version

```
100 REM HIDDEN MAZE: VIC-20 VERSION
110 PRINT"{CLEAR}";:GOSUB 360:GOSUB 480
120 PP=253
130 POKE SCR+PP,5:POKE CMEM+PP,2
140 DIM DIR(3)
150 DIR(0)=22:DIR(1)=23:DIR(2)=21:DIR(3)=1
160 T=TI
```



Hidden Maze – Atari and VIC-20 Version

VIC-20 Notes

The VIC-20 version of Hidden Maze will run on a standard 5K VIC. Use your joystick controller to move the smiling face around the maze, which gradually appears as you move about. Try to reach the upper left-hand corner of the maze as quickly as you can. You can press the fire button to see the entire maze for a few seconds, but you will be "paralyzed" for another few seconds as a penalty.

This game is a direct translation of the Atari version and, as such, is an illustration of some aspects of converting Atari programs to the VIC. The Atari GRAPHICS 1 screen is similar to the VIC-20 screen (20x24 vs. 22x23). Both machines store custom characters in the same format (but at different memory locations). POKEs can be used on both machines to manipulate redefined characters as "shapes," such as the face used in the VIC version.

```
170 FOR I=0 TO 3
180 POKE CMEM+PP+DIR(I),5
190 POKE CMEM+PP-DIR(I),5
200 NEXT I
210 POKE37154,127:X=(NOTPEEK(37151))AND60-((PE
    EK(37152)AND128)=0):POKE37154,255
211 IFX=0THEN210
215 TP=PP-22*((XAND8)>0)+22*((XAND4)>0)-((XAND
    1)>0)+((XAND16)>0)
220 CHR=-(3*((XAND16)>0)+4*((XAND1)>0)+5*((XAN
    D4)>0)+6*((XAND8)>0))
230 IFCHR<3ORCHR>6THENCHR=5
240 IF(XAND32)THENPOKECC,8:FORW=1TO2000:NEXT:P
    OKECC,27:FORW=1TO2000:NEXT
250 IF PEEK(SC+TP)<>32 THEN 270
```

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```
260 POKE SCR+PP,32:POKE SCR+TP,CHR:POKE CMEM+T
    P,2:PP=TP
270 IF PP<>23 THEN 170
280 FORI=1TO100:POKE CCTRL,255*RND(0):NEXT:POK
    ECCTRL,27
290 PRINT"{CLEAR}{REV}{PUR}YOU DID IT!":POKE36
    869,240
300 SEC=INT((TI-T)/60)
310 PRINT"{GRN}IN";SEC;"SECONDS"
320 PRINT:PRINT"{CYN}PRESS {RED}{REV}SPACE{OFF
    OFF}{CYN} TO":PRINT"PLAY AGAIN.{BLU}"
340 GETA$:IFA$=""THEN340
350 RUN
360 REM LOAD CHARACTER SET
365 CHSET=7168:POKE51,240:POKE52,CH/256-1:POKE
    55,240:POKE56,CH/256-1
370 FORI=0TO7:POKECH+256+I,0:NEXT
380 READA:IFA=-1THENRETURN
390 FORJ=0TO7:READB:POKECHSET+A*8+J,B:NEXTJ
400 GOTO380
410 DATA3,56,124,174,174,254,186,68,56
420 DATA4,56,124,234,234,254,186,68,56
430 DATA5,56,84,214,254,254,186,68,56
440 DATA 6,56,124,254,214,214,186,68,56
441 DATA 7,255,255,255,255,255,255,255,255
470 DATA -1
480 POKE36869,255
485 PRINT"{CLEAR}{22 DOWN}{REV}GENERATING MAZE
    {HOME}{OFF}";
490 SC=7680:CMEM=38400:CCTRL=36879
500 DIMA(3):A(0)=2:A(1)=-44:A(2)=-2:A(3)=44
510 A=SC+23:WL=7:HL=32
520 FORI=1TO21:PRINT"{WHT}GGGGGGGGGGGGGGGGGGG"
    :NEXT:POKEA,5
530 J=INT(RND(1)*4):X=J:POKESC+505,J+128:POKEC
    M+505,8*RND(0)
540 B=A+A(J)
550 IFPEEK(B)=WLTHENPOKEB,J+1:POKEA+A(J)/2,HL:
    A=B:GOTO530
560 J=-(J+1)*(J<3):IF J<>X THEN 540
570 J=PEEK(A):POKEA,HL:IFJ<5THENA=A-A(J-1):GOT
    O530
575 PRINT"{HOME}{22 DOWN}                {HOME}
    ";:POKESC+505,32
580 RETURN
```

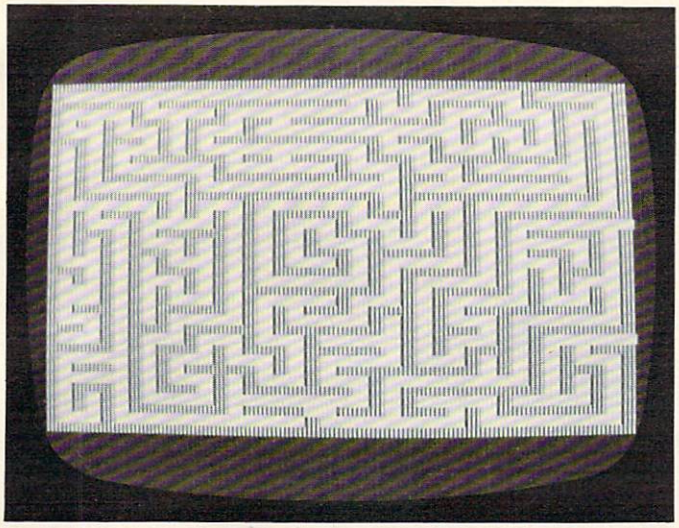
Program 5: Apple II Version

```
100  REM     HIDDEN MAZE:APPLE II
                      VERSION
110  HOME
120  GR : REM  GO INTO LO-RES MODE
130  HTAB 13: FLASH : PRINT "GENE
     RATING MAZE": NORMAL
140  REM  INITIALIZE VARIABLES
150 A(0) = 2:A(1) =  - 80:A(2) =
      - 2:A(3) = 80
160 WL = 8:HL = 7:CT = 0
170  DIM M(1680)
180 A = 859:L = 40
190  REM  GENERATE MAZE
200  FOR I = 2 TO 38: FOR J = 0 TO
     38
210 M(I * L + J) = WL: COLOR= J: PLOT
     L *  RND (1),L *  RND (1): NEXT
     : NEXT
220 M(A) = 4: GR
230 J =  INT ( RND (1) * 4):Z = J
240  COLOR= 16 *  RND (1)
250  PLOT L *  RND (1),L *  RND (1)
260 TT =  PEEK ( - 16336)
270 B = A + A(J): IF M(B) = WL THEN
     M(B) = J:M(A + A(J) / 2) = H
     L:A = B: GOTO 230
280 J = (J + 1) * (J < 3): IF J <
     > Z THEN 270
290 J = M(A):M(A) = HL: IF J < 4 THEN
     A = A - A(J): GOTO 230
300  GR :PX = 19:PY = 21: HOME
310 XD(0) = 1:YD(0) = 0:XD(1) = 0
     :YD(1) = 1:XD(2) =  - 1:YD(2
     ) = 1:XD(3) = 1:YD(3) = 1
320 D(0) = 1:D(1) = 40:D(2) = 39:
     D(3) = 41
330  REM  RANDOMLY KNOCK HOLES IN
      MAZE
340  FOR I = 1 TO 20:M((36 *  RND
     (1) + 2) * 40 + 38 *  RND (1
     )) = HL: NEXT
350 LOC = PX + PY * 40
360  FOR I = 0 TO 3
370  COLOR= M(LOC + D(I)): PLOT P
     X + XD(I),PY + YD(I)
380  COLOR= M(LOC - D(I)): PLOT P
     X - XD(I),PY - YD(I)
390  NEXT I
400  COLOR= 15: PLOT PX,PY
410 DIR =  PEEK ( - 16384): IF DI
     R < 128 THEN CT = CT + 1: GOTO
     410
420  POKE  - 16368,0:T =  PEEK ( -
     16336)
430 DIR = DIR - 128
440 TX = PX + (DIR = 75) - (DIR =
     74)
450 TY = PY + (DIR = 77) - (DIR = 73)
```

Apple II Notes

The Apple II version of Hidden Maze uses low-resolution graphics (40x40). The maze is generated inside a 40x40 array, and each part of the maze is displayed with the standard PLOT and COLOR commands. A good enhancement to the game would use page-flipping in the high-resolution mode (to quickly flash the completed maze), and a series of shapes for the player character.

Your player character is represented by a white square. Use the I, J, K, and M keys (I = up, M = down, J = left, and K = right) to move the square within the maze. Try to "escape" the maze by reaching the upper left-hand corner as quickly as possible. If you get stuck, press SPACE for a brief view of the entire maze (you will be charged 500 extra "time units" for this, however, and the screen will clear, erasing all the paths you've uncovered).



Hidden Maze – Apple Version

```
460   IF DIR = 32 THEN  GOSUB 620:
      GOTO 350
470   IF M(TX + TY * 40) <  > HL THEN
      410
480 M(TX + TY * 40) = 15:M(PX + P
      Y * 40) = HL
490   COLOR= HL: PLOT PX,PY: COLOR=
      15: PLOT TX,TY:PX = TX:PY = TY
500   IF (PX + PY * L) <  > 121 THEN
      350
510   FOR K = 1 TO 10
520   FOR I = 1 TO 10:A =  PEEK ( -
      16336): FOR W = 1 TO 10 - I:
       NEXT : NEXT
530   FOR W = 1 TO 50: NEXT : NEXT
540   TEXT : HOME : FLASH
550   FOR I = 1 TO 24: PRINT "
            ": REM  39 SPACES
560   NEXT : VTAB 11: HTAB 15: PRINT
      "YOU DID IT!"
570   FOR W = 1 TO 5000: NEXT
580   HOME : INVERSE
590   PRINT "YOUR SCORE:";CT
600   NORMAL
610   END
620   REM  DISPLAY WHOLE  MAZE
630   FOR I = 2 TO 39
640   FOR J = 0 TO 38
650   COLOR= M(I * L + J): PLOT J, I
660   NEXT J
670   NEXT I
680   FOR W = 1 TO 500: NEXT
690 CT = CT + 500: GR : RETURN
```

A Monthly Column

The World Inside The Computer

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!**

Letters From Readers:

Software, Sexism, And Other Topics

Fred D'Ignazio
Associate Editor

I have received lots of mail from people who read this column. Most people write to compliment me and tell me I'm on the right track. But I also get letters that are critical. I welcome both types of letters. Please keep them coming.

Recently, I received a letter from Jan Murphy who wrote that she had been enjoying my column each month. Then she read the column on the computer friend (**COMPUTE!**, August 1982). On page 82, she read the following words:

> Is this child a boy or a girl? The computer friend should know.

This line profoundly angered and upset Jan. Why? I'll let her tell you in her own words:

Why am I mad? I said to myself, 'How refreshing it would be to have a friend who didn't care *if you were a boy or a girl. And this computer friend idea would be a great chance to do that, but if everyone makes the computer friend* know *then that chance would be wasted.'*

Why *"should" the computer friend know the gender of a child? So the friend can treat the child in an "appropriate" way? How about letting the computer friend treat the child like a child instead?*

I don't go around saying all men are horrible, or get active in political things, or do many other things that people imagine "feminists" do. I reject the term feminist; I want human *liberation, freedom for both men and women to be who they are. So if my brother can't fix a car, who cares? That makes him bad at fixing cars, not "less masculine". And if I like computers, why shouldn't I? This is the kind of trap I see us all falling into when I read that the computer friend "should know" the child is a boy or a girl.*

It can't be coincidence that girls often do better in math in elementary school, yet by the time they are in the 12th grade, they can't cope with numbers. There were 3 out of 30 in my physics class, 3 girls and 27 boys. Why do you think I never learned which way to turn a screwdriver until one of my (male) friends taught me, in high school? Because "girls" don't get building toys for Christmas, that's why. Or telescopes, or chemistry sets, or tools. Why? There's no reason – it's just the way things have always been done, that's all, and we don't bother to cast off all the old baggage from the past when a better way of doing things turns up. (Perhaps I should say it this way: nobody likes to give up old software.) That's natural. But (as

usual) Ursula K. LeGuin has said it before, and said it better than I ever could:

> *To oppose something is to maintain it. They say here that "all roads lead to Mishnory." To be sure, if you turn your back on Mishnory and walk away from it, you are still on the Mishnory road. To oppose vulgarity is inevitably to be vulgar. You must go somewhere else; you must have another goal; then you walk another road.*
>
> –The Left Hand Of Darkness
> *(Estraven, in chapter 11)*

I want our children to be people *first, and doers of great deeds, and makers of great works, creators and conservers and heroes; all these things first, and then, later, when they know who they are and that they can do great things, and that the world is full of wonderful things for them to learn, when they are firmly settled with a sense of their worth, then, they can also learn to be* boys *and* girls *(if it is still necessary) or* men *and* women. *But I want us to break the circle, as LeGuin would say, and go free. That's my goal. You want kids to be able to learn and grow, too, otherwise you wouldn't write such a neat column. Right?*

So when you make your computer friend with your child (and this goes for both your children) please *be careful and think about what you might be doing (unconsciously, I know) when you tell the computer friend things about your child. You've been pretty good so far, using "she" and "her" some of the time (I've noticed, yes, and I was impressed), so keep up the good work.*

Well, you wanted input on your idea for a computer friend/pet. I don't know if this is quite what you had in mind. But a computer named after the Archmage of Roke deserves the best, and it would break my heart to see him acting like the computer in a bad Heinlein novel.

Thanks for your columns (I loved the story about Eric and your floppy disks; I'm glad you didn't lose anything) – I'm looking forward to Catie and Eric's further adventures.

A Response To Jan's Letter

Jan's letter was thoughtful and thought-provoking. It angered me and upset me. It also convinced me that I had made a serious blunder.

I spent several days thinking about what Jan said and talking it over with my wife. I've come up with a tentative response.

First, I'm glad Jan wrote. The issue she raises is vital. The more "friendly" that software becomes – the more it acts like a person – the more it will carry hidden values. The question is: what are those values? Are they fair to all people? Or are they prejudiced and unfair?

Also, this issue assumes even greater importance now that young children are beginning to use personal computers. These children's values are largely unformed or, at least, extremely malleable. Values hidden inside computer-friend and computer-tutor software might be easily transmitted to young children. Again, it's important for us, as parents and teachers, to uncover these values and make sure they are similar to our own values.

In this specific case, however, I'm afraid that I disagree with Jan over whether the computer friend should ask the child's sex. I still think it should. It should for two reasons.

First, the child's sex is a biological fact. Second, the child's sex is an important, perhaps decisive, factor in determining how other people will treat the child. For good or bad, it is too big a factor for the child, or the friend, to ignore. Only by dealing with it can the child (and the friend) overcome it.

Back to reason number one: biology. For biological reasons alone, the child's sex is a central fact of the child's life. The child identifies herself or himself, in part, based on that fact.

I'm not saying what that fact means. I'm not saying that girls and boys shouldn't be free to express their personalities. I'm only saying it is an important fact and should not be covered up, rationalized, or denied. If I were a girl or a boy and I had a computer friend, I would want *my* friend to know my sex.

Second, unlike the computer friend, the child does not live in a vacuum. It lives in the real world. And the real world is filled with people who discriminate against women and men (in different ways, of course). Prejudice is built into the laws, into people's values and opinions, into institutions, and into almost every activity of our lives.

If the friend is to become a real friend, it must learn which side of the sexual fence the child is on. Only then will it be able to relate to the challenges the child will face in trying to overcome the injurious sexual stereotypes that pressure the child into a certain kind of behavior, career, style of life, or whatever.

This issue seems a little over-dramatized, given the extremely simple computer friend we have discussed so far. But a major trend in computer software is to anthropomorphize computers and make them more lifelike, human, and friendly. Computer friends in the near future won't be toy programs to amuse preschoolers. They will be built into silicon chips and be an intimate part of our daily lives – in the office, in the school, and in the home. Therefore, the type of values our "friends" should have is a good issue to be thinking about right now.

What Do You Think?

Now it is your turn, readers. What do you think about all this? Please write and tell me how you

feel. Send your letters to:

Fred D'Ignazio
c/o **COMPUTE!**
P.O. Box 5406
Greensboro, NC 27403

A couple of months from now, I'll revive this issue and print some of the most thought-provoking letters I receive.

Computer Friends For Adults

A couple of weeks after I'd received Jan's letter, I got a letter from Irwin J. Davis of Bridgewater, New Jersey. In his letter, he proposed a computer friend for adults. Here is an excerpt from his interesting letter:

I read with interest your article about building a computer friend for a child. It did occur to me that the same concept could apply to adults. Why not build into the computer an adult personality like The Sage or Chief Mentor. The programmer could put in all his favorite sayings or aphorisms from secular or religious sources as Thoreau, Montaigne, The Bible, etc. The computer could suggest meditation exercises, relaxation techniques depending on how the person felt. In the past people would keep a journal and write sayings or thoughts of importance in them. Why not put them into a computer under certain categories and recall them for certain moods. Suggested types;

The Sage or Philosopher
The Psychologist
The Swami
The Man of Action
The Rabbi, Minister, or Priest

The programmer would have to know quite a bit about his character, which would be a good exercise for him.

What do you think about this adult computer friend? Write me if this letter has given you any ideas.

Computing In The Third World

I am tucked away in a nice little city in the U.S. This city has every kind of computer support system I could possibly want. But what would happen if I were a total novice who wanted to acquire a personal computer *and I lived somewhere in the Third World* (a developing country in Africa, Asia, or Latin America)?

This was the issue posed to me when I received a letter from J. J. Bichier, in Caracas, Venezuela. Bichier is a bush pilot and author. He wants to get a personal computer.

Here is his story:

I am a bush pilot-operator, out there in South America. Though the idea has been floating in my mind for a long time, a couple of months ago on a flight to Miami, I caught up with computers.

Flight plans, maintenance, operations, costs, losses and profits, all could nicely be automated and streamlined down to the meanest decimals, if I put together the proper hard- and software (within a reasonable budget) and learned how to use it.

To the good!

Besides the natural fascination for the technology itself, my main interest in computers lies in the fact that I am also an author.

When I think of the tedious time- and energy-consuming process of writing large books with paper, pen, typewriter, and dictionaries, my mind overflows with the reams of crumpled and unfinished versions I have to go through to get to the final copy. I am sixty and, besides the hard labor, there may not be that much time available. That's where an adequate word processor, proofreading attached, comes in.

When I think of the possibility of pouring schematics, material, partial or polished chapters into the box, with the ability to retrieve the text instantly, look at it, work on it and store it again to maturation of page, chapter, book, I drool.

I naturally surrounded myself with all the magazines and a couple of books I could find, haphazardly, to fill in the blanks. I went through them hungrily. I am learning PET/CBM BASIC and it doesn't seem that far off.

But all the ads do not tell the whole story. Venezuela, my country, lies thousands of miles and weeks away from the mainstream of marketing, support and maintenance infrastructures of any technology, computation to the fore. That has to be considered as well. Another fact is my total lack of experience with the equipment, technologies, and skills concerned.

For weeks I have sent letters to manufacturers, wholesalers, dealers and others, to make up my mind as to hardware, softwares, methods and prices. I thought their literature might fill some of the gaps. To my dismay, there was no feedback. Nothing flat.

Since no one in my surroundings is interested enough or possesses the necessary experience to help me, I am calling blind: I beg of you to do so, if you would and could find the time.

After reading all the ads and related articles, promising the "ultimate tool" for so many dollars less than their competitors and a lot of mulling over, I come up with the following system layout:

– Commodore 8032 (main unit)
– Z RAM board (summing 96K main working memory and Z 80 64K CPM compatible memory)
– Commodore 8250 2 mega floppy storage
– C Itoh F 10 daisy wheel silent printer
– Word Pro 5+
– Compatible proof reader (unidentified)
– Small business management software I could easily adapt to airplanes (unidentified)

– Odds and cables
– Spare daisy wheels and ribbons
– Spare floppy disks
– All user and maintenance manuals for each piece of equipment
– Fast access to parts, boards, chips, bits and pieces
– Summing some $5000
– To be delivered at Fort Lauderdale Executive Airport, Florida, which is of easy reach for me.

Questions abound. Are the components wholly compatible with each other? How reliable and gremlin proof? Is the whole system compatible with my goal? Did I shoot short of the necessary memory to manipulate the makings of books? Etc.

My audacity may surpass my ignorance and you may have a good laugh.

There is no 100% proof reason for me to espouse the Commodore system rather than any other in its price range. It just seems to fit and for no valid reason at all I like it. My philosophy on the matter is that whichever system I end up with, my task will be hundreds of times easier, once I master its particularities, learn it inside out, and stick with it.

Another factor in favor of Commodore is that it is represented in Caracas, though it carries a 100% markup over stateside retail prices. There may be some support there. On the other hand, a son of mine is trouble shooting for Ohio Scientific in Venezuela. With the proper manuals in hand, there should be no fuss to keep going.

Still, the decision is intimidating.

Another interesting challenge I can come up with is this: I am trilingual, but do word processors and proofreaders exist for Spanish or French tongues? The answer to that might make of me another non-native English writer, though most of what I have to say is a lot tastier in its native Spanish.

This is my story. I hope your secretary will be kind enough to let it reach you – so you may decide to help.

Whichever happens, I shall be counting the days to thank you.

If you have any knowledge that would help Señor Bichier, please write him directly:

Cap J. J. Bichier
Apartado de Correo Este 60409
Caracas 1060
Venezuela
South America

Also, I would very much like to hear from readers who know what it is like to use personal computers outside the United States, particularly in the Third World. In a couple of months, I will touch on this subject again and print excerpts from some of the letters I receive.

Upcoming: Teacher And Pet

In two months, I'll return to my discussion of the computer friend. We'll make the friend capable of remembering things it learns from the child. Then we'll experiment with this feature by creating a "friendly" computer teacher and a "friendly" computer pet.

As you read the column and try the friend programs, please write me with your comments and send me copies of program enhancements you develop – on any of the popular machines. At the end of my discussion about computer friends, I will print the most helpful letters and listings. ©

High res graphics can be used for games, math equation plotting, light pen applications, drawing designs – any application where you want to turn on one dot on the TV screen. This article explores high resolution graphics on the 5K and extended 8K VIC-20.

Understanding VIC High Resolution Graphics

Roger N. Trendowski
Randolph, NJ

The VIC performs high res graphics through bit mapping the screen. Bit mapping is a method where each dot of resolution on the screen (called a *pixel*) is assigned its own bit in memory. If the bit is one, then the pixel is on; if zero, the pixel is off.

Your screen displays 506 alpha/numeric/graphic characters, 22 horizontal and 23 vertical. Since each character is made of 8x8 pixels, your screen consists of 32384 pixels. With high res graphics, you can selectively turn off or on each of these 32384 pixels – if you have enough memory (more about memory requirements later). Without enough memory, the X or horizontal coordinate may vary from 0 to 176, and Y from 0 to 184.

VIC Technique

Bit mapping is done on the VIC using the "programmable character" technique – when you POKE a screen location with a number from within that location. Try this on an unexpanded VIC: press the [RUN STOP] [RESTORE] keys, then type in:

```
POKE36879,62
POKE7690,0
```

This places a character display code of zero in the top middle of your screen (location 7690). An "@" character should appear. The first POKE turns the screen blue so that you can see the character. To display this character, VIC takes the display code and looks up the corresponding eight lines in ROM (Read Only Memory) starting with location 37768.

In the case of display code "0", the first eight bytes (memory locations) of ROM are used – 37768 through 37775. Each eight-bit byte in ROM defines a row of pixels which make up part of the "@" character. Now, if the display code "1" was POKEd instead of "0", an "A" would be displayed – it is stored in eight bytes of ROM starting at 32776.

The next step in understanding the bit mapping technique is to see how programmable characters are changed. Since the ROM area where the alpha/numeric/graphic characters are stored cannot be changed by a POKE command, we must change the VIC pointer from ROM to unused locations in RAM (Random Access Memory). To change this pointer, type in:

```
POKE36869,253
```

This memory location, which contains both the character memory pointer and a screen memory pointer, now points to RAM location 5120. The graphic garbage on your screen represents random data stored in the new eight-byte character RAM locations. Hit the [RUN STOP] [RESTORE] keys to clear the screen.

Try this short program which will show some of the fundamentals of high res graphics and bit mapping.

```
10 POKE36879,62
20 FORI=5120TO6143:POKEI,0:NEXT
30 POKE7680,0
40 POKE36869,253
50 POKE5120,1
60 GOTO50
```

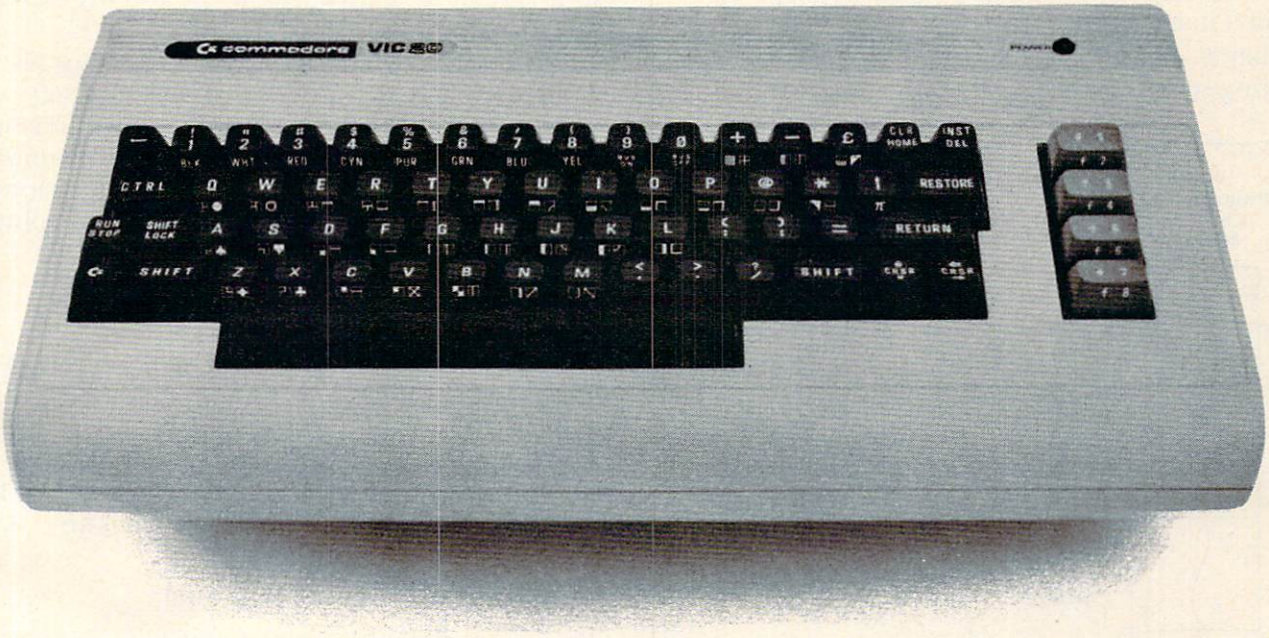
Look at what has happened at the top left of the screen. A pixel has been turned on in the first row. Line 20 of the program cleared random data out of the RAM memory locations 5120-6143. Line 30 put a display character code of zero in 7680 (normally an @ character equals display code zero). Line 40 changed the character pointer from ROM to RAM location 5120. Line 50 created a new character in the first of eight bytes that define display character zero. The remaining seven bytes of display character zero (locations 5121 through 5127) remain cleared, meaning their bits are equal to zeros. Line 50 causes bit position 0 (right-most bit in the byte) to equal one. Line 60 causes VIC to remain in a loop so that the screen does not display "READY" and interrupt our demonstration. A conclusion from this exercise is that setting a bit to one in programmable character memory (e.g., 5120, bit #0) turns on a corresponding pixel.

Try using binary word encoding with different values (0-255) in line 50 of the above program.

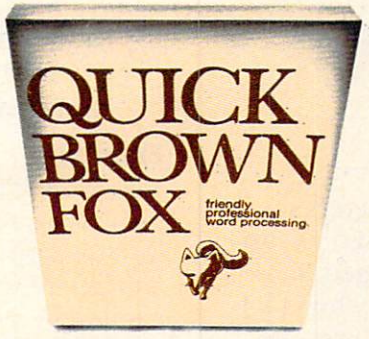
```
Bit #  76543210
Byte 5120 ^^^^^^^^
          00000001 = 1
          00000010 = 2
          10000000 = 128
```

To expand your understanding, type the following change to the above program and run it:

WORD PROCESSOR?



You bet! Quick Brown Fox word processing software has more features than Word Star and runs on even a standard VIC-20. And it can grow and grow. Add memory, 80 column display, disks, even a letter quality printer. We'll show you how a first-class word processor can be yours for less than $2000! It all starts with the Quick Brown Fox at $65.



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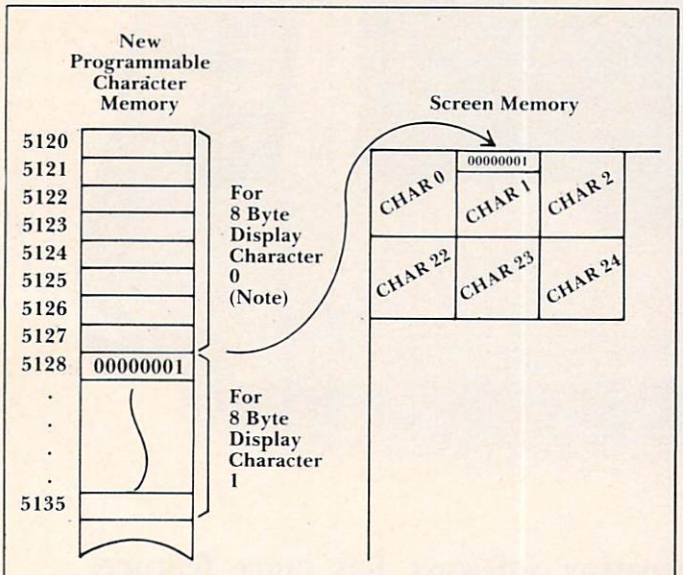
Dealer Inquiries Invited (212) 925-8290

```
30 U=0:FORJ=7680TO7701:POKEJ,U:U=U+1:
   NEXT
50 POKE5128,1
```

The screen should show a pixel set in the 16th position from the left. Line 20 POKEd display codes of 0,1,2...21 into VIC's screen memory 7680 through 7701. Corresponding eight-byte blocks of RAM, starting with 5120, are cleared except for the bit 0 in byte 5128 – the top row of character number 1. Therefore, VIC turns on the corresponding screen pixel.



Note: When 8x16 character size is used, 16 bytes are used to define a display character on the screen.

Display Characters

If there are 506 character positions on the screen and only 256 possible display characters, then the question is: how do you fill up the rest of the screen? Use an obscure memory location – 36867, bit 0.

Type "NEW" and then type the following lines without line numbers:

```
POKE36879,62
POKE36867,(PEEK(36867)OR1
POKE7690,0
```

Among graphic garbage, two characters should have appeared at the top center of the screen: an "@" over an "A". The second line changed the VIC to a character matrix size of 8x16 (when bit 0 of this location equals 1). The VIC now uses the first 16 bytes to define display character 0. The third line POKEs display code zero into location 7690. In this way, by POKEing from 0 through 253 display codes on the screen, we can display all 506 character positions.

Memory Requirements

As mentioned earlier, bit mapping the entire screen would require 32384 pixels or 4048 bytes of RAM (32384 divided by eight bits per byte). With the original VIC-20, you have only 3583 bytes of BASIC RAM to work with for both the program and bit mapping. Therefore, you will have to limit the area of the screen you map. With a +3K or +8K memory expander cartridge, you can map a larger portion of the screen. It takes both the 3K and 8K expansions to bit map the entire screen.

When using an 8K expander, you must also perform some extra operations. A critical step will be to locate your high res program above screen memory and programmable character memory. I suggest location 8192, which is the first location in the 8K expander. The following 8K high resolution demonstration program will explain this technique.

X and Y Coordinate Calculations

Given that we now know how to turn a pixel off or on by changing a bit in programmable character memory (5120+), we still must have the program take an X or Y coordinate and translate it to the corresponding byte number and bit location. The following calculations must be made by the program:

```
CHAR = INT(X/8)*11+INT(Y/16)
```

This gives the display code of the character you want to change. Next, calculate the proper row in the character by using:

```
ROW = (Y/16-INT(Y/16))*16
```

From the CHAR# and ROW#, you can calculate the byte where X and Y lies.

```
Byte = 5120+16*CH+R0
```

The last calculation to be made identifies which bit must be changed.

```
Bit = 7-(X-(INT(X/8)*8))
```

To turn on any bit with the coordinates X,Y, use this formula:

```
POKE BY,PEEK(BY) OR (2↑BI)
```

Example

Program 1, for the unexpanded 5K VIC, bit maps approximately two-thirds of the screen and allows you to control pixel plotting with a joystick. The portion of the screen used for high res graphics is limited by your BASIC RAM area. Only 1022 bytes are left available for a BASIC program (locations 4096 to 5019). By changing the programmable character pointer from location 5120 to 6144 or 7168 (see Table 1), you make more bytes available for your BASIC program; therefore, there is less bit map area of the screen.

In Program 1, line 50 sets up parameters for joystick control and starting X and Y coordinates.

Line 60 colors the screen so that pixels will show. Line 70 clears all programmable character locations. Line 80 changes the VIC screen to an 8x16 character matrix size. Line 90 POKEs display codes zero through 153 in screen memory locations 7680 through 7832. If you insert an "END" statement between lines 90 and 100, you can see the display characters as taken from ROM. Line 100 changes the character pointer from ROM to RAM (location 5120). The screen clears to black because there are no programmable characters defined in 5120 to 7679.

The main program loop starts at line 110. This line points to the subroutine for reading the X and Y coordinates from the joystick. (If you want an explanation of this subroutine, look up David Malmberg's article in the fall 1981 issue of *Home and Educational Computing!*.) Lines 120 through 160 perform the necessary character (CH), row (RO), byte (BY), and bit (BI) calculations and operations to turn on a pixel. Warning: when you are playing with the demo program, don't go out of bounds or else you will invade other important memory locations. Strange things will appear!

Example Program For 8K Expanded VIC-20

This demonstration program will bit map approximately 75% of the screen, leaving 8192 bytes free for your application program. By the way, these 8192 bytes are all located in the 8K expander. The 75% limitation results from the VIC requirement that all screen memory and programmable character memory be resident in the VIC and not in the 8K RAM expander.

Before typing in or loading this program, type in the following:

```
POKE44,32
POKE642,32
POKE8192,0
```

These three POKEs are critical! The first and second commands place the new page number of where your BASIC program will be loaded into RAM. The page number is derived by dividing the intended starting address by 256 since there are 256 bytes per page in the VIC (8192/256 = 32). The third command zeros the first word of your BASIC program area – a must if you expect this thing to run. Now type in the program.

Except for a few lines, the explanation of this 8K program is the same as for the 5K demo program, except for three lines. Line 90 now contains the starting screen address of 4096 and character display codes up to 190. Line 100 POKEs a 205 into the character pointer to point to location 5120. This difference (253 VS 205) is due to the dual function that 36869 performs. Only the lower four bits of this location contain the character memory pointer. Line 295 is also changed. The Y represents the maximum Y coordinate you can turn on with the joystick.

Program 1.

```
10 REM ORIGINAL 5K VIC   EXAMPLE OF HIGH RES ~
     GRAPHICS
40 REM
50 DD=37154:P1=37151:P2=37152:X=10:Y=10
60 POKE36879,8:PRINT"{CLEAR}"
70 FORI=5120TO8185:POKEI,0:NEXT
80 POKE36867,PEEK(36867)OR1
90 FORI=0TO153:POKE7680+I,I:NEXTI
100 POKE36869,253
110 GOSUB200
120 CH=INT(X/8)+INT(Y/16)*22
130 RO=(Y/16-INT(Y/16))*16
140 BY=5120+16*CH+RO
150 BI=7-(X-(INT(X/8)*8))
160 POKEBY,PEEK(BY)OR(2^BI)
170 GOTO110
180 REM
200 POKEDD,127:P=PEEK(P2)AND128
210 J0=-(P=0)
220 POKEDD,255:P=PEEK(P1)
230 J1=-((PAND8)=0)
240 J2=-((PAND16)=0)
250 J3=-((PAND4)=0)
260 IFJ0=1THENX=X+1
270 IFJ2=1THENX=X-1
280 IFJ1=1THENY=Y+1
290 IFJ3=1THENY=Y-1
295 IFY>104THENY=104
300 RETURN
```

Program 2.

```
10 REM ORIGINAL 8K VIC   EXAMPLE OF HIGH RES ~
     GRAPHICS
40 REM
50 DD=37154:P1=37151:P2=37152:X=10:Y=10
60 POKE36879,8:PRINT"{CLEAR}"
70 FORI=5120TO8185:POKEI,0:NEXT
80 POKE36867,PEEK(36867)OR1
90 FORI=0TO190:POKE4096+I,I:NEXTI
100 POKE36869,205
110 GOSUB200
120 CH=INT(X/8)+INT(Y/16)*22
130 RO=(Y/16-INT(Y/16))*16
140 BY=5120+16*CH+RO
150 BI=7-(X-(INT(X/8)*8))
160 POKEBY,PEEK(BY)OR(2^BI)
170 GOTO110
180 REM
200 POKEDD,127:P=PEEK(P2)AND128
210 J0=-(P=0)
220 POKEDD,255:P=PEEK(P1)
230 J1=-((PAND8)=0)
240 J2=-((PAND16)=0)
250 J3=-((PAND4)=0)
260 IFJ0=1THENX=X+1
270 IFJ2=1THENX=X-1
280 IFJ1=1THENY=Y+1
290 IFJ3=1THENY=Y-1
295 IFY>143THENY=143
300 RETURN
```

Table 1. Important Memory Locations For High Res Graphics

5K (Unexpanded) VIC-20

7680	Start of screen memory
5120 or 6144 or 7168	Start of special RAM for programmable characters
63869	Pointer to character set RAM memory 253 for location 5120 254 for location 6144 255 for location 7168
36867	Sets 8x16 dot character size (Bit 0 = 1)

Table 2. VIC-20 With +8K Expander

43,44	Pointer to start of BASIC Program (Normally, 1,18; change to 1,32 for location 8193)
642,643	Pointer to start of BASIC Program (Normally, 0,18; change to 0,32 for location 8192)
5120 or 6144 or 7168	Start of special RAM for programmable characters
8192	First memory location of BASIC program area. Must be set to zero.
63869	Pointer to character set RAM memory, normally 192; must be set to: 205 for 5120 206 for 6144 207 for 7168
36867	Sets 8x16 dot character size (Bit 0 = 1)

For Apple Logo and Atari PILOT, this program provides a way to make the turtle draw the numerals from zero to nine. Using the techniques shown, you will be able to extend this method to include the alphabet as well. TI and Radio Shack Logo users can build a program from the examples given.

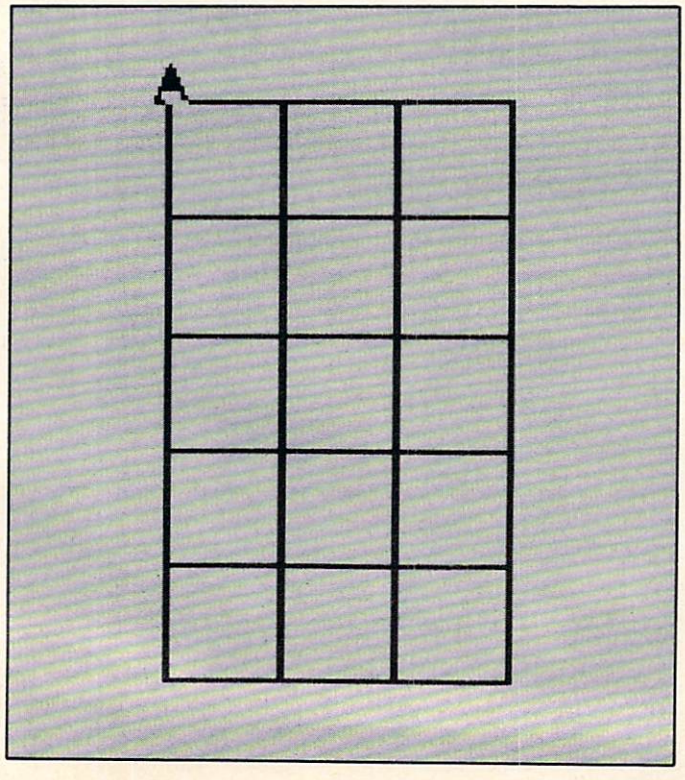
Making The Turtle Count

David D. Thornburg
Associate Editor

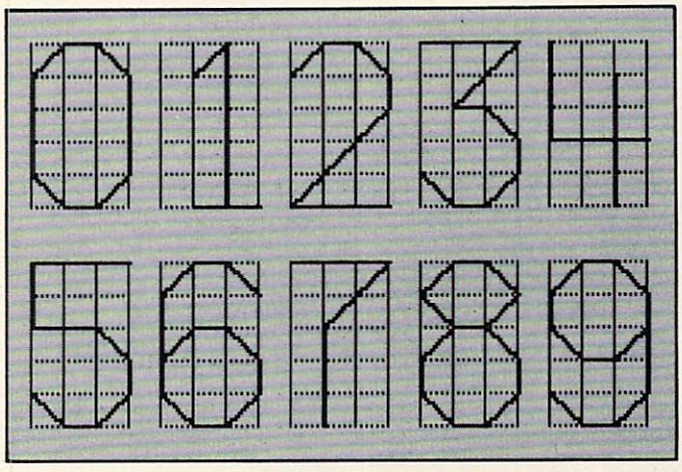
With the single exception of Apple SuperPILOT, none of the popular turtle graphics systems with which I am familiar allows the user to freely intermix text and graphics. One solution to this problem is to teach the turtle how to write!

If we are going to have the turtle draw numbers on the screen, we should pick a number drawing technique that lets us draw numbers of any size, orientation, location, and color we choose. The result will be a text display system that is more powerful than traditional dot matrix characters.

The character field I have chosen is three units wide and five units high. If the resultant characters are too high and skinny on your display, you will want to modify our method slightly to satisfy your own taste. The turtle starts and ends each character at the upper left corner of the grid, with its orientation pointing up along the left edge.



Using this grid we can design the numerals we want to draw, as shown below:



Each procedure for drawing consists of picking the turtle's pen up, moving the turtle to the starting position, putting the pen down, drawing the character in one continuous motion, picking the pen up, and moving the turtle back to its starting position and orientation. The shapes of the characters are defined so that each line segment is either along a grid length or along a grid diagonal. Since the length of the diagonal is larger than the grid length by the square root of two, our procedures need to incorporate this number.

This is fairly easy for the Apple Logos since they all use floating point arithmetic. Atari PILOT, TI Logo, and Radio Shack Color Logo, however, use only integer arithmetic. So, for these languages, we need to find a way to approximate the multiplication of a number by the square root of two. Obviously, we can't use the decimal number 1.414 because the language won't know what to do with it. Similarly, we can't just multiply by (1414/1000) because, if this division is performed first, the result will be one! But, if we first multiply the grid size by 1414 and then do the division by 1000, the result should be an effective approximation.

The following listings for the ten numeral

procedures are shown in Apple Logo and Atari PILOT. Users of TI Logo, Radio Shack Color Logo, and other languages using integer arithmetic will have to mix and match from these two sets of procedures as needed.

Apple LOGO

```
TO ZERO :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
BACK :SIZE
PENDOWN
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE * 3
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE * 3
PENUP
FORWARD :SIZE
PENDOWN
END

TO ONE :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
BACK :SIZE RIGHT 90
FORWARD :SIZE LEFT 45
PENDOWN
FORWARD :ROOT
RIGHT 135 FORWARD :SIZE * 5
RIGHT 90 FORWARD :SIZE
BACK :SIZE * 2
PENUP
RIGHT 90 FORWARD :SIZE * 5
LEFT 90 FORWARD :SIZE * 3
RIGHT 90
PENDOWN
END

TO TWO :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
BACK :SIZE
PENDOWN
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT * 3
LEFT 135 FORWARD :SIZE * 3
PENUP
LEFT 90 FORWARD :SIZE * 5
LEFT 90 FORWARD :SIZE * 3
RIGHT 90
PENDOWN
END

TO THREE :SIZE
MAKE "ROOT :SIZE * 1.41421
RIGHT 90 FORWARD :SIZE * 3
RIGHT 135 FORWARD :ROOT * 2
LEFT 135 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
PENUP
RIGHT 45 FORWARD :SIZE * 4
PENDOWN
END

TO FOUR :SIZE
MAKE "ROOT :SIZE * 1.41421
RIGHT 180 FORWARD :SIZE * 3
LEFT 90 FORWARD :SIZE * 3
BACK :SIZE
LEFT 90 FORWARD :SIZE * 2
BACK :SIZE * 4
PENUP
FORWARD :SIZE * 5 LEFT 90
FORWARD :SIZE * 2 RIGHT 90
PENDOWN
END

TO FIVE :SIZE
MAKE "ROOT :SIZE * 1.41421
RIGHT 90 FORWARD :SIZE * 3
BACK :SIZE * 3
RIGHT 90 FORWARD :SIZE * 2
LEFT 90 FORWARD :SIZE * 2
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
PENUP
RIGHT 45 FORWARD :SIZE * 4
PENDOWN
END

TO SIX :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
RIGHT 90 FORWARD :SIZE * 3
RIGHT 90 FORWARD :SIZE
RIGHT 135
PENDOWN
FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE * 3
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
PENUP
RIGHT 135 FORWARD :SIZE * 3
PENDOWN
END

TO SEVEN :SIZE
MAKE "ROOT :SIZE * 1.41421
RIGHT 90 FORWARD :SIZE * 3
RIGHT 135 FORWARD :ROOT * 2
LEFT 45 FORWARD :SIZE * 3
PENUP
RIGHT 180 FORWARD :SIZE * 5
LEFT 90 FORWARD :SIZE
RIGHT 90
PENDOWN
END

TO EIGHT :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
RIGHT 90 FORWARD :SIZE
PENDOWN
FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 90 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
RIGHT 90 FORWARD :ROOT
PENUP
LEFT 135 FORWARD :SIZE
RIGHT 90
PENDOWN
END

TO NINE :SIZE
MAKE "ROOT :SIZE * 1.41421
PENUP
RIGHT 90 FORWARD :SIZE * 3
```

Atari PILOT

```
*ZERO
C: #R=(#S*1414)/1000
GR: PENUP
GR: DRAW -#S
GR: PEN YELLOW
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S*3
GR: TURN 45: DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45: DRAW #R
GR: TURN 45; DRAW #S*3
GR: PENUP
GR: DRAW #S
GR: PEN YELLOW
E:

*ONE
C: #R=(#S*1414)/1000
GR: PENUP
GR: DRAW -#S; TURN 90
GR: DRAW #S; TURN -45
GR: PEN YELLOW
GR: DRAW #R
GR: TURN 135; DRAW #S*5
GR: TURN 90; DRAW #S
GR: DRAW -#S*2
GR: PENUP
GR: TURN 90; DRAW #S*5
GR: TURN -90; DRAW #S*3
GR: TURN 90
GR: PEN YELLOW
E:

*TWO
C: #R=(#S*1414)/1000
GR: PENUP
GR: DRAW -#S
GR: PEN YELLOW
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R*3
GR: TURN -135; DRAW #S*3
GR: PENUP
GR: TURN -90; DRAW #S*5
GR: TURN -90; DRAW #S*3
GR: RIGHT 90
GR: PEN YELLOW
E:

*THREE
C: #R=(#S*1414)/1000
GR: TURN 90; DRAW #S*3
GR: TURN 135; DRAW #R*2
GR: TURN -135; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: PENUP
GR: TURN 45; DRAW #S*4
GR: PEN YELLOW
E:

*FOUR
C: #R=(#S*1414)/1000
GR: TURN 180; DRAW #S*3
GR: TURN -90; DRAW #S*3
GR: DRAW -#S
GR: TURN -90; DRAW #S*2
GR: DRAW -#S*4
GR: PENUP
GR: DRAW #S*5; TURN -90
GR: DRAW #S*2; TURN 90
GR: PEN YELLOW
E:

*FIVE
C: #R=(#S*1414)/1000
GR: TURN 90; DRAW #S*3
GR: DRAW -#S*3
GR: TURN 90; DRAW #S*2
GR: TURN -90; DRAW #S*2
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: PENUP
GR: TURN 45; DRAW #S*4
GR: PEN YELLOW
E:

*SIX
C: #R=(#S*1414)/1000
GR: PENUP
GR: TURN 90; DRAW #S*3
GR: TURN 90; DRAW #S
GR: TURN 135
GR: PEN YELLOW
GR: DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S*3
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: PENUP
GR: TURN 135; DRAW #S*3
GR: PEN YELLOW
E:

*SEVEN
C: #R=(#S*1414)/1000
GR: TURN 90; DRAW #S*3
GR: TURN 135; DRAW #R*2
GR: TURN -90; DRAW #S*3
GR: PENUP
GR: TURN 180; DRAW #S*5
GR: TURN -90; DRAW #S
GR: TURN 90
GR: PEN YELLOW
E:

*EIGHT
C: #R=(#S*1414)/1000
GR: PENUP
GR: TURN 90; DRAW #S
GR: PEN YELLOW
GR: DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 90; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN 45; DRAW #R
GR: TURN 90; DRAW #R
GR: PENUP
GR: TURN -135; DRAW #S
GR: RIGHT 90
GR: PEN YELLOW
E:

*NINE
C: #R=(#S*1414)/1000
GR: PENUP
GR: TURN 90; DRAW #S*3
```

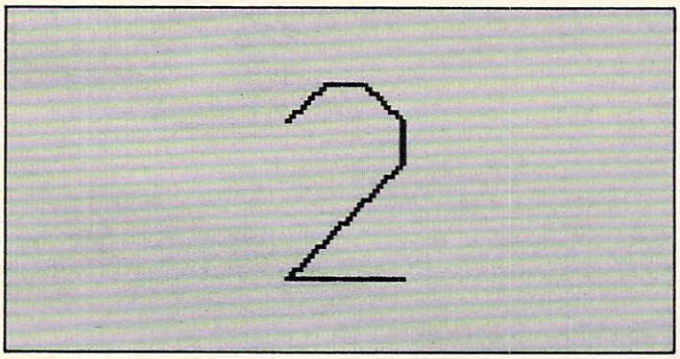
```
RIGHT 90 FORWARD :SIZE
RIGHT 135
PENDOWN
FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
LEFT 45 FORWARD :ROOT
LEFT 45 FORWARD :SIZE
RIGHT 180 FORWARD :SIZE * 3
RIGHT 45 FORWARD :ROOT
RIGHT 45 FORWARD :SIZE
RIGHT 45 FORWARD :ROOT
PENUP
RIGHT 45 FORWARD :SIZE * 4
PENDOWN
END
```

```
GR: TURN 90; DRAW #S
GR: TURN 135
GR: PEN YELLOW
GR: DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN -45; DRAW #R
GR: TURN -45; DRAW #S
GR: TURN 180; DRAW #S*3
GR: TURN 45; DRAW #R
GR: TURN 45; DRAW #S
GR: TURN 45; DRAW #R
GR: PENUP
GR: RIGHT 45; DRAW #S*4
GR: PEN YELLOW
E:
```

Now that these characters have been defined, it is easy to place a numeral anywhere you want on the graphics screen. For example, if (in LOGO) you enter:

```
CLEARSCREEN
HIDETURTLE
TWO 10
```

you will see the numeral 2 on the screen.



In Atari PILOT, the length of the grid unit is given by #S, so you must first enter:

```
C: #S=10
U: *TWO
```

to get this result.

But what about numbers longer than one digit? How does one print these? A LOGO procedure to print multiple digit numbers (using recursion) is shown below (you *have* been reading the "Friends of the Turtle" columns on recursion, haven't you?):

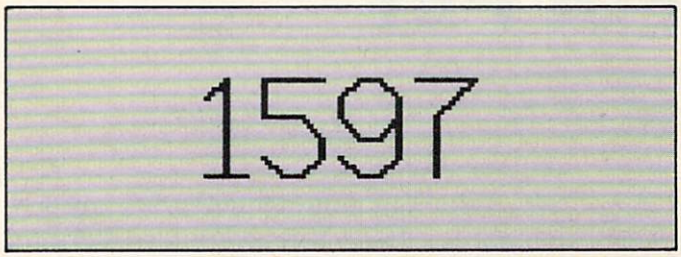
```
TO NUMB :LIST :SIZE
IF :LIST = [] [STOP]
RUN SENTENCE FIRST :LIST :SIZE
PENUP
RIGHT 90 FORWARD :SIZE * 4 LEFT 90
PENDOWN
NUMB BUTFIRST :LIST :SIZE
END
```

(Note: crafty Atari PILOT programmers will find at least two alternate ways to do this. At least one of these people will be kind enough to share the results with the rest of the readers.)

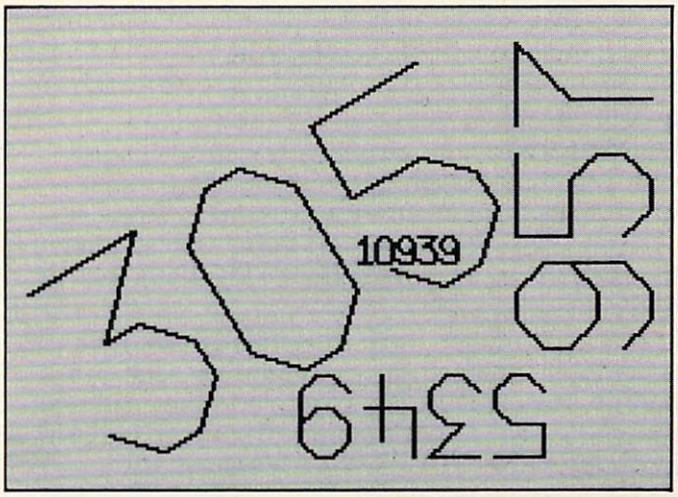
Now, with this procedure in hand, LOGO users should try entering something like:

```
CLEARSCREEN
NUMB [ONE FIVE NINE SEVEN] 5
```

to see what happens.



Experiment with different numbers, sizes, starting points, and orientations. You will find that you can print numbers at any angle. This is very handy for labeling graphs.



Expanding these ten numerals to the full alphabet is fairly straightforward. Any takers? ©

Review:

Supergraphics For PET

Elizabeth Deal
Malvern, PA

Supergraphics, written by John Fluharty, is a language extension for PET/CBM computers. Versions are available for Upgrade and 4.0 systems, 40 and 80 column. A ROM version (for $19000 or $A000 location) is currently available. The RAM versions are being discontinued.

First Impressions

Supergraphics seems to be a well thought out enlargement of the PET's resident BASIC interpreter. Its Turtle graphics, commands to plot lines in quarter-graphics mode, and general picture handling make it an ideal graphics package for children and adults who daily face the need to move spaceships around the screen.

The program does everything as described in the advertising and in the book. The book is clear and concise.

All commands work without a glitch. The mnemonics are well chosen, and there is no ambiguity. Kids can use the system and have, in fact, for over a year in various schools. Several similarities to the Radio Shack language permit children to switch between the PET and the other computer with little difficulty. Words such as CLS and HOME are understood by both languages. PRINT-at is a new concept for PET users, but is easy to grasp and quite efficient.

The housekeeping is fine. The PET is left in a relatively clean state during and after use, and even the memory locations used by such common utilities as the *Toolkit* and *Power* have not been clobbered (though some utilities might get disabled).

The demonstration programs are dazzling, though somewhat misleading. Some things are a bit more difficult to do than the demo would suggest. But then graphics are always tough. The package is well worth the money, and John Fluharty should be congratulated for enriching the PET's vocabulary.

Graphics Commands

There are commands to clear the screen, reverse it, place cursor home, and to list a program on a printer in program or direct mode. A dump of the screen to a printer is supported, but is not quite accurate (quotes are replaced by single quotes). You may switch text/graphic modes without POKEing. Screen images can be transferred to several adjacent alternate areas, permitting animation by quick transfers. The screen cannot be saved, but alternate areas can, so the effect is almost the same. This method is particularly useful to tape users. Saving is done through the monitor.

Quarter-graphics commands include setting and turning off points, drawing lines, drawing boxes, and filling them. Lines can be drawn in normal X-Y coordinates (0,0 in the upper left-hand corner) or in polar coordinates (0,0 in the center of the screen). The 80-column program supports 2:1 scaling of the X-axis. Lines and boxes drawn in quarter-graphics mode can be moved by the MOVE command. The motion can preserve whatever non-quarter-graphics characters are already on the screen. The unit of motion is quarter-graphic, that is, half a row or half a column at one time.

Normal size graphics commands include printing at specified coordinates, Radio Shack fashion (PRINT@col,row;"string"), defining a window for further operation, moving a window in four directions, filling one with a desired character, saving one in an alternate area, and bringing it back. Reversal of a window can't be done.

You may move anything you draw. You can put a spectacular spaceship on the screen using the PRINT@ command (or normal PRINT or POKEs), define its boundaries with CSET X,Y,X1,Y1 and zoom it around with words such as CMOVEU: CMOVEL. Diagonal motion is done by pairs, as in CMOVED:CMOVER. Motion is lightning-fast; you need PAUSE to keep it under control. More than one object can be moved "at the same time," but you'll need to keep track of the definitions, a process neither as easy nor as fast as it might seem.

The book provides little programming help in thinking graphics. Demonstration programs are hard coded with numbers, so you're on your own in the normal world of tedious graphics housekeeping. (Where are we, where are we going, what is there, what do we do if something is or isn't there, take it off, redraw, and back to start. Pheew!)

These block move commands get plenty of use. One-object motion is unquestionably splendid. Two or three objects – such as the background that wraps around or continuously scrolls left to right, and two competing spaceships controlled by users – get a bit sluggish. The reason is that you have to keep track of who is where at the moment, and you have to keep track of collision with another spaceship or walls of the screen. Even though it

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takes only two or three extra lines of BASIC code to process the arrays of housekeeping definitions, it slows the process down, and the book confirms it.

I don't mean this note as a criticism of the program. None of the multipurpose graphics packages I have seen on the PET can handle motion of multiple objects or evaluate the situation at the edges of the screen. It requires tricky coding of tricky possibilities – a mind-reading program, *Wordpro* scope.

Turtle Graphics

Turtle graphics are included in the package: set and reset modes control the process. Work on the reversed screen is logically reversed. Additional commands position a turtle, set its direction, move pen up or down, and perform turns and units of forward motion. All Turtle commands work with quarter-graphics in polar coordinates.

Turtle graphics are a big hit in computer education. Children can learn programming by working with tangible things. We find this implementation nice and easy to use, but sometimes a bit abstract. Since the turtle is invisible, placing it on the screen and setting its direction provide no feedback until the turtle has moved forward. Should the turtle go over an existing line, it is again invisible until its direction is changed. A directional cursor might be helpful.

The turtle can accomplish some nice things, like drawing and rotating objects. The name of the game is learning geometry, and programming things such as rotation of objects should do the job.

I wish that Turtle graphics programs meant for small children limited out of bounds parameters. "Illegal quantity error" on a too large Y is a fact of life people must accept. But little users have enough trouble spelling words correctly; they could be helped by programs that avoided picture-destroying error messages. A no-action on the turtle's part would tell them they are wrong. I may be wrong: perhaps they *should* learn the hard facts of programming life right away.

Miscellaneous Commands

There are several other nice commands. For example, PAUSEX pauses execution for X jiffies. If a zero is given, a message prints "press space to continue" on the bottom line. This can be used instead of a GET loop. Pause is designed mainly to control the rate of animation.

An EXEC command in direct mode loads and runs a program. In program mode, it permits you to overlay a program longer than the calling program. Quite handy. The variables are cleared.

The OFF command turns *Supergraphics* off when you no longer need it, or when you write files from the machine language monitor or do several I/O commands to tape. *Supergraphics* turns its IRQ vector off for most I/O commands, hence it does not interfere – a nice and necessary touch.

The provision for repeating-key on all keys is useful in editing programs.

The SOUND commands are incredible. There are two versions. One is a simplified normal use of CB2 sound; the three POKEs have been squeezed into one command, "SOUND pitch, jiffies duration". The other is an elaborate system which can play music while the program is running or while you are editing the program. Once started, it will play on and on, until you turn it off with SOUND 0,0. A song maker provided in the book helps you include your own songs in a standardized manner.

User Extensions

We have seen that the IRQ routine has already taken a detour to repeat keys and play music. The IRQ routine can take another detour via a TASK command if you write a routine and tell the system where it is. This is valuable.

One more extension can be made in the IEEE vector: during IEEE processing the program checks to see if the user has his own wishes. Special routines can be added, such as a multi-user routine. One such routine has been implemented in a school system where the author teaches. I have not tried this command nor seen it in action.

The validity of the IRQ and the IEEE extension vectors is not checked. There is no extension of the CHRGET vector.

Documentation

The package includes a well-written, concise booklet. There are practically no muddy spots; all commands are explained clearly. The book does not say, for example, that the screen dump command forces paging on the printer.

Both the startup procedure and the various tips on using the system are unambiguous. A valuable set of hints is offered for speeding the processing.

Even though the demo programs show how to work the system, some graphics instructions might be more useful to kids who have never heard of X and Y coordinates. I am sure the schools will take care of it, though they will have to cope with the 0,0 in a funny place.

For programming types, one of the most valuable features is a listing of memory locations used by the program. This helps in understanding the system and permits you to use some values to advantage. You may wish to check the book; however, it seems to me that six more locations are zeroed than used, hence you should stay away from them.

Incidentally, the code is written in tiny, clear

units. With Supermon's help, you can get at some little routines independently of *Supergraphics*.

Housekeeping

This section of my review deals with how the system is built, which has a bearing on how you use your PET. The discussion is not unique to this program; most programs of similar construction share these features.

Supergraphics adds some 35 commands to BASIC by intercepting the CHRGET routine. When you say SYS-supergraphics, you're asking PET to take a detour in its work to process the new commands. Unlike various editing utilities which are inactive during program execution, *Supergraphics* is *designed* to be enabled at all times. All commands are valid in program mode: they are interpreted, and, if needed, acted on, before BASIC gets a look at them. This slows BASIC down considerably – a do-nothing counting loop runs at a quarter of its normal speed.

PET needs time to process the new commands. Purely graphics programs, especially simpler ones of the type children write, don't suffer from the slow-down; in fact, it is unnoticeable. If you mix a lot of non-graphics commands, it is a good idea to use the OFF command frequently, for speed. The only time speed is a problem is in those calculations necessary to detect walls and collisions. At such times *Supergraphics* shouldn't be turned off, since turning it back on re-initializes all the working locations.

There are two things you should be aware of. First, a program written for *Supergraphics* obviously cannot run on a system that does not have *Supergraphics*. Users should be careful what they send to their friends, but this should cause no problem with its use in private or in schools. Second, while *Supergraphics* is enabled, any utility hooked up in any of the *first five bytes* of the CHRGET code is obviously disabled. You may have to cope with this in debugging. The current procedure is to do the OFF command before going SYS-utility. Use of OFF is mandatory: if you forget it, BASIC will not function.

Supergraphics
AB Computers
252 Bethlehem Pike
Colmar, PA 18915
$45 (school discount available)
specify which PET and desired chip location

Book Review:

TRS-80 Color Programs

Linton S. Chastain
Greensboro, NC

If you have a 4K or 16K Non-Extended or Extended BASIC Color Computer and a cassette recorder, you might be interested in a new book titled *TRS-80 Color Programs*, by Tom Rugg and Phil Feldman. The well-documented programs are useful to both the novice and the more advanced programmer. The book is not only a useful source of programs for the Color Computer, but also a teaching tool for beginning programmers.

The book has 37 programs, only nine of which will not run on a 4K machine. Divided into six sections, the book covers such topics as home and office applications, education, games, graphics, and math, and also has some short miscellaneous programs.

Section one contains eight programs – two new ones, and six modified for the Color Computer from the authors' previous book, *TRS-80 Programs*. Section two, with one new and six modified programs, deals with education. Section three, games, has one new and six modified programs, along with some color pictures of screen displays. Section four presents four modified graphics programs. Section five, math, has six modified programs. In section six are miscellaneous programs, one new and four modified.

The screen displays for the programs in the authors' new book are quite good. I have replaced some of my modified programs based on the earlier book with the new ones in the present book, primarily because of the enhanced screen displays.

TRS-80 Color Programs is a useful book for both the novice and the more advanced programmer. It goes beyond the example programs presented in the Color Computer manuals. In addition to helping you understand programming, the book also demonstrates some useful commands that help you shorten your programs and improve your screen displays.

TRS-80 Color Programs fortifies the authors' belief that most programs of similar language can be modified to run on other computers, and it helps to defuse the myth that the Color Computer is merely a toy or game computer.

TRS-80 Color Programs
dilithium Press
$19.95 paperback
332 pages

Review:

Apple Adventures

Dale Woolridge
Harrisburg, PA

Adventure games are older than Apple computers, and a high percentage of micro owners have played with them. These games give you a "world" containing dragons, demons, objects to be manipulated, etc. You use simple commands to move through the "world" and manipulate it.

Adventure – Colossal Cave

This is the original *Adventure* game, written first in FORTRAN for a PDP-10, by Willie Crowther and Don Woods. This program was implemented on the Apple by Master Jacobi. The program was compressed to fit entirely into 48K of RAM to avoid accesses to the disk.

Adventure has 15 treasures which add points to your score. It might not be obvious what a treasure is, so you might be tempted to pick up any object you find. There are 40 useful objects, but they have side effects. For example, the bird is afraid of the rod, and a certain magic word works only when you possess certain objects. The "world" is fairly large, containing 130 rooms. It is easy to find about a tenth of the rooms; the others are hard to find. In addition, there are 12 obstacles or opponents.

The game is complicated enough to keep you busy for a long time. If you are stumped, you can save the game to be resumed later. When you resume, you are asked if you want to load the saved game. If you say yes, you get back into the saved game, and the game is deleted from the disk. If you say no, you can start a new game while the saved game remains on the disk. You can save only one game.

Help, For A Price

A wizard, Arian, guides you through the world. A surprising, and amusing, feature of the game is that if you try many times to do a certain thing, but fail, the wizard will finally offer to help – for a price.

There is apparently a random element to the game. There is at least one situation in which you may or may not be killed, depending on chance.

The scoring scheme is somewhat unusual. You get points merely for discovering parts of the world and for finding objects. Getting killed costs you points. Your wizard might be able to bring you back to life, but you might lose the objects you were carrying.

The program is on a protected disk. The disk boots and the program loads in only nine seconds. At the beginning of the game a message appears briefly on the screen, and if you are a slow reader you might miss some of it. The message appears during the boot phase and disappears when the program executes. However, most of the program is well written and courteous to the user.

Adventureland

This Scott Adams' game has several features unusual in adventure games. The graphics were done using Penguin Software's Picture Editor, by Mark Pelczarski. The quality of the pictures is quite good. It takes 10-20 seconds, typically, to load a picture from the disk, and in case you don't have the time, the program lets you switch between graphics mode and all text mode. Often, a complete picture is "painted" on the screen, and then the disk drive comes on and certain objects are superimposed on the picture. This feature of the program gives you clues about the game, since the superimposed objects can generally move or be moved.

Use Peripherals

If you have a Votrax Type 'N Talk voice synthesizer, you can get the computer to speak the responses to your command. The responses will also be displayed on the screen.

If you have a lowercase adapter on your Apple, you can switch between all uppercase mode and upper/lowercase mode. And if you have a printer, you can get a hard copy of your adventure. The instruction booklet says that with some printer cards you might have to initialize the card in Applesoft before starting the adventure program. The Silentype printer does not require initialization before the game.

Another nice feature is that you can save up to four adventures to be resumed later. Considering that an adventure can occupy you for hours, this feature is desirable.

Before the game begins, you are invited to read an "open letter." The letter is a lecture on software piracy and includes several high resolu-

tion graphic pictures (of pirates, the American flag, etc.).

It is very important to have the proper mind-set when playing *Adventureland.* You must be able to tolerate some frustration, since you might get "stuck" in part of Adams' world. Also, you should realize that a game is not won in a few minutes of play; it might be complicated enough to keep you busy for weeks or months. Ideas may come to you while you are driving, and when you try them out that evening a whole new part of the world will be revealed to you.

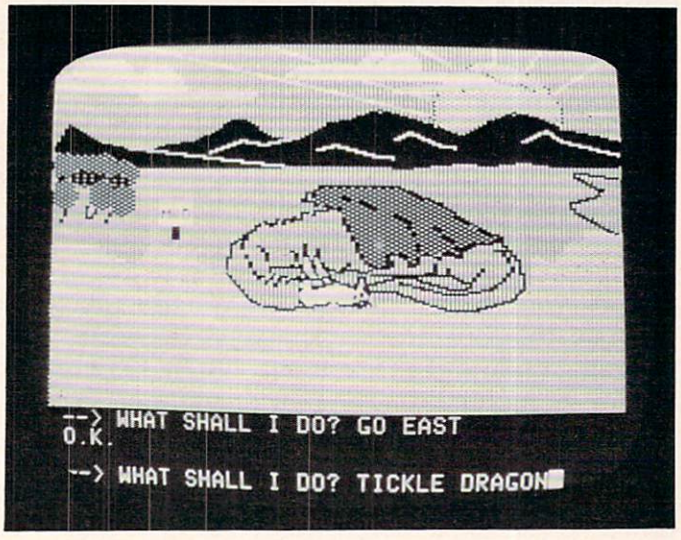
The author's sense of humor is evident. He has apparently anticipated some of the commands you are likely to give and has prepared comebacks for you.

There is little randomness in *Adventureland.* As a rule, the same set of commands will have the same effects in different games. Success is obtained by using reason and common sense. However, there is an element of magic in the game; for example, you can come back to life if you give the right commands after being killed. There are also magic words.

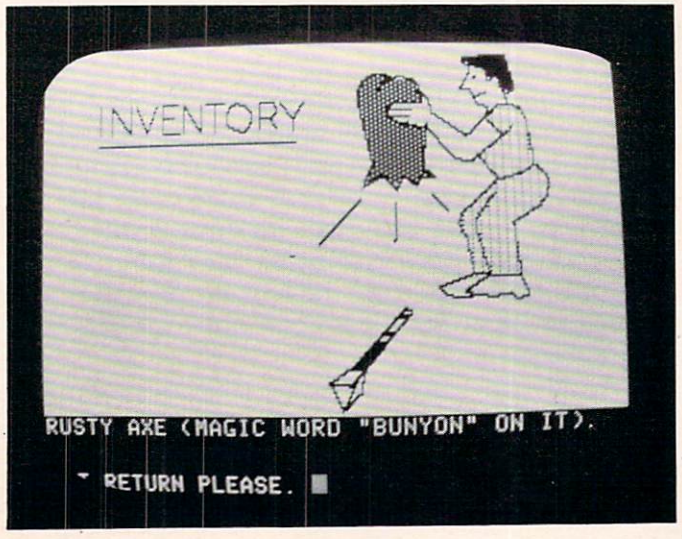
It is very difficult to "crash" the program by giving bizarre input. It simply returns a message that it doesn't understand. Pressing RESET, however, will restart the game and clear out your adventure.

Adventure – Colossal Cave
Frontier Computing Inc.
P.O. Box 402
666 N. Main
Logan, UT 84321
$10 plus $1 shipping

Adventureland
Adventure International
507 East Street
Box 3435
Longwood, FL 32750
$29.95 disk ©



Teasing the dragon in Adventureland.



Taking inventory in Adventureland.

Review:

The VIC "Cardboard"

Harvey B. Herman
Associate Editor

Inserting a VIC cartridge is not a task for small and sometimes clumsy fingers. I have always insisted that my younger children call me when they want to change games. Thus, they are occasionally frustrated when I am not available for the task. The "Cardboard" promised to relieve this headache.

"What is it?" you ask. I believe the technical term is "motherboard." Its purpose is to extend, externally, the VIC expansion connector. All the pins on that connector are brought out by means of a ribbon cable to six exact duplicates of the VIC memory expansion port. You can plug in six cartridges, memory boards or games, and select any one of them easily with a dip switch. Yes, tiny fingers are ideal for this job, with no adult worries about mechanical damage to the VIC.

Next question, "Is it worth it?" The answer, "Yes and no."

Yes, because it enables little children to change applications easily. Also, it is solidly constructed and comes with an easy to understand, 18-page breezily written manual. It even has a reset switch which can extend the life of your VIC if you frequently turn it on and off to reset.

No, because it is relatively expensive (although cheaper than some) when compared with the VIC's original discounted price. Furthermore, the fact that it is not fused is bothersome. Can the VIC's power supply handle an indefinite number of plug-ins at the same time? I wonder.

On balance, I like this product and recommend it. I am using it with four or five popular games, and it has worked beautifully for the children. If you do buy it, keep a watchful eye out for power supply overheating or have someone knowledgeable fuse it for you. Then, enjoy the convenience.

Cardboard Expansion Interface
Cardco, Inc.
3135 Bayberry
Wichita, KS 67226
$119.95

Review:

Mikro Chip Assembler For PET

Arthur B. Hunkins
School of Music
University of N. Carolina at Greensboro
Greensboro, NC

Mikro, from Skyles Electric Works, is a 4K ROM assembler chip for PET/CBMs with Upgrade or 4.0 BASIC. It is not available for "Classic" PETs with original ROMs. Residing at hex address A000, Mikro is offered in a number of configurations that will otherwise accommodate virtually *all* PETs. For cassette-based systems, particularly those with limited memory, Mikro is a machine language programming boon, and well worth the $80.

Mikro is compatible with both Toolkit and Command-O. Indeed, a single SYS call initializes Mikro and the utility. All of Toolkit's commands are active while Mikro is running, and a number of them are applicable to machine language program development. One example: since Mikro uses BASIC line numbers, Toolkit's AUTO numbering command facilitates entering line numbers.

The user's manual for Mikro is both thorough and comprehensive. Although organized in a non-traditional manner that takes getting used to, its 49 pages contain a wealth of information. Included are sample programs, bibliography, installation and crash recovery procedures, a listing of the more than 15 error/warning messages with explanations, an overview of 6502 opcodes and addressing modes, and the few known bugs along with suggested remedies. The manual is *not* a treatise on 6502 machine language and its applications. The short, annotated bibliography will point you in the right direction, however. (Skyles recommends Leventhal's, DeJong's, and Zaks' books.)

Will Accept Four Number Bases

Since Micro operates with pseudo-BASIC statements (programs are SAVEd and LOADed as BASIC program files), PET's superior screen editing features are available to the user, in either LIST or Micro's FORMAT mode. Mikro's commands are: FORMAT, ASSEMBLE, and CONVERT (number base). The latter converts a number in decimal, hexadecimal, octal or binary to all the others. Incidentally, Mikro accepts numbers in any of these four bases!

Actual assembly of a short program is virtually instantaneous (hurrah for machine language assemblers!). Unless specified, assembly defaults to the second cassette buffer ($033A). Immediately following assembly, Mikro offers a partial or complete listing on a printer – the same listing as formatted input plus hex memory locations and their (hex) values. If you don't have a printer, you are out of luck here; Mikro will not print to the screen. I tested the print option with an Axiom EX-801 printer, and the operation went very smoothly. The only inconvenience was the fact that printer formatting (e.g., selecting 80 rather than the default 40 columns) must be done prior to assembly, by opening, formatting, then closing a file.

Once assembly has begun, Mikro is in control, and there is no way of interrupting it until after the printout. This can be more inconvenient than it might seem, because one of Mikro's "mites" is that during short printouts, it spews forth almost two extra pages of (often expensive) paper. The recommended fix is to turn off your printer. That effectively solves the immediate problem, but also means that you must reformat your printer. Perhaps you will not experience this problem.

Includes Five Pseudo-ops And Append

As an assembler, Mikro is easy to use. On an 8K PET it reserves 1K at the top of memory for its own use; with 16 and 32K machines, it takes proportionately more. Syntax is standard, and the only crucial point to remember is that spaces are used as delimiters. A semicolon is required to

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."

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indicate a leading remark, and remarks are also possible at the end of lines. One problem the manual cautions the user against is spaces following commas in remarks. When I did it anyway, there were no bad consequences at all. Maybe I was just lucky.

Five pseudo-ops are implemented: 1) =, for label setting including *= for program origination, 2) TXT, for ASCII text within quotes, 3) BYT, 4) WOR, and 5) END (optional). A special application of END involves appending (or merging) a BASIC program onto the end of one in machine language. Following assembly of the ML program (up to END), the appended BASIC program can be run by commanding RUNxxxx or GOTOxxxx, where xxxx is the first line number of the BASIC program.

No comments are allowed following BYT or WOR, nor are spaces permitted at the commas in the list of values. Although all values are assembled, only the first three appear in any listing. A useful variety of arithmetic operators and labels is allowed in the argument field.

One of Mikro's handiest features is a GO option for JMP and branching statements. For example, JMP GO20 is a valid statement meaning jump to the instruction in BASIC line #20. These branches are also automatically handled by Toolkit's RENUMBER command.

Mikro represents an excellent, cost-effective investment for Upgrade and 4.0 PET (and CBM) owners wishing to do small to moderate amounts of machine language programming. I particularly recommend it for PETs that are cassette-based and have limited amounts of memory (such as 8K).

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Review:

Epson Graftrax-80

Charles Brannon
Editorial Assistant

Graftrax-80 is a ROM upgrade for the Epson MX-80 printer. Epson introduced their MX-80, a small, fast, relatively quiet 80 character printer at under $800. They packed it with more intelligence than some of the computers using it. Among its features are: two character widths (80 and 132); elongated, double-strike, and emphasized printing; horizontal and vertical tabs; and definable form length and line spacing. The standard MX-80 also provides block graphics (compatible with the TRS-80) that can be used for low resolution screen dumps, pictures, charts, and graphs.

Epson announced that a $100 upgrade could be made to the MX-80 to provide graphics capabilities. And it would provide graphics *twice* as dense as the MX-70 (MX-80's lower priced relative).

Installation

Upgrading your MX-80 is easy, if you know how to remove and install IC's. Otherwise, you should have it installed by an authorized technician. The upgrade consists of three ROM chips that replace a single ROM resident on the board. With three times the memory, this should give you a hint of the potential of Graftrax. You also have to cut a jumper and set 12 tiny DIP switches.

After you have performed this surgery, what do you get? Well, prepare for a surprise – this transplant does more than add graphics – you've got a whole new printer!

Graftrax-80 adds a plethora of new features, and improves on others. All the modes can be mixed on a single line, a trick formerly impossible. The duration of the bell has been reduced from three seconds to a bearable 1/3 second. A backspace function permits underlining (but it's slow).

A popular new feature is the alternate character set – italics. This looks quite fancy. You can easily mix the italics font with standard text. You can now go into the TRS-80 mode via software (formerly you had to set a DIP switch). You can set

Figure 1. Graftrax-80 Character Sets

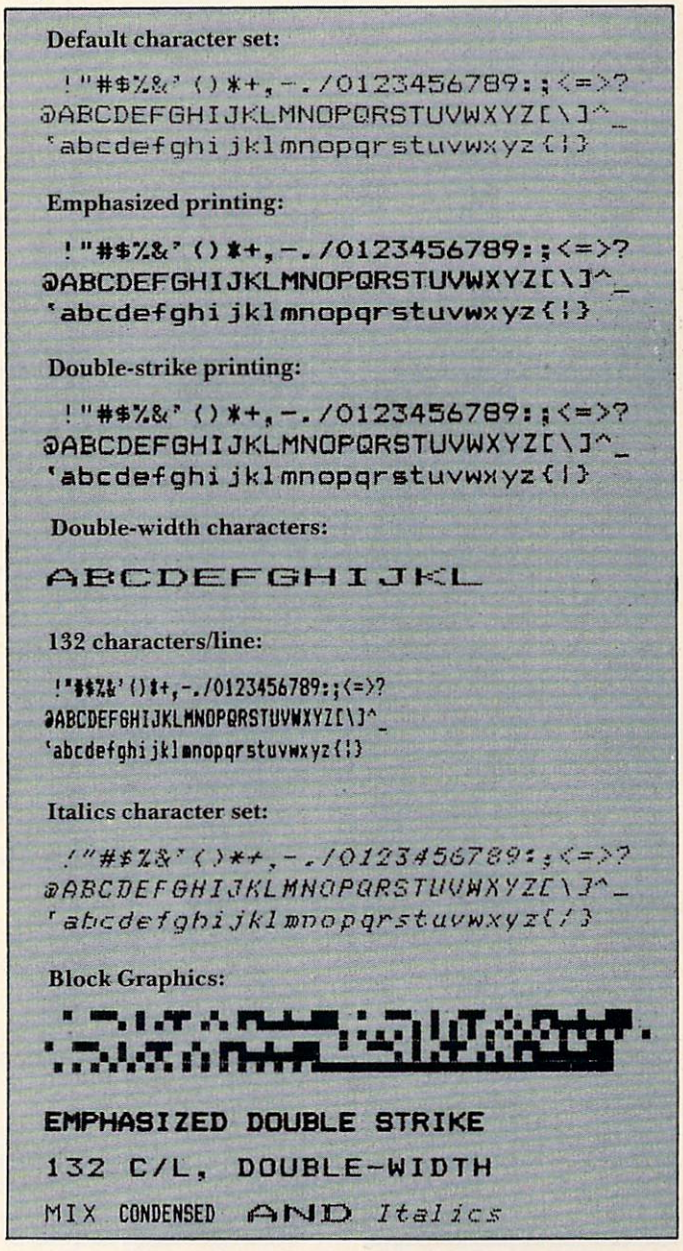
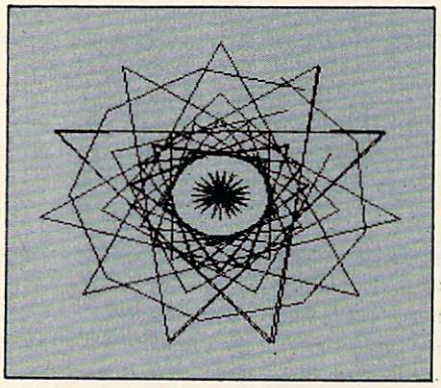


Figure 2. Graftrax Graphics



an "MSB mode" that will force bit seven high (for sending a character greater than ASCII 128). This is useful for computers and interfaces that can only send seven bits per byte (such as the Apple II).

One of the most significant new functions is the ability to redefine all the printer codes. You can change almost any of the special codes into any code you like. For example, double-strike is set with ESC-G (ASCII 27 followed by ASCII 71). You could change this to ESC-D (easier to remember), but you would be replacing the "Set horizontal tab" command which is normally keyed to ESC-D. One possibility of this feature is that you could change the MX-80's special codes to approximate the codes of, say, the Centronics 737. You could then run software written for the 737 without modification.

Extraordinary Graphics

The graphics capabilities are superb – up to 120 dots per inch. This permits a total horizontal width of up to 960 dots. This is more resolution than most computers can display, so it is more than adequate for screen dumps. The 480 mode (480 dots per line) is faster than the 960 mode, and it is usually used for screen dumps. The graphics are fairly easy to use: you send a code specifying which mode, and how many bytes of graphics you are sending. Then, a byte at a time is sent from the computer that specifies each bit of the eight dot (vertical) line. For example, to print a special character, ten bytes would be sent.

```
7   000000     128
6  0       0   64
5 0  0000  0   32
4 0 0      0   16
3 0 0      0   8
2 0  0000  0   4
1  0       0   2
0   000000     1
   1234567891
             0
```

The copyright symbol

The printhead is a strip with nine tiny needles set into it. Each needle is activated by a "1" bit, or left seated with a zero. Unfortunately, the ninth pin can't be fired because there are only eight bits in a byte. The first byte sent would look like: 00111100 (turned on its side). In this way, an 8x*n* "strip" of dots would be printed.

Speed

With 480 dots per line, using Graftrax from BASIC

is unbearably slow, since 480 bytes have to be individually calculated and sent, one at a time. You would probably want a machine language program to do the printing.

Graftrax Plus

A new version of Graftrax, called Graftrax Plus, is now available for $65. It improves and expands upon the already enhanced features of Graftrax. In addition, owners of the MX-100 (which already has Graftrax) can upgrade to Graftrax Plus and enjoy compatibility with the MX-80 equipped with Graftrax Plus.

In addition to the italics character set (missing on MX-100 Graftrax), Graftrax Plus adds several features, including: superscript and subscript (the printer doesn't really adjust the paper; it just uses tiny half-height characters), improved graphics, and true underlining, with underlining on/off commands.

Graftrax-80
Epson America, Inc.
3415 Kawisha St.
Torrance, CA 90505
$99.00

A Monthly Column

Computers And Society

David D. Thornburg
Associate Editor

Inspector Fenwick – Please!

Hey, Rocky, I think I just saw the girl of my dreams!
Gee, Bullwinkle, where's that?
At the Moose America Pageant – where else?

A Saturday morning replay of *Rocky and His Friends*? No, this is a sample of the dialog that greets visitors to one of the newer purveyors of food and entertainment – Bullwinkle's. What does this have to do with the social impact of computers? Read on, dear readers, read on.

It all began in the 1950s when Walt Disney and his designers concocted Audio Animatronics, an analog-based control system that gave motion to the mannequins in such Disneyland favorites as the Enchanted Tiki Room. This technology was further advanced by the Disney group to make such shows as Pirates of the Caribbean, Country Bear Jamboree, and America Sings. The result was the creation of remarkably lifelike animated stage shows using automatons. In the hands of Disney designers, the result was magical.

Dining With Computers

A few years ago, Nolan Bushnell (founder of Atari and godfather to a host of innovative companies) developed Cyberamics to bring animated characters into a combined arcade/restaurant – Chuck E. Cheese's Pizza Time Theater. Visitors to this establishment are treated to various shows, including Dolly Dimples, a delightful animated hippopotamus night club singer, and, in another part of the restaurant, Chuck E. Cheese and his cohorts, who provide their own brand of cornball entertainment to go with the pizza. Central to Pizza Time is the arcade room, filled to the brim with a great diversity of video games, each operated with tokens marked "In Pizza We Trust."

The success of this technology-based restaurant has been phenomenal, and it was clear from the start that others would soon develop their own version of this concept.

Next enters David Brown, developer of two Marriott's Great America theme parks and the Roy Rogers' Family Restaurant chain. David thought that Pizza Time was a great concept, but that the food quality could be improved. Brown's idea was to create a place that was a restaurant first, but which incorporated entertainment in the dining area and a separate game room with a modest assortment of popular arcade games. This idea became Bullwinkle's.

As luck would have it, the world's first Bullwinkle's was constructed only a few miles from my humble abode. In the interest of keeping my readers abreast of the latest in technology, I had to visit Bullwinkle's many times, consuming vast quantities of chicken and pizza and ice cream, watching shows, and playing myriad games.

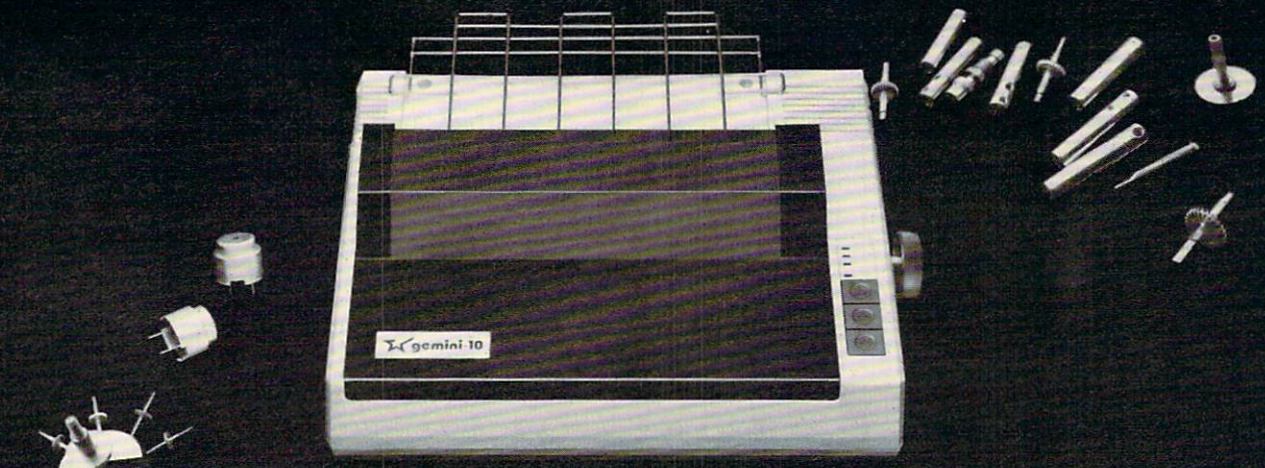
During one such visit it was my pleasure to meet their marketing maven, Larry Schuller. As he showed me around and answered my questions, it was clear that computer technology plays a critical role in this restaurant.

First, the animated characters themselves are controlled by Moosetronics, a set of distributed processors running off an S-100 bus. The song and dance routines are stored on both tape (audio and synchronization) and disk (for various body movements). Some of the characters are quite elaborate. Bullwinkle, for example, is about six feet tall. His eyes, mouth, head, arms, and legs all move in fairly realistic fashion (realistic for a moose based on a cartoon character), and this attention to detail characterizes several of the other eleven animals as well. The attention to detail includes placing the loudspeakers in each figure so the sound comes from each animal as it is singing or talking.

Fantasy Fountain

If this elaborate production weren't enough, visitors are also treated to a computer-controlled fantasy fountain show in which 250 jets propel 300 gallons of water in a dazzling array of arcs and spirals. All this takes place under colored lights in accompaniment to such melodies as *The Blue Danube* and *Raindrops Keep Fallin' on My Head*. This water show, more than anything else, appears to be the prime attraction to the over-30 crowd (your esteemed author included).

But the computers don't stop here. The system which notifies people when their order is ready is none other than a trusty Apple II located near the



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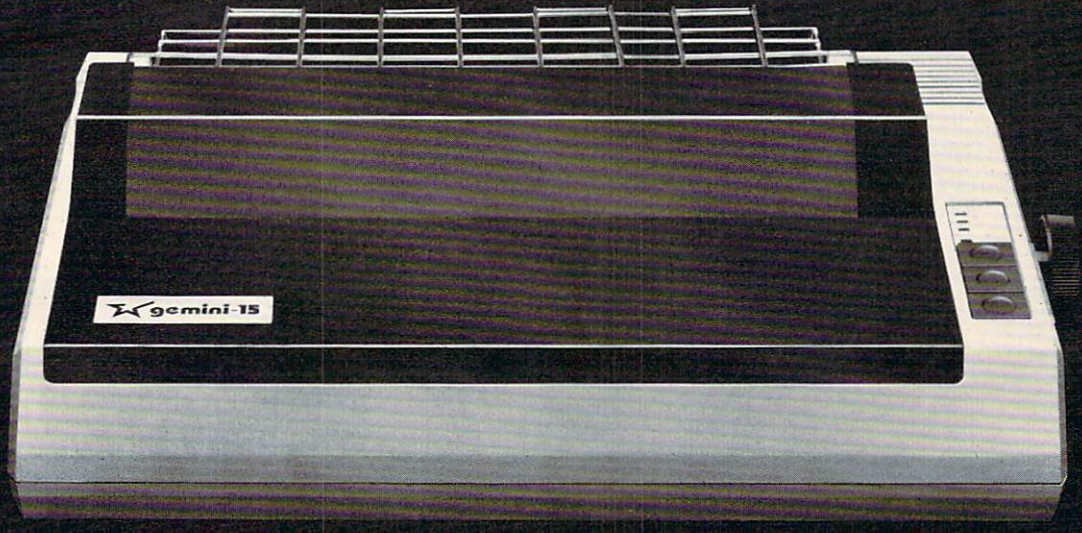

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

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.

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kitchen. Monitors scattered throughout the restaurant show which orders are ready, and each new order is announced by a high resolution image of Bullwinkle holding up the new number.

The professionalism in their mechanical characters is reminiscent of Disney's Country Bear Jamboree, and for good reason. It was designed by a collection of Disney graduates who now ply their craft for others.

Aside from pure money, what motivated the people at Bullwinkle's to create this restaurant? According to Larry Schuller, microcomputer-based entertainment *belongs* in restaurants. The provision of electronic fun to go with the food is perhaps the next stage in the evolution of family dining.

Interestingly, the arcade seems to be almost an afterthought at Bullwinkle's. Off away from the eating area, 50 games provide entertainment for patrons who, in my opinion, show much greater care for the machines than I am used to seeing. While I was unable to get the exact figures, I found that Bullwinkle's derives a considerably smaller fraction of its revenues from the games than does Pizza Time Theater. That doesn't bother Bullwinkle's at all. As Schuller says, they are aware of the continuing controversy surrounding these games. When will the controversy go away? In Schuller's mind, the controversy surrounding these games will go away when the games become more educational.

The Next Step

There is no question that arcade games can be made more educational – Children's Television Workshop has shown that. But just as Bullwinkle's feels that it has improved the electronic entertainment/restaurant idea of Nolan Bushnell, they also feel that they can someday make improvements in the design of the arcade games themselves.

As nice as such improvements might be, they are not their first order of business. The next step is to carefully locate the next several restaurants. Not surprisingly, their first announced franchise was for 13 restaurants in Canada, with the first to open in Edmonton in March. Dudley Do Right of the Royal Canadian Mounted Police has been a popular character there for years, so the success of this expansion venture is virtually guaranteed.

This doesn' t mean that the United States has been ignored. Twenty-nine restaurants are scheduled for construction here in 1983, 20% of which will be company owned. In addition, negotiations are underway to share this technology with the United Kingdom. One has to be "moost" impressed with this expansion plan, especially since each restaurant costs well over a million dollars to set up.

As the water show comes to a close, and the curtain falls on Dudley Do Right, one must wonder what computer pioneers like John von Neuman would have thought. Computer technology has advanced extraordinarily in the past 30 years. Have its applications advanced as well?

Boris, if I hear one more moose joke I will blow up the stage!

Natasha, darling, that would be moost *devious of you!*

A Monthly Column

COMPUTE! *welcomes Keith Falkner, whose "Extrapolations" column begins this month. Keith, who has extensive experience at all levels of computing, has contributed several excellent Apple articles to* **COMPUTE!** *in the past. To start his monthly column, he demonstrates how to use a simple BRUN to bring in the power of the renumber program – without affecting the program in memory. There's also a way to make yourself a simple assembler if you don't have the Mini-assembler.*

Extrapolations

Beat The "Applesoft Renumber" Blues

Keith Falkner, Toronto

On your System Master diskette there is a very powerful utility program called *Renumber*. This program can merge two Applesoft programs and can move several lines from one place to another within an Applesoft program. Of course, Renumber will also renumber the lines of an Applesoft program, and the options it offers in this function are as complete as anyone could wish.

Furthermore, Renumber is cleverly packaged as an Applesoft program so that no complicated machine language instructions are needed to run it.

Protecting Memory

When you run Renumber, a hidden machine language component relocates itself to the top 2048 bytes of memory, prevents Applesoft from overwriting it, and enables the ampersand (&) command. Thereafter you can LOAD, RUN, SAVE, etc., as usual, and the ampersand command invokes one of the three functions of Renumber. This is very clever packaging, because this way only one version of Renumber is needed for 32K or 48K Apples, regardless of the current upper limit of memory.

Setting MAXFILES or running the utility known as Program Line Editor both alter the upper limit of memory, but Renumber does not care. This versatility is commendable, but it comes at a price. If you have not bothered to run Renumber, but are working on an Applesoft program and wish to renumber it, you must first SAVE it, then run Renumber, then reload your Applesoft program. Generally, you do not need this flexibility. For example, if you have a 48K Apple, the machine language component eventually resides in locations $8E00-$95FF (36352-38399).

I'll show you how to save this machine language routine, together with a prologue to do the minimum initialization. Then a simple BRUN command will activate the essence of the Renumber program, without affecting any Applesoft program in memory. At the same time we will deal with the more or less well-known bug. If the program being renumbered contains a multiplication by a constant, such as X1 = J * 100, and there is a line number 100 which becomes, say, line number 80 upon renumbering, the constant may become 80 as well.

This is a consequence of the clever relocation routine which makes the machine language code function in whatever memory locations it occupies. Specifically, the token for LIST is replaced by the token for multiplication because the sequence of tokens $AC $B0 $BC is taken for the instruction LDY $BCB0, and the relocation routine changes this to LDY $CAB0.

So $BC, the token for LIST, has been replaced by $CA, the token for *. Hence, line number references following LIST (a rare verb to find in a BASIC program) can never be renumbered, and constants which appear to be line number references in a multiplication statement are subject to bogus renumbering! Fortunately, this is easy to fix.

One more thing should be done to Renumber. Some of us have a program to load PET tapes into our Apples, and some of these programs have spaces between the words or numbers in the program. In PETs this practice improves legibility, but not so in Apples, so Applesoft removes any extra spaces you may type in. Thus, Renumber does not expect spaces in, for example, GOSUB_____400. Those spaces prevent Renumber from changing that 400 if renumbering gives line 400 a new line number. The fix for this problem is included in Programs 1 and 2.

Now it's your turn to do some work: if you use DOS 3.2, type the lines in Program 1; if you use DOS 3.3, type the lines in Program 2. In either case, test your results as shown below.

Type in this trivial program:

```
1 INPUT X
2 IF X < 1 THEN 1
3 ON X GOSUB 39,87
27 END
39 LIST 87
45 RETURN
87 PRINT 99 * 39
99 GOTO 45
```

Now ready the renumbering routine:

```
BRUN BRENUMBER
```

Now renumber your program:

```
&
LIST
```

The result should look like this:

```
10 INPUT X
20 IF X < 1 THEN 10
30 ON X GOSUB 50,70
40 END
50 LIST 70
60 RETURN
70 PRINT 99 * 39
80 GOTO 60
```

With the stock Renumber program in a 48K Apple, line 50 would still say LIST 87 and line 70 would now say PRINT 99 * 50. Now type NEW ... the above is worthless. Don't proceed until you get it right, because an unreliable or inaccurate tool is much worse than none at all.

Here is what you have produced. *Brenumber* is a small (ten sector) binary program which loads into locations $8DE0-$95FF, sets the upper limit of memory to $8E00 (minus one), and sets up the ampersand (&) command to invoke the functions of Renumber. Brenumber may be used only in a 48K Apple, and then only when MAXFILES has its default value of three. There are no safeguards in Brenumber, so unpredictable results occur if these constraints aren't met.

Orderly Programs

Now, suppose you are working on an Applesoft program and you decide to renumber it. Without bothering to save it, just BRUN Brenumber and you have all the facilities of Renumber available. It's important to remember that the BRUN command *did not* renumber your program; it just enabled the ampersand (&) command which does the actual renumbering. So let's think of clever ways to use the Renumber program. The program, with 16 screens of instructions, can be formidable to try to understand, but it's worth learning.

Briefly, renumbering is done by typing the ampersand (&) and maybe some parameters. The parameters tell Renumber two things: what line numbers to assign and what portion of the program is to be renumbered. All the parameters are optional, the default being to renumber the whole program 10, 20, 30, etc.

FIRST=1000 the first line number will be 1000.
INC=20 successive line numbers increase by 20.
START=5000 only lines 5000 and later will be renumbered.
END=6990 only lines up to 6990 will be renumbered.

The FIRST and INC parameters are straightforward, so let's see how the START and END parameters can help us. One way I make my programs neat and readable, as well as accurate, is to have a main routine whose line numbers are less than 1000, and a menu which eventually says something like ON SEL GOSUB 1000,2000,3000, ... 11000, for example, if there are 11 selections from the main menu. Then I use line numbers 20000 and up for subordinate routines such as entitling the screen, formatting numbers, etc.

So how do I preserve this orderly scheme in renumbering the program? Well, consider the effect of these commands:

```
& F 100, S 0, E 999      (parameters can be abbreviated)
& F 1000, S 1000, E 1999
& F 2000, S 2000, E 2999
```

and so on, until finally

```
& F 20000, S 20000
```

The first command will renumber only the main routine; the second will renumber lines 1000-1999, etc., and the last will renumber only the elementary routines. All very fine, but who wants to type in 21 commands to renumber a program? Well, here is a simple six-line program to create an EXEC FILE named RENUM. Customize the program to suit yourself, then run it one time and keep its output on the same disk you have Brenumber on. Then, when you wish to renumber a program in the complex way outlined above, just type EXEC RENUM.

```
10 D$ = CHR$ (4):F$ = "RENUM":Q$ = CHR$ (34)
20 PRINT D$"OPEN"F$: PRINT D$"WRITE"F$: PRINT
     "MON I"
30 PRINT "IF PEEK(36352)<>164 THEN ?CHR$(4)"Q
    $"BRUN BRENUMBER"Q$
40 X = 100:Y = 999: FOR I = 0 TO 30: IF I THE
    N X = Y + 1:Y = Y + 1000
50 PRINT "& F"X",S"X",E"Y: NEXT
60 PRINT "? CHR$(7)": PRINT "NOMON I": PRINT ~
    D$"CLOSE"
```

RENUM can take several minutes to do its work on a large program, so you have an opportunity for a break. It is vital that you never press RESET while Renumber (or Brenumber) is operating – it's almost certain to destroy your program! The MON I statement at the start of the EXEC FILE causes each command to be listed as it is read from disk, so watch and wait patiently.

Hiding And Moving Lines

The HOLD and MERGE functions of the Renumber program are probably poorly understood; here is an example which barely hints at the power of these commands.

LOAD PHONE LIST	**from System Master disk**
BRUN BRENUMBER	**from the disk where you put it**
& 5400, F1000	**to make a gap for more lines of DATA**
SAVE PHONE INTERIM	**we need it on disk for a moment**
DEL 1,200	**discard the prologue and credits**
DEL 351,63999	**discard everything but DATA statements**
& F351, I1	**old DATA from 201-350 becomes 351-500**
& HOLD	**put 150 lines into "hold-file" in memory**
LOAD PHONE INTERIM	**you can DELETE it now or later**
& MERGE	**combine old and new, now 300 DATA statements**

In line 1720 and 2590, change the figure 150 to 300.
In line 1160, change the program name to PHONE LIST 300.

SAVE PHONE LIST 300	**wherever you want the finished product.**

We start with Phone List, a program on your DOS System Master disk, and double its capacity from 150 to 300 names.

This clever program actually stores names and telephone numbers in DATA statements with line numbers from 201 through 350. The two DEL statements eliminate all lines but these, which are then renumbered 351 through 500 by 1. The &HOLD command hides these lines and a LIST command at this point would show no lines. After the Phone Interim program is reloaded, the hidden lines are merged into the gap between lines 350 and 1000.

When you consider all that this involves, the process is very rapid. It's hard to see how such a significant change could have been wrought any other way, without a lot of tiresome typing. Using the techniques shown above, you can move a bunch of lines around within a program, combine two programs, and incorporate proven routines from one program to another without the error-prone step of retyping.

Some programs have lines with line numbers greater than 63999, the legal maximum. Renumber is clever enough to leave these alone, and this is probably for the best. A word of caution in this area: I once fabricated an illegal line number 65535 and spent several days looking for the mysterious cause of a number's silently changing from 2 to 2.000000007. The problem disappeared when I removed the bad line number.

As with most tools, practice improves skill. Do use the Brenumber program to its limit – it's very, very good. But, and it's a big *but,* be prudent. Save an important program before renumbering it, and don't overwrite that backup until the renumbered version is proven.

Homework Assignment: If you have an Apple II Plus with no Integer ROM Card nor Language Card, you may have no Apple Mini-Assembler. In that case, follow the instructions below. You will create a one-pass assembler which will be of use in future columns in this series. Please note that "CTRL-Y" means hold down the CTRL key and type "Y". In the lines where this is used, a space is shown for clarity only; do not type any spaces in those two lines!

How To Make A Mini-Assembler If You Have An Apple II Plus

Take a diskette to an Apple which has both Integer BASIC and Programmer's Aid.

If a 16K RAM card is installed, boot the System Master diskette.

```
]INT
>CALL -151
*D4D5G
*6000:4C 98 60
*6003<F500.F63C CTRL-Y *
*6003<F500.F63C CTRL-Y
*BSAVE MINI-ASSM,A$6000,L$140
(THANK THE NICE APPLE.)
```

Program 1.

```
RUN RENUMBER
(PRESS RETURN WHEN INVITED.)
CALL -151
8DE0: A9 8E 85 70 85 74 8D F7
8DE8: 03 A9 00 85 6F 85 73 8D
8DF0: F6 03 A9 4C 8D F5 03 20
8DF8: 6C D6 4C D0 03 4C D0 03
90DE: 20 F0 95
95ED: 30 8D 28
95F0: 20 B5 94 08 C9 20 F0 F7
95F8: 28 60
94D4: BC    <---BUG FIXER!!!
(INSERT DISK TO HOLD RESULT.)
BSAVE BRENUMBER,A$8DE0,L$820
```

Program 2.

```
RUN RENUMBER
(PRESS RETURN WHEN INVITED.)
CALL -151
8DE0: A9 8E 85 70 85 74 8D F7
8DE8: 03 A9 00 85 6F 85 73 8D
8DF0: F6 03 A9 4C 8D F5 03 20
8DF8: 6C D6 4C D0 03 4C D0 03
90DA: 20 F0 95
95ED: 30 8D 28
95F0: 20 B2 94 08 C9 20 F0 F7
95F8: 28 60
94D1: BC    <---BUG FIXER!!!
(INSERT DISK TO HOLD RESULT.)
BSAVE BRENUMBER,A$8DE0,L$820
```

For PET/CBM computers with a disk drive, this program will list any program in a way that can be easily understood: all the special characters for all the Commodore computers are taken into account.

A Universal Program Lister

Jim Butterfield
Associate Editor

You'll need a PET/CBM disk system to run Lister. It will neatly list any BASIC program you have on disk to the screen or printer.

There are lots of Lister type programs around. This one isn't much different, except that it is very complete. It runs very slowly; have a cup of coffee while it's running.

Why Another?

Several months ago, I passed out a program at the Toronto PET User Group meeting. It contained a number of the 4.0 disk commands. I confidently said at the time, "Those of you with earlier systems won't have any trouble converting DOPEN to OPEN and so on...."

What I didn't think of was this: users with an earlier system couldn't list the program properly. Their computers couldn't understand DOPEN tokens and printed nonsense instead.

The problem is more general. If you don't have an 80-column machine, you won't be able to make any sense out of the window-making characters that are used there. If you don't have a VIC, you'll be baffled by the characters that set color.

So I embarked upon a new Lister which would contain the special characters for all Commodore machines: PET, CBM, and VIC. It seemed like an easy project.

Code Inflation

But the program grew. As it was written, a number of possibilities kept cropping up – things that would be handy for the user if provided.

The listing job wasn't hard. Just pick it off disk, translate the tokens, and put it on the screen. But then – it would be nice if the output could go to the printer.

As long as output goes to the printer, it should be neat. Why not put spaces in strategic places? That way, ONCEGOTO5,6 might print as ON CE GOTO 5,6 and be much more readable.

If we're stretching out a line of code, it might not fit onto a single line of listing. If we need to break it in two, it would be nice to pick a logical break point, so that a word like PRINT doesn't get split in the middle.

It's often nice to see cursor movements spelled out – especially the ones that do not work on your machine. And repeated cursor movements should be numbered, so that you don't print DOWN,DOWN,DOWN. Instead, DOWN3 will deliver the message. Of course, there are other times when you would prefer to have the listing show in the same way that it does with a conventional screen LIST.

Sometimes, when your program is printing instructions, they are in upper- lowercase ("text mode") and you'd like the listing to reflect it. At other times, you need the graphics because that's what your program is printing.

Of course, if you want to do different parts of your program in different modes, you'll need a line number range in order to list the parts you want at any particular time.

The long lines combined with text mode create another problem. My printer (a 2023) is too dumb to realize that if I print over 80 characters, I want the continuation line to be in the same mode as before. Instead, it drops back to graphics mode. So I had to count characters carefully and arrange my own split lines.

Spaces are a special problem. Most of the time, they should be printed as spaces; but sometimes that's hard to read, especially when the spaces are part of a cursor-movement stream. I made a compromise on this one.

Program Details

The program is in BASIC, so you can modify it to your particular needs and printer. It won't quite fit the VIC; if you want to try a VIC modification don't forget to change the POKEs on line 630 and the PEEK at line 32768. PET/CBM machines will list VIC programs directly from disk, even where the BASIC programs can't be LOADed, LISTed or RUN on the PET.

A Few Comments On Program Variables

L9 is the length of a line, normally 40 or 80;

Q is quotes-mode; it also notes REM statements;

A$(J) is a table of cursor-control names, and **A(J)** is the corresponding character designations;

K$(J) is similarly a list of BASIC keywords;

C and **C1** are flags to tell whether adjacent characters are alphanumeric, so that we will split PRINTX into PRINT X but not PRINT"X";

B counts the number of repeated cursor movements; **B1$** is the current keyword;

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F$ is the character preceding a spelled-out cursor movement; it is either a left-square-bracket or a comma;

M$ is the down-shift character for text mode printing, when needed;

P$ is the print string; everything is assembled here before printing.


```
90 REM LISTER          JIM BUTTERFIE
   LD
100 DATA 19,147,17,145,29,157,18,14
   6,20,148,141,32
110 REM 80-COLUMN CURSOR STUFF
120 DATA 7,21,149,22,150,14,142,25,
   153
130 DATA 15,143
140 REM VIC STUFF
150 DATA 144,5,28,159,156,30,31,158
160 DATA 8,9,133,137,134,138,135,13
   9,136,140
170 DATA HOME,CLEAR,DOWN,UP,RIGHT,L
   EFT,RVS,RVOFF,DEL,INST,RET
   URN,SPACE
180 DATA BELL,D.LINE,I.LINE,ER.BEGI
   N,ER.END,TEXT,GRAPHIC,SCRO
   LL.UP,SCROLL.DOWN
190 DATA TOP,BOTTOM
200 DATA BLACK,WHITE,RED,CYAN,MAGEN
   TA,GREEN,BLUE,YELLOW
210 DATA LOCK,UNLOCK,F1,F2,F3,F4,F5
   ,F6,F7,F8
220 DIMA(40),A$(40),K$(90)
230 FORJ=0TO40:READA(J):NEXTJ
240 FORJ=0TO40:READA$(J):NEXTJ
250 DATA END,FOR,NEXT,DATA,INPUT#,I
   NPUT,DIM,READ,LET,GOTO,RUN
   ,IF,RESTORE,GOSUB
260 DATA RETURN,REM,STOP,ON,WAIT,LO
   AD,SAVE,VERIFY,DEF,POKE,PR
   INT#,PRINT,CONT
270 DATA LIST,CLR,CMD,SYS,OPEN,CLOS
   E,GET,NEW,TAB(,TO,FN,SPC(,
   THEN,NOT,STEP
280 DATA +,-,*,/,^,AND,OR,>,=,<,SGN
   ,INT,ABS,USR,FRE,POS,SQR,R
   ND,LOG,EXP,COS
290 DATA SIN,TAN,ATN,PEEK,LEN,STR$,
   VAL,ASC,CHR$,LEFT$,RIGHT$,
   MID$,GO,CONCAT
300 DATA DOPEN,DCLOSE,RECORD,HEADER
   ,COLLECT,BACKUP,COPY,APPEN
   D,DSAVE,CATALOG
310 DATA RENAME,SCRATCH,DIRECTORY
320 FORJ=0TO89:READK$(J):NEXTJ
400 CLOSE1:INPUT"NAME OF PROGRAM FI
   LE";G$
410 OPEN 1,8,3,G$+",P,R"
420 GET#1,A$,B$
430 IFA$<>CHR$(1)ANDA$<>""GOTO400
440 IFA$=""THENA$=CHR$(1):GET#1,X$
450 INPUT"LINE NUMBER RANGE  -{03 L
   LEFT}";Z$
460 L0=0:L1=0:L2=1E9
470 FORJ=1TOLEN(Z$):Y$=MID$(Z$,J,1)
480  Y=ASC(Y$):IFY>=48ANDY<=57GOTO5
   10
490  IFY=32GOTO510
500  L0=J:IFY<>45GOTO600
510 NEXTJ
520 IFL0<LEN(Z$)THENL2=VAL(MID$(Z$,
   L0+1)):IFL2=0THENL2=1E9
530 IFL0>1THENL1=VAL(Z$)
540 IFL0=0THENL1=L2
600 P3$="[":P4$="]":INPUT"LIST TO P
   RINTER  N{03 LEFT}";Z$
610 P=3:IFASC(Z$)=89THENP=4:L$="{DO
   DOWN}":P3$=CHR$(219):P4$=C
   HR$(221)
620 P1$="[":P2$="]":INPUT"GRAPHICS ~
   OR TEXT  G{03 LEFT}";Z$
630 POKE59468,12:IFASC(Z$)=84THENPO
   KE59468,14:M$=L$:P1$=P3$:P
   2$=P4$
640 INPUT"TRANSLATE CURSOR MOVES  N
   {03 LEFT}";Z$
650 IFASC(Z$)=89THENT7=1
660 OPEN4,P:F$=P1$
670 J=80:IFP<>3GOTO690
680 PRINT"{CLEAR}":PRINT"++++++++++
   ++":FORJ=1TO81:IFPEEK(3276
   8+J)=32THENNEXTJ
690 L9=J:PRINT#4,"PROGRAM:  ";G$
700 REM NEW LINE
710 GOSUB2010:Q=0:T1=1:C1=-1:GET#1,
   A$,B$:IFST<>0GOTO3000
720 IFB$=""GOTO3000
730 GET#1,A$,B$
740 L=ASC(A$+CHR$(0))+ASC(B$+CHR$(0
   ))*256
750 IFL<L1GOTO1080
760 IFL>L2GOTO3000
770 F2=1:PRINT#4,M$;P$:P$=STR$(L)+"
    "
800 REM START TEXT HERE
810 GET#1,A$:IFA$=""GOTO710
820 T=0:A=ASC(A$):IFA=32ANDF$=","GO
   TO840
830 IFQ=0OR(AAND127)>31ORT7=0GOTO90
   0
840 FORJ=0TO40:IFA=A(J)THENB$=A$(J)
   :GOTO860
850 NEXTJ:GOTO1000
860 IFB$=B1$THENB=B+1:GOTO810
870 IFB>0THENA$=MID$(STR$(B+1),2)+F
   $+B$:GOTO890
```

(continued on p. 196)

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```
880 A$=F$+B$
890 B=0:B1$=B$:F$=",":F1=1:GOTO1010
900 A=A-128:IFA<0ORQ<>0GOTO1000
910 IFA=127THENA$="_":GOTO1000
920 T=1:A$=K$(A)
930 IFA=15THENQ=2
1000 GOSUB2010
1010 IFA$=CHR$(34)THENQ=1-Q
1020 REM C=-1 FOR ALPHANUMERIC
1030 C=ASC(LEFT$(A$,1)):C=(C<48ORC>5
     7)AND(C<65ORC>90)
1040 IFT<>T1ORT=1THENT1=T:IFNOTCANDN
     OTC1THENP$=P$+" ":GOSUB250
     0
1050 C=ASC(RIGHT$(A$,1)):C1=((C<48OR
     C>57)AND(C<65ORC>90))ORA=3
     7
1060 P$=P$+A$:GOSUB2500
1070 GOTO810
1080 REM SKIP TO NEXT LINE
1090 GET#1,A$:IFA$=""GOTO710
1100 GOTO1090
2000 REM CLOSE OFF CURSOR EXPRESSION
2010 IFF1=0GOTO2040
2020 IFB>0THENP$=P$+MID$(STR$(B+1),2
     ):GOSUB2500
2030 B=0:F1=0:B1$="":P$=P$+P2$:GOSUB
     2500:F$=P1$
2040 RETURN
2500 IFLEN(P$)<L9GOTO2600
2510 FORJ=L9TOL9*.6STEP-1
2520 IFMID$(P$,J,1)=":"GOTO2580
2530 NEXTJ:FORJ=L9-1TOL9*.6-1STEP-1
2540 P=ASC(MID$(P$,J))
2550 IFP=91GOTO2580
2560 IFP=59ORP=44ORP=93THENJ=J+1:GOT
     O2580
2570 NEXTJ:J=L9-1
2580 PRINT#4,M$;LEFT$(P$,J-1)
2590 P$="    "+MID$(P$,J)
2600 RETURN
3000 IFLEN(P$)>0THENF2=1:PRINT#4,M$;
     P$
3010 IFF2=0THENPRINT"** NO LINES FOU
     ND **"
3020 CLOSE1:GOSUB2000:CLOSE4
```

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This program is only 48 lines long, loads in only 36 cassette turns, uses up only 1.6K, and costs nothing – but it will renumber your BASIC program in RAM, resolve line number references, and remain in memory so you can use it again and again. And all of it is in BASIC!

RENUMBER

(And a Brief Exploration Of BASIC)

Manny Juan
Dale City, CA

Type this program as is into your Atari – the first three lines must be entered exactly as shown – and save it on a cassette with the LIST"C" command. This command saves the program as ASCII text instead of as tokenized statements (as when a program is saved with CSAVE). A program saved this way may be reentered later to merge with another program already in memory, as described below.

Now type NEW to clear memory and CLOAD your favorite program. Make sure that the highest line number is less than 32100 and that it is an END statement. After the load is finished, place the tape containing RENUM (the renumbering program) into the cassette drive and type ENTER"C". This will make the Atari think that program statements (which are normally entered at the keyboard) are now being ENTERed from the cassette drive. After you have done this, RENUM becomes a part of your program, occupying the last 48 lines of it and ready to be invoked.

To renumber your program, simply type GOTO 32100. The program displays "FROM,BY?" and awaits your response. Type the line number you want your program to start with, followed by the increment value you desire. Please make sure that the potential line numbers will not extend beyond 32100. Sit back and wait for a couple of minutes. (The time varies according to the size of the program and the number of line number references RENUM has to resolve.)

This utility will renumber your program according to the starting number and increment value you supply. It also resolves all line number references in the following statement types: GOTO, GOSUB, IF...THEN, ON...GOTO, ON...GOSUB, TRAP, and RESTORE. It can recognize references to non-existent line numbers (e.g., TRAP 40000), and it attempts to recognize symbolic references (e.g., GOTO LABEL).

Whenever it encounters any of these conditions, RENUM will display, on the screen, the new line number of the current line being scanned, followed by "NF" if the referenced line was Not Found, or "SR" if a Symbolic Reference was encountered.

I suggest that you note these messages on paper so that you may investigate them later. Statements flagged with "NF" (other than some TRAP statements which may reference line numbers above 32768) usually imply that those statements are unexecutable. The presence of "SR" messages should tell you to look for those places in the program where the offending symbolic reference is assigned a value, so it can be adjusted according to the new numbering sequence.

When the renumbering process is completed, this utility displays the number of lines in your program, followed by this message:

LIST"C:",bbbbb,eeeee

where *bbbbb* is the beginning number and *eeeee* is the ending number of your program. You may position the cursor over this line and press the RETURN key if you are ready to save your program in ASCII format on cassette. (Note that a CSAVE command issued at this point would have saved your program and this utility on cassette in tokenized form.) Just remember to use the ENTER"C" command to reload your program next time, though. After that, you then CSAVE it again in a more compact form.

If you are doing program development, RENUM becomes a very handy tool to use to "open up" crowded line numbers to allow easy insertion of new lines. And if you are an author, RENUM adds a slight touch of professionalism to your articles with neatly renumbered program listings.

Program Logic

The logic of RENUM is very simple. Starting from the first line, it scans each statement and considers only those that may refer to a line number (GOTO,

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IF...THEN, etc.). If the line number reference extracted is less than the line number of the current line being scanned, it searches forward from the beginning of the program; otherwise, it begins its search from the current line.

While performing its search, it also keeps track of the future line number for each line encountered. When it finds a match, it replaces the line number reference by the future line number of the matching line. After it has resolved all such line number references, it starts over from the top; this time, it steps through all the lines of the program, a line at a time, and actually renumbers them. That's all there is to it.

Let me advise you at this point that the remainder of the article will discuss some internal mechanisms of the BASIC interpreter and will be more technical. If you are satisfied with the utility of RENUM, skip the rest of the article. But, if you're a system programmer, read on!

How does RENUM know where to start? The address of the first line in a program is always pointed to by a two-byte register at locations 136 and 137. (The value of a two-byte register is always computed as the left byte + 256 * right byte.) Before we discuss how RENUM steps through the program, resolves line number references and renumbers lines, we need some background information on how BASIC works.

BASIC Tokens

As everyone probably knows by now, a BASIC program is always stored in RAM in a "tokenized" format. Keywords (PRINT, LET, GOTO, etc.) are replaced by single bytes whose values identify the keyword. Variables are also stored as single bytes whose value is 128 + N, where N is the position of the variable in the variable table (the first variable occupying position zero).

Numeric literals (like those found in expressions or in statements like A = 123 or GOTO 32700) are replaced by seven bytes. The first byte is always 14, which stands for "numeric literal follows," and the last six bytes make up the BCD (Binary Coded Decimal) representation of the literal. Line numbers are encoded into a two-byte representation so that the right byte multiplied by 256 plus the left byte equals the value of the line number.

Each BASIC line (except REM and DATA), whether it is made up of one statement or multiple statements, is always stored as a string of one-byte tokens in this format:

N1, N2, PL, (LL, TK, ... other tokens..., DM)...

where the portion enclosed in parentheses may occur one or more times. N1 and N2 make up the line number so that LN = N1 + 256 * N2. PL is the length of the whole tokenized string, including N1 and N2. If PL is added to the address of N1, we get the address of the next line. LL is the offset, relative to the address of N1, of the next statement within the string.

The value of LL is never greater than PL, but it is equal to PL at the last or only statement within the line. TK is the token representing the keyword, and it may be followed by other tokens. Finally, DM is an end-of-statement delimiter. It contains a value of 22 if the statement is the last or only statement in the line; otherwise, it contains a value of 20.

For example, consider this line in BASIC:

356 ?A:GOTO 12345

The resulting token string that represents it is fully annotated below:

Relative Address	Token Value	Description
0	100	356 MOD 256
1	1	INT(356/256)
2	17	offset to next line
3	7	offset to next statement
4	40	token for ?
5	128	variable number + 128
6	20	end of first statement
7	17	offset to next line
8	10	token for GOTO
9	14	"number follows"
10	66	exponent byte of literal
11	1	1, of 12345 (0 * 16 + 1)
12	35	23, of 12345 (2 * 16 + 3)
13	69	45, of 12345 (4 * 16 + 5)
14	0	other digits, if any
15	0	same as above
16	22	end of statement and line
17		(start of next line)

A tokenized statement is not necessarily compressed, as you can see above. Compression is more readily apparent in a program where long, meaningful variable names are used generously, and literals sparingly.

The syntax for GOTO, "GO TO", GOSUB, TRAP, and RESTORE (tokens 10, 11, 12, 13, and 35, respectively) requires a line reference immediately following the keyword. (RESTORE sometimes requires none.) For these statement types, RENUM immediately resolves the line number references, if any. Both ON...GOTO (tokenized format 30,...,23) and ON...GOSUB (format 30,...,24) are followed by a list of line number references which are separated internally by the token 18. You may say that token 18 stands for the commas separating the numbers.

Finally, IF...THEN is recognized as the token string (7,...,27). When a line number reference immediately follows THEN, that number becomes a part of the IF...THEN token string. In all other cases (as in IF...THEN A = 0, or IF...THEN GOTO

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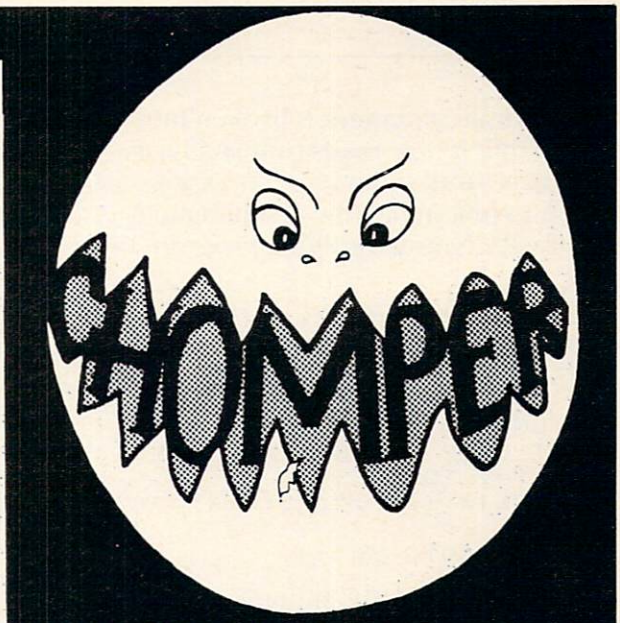

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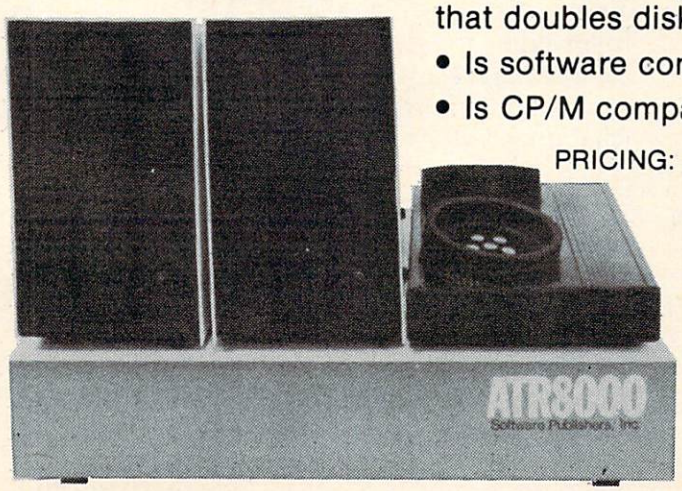

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100), the whole statement is broken into two token strings so that it now reads (internally) as "IF...THEN <null statement>: next statement." I urge you to investigate these statement types, and others, by RUNning the short program below:

```
10 DIM A$(1)
20 X=PEEK(136)+PEEK(137)*256
30 LN=PEEK(X)+PEEK(X+1)*256:PL=PEEK(X
   +2)
40 IF LN=32768 THEN STOP
50 IF LN<=90 THEN 90
60 LIST LN:? "ADDR=";X
70 FOR I=1 TO PL
80 ? PEEK(X+I+1);",";:NEXT I:? :INPUT
    A$
90 X=X+PL:GOTO 30
```

Just add the BASIC statements you want to examine after line 90 and type RUN. Line 40 checks for end of program. A "phantom" line (numbered 32768) is always present as the last statement of any program to tell the BASIC interpreter where the program ends. It cannot be listed, deleted, or referenced. But it *is* there.

If you also want to see all the valid keywords in BASIC, and their tokenized values as well, type this program in.

```
5 DIM A$(10)
10 I=42161:K=0:? CHR$(125)
20 A$="":J=0
30 C=PEEK(I):IF C>128 THEN 100
40 J=J+1:A$(J)=CHR$(C)
50 I=I+1:GOTO 30
100 C=C-128:J=J+1:A$(J)=CHR$(C)
110 PRINT K,A$
120 K=K+1:IF K>53 THEN STOP
130 I=I+3:GOTO 20
```

You will notice that there are 54 (0 through 53) keywords. BASIC looks up this table when translating a statement into a token string. If it finds no match, BASIC assumes that the statement has an implied LET keyword, and it assigns a token value of 54 for the keyword portion of the resulting token string.

BCD To Decimal, And Back

As I said earlier, all numeric literals used in BASIC statements (including line number references) are expressed in BCD (Binary Coded Decimal) format internally. When I discovered this, while I was investigating tokens, I realized that I needed the capability of converting a line number reference from BCD to decimal, and back, in order to make RENUM work.

The process takes many steps, including normalization of a number to even powers, "chunking" of digits by two's, and merging nybbles [*a piece of information that's four bits long*] to bytes [*one that's eight bits*]. In fact, a whole article could be devoted to BCD to decimal conversion. Suffice it to say that I did not have to write a lengthy routine to do the conversion – I simply took advantage of BASIC's built-in conversion routines.

BASIC Variable Table

BASIC maintains a variable table (addressed by locations 134 and 135) where all variables are stored. Each entry in the table is eight bytes long; the first byte specifies the variable type, and the second byte identifies the variable number, which starts with zero. For scalar variables (not DIMensioned), the first byte is always zero, and the segment defined by bytes three through eight contains the BCD representation of the variable's value.

Let's define a variable, say WM, to be our work area for doing the conversion. To convert a BCD number to decimal, we just POKE the six bytes representing the number into the BCD segment of the entry corresponding to WM. *Voilà*! WM now contains the decimal value of the number (as would be proved by PRINTing it).

To convert the other way (as when we are replacing a line number reference by a future line number), we simply equate WM to the desired decimal value, extract the last six bytes of WM's entry in the variable table, and POKE them into the token string to replace the old BCD number.

BASIC Symbol Table

But how do we know where WM resides in the variable table? When RENUM is first loaded (or ENTERed from cassette), dozens of variables would have already been added to the variable table. All variables defined and used in the program (or even in direct mode) get stored in the table. But before each one is added, the variable's NAME is first added to the end of another table – the symbol table. (It starts at location 2048 on a cassette-based system, and it seems to start at 7676 when DOS II is present.)

This table is actually a character string which is a concatenation of all variable names – in the sequence they are first defined. And this sequence is followed by the variable table. The last character of each name is flagged (bit seven turned on) to serve as a terminator. Type in this short program to see what the symbol table looks like:

```
10 X=2048
20 I=0
30 C=PEEK(X+I)
40 IF C=0 THEN STOP
50 PRINT CHR$(C);
60 I=I+1
70 GOTO 30
```

Before RUNning it, enter a few variables with long names (RUMPLESTILTSKIN=0, etc.) in direct mode so you can recognize them. The characters appearing in reverse video mark the ends of

the variable names.

With this information, it is possible to resolve the question posed above by extracting the variable name string segments, one at a time, until one of them matches "WM," at which point the variable number for WM would be obtained. However, this method requires a slow and lengthy routine to perform string extraction and matching. There has to be a better way.

Current Line Pointer

A new register comes into play. Locations 138 and 139, I discovered, always point to the current line being executed. With this new knowledge, I was able to define WM and pinpoint its location in the variable table in a single line of BASIC! I refer you now to line 32120 in the listing. The first statement defines the variable WM. Keep in mind that when this whole statement was tokenized, an entry for WM was added to the variable table, and its variable number now appears in the tokenized string.

The second statement determines the address of this very same line as it is being executed. At this point, X points to the beginning of the line. Let us dissect the third statement. The expression "(X+5)" positions us to the token for WM in the statement "WM=0". "PEEK(X+5)-128" looks at that byte and converts it to the true variable number assigned to WM. Multiplying it by eight computes the offset from the beginning of the variable table (defined by the first two terms of the statement). Finally, adding two to the result positions us to the BCD segment of WM's entry in the variable table. With this address saved in Y, BCD to decimal conversion (and back) becomes a breeze (as shown respectively by the one-liners 32470 and 32530).

RENUM, Line By Line

With all that background information out of the way, we can now talk about the other significant lines in RENUM. Lines 32100 through 32210 are the main loop of the program, which positions the variable C to the keyword token of every statement encountered before it enters the "analyze-keyword" subroutine at line 32280. The next loop, 32220 through 32270, performs the actual renumbering of the lines.

Line 32290 checks for GOTO,GO TO, GOSUB, TRAP, and RESTORE. Lines 32300 through 32370 check for the statements ON...GOTO and ON...GOSUB. Line 32330 skips numeric literals that the program might come across following the keyword ON, but before the words GOSUB (token 24) or GOTO (token 23). Lines 32380 through 32440 handle the IF statement, and line 32410 similarly skips insignificant numbers until it encounters the word THEN (token 27). The reason for skipping over these numeric literals is to preclude RENUM from misinterpreting BCD segments as valid tokens. Line 32430 handles the case where IF...THEN is immediately followed by a line number.

The subroutine starting at 32450 performs the search and replace operation. Line 32450 itself checks for end of statement (as when RESTORE is not followed by a number). When a line number reference is found, line 32470 converts it (now expressed as six bytes in BCD format) into decimal for comparison with the current line, which is performed at 32480.

At this point, it is determined whether searching is to start from the top or from the current position. Lines 32500 and 32510 search for a matching line number. When a match is found, line 32530 converts the future line number of that matching line to BCD as described previously and replaces the original reference. Finally, control is transferred to 32550 when the actual renumbering process is completed.

The program itself can be further reduced in size by merging statements into single lines, but that is up to you. The most obvious features missing from the program are sound and graphics, and that can be easily remedied.

```
32100 REM RENUMBER BY MANNY JUAN
32110 T8=256:I=1:Z=32100
32120 WM=0:X=PEEK(138)+PEEK(139)*T8:Y
      =PEEK(134)+PEEK(135)*T8+8*(PEEK
      (X+5)-128)+2
32130 ? "FROM,BY":INPUT FR,BY:? CHR$(
      125)
32140 B=PEEK(136)+PEEK(137)*T8:X=B:M=
      FR
32150 LN=PEEK(X)+PEEK(X+I)*T8:SOUND 0
      ,LN,10,8
32160 IF LN=Z THEN 32220
32170 PL=PEEK(X+2):C=X+3
32180 LL=PEEK(C):C=C+I
32190 GOSUB 32280
32200 IF LL<PL THEN C=X+LL:GOTO 32180
32210 X=X+PL:M=M+BY:GOTO 32150
32220 M=FR:X=B:SOUND 1,0,0,0
32230 LN=PEEK(X)+PEEK(X+I)*T8:SOUND 0
      ,32768-LN,10,8
32240 IF LN=Z THEN 32550
32250 MH=INT(M/T8):ML=M-MH*T8
32260 POKE X,ML:POKE X+I,MH
32270 M=M+BY:X=X+PEEK(X+2):GOTO 32230
32280 TK=PEEK(C)
32290 IF TK=10 OR TK=11 OR TK=12 OR T
      K=13 OR TK=35 THEN C=C+I:GOSUB
      32450:RETURN
32300 IF TK<>30 THEN 32380
32310 C=C+I:D=PEEK(C)
32320 IF D=23 OR D=24 THEN 32350
32330 IF D=14 THEN C=C+6
32340 GOTO 32310
32350 C=C+I:GOSUB 32450:D=PEEK(C)
32360 IF D<>20 AND D<>22 THEN 32350
32370 RETURN
```

(continued on p. 206)

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```
32380 IF TK<>7 THEN RETURN
32390 C=C+I:D=PEEK(C)
32400 IF D=27 THEN 32430
32410 IF D=14 THEN C=C+6
32420 GOTO 32390
32430 C=C+I:IF C<(X+LL) THEN GOSUB 32
      450
32440 RETURN
32450 D=PEEK(C):IF D=20 OR D=22 THEN
      C=C+I:RETURN
32460 IF D<>14 THEN ? M;" SR,";:C=C+I
      :RETURN
32470 C=C+I:FOR J=0 TO 3:POKE Y+J,PEE
      K(C+J):NEXT J
32480 IF WM<LN THEN WX=B:RN=FR:GOTO 3
      2500
32490 WX=X:RN=M
32500 WN=PEEK(WX)+PEEK(WX+I)*T8:SOUND
       1,WN,10,8
32510 IF WN<Z AND WN<WM THEN RN=RN+BY
      :WX=WX+PEEK(WX+2):GOTO 32500
32520 IF WN<>WM THEN ? M;" NF,";:GOTO
       32540
32530 WM=RN:FOR J=0 TO 3:POKE C+J,PEE
      K(Y+J):NEXT J
32540 C=C+6:RETURN
32550 ? :? (M-FR)/BY;" LINES"
32560 ? "LIST";CHR$(34);"C:";CHR$(34)
      ;",";FR;",";M-BY
32570 END                                    ©
```

If you've ever used the VIC's data file functions to do tape saves and loads of machine code, hex tables, or graphics, you'll appreciate the speed, ease, and flexibility with which this program, Dump/Recover, accomplishes those tasks. You'll also learn a bit about using BASIC's internal machine language routines.

VIC Block SAVE And LOAD

Sheila Thornton
New York, NY

This program is built around four of the kernal routines, the self-contained machine language software modules in VIC's operating system which can be accessed through a group of JMP instructions located at the top of memory.

These routines – SETLFS, SETNAM, SAVE, and LOAD – are subroutines of the SAVE and LOAD functions in BASIC, but can be used individually to save any size memory block up to location 32766 ($7FFE) and to load the saved matter into its original position or a new one.

To discourage casual copying of their proprietary software, Commodore has inserted code in the SAVE routine which aborts attempted tape saves above 32766 ($7FFE hex). However, a VIC owner who boasts a 1540 disk has informed me that, curiously, this prohibition doesn't extend to disk saves.

Dump/Recover (Program 1) combines 43 bytes of machine code and ten lines of BASIC to connect you to the kernal routines and to allow specification of start and end address and name via an INPUT statement.

Understanding The Method

Program 2 is a commented disassembly of the machine code that Dump/Recover must POKE into memory. In the first four instructions, the logical file number, device, and secondary address are selected, and then the SETLFS routine which makes it all happen is called. The second four instructions specify the length of the file name and its location in memory, and then jump to SETNAM, which will expect to find the file name immediately above the end of the array variables (as pointed to by zero page locations 49 and 50) and the name length at address 0.

At this point, the SAVE or LOAD routines can be called, but the usual tape messages (other than the PRESS... instructions) will not be displayed. Some sleuthing inside VIC's Operating System disclosed that SAVE and LOAD require that bit seven at address 157 ($9D) be set for the messages to be printed. The two instructions following the jump to SETNAM accomplish this.

While these messages are not required for a successful save or load, I find it comforting to see that VIC is indeed SAVING/SEARCHING FOR/LOADING the file I've specified. This feedback also serves as a check for typing errors, and helps to spare VIC from doggedly searching through an entire cassette for, say, "OPCODE TABEL" while I've excused myself to make tea. Unfortunately, I wasn't able to find how to turn on the "?LOAD ERROR" message, so this is handled in BASIC.

After completing these preparatory routines, the program returns to BASIC, which checks whether a save or load has been chosen and jumps to the appropriate machine code. LOAD will look at addresses 251 and 252 ($FB, $FC) to find the start address, and SAVE will additionally use 253 and 254 for the end address.

Since Dump/Recover's purpose is to save and load any permitted section of memory, I decided that the "safest" place to put the machine code was in the BASIC input buffer (512 to 600 – $0200-$0258), making it necessary to re-POKE the code every time the program is run. While this doubles the permanent program length (to 487 bytes), it does add flexibility.

Returning to Program 1, you can see that Dump/Recover's first job is to accept the start and end addresses (in decimal) and the file name, so the input buffer can be freed up for the machine code. The end address entered for a save must be one higher than that of the last byte to be saved. For a load, a "0" must be entered as the end address.

Line 1003 places the name length in location 0 and turns the end-of-arrays pointer, plus the name length, into a decimal number. Because all of the program's variables must be set up before the latter step is taken, "U" is first set equal to "1." In line 1004, the program puts the file name above the BASIC variables, jumps to the SETLFS and SETNAM routines, POKEs the start address pointer, and tests whether a dump or recovery has been selected. If a dump, line 1005 places the end address in memory, jumps to the appropriate machine code, and ends the program.

Since a side effect of the LOAD routine is that the numeric and array variable pointers are set to the end address of the loaded material, line 1006 saves the pointers in the input buffer before LOAD is called, and restores them afterward. Line 1007 checks the I/O STATUS word, and prints a load error message if STATUS reports either an unrecoverable load error or any mismatch.

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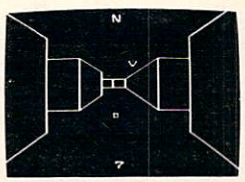

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VIC 20/PET/CBM OWNERS

If the END statements in lines 1005 and 1008 are changed to RETURNs, Dump/Recover can be used as a subroutine; but don't forget that, while RUN restores the DATA pointer, GOSUB does not. I have fashioned short, unique versions of Dump/Recover to include in programs which need to load in binary data and to preface frequently used machine code tapes so they will load in without making BASIC forget where it's put its variables.

Material saved with Dump/Recover can be verified from BASIC using the format, VERIFY "FILENAME",1,1. BASIC will also load these tapes, but the adjustment made to the variable pointers may make it necessary to execute a NEW after the load. You'll often find it necessary to protect the loaded file from BASIC by lowering the string and end-of-memory pointers.

The kernal routines are pretty thoroughly documented in the *Programmer's Reference Guide* (pp. 182-211), but I'd like to share with you some omissions and errors I discovered there while writing this program. First, the *Guide* neglects to say what the valid secondary addresses are for the SAVE function. I wasn't surprised to discover that they are the same as used in BASIC:

0 = Relocatable save
1 = Non-relocatable save
2 = Relocatable save with end-of-tape marker
3 = Non-relocatable save with E-O-T marker

The discussion of the SETLFS routine indicates that 255 ($FF) should be used if *no* secondary address is desired. While this may be true for other I/O operations, a 255 functions exactly like a 3 for a tape save. The *Guide* also gives incorrect secondary addresses for a load. In fact, a "0" will permit a relocating load, and a "1" will inescapably send the file back to its origin.

With just a few bytes of simple "straightline" code, even inexperienced machine language programmers can tap significant programming power and speed from the 36 kernal routines. I've found other documentation errors in the *Guide*, though, so I suggest you thoroughly test out a routine before incorporating it in a program.

Program 1: BASIC Version

```
999 REM "DUMP/RECOVER" FOR VIC-20
1000 PRINT"START,END,NAME":INPUTV,W,V$:R=540:FO
    RJ=1TO43:READT:POKER+J+5,T:NEXT:GOTO1
    000
1001 DATA169,1,162,1,160,0,32,186,255,165,0,166
    ,49,164,50,32,189,255,169,128,133,157
    ,96
1002 DATA169,0,166,251,164,252,32,213,255,96,16
    9,251,166,253,164,254,32,216,255,96
1003 T=LEN(V$):POKE0,T:U=1:S=256*PEEK(50)+PEEK(
    49)+T
1004 FORJ=1TOT:POKES-J,ASC(RIGHT$(V$,J)):NEXT:S
    YS546:U=V:T=252:GOSUB1009:IFW=0THEN1006
1005 U=W:T=254:GOSUB1009:SYS579:END
1006 FORJ=0TO5:POKER+J,PEEK(45+J):NEXT:SYS569:F
    ORJ=0TO5:POKE45+J,PEEK(R+J):NEXT
1007 IFSTATUSAND48THENPRINT:PRINT"?LOAD":PRINT"
    ERROR";
1008 END
1009 POKET,INT(U/256):POKET-1,U-256*PEEK(T):RET
    URN
```

Program 2: Machine language subroutines

```
0222 A9 LDA #01      ;SET FILE NO.
0224 A2 LDX #01      ;SET DEVICE NO. (TAPE)
0226 A0 LDY #00      ;SET SEC. ADDR.
                     ; (RELOCATABLE)
0228 20 JSR FFBA     ;CALL SETLFS
022B A5 LDA 00       ;GET NAME LENGTH
022D A6 LDX 31       ;GET NAME START ADDR. LO
022F A4 LDY 32       ;GET NAME START ADDR. HI
0231 20 JSR FFBD     ;CALL SETNAM
0234 A9 LDA #80      ;
0236 85 STA 9D       ;TURN ON TAPE MESSAGES
0238 60 RTS          ;
0239 A9 LDA #00      ;SET LOAD FUNCTION
023B A6 LDX FB       ;GET LOAD START PNT. LO
023D A4 LDY FC       ;GET LOAD START PNT. HI
023F 20 JSR FFD5     ;CALL LOAD
0242 60 RTS          ;
0243 A9 LDA #FB      ;SET SAVE START PNT.
                     ;OFFSET
0245 A6 LDX FD       ;GET SAVE END PNT. LO
0247 A4 LDY FE       ;GET SAVE END PNT. HI
0249 20 JSR FFD8     ;CALL SAVE
024C 60 RTS          ;
```

This program for the Atari 400/800, 8K memory, lets you mix text and graphics easily on any four-color graphics screen. Characters can be redefined and moved about as "game shapes" at high speed on the graphics screen.

TextPlot II

Mark Grebe
York, NE

When "TextPlot" (**COMPUTE!**, November 1981, #18) was published, I thought that it would probably be limited to such uses as labeling graphs. At the time, I was busy writing games for the Atari, so I overlooked this valuable routine. However, when David Plotkin's article, "Using TextPlot for Animated Games" (**COMPUTE!**, April 1982, #23), appeared, it caught my eye immediately. I had been toying with the idea of writing a machine language routine similar to Apple's shape tables, so I decided to see if TextPlot would work.

I soon found that TextPlot had a limitation. It can place the character only at horizontal positions that are divisible by four. In the four color modes, the Atari stores information for four pixels in one byte. When you attempt to move the object horizontally, it jumps four pixels instead of moving smoothly.

After many hours of writing, I finished a revision. The command to invoke TextPlot II is almost identical to the one used in TextPlot:

```
A=USR(ADR(A$),chr,color,horiz,vert)
```

There must be four parameters in the command. Unlike TextPlot, if you don't have four, the program returns an ERROR -22. TextPlot merely used the system bell. (I would like to suggest that machine language programmers use this error number as a standard for the wrong number of parameters in a USR statement.) The meanings of the parameters are:

chr - ASCII value of the character you wish to plot.

color - The color of the character (1-3).

horiz & vert - these are the same as the X and Y values used for PLOT and DRAWTO in the graphics mode you are in.

TextPlot II is a BASIC loader program. Since the program is too large to fit in page six, it is broken into two parts. The portion in the variable A$ is completely relocatable, as the only call used is JSR $0600. This is a call to the other portion of the program.

Well, that's it, short and simple. If you come up with any amazing games using TextPlot II, please let me know. If you don't want to type in all those data statements, I'll be happy to make you a copy. Just send a cassette or diskette, an SASE mailer, and $3 to:

Mark Grebe
36 Edison Avenue
York, NE 68467

```
30000 DIM A$(354):FOR I=1 TO 354:READ
       X:A$(I,I)=CHR$(X):NEXT I:FOR I
      =0 TO 21:READ X:POKE 1536+I,X:N
      EXT I
30010 DATA 104,240,10,201,4,240,13,17
      0,104,104,202,208,251,169,22,13
      3,185,76,64,185,104,133,195,104
30020 DATA 201,128,144,4,41,127,198,1
      95,170,141,22,6,224,96,176,15,1
      69,64,224,32,144,2,169,224
30030 DATA 24,109,22,6,141,22,6,104,1
      04,141,23,6,104,104,141,24,6,20
      1,4,144,5,56,233,4
30040 DATA 176,247,133,214,201,0,240,
      7,169,4,56,229,214,133,214,78,2
      4,6,78,24,6,6,214,24
30050 DATA 104,104,141,25,6,133,186,1
      66,87,169,10,224,3,240,8,169,20
      ,224,5,240,2,169,40,133
30060 DATA 207,133,187,165,88,133,203
      ,165,89,133,204,32,0,6,24,173,2
      4,6,101,203,133,203,144,2
30070 DATA 230,204,24,165,203,101,212
      ,133,203,165,204,101,213,133,20
      4,173,22,6,133,187,169,8,133,18
      6
30080 DATA 32,0,6,165,212,133,205,173
      ,244,2,101,213,133,206,160,0,16
      2,8,169,0,133,209,133,208
30090 DATA 177,205,69,195,72,104,10,7
      2,144,8,24,173,23,6,5,208,133,2
      08,224,1,240,8,6,208
30100 DATA 38,209,6,208,38,209,202,20
      8,228,104,152,72,160,0,132,215,
      132,212,166,214,240,88,56,38
30110 DATA 215,202,208,250,177,203,5,
      215,69,215,145,203,165,215,73,2
      55,133,215,200,200,177,203,5,21
      5
30120 DATA 69,215,145,203,166,214,6,2
      09,38,212,202,208,249,160,0,24,
      177,203,101,212,145,203,169,8
30130 DATA 56,229,214,170,132,212,70,
      208,102,212,202,208,249,240,2,2
      08,135,160,2,24,177,203,101,212
30140 DATA 145,203,24,165,208,101,209
      ,160,1,145,203,24,144,9,165,209
      ,145,203,200,165,208,145,203,10
      4
30150 DATA 168,24,165,203,101,207,133
      ,203,144,2,230,204,200,192,8,20
      8,206,96
30160 DATA 169,0,133,212,162,8,70,186
      ,144,3,24,101,187,106,102,212,2
      02,208,243,133,213,96
```

Create and Modify multicolored sprites on the Commodore 64, the easy way.

Commodore 64 Sprite Editor

Stephen Meirowsky
Peabody, KS

The new Commodore 64 computer has one of the best, if not the best, graphics capabilities of any home computers.

Graphics Potential

The 64 has text graphics with a 40 x 25 character format, just like the PET. Plus, it has *Sprites* to use with the text graphics. These tools allow you to design your own pictures in four different colors (the manual shows how to use only one color), just like arcade video games. Sprites can be one of 16 colors in the single-color mode, and four of eight colors in the multicolor mode.

Eight sprites are available for screen display in a 24 horizontal by 21 vertical pixel format. Each sprite has a different "display hierarchy" when crossing over another sprite. Sprite 0 would move in front of Sprite 1; Sprite 1 and Sprite 0 would move in front of Sprite 2, and so on up to Sprite 7. All other sprites would move in front of Sprite 7. Also, you can tell each sprite whether it moves in front of or behind the normal text graphics.

Each sprite can be expanded to twice its size, horizontally, vertically, or both. Automatic collision detection tells you when sprites have hit each other or when a sprite has hit the background text graphics.

Commodore's manual gives the register number in the graphics IC chip which gives access to the collision information. First of all, the sprite-to-sprite collision is register 30 decimal. When sprites collide, the graphics chip sets their bits in this register. Second, the sprite to background graphics collision is register 31 decimal. When a sprite collides with the background, its bit is set.

Creating a Sprite

To make a sprite, you must first draw it on a 24x21 grid. Then you convert the set dots in each row into three separate bytes of data, using binary code. For each byte, add up the number according to its bit. The numbers for each bit in a byte are 128, 64, 32, 16, 8, 4, 2, 1.

Example of converting the grid:

```
Row 1  +.....+.....++++++++
Row 2  +..+..+.....++++++++
Row 3  ...+...+.....+++...+++
```

```
101 DATA 129,1,255:REM DATA FOR ROW1
102 DATA 145,1,255:REM DATA FOR ROW2
103 DATA 17,1,199 :REM DATA FOR ROW3
104 DATA
```

Next, POKE into memory the 63 bytes of data to describe the sprite to the computer. The conversion of the grid into 63 bytes is not hard, but it is very time consuming. This is the reason for the Sprite Editor.

The Easy Way

The sprite editor gives many easy single-key commands to edit the sprite, display it, and save it. When the program is executed, commands are printed along the left side of the screen. On the right side of the screen is a 24x21 grid which is used to edit a sprite. To move the cursor, use the cursor keys. If you want a pixel set on the sprite, push the 1, 2, or 3 keys. If you want the pixel erased, push the "←" key. Any time you want to see the actual sprite, push the "=" key and it will compute the grid into the byte form and display the sprite in the lower left corner of the screen.

If you make any updates on the grid, they will not be displayed in the corner until the "=" key is pushed again. Once the sprite has been displayed, it can be enlarged horizontally or vertically by pressing "X" or "Y". Also, you can display the data for using this sprite in a program by pushing "B".

On all four of the following commands, the computer will ask if it is the correct command to be executed. The four commands are "N" for erasing the grid and the sprite to edit a new sprite; "S" for saving sprite data to cassette; "L" for loading a sprite from cassette; and "Q" for quitting the program.

To change colors while creating a sprite, use the "F1," "F3," "F5," and "F7" keys.

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```
10 POKE53281,6:DIM A(21,24),B(63),A$(15):X=0:
   Y=0:R=0:C=0:S=1039:S1=55311
11 V=53248:POKEV+21,0:POKEV+23,0:POKEV+29,0:R
   ESTORE:FORX=0TO15:READA$(X):NEXT
12 PRINT"{CLEAR}":FORR=1TO21:FORC=1TO24:A(R,C
   )=46:NEXT:NEXT:FORX=1TO63:B(X)=0:NEXT
14 POKEV+4,60:POKEV+5,200:POKE2042,13:POKEV+3
   7,0:POKEV+41,14:POKEV+38,1
16 FORX=1TO63:POKE831+X,B(X):NEXT:POKEV+21,4:
   POKEV+28,4
20 PRINT"{CLEAR}{DOWN}MC SPRITE EDITOR{DOWN}"
22 PRINT"_ ERASE"
23 PRINT"1 MC 0-BLACK"
24 PRINT"2 SC  -LT BLUE"
25 PRINT"3 MC 1-WHITE"
32 PRINT"= COMPUTE SPRITE"
33 PRINT"X SCALE 'X'"
34 PRINT"Y SCALE 'Y'"
35 PRINT"B BASIC DATA"
36 PRINT"N NEW SCREEN"
37 PRINT"S SAVE SPRITE"
38 PRINT"L LOAD SPRITE"
39 PRINT"Q QUIT"
50 Y=0:FORR=1TO21:FORC=1TO24:Y=Y+1:POKES+Y,A(
   R,C):POKES1+Y,14:NEXT:Y=Y+16:NEXT
55 X=1:Y=1:GOTO79
60 GETA$:IFA$=""THEN60
61 R=S+X+(Y-1)*40:C=A(Y,X):POKER,C:POKER+1,C
62 IFA$="{DOWN}"THENY=Y+1:IFY>21THENY=1
63 IFA$="{UP}"THENY=Y-1:IFY<1THENY=21
64 IFA$="{RIGHT}"THENX=X+2:IFX>24THENX=1
65 IFA$="{LEFT}"THENX=X-2:IFX<1THENX=23
66 IFA$="_"THENA(Y,X)=46:A(Y,X+1)=46
67 IFA$>"0"ANDA$<"4"THENR=48+VAL(A$):A(Y,X)=R
   :A(Y,X+1)=R
68 IFA$="="THEN100
69 IFA$="X"THENPOKEV+29,ABS(PEEK(V+29)-4)
70 IFA$="Y"THENPOKEV+23,ABS(PEEK(V+23)-4)
71 IFA$="B"THEN120
72 IFA$="L"ORA$="S"ORA$="N"ORA$="Q"THEN190
73 IFA$="{F1}"THENR=33:GOSUB130
74 IFA$="{F2}"THENR=37:GOSUB130
75 IFA$="{F3}"THENR=41:GOSUB130
76 IFA$="{F4}"THENR=38:GOSUB130
79 R=S+X+(Y-1)*40:C=A(Y,X)+128:POKER,C:POKER+
   1,C:GOTO60
100 Y=0:FORR=1TO21:FORX=0TO2:Y=Y+1:B(Y)=0:FORC
   =1TO7STEP2:Q=A(R,X*8+C)-48
102 IFQ<0ORQ>3THENQ=0
104 B(Y)=B(Y)+2^(7-C)*Q:NEXT:NEXT:NEXT:FORX=1T
   O63:POKE831+X,B(X):NEXT:GOTO55
110 PRINT"{REV}"A$": YES OR NO"
111 FORX=1TO10:GETN$:NEXT
112 GETN$:IFN$=""THEN112
114 PRINT"{UP}                    {UP}":RETURN
115 PRINT"{REV}CONTINUE":GOTO111
119 REM
120 PRINT"{CLEAR}":FORX=1TO7:PRINT"DATA";:FORY
   =1TO9:PRINTB((X-1)*9+Y)"{LEFT},";:NEXT
122 PRINT"{LEFT} ":NEXT:PRINT:GOSUB115:GOTO20
130 C=PEEK(V+R)AND15:C=C+1:IFC>15THENC=0
132 POKEV+R,C:PRINT"{HOME}{03 DOWN}";:IFR=33TH
   EN136
133 PRINT"{DOWN}";:IFR=37THEN136
134 PRINT"{DOWN}";:IFR=41THEN136
135 PRINT"{DOWN}";
136 PRINT"{07 RIGHT}"A$(C)"  ":RETURN
190 GOSUB110:IFN$<>"Y"THEN79
191 GETN$:GETN$:IFA$="N"THEN11
192 IFA$="Q"THENPOKEV+21,0:POKEV+28,0:PRINT"{0
   4 DOWN}":END
194 PRINT"{CLEAR}":POKEV+21,0:INPUT"NAME OF SP
   RITE";N$:PRINT
196 IFA$="L"THENOPEN1,1,0,N$:GOTO300
200 OPEN1,1,1,N$:FORX=1TO63:PRINT#1,B(X):NEXT:
   CLOSE1:GOTO16
300 FORX=1TO63:INPUT#1,B(X):NEXT:CLOSE1:PRINT"
   {DOWN}COMPUTING SPRITE MATRIX"
310 Y=0:FORR=1TO21:FORX=0TO2:Y=Y+1:FORC=2TO8ST
   EP2:Q=X*8+C:P=2^(8-C)
312 S=B(Y)AND(P*3):A(R,Q)=46:A(R,Q-1)=46
314 IFS>0THENA(R,Q)=S/P+48:A(R,Q-1)=S/P+48
330 NEXT:NEXT:NEXT:S=1039:GOTO16
500 DATA BLACK,WHITE,RED,CYAN,PURPLE,GREEN,BLU
   E,YELLOW
510 DATA ORANGE,BROWN,LT RED,GRAY1,GRAY2,LT GR
   N,LT BLUE,GRAY3
```

Add five invaluable commands to VIC BASIC: renumber, delete, find, change, and kill. This enhancement to BASIC automatically locates itself, protects itself, and becomes "part of the computer." It requires 1200 bytes of RAM, a little more than 1K. The article describes the step-by-step process of entering this program (it's machine language, but you can enter and use it without knowing machine language). Alternatively, the author offers to make tape copies – see instructions below.

Tiny Aid For VIC-20

David A. Hook
Barrie, Ontario

Since the early days of the PET, various enhancements for BASIC have been available. Bill Seiler, then of Commodore, produced the first public-domain version, called "BASIC-Aid."

Many updates and improvements have been made over the past couple of years. The PET/CBM program has ballooned to a 4K package for almost every possible PET/CBM equipment configuration.

As has been customary in the Commodore community, Jim Butterfield developed a version of the BASIC-Aid. He called this Tinyaid2 (or Tinyaid4, for BASIC 4.0). This offered the six most useful commands from the full-fledged program.

Following is my modification of that work, designed to provide VIC users with the same benefits. After using this for a while, I think you will find the added commands nearly indispensable.

Features

VIC Tiny Aid is a machine language program which consumes about 1200 bytes of your RAM memory. After you have loaded the program, type "RUN" and hit "RETURN". The program repacks itself into high memory. The appropriate pointers are set so that BASIC will not clobber it. VIC Tiny Aid is now alive.

Once activated, five commands become attached to BASIC. They will function only in "direct" mode; i.e., don't include them in a program.

```
(1) NUMBER 1000,5        'RETURN'
    NUMBER 100,10
```

Renumbers a BASIC program with a given starting line number and given increment between line numbers. The maximum increment is 255.

All references after GOTO, THEN, GOSUB, and RUN are automatically corrected. A display of these lines is presented on the screen as it works. If a GOTO refers to a non-existent line number, then it is changed to 65535. This is an illegal line number, and must be corrected before the BASIC program is used.

```
(2) DELETE 100-200       'RETURN'
    DELETE - 1500
    DELETE 5199 -
```

Deletes a range of lines from a BASIC program. Uses the same syntax as the LIST command, so any line range may be specified for removal. DELETE with no range will perform like a NEW command, so be careful.

```
(3) FIND /PRINT/         'RETURN'
    FIND /A$/, 150-670
    FIND "PRINT", 2000-
```

Will locate any occurrences of the characters between the "/ " marks. Almost any character may mark the start/end of the string to be found, so long as both are the same. The first example will find all the PRINT instructions in the program.

If you are looking for a string of text which contains a BASIC keyword, you must use the quote characters as markers. This will prevent the search string from being "tokenized."

If a limited line-range is desired, use the same syntax as for LIST. Note that a comma (",") must separate the line-range from the end marker.

All lines containing the string are printed to the screen. If a line has more than one of them, each occurrence will cause a repetition of that line.

```
(4) CHANGE -PRINT-PRINT#4,-      'RETURN'
    CHANGE /ABC/XYZ/, 6000-
    CHANGE /DS$/D1$/, -5000
```

Using the same syntax as FIND, you may change any string to any other string in a BASIC program. This command is very powerful and was

not part of the early versions of BASIC-Aid or Toolkit.

As before, you may indicate a line-range. As the changes are made, the revised lines are displayed on the screen.

Watch out for the difference between BASIC keywords and strings of text within quotes. You may use the quote characters to differentiate, as with FIND.

(5) KILL 'RETURN'

This command disables VIC Tiny Aid and its associated commands. A syntax error will be the result if any of the above commands are now tried.

Since the routine is safe from interference from BASIC, you may leave it active for as long as your machine stays on. It is possible that VIC Tiny Aid may interfere with other programs that modify BASIC's internal "CHRGOT" routine. The KILL command allows you to avoid this conflict.

Procedure

The VIC contains no internal machine language monitor, which is really the only practical way to enter this program. So follow one of the three methods below to perform the task.

(1) Borrow an Upgrade or BASIC 4.0 PET/CBM, with its internal ML monitor. This will be the easiest method to enter the program.

(2) Use your VIC-20, but you must have a machine language monitor:

— Jim Butterfield's Tinymon For VIC (**COMPUTE!**, January 1982, #20).

— my adaptation of Supermon For VIC (*The Transactor*, Volume 3, Issue #5).

— VICMON cartridge from Commodore.

(3) The easy way:

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If you are using a VIC, and have a 3K RAM or SUPEREXPANDER cartridge, plug this in. It will be somewhat easier to follow, since programs are then "PET-compatible" without further juggling. However, don't use the 8K or 16K expansion for this job.

If you are familiar with the operation of the ML monitor, please skip ahead to the specifics below.

You are about to type in almost 2500 characters worth of hexadecimal numbers. In addition to the digits from zero to nine, the alphabetic characters from A-F represent numbers from ten to fifteen. These characters, and three instructions, will be all that are used to enter our program. You don't have to understand the process – just type in the characters exactly. It's not very exciting, but don't be too intimidated by the "funny" display.

Believe it or not, this is the most efficient way to enter the information. The program will use only 1200 characters of memory. Using a "BASIC loader" (with DATA statements), the program wouldn't fit in a 5K VIC!

Enter the machine language monitor program using a:

TINYMON/SUPERMON FOR VIC – LOAD and RUN the program.

PET/CBM – Type "SYS1024" and hit "RETURN".

VICMON Cartridge – "SYS 6*4096" or "SYS 10*4096" (this depends on the version you have), then type "RETURN".

Note: If you are working on the unexpanded VIC, you will need to follow the alternate instructions in parentheses below.

The cursor will be flashing next to a period character ("."). Type the entry starting at the current cursor position:

.M 0580 05C0 'RETURN' (.M 1180 11C0)

Several lines should appear on the screen, much like the "memory-dump" which accompanies this article. A four-digit quantity called an "address" leads off a line, and either eight or five columns of two-digit values appear alongside.

Look at the tables of values in the article. They show eight rows of these addresses. Note that the first "block" has the address "0580," which matches the first address just above. The first row of the next table shows "05C0," which is the second (or ending) address just above.

Your mission is to type in the matching values from the article, in place of the two-digit values you see on the screen. If you're using your VIC for this job, you will have to be on your toes. The tables show eight bytes per row, whereas the various VIC monitors present only five bytes at a time. You could mark off the values in groups of five before you start.

Remember to hit "RETURN" at the end of each screen line, or the changes won't be made.

Double check the values you've typed. It's not easy to find an error later on.

Look at the next block of values. Type in the

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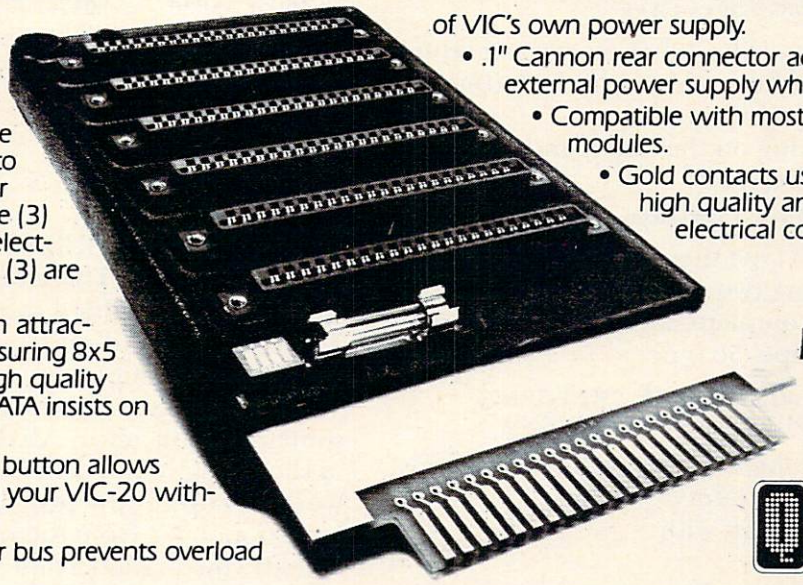

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start/end addresses to display:

```
.M 05C0 0600    'RETURN'    (.M 11C0 1200)
```

Type in the values required and go on with the rest of the blocks.

You will use addresses ranging from:

```
05xx-06xx-07xx-08xx-09xx-0Axx
```

as shown in the tables. The "x" characters stand for the other two digits of the address in the leftmost column.

If you are working on the unexpanded VIC, the sequence of addresses is:

```
11xx-12xx-13xx-14xx-15xx-16xx
```

You will have to type these pairs of characters in place of the leading two shown just above.

With that task complete, we are ready to preserve this work on tape. So type:

```
.S "VIC AID.ML",01,0580,0AB6   'RETURN'
(or: .S "VIC AID.ML",01,1180,16B6   'RETURN')
```

Mount a blank tape, and follow the instructions. Save a second copy, for safety.

Exit the ML monitor, with:

```
.X    'RETURN'
```

VERIFY the program normally before going any further.

Now comes the easy part. Type "NEW", then the BASIC listing. Enter this exactly, without including any extra text. Save this as "VIC AID.BAS" and VERIFY it.

Leave this program in memory for the next stage.

Finally, LOAD the "VIC AID.ML" and SAVE "VIC AID.REL" on another blank tape. Both the BASIC part and the machine language part have been SAVEd together.

Check-Out

We are going to check out the machine language using a "checksum" method. Type in "NEW" before proceeding. Now enter the following program:

```
10 I=0 (or: 10 I=3072 for unexpanded VIC)
20 T=0:FOR J=1408+I TO 2741+I
30 T=T+PEEK(J)
40 NEXT J
50 PRINT T
```

After a few seconds, if the value 161705 appears, you've likely got it perfectly. Go to the next section.

If not, there's at least one incorrect entry. Change the two values in line 20, using the table below. Re-RUN the program and compare against the value in the third column.

Repeat the process for each row, noting any that don't match. Each row corresponds to two "blocks" from the last section. You will have to re-enter the ML monitor to re-check those sections that differ. Re-SAVE the ML part!

Block #	Value 1	Value 2	Checksum
1- 2	1408	1535	15201
3- 4	1536	1663	17221
5- 6	1664	1791	15925
7- 8	1792	1919	15117
9-10	1920	2047	15565
11-12	2048	2175	14141
13-14	2176	2303	15840
15-16	2304	2431	16276
17-18	2432	2559	15152
19-20	2560	2687	15194
21	2688	2741	6073

Operation

The final acid test. RELOAD the program from tape and RUN it. The screen will clear and a brief summary of the added commands will be displayed. The cursor should return almost instantly, under the "READY." message.

If the cursor does not come back, there is something still amiss. All the numbers appearing in the listing in this article were produced from a working copy of the program (Honest!). You still have option (3) from the procedure section available. If you do send a tape/disk at this point, include your non-functioning version. I can then do a compare, to see where the error(s) were.

This has been a massive exercise, and mistakes can easily creep in. Your comments are welcome.

Program 1: Memory Dump of Tiny Aid

```
0580 A5 2D 85 22 A5 2E 85 23
0588 A5 37 85 24 A5 38 85 25
0590 A0 00 A5 22 D0 02 C6 23
0598 C6 22 B1 22 D0 3C A5 22
05A0 D0 02 C6 23 C6 22 B1 22
05A8 F0 21 85 26 A5 22 D0 02
05B0 C6 23 C6 22 B1 22 18 65
05B8 24 AA A5 26 65 25 48 A5

05C0 37 D0 02 C6 38 C6 37 68
05C8 91 37 8A 48 A5 37 D0 02
05D0 C6 38 C6 37 68 91 37 18
05D8 90 B6 C9 DF D0 ED A5 37
05E0 85 33 A5 38 85 34 6C 37
05E8 00 AA AA AA AA AA AA AA
05F0 AA AA AA AA AA AA AA AA
05F8 AA AA AA AA AA AA AA AA

0600 DF AD FE FF 00 85 37 AD
0608 FF FF 00 85 38 A9 4C 85
0610 7C AD D9 FB 00 85 7D AD
0618 DA FB 00 85 7E 4C 8F FC
0620 00 F0 03 4C 08 CF A9 C9
0628 85 7C A9 3A 85 7D A9 B0
0630 85 7E 60 DB FB 00 85 8B
```

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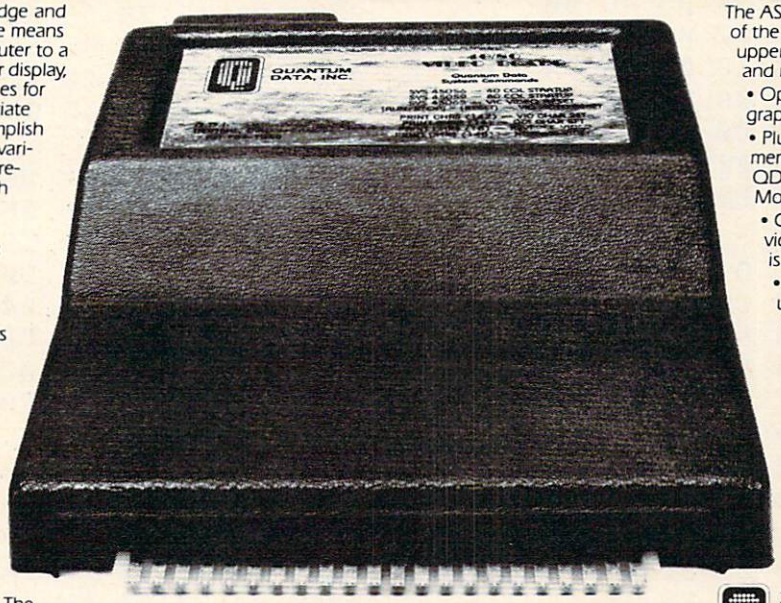

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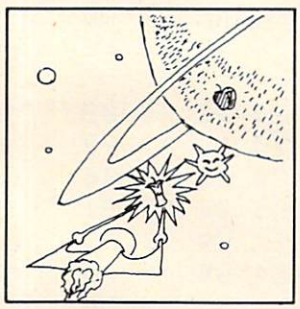

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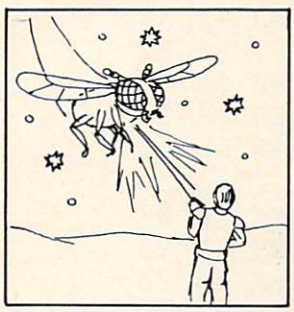

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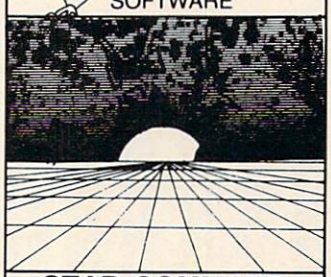

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```
0638 86 97 BA BD 01 01 C9 8C

0640 F0 10 D0 02 A4 8C A6 97
0648 A5 8B C9 3A B0 03 4C 80
0650 00 00 60 BD 02 01 C9 C4
0658 D0 ED A5 8B 10 02 E6 7A
0660 84 8C A2 00 00 86 A5 CA
0668 E8 A4 7A B9 00 00 02 38
0670 FD D9 FF 00 F0 13 C9 80
0678 F0 13 E6 A5 E8 BD D8 FF

0680 00 10 FA BD D9 FF 00 D0
0688 E4 F0 BF E8 C8 D0 E0 84
0690 7A A5 A5 0A AA BD F5 FF
0698 00 48 BD F4 FF 00 48 20
06A0 E9 FB 00 4C 73 00 00 20
06A8 B2 FD 00 A5 5F A6 60 85
06B0 24 86 25 20 13 C6 A5 5F
06B8 A6 60 90 0A A0 01 B1 5F

06C0 F0 04 AA 88 B1 5F 85 7A
06C8 86 7B A5 24 38 E5 7A AA
06D0 A5 25 E5 7B A8 B0 1E 8A
06D8 18 65 2D 85 2D 98 65 2E
06E0 85 2E A0 00 00 B1 7A 91
06E8 24 C8 D0 F9 E6 7B E6 25
06F0 A5 2E C5 25 B0 EF 20 33
06F8 C5 A5 22 A6 23 18 69 02

0700 85 2D 90 01 E8 86 2E 20
0708 59 C6 4C 67 E4 20 7C C5
0710 20 73 00 00 85 8B A2 00
0718 00 86 49 20 8C FD 00 A5
0720 A5 C9 00 00 D0 07 A2 02
0728 86 49 20 8C FD 00 20 73
0730 00 00 F0 03 20 FD CE 20
0738 B2 FD 00 A5 5F A6 60 85

0740 7A 86 7B 20 D7 CA D0 0B
0748 C8 98 18 65 7A 85 7A 90
0750 02 E6 7B 20 CA FF 00 F0
0758 05 20 DC FD 00 B0 03 4C
0760 8F FC 00 84 55 E6 55 A4
0768 55 A6 31 A5 32 85 8B B1
0770 7A F0 D8 DD 00 00 02 D0
0778 ED E8 C8 C6 8B D0 F1 88

0780 84 0B 84 97 A5 49 F0 5B
0788 20 F0 FD 00 A5 34 38 E5
0790 32 85 A7 F0 28 C8 F0 CA
0798 B1 7A D0 F9 18 98 65 A7
07A0 C9 02 90 40 C9 4B B0 3C
07A8 A5 A7 10 02 C6 8B 18 65
07B0 0B 85 97 B0 05 20 24 FE
07B8 00 F0 03 20 0C FE 00 A5

07C0 97 38 E5 34 A8 C8 A5 34
07C8 F0 0F 85 8C A6 33 BD 00
07D0 00 02 91 7A E8 C8 C6 8C
07D8 D0 F5 18 A5 2D 65 A7 85
07E0 2D A5 2E 65 8B 85 2E A5
07E8 7A A6 7B 85 5F 86 60 A6
07F0 43 A5 44 20 3D FE 00 20
07F8 E1 FF A9 00 00 85 C6 A4

0800 97 4C F2 FC 00 A4 7A C8
0808 94 31 A9 00 00 95 32 B9
0810 00 00 02 F0 15 C5 8B F0
0818 05 F6 32 C8 D0 F2 84 7A
0820 60 C9 AB F0 04 C9 2D D0
0828 01 60 4C 08 CF 90 05 F0
0830 03 20 A6 FD 00 20 6B C9
0838 20 13 C6 20 79 00 00 F0

0840 0B 20 A6 FD 00 20 73 00
0848 00 20 6B C9 D0 E0 A5 14
0850 05 15 D0 06 A9 FF 85 14
0858 85 15 60 20 CA FF 00 85
0860 43 20 CA FF 00 85 44 38
0868 A5 14 E5 43 A5 15 E5 44
0870 60 A5 7A 85 22 A5 7B 85
0878 23 A5 2D 85 24 A5 2E 85

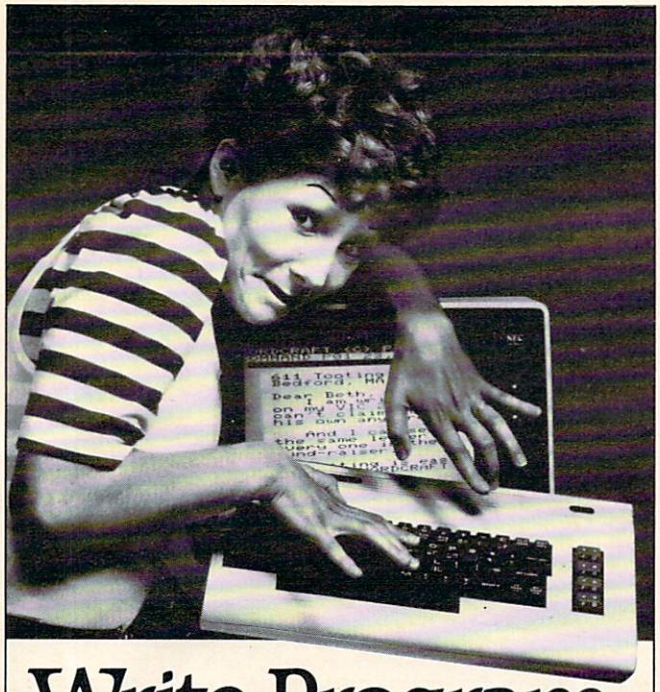
0880 25 60 A5 22 C5 24 D0 04
0888 A5 23 C5 25 60 A4 0B C8
0890 B1 22 A4 97 C8 91 22 20
0898 01 FE 00 D0 01 60 E6 22
08A0 D0 EC E6 23 D0 E8 A4 0B
08A8 B1 24 A4 97 91 24 20 01
08B0 FE 00 D0 01 60 A5 24 D0
08B8 02 C6 25 C6 24 4C 24 FE

08C0 00 A0 00 00 84 A5 84 0F
08C8 20 CD DD A9 20 A4 A5 29
08D0 7F 20 D2 FF C9 22 D0 06
08D8 A5 0F 49 FF 85 0F C8 B1
08E0 5F F0 19 10 EC C9 FF F0
08E8 E8 24 0F 30 E4 84 A5 20
08F0 7C FE 00 C8 B1 AE 30 D6
08F8 20 D2 FF D0 F6 20 D7 CA

0900 38 60 A0 9D 84 AE A0 C0
0908 84 AF 38 E9 7F AA A0 00
0910 00 CA F0 EE E6 AE D0 02
0918 E6 AF B1 AE 10 F6 30 F1
0920 20 6B C9 A5 14 85 35 A5
0928 15 85 36 20 FD CE 20 6B
0930 C9 A5 14 85 33 A5 15 85
0938 34 20 8E C6 20 CA FF 00

0940 20 CA FF 00 D0 21 20 AC
0948 FF 00 20 CA FF 00 20 CA
```

(continued on p. 222)



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0950 FF 00 D0 03 4C 8F FC 00
0958 20 CA FF 00 A5 63 91 7A
0960 20 CA FF 00 A5 62 91 7A
0968 20 B7 FF 00 F0 E2 20 CA
0970 FF 00 20 CA FF 00 20 CA
0978 FF 00 C9 22 D0 0B 20 CA

0980 FF 00 F0 C5 C9 22 D0 F7
0988 F0 EE AA F0 BC 10 E9 A2
0990 04 DD D4 FF 00 F0 05 CA
0998 D0 F8 F0 DD A5 7A 85 3B
09A0 A5 7B 85 3C 20 73 00 00
09A8 B0 D3 20 6B C9 20 51 FF
09B0 00 A5 3C 85 7B A5 3B 85
09B8 7A A0 00 00 A2 00 00 BD

09C0 00 00 01 C9 30 90 11 48
09C8 20 73 00 00 90 03 20 82
09D0 FF 00 68 A0 00 00 91 7A
09D8 E8 D0 E8 20 73 00 00 B0
09E0 08 20 91 FF 00 20 79 00
09E8 00 90 F8 C9 2C F0 B8 D0
09F0 96 20 AC FF 00 20 CA FF
09F8 00 20 CA FF 00 D0 08 A9

0A00 FF 85 63 85 62 30 0E 20
0A08 CA FF 00 C5 14 D0 0F 20
0A10 CA FF 00 C5 15 D0 0B 20
0A18 D1 DD A9 20 4C D2 FF 20
0A20 CA FF 00 20 B7 FF 00 F0
0A28 D2 20 A2 FF 00 E6 97 20
0A30 24 FE 00 E6 2D D0 02 E6
0A38 2E 60 20 A2 FF 00 C6 97

0A40 20 0C FE 00 A5 2D D0 02
0A48 C6 2E C6 2D 60 20 F0 FD
0A50 00 A0 00 00 84 0B 84 97
0A58 60 A5 35 85 63 A5 36 85
0A60 62 4C 8E C6 A5 63 18 65
0A68 33 85 63 A5 62 65 34 85
0A70 62 20 CA FF 00 D0 FB 60
0A78 A0 00 00 E6 7A D0 02 E6

0A80 7B B1 7A 60 89 8A 8D A7
0A88 43 48 41 4E 47 C5 44 45
0A90 4C 45 54 C5 46 49 4E C4
0A98 4B 49 4C CC 4E 55 4D 42
0AA0 45 D2 00 00 A5 FC 00 41
0AA8 FC 00 A5 FC 00 C6 FB 00
0AB0 98 FE 00 AC FB 00 03 AA
0AB8 AA AA AA AA AA AA AA AA
```

Program 2: BASIC section of Tiny Aid

```
1 PRINT"{CLEAR}    {REV} VIC TINY AID "
2 PRINT"{DOWN}  ADAPTED FOR VIC BY:
3 PRINT"     DAVID A. HOOK
4 PRINT"{DOWN}  FROM 'TINY AID' BY:
5 PRINT"    JIM BUTTERFIELD
6 PRINT"{DOWN}  AND 'BASIC AID' BY:
7 PRINT"      BILL SEILER
8 PRINT"{DOWN}{REV}SAMPLE  COMMANDS:
9 PRINT"{DOWN}CHANGE /?/PRINT#4,/
10 PRINT"FIND .GOSUB., 200-
11 PRINT"DELETE 130-625
12 PRINT"NUMBER 100,5
13 PRINT"KILL        (VIC AID)
14 SYS(PEEK(43)+PEEK(44)*256+383)
```

©

This tutorial shows a quick and easy way to select random numbers using PEEK and POKE to increase speed. The technique is also demonstrated as an alternative to the SOUND command.

Atari PEEK And POKE Alternatives

Jerry White
Levittown, NY

When writing a BASIC program, it is often necessary to find the fastest possible method to achieve a desired result. When speed is important, an assembler subroutine is usually the best alternative. In many cases, however, using PEEK and POKE instructions instead of conventional routines can significantly increase the speed.

In each of the four example routines below, RAM location 540 is used as a timer. The term "jiffy" is used to denote 1/60 of a second. Location 540 counts backwards until it reaches zero. When the number 255 is POKEd into this location, it will take four and one quarter seconds to count back to zero.

Each routine begins with a Graphics 0 command to clear the screen. You might want to try Mode 2 later on to see how the elapsed time of each routine is affected. Standard text mode was chosen so the routines could be listed on the screen and the elapsed time displayed.

Time tests 1 and 2 show two ways to select a random number between zero and 255. The first method is the conventional way. For demonstration purposes, the random number was selected ten times.

The second listing provides an alternative method which is four times faster. Our number is selected with a PEEK at location 20. This is also a jiffy counter, but unlike location 540, this one counts forward until it reaches 255. It is then reset to zero and continues counting normally. This method of selection is only useful when a single random number is required. For example, to return a decision on a 50 percent probability, check location 20 for less than, or for equal to, 127. This method would not be effective if more than one number is needed within a short period of time. It is, however, an excellent alternative in most cases, and is much faster than the conventional method because the multiplication is eliminated.

Time test routines 3 and 4 loop through the 256 pitches of Atari's undistorted sound. Test 3 uses the conventional SOUND command. The execution time was 123 jiffies, or just over two seconds. Test 4 uses the POKE command. The difference was 17/60ths of a second.

There are many situations where the PEEK and POKE commands can be used to speed up your BASIC programs. There are also things that could not be done at all in Atari BASIC were it not for PEEK and POKE. I will continue to explore this subject in future **COMPUTE!** tutorials.

Atari BASIC Time Test 1

```
5 GRAPHICS 0:LIST
10 POKE 540,255:FOR TEST=1 TO 10:X=RND
   (0)*256:NEXT TEST:TIME=PEEK(540)
20 ? :? "TIME=";255-TIME;" 60ths of a
   second."

TIME=16 60ths of a second.
```

Atari BASIC Time Test 2

```
5 GRAPHICS 0:LIST
10 POKE 540,255:FOR TEST=1 TO 10:X=PEE
   K(20):NEXT TEST:TIME=PEEK(540)
20 ? :? "TIME=";255-TIME;" 60ths of a
   second."

TIME=4 60ths of a second
```

Atari BASIC Time Test 3

```
5 GRAPHICS 0:LIST
10 POKE 540,255:FOR TEST=0 TO 255:SO.0
   ,TEST,10,2:NEXT TEST:TIME=PEEK(540)
20 ? :? "TIME=";255-TIME;" 60ths of a
   second."

TIME=123 60ths of a second
```

Atari BASIC Time Test 4

```
5 GRAPHICS 0:LIST
10 POKE 540,255:FOR TEST=0 TO 255:POKE
   53760,TEST:NEXT TEST:TIME=PEEK(540)
20 ? :? "TIME=";255-TIME;" 60ths of a
  second."

TIME=106 60ths of a second
```

For Commodore 2022 and 2024 printers, add an automatic shut-off to stop the machine when the paper has run out.

Paper Monitor Switch For 2022 Printer

Rev. Jack Weaver
Homestead, FL

Dire warnings are always posted for the users of dot-matrix printers. The warning DO NOT OPERATE UNLESS PAPER IS IN THE MACHINE is justified!

It is somewhat surprising, then, that Commodore did not see fit to include a Paper Monitor Switch in its 2022 and 2024 printers.

We use large amounts of fan-fold paper and have found, to our dismay, that not every stack of fan-fold paper is truly a continuous stack. For some reason, the stack may be separated, and this might not be obvious until it is too late. The paper runs out, the tractor runs on, and the printer continues to print – all without paper. This prompts visions of those tiny wires that make up the print head beating themselves flat against the platen and then ruining the guides through which they run.

The solution offered here works perfectly and has saved our print head more than once when we have had to leave the room during a printing run.

Our solution is twofold. First, the hardware fix.

The principle used is very simple. We discovered that if we grounded the PA-2 pin (Pin ID character E) on the Parallel User Port, a value of 251 is produced when location 59471 is PEEKed.

(This method naturally assumes that the PA-2 pin is not being used for any other peripheral.) If the PA-2 is *not* grounded, when we PEEK location 59471, the value is 255. Our method grounds PA-2 when the paper runs out and isolates PA-2 when paper is in the printer.

We used the tractor feed carriage (which is isolated from ground) as the bracket to which we attached a three-inch long, stainless steel fishing leader, properly bent to touch the paper entry guide when no paper is in the machine.

This stainless steel "whisker" is attached to the PA-2 pin by a 28-gauge stranded wire which we coiled for flexibility. (The wire is soldered to an appropriate edge card connector which matches the Parallel Port.) When the paper is properly in the machine, the steel "whisker" is isolated from the paper guide by the paper itself. This gives us the two circumstances needed for our PEEKing program. The attached drawings should be self-explanatory.

The Software Fix

You may call the subroutine with a GOSUB before and just after paging – or preferably just before every PRINT # command to the printer. After the bottom edge of the last sheet of paper has passed the "whisker," the program will stop until the up-arrow key (↑) is pressed (which should be done only *after* new paper has been introduced).

The Subroutine

Line 4000 returns you to the program if the value of PEEK(59471) is equal to anything other than 251. This means that there is still paper in the printer.

If PEEK(59471) is equal to 251, then the paper is out, and line 4010 fills the screen with the warning that the paper has run out.

Line 4015 clears the keyboard buffer in the event that the up-arrow has been pressed during the run.

Lines 4016-4027 give an audible signal if you have installed a CB-2 line amplifier for sound.

Line 4029 goes back for more sound continuously until the up-arrow is pressed.

Line 4030 turns off sound after up-arrow is pressed and returns from the subroutine to the main program.

Included is a short program for testing the proper grounding of the PA-2 line. After the line is properly connected, run this short program and manually ground and un-ground the "whisker"; you will see the value of PEEK(59471) change as you do it. If it does not change back and forth from 251 to 255 as you manually operate the "whisker," then there is some error in your construction. Use extreme care that only the PA-2 pin is selected for grounding. Consult your PET manual or see attached diagram of the Parallel User Port.

This arrangement has no effect on any of our peripheral operations (such as our 2040 disk or the 2040 printer).

Program 1: Monitor/Indicator For 2022 Printer

```
4000 IF PEEK(59471)<>251 THEN RETURN
4010 FOR J=1 TO 10:PRINT "■PAPER IS OUT ¬
     ¬XXX PUT IN NEW PAPER":PRINT:NEXT J
4012 PRINT "↓↓↓TYPE '^' WHEN READY TO ¬
     ¬CONTINUE"
4015 GET WQ$:IF WQ$<>"" THEN 4015
4016 POKE 59467,16:POKE 59466,15:J=1
```

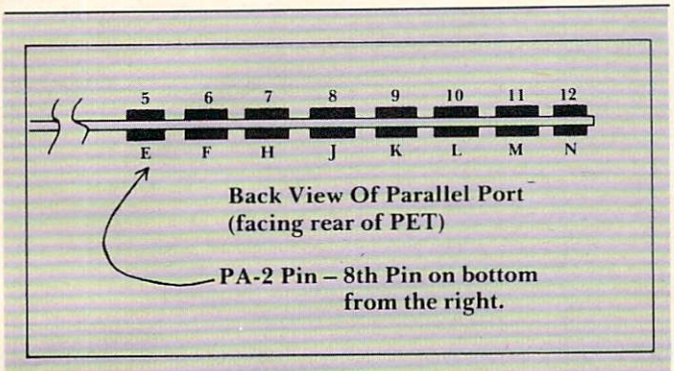
```
4020 GET WQ$:FOR X=255 TO 1 STEP -J:
     ¬POKE 59464,X
4025 IF PEEK(151)=59 THEN 4030
4027 NEXT X:J=J+1:IF J=10 THEN J=1
4029 IF WQ$<>"^" THEN 4020
4030 GET WQ$:POKE 59467,0:RETURN
READY.
```

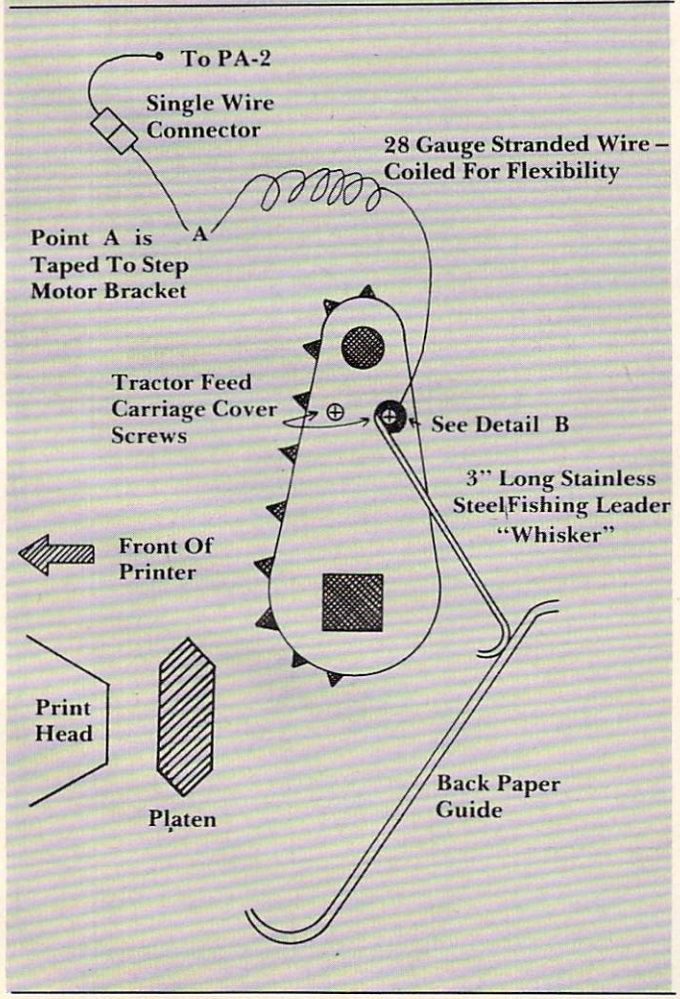
Test Program: Grounding

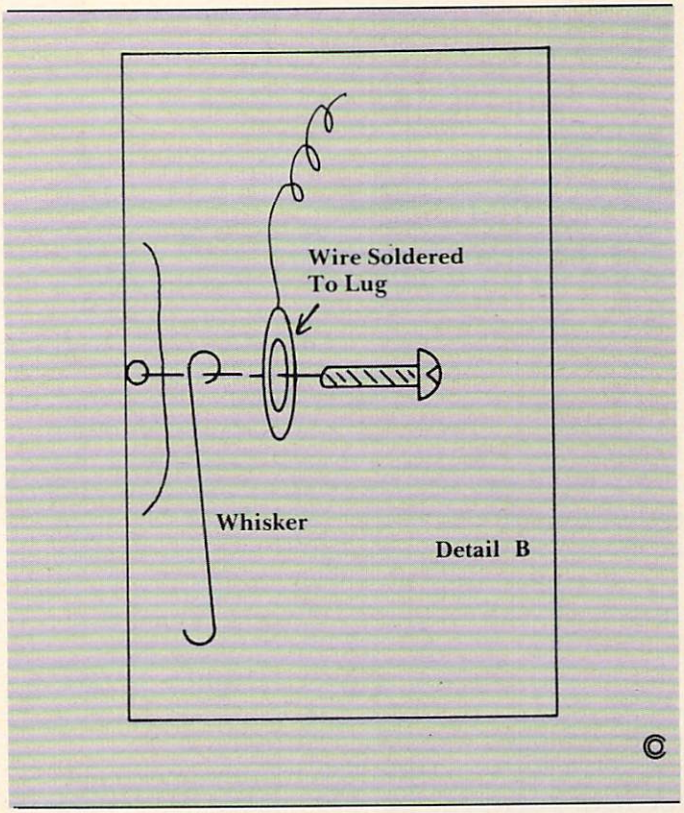
```
10 PRINT PEEK(59471)

20 GOTO 10

READY.
```







"Change Disk" changes the device number of any Commodore disk: 2040, 4040, 8050 or 2031. It is an adaptation of a Commodore utility program.

A Floppy With A Strange Device

Jim Butterfield, Associate Editor

Why would you want to change a device number logically? You can dig into the innards and restrap the disk to a new device number if you wish. "Logical" changes are temporary and vanish when power is removed from the unit.

The most usual reason is a temporary hookup. In order to make copies or do some similar job, you want to hook together two or more units. Maybe you've borrowed an 8050 from a friend for the afternoon; he wouldn't be pleased to find the unit restrapped when you return it.

The trick is to have the program search out the right place to do the disk unit change. There are three different sets of locations which are used on various disks: 12/13 on the early 2040 and 3040 units; 119/120 on 2031 units; and 50/51 on 4040s and 8050s. We find out which one is correct by PEEKing the innards of the disk and seeing which set of locations contains the correct (old) numbers. When we find the right one, we make the change.

For those users interested in "innards": the disk units check the device strapping once only at power up. It stores the computed "listen" and "talk" addresses in RAM memory, and from then on will use only the computed values. So we can change RAM, and the device number will be operational until we cut the power.

```
99 DATA 12,50,119,0
100 INPUT"OLD DEVICE NUMBER";DO
110 IFDO<8 OR DO>15 THEN100
150 INPUT"NEW DEVICE NUMBER";DN
160 IFDN<8 OR DN>15 THEN150
200 OPEN15,DO,15:REM COMMAND CHANNEL
210 A$=CHR$(DO+32):B$=CHR$(DO+64)
220 READA:IFA=0THENPRINT"DISK NOT R
    ECOGNIZED!";GOTO310
230 PRINT#15,"M-R"CHR$(A)CHR$(0):GE
    T#15,X$:IFX$<>A$GOTO220
240 PRINT#15,"M-R"CHR$(A+1)CHR$(0):
    GET#15,X$:IFX$<>B$GOTO220
300 PRINT#15,"M-W"CHR$(A)CHR$(0)CHR
    $(2)CHR$(DN+32)CHR$(DN+64)
310 CLOSE15
```

©

This may be the next best thing if you don't have a disk drive for your VIC. You can store and quickly locate up to 60 pages of information on one cassette tape.

VIC File Clerk

Dennis Surek
Welland, Ontario

This program is designed to save you some space around the house – space perhaps presently occupied by large filing cabinets or old cardboard storage boxes. You will be able to file and at any time read back quickly 60 pages of information stored on one side of a 60-minute cassette.

Whether it is recipes, or budgets, or utility bills, the computer stores them efficiently and accurately. This program should be SAVEd at the beginning of every tape that is to be converted into a filing cabinet.

The program first displays the file numbers and names and then asks which one you wish to access, and whether you wish to read or write to that file. If you are writing, the instructions will appear. Whether you are writing or reading, you will "Fast Find" to the proper file. [*See* Home and Educational Computing!, *Fall 1981, p. 15.*]

If you are writing, you can write as many pages as the file maximum allows. If you are reading, you can switch to writing subsequent pages, or you can continue reading through following pages and files.

Line 10 sets the number of files (NF) at 15 and the number of pages per file (NP) at 4. Changing either or both of these to lower values is easily done and requires no further changes to the program. The product NF x NP should be kept to 60 or less. With this in mind, it is just as easy to decrease NF and increase NP. But note that the program only fast finds to each file, and that increasing the number of pages per file defeats this fast find feature.

Increasing NF to more than 15 creates some minor problems. You will have to put additional data statements for file names between lines 100 and 240. Secondly, to keep the menu from scrolling up when the program is run, insert the following four lines:

```
81 IF I<>INT(NF/2)THEN90
82 PRINT"PRESS ANY KEY TO":PRINT
   "CONTINUE"
83 GETB$:IFB$=" "THEN83
84 PRINT"(CLEAR)"
```

These lines allow you to see half of the file names first and then to call for the rest when you are ready.

Three Naming Choices

Lines 100 to 240 are reserved for file names. There are three methods for dealing with file names. If you know all of the file names ahead of time, you could enter them when you key in this program. Conversely, you might not bother with file names at all, but use only the file numbers, writing descriptions of the files on the cassette box.

The system that I use is to save the program at the exact beginning of the magnetic portion of each tape. I then simply edit any of these lines to the title I want and reSAVE the program starting at the same position on the tape. The new program has not changed in length and therefore will still fast find to the proper file headers.

Lines 250 to 290 determine which file you want and whether you wish to read or write. If you are reading file #1, then line 300 branches to the read file routine beginning on line 660. This is possible because the PLAY key is already down from loading the program and no fast forward is required. In all other cases, some cassette key instructions will be needed. Line 310 determines if any keys are down and instructs you to press STOP in order to bring all keys up. Line 320 temporarily halts the program until this is done. If you are writing file #1, then line 330 branches to the write routine on line 420. Again, no fast forward is required for this file.

For all other files the cassette must be put into fast forward. Line 340 gives this instruction, and line 350 halts the program until the fast forward key is depressed. Line 360 begins the timer, and line 370 halts the program until an elapsed time of 90 jiffies per page per file is reached. At that instant, line 380 stops the cassette motor. Lines 390 and 400 get all keys up in a manner described previously. Line 410 branches to the read routine, and lines 420 to 500 are the instructions for writing a file.

Line 510 opens the file for writing and increments the page count. In the command OPEN1,1,1 the first "1" is the logical file number or reference number for our data file. The second specifies cassette drive #1, and the third indicates that the file is being opened for writing with no end of tape marker. It is the absence of this marker that allows the reading of consecutive pages later. For convenience, all files are assigned logical file #1. The program keeps track of the actual file number with the variable F.

Lines 520 to 590 input from the keyboard up to 20 message lines that make up one page. If a message line containing more than 22 characters is entered, it is edited to that length by line 540. Line 550 displays the last five characters of the message line as accepted so that you know how to begin your next message line.

If you are writing fewer than 20 message lines and have signaled this with the input message STOP, then line 580 will fill the rest of the page with blank message lines. This keeps all the pages the same length and therefore at a specific location on the tape. This enables you to later change any page simply by writing over the old one without having to rewrite the following pages in that file. Lines 600 to 650 determine if you wish to write the next page. If the answer is no, the program terminates.

Lines 660 to 740 are the read file routine. The zero in the command OPEN1,1,0 indicates a read operation. Line 720 moves the cursor up one line if the message line is 22 characters so that no blank lines will be displayed between message lines.

Lines 750 to 780 are for inputting and branching on commands to read or write subsequent pages. Lines 790 to 810 are the usual instructions to get all cassette keys up when changing from reading one page to writing the next page.

This program has been kept reasonably short so that load time is at a minimum. For that reason, there is no programming of special color or sound commands.

```
10 NF=15:NP=4:DIMA$(NF),O$(20)
20 PRINT"{CLEAR} ***VIC FILE CLERK***"
30 REMBY DENNIS SUREK
40 REM   555 LLOYD AVE
50 REM   WELLAND,ONT
60 PRINT"THIS PROGRAM WILL"
70 PRINT"READ OR WRITE TO FILE:"
80 FORI=1TONF
90 READ A$(I):PRINTI;TAB(5);A$(I):NEXTI
100 DATA UNNAMED
110 DATA UNNAMED
120 DATA UNNAMED
130 DATA UNNAMED
140 DATA UNNAMED
150 DATA UNNAMED
160 DATA UNNAMED
170 DATA UNNAMED
180 DATA UNNAMED
190 DATA UNNAMED
200 DATA UNNAMED
210 DATA UNNAMED
220 DATA UNNAMED
230 DATA UNNAMED
240 DATA UNNAMED
250 INPUT"FILE SELECTED";F
260 IFF<1ORF>NFTHEN250
270 INPUT"R-READ/W-WRITE";C$
280 IFC$="W"ORC$="R"THEN300
290 GOTO270
300 IFF=1ANDC$="R"THEN660
310 PRINT"{CLEAR}";:IF(PEEK(37151)AND64)=0THEN
    PRINT"PRESS STOP ON TAPE"
320 IF(PEEK(37151)AND64)=0THEN320
330 IFF=1THEN420
340 PRINT"PRESS FAST FORWARD"
350 IF(PEEK(37151)AND64)=64THEN350
360 PRINT"OK":A=TI
370 IFABS(TI-A)<(F-1)*NP*90THEN370
380 POKE37148,PEEK(37148)AND247
390 PRINT"PRESS STOP ON TAPE"
400 IF(PEEK(37151)AND64)=0THEN400
410 IFC$="R"THEN660
420 PRINT"{CLEAR}";
430 PRINT"INSTRUCTIONS TO"
440 PRINT"{REV}WRITE FILE"
450 PRINT"{02 DOWN}MAXIMUMS:"
460 PRINT"========"
470 PRINT"{DOWN}-20 LINES PER PAGE"
480 PRINT" (TYPE STOP IF LESS)"
490 PRINT"-";NP;"PAGES PER FILE"
500 PRINT"{02 DOWN}{REV}WAIT{OFF} FOR PROMPT.F
    IRST"
510 OPEN1,1,1:PC=PC+1
520 PRINT"{CLEAR}{REV}WRITE FILE";F;"PAGE";PC
530 FORK=1TO20:INPUTO$(K):IFLEN(O$(K))<=22THEN
    560
540 O$(K)=LEFT$(O$(K),22)
550 PRINT"*LINE EDITED TO*";RIGHT$(O$(K),5)
560 IFO$(K)="STOP"THEN580
570 PRINT#1,O$(K):NEXTK
580 FORI=KTO20:PRINT#1," ":NEXTI
590 CLOSE1
600 PRINT"WRITE NEXT PAGE?":INPUT"Y/N";W$
610 IFW$="N"THEN820
620 IFW$="Y"ANDR$="N"THEN790
630 IFW$="Y"ANDPC<NPTHEN510
640 IFPC>=NPTHENPRINT"MAX";NP;"PAGES REACHED":
    GOTO820
650 GOTO600
660 OPEN1,1,0:PC=PC+1
670 IFPC>NPTHENPC=1:F=F+1
680 PRINT"{CLEAR}";
690 PRINT"{REV}READ FILE";F;"PAGE";PC
700 FORK=1TO20
710 INPUT#1,O$(K)
720 PRINTO$(K):IFLEN(O$(K))=22THENPRINT"{UP}";

730 NEXTK
740 CLOSE1
750 PRINT"READ NEXT PAGE?":INPUT"Y/N";R$
760 IFR$="Y"THEN660
770 IFR$="N"THEN600
780 GOTO750
790 PRINT"PRESS STOP ON TAPE":R$="Y"
800 IF(PEEK(37151)AND64)=0THEN800
810 GOTO510
820 END
```

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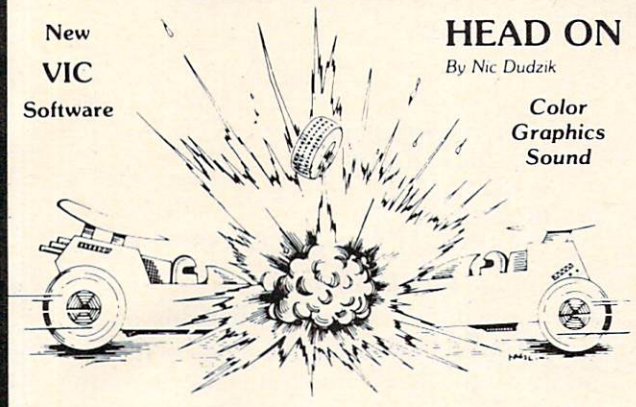

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These three short Applesoft programs show you how to change line numbers in order to delete and create undeletable lines.

Undeletable Lines, Revisited

P. Kenneth Morse
Augusta, GA

Michael P. Antonovich described (**COMPUTE!**, October 1981, #17) a method of using the Apple's monitor to enter Applesoft program statements that could not be easily deleted using the Applesoft DEL command. He indicated that a way to get rid of such lines was to change the end-of-program pointer in $69-6A (115-116, decimal).

There are, however, at least two other general approaches to deleting "undeletable" lines:

(1) Change the line number back to a deletable number. This may be done by using the monitor (or POKE statements) to modify the number of a specific line, or by simply running Apple's Renumber program. Once a deletable line number has been achieved, DEL will complete the job. Readers may find the program text file Deletable (see Program 1) helpful in quickly gaining control of undeletable lines.

(2) LIST the deletable portion of the program to a new text file, clear memory with a NEW command, and then EXEC the text file. The undeletable lines will have vanished!

Mr. Antonovich's approach (changing the end-of-program pointer) and the text file approach (#2 above) will work only when the undeletable lines are at the end of the program. However, undeletable lines may also be placed at the beginning of the program (where they inhibit LISTings beginning at specific line numbers) or in mid-program. For example:

```
10 PRINT "THIS IS ";
20 PRINT "A TEST"
```

may be converted to

```
65535 PRINT "THIS IS ";
20 PRINT "A TEST"
```

by entering

```
POKE 2051,255:POKE 2052,255
```

in immediate execution mode, and the program will RUN and LIST, but you cannot RUN, LIST or GOTO either 20 or 65535 as specific line numbers. However, it is not practical to make the opening lines undeletable, since the program would then work only for the trivial case of a program with no GOTOs or GOSUBs! To test this, enter:

```
NEW
10 PRINT "THIS IS ";
20 PRINT "A TEST "
30 GOTO 50
40 STOP
50 PRINT "IT WAS A SUCCESS"
```

and change line 10 to line 65535 as above. The program will not be able to find line 50!

Secondly, it is not necessary to key in an entire line through the monitor to achieve an undeletable line number. Programs 2 and 3 below provide Applesoft and Integer BASIC programs that will change specified line numbers to the undeletable value of 65535.

Deletable (Lines 1-8 In Program 1)

RUNning Program 1 creates a program text file, Deletable, which may be EXECed to convert undeletable Applesoft lines to a deletable range (63000-63999). Deletable will renumber up to 1000 undeletable lines per run. Once the line numbers are in the deletable range, DEL will finish the job.

Line 0 is a temporary line, used to create the text file Deletable by LISTing to the file lines 1-8. When Deletable is RUN, line 2 sets the value of the high and low bytes to be POKEd as the new deletable line number. Line 3 initializes L1, the line address, as the start-of-program address stored in bytes 103-104 (decimal). Line 4 calculates CL, the line number being tested, and determines if it is undeletable (i.e., at least 64000). If the value of CL (line 4) is undeletable, deletable values are POKEd (line 5), the POKE values are incremented, and control is passed to line 6. When all line numbers have been tested (or 1000 lines have been made deletable), Deletable deletes itself!

Deletable may also come in handy in case of a bombed Applesoft program caused by an inadvertent POKE which created an illegal line number. However, if the pointer to the next line was bombed, Deletable will not be able to help.

To use Deletable:

— Key in (and SAVE) Program 1
— RUN (this will create Deletable)
— LOAD the program containing the undeletable lines
— EXEC Deletable
— RUN

Applesoft (Lines 61800-61970 In Program 2)

The program will renumber as 65535 all lines between 62000-63999 and then delete itself. Here's how it works.

Beginning with the first line currently in memory, the program calculates CL, the current line number (line 61920). If CL is less than 62000, then the address (L1) of the next line number is calculated in line 61940, and the program recycles to 61920. If the number is at least 62000, the address of the line number is saved in the L() array, and a test is made to determine if the end of the lines to be renumbered has been reached.

If not, the program returns to 61920 to test the next line number. If it is the final line, it then renumbers each line referenced in the L() array to 65535, and DELetes Applesoft Permanent Notice. If you expect to renumber more than ten lines, you will need to DIM L(), either as a direct command or by inserting a DIM statement in the program.

To use Applesoft Permanent Notice:

— Key in and SAVE Program 2
— RUN (this creates Applesoft Permanent Notice)
— NEW or LOAD a program
— Enter lines numbered 62000-63999 which you want to be made permanent
— EXEC Applesoft Permanent Notice
— RUN 61800

Integer (Lines 31000-31170 in Program 3)

Integer Permanent Notice operates in somewhat similar fashion, but the lines to be renumbered should be in the range 32000-32767 (remember: Integer BASIC doesn't like numbers greater than 32767). Lines 31070-31090 determine L1, the address of the line number to be tested. CL, the line number itself, is calculated in 31100 and tested in 31110. If CL is 32000 or greater (line 31120), then L1 is tested (line 31130) to see if the final line has been tested. If not, the address L1 is stored in the array ADD(L), L is incremented, and control shifts to line 31120. When all line numbers have been tested, the value 255 (line 31160) is POKEd into both bytes of each address stored in ADD(). ADD() is currently DIMensioned at 10; this may be changed to renumber more than ten lines to undeletable status.

To use Integer Permanent Notice:

— Key in and SAVE Program 3
— RUN
— NEW or LOAD a program file
— Enter lines to be made permanent. Number them between 32000 and 32767
— EXEC Integer Permanent Notice
— RUN 31000

Program 1: Deletable

```
0 D$ = CHR$ (4): PRINT D$"OPEN DELETABLE": PRINT D$"WRITE
   DELETABLE": LIST 1 - 8: PRINT D$"CLOSE DELETABLE": END
1 REM

      SAVE 'DELETABLE' BEFORE RUNNING!


2 HI = 246:LO = 24: REM  VALUE IS 63000
3 L1 = PEEK (103) + 256 * PEEK (104):L = 0
4 CL = PEEK (L1 + 2) + 256 * PEEK (L1 + 3): IF CL < 64000
   THEN 6
5 POKE L1 + 2,LO: POKE L1 + 3,HI:LO = LO + 1: IF LO > 255
   THEN LO = 0:HI = HI + 1
6 L1 = PEEK (L1) + 256 * PEEK (L1 + 1): IF L1 = 0 THEN 8
7 IF 256 * HI + LO < 64000 THEN 4
8 DEL 1,8
```

Program 2: Applesoft Undeletable

```
1 D$ = CHR$ (4):F$ = "APPLESOFT PERMANENT NOTICE": PRINT
   D$"OPEN"F$: PRINT D$"WRITE"F$: LIST 61800,61970: PRINT
   D$"CLOSE": END
61800 REM --------------------
61810 REM   'PERMANENT NOTICE'
61820 REM     BY KEN MORSE
61870 REM --------------------
61875 TEXT : HOME : PRINT "'REM' LINES FOR PERMANENT
   NOTICES SHOULDBE NUMBERED 62000 OR HIGHER, AND SHOULD
   BE THE HIGHEST NUMBERED LINES IN THE   PROGRAM"
61880 PRINT : INPUT "MAKE PROGRAM LINES PERMANENT
   BEGINNING  AT 62000 THROUGH ";LL
61890 IF LL < 62000 THEN 61880
61900 FL = 62000
61910 L1 = PEEK (103) + 256 * PEEK (104):L = 0
61920 CL = PEEK (L1 + 2) + 256 * PEEK (L1 + 3): IF CL =
   > FL THEN 61950
61940 L1 = PEEK (L1) + 256 * PEEK (L1 + 1): GOTO 61920
61950 L(L) = L1 + 2:L1 = PEEK (L1) + 256 * PEEK (L1 +
   1):CL = PEEK (L1 + 2) + 256 * PEEK (L1 + 3): IF L1 >
   0 THEN L = L + 1: GOTO 61950
61960 FOR J = L TO 0 STEP - 1: POKE L(J),255: POKE L(J) +
   1,255: NEXT J
61970 DEL 61800,61970: END
```

Program 3: Integer BASIC Undeletable

```
1 D$ = "": REM    CTRL-D
2 PRINT D$;"OPEN INTEGER PERMANENT NOTICE": PRINT
   D$;"WRITE INTEGER PERMANENT NOTICE": LIST 31000,31170:
   PRINT D$;"CLOSE"
31000 REM    --------------------
31010 REM      'PERMANENT NOTICE'
31020 REM      FOR INTEGER BASIC
31030 REM        BY KEN MORSE
31040 REM    --------------------
31050 DIM ADD(10)
31060 FL = 31999:L = 0
31070 L1 = PEEK (202):L2 = PEEK (203)
31080 IF L2 > 127 THEN L2 = L2 - 256
31090 L1 = L1 + 256 * L2
31100 CL = ( PEEK (L1 + 1)) + 256 * ( PEEK (L1 + 2))
31110 IF CL > FL THEN 31130
31120 L1 = L1 + PEEK (L1): IF CL < = FL THEN 31100
31130 IF L1 > PEEK (76) + 256 * ( PEEK (77) - 256) THEN
   31160
31140 ADD(L) = L1
31150 L = L + 1: GOTO 31120
31160 FOR J = L TO 0 STEP - 1: POKE ADD(J) + 1,255: POKE
   ADD(J) + 2,255: NEXT J
31170 END
```

Atari Moving Message Utility

Michael A. Ivins
Cheyenne, WY

"Ticker Tape Atari Messages," **COMPUTE!**, February 1981, struck me as being an excellent way for dealers and others to present promotional and other kinds of messages. However, the message I tried to type in was one of several hundred characters and occupied many lines of text on the screen.

When I tried to run the message, I found that nothing was being displayed beyond the third screen line of my original text. This coincides with the limit placed on a logical line of program code.

I then set out to expand the program. The program which accompanies this article is the result. It is a menu-driven program with four options. The first option is the entering of a long message in shorter segments (I call them "phrases") and concatenating these into the main message string. The load and save routines allow choice of disk or tape and include error traps in case you forgot to turn on your tape recorder. These two options eliminate the need to type a new message every time the program is run. For an explanation of the actual message movement, I refer you to the original article.

In the preparation of this program, I ran into something which I have not seen documented anywhere. When you want to change the DIM of a variable, you will encounter an ERROR 9 unless you use the CLR command, as I did in lines 100 and 200. The *BASIC Reference* states, "This command clears the memory of all previously dimensioned strings, arrays, and matrices so the memory and variable names can be used for other purposes. It also clears the values stored in undimensioned variables."

It also does something not mentioned in the manual. When I first attempted to use the command, I wanted to put it in a subroutine. However, every time I did this I was presented with an "ERROR 16", which means a RETURN was encountered without a matching GOSUB. It is now apparent to me that the CLR command not only clears variables, but also clears the "stack" similar to the way the "POP" command does. This means that a CLR command must never be used as part of a subroutine or in a FOR-NEXT loop.

Some Few Hints

The way the program is written, you can enter a message of up to 2000 characters. This is a pretty long message, but if you should like an even longer one it is only necessary to change the DIM statements in the enter and load routines. If you would like your message to be more colorful, mix upper- and lowercase letters and inverse. They will still be displayed as uppercase letters, but in as many as four different colors (a similar trick gives us the colored stars in the message border).

A control comma (graphics heart) will show as a blank space, and it is sometimes wise to add it at the end of a phrase to insure separation from the start of the next one. Finally, although this program will accept phrases up to three lines long, I advise entering shorter phrases to avoid any chance of losing something.

Ticker Tape Update

```
1 REM MOVING MESSAGE UTILITY
10 OPEN #1,4,0,"K:":GOTO 20
15 ? CHR$(125);"YOU MUST ENTER OR LOA
   D A MESSAGE FIRST":GOTO 25
20 ? CHR$(125)
25 ? "MOVING MESSAGE UTILITY"
30 ? :? "ENTER NEW MESSAGE":? :? "LOA
   D AN OLD MESSAGE":? :? "SAVE CURRE
   NT MESSAGE":? :? "RUN CURRENT MESS
   AGE"
35 GET #1,A:IF A<>69 AND A<>76 AND A<
```

LONDON SOFTWARE presents
THREE NEW GAMES FOR ATARI 400/800®

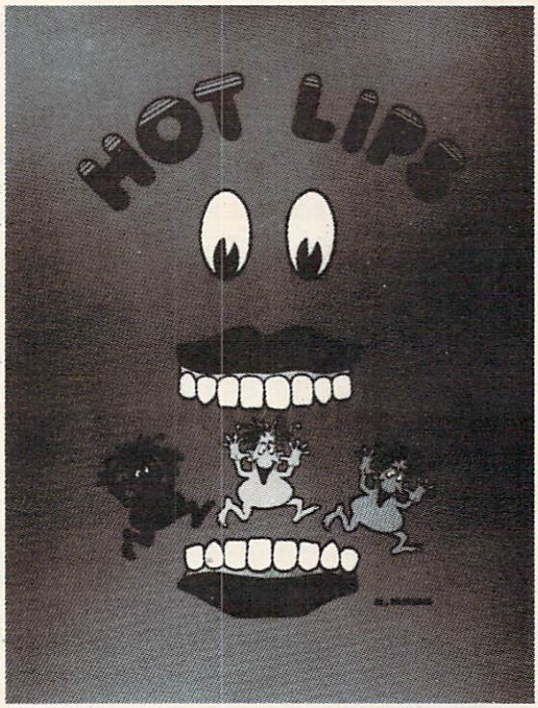
COMPUTE MAGAZINE GAME REVIEW. . . (Sept. 1982) says. . .

"Space Ace. . . requires the reaction instincts of a pro-hockey goalie. It's suitable for all but very young children and is aimed at the video game addicts among us. . . fans of arcade-style games should find Space Ace both well executed and challenging."

Your ship, controlled in all eight directions by your joy stick, battles five incredible "bogies" whose unique shapes, sounds and actions are arcade quality in every way, and are guaranteed to "blow you away" unless you are a true SPACE ACE.

—3 levels of play —100% machine language
—bonus ship and time limit options —Hi-res graphics

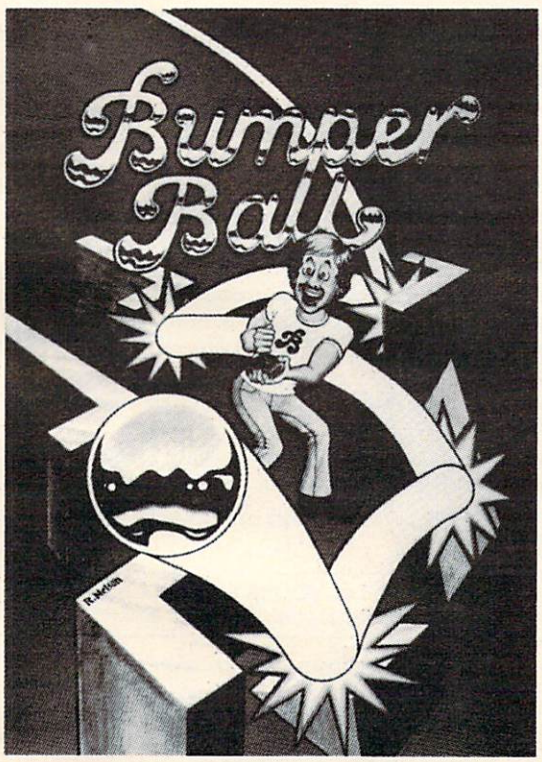
$29.95



CHOMP! CHOMP! CHOMP! Sounds and sights of giant gnashing teeth, marching critters and musical notes of delight greet you from the screen as you are tracked by an army of hungry little critters. To escape and score you must entice these critters into the crunching jaws of HOT LIPS. This megamouth eats anything, (including you!) and you must be quick to avoid its teeth. Various pitfalls and bonus scoring opportunities visually surprise and excite you as you become immersed in the strategy of this action-packed game. The "critters" are outstanding graphically and provide a challenge for every game player. Full hi-res graphics and exceptionally smooth continuous action make this a truly fun game.

—2 player option
—100% machine language
—multi-level of play

$29.95



Better than a pinball game; better than a maze game; This fast action game is for the new gamester as well as the true gamestar. Choose the "easyball" play level to start and get the hang of playing. You score by deftly controlling a fleet of paddles off which bounce multi-colored balls and travel through changing bumpers, multi-point gateways, and across flashing scoring zones.

When you have mastered "easyball" shift up to the "bumperball" level of play. Everything gets tougher and you really have to "move out" to score. The action is fast and continuous, and the colors, sound, music and Hi-Res graphics are truly arcade quality. Two player option and 100% machine language of course!

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Space Ace, Hot Lips, and Bumperball, all require 16K, joystick, and are available on either disk or cassette. See your dealer or order direct. London Software, 374 Wildwood Avenue, Piedmont, CA 94611. Phone orders (415) 893-1090. Visa/MC. Please add $1.50 postage and handling. California residents add additional $1.95 sales tax. ®Atari 400/800 is a registered trademark of Atari Incorporated.

```
   >82 AND A<>83 THEN 35
40 IF A=69 THEN 100
41 IF A=76 THEN 200
42 IF A=83 THEN 300
43 GOTO 400
100 CLR :DIM X$(2000),B$(1),W$(20),P$
    (20),Y$(20),Z$(20),M$(115),Q$(15)
101 W$="* ■ {J} {■J} * ■ {J} {■J} * ■ "
    :Y$=W$
102 ? CHR$(125);"ENTER YOUR MESSAGE O
    NE SENTENCE OR":? "PHRASE AT A TI
    ME, HITTING RETURN"
103 ? "AFTER EACH ONE.":? "NO INDIVID
    UAL SENTENCE OR PHRASE"
105 ? "MAY BE LONGER THAN 110 CHARACT
    ERS.":? "WHEN THE LAST PHRASE IS
    ENTERED, HIT"
108 ? "RETURN AGAIN FOR THE MENU"
110 INPUT M$:IF M$="" THEN 125
115 X$(LEN(X$)+1)=M$:IF LEN(X$)<1900
    THEN 110
125 IF LEN(X$)<20 THEN FOR C=1 TO 20-
    LEN(X$):X$(LEN(X$)+1)=B$:NEXT C:X
    $(LEN(X$)+1)=B$
130 DIM A$(LEN(X$)),C$(LEN(X$)):A$=X$
135 GOTO 20
200 CLR :DIM X$(2000),B$(1),W$(20),P$
    (20),Y$(20),Z$(20),M$(115),Q$(15)
201 ? "{CLEAR}LOAD FROM CASSETTE OR D
    ISK";:INPUT Q$
202 W$="* ■ {J} {■J} * ■ {J} {■J} * ■ "
205 IF Q$(1,1)<>"C" AND Q$(1,1)<>"D"
    THEN 200
210 IF Q$(1,1)="D" THEN 220
215 Q$(2)=":":? "INSERT CASSETTE WITH
     MESSAGE INTO":? "TAPE RECORDER.
    PRESS RETURN WHEN READY":GOTO 230
220 ? "ENTER FULL FILENAME":? "EXAMPL
    E-'D:PROMO1.MSG'"
225 INPUT Q$
228 TRAP 280
230 OPEN #3,4,0,Q$
231 X=1
235 INPUT #3,X:FOR I=1 TO X:GET #3,A:
    X$(I,I)=CHR$(A):NEXT I
240 X$(X,X)=CHR$(A)
245 CLOSE #3
250 ? "LOAD COMPLETE":? "PRESS ANY KE
    Y FOR MENU."
260 GET #1,A
265 DIM A$(LEN(X$)),C$(LEN(X$)):A$=X$
270 GOTO 25
280 ? "DEVICE DOES NOT RESPOND.":? "C
    HECK TO SEE THAT IT IS CONNECTED"
285 ? "TO THE COMPUTER AND IS TURNED
    ON.":? "NOW ENTER THE DEVICE CODE
     AND FILE-"
290 ? "NAME (IF ANY) TO TRY AGAIN.":I
    NPUT Q$:CLOSE #3:GOTO 230
300 TRAP 15:IF X$="" THEN 15
305 ? CHR$(125);"SAVE TO CASSETTE OR
    DISK";:INPUT Q$
310 IF Q$(1,1)<>"C" AND Q$(1,1)<>"D"
    THEN 305
315 IF Q$(1,1)="D" THEN 325
320 Q$(2)=":":? "INSERT CASSETTE INTO
     TAPE RECORDER.":? "PRESS RETURN
    WHEN READY.":GOTO 335
325 ? "ENTER FULL FILENAME":? "EXAMPL
    E- 'D:PROMO1.MSG'"
330 INPUT Q$
332 TRAP 380
335 OPEN #3,8,0,Q$
340 ? #3;LEN(X$)
350 FOR I=1 TO LEN(X$)
355 PUT #3,ASC(X$(I,I))
360 NEXT I
365 CLOSE #3:? "SAVE COMPLETE.":? "PR
    ESS ANY KEY FOR MENU"
370 GET #1,A
375 GOTO 20
380 ? "DEVICE DOES NOT RESPOND.":? "C
    HECK TO SEE THAT IT IS CONNECTED"
385 ? "TO THE COMPUTER AND IS TURNED
    ON.":? "NOW ENTER THE DEVICE CODE
     AND FILE-"
390 ? "NAME (IF ANY) TO TRY AGAIN.":I
    NPUT Q$:CLOSE #3:GOTO 335
400 TRAP 15:IF X$="" THEN 15
401 GRAPHICS 18:Y$=W$
405 POSITION 1,3:? #6;W$(1,19):P$=W$(
    2):P$(LEN(P$)+1)=W$:W$=P$
410 POSITION 1,7:? #6;Y$(1,19):Z$=Y$(
    2):Z$(LEN(Z$)+1)=Y$:Y$=Z$
415 POSITION 1,5:? #6;A$(1,19):C$=A$(
    2):C$(LEN(C$)+1)=A$:A$=C$:K=PEEK(
    764)
420 FOR TI=1 TO 40:POKE 77,0:SETCOLOR
     INT(RND(0)*4),INT(RND(0)*15),8:I
    F K=255 THEN 405
425 GOTO 20                                ©
```

Restore (N) In Applesoft

Michael Erperstorfer
Vienna, Austria

The usual RESTORE statement in Applesoft simply resets the data list pointer to the first occurrence of a DATA statement in an Applesoft program, though in some applications it would be necessary to READ from a distinct DATA line. With a small machine language program, it is rather easy to build a RESTORE with a parameter.

This is done with the ampersand (&) command. This symbol, when executed as an instruction, causes an unconditional jump to memory location $03F5. At location $03F5 there must be a JMP instruction to your machine language program, which is then terminated with an RTS instruction to pass control back to Applesoft.

The syntax of RESTORE(N) with the ampersand is &N where N is an integer in the range 0-65535. If there is no line number N, the data list pointer will be set to the next DATA line in the program. If there are no more DATA lines, an OUT OF DATA error message will be displayed. Before the first use, the machine language must be linked with CALL 768.

```
0000-                          ;RESTORE(N)...&N
0000-                          ;
0300-  A9 0B      LDA   #$0B   ;LOAD LB OF &-JMP.
0302-  8D F6 03   STA   $03F6
0305-  A9 03      LDA   #$03   ;LOAD HB.
0307-  8D F7 03   STA   $03F7
030A-  60         RTS          ;END OF INITIALIZATION.
030B-  20 67 DD   JSR   $DD67  ;EVALUATES NUMBER AND
                               ;STORES IT IN FP-AAC #1.
030E-  20 52 E7   JSR   $E752  ;CONVERTS FP-ACC #1 INTO
                               ;2BYTE INT ($50,$51)
0311-  20 1A D6   JSR   $D61A  ;SEARCHES FOR LINE#
                               ;(IN $50,$51).
0314-  38         SEC          ;$9B,$9C POINT TO LINK
                               ;FIELD OF DESIRED LINE.
0315-  A5 9B      LDA   #$9B   ;LOAD DATA LIST POINTER
                               ;($7D,$7E)
0317-  E9 01      SBC   #$01   ;CONTENTS OF $9B,$9C-1.
0319-  85 7D      STA   $7D
031B-  A5 9C      LDA   $9C
031D-  E9 00      SBC   #$00
031F-  85 7E      STA   $7E
0321-  60         RTS          ;RETURN TO BASIC.
```

BASIC loader for machine language program:

```
10 FOR I = 768 TO 801: READ V: POKE I,V: NEXT

15 CALL 768
20 DATA 169,11,141,246,3,169,3,141,247,3,96,3
    2,103,221,32,82,231,32,26
30 DATA 214,56,165,155,233,1,133,125,165,156,
    233,0,133,126,96
```

The ML routine can now be saved either on disk with BSAVE RESTORE(N),A$300,L$22 or on tape with 300.321W.

A simple example for the use of &N:

```
10 PRINT CHR$(4)"BRUN RESTORE(N)"
20 INPUT "LINENUMBER: ";LN
30 & LN
40 READ L
50 PRINT "HERE IS LINE #"L
60 GOTO 20
100 DATA 100
110 DATA 110
120 DATA 120
130 DATA 130
140 DATA 140
150 DATA 150
```

A PET program that allows you to easily move machine language programs from one area of memory to another. You can relocate any section or all, translate internal references, or move it verbatim. It handles JSRs, JMPs, and references to tables.

CODEMOVER

Everett Lumpkin
Modoc, IN

Have you ever created a great machine code utility only to realize that the area of memory in which it resides is needed by another program? Maybe you have wanted to make a copy of Supermon (a high memory monitor utility) for a friend's 8K machine. "Codemover" will move machine code to a new location rapidly and accurately.

Machine language consists of codes that the 6502 executes. The code may process or transfer data, test and branch, and control input and output. All of these instructions use different addressing techniques, and the principal concern of our code-moving program is to translate the proper address along with some jump and other instructions. The instructions can be broken into three groups.

The first group requires the most attention. These are the three-byte codes using absolute, absolute indexed, and absolute indirect addressing. Some examples would be LDA $40FC, JMP $4095, EOR $033A,Y, JMP($033A). Each of the instructions in this group is followed by two bytes containing the address in the normal low, high format. If these two bytes point to an address within the machine language program itself, they will need to be changed to reflect the new location of the program. If they point to an address outside the target program (i.e., a routine in ROM), a new address need not be computed.

The second group contains instructions which require two bytes. Some examples are LDA $FF, CMP #$FF, STA($40,X), ROL $28,X, and BEQ $0352. The branch instructions are *relative*, a *displacement* from their address. As a result, they will point to the correct offset address after they are moved. Branches can simply be moved without any worry.

The last group consists of instructions only one-byte long. They are also just moved with no adjustments necessary because they do not point to an address. Some examples are CLD, PHA, ROL, and ASL.

The Program

The program is relatively self-explanatory, although a few comments may be helpful. It is written in PET BASIC and should be easy to transfer to other machines; it requires about 4K. The lines that do the actual moving are 1325 to 1560. Two subroutines at 100 and 200 convert from hex to decimal and vice versa. At line 300 are stored the opcodes, which are three and two bytes long.

At line 1410 Codemover PEEKs the current memory location and compares it with the three-byte opcodes stored in C3%() array. If a match is found, the program then computes the address from the following two bytes to see if it is within the boundaries of the original machine code. If it is, a new address is computed, using the displacement, and POKEd into the new code. Otherwise, no displacement is calculated.

If the code is not a three-byte opcode, it is then checked against the array of two-byte opcodes. If a match is found, the program then moves two bytes of code. Otherwise, the computer moves only one byte before PEEKing the next machine code instruction.

The program has another mode of moving machine code besides translation of the JMP addresses. You may want to move a lookup table verbatim so that the copy is exactly like the original. Failure to do this may cause the table to be changed slightly.

Now the next time that a machine utility is in an unfortunate or busy location, simply move it, letting the computer do all the work. After all, isn't that what these machines are for?

```
30 DI$="0123456789ABCDEF"
40 DIM C3%(47),C2%(73)
50 REM*********VARIBLES**************
52 REM
54 REM  BO    --BEGIN OF ORIGINAL CODE
56 REM  LO    --LAST OF ORIGINAL CODE
58 REM  BC    --BEGIN OF COPY CODE
60 REM  LC    --LAST OF COPY CODE
62 REM  D     --DISPLACEMENT OF CODE
64 REM  I1    --BEGIN OF SECTION
66 REM  I2    --END OF SECTION
68 REM  C3%(47)  --3 BYTE OPCODES
70 REM  C2%(73)  --2 BYTE OPCODES
72 REM  ADD      --FORMER ADDRESS
74 REM  NADD     --COMPUTED ADDRESS
76 REM
78 REM*******************************
99 GOTO 900
100 REM SUB TO TRANSLATE DECIMAL TO HEX:ENTER ~
```

Command-O or Command-O-Pro?

It's called the Command-O-Pro in Europe, Command-O in the U.S.

But whatever you call it, this 4K byte ROM will provide your CBM BASIC 4.0 (4016, 4032) and 8032 computers with 20 additional commands including 10 Toolkit program editing and debugging commands and 10 additional commands for screening, formatting and disk file manipulating. *(And our technical writer dug up 39 additional commands in the course of doing a 76-page manual!)*

Extends Commodore's 8032 advanced screen editing features to the ultimate. **SCROLL** up and down, insert or delete entire lines, delete the characters to the left or right of the cursor, select **TEXT** or **GRAPHICS** mode or ring the PET's bell. Redefine the window to adjust it by size and position on your screen. And define any key to equal a sequence of up to 90 key strokes.

Resides in hexadecimal address **$9000**, the rightmost empty socket in 4016 and 4032 or the rearmost in 8032. If space conflicts, Socket-2Me or GO-4IT available at a very special price.

Command-O from Skyles Electric Works	**$ 75.00**
Complete with Socket-2ME (2 sockets)	**90.00**
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```
    AS A$--RETURN A$ AS DECIMAL
120 A=VAL(A$):A$=""
130 FORI=3TO1STEP-1:B=INT(A/(16^I))
140 A$=A$+MID$(DI$,B+1,1):A=A-B*16^I
150 NEXTI
160 A$=A$+MID$(DI$,A+1,1)
170 RETURN
200 REM SUB TO TRANSLATE HEX TO DECIMAL:ENTER ~
    AS A$--RETURN A$ AS DECIMAL
205 A=0
210 FORI=LEN(A$)TO1STEP-1:FORJ=1TO16
220 IFMID$(A$,I,1)=MID$(DI$,J,1)THENA=A+(J-1)*
    16^(LEN(A$)-I)
230 NEXTJ,I
240 A$=STR$(A):RETURN
300 REM 3 BYTE OPCODES
310 DATA76,32,173,174,172,109,45,14,44,205,236
    ,204,206,77,238,78
320 DATA 13,46,110,237,141,142,140,125,61,30,2
    21,222,93,254,189
330 DATA 188,94,29,62,126,253,157,121,57,217,8
    9,185,190,25,249,153,108
340 REM 2 BYTE OPCODES
350 DATA 101,37,6,36,197,228,196,198,69,230,16
    5,166,164,70,5
360 DATA 38,102,229,133,134,132,105,41,201,224
    ,192,73,169,162,160
370 DATA 9,233,97,33,193,65,161,1,225,129,113,
    49,209,81,177
380 DATA 17,241,145,117,53,22,213,214,85,246,1
    81,180,86,21,54
390 DATA118,245,149,148,144,176,240,48,208,16,
    80,112,182,150
400 REM SUB TO READ OPCODES
420 FORI=0TO47:READC3%(I):NEXT
430 FORI=0TO73:READC2%(I):NEXT
440 RETURN
899 REM ********MAIN PROGRAM*********
900 A$="CODEMOVER"
910 PRINT"{CLEAR}{02 DOWN}"TAB(30)A$
920 FORI=1TO9
930 PRINT"{HOME}{02 DOWN}"LEFT$(A$,I)TAB(30);:
    FORJ=0TOI:PRINT" ";:NEXT:PRINTRIGHT$(
    A$,9-I);
940 FORJ=1TO350:NEXT
950 NEXT
960 PRINT"{DOWN}BY{DOWN}EVERETT LUMPKIN"
1000 PRINT"{HOME}{07 DOWN}THIS PROGRAM WILL MOV
    E A SECTION OF "
1010 PRINT"MACHINE CODE TO A NEW LOCATION TRANS
    LAT-"
1020 PRINT"{UP}ING ALL THE JMP'S AND OTHER ADDR
    ESSES."
1030 PRINT"BECAUSE SOME PARTS OF THE PROGRAM WI
    LL"
1040 PRINT"NEED TO BE MOVED VERBATIM (TABLES EC
    T.),"
1050 PRINT"{UP}THIS PROGRAM WILL PROCESS THE CO
    DE A"
1060 PRINT"SECTION AT A TIME.{DOWN}":GOSUB400
1070 PRINT"ENTER THE BOUNDRIES OF ENTIRE PROGRA
    M.  FOLLOW EXAMPLE FORMAT."
1075 PRINT"  B000-B7FF{UP}":INPUTA$
1077 B$=RIGHT$(A$,4):A$=LEFT$(A$,4)
1080 GOSUB200:BO=VAL(A$):A$=B$:GOSUB200:LO=VAL(
    A$)
1090 PRINT"{DOWN}YOUR PROGRAM IS AT ";BO;"DECIM
    AL TO"
1100 PRINT LO;"DECIMAL AND IS ";LO-BO;"BYTES LO
    NG."
1110 PRINT"{DOWN}ENTER THE BOUNDARIES WHERE YOU
     WOULD LIKE{UP}"
1120 PRINT"{UP}THE PROGRAM TO BE COPIED.  TYPE ~
    ????"
1130 PRINT"IF YOU WANT THE COMPUTER TO COMPUTE ~
    AN"
1140 PRINT"ADDRESS.":PRINT"  B000-B7FF{UP}"
1145 INPUTA$:B$=RIGHT$(A$,4):A$=LEFT$(A$,4)
1150 IFLEFT$(A$,1)="?"THEN1170
1160 GOSUB200:BC=VAL(A$)
1170 IFLEFT$(B$,1)="?"THENLC=BC+(LO-BO):GOTO119
    0
1180 A$=B$:GOSUB200:LC=VAL(A$):BC=LC-(LO-BO)
1190 PRINT"{DOWN}YOUR NEW PROGAM WILL BE"
1200 PRINTBC"-"LC"IN DECIMAL
1210 A$=STR$(BC):GOSUB100:PRINTA$"-";
1220 A$=STR$(LC):GOSUB100:PRINTA$" IN HEX"
1225 I1=BO:I2=LO:D=BO-BC
1230 PRINT"{DOWN}ENTER THE {REV}SECTION{OFF} OF
     CODE TO BE MOVED."
1240 A$=STR$(I1):GOSUB100
1250 PRINT"  "A$"-";:A$=STR$(I2):GOSUB100
1260 PRINTA$"{UP}":INPUTB$
1270 A$=LEFT$(B$,4):GOSUB200:I1=VAL(A$)
1280 A$=RIGHT$(B$,4):GOSUB200:I2=VAL(A$)
1290 PRINT"{DOWN}IS IT TO BE {REV}T{OFF}RANSLAT
    ED OR MOVED {REV}V{OFF}ERBATIM"
1300 GETA$:IFA$=""THEN1300
1310 IFA$="T"THEN1400
1320 IFA$<>"V"THEN1290
1325 REM MOVE VERBATIM
1330 FORI1=I1TOI2:A%=PEEK(I1):B=I1-D:PRINTB,A%"
    {UP}":POKEB,A%:NEXT
1340 IFI1>=LOTHEN1600
1350 I1=I2+1:I2=LO:GOTO1230
1400 REM TRANSLATE ADDRESS'S AND MOVE
1405 I1=I1-1
1410 I1=I1+1:A%=PEEK(I1):PRINTI1,A%"{UP}":IFI1>
    I2THEN1340
1420 REM IS IT 3 BYTE OPCODE?
1430 FORJ=0TO37:IFC3%(J)<>A%THENNEXTJ:GOTO1510:
    REM NOT 3BYTE
1435 REM 3 BYTE OPCODE
1440 POKEI1-D,A%
1450 ADD=PEEK(I1+2)*256+PEEK(I1+1)
1460 IF(ADD>LO)OR(ADD<BO)THEN I1=I1+1:A%=PEEK(I
    1):GOTO1540
1470 NADD=ADD-D
1480 POKE(I1+2-D),INT(NADD/256)
1490 POKE(I1+1-D),NADD-INT(NADD/256)*256
1500 I1=I1+2:GOTO1410
1510 REM IS IT A 2 BYTE OPCODE?
1520 FORJ=0TO73:IFC2%(J)<>A%THENNEXTJ:POKEI1-D,
    A%:GOTO1410:SINGLE BYTE OPCODE
1530 REM 2 BYTE OPCODE
1540 POKEI1-D,A%:I1=I1+1
1550 A%=PEEK(I1):POKEI1-D,A%
1560 GOTO1410
1600 PRINT"{CLEAR}YOUR PROGRAM HAS NOW BEEN MOV
    ED"
1610 PRINT"{02 DOWN}OLD LOCATION        NEW LOC
    ATION"
1620 PRINT"$";:A$=STR$(BO):GOSUB100:PRINTA$"-$"
    ;
1630 A$=STR$(LO):GOSUB100:PRINTA$;TAB(20);
1640 A$=STR$(BC):GOSUB100:PRINT"$"A$"-$";
1650 A$=STR$(LC):GOSUB100:PRINTA$
1660 PRINTBO"-"LO;TAB(20);BC"-"LC
1670 PRINT"{03 DOWN}ALTHOUGH THIS PROGRAM HAS T
    RANSLATED"
1680 PRINT:PRINT"THE JMP'S, JSR'S AND OTHER ADD
    RESSES"
1690 PRINT:PRINT"THERE MAY BE OTHER PROBLEMS WI
    TH THE NEW"
1700 PRINT"LOCATION WHICH ARE HIDDEN.  IN OTHER
    "
1710 PRINT:PRINT"WORDS, SAVE THE NEW CODE BEFOR
    E TRYING"
1720 PRINT:PRINT"IT.--GOOD LUCK!"
```

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This month, I will follow through with at least one of my promises for some heavier assembly language stuff: the discussion and source for the fix to the 850 handler LOMEM problem. Unfortunately, I did not manage to complete the other promised project, the BASIC Cassette Verify program.

That program has proven more difficult to write than I had suspected it would, primarily because it's hard to get the debugger and BASIC to cooperate. With some luck I will have the problem fixed very shortly.

In any case, I've also got a few little tidbits to share with you, so let's tackle them first.

Atari-CP/M Revisited

First, I would like to clear up a misunderstanding (on my part) about the Vincent Cate (USS Enterprises) Atari-to-CP/M connection, mentioned a couple of issues ago. I stated that one problem with the system was that you would not be able to use standard Atari diskettes. Not totally true. If you have (or have access to) an Atari compatible 810 drive, you *can* copy programs from the 810 to the CP/M host. (Vincent claims that the system is even capable of properly simulating self-booting disk games, etc., though I would imagine that some of the heftier protection schemes might defy his standard system.)

Anyway, the address for USS Enterprises is 6708 Landerwood Lane, San Jose, CA 95120. I hope this doesn't seem too much like an ad or endorsement: I have *not* used the system. I have, however, heard from people who have and who say it does what it claims to do.

In the same column, I mentioned a new product to be introduced soon which would function either as an Atari disk controller (810 emulator) and/or as a CP/M system in which the Atari console was a smart terminal. That project is apparently at the reality stage, so I guess in fairness I should now mention it by name.

The company producing the product is Software Publishers, Inc., of Arlington, Texas. (I know, I know. *Software* publishers?) The base price of the controller, I have been told, is about $500 without disk drive. The CP/M add-on will be (is?) about $250. Perhaps someone will soon give us a review of the viability of this concept.

Double No-Trouble

Speaking of viability: We have been using our Percom drives (one double density, one double sided and double density) for about three months now. We are more than satisfied with their reliability. And, of course, the new OS/A+ we produced for use on the larger drives allows considerable flexibility. Perhaps the Atari can be used as a business machine after all.

And to be sure that we don't slight anyone, I need to mention that our MPC double density system has been here about a month now also and seems to be working fine.

So far, all the things we've tried seem better for most purposes than the 810 drives, though all of them seem to have trouble with some heavily protected diskettes. Moral: buy the drive, forget the diskettes. (Side issue and pet peeve: If it's that heavily protected, it will have trouble even on a slightly out of speed Atari 810. So far, I have plunked down my scarce dollar only three times for copy-protected disks. I think I will try to be thriftier in the future.)

Percom DOS

By now it should be general knowledge that the "new and improved DOS" that Percom has been publicizing is none other than OS/A+. But it is a significant change from our "old" OS/A+, which is really just a CP/M-like keyboard interface hooked to the Atari DOS 2.0S File manager. Thanks to the efforts of Mark Rose, our youngest associate and a junior at Stanford University, we have managed to produce an all new, random access DOS designed to interface to any and all disk drives from 128 kilobytes to 16 megabytes. The "random access" description implies that you are not tied to the tyrany of NOTE any more (and POINT is now reasonable: you POINT to a byte position *within a file*, just like on the big guys' systems, and better than CP/M).

This may sound like an advertisement for OSS and Percom, but it really isn't. First of all, our profits aren't really tied to the sales of this new DOS, so it isn't really an ad for us. And second, it appears that OS/A+ will be used by all the other Atari-compatible drive manufacturers, so Percom is offering it first but not alone. Anyway, the real reason I brought this up (aside from wanting to pat Mark Rose on the back in public) is to pass on a few of the things that you should watch out for if you are thinking of moving to either more or larger

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LOMEM On The Tot-Mem Poll

I am sadly dismayed to see so many Atari-produced and Atari-compatible products being introduced nowadays which violate one of the prime rules for running on an Atari: *don't put anything lower in memory than LOMEM.*

After all, the operating system provides these nice, convenient locations LOMEM and HIMEM, which contain the addresses of the bottom and top of usable memory. Why not use them?

But no, let us assume that we will run under Atari DOS 2.0S, with two single density drives, with our blinders on (so that we cannot see the future). Phooey. How about a little table to show the values of LOMEM under various DOS configurations, with various numbers of drives and files available?

LOMEM With Various DOS's

Dos Used	Number Of Drives	Number Of Files	Contents Of LOMEM
Atari DOS 2.0S	2-S	3	$1C00
Atari DOS 2.0S	4-S	7	$1F00
Atari DOS 2.0S	2-D	3	$1E80
Atari DOS 2.0S	2-S, 2-D	5	$2180
Atari DOS 2.0S	4-D	7	$2380
OS/A + ver 2.0	2-S	3	$1F00
OS/A + ver 2.0	4-S	7	$2100
OS/A + ver 2.0	4-D	7	$2680
OS/A + ver 4.0	2-D	3	$2C00
OS/A + ver 4.0	4-DD	7	$3300

legend: -S means single density drives
-D means double density drives
-DD means double sided, double density

Surprised? It gets worse: if you load the RS-232 handler for the 850 Interface Module, you must add almost $700 to all the table figures! (And I left out K-DOS simply because I don't know the correct figures there, but I understand that they are all over $3000.)

"But," you say, "how come you show Atari DOS with double density drives?" Aha! You didn't know that Atari DOS will handle double density drives for most user programs? (The menu can get confused, especially for duplicating disks, but BASIC – for example – runs just fine.)

We agonized a long time over coming out with OS/A + version 4, the Percom (et al.) random access DOS, with its much higher LOMEM values. But then we realized that, given that you will use double density and larger disks, there is simply no way to stay completely compatible. So, if you're going to do it, do it right.

Incidentally, Percom's initial patches to Atari DOS 2.0S solved the problem in a different way: they moved the disk buffers to the top of memory and dropped HIMEM. Of course, then they ran into trouble with the programs that ignore HIMEM. Like BASIC A+? Wellllll, I guess we have to take our lumps, too. Sigh. But we're working on it, honest.

So this has gone on long enough. The moral: if you're writing assembly language programs, pay attention to the rules. If you're stuck with an interpreter or compiler that does it wrong, go yell at the company that palmed it off on you.

Mishandler

Since I am ranting on about LOMEM anyway, let's tackle the problem I presented last month: the Atari RS-232 handler for the 850 Interface Module does not handle the RESET key properly when the disk device (or other previously loaded handlers) is present.

The result is that LOMEM will be reset to what the disk handler thinks it is, rather than above the 850's driver. And, of course, this means that any program which uses LOMEM properly will zap the RS-232 (Rn:) drivers. Which might not be so bad except that the Rn: name will still be recognized by CIO. Which might be a real disaster.

Why did all this come about? Because Atari didn't follow their own advice. When you steal DOSINI from DOS, in order to link yourself into the RESET chain, the *first* thing you should do is call the old DOSINI. Instead, the 850 handler does all its initializing, resets LOMEM to above itself, and *then* calls the old DOSINI! (And, of course, poor old FMS doesn't know that R: exists, so it moves LOMEM to just above itself. And, admittedly, you *could* fix the problem by having DOS change LOMEM only if the change is upward. This is left as an exercise to the reader.)

So what do we do about this bug? If you are using BASIC (or BASIC A+), forget about it. BASIC maintains its own LOMEM pointer, which is initialized only at BASIC coldstart time (e.g., at power-up). In fact, many system programs either do similar things or have been purposely assembled in higher memory to avoid all possible drivers. (Except see that good old table. Maybe they aren't all high enough?)

However, if you need to fix this problem, chances are you need to fix it quickly and thoroughly. The machine language program below seems to do a reasonably good job of patching the mess. But, of course:

Caveats: (1) This program works as shown with *my* 850 Interface Module. I know for a fact that Atari has made more than one version of this beast, so I can *not* guarantee it will work on yours. (2) This program works by patching the AUTORUN.SYS (also known as AUTORUN.232 or

RS232.OBJ or RS232.COM) file. If you are not using Atari DOS (or OS/A+, for RS232.OBJ or RS232.COM), then this will work only if you can load and execute this routine at the addresses shown in the listing.

So how does this program work? To understand it, we must first understand how the Rn: handler is loaded from the 850.

Here I Am

When the Atari computer is powered up, it finds out if a disk drive is attached by sending out a status request command (via SIO). If, indeed, disk drive number one is alive and well, then the disk boot proceeds. But if the 850 is alive and well, it is also sitting on the serial bus, looking at SIO sending status request command(s) to the disk. SIO will try 13 times to boot the disk before giving up. But here is where the 850 gets sneaky: if the disk doesn't answer after about ten of those tries, the 850 jumps on the bus and says "Here I am! I'm the disk drive! Boot me!"

And, of course, the computer indeed "boots" the disk – whether it actually is the drive's controller chip responding or whether it is an 850 in chip's clothing. And that's how those 1800 or so bytes of code get into the computer when all you have is an 850.

But how does that code get pseudo-booted when you *do* have a disk? Well, one way would have been to distribute the handler on the disk. But why waste all that good code sitting out in the 850, just waiting to be executed? So AUTORUN.SYS (in any of its aliases) is a very small routine that performs just the right operations to load the 850's serial handlers.

In building the program presented here, I have cheated. Quite frankly, I have not investigated why and how the code used in AUTORUN.SYS works. And quite franker, I don't care. What I have done is simply build my program around that code. And here's what my program does.

First, I get the current contents of DOSINI (presumably the address of the FMS initialization routine) and save them for later use. Then I fall through and let the 850's code be loaded and initialized. If this process is successful, I then find the new contents of DOSINI (the Rn: driver's initialization routine address) and save them also. And where do I save the two initialization addresses? In the middle of the patch to be applied to the 850 driver.

Then all I need do is move the patch into the middle of the driver and relink DOSINI to point to the patch. Now, the cute part of all this is: where do we put the patch? Why, right on top of the erroneous call to the FMS initialization. (The one that occurs *after* the 850 init, remember?)

Ummm, but I'm patching a JSR to the FMS init followed by a JMP to the 850 init. How does all that fit into the space of one (previous) JSR? And what about the code immediately preceding the patch? Here it comes, the kludge. The code we are replacing includes a check of the warmstart location, since the handler does not bother to call the FMS initialization if it doesn't need to. Well, with our code patch, the FMS always gets called to init itself. But so what? It doesn't hurt anything, just slows the loading of this 850 interface code an unnoticeable amount.

Anyway, if you can follow the code, you will note where the patch is being applied. The byte immediately before the patch location *must* be a CLC instruction. (Check it out by loading the RS-232 handlers and then using a debugger to list the code.) If it is not, then your 850 differs too much from mine to use this routine as is. (And if you figure out where to patch it, why not tell all of us.)

Last but not least, notice that the patch is intrinsically relocatable, just as is the 850 handler. It should work in virtually any memory and/or disk drive and/or DOS configuration.

Whew! That was lengthy and heavy, right? Well, cheer up, there's more to come next month. Like how to add a default drive specifier to Atari DOS and OS/A+. If you have two drives, wouldn't it be convenient to be able to specify that "D:..." meant "D2:..." once in a while? Watch this space.

Atari 850 Fixer Upper
or: when in doubt, punt.

```
0000          1010        .PAGE  "  or:  when in doubt, punt."
              1020 ;
              1030 ; Some equates
              1040 ;
0043          1050 FIXOFFSET = $43        ; read the text
000C          1060 DOSINI =    $0C        ; the cause of all this
              1070 ;
              1080 ;
              1090 ; This first code is simply to save the original
              1100 ;   contents of DOSINI for later use, like the
              1110 ;   850 code should have done in the first
              1120 ;   place.  Sigh.
              1130 ;
0000          1140        *=   $3800-10
              1150 NEWLOADER
37F6 A50C     1160        LDA  DOSINI     ; presumably, we are saving
37F8 8D7738   1170        STA  PATCH2+1   ; the FMS init vector for
37FB A50D     1180        LDA  DOSINI+1   ; later use, but the beauty of
37FD 8D7838   1190        STA  PATCH2+2   ; this: it works w/o FMS also
              1200 ;
              1210 ;
              1220 ; Now we begin the original Atari loader code.
              1230 ;
              1240 ; If your code doesn't agree with this, it
              1250 ;   is possible that your 850's internal
              1260 ;   is different also.  If so, apply the
              1270 ;   patches with caution.  Read the text.
              1280 ;
              1290 ; CAUTION: this code is uncommented, simply
              1300 ;   because I'm not sure exactly what it
              1310 ;   is doing.  But who cares...it works.
              1320 ;
3800          1330        *=   $3800     ; where the Atari code was found
              1340 LOADER
3800 A950     1350        LDA   #$50
3802 8D0003 1360          STA   $0300
3805 A901     1370        LDA   #$01
3807 8D0103 1380          STA   $0301
```

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```
380A A93F  1390        LDA   #$3F
380C 8D0203 1400       STA   $0302
380F A940  1410        LDA   #$40
3811 8D0303 1420       STA.  $0303
3814 A905  1430        LDA   #$05
3816 8D0603 1440       STA   $0306
3819 8D0503 1450       STA   $0305
381C A900  1460        LDA   #$00
381E 8D0403 1470       STA   $0304
3821 8D0903 1480       STA   $0309
3824 8D0A03 1490       STA   $030A
3827 8D0B03 1500       STA   $030B
382A A90C  1510        LDA   #$0C
382C 8D0803 1520       STA   $0308
382F 2059E4 1530       JSR   $E459
3832 1001  1540        BPL   $3835
3834 60    1550        RTS
3835 A20B  1560        LDX   #$0B
3837 BD0005 1570       LDA   $0500,X
383A 9D0003 1580       STA   $0300,X
383D CA    1590        DEX
383E 10F7  1600        BPL   $3837
3840 2059E4 1610       JSR   $E459
3843 3006  1620        BMI   $384B
3845 200605 1630       JSR   $0506
3848 4C4C38 1640       JMP   FIXIT     ; this WAS a 'JMP (DOSINI)'
384B 60    1650        RTS
           1660 ;
           1670 ; Now the 850 has loaded its code into memory...
           1680 ;   so we can patch its boo-boos
           1690 ;
           1700 ;
           1710 ;
           1720 FIXIT
384C A50C  1730        LDA   DOSINI    ; The 850 code has patched
384E 8D7A38 1740       STA   PATCH3+1  ; its init entry point into
3851 A50D  1750        LDA   DOSINI+1  ; 'DOSINI' ... we will jump
3853 8D7B38 1760       STA   PATCH3+2  ; to it at the end of our patch
           1770 ;
3856 A043  1780        LDY   #FIXOFFSET ; for my 850!  read the text
3858 A200  1790        LDX   #0        ; loop index
           1800 ;
           1810 ; We move our patch code into the 850's code
           1820 ;
           1830 PATCHLP
385A BD7538 1840       LDA   PATCH1,X  ; a byte of patch...
385D 910C  1850        STA   (DOSINI),Y ; into the 850 code
385F C8    1860        INY             ; next patchloc
3860 E8    1870        INX             ; next byte of patch
3861 E008  1880        CPX   #8        ; unless done
3863 D0F5  1890        BNE   PATCHLP
           1900 ;
3865 A944  1910        LDA   #FIXOFFSET+1 ; again, caution...read text
3867 18    1920        CLC
3868 650C  1930        ADC   DOSINI    ; we move DOSINI to point
386A 850C  1940        STA   DOSINI    ; to our patch...which in
386C A50D  1950        LDA   DOSINI+1  ; turn will jump back to
386E 6900  1960        ADC   #0        ; the 850's init code.
3870 850D  1970        STA   DOSINI+1
           1980 ;
3872 6C0C00 1990       JMP   (DOSINI)  ; and this actually goes to our
                                         patch!
           2000 ;
           2010 ;
           2020 ; This patch area has two addresses placed
           2030 ;   in it and then it is moved en masse
           2040 ;   into the 850 code, as a patch thereto
           2050 ;
           2060 PATCH1
3875 60    2070        RTS             ; gets rid of some unneeded code
           2080 PATCH2
3876 200000 2090       JSR   0         ; becomes JSR FMSINIT, or some
                                         such
           2100 PATCH3
3879 4C0000 2110       JMP   0         ; to original reset point
387C 00    2120        BRK
           2130 ;
           2140 ; This is just to make it a LOAD AND GO file
           2150 ;
           2160 ; You might wish to use $2E2 instead if you
           2170 ;   understand the implications thereof
           2180 ;
387D       2190        *=    $2E0
02E0 F637  2200        .WORD NEWLOADER
02E2       2210        .END
```

Here's what a father and his eleven-year-old son came up with when they first brought their VIC home.

Checkbook

Harvey B. Herman
Associate Editor

Harvey Gets A Computer

For many months I had been hearing about a wonderful new personal computer which Commodore markets. After using it for several days, I came to believe that the hyperbole put out about it was justified and Commodore has a best seller, possibly the first gold microcomputer. It surely will rival their earlier PET model (er, sorry, CBM), but it is intended for a different clientele (everybody).

If it is true that millions of consumers are buying VIC and other machines, it follows that not all of them can be experienced computer hobbyists. It would be a shame if someone brought one home, without a plug-in cartridge or other program (software), and did not know what to do with it, even after reading the manual. This article is intended to illustrate one application for a personal computer. The program, checkbook balancer (called Checkbook), can be used to demonstrate to friends, neighbors, and spouses the hidden potential in our e.t. (expensive toys). We don't want them to ever get the idea that its only use is for playing games. Later you can show off a fun program if you have one. VIC and a color TV play some great games. However, in a demo, applications programs first is the rule.

The Kids Take Over

My kids kicked me off the VIC shortly after I brought it home and set it up (super easy to do, set up – not kick me off, as I scream and carry on a lot). The eleven year old, Mark, typed in a program he had seen demonstrated on a PET at his elementary school. This program and mine, discussed below, do not make use of the color features of the VIC. I am still a novice in that area. However, our experience with PET BASIC transferred easily to the new machine as the commands are identical. When it is given your age in years, Mark's program calculates how many days old you are. The program is not perfect. For example, leap years are not allowed for. However, he was very cocky after it worked. I mention this experience because I feel the reader is probably over 11 years old and should not allow a kid to show him up. Teach yourself VIC BASIC, if you have not already done so, and learn to be a better computer programmer than my eleven year old son. It really is not difficult.

Harvey Regains Control

At this point I asserted my authority (such as it is) and took over command of the VIC. On paper I composed a checkbook balancing program, typed it in, and, after correcting a few mistakes, had a working program. The whole process took about two hours, which I would guess is probably about average for an experienced BASIC programmer like myself (no brag). The Checkbook program (like any other) can be divided logically into three sections: input, calculations, and output. First, the previous month's balance is asked for. Then queries about the number and amount of deposits and checks follow. Calculations are done after each input operation. The only result, the new checkbook balance, is output at the end, along with a reprise of the input data for checking purposes.

You Can Do It Better

If the program is unintelligible to you because you have not learned VIC BASIC, you can still type it in and show it to your friends. (Make sure you know how to SAVE and LOAD short programs on tape before typing in a program as long as this one.) Of course the Checkbook program could be improved and even customized. Part of the allure of personal computers is that we can make them do what we want rather than vice versa. For example, if you feel that it is important to save the data on tape for future reference, read the manual on tape files and add this feature to the program.

Checkbook has now become, in part, your program of which you can be proud. The fact that you have added even more practical utility makes it

that much sweeter. Tell your friends about "your program," but please try not to be too cocky. Happy computing on your VIC!

VIC Technical Notes

1. RETURN as a sole response to INPUT does not stop program as in previous Microsoft BASICs. Program continues using old value of variable.

2. INPUT with prompt in quotes has a restriction. Length of prompt should be 20 characters or less (not counting cursor control characters). Otherwise, prompt message is included in response string.

3. All programs on tape begin loading at hex 1001. PET tapes made with 2.0 (Upgrade) ROMs load into VIC normally. PET tapes made with 1.0 (Original) ROMs have first line garbled.

4. VIC tapes can be loaded into PET if an append procedure is used. First NEW, then append (with tool kit or similar program), and VIC tapes will load normally.

5. As with PET, the STOP key does not work when the program is waiting for input. Instead, press RUN/STOP and RESTORE. VIC will stop without losing your program. This method should get you out of many other awkward spots, but will not work if certain critical pointers are lost (say by an errant machine language program).

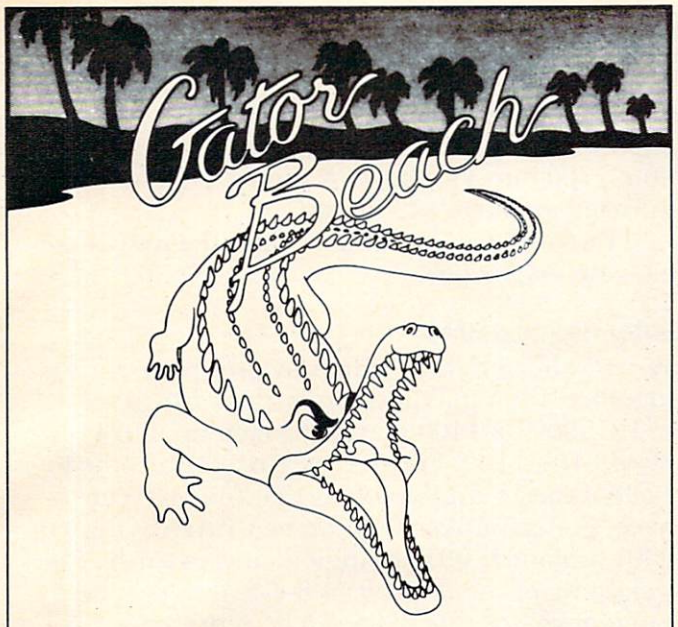
6. It helps to keep a list of the color graphics symbols handy (and for that matter, cursor control also) when typing programs from a printed list. This will save much frustration caused by trial and error pecking during program entry.

Program 1.

```
10 REM CHECK BOOK BALANCE PROGRAM
20 REM HARVEY B. HERMAN
30 REM
40 DIM D(20),C(50):REM 20 DEPOSITS, 50 C
   HECKS
50 PRINT "{CLEAR}     {REV}CHECK BOOK":PR
   INT
60 INPUT "DO YOU WANT{12 RIGHT}INSTRUCTI
   ONS";A$
70 GOSUB 710
80 ON J GOTO 110,100,90
90 PRINT "WHAT?":PRINT:GOTO 60
100 PRINT:PRINT "PROGRAM ASKS FOR
    EVIOUS BALANCE,     DEPOSITS AND
     CHECKS"
110 PRINT
120 INPUT "PREV. BAL.";PB:NB=PB
130 PRINT
140 INPUT "ANY DEPOSITS";A$
150 GOSUB 710
160 ON J GOTO 250,180,170
170 PRINT "WHAT?":PRINT:GOTO 140
180 PRINT
190 INPUT "HOW MANY";N
200 PRINT
210 FOR I=1 TO N
220 INPUT "DEPOSIT";D(I):PRINT
230 NB=NB+D(I)
240 NEXT I
250 PRINT
260 INPUT "ANY CHECKS";A$
270 PRINT
280 GOSUB 710
290 ON J GOTO 370,310,300
300 PRINT "WHAT?":PRINT:GOTO 260
310 INPUT "HOW MANY";M
320 PRINT
330 FOR I=1 TO M
340 INPUT "CHECK";C(I):PRINT
350 NB=NB-C(I)
360 NEXT I
370 PRINT "HIT A KEY WHEN READY"
380 GET A$:IF A$="" THEN 380
390 PRINT
400 PRINT "{CLEAR}     {REV}DATA SUMMARY"
410 PRINT
420 PRINT "PREV. BAL.","  NEW BAL."
430 PRINT PB,NB
440 PRINT
450 PRINT "HIT A KEY WHEN READY"
460 GET A$:IF A$="" THEN 460
470 IF N=0 THEN 580
480 PRINT "{CLEAR}     {REV}DATA SUMMARY"
490 PRINT
500 PRINT
510 PRINT "     DEPOSITS"
520 FOR I=1 TO N
530 PRINT "DEPOSIT";I;"  $";D(I)
540 NEXT I
550 PRINT
560 PRINT "HIT A KEY WHEN READY"
570 GET A$:IF A$="" THEN 570
580 IF M=0 THEN 690
590 PRINT "{CLEAR}     {REV}DATA SUMMARY"
600 PRINT
610 PRINT
620 PRINT "     CHECKS   "
630 FOR I=1 TO M
640 PRINT "CHECK";I;"  $";C(I)
650 NEXT I
660 PRINT
670 PRINT "HIT A KEY WHEN READY"
680 GET A$:IF A$="" THEN 680
690 PRINT "{CLEAR}":PRINT" {REV}SEE YOU N
    EXT MONTH"
700 END
710 IF LEFT$(A$,1)="Y" THEN J=2:RETURN
720 IF LEFT$(A$,1)="N" THEN J=1:RETURN
730 J=3:RETURN
```

Program 2. Mark's Program

```
10 PRINT"{CLEAR}
20 PRINT"THIS IS A GAME THAT SHOWS HOW M
    ANY DAYS OLD YOU ARE."
30 PRINT"ENTER YOUR AGE SO YOU WILL LEAR
    N."
40 INPUT A
50 PRINT"YOU ARE";A * 365;"DAYS OLD"
```



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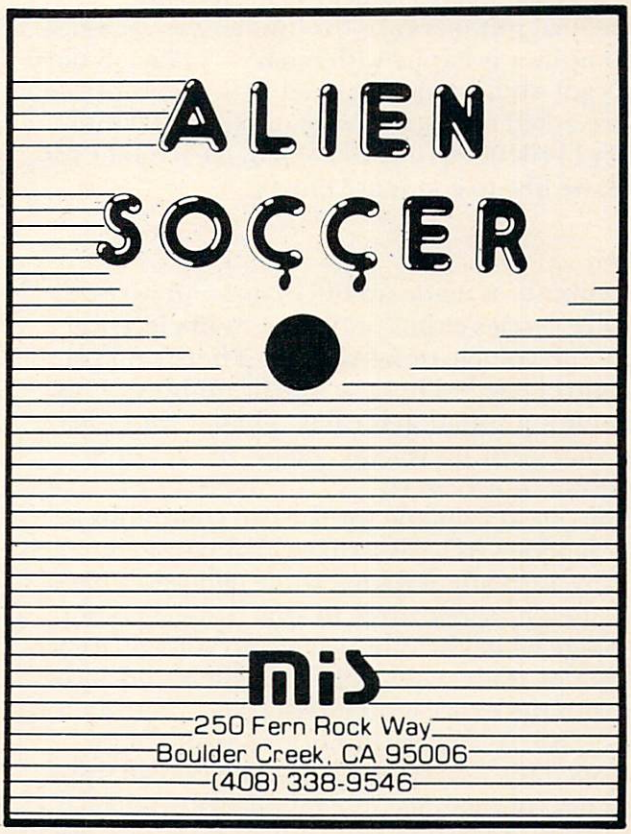

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A Monthly Column

Machine Language:

Hexed!

Jim Butterfield
Associate Editor

You often find nonsense printed about hexadecimal numbering systems. For example, one source says, "We use hexadecimal numbers when programming in machine language, since that's what the computer uses." Balderdash! There is no such thing as a hexadecimal computer – they're all binary.

It may seem hard to believe at first, but hexadecimal numbers are for human convenience. The computer is happy with binary – in fact, binary is all it's got – but we are not likely to wax enthusiastic if we are asked to place a value of 00001100 into location 1110100001001100. To make it easier for people, we like to condense binary.

Binary

The computer is made up of circuits and wires. Each wire carries either of two kinds of electrical signal – full voltage or no voltage. There's no volume control needed here: it's all or nothing. This two-condition situation is called binary, for its two states: voltage or no voltage, on or off, yes or no, up or down, one or zero.

The one/zero name for the two conditions is handy: it allows us to describe a group of logic signals by a stream of digits. If the computer has a group of eight wires, three of which are carrying full voltage while the others have no voltage, we can describe these wires' states concisely and accurately with the expression 00101100.

Now, there's a very important group of 16 wires called the *address bus*. These wires "call up" a certain part of memory. We might write out such an address as 1110100001001100, giving the condition of each wire of the address bus. The contents of each memory location is delivered on a group of eight wires, called a *data bus*; we might store 00001100 into a location. A group of eight "bits" of information is called a "byte".

But it seems unwieldy to write the individual bits out, one by one.

Enter Hexadecimal

We can shorten these values by grouping the bits together, four at a time. Thus, the address 1110100001001100 may be broken up into 1110-1000-0100-1100. Further, we can give a name to each of the 16 combinations that four bits can have. For example, 0000 can be written as digit 0; 0001 as digit 1; 0010 as digit 2; and so forth. The weighting of the four bits is 8-4-2-1, so that we can quickly see that 0101 can be represented as 4 + 1 or 5.

This works well for the first ten combinations: 0000 is written as 0 and 1001 as 9. But there are six combinations that total ten or more. Our objective is to write one digit to represent the four bits, so we can't write binary 1010 as 10 for ten; that's two digits. We pick a new scheme for these values: 10 is written as a letter A, 11 as a B, and so on, until we reach 15, which is written as F. The whole table becomes:

0000 - 0	0100 - 4	1000 - 8	1100 - C
0001 - 1	0101 - 5	1001 - 9	1101 - D
0010 - 2	0110 - 6	1010 - A	1110 - E
0011 - 3	0111 - 7	1011 - B	1111 - F

Now we can write address 1110100001001100 as hexadecimal E84C, which is more compact and easier to remember. We can go the other way easily, too: if we see a value of hex 85 we can write it immediately as binary 10000101 if we need to. Note: this is not the same as the decimal value eighty-five, and we tend to say "eight-five" to keep the two number systems clear.

So we can view hexadecimal notation as a compact way of writing the computer's binary numbers. Hexadecimal, by the way, means "based on 16". You can see that there are 16 combinations, 16 different digits.

Converting To Decimal

If we have a hexadecimal number like 85, we sometimes would like to know its equivalent value in decimal. For example, if we PEEK the number in BASIC, we would see a value of 133 stored in the same location – that's the decimal value. We often need to do conversion. Even to PEEK, we'd need to change the hexadecimal address into decimal so that we could tell BASIC where to look.

In the early days (remember?) we used to be told that a number like 263 means "two hundreds, and six tens, and three units." Same rules for

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hexadecimal, except that we use powers of 16 instead of powers of 10. So 85 is "eight sixteens, and five units"; or, to put it mathematically, 8 x 16 +5. This works out to 133, as mentioned before. An address like E84C works out as 14 x 4096 + 8 x 254 + 4 x 16 + 12. The 14 is the value of the E digit, and 4096 is the third power of 16. The whole thing works out to 59468.

You can do this quickly on your computer (don't forget to use the asterisk for multiplication). If you have a pocket calculator, there's an easier method. Type in the value of the first digit. If there are any more digits, multiply by 16 and add the value of the new digit. Repeat until you run out of digits.

Let's try this with E84C. Type in 14 (that's the E). Multiply by 16 and add the 8. Multiply by 16 and add the 4. Multiply by 16 and add 12 (for C). That's it: you should get 59468 as before.

Decimal To Hexadecimal

You will often have a decimal number that you would like to convert to hexadecimal. There are several different methods of doing this.

An easy manual method is to divide repeatedly by 16: the remainder is the next hexadecimal digit, going from right to left. If we started with 133, dividing by 16 gives 8 with a remainder of 5. The 5 is the right-hand digit. Now divide the 8 by 16: you get zero with a remainder of 8. This goes to the left of the 5 to give a result of 85 hex.

Remainders are hard to do on calculators and computers. Here's a method I prefer that works easily on either:

If the number is less than 256, divide by 16; otherwise divide by 4096. You'll get a number which has a whole and fractional part. The whole value is your first digit; make a note of it and then subtract it. Now multiply by 16 and repeat the whole procedure: you'll get two digits for numbers less than 256, and four for greater numbers.

Suppose we have 59468 on our hand calculator. Divide by 4096; you'll get a number like 14.51855. The 14 is your first digit, E: write it down and then subtract the 14. Multiply the remaining .51855 by 16 and you'll get 8.2968. Note the 8 behind the E, subtract 8, and you're ready for the next multiplication by 16. Keep going and you'll get the 4, and finally the last digit will be 12 (it may be 11.99, but we can stretch a point), for which we write down C. Result: hexadecimal E84C.

Hexadecimal numbers are for our convenience. They are very close to the computer's internal notation – binary – but a little more compact and easier for us.

We've talked about simple conversion methods from hexadecimal to decimal and back. They are useful for small computers. If you are a numbers freak, there's lots more for you to dig into: negative numbers, fractions, and even floating point hexadecimal. But the basics will take you a long way.

Some beginners wonder if machine language programmers know secret spells and incantations to make their programs work. I tell them that it's purely logical – no special secrets are required. But it's nice to know how to deal with a hex... number.

This utility program lets you control the speed and direction of LIST.

Speed Limit For Your Atari

Mike Steinberg
Brooklyn Park, MN

Speed is a virtue when you're running a program, but when you enter the command to LIST, and watch your work fly by...the virtue turns to vengeance! Having to enter line numbers and commas to create a section-by-section list is a real time waster...and what's the computer for if not to help you save time rather than waste it?

Line Pacer, will make listing and editing more effective and enjoyable, without the need of a printer, disk drive or assembler-editor. It's so simple to enter and use, you can have it up and running even if you've only read chapter one of the *Atari BASIC Manual.*

A few notes are helpful before you put Line Pacer to work. The program occupies lines zero through nine. This is necessary since most other programs begin on line ten or higher. This enables Line Pacer to co-exist with any program starting at line ten or higher.

Another handy feature is the ability to determine the speed at which your listing will progress. In order for Line Pacer to work, it must be recorded on tape (or disk) using the LIST rather than the SAVE command.

When you're ready to use Line Pacer, enter your main program first – making sure it starts at line ten or higher. Next, call up Line Pacer from the cassette or disk where you've stored it. Use the ENTER rather than the LOAD command.

Since Line Pacer is a program itself, when you hit RUN and return, Line Pacer will take over with its "read" mode. Once you've determined the number of lines, the SELECT button will control the forward movement and the OPTION button will allow you to backtrack.

The "edit" mode can be entered by pressing the BREAK key. Once you've made your edit, you can go back to Line Pacer by typing CONT and hitting the return key.

When you're done editing or reading and want to run your program, just type GOTO and the number of the first line of your actual program, hit RETURN, and you're off and running.

```
0 ? :? "{13 SPACES}LINE PACER
  {14 SPACES}":? :? "{4 SPACES}AN M.J.
  S.A. PROGRAM (C) 1981":? :?
1 PRINT " TO ADVANCE PRESS 'SELECT'":
  ? :? " TO BACKUP PRESS 'OPTION'":?
  :?
2 PRINT "PRESS BREAK FOR EDIT MODE":?
   :? "TYPE 'CONT' AND PRESS RETURN W
  HEN YOU HAVE FINISHED YOUR EDIT"
3 ? :? "HOW MANY LINES PER SELECT";:I
  NPUT LIN:? :?
4 FOR LST=9 TO 50000 STEP LIN
5 LIST LST+1,LST+LIN
6 IF PEEK(53279)=5 THEN GOTO 9
7 IF PEEK(53279)=3 THEN LST=LST-LIN:G
  OTO 5
8 GOTO 6
9 NEXT LST:GOTO 5:REM ** SHOULD BE CO
  DED ON TAPE OR DISK WITH 'LIST'  AN
  D CALLED WITH 'ENTER'                ©
```

A Graphics Plot For The Epson MX-80 Printer

William L. Osburn
Wyoming, DE

For those Atari owners with an Epson MX-80 printer and the Macrotronics Parallel Printer Interface, here is a short BASIC routine which will copy a graphics mode 7 display onto the printer.

Before running this routine, X$ must be DIMensioned to 80 characters. The graphics you want copied must already be displayed on the screen.

```
5200 REM SET UP GRAPH PRINTER PLOT
5210 LPRINT CHR$(27);CHR$(65);CHR$(131);
     CHR$(27);CHR$(50);CHR$(15)
5230 FOR I=0 TO 159
5240 FOR J=0 TO 79:POSITION I,J:GET #6,A
5250 IF A=0 THEN X$(79-J+1,79-J+1)=" ":
     GOTO 5270
5255 IF A=1 THEN X$(79-J+1,79-J+1)=".":
     GOTO 5270
5260 X$(79-J+1,79-J+1)="*"
5270 NEXT J
5280 LPRINT X$
5290 NEXT I
5295 LPRINT CHR$(7);CHR$(7)
5300 END
```

Line 5210 sets up the horizontal and vertical spacing of the Epson MX-80. The commands CHR$(27); CHR$(65); CHR$(131); CHR$(27); CHR$(50) set the vertical line spacing to 3/72 of an inch. The line spacing can be set to any 1/72 of an inch. CHR$(15) sets the horizontal printing to 132 characters per line. Lines 5230 and 5240 direct the pixel scan of the screen. The command LOCATE I,J,A can be used in place of POSITION I,J: GET #6, A in line 5240. The returned value of variable A will be either 0,1,2, or 3, depending on the COLOR exp used for that pixel. Lines 5250, 5255 and 5260 set the X$ array for printing depending on the value returned for A. In this case I used "." for the border and "*" for the curve. The border and the curve were in different colors. Line 5280 prints the string array X$ (x=I, y=0 to 79). Line 5295 rings the MX-80 buzzer after the printing is done. The plot takes about nine minutes to complete and this allows me to do something else.

The result is a copy of the screen onto paper. The routine rotates the plot 90° clockwise in order to print.

This handy input routine makes a program crash-proof. See the substitution in Program 2 for VIC.

Flashing Prompt For VIC And PET

Glenn Murray
Fredericton, N.B.

Displaying longer passages of information on the screen means choosing how to pause at an appropriate point to let the user digest one section, and then move along to the next. This is especially important in CAI programs for schools, or any time you're relating instructions or outputting a lengthy report.

A computer novice, I began to use a CBM 8032 for word processing last year, and was soon lured into writing simple programs to convey information on local history and astrology via the microcomputer. This usually involves long passages of text and graphics, needing more than one screenful for display.

Earlier Versions

At first, I used simple INPUT statements to create a pause, such as: "Type 'C' to continue", but this required pressing both the C-key and RETURN to move forward. Also, the possibility always existed of simply striking RETURN and falling out of the program altogether. To avoid this, I tried ending each passage with a time-delay (FOR I = 1 TO 20000: NEXT to allow 20 seconds for reading that segment, for instance). I soon discovered that people read at widely differing speeds, and are sometimes interrupted long enough for an important passage to whiz past unread. Obviously, this was not the answer.

Reverting to INPUT statements, I tried inserting default values at the response-point, so that most users would find the appropriate response already in place and could simply press RETURN to continue. Using cursor-controls, I had the cursor pause and flash right on the default value, like so:

```
100 INPUT"ANOTHER ROUND?...'Y'OR'N'...
   {02 RIGHT}Y{03 LEFT}";R$
110 IFR$<>"Y"ANDR$<>"N"THEN100
```

This was better than anything I'd tried earlier, but it still wasn't appropriate when the program simply needed a cue to continue. I then discovered the value and immediacy of the GET statement. Using GET instead of INPUT means that, even without default values, the user has to touch only a single key to register his response. Now, when the prompt said "PRESS 'C' TO CONTINUE..." that was really all that was required. How wonderful!

The trouble now was that no single letter-key on the PET/CBM keyboard is quite so noticeable or quite so familiar (even to the casual user) as the large RETURN key. I still felt the most sensible and completely comfortable suggestion was:

PRESS 'RETURN' TO CONTINUE...

The other problem was that I'd become fond of the flashing cursor with its self-contained default value as an attention getting device at the end of a passage of text. Obviously, then, the "ideal" prompt would be to see the above cue (PRESS RETURN TO CONTINUE) appear at the bottom of the screen and flash slowly until the response was entered.

The Blinking Prompt

The enclosed subroutine accomplishes this in a very simple fashion. It can be loaded before writing a program or added to already existing programs, and accessed by simply using "GOSUB 10000" where you might otherwise use an INPUT, GET, or time-delay to hold a screenful of text before moving on. The words "PRESS RETURN TO CONTINUE" will flash on the bottom line of your screen (line 23 – hence cursor-down 22 times in line 10110) until the RETURN key is pressed, and then the program continues.

The short demo-program illustrates the use of this device to beginning-programmers and has plenty of REM statements to make its simplicity obvious. It should work on most micros, although the position of the flashing prompt might need adjustment to appear at the bottom-center of your monitor screen. This version is for the 40-column PET, but adding 20 extra spaces to the TAB indicators (that goes for line 10110 in the subroutine too!) makes it look fine on the 80-column machine as well.

If you don't want the flashing to begin instantly when the screenful of information changes, insert a simple time-delay of several seconds immediately before your "GOSUB 10000" (as seen in line 260 of the demo-program). This will give the user time to digest most of your information before the blinking prompt appears at the bottom of the screen.

Program 1: Subroutine and Demonstration

```
10 REM  BLINKING PROMPT SUBROUTINE
     DEMONSTRATION
100 PRINT"{CLEAR}"
200 PRINTTAB(7)"{08 DOWN}THIS WILL ~
    DEMONSTRATE THE USE"
210 PRINTTAB(7)"{DOWN}OF A BLINKING
     PROMPT TO CREATE"
220 PRINTTAB(7)"{DOWN}A PAUSE, AND ~
    THEN QUICKLY RESUME"
230 PRINTTAB(7)"{DOWN}ANY PROGRAM W
    HEN THE USER IS"
240 PRINTTAB(7)"{DOWN}READY TO PROC
    EED..."
260 FORI=1TO3000:NEXT:  REM  WAIT T
    O START FLASHING
270 GOSUB10000
300 PRINT"{CLEAR}"
310 PRINT"{06 DOWN}LIST THE PROGRAM
     & SEE HOW IT WORKS."
320 PRINT"{02 DOWN}THE SUBROUTINE I
    S AT LINE 10000."
330 PRINT"{02 DOWN}USE IT ANYTIME V
    IA GOSUB STATEMENTS."
500 END
10000 A$="{REV}"
10010 FORL=1TO1000
10100 PRINT"{HOME}"
10110 PRINTTAB(10)A$;"{22 DOWN}HIT RE
    TURN TO CONTINUE"
10120 GETR$:IFR$=CHR$(13) THEN RETURN

10130 FORI=1TO333:NEXT
10150 IFA$="{REV}" THEN A$="{OFF}":GO
    TO10300
10160 IFA$="{OFF}" THEN A$="{REV}":GO
    TO10300
10300 NEXT L
```

Program 2: Make this substitution to use this technique on the VIC.

```
10110 PRINTTAB(2)A$;"{20 DOWN}HIT RETURN TO
    CONT"
```

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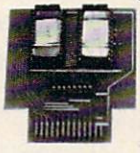

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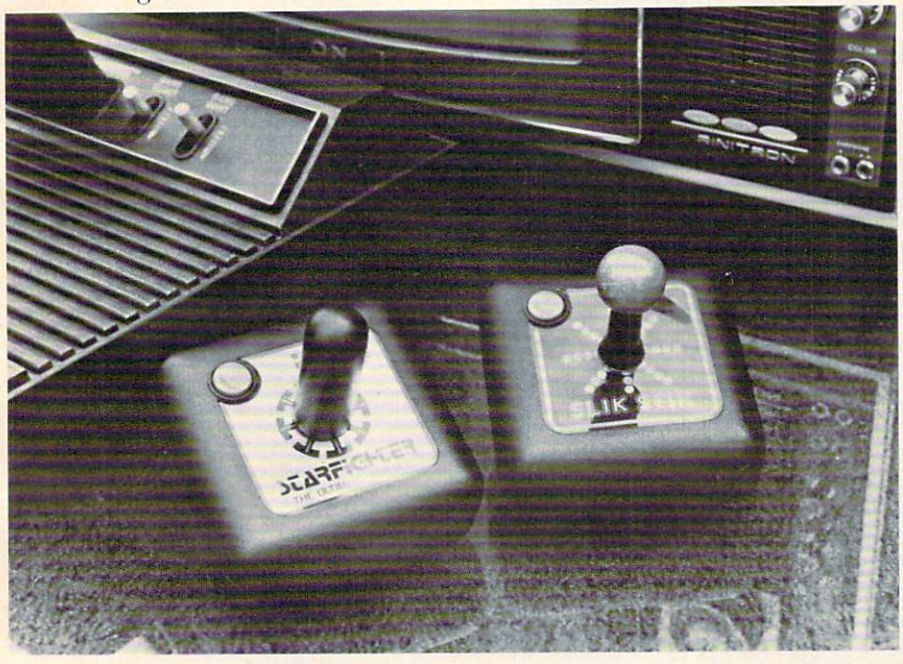

Suncom's Starfighter and Slik Stik

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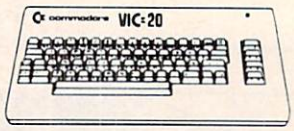

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The Computer Outlet is an associate of The Computer Learning Center For Children. We are experts in educational technology and can customize educational software curriculums for school districts, individual schools, or for the child at home. Please 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.

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COMPUTER OUTLET

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Deadly Secrets	$ 23
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light sensitive pen barrel connected to electronic circuitry by a three foot lightweight cable. Since the electronics circuit is on a board, the pen barrel is thinner. The circuit board plugs into the VIC's user port and is ready to use with only minor "tuning."

A free demonstration program accompanies the unit, as well as complete documentation on installation, operation, and programming. The Touch-n-Light Pen retails for $75. Also available is educational and recreational software which retails for $9.95 to $14.95.

Sunshine Peripherals Inc.
1229 East 28th Street
Brooklyn, NY 11210

CyberLOGO Turtle For The Apple

Cybertronics has released the CyberLOGO Turtle, an open-ended computer literacy learning environment. It runs on any Apple II in 48K (no language card is required). The CyberLOGO Turtle provides these LOGO features:

Turtle graphics
Full screen editor
Filing system for saving both programs and pictures
Sound
Color pictures and backgrounds
Global and local variables

The CyberLOGO Turtle also includes a STEP mode for easy debugging. This facility allows a student to execute a program one line at a time to locate programming errors.

A CyberLOGO Turtle SKETCH mode is included for the exploring student. In SKETCH, students can move the CyberLOGO Turtle and draw pictures by pressing single keys.

Unlike any other LOGO product, the CyberLOGO Turtle offers on-line HELP. HELP provides guidance for the first-time user, a complete description of the CyberLOGO Turtle language, and quick solutions to students' most frequent problems.

The CyberLOGO Turtle manual, written in friendly, jargon-free language by Dr. Pamela Sharp of the Stanford University Psychology Department, is designed specifically for the novice user.

The CyberLOGO Turtle is priced at $99.95. To order, write or call:

Cybertronics International, Inc.
Software Publishing Division
999 Mount Kemble Avenue
Morristown, NJ 07960
(201)766-7681

A Financial Wizard From Computari

Computari has released *A Financial Wizard*, version 1.5, which supersedes their *Personal Finance* for the Atari.

A Financial Wizard is capable of storing 100 checks per month (220 checks with the two drive option) and allows 26 major and 36 sub- expense categories. Available core programs include Check Entry, Budget Entry, Check Search, Tabulations, Bargraph, Check Balancer, Checkwriter, and Utilities (which includes an audit program).

All data is entered through the Check Entry program, which allows users to scan and correct previous entries with ease. Colorful graphics using a custom display list format and defined data fields makes data entry easy. All data resides on the program disk, so there is no disk switching.

Household budgets are created with Budget Entry. The COPY MONTH and COPY CATEGORY features allow rapid creation of a year's budget.

Check Search allows single or multiple (up to seven) parameter searches at one time.

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Tabulations lists expenses by month, year to date, or by category over a twelve month span, while Bargraph provides the same data in bargraph form. With an 80-column printer with graphics capability, the user can reproduce the bargraph on paper.

Check Balancer offers a fast way to balance the computerized checkbook and includes a correction mode. Checkwriter will print checks which are obtained through Abacus Software.

Those who have the earlier *Personal Finance* package may update to the new version by sending $10 and their PF disk to: On-Line Computer Center, 10944A N. May Avenue, Oklahoma City, OK 73120.

The new *Financial Wizard* costs $34.95. A clear plastic disk case, for storing up to ten FW diskettes, is available for an additional $4.

Computari
9607 Athlone
Dallas, TX 75218
(214)327-4649

Software For Timex And Sinclair

Software Development Associates has cassette-based software for the Sinclair ZX-81 and the Timex/Sinclair 1000. The software includes programs to entertain, educate, and assist in financial planning. An introductory cassette containing five games (SDA-Match23, SDA-Battlecard, SDA-Gunner, SDA-Mugwumps, and SDA-Snark) is available for $3.95. A free catalog is also available by sending a SASE to:

Software Development Associates
Dept. C1, 2240 W. McRae Way
Phoenix, AZ 85027

Joystick And Terminal Program For The Color Computer

Spectrum Projects has announced two new products, the Spectrum Stick and the Colorcom/E terminal program.

The Spectrum Stick is a new joystick for the Color Computer. Its features are:

- Hair trigger fire button.
- Swivel-ball type component.
- Extra long cable.
- Brush aluminum knob.
- Sturdy construction.
- A red LED indicator.

The Spectrum Stick costs $39.95 plus $2 for shipping and handling.

The Colorcom/E, a terminal program for the Color Computer, comes in a ROM Cartridge ready to plug in and run. Colorcom/E's features and capabilities include:

- On-line and off-line scrolling.
- Off-line printing of data.
- Receiving and sending cassette files.
- Support of any serial printer.
- Full and half duplex.
- An optional word mode to eliminate word wrap.

Data can be easily edited before printing or writing to cassette.

The price is $49.95.

Spectrum Projects
93-15 86 Drive
Woodhaven, NY 11421
(212)441-2807

SuperPET Upgrade Board For CBM 8032

Commodore Business Machines has announced the availability of a single board upgrade that converts the CBM 8032 microcomputer into a SuperPET.

LOGOS SOFTWARE you can use VIC-20/64

QUIZ KIT

A unique instructional program to be used at any level of learning. Easy detailed instructions allow you to create your own quizzes on any subject you choose. No limit on the number of questions you can enter and no memory expansion is needed either! Use your VIC printer for printouts of tests ready for classroom use. An invaluable tool for the parent and the instructor.

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SPELL IT!

Test and improve your spelling abilities and have fun, too! Create your own vocabularies to fit your needs. Great for instructional use. Detailed documentation with step by step instructions for the computer novice.

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BOLDFACE

This program utilizes three specially designed letter types that you can use to create on your VIC printer personalized headlines and messages in a variety of sizes. A plethora of applications. Program requires 8K memory expansion for VIC-20.

Price $18.00

ABC abc KLM nop*

*Reduced size

MAILING LIST

Turn your computer into an electronic agenda! Enter names, addresses, phone nos. and comments. Use one-key-stroke command to sort by name or state, modify, delete or add new entries; print your mailing labels.

For VIC-20 (8K, printer optional) $18.00
For Com. 64 (Many additional features) ..$24.50

CHARACTER GENERATOR

Design your own special characters for any application (games, math, etc). Enhance your programs with your own unique figures. Program comes on tape with two sample runs that create strange creatures for games and digital electronic symbols and a detailed manual. Program available for VIC-20 only.

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STATISTICS I & II A most useful tool for statistical analysis and estimation. Program performs linear and nonlinear regression (curve fitting) and returns the error of the approximation. It also computes the mean, median and standard deviation and plots histograms.

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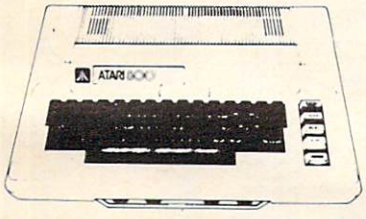

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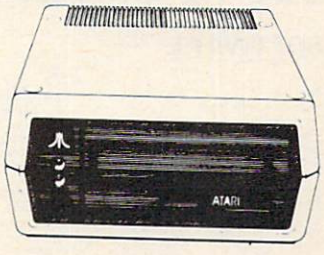

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The standard CBM model 8032 contains 32K of RAM and includes Commodore BASIC. With the SuperPET board, the upgraded machine will feature an RS-232 interface, 64K additional RAM in 8K RAM chips, and a standard 6502 microprocessor as well as a pseudo 16 bit 6809 based processor. An external switch for processor selection also allows programs designed for the 8032 to operate without modification.

The upgrade board also provides six languages, including Waterloo Computing Systems Limited's microBASIC, microPascal, microFORTRAN, microAPL, microCOBOL, and 6809 Assembler. Applications developed on the SuperPET can be up-loaded to a mainframe system, and executed without modification.

The upgrade board (part number 900003501) sells for $795.

Commodore Business Machines, Inc.
Computer Systems Division
The Meadows
487 Devon Park Drive
Wayne, PA 19087
(215)687-9750

Printer Programming Manual For VIC And Epson MX-80

Robert E. Huffman, of Munster, Indiana, has written a 53-page booklet titled *VIC-20: MX-80 Connection*. It is a printer programming manual for making the VIC-20 work with the Epson MX-80 with Graftrax-Plus.

Written for beginners, the booklet carefully explains each program – line by line, step by step. The programs present techniques that can be used by anyone with an understanding of BASIC fundamentals.

The booklet costs $15. Copies may be obtained by writing to:

Robert E. Huffman
9607 Dogwood Lane
Munster, IN 46321

Personal Finance Records For The Atari

SCITOR has announced the Personal Finance and Record Keeping package for the Atari 800 computer with 40K RAM, 1 810 disk, and BASIC.

The SCITOR Personal Finance and Record Keeping package provides homes and small businesses with a complete yet simple automated records system. You can organize and keep track of expenses, checks, credit cards and other personal records. Reports, high resolution graphics, and color bar charts can be generated from the records, providing insight into expenses, budgets, and progress

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FOX 20: ™ The magazine for *VIC-20 users

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versus goals. The ledger is Visi-Calc compatible. The package costs $75.

SCITOR Corporation
710 Lakeway, Suite 290
Sunnyvale, CA 94086
(408)730-0400

Action Games For The VIC-20

Creative Software announces two new action games from Tom Griner, author of *Black Hole* and *Astroblitz*. The two ROM-based cartridges are: *Videomania* and *Terraguard*.

Videomania is an arcade-style action game pitting the player against the Evil Eyes, Walwokers, and the deadly Killer Box.

Terraguard, a multi-level arcade-style hi-resolution reflex game, constantly bombards the player with deadly space debris while he tries to gun down the Heeby-Jeeby, roving Eye and chomping Mouth. Even if he succeeds, he still must elude the enemy tractor beam.

Creative Software
201 San Antonio Circle
Mountain View, CA 94040
(415)948-9595

Two Utility Packages For The Atari

Synergistic software has released two utility packages for Atari 400/800 computers. Both *The Programmer's Workshop* and *The Disk Workshop* contain seven programs. One of the programs is Micro-DOS, a RAM resident program similar to Atari's DUP.SYS. Since Micro-DOS is on-line and available any time, it provides quick and easy access to the DUP.SYS. functions.

THE MONKEY WRENCH™ FOR ATARI

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A BASIC and machine language programmers aid for 800 users. Plugs into right slot and works with ATARI BASIC. Adds 9 new direct mode commands including auto line numbering, delete lines, change margins, memory test, renumber BASIC, hex/dec conversion, cursor exchange, and machine language monitor.

The monitor contains 15 commands used to interact with the 6502. Some are display memory/registers, disassemble, hunt, compare, hex/dec convert, transfer memory, and printer set/clear. Uses screen editing.

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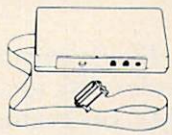

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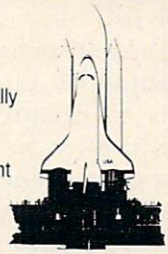

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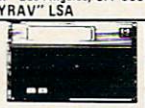

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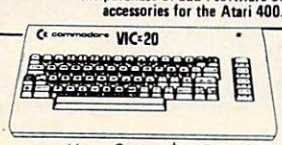

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The Disk Workshop includes disk editing capabilities, fast copying of disks, a formatted disk directory which can be sent to a printer, use of machine language character strings in BASIC, a screen dump for the MX-80 Epson Printer with Graftrax or Graftrax Plus, and transfer capabilities of large files to disk or cassette.

Both packages require an Atari 400/800 computer with 32K and one disk drive. The price for each package is $34.95.

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

PET Joystick Interface

J Systems Corp. announces the immediate availability of its new PET Joystick Interface. This versatile interface card adds joystick/paddle capabilities to all PET/CBM computers. The device enables the PET to accept inputs directly from two Apple joysticks, four Apple game paddles, or two Atari joysticks. Interface is complete and ready to plug into the user port.

All modes of operation are software selectable. The device features short access time (less than ten milliseconds/ joystick) and high resolution digitization (greater than eight bits). This makes the interface ideal, not only for joysticks and paddles, but also for connecting any four resistive sensors to the PET/CBM. Fast machine language input routines, callable from a BASIC program, are included.

The price of the PET Joystick Interface is $49.95. This price includes the card, power supply, documentation, and sample software. The device can be ordered directly from:

J Systems Corp.
1 Edmund Place
Ann Arbor, MI 48103
(313)662-4714

Skill/Action Game For Atari

PlatterMania, a ROM cartridge for the Atari 400/800, is a new action game from EPYX. The game can be played by one or up to four players.

A player begins with four spinning plates on top of four rods. He must be fast and accu-

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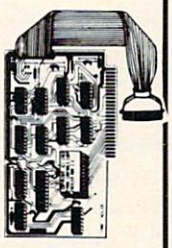

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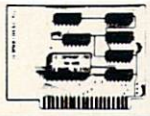

for Epson, OKI, NEC 8023, C. ITOH 8510 provides resident HIRES screen dump and print formatting in firmware. Plugs into Apple slot and easy access to all printer fonts through menu with PR# command. Use with standard printer cards to add intelligence. **$49.00** specify printer.

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rate as he moves from rod to rod – making sure that no plate spins hard enough to fly off or slows enough to fall off. As the player's skill improves, the game increases in difficulty, providing up to 12 rods balancing plates.

PlatterMania is available on ROM cartridge for the Atari (with joystick or paddle controller). The suggested retail price is $39.95.

EPYX/Automated Simulations, Inc.
1043 Kiel Court
Sunnyvale, CA 94086

Carrying case holding Commodore computer, disk drive, and power supply.

Carrying Case For Commodore 64 And VIC

The Computer Case Company has recently added two cases for the Commodore 64 computer. The CM703 case will hold the Model 64 computer and one or two 1541 disk drives, as well as the power supply. The CM704 case will hold the Model 64 computer along with the dataset program recorder and the power supply. Both cases have ample room for additional equipment, working papers, manuals, etc. The cases can also be used for the Commodore VIC and related equipment.

These cases are not only portable but also provide a convenient and safe method of storage. Replacing and locking the lid protects the computer and software from tampering and unauthorized use. The tops are easily removed so that the equipment can be operated without removal from the case. Cables and plugs are protected from possible inadvertent damage or failure resulting from repeated connecting and disconnecting.

The cases are constructed of luggage material with hard sides, padded handles, brass hardware, and key locks. Rubber pads protect furniture, and steel lugs on the bottom protect the case. The outside is covered in scuff-resistant, brown textured vinyl.

Computer Case Company
5650 Indian Mound Court
Columbus, OH 43213
(614)868-9464 or (800)848-7548

Games From Avalon Hill

New game releases from Avalon Hill are:

Legionnaire, a realtime war game for the Atari 400/800. The player assumes the role of Julius Caesar and commands ten legions against the barbarian tribes. The scrolling battlefield allows the player to inspect the entire ten square foot map stored in the computer's memory. The game features high-resolution graphics and sound effects and requires 16K. The cost for the cassette is $35.

A one or two-player game, *Moon Patrol* is an arcade-style game for the Atari. Players circle the moon, trying to touch down at the landing site, while dodging and destroying enemy invaders. Available on cassette, the game requires 16K and costs $25.

Telengard is for Apple II and TRS-80 Models I and III computers with 48K memory. It is a fantasy role-playing game that requires players to descend into a 50-level dungeon. Before his journey, a player may choose the character attributes he thinks will help him defeat the monsters within the dungeon and return with wealth and power. *Telengard* is a realtime game and emphasizes quick decision-making: if a player doesn't make a decision in five seconds, the computer will make it for him. A manual of rules and suggestions is included. Available on diskette, the game costs $28.

G.F.S. Sorceress is a space adventure set in the year 2582. The player assumes the role of Joe Justin, wrongly accused and convicted of mutiny, and sentenced to drift in space for the rest of his life. The player's goal is to vindicate Joe Justin. The game is available for the Atari 400/800, Apple II, and TRS-80 Models I and III. The cassette version is $30; the diskette, $35.

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Another strategy simulation game, *Andromeda Conquest* requires players to form and protect galactic empires. They must locate star systems with the highest resource values for colonization, but they also face opponents wanting the same star system. Cassette and disk versions are available ($18 and $23, respectively) for the Apple II+, Atari 400/800, TRS-80 Models I and III, and PET/CBM 2001 (no disk version for PET). The game requires 16K. There is also a 48K disk version for the IBM personal computer.

The Avalon Hill Game Company
4517 Harford Road
Baltimore, MD 21214
(301)254-5300

Memory Expansion For The Atari

Axlon Inc. has introduced a 48K memory expansion module for the Atari 400 home computer. Called the RAMCRAM Plus 48K, the new product provides 49,062 bytes of Random Access Memory in a single module.

This memory module allows Atari 400 owners to upgrade their computers to equal the computing power of its larger, more expensive brother, the Atari 800. With the RAMCRAM Plus 48K, Atari 400 users will have full access to software enjoyed by Atari 800 users.

The module requires no soldering modifications to the Atari 400 and can be easily installed with only a screwdriver in less than ten minutes. It offers gold plated contacts and a fully socketed board and is fully compatible with existing Read Only Memory (ROM) cartridges. The retail price is $229.95.

Axlon, Inc.
170 N. Wolfe Road
Sunnyvale, CA 94086
(408)730-0216

Adventure Game From Computerware

Computerware has introduced *El Diablero,* an adventure game for the Radio Shack Color Computer and TDP System 100.

The player is isolated in the middle of a desert in the Southwest. He has been a student of an aged sorcerer, but the sorcerer is missing. The player has apparently forgotten the sorcery techniques he's been taught, but he has two clues to work with. He can remember that a "diablero" had become his teacher's enemy, and he can recall a curious verse.

El Diablero costs $19.95 on cassette or $24.95 on disk (plus $2 for shipping and handling).

Computerware
Box 668
Encinitas, CA 92024
(714)436-3512

Communications Packages For VersaModem

Bizcomp has introduced two companion communications software packages for its Model 1080 VersaModem. *Term Emulator II* allows an Apple II Plus computer to communicate with The Source, Dow-Jones and University Computers, and *mini-McTerm* brings the same capabilities to Commodore PET/CBM.

Both communications packages eliminate the need for interface cards. A special low-cost cable plugs directly into the game jack on the Apple II. Modem operating parameters such as parity, duplex, and stopbits are conveniently changed from a setup menu. The RAM-copy feature permits the Apple to capture data from remote computers.

Using the *mini-McTerm* package, Commodore PET/CBM computers can be interfaced directly via the user port, bypassing the need for RS-232 conversion boxes. The user port interface also prevents excessive loading of the IEEE bus. Simul-

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Prices for the software packages on diskette, complete with interface cable and modular T-adapter, are: $29.95 for the Apple, $74.95 for the Commodore PET/CBM, and $24.95 for the Commodore VIC.

BIZCOMP Corporation
P.O. Box 7498
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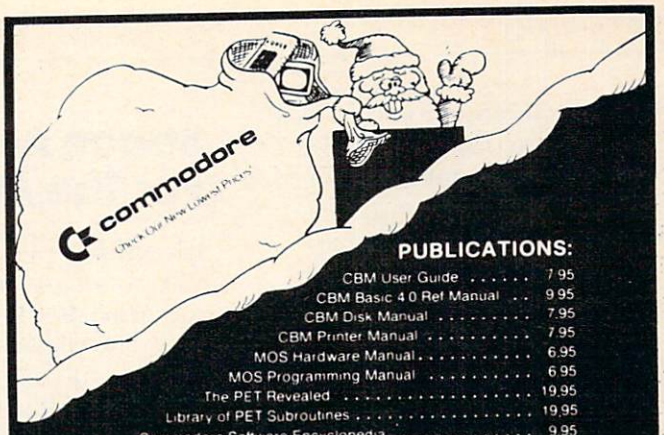

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Monster Maze is available on ROM cartridge for the VIC-20 and Atari 400/800 (with joystick controller), on disk for the Apple (48K with Applesoft in ROM) and TRS-80 (32K), and on cassette for the TRS-80 (16K, Level II). The suggested retail price is $39.95 for the ROM cartridge and $29.95 for disk and cassette.

EPYX/Automated Simulations, Inc.
1043 Kiel Court
Sunnyvale, CA 94086

Space Adventure For The Atari

BRAM has released *Attack at EP-CYG-4*, an arcade-style game for the Atari 400/800.

The player orbits the fourth planet of Epsilon Cygnus. The enemy: the Tartillians, a machine race who destroyed their humanoid creators and have sworn to destroy all humanoids.

The game offers a choice of missions and levels of difficulty. It may be played by one person or by two. A single player is in full control of his ship and its weapons and defenses. Two players – one acting as pilot, the other as gunnery officer – share the decisions of the mission.

Attack at EP-CYG-4 offers:

– 100% machine language; hi-res graphics with sound

– One player or cooperative two-player operation

– Two different missions on cassette (16K)

– Three different missions on diskette (24K)

– Three levels of difficulty

– Advanced joystick control capabilities

– Free poster

The price is $29.95 (cassette) or $32.95 (disk).

BRAM Inc.
18779 Kenlake Place NE
Seattle, WA 98155

Spread Sheet For VIC

Western New England Software announces an electronic spread sheet for the VIC-20. *Short Sheet* is a fully functional spread sheet which features: all the mathematic functions available on the VIC, full error handling, selectable dollars and cents mode, selectable manual recalculation,

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Short Sheet requires a VIC-20 with a minimum of 11K of memory. Cost is $20.

Western New England Software Associates
P.O. Box 31
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Farmers, Agribusiness Get Nationwide Electronic Information System

AgriStar, a new electronic business information, communications, and computing service for U.S. farmers, ranchers, and agribusinessmen, has been introduced by AgriData Resources, Inc., the Milwaukee-based publisher of *FarmFutures* magazine and a range of daily, weekly, and monthly farm business information services.

The AgriStar service will afford farmers, ranchers, and others in the business of agriculture, instantaneous electronic communications among themselves and equally instant access via any microcomputer terminal to the complete array of business, financial, marketing, weather, and news information. All information is continuously updated from several thousand electronically linked sources throughout the U.S. and the world.

AgriStar went into commercial operation in early November, following a nationwide test with 130 farmers.

Tandy Corporation is handling the nationwide retail distribution of the AgriStar service through some 5,000 of its Radio Shack stores and dealers in or near agricultural communities, beginning in January.

A major information source will be Commodity News Service, Inc. (CNS), a subsidiary of Knight-Ridder Newspapers. CNS will provide financial and commodity market information, which will be edited and formatted by Agri-Data for use by farmers and others engaged in agricultural production.

In addition to CNS, AgriData Resources has made information agreements with several major ag-industry publishers, meteorological services, commodity brokerage houses, and selected agricultural corporations, associations, and colleges. Market analysis and recommendations from a range of economists and analysts, including AgriData's Top Farmer advisory service, will be available.

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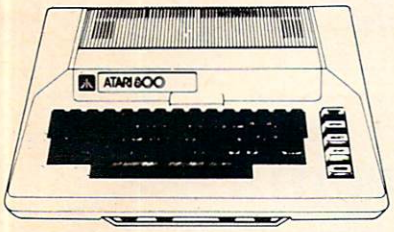

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Modifications Or Corrections To Previous Articles

PET Laser Gunner

The following line was missing from the PET/CBM version of this game, November 1982, p. 44:

```
8 PRINT"{CLEAR}";:GOTO85
```

PET Picture Files

Our thanks to author Liz Deal for pointing out that her screen save routine (November 1982, p. 202) will work on 40-column machines except for the Fat-40.

Commodore 64 Memory Map

Just checking to see if you're on your toes. The Commodore 64 memory maps (October 1982, pp. 150-155) contained two minor errors which everybody noticed (and told me about). The "Tape error log" hex addresses should be 0100 to 013E and memory 0800 to 9FFF is of course BASIC RAM memory, not ROM. Good spotting, readers ... Jim Butterfield.

Atari Variable Table Refresh

On page 152 of the July 1982 issue, lines 32000 and 32040 should have a "D: following the first quotation mark (see line 32010 for the correct format).

Micros With The Handicapped

Lines 30 and 210 (October 1982, p. 125) require a backarrow where there is an underline. ©

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COMPUTE!'s Listing Conventions

Many of the programs which are listed in **COMPUTE!** use special keys (cursor control keys, color keys, etc.). To make it easy to tell *exactly* what should be typed in when copying a program into the computer, we have established the following listing conventions.

For The Atari

In order to make special characters, inverse video, and cursor characters easy to type in, **COMPUTE!** magazine's Atari listing conventions are used in all the program listings in this magazine.

Please refer to the following tables and explanations if you come across an unusual symbol in a program listing.

Atari Conventions

Characters in inverse video will appear like: INVERSE VIDEO
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.

For 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, S would mean to type the S key while holding the shift key. This would result in the "heart" graphics symbol appearing on your screen.

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*.

For The Apple

Programs listed as "Microsoft" are written for the PET/CBM, Apple, OSI, etc. Although the programs are general in nature, you may need to make a few changes for them to run correctly on your Apple. Microsoft BASIC programs written for the PET/CBM sometimes contain special cursor control characters. The following table shows equivalent Apple words. Notice that these Apple commands are *outside* quotations (and even separate from a PRINT statement). PRINT"[RVS]YOU WON" becomes INVERSE: PRINT"YOU WON":NORMAL

[CLEAR[(Clear Screen) HOME

[DOWN] (Cursor down)
Apple II +: Call -922
POKE 37,PEEK(37)+(PEEK(37)<23)

[UP] (Cursor up)
POKE 37,PEEK(37)-(PEEK(37)>0))

[LEFT] (Cursor left) PRINT CHR$(8);

[RIGHT] (Cursor right)
PRINT CHR$(21)

[RVS] (Inverse video on. Turns off automatically after a carriage return. To be safe, turn off inverse video after the print statement with NORMAL unless the PRINT statement ends with a semicolon.)
INVERSE

[OFF] (Inverse video off) NORMAL

Shifted characters can represent either graphics characters or uppercase letters. If within text, just use the non-shifted character, otherwise substitute a space. Some "generalized" programs contain a POKE such as POKE 59468,14. Omit these from the program when typing it in. One final note: you will probably want to insert a question mark or colon within an INPUT prompt. PET/CBM and many other BASICs automatically print a question mark:

INPUT "WHAT IS YOUR NAME";N$
becomes
INPUT "WHAT IS YOUR NAME?";N$

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 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}		

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}		

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.

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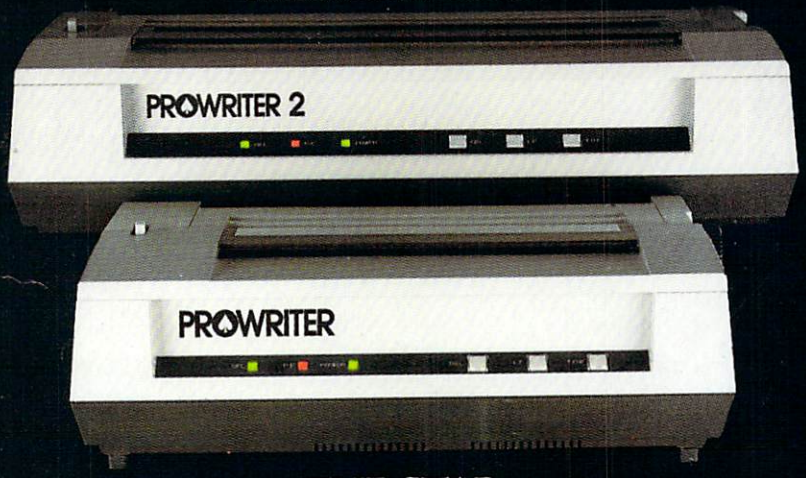

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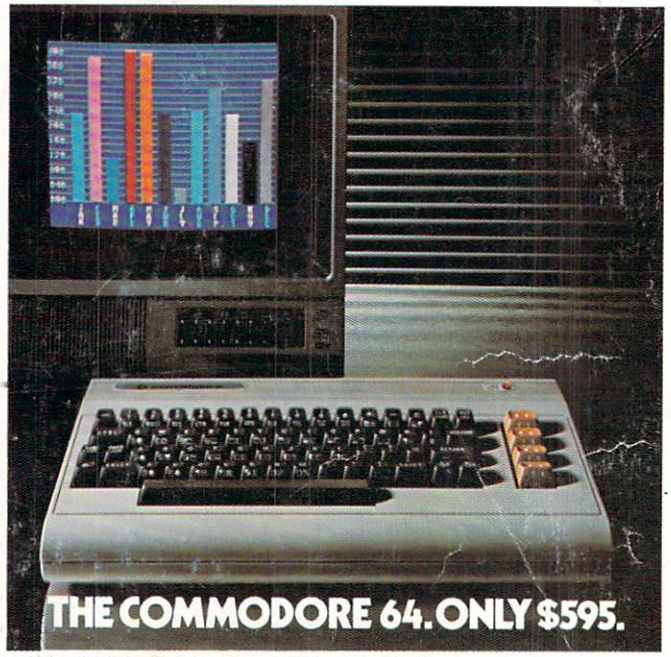

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