Apple's Macintosh Unveiled

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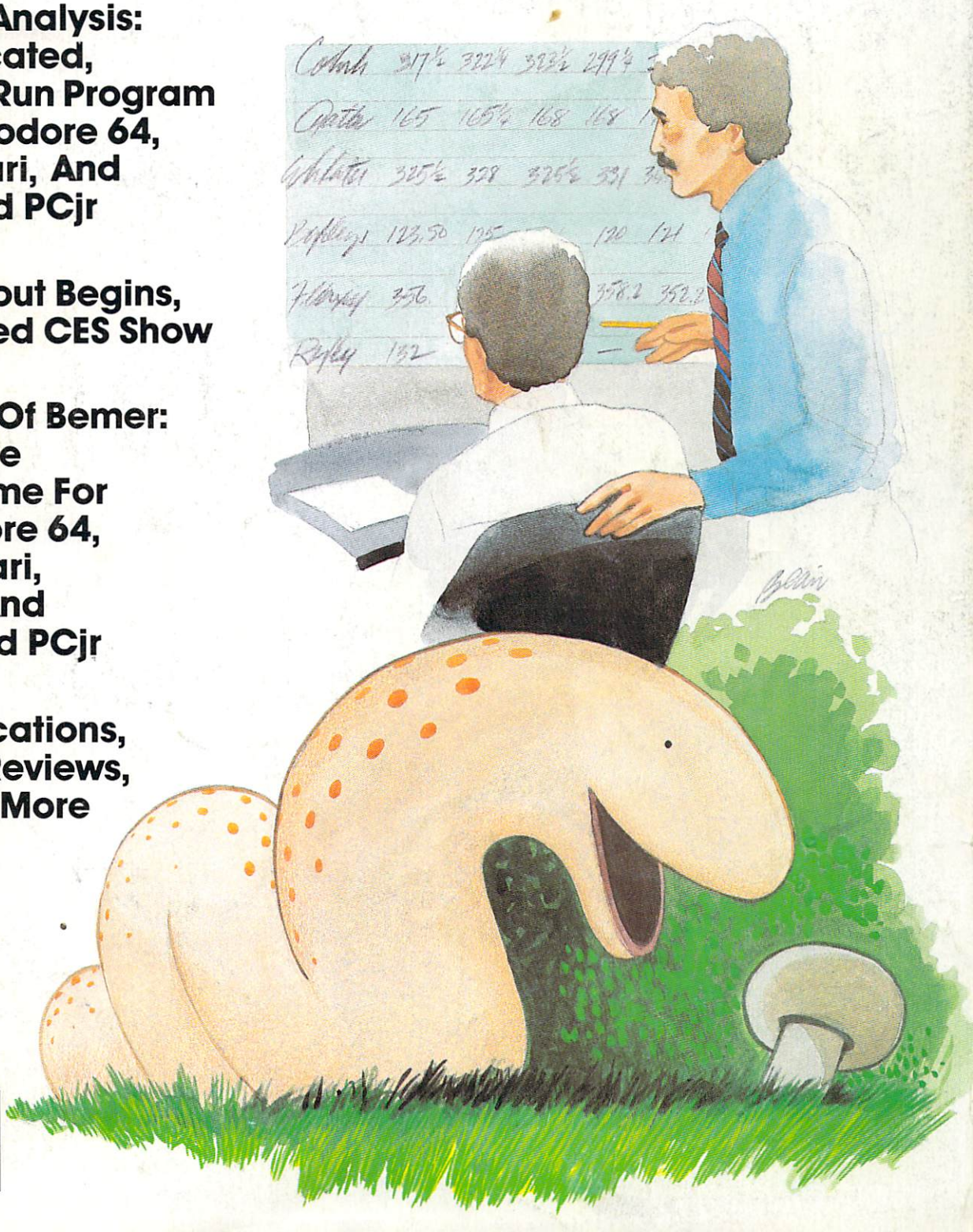

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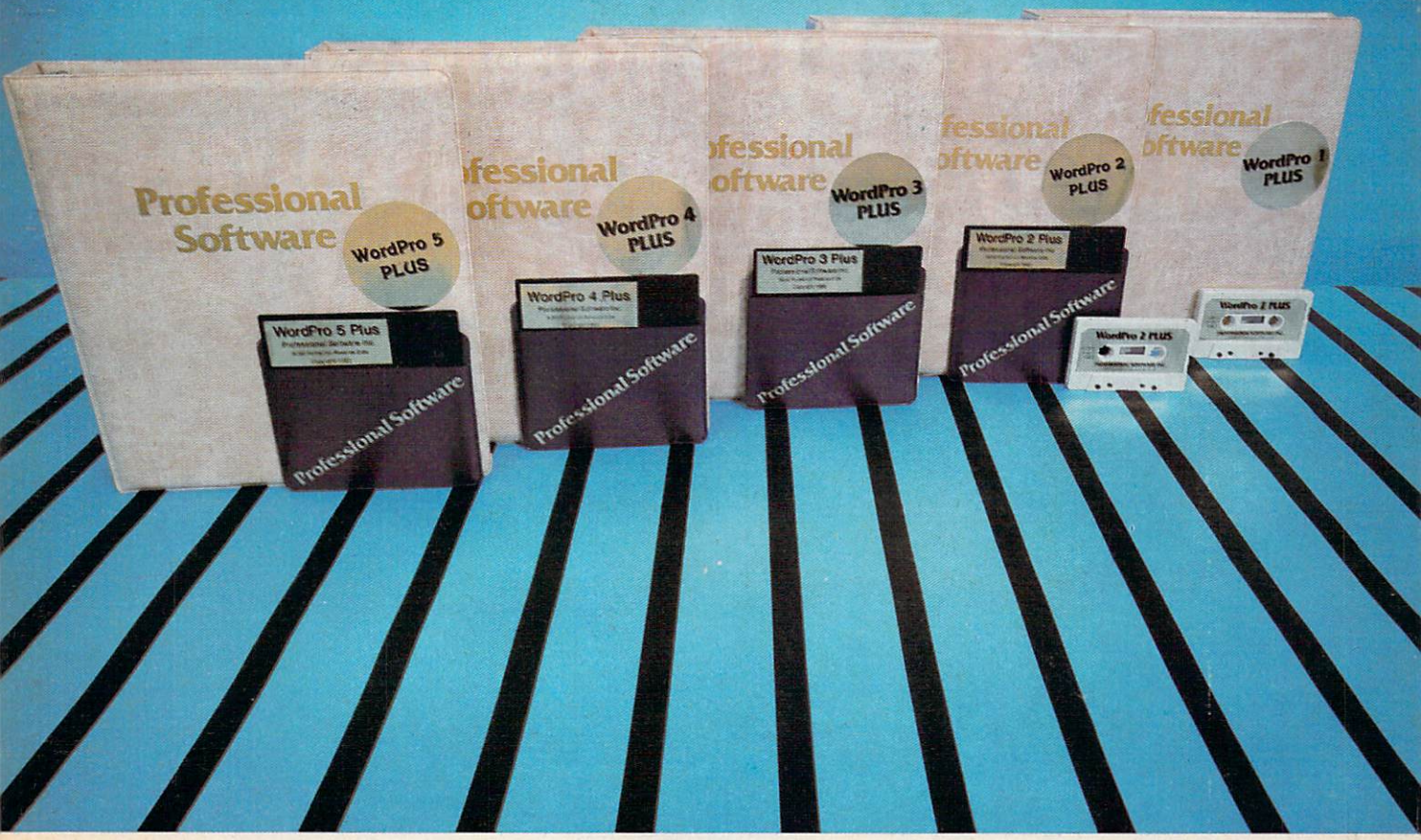

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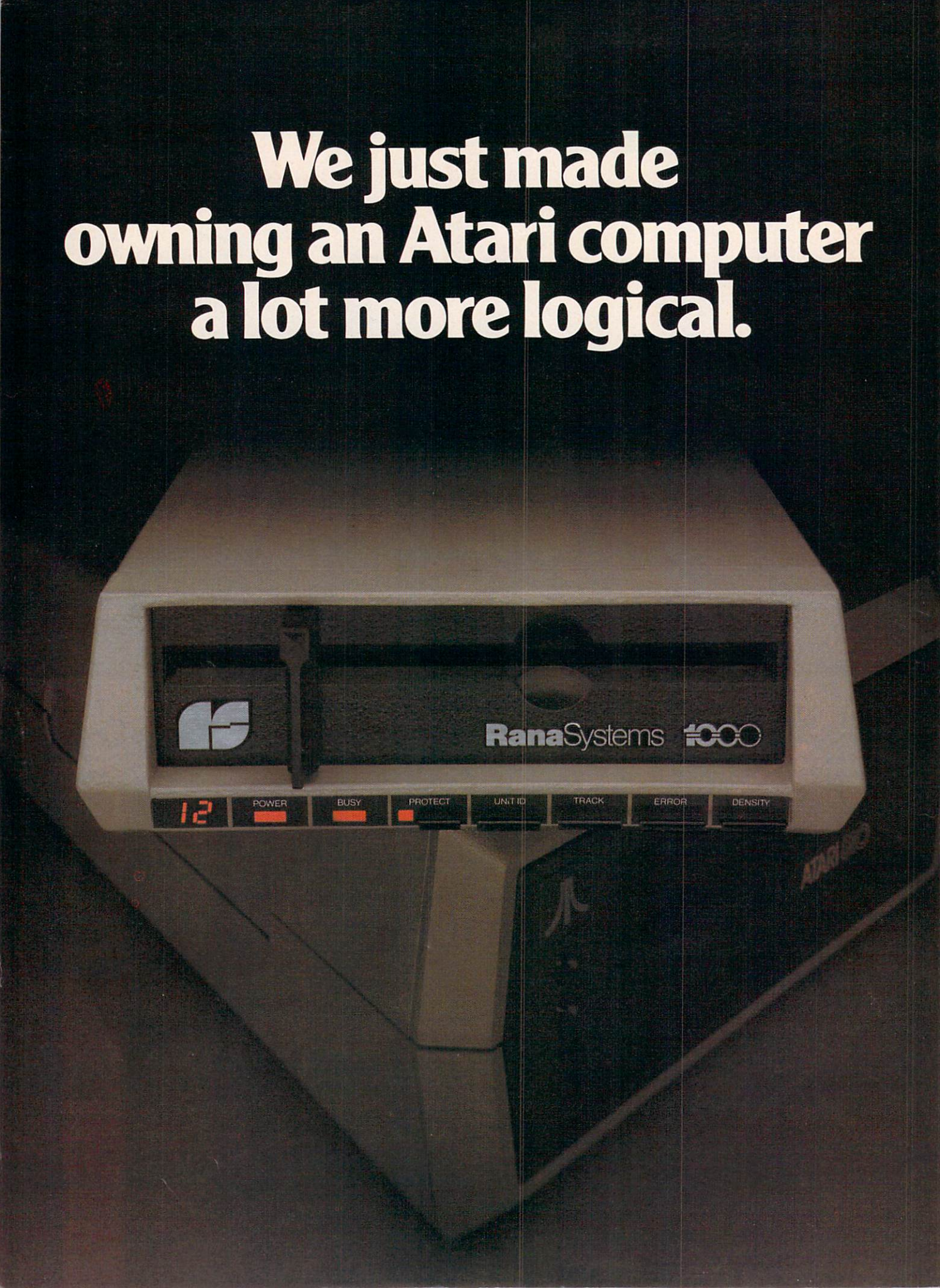

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EDITOR'S NOTES

Richard Mansfield, senior editor of COMPUTE!, *has some reservations about the nearly unanimous praise which has greeted the introduction of Apple's new Macintosh computer. This month, I'm turning over this space to him for a guest editorial.*

Robert Lock
Editor In Chief

In the brouhaha surrounding the introduction of Apple's new Macintosh, little has been said about the most shocking thing about this "new generation" computer—it doesn't include a language. You can't program it. There's no BASIC inside. BASIC and other programming languages will be available later, but the essence of this machine, its spirit, is a rejection of programming itself.

In this respect, it's more like a streetcar than a passenger car. The places you can go with it are predetermined, tracks laid down in the pavement. For now, there are three destinations: word processing, spreadsheet analysis, and picture painting. Do you have something else in mind? You'll need to wait until the software is available and you'll need to buy another disk.

Expressions of doubt about this new machine have been few and faint. The media, aided by computer industry gurus, has sent up a nearly unanimous cry of joy. It's been called the first true consumer computer, an appliance computer. It's been called the computer that's easiest to learn. Perhaps we could raise a few questions, just a brief pause for reflection.

What is the spirit of Macintosh? To find out, let's look at what happens when you turn it on. A picture of a diskette appears on screen with an arrow pointing at it. Unlike other computers which might print "INSERT DISK" on screen (or not print anything, expecting you to remember to insert a disk), Macintosh's message is easy to understand. You don't need to know how to read.

Next, you insert the disk and the disk drive activates itself. Until now, you had to be able to type in something like "LOAD" to pull the software in from the disk. Macintosh does that for you. You don't need to know how to type.

From here on it gets a bit more challenging—you have to be able to point the screen arrow to a picture and press a button. This is not done from the keyboard, however. Attached to the computer is a "mouse," a little rolling device that moves the arrow around the screen as you push the mouse around a table. On top of the mouse is the button you press when the arrow is on the picture you want.

You might have a screen with a picture of a hand holding a pen, a hand painting, a file folder, a memo pad—whatever symbols represent different software on the disk. If you select, say, the hand holding the pen, a new set of picture choices appears and you're well on your way. You're setting things up to begin word processing, to begin writing something. At this point, though, you'll have to abandon the mouse and start typing your own words.

Clearly, there are always tradeoffs between convenience and freedom, between what's easy to learn and what's versatile in use. Some people will opt for the former, arguing that computing isn't very interesting, they're not going to be using a computer that often, and whenever they do use it they want it to be convenient and simple. That's their right, of course. I feel the same way about telephones. I don't like using them. I wouldn't want one that could remember 50 numbers, could record messages, or could locate me anywhere in the city and set off an alarm hanging on my belt.

I want to dial, communicate a message, and get on with my life. For people who feel this way about computers, a task-oriented, prepackaged software machine like the Macintosh is ideal. Mouse, little pictures, and all.

But if you like computing, if you find it challenging and creative to work with programs, all the menus within menus and the mousing will just get in the way. The first few times, it will be easier to get into the word processing mode by the see-it-point-at-it method. However, I suspect all this could become rather tiresome rather quickly.

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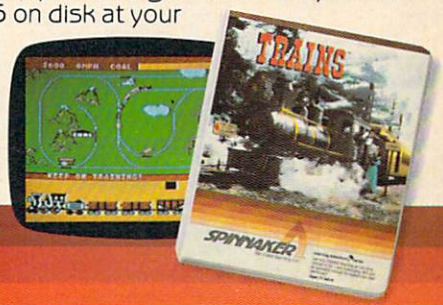

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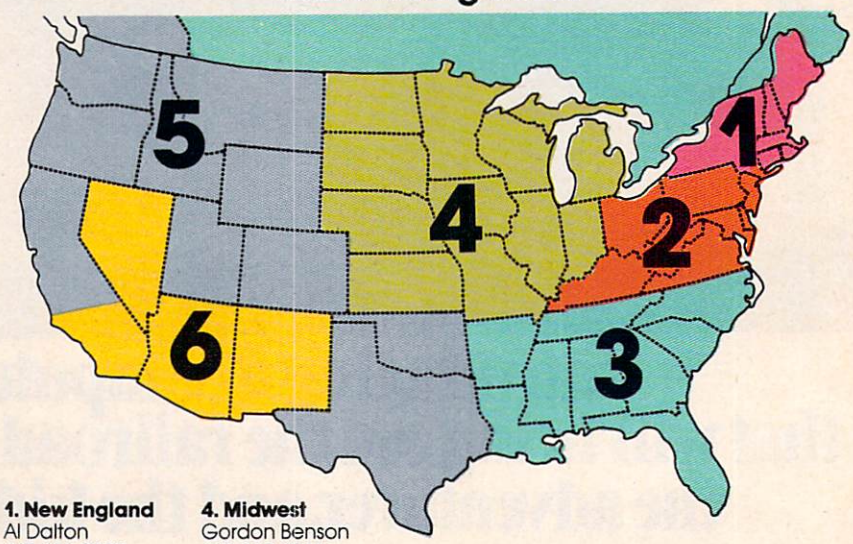

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The Shakeout Begins: A Watershed Winter CES

Tom R. Halfhill, Features Editor

At this year's Winter Consumer Electronics Show, held in January in Las Vegas, there was more of almost everything—more attendees (an estimated 90,000), more reporters, more buildings, more exhibits, more aisles, more video, more audio, more computer-related products. But for the first time, there were not more home computers.

No doubt about it—the personal computer industry speeds through life in the fast lane. Evolutionary changes which would take years or even decades to develop in other industries transform the personal computer industry in months. The sides of the computer turnpike are littered with stalled and broken-down companies which ran out of gas or couldn't afford the tolls. And in the face of fierce competitive realities, the laid-back camaraderie which once symbolized the jeans-clad hobby industry is rapidly becoming excess baggage, something to be flung out the window to reduce weight.

All of this was visible at the most recent Consumer Electronics Show.

CES is a great place for industry-watchers. For one thing, it's the biggest trade show

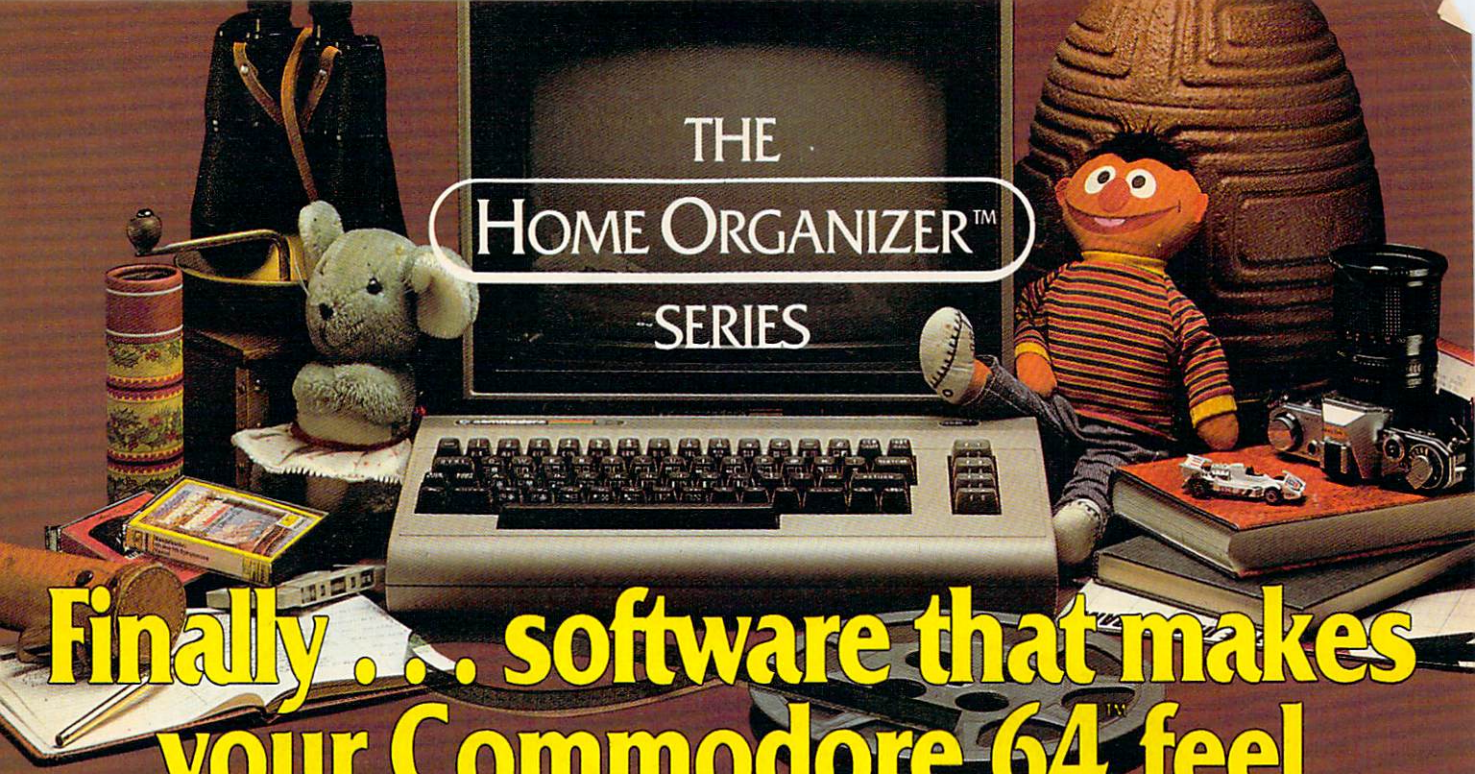
BULLETIN:

Commodore's New Computers In Doubt

After this CES report was written, Commodore's top management underwent a radical shake-up which casts doubt on the new products announced at CES.

In a surprise move, Commodore founder Jack Tramiel resigned as president and chief executive officer. Two weeks later, four more top executives resigned. Commodore is now reorganizing its entire management structure.

As a result, the new Commodore 264 computer is being delayed indefinitely. General Manager Sol Davidson told *The Wall Street Journal* that Commodore is reexamining the computer and will introduce it "when there's a need for it...[the 264] could come before the end of 1984, we'll just have to watch carefully." Davidson also was quoted as saying, "I think our zeal [in announcing the computer] was greater than our determination in [bringing it to] the marketplace."



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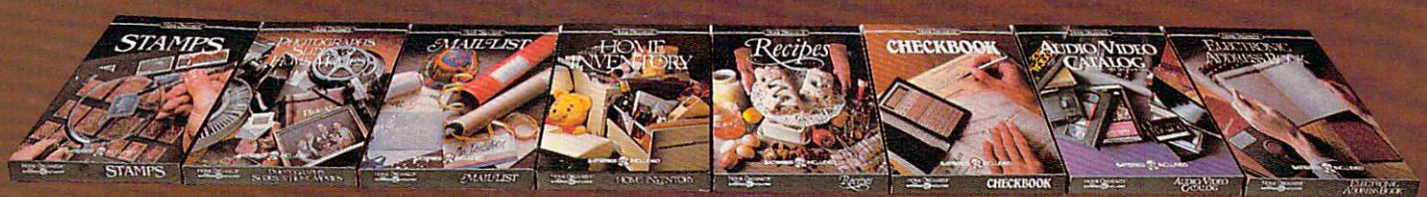

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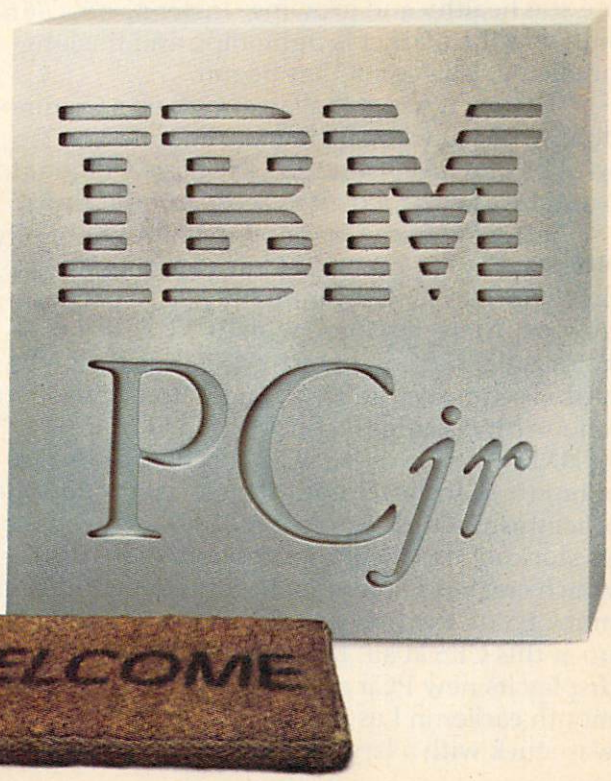

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in the world, a fantastic extravaganza for anyone who is into gadgets. It's the show where consumer electronics manufacturers gather en masse twice a year (Las Vegas in January and Chicago in June) to exhibit their newest wares.

Despite the show's name, consumers are barred. The 80,000–90,000 attendees are all exhibitors, dealers, celebrities, or journalists. Exhibitors come to entice dealers. Celebrities come at the expense of exhibitors to help lure the dealers and journalists. And journalists come to interview exhibitors and skip from press party to press party hosted by celebrities.

Besides all that, for industry observers and journalists CES is also a crystal ball. Sometimes a cloudy crystal ball, but nonetheless invaluable for divining the near future. It's like peering into the windows of the cars flashing by on the computer turnpike. This year's Winter CES was an indication that the heavy traffic building up for the last couple of shows is turning into a demolition derby.

Computer Wars Among The Wares

Most noticeable was the glaring lack of new home computers introduced. This was a significant change from the Summer CES, where no less than 17 new computers were on display (see "The Fall Computer Collection At The Summer Consumer Electronics Show," COMPUTE!, August 1983). In fact, a few companies which introduced new machines at the Summer CES were empty-handed at the Winter CES, having decided to cut their losses early and abandon the market. Other companies were absent altogether. This doesn't mean that home computing is fizzling out. Sales are still healthy and growing. Instead, it's a sure sign that the market is tightening and the long-predicted "shakeout" has begun.

The big news at the latest CES was Commodore, which attracted the most attention by far with its new 264/364 series. The large Commodore exhibit was crowded all four days of the show.

But aside from Commodore, almost nobody else was displaying new home computers. A newly formed British company had a few prototypes. Atari was there with its XL series announced at the Summer CES—minus the now officially canceled 1400XL, and with vague speculations concerning the future of the top-line 1450XLD. Apple was at CES for the first time in about three years—minus its new computer, the Macintosh, which Apple preferred to introduce at its stockholders meeting later in January. IBM—which created a stir when it exhibited at the Summer CES for the first time in history—didn't show up at this CES at all. Instead, IBM preferred to display its new PCjr at the Comdex trade show a month earlier in Las Vegas. Texas Instruments was stuck with a large exhibit at CES, reserved long before the TI-99/4A was dropped. Not a single TI-99/4A was in evidence, and the TI booth looked forlornly deserted since it just happened to be directly across the aisle from the busy Commodore exhibit.

Another odd juxtaposition of booths in the Convention Center revealed just how fierce the competition is getting. Coleco's large exhibit, humming with activity around dozens of Adams and ColecoVisions, happened to face the SpectraVideo exhibit right across the aisle. SpectraVideo has been at the last couple of CES shows with its heavily advertised but unavailable SV-318 and SV-328 computers. At this CES, SpectraVideo said the SV-318 has been dropped in favor of an upgraded SV-328 Mark II and a new model, the SVI-728 MSX. To promote its new computers—and, one suspects, to wage psychological warfare against the Coleco representatives across the aisle—SpectraVideo continuously staged a little presentation during the show.

The woman conducting the presentation compared the SpectraVideo computers against the Commodore 64 and especially the Coleco Adam. At one point, she prepared to demonstrate how much louder the Adam's (letter-quality) printer is than the SpectraVideo's (dot-matrix) printer. "But first," she smiled, "union rules require that I wear these." Then she donned a pair of industrial-duty ear protectors.

Later in the presentation, when asserting that the SpectraVideo is a better buy than the Adam, she asked rhetorically, "Just how much of a Coleco Adam could you buy for the price of a SpectraVideo? Let's find out." Then she switched on a screaming circular saw and disappeared for a few seconds behind a counter. She emerged holding an Adam presawed in half, spilling out chips and wires. Finally she dropped the mangled computer into a large trash can while the sound of a flushing toilet echoed through a PA system aimed at the Coleco booth.

Meanwhile, the Coleco people tried their best to ignore the psychological attack. "The first day of the show, they were using an actual toilet instead of a trash can," said Coleco press representative Barbara Wruck, "but the show management made them take it down."

Somehow this typifies what a dog-eat-dog battle for survival the home computer market has become.

Commodore's Built-In Software

Yet this CES clearly belonged to Commodore. The company announced a new series of personal computers accompanied by a line of peripherals, plus more software for all its machines.

To set the record straight, Commodore flatly denied rumors that it plans to drop the VIC-20

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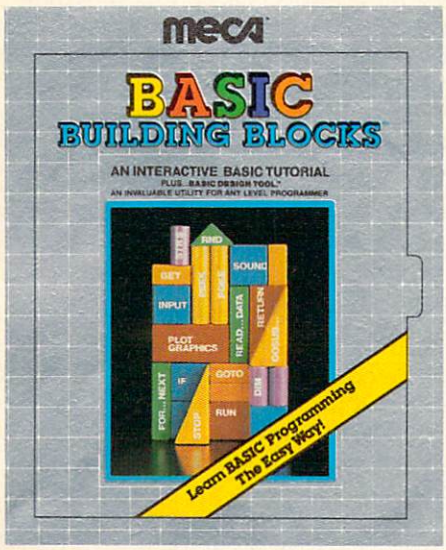
"BASIC BUILDING BLOCKS™ lets us interact with our computer and learn at our own pace. Dad says it's so easy to use, it even eliminates the need for him to read the manual. You should see all the programs Mom has written by herself. I like it because it really gets into the fun of the computer...fast. BASIC BUILDING BLOCKS is like having personal computer experts in our house."



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and Commodore 64 to make room for the new products. Commodore officials said it would be crazy to discontinue the 64 at a time when sales are booming, and that the VIC—whose sales are slackening—will be carried as long as demand warrants. Although some trade papers have been predicting the quick demise of the VIC, its life may have been prolonged by recent changes in the low-end market. Now that Atari has dropped the 400 and Texas Instruments has left the market

The Commodore 264. Note the unusual arrow-shaped cursor keys. The Commodore 364V is similar, but has a numeric keypad to the right of the keyboard.

altogether, the VIC is the only widely available home computer for under $100 (except for the small Timex/Sinclair TS-1000 and Radio Shack Micro Color Computer).

Two new computers head up Commodore's latest product line: the Commodore 264 and the Commodore 364V. No prices were announced, but Commodore says the 264 will retail for under $500 and the 364V for slightly more. Commodore says the 264 will be available by April 1 and the 364V a few months later, but based on past experience, these target dates may well be optimistic. We were told privately that most likely the 264 will hit the stores in quantity this summer (see box).

The new computers' main features over current machines include built-in application software, more usable memory, and a more powerful BASIC. The 264 and 364V are almost identical except the 364V has a numeric keypad and built-in speech synthesizer. New peripherals include a faster, parallel disk drive, a redesigned serial disk drive, a redesigned color monitor, a plug-in speech module, a daisy wheel printer, an inexpensive dot-matrix printer, and a color dot-matrix printer. Most of these peripherals will work with the Commodore 64 and VIC-20 as well.

The most significant new feature is probably the built-in software. Commodore says it will work like this: When you buy a 264 or 364V, you get to choose from a selection of application software on ROM chips. If you want a computer with a built-in word processor, for example, the dealer either sells you one with that option already installed or plugs in the proper chip himself. The chips are internal and not designed to be installed by average users. It's like ordering a car with various options.

When you first switch on a 264 or 364V, a message at the top of the screen tells what type of software is installed. You can run this program at the touch of a key. In effect, it's a permanently plugged-in ROM cartridge. There's still a cartridge slot behind the computer if you want to plug in something else. And, of course, you can always load in programs from disk or tape as usual. The built-in software does not interfere with anything or deprive other applications of memory.

The selection of ROM software will be limited to whatever Commodore offers. At CES, various prototype 264s were running *SuperScript 264*, a word processor; *EasyCalc 264*, an electronic spreadsheet; *Commodore 3-Plus-1*, an integrated package which includes a word processor, file manager, spreadsheet, and business graphics; Logo; PILOT; and *Magic Desk II*, an integrated package with Lisa-like icons, a text editor, spreadsheet, file manager, and calculator. One 264 was even running an educational game. All of these programs will be available on cartridge as well as installed ROM chips.

A Step Sideways?

Although Commodore's new computers were generally well-received at CES, there were some questions raised about software compatibility and how the 264/364V will fit into Commodore's existing product line. Compared to the Commodore 64, they offer intriguing new features, but they're also missing a few. If, as expected, the 264 and 364V retail in the $400–$600 range, more than one observer noted that it may be advantageous to buy a 64 and upgrade it instead. But as usual, there will be tradeoffs involved both ways.

The Commodore 264 has 64K RAM (Random Access Memory); 32K ROM (Read Only Memory); a 40-column by 25-line screen display in text mode; a high-resolution graphics mode of 320 by 200 screen dots; 128 colors; a 67-key full-stroke keyboard; four programmed (and reprogrammable)

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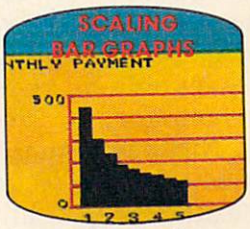

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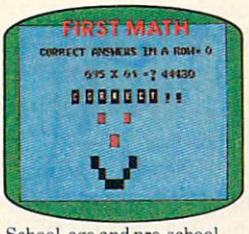
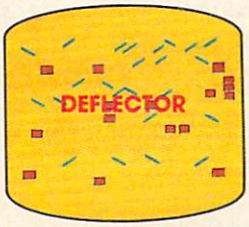


School-age and pre-school children are rewarded for right answers, corrected on their wrong ones.



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function keys; all the standard PET graphics characters; a 7501 microprocessor chip for the central processing unit (CPU); two tone generators with eight volume levels; and your choice of a built-in application program, such as a word processor or electronic spreadsheet. The 364V has all the above plus the numeric keypad and voice synthesizer.

Notice the similarities to and differences from the Commodore 64. Both have 64K RAM, 40x25 text modes, 320x200 graphics modes, PET graphics characters, and four function keys. But while the 64 leaves only about 39K out of 64K free for BASIC programming, the 264/364V leaves a whopping 60K. This was accomplished by a more advanced system of bank-selection (sharing memory in the same address space).

The Commodore 64 is limited to 16 colors, while the 264/364V have 128 colors. This is because each of the 264/364V's 16 standard colors has eight luminances (shades). This is very much like the color graphics on Atari computers. Early Ataris also had 128 colors (16 colors x 8 luminances), and current Ataris have 256 colors (16 colors x 16 luminances).

The Commodore 64 and 264/364V each have four function keys, but the 264/364V's keys are more advanced. For one thing, they are preprogrammed. Frequently used commands such as LIST, RUN, LOAD, and SAVE are only a keystroke away. For another thing, the keys are easier to reprogram by average users. One line of BASIC does the trick.

Another welcome addition to the 264/364V keyboard is the four separate cursor keys. These arrow-shaped keys are conveniently arranged in a diamond pattern at the lower-right corner of the keyboard (see photo). There are also two CONTROL keys. The extra one is where the RESTORE key used to be on the VIC and 64. However, this means the RUN/STOP–RESTORE combination to reset the computer no longer is available. There's a reset button on the right side of the 264/364V, next to the power switch, but it's a cold start reset—pressing it wipes out your BASIC program (not true of RUN/STOP–RESTORE).

You'll also notice that the 264/364V have a few other things missing, too, compared to the Commodore 64. There are no sprite graphics and no synthesizer chip. Two of the 64's strongest features are its multicolored sprites—which make computer animation a lot easier—and its SID chip (Sound Interface Device), the most advanced sound chip in any home computer. Instead of a SID, the 264/364V have a two-channel sound generator. This is similar to the VIC's sound generator, but with two channels instead of three.

More Powerful BASIC

Perhaps to make up for these drawbacks, the 264/364V have the most powerful version of BASIC ever built into a Commodore computer. Oddly, it's named BASIC 3.5. This would seem to imply that in terms of power it is halfway between the BASIC 2.0 (Upgrade BASIC) found in the VIC and 64 and the BASIC 4.0 found in the Commodore 8032 and SuperPET machines. Yet BASIC 3.5 includes the disk commands of 4.0 and adds dozens of other instructions.

We weren't able to get a list of all the new 3.5 commands by press time, but we did manage to ferret out most of them by exploring the ROMs with the 264/364V's built-in machine language monitor. Disk commands include DLOAD and DSAVE, DIRECTORY, HEADER, SCRATCH, COLLECT, COPY, RENAME, BACKUP, and DELETE. Sound and graphics commands include SOUND, VOL, RLUM, RDOT, GRAPHIC, PAINT, BOX, CIRCLE, GSHAPE, SSHAPE, DRAW, COLOR, SCNCLR, and SCALE. There's also a JOY command for the joysticks. Programmers will appreciate commands such as DEC and HEX$ (for converting decimal and hexadecimal numbers), MONITOR (to enter the built-in machine language monitor), ERR$ (read error message), TRAP (to divert the program to a specified line number on an error), TRON and TROFF (trace on/trace off for debugging), AUTO (auto line-numbering), LOCATE, HELP, DOLOOP, EXIT, WHILE-UNTIL, PRINT USING, and KEY (for reprogramming the function keys).

Most of the graphics commands are self-explanatory. GRAPHIC instantly switches the screen into the specified graphics mode. SCNCLR clears the graphics screen. We aren't sure about GSHAPE, SSHAPE, and SCALE, but one Commodore representative mentioned something about shape tables for animation, so these commands may be a replacement of sorts for the missing sprites.

For Productivity-Minded Users

As you can see, the new computers do offer interesting features beyond those found in the Commodore 64. Commodore says the 264/364V will not be aimed at the same market as the 64, so the higher prices, missing sprites, and simple sound will not be a handicap. Commodore envisions the 264/364V as computers for "productivity-minded" users who prefer the convenience of built-in application software. They see the 64 as a general-purpose home computer for entertainment as well as more practical applications. Yet the 264/364V's luxurious graphics commands suggest there may be some overlap in this area.

Critics of the new computers point out that you could put together the virtual equivalent of a 264 by starting with a Commodore 64 and adding the extra features. You could buy a 64 for under

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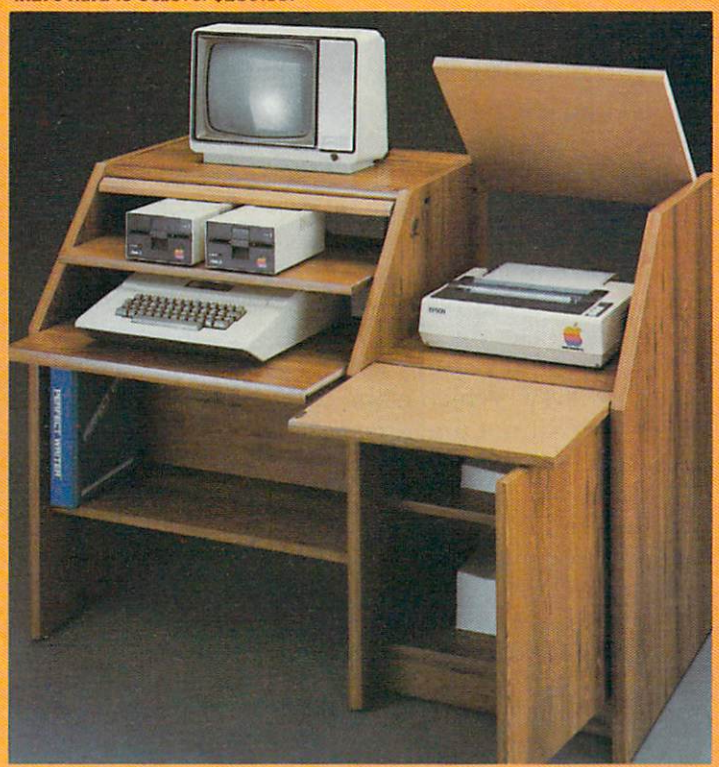

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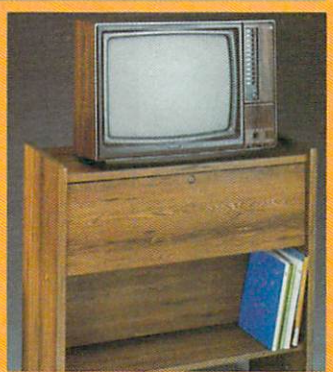

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Twist tabs on the back of the center panel allow for neat concealed grouping of wires while a convenient storage shelf for books or other items lies below.

The printer sits behind a fold down door that provides a work surface for papers or books while using the keyboard. The lift up top allows easy access to the top and rear of the printer. A slot in the printer shelf allows for center as well as rear feed printers.

Behind the lower door are a top shelf for paper, feeding the printer, and a bottom shelf to receive printer copy as well as additional storage.

Stand fits same computers as the CS-1632 as well as the Apple I and II, IBM-PC, Franklin and many others.

The cabinet dimensions overall: 39-1/2" high x 49" wide x 27" deep.

Keyboard shelf 20" deep x 26" wide. Disk drive shelf 15-34" deep x 26" wide. Top shelf for monitor 17" deep x 27" wide. Printer shelf 22" deep x 19" wide.

HYTEC SYSTEMS

$200, add a Simon's BASIC cartridge to get a similar array of advanced commands, and get one or more application programs on cartridge for $100 or so. That way you'd have the sprites and SID chip, and if the 264 sells for $400 to $500, the 64 system might even be cheaper. Add a voice synthesizer, and the 64 system would resemble a 364V.

You still wouldn't have as much usable memory, however—remember the new computers leave 60K free for BASIC. Your programs wouldn't be as transportable to other machines, because not every one would have Simon's BASIC. The application software on cartridge would be marginally less convenient than the new computer's built-in software. But otherwise, the beefed-up 64 system would be quite similar to the 264/364V. Which is the better buy? We cannot presume to know what's best for every user. As always, it depends on individual tradeoffs—like whether to buy a Commodore or an Atari versus a Coleco or a Radio Shack. The question will be resolved in the marketplace.

60K free RAM in an eight-bit computer which also includes 32K ROM (normally eight-bit computers are limited to 64K total memory).

Commodore says its most popular software for the 64 will be converted to the 264/364V as soon as possible. Intermediate home programmers probably could convert many BASIC programs. Programs with extensive machine language probably will require the talents of advanced programmers.

The sleek Elan Enterprise from Britain. Notice the built-in joystick. Two more sticks can also be plugged in.

Software Compatibility

There was some confusion at CES over how much Commodore 64 software will be compatible with the new 264/364V. Generally speaking, not much.

About the only programs that will work without modification are those written in straight BASIC without PEEKs or POKEs. BASIC 3.5 appears to be upward-compatible from BASIC 2.0, which means that BASIC programs written on a VIC or 64 might work on a 264/364V, but not necessarily vice versa. PEEKs and POKEs are important because they directly access memory, and the 264/364V's internal memory maps are not the same as those in the older computers. For instance, the cassette buffer in the new computers starts at address 819 instead of 828—a small difference, but one which could affect some programs using the buffer for storing machine language subroutines.

Because of the memory differences, nearly all machine language programs will have to be modified or rewritten (which includes the vast majority of commercial software). Fortunately, at least the machine language itself is compatible. Don't let the 7501 CPU chip in the 264/364V throw you; it's still fundamentally identical to the 6502/6510 chips in the VIC and 64. The instruction set is the same. The differences are in the hardware. The 7501 has extra lines to control a more advanced bank-selection system. This makes it possible to have

Superfast New Commodore Disk

Commodore also announced a complete line of charcoal gray peripherals designed to match the 264/364V. No prices or availability dates were released by press time. Most of these peripherals are also compatible with the VIC and 64.

One which isn't directly compatible is the SFS 481 parallel disk drive. This hooks up to the new computers via a rear parallel port and is markedly faster than the current 1541 serial disk drive. (Parallel peripherals are faster than serial devices because they exchange data with the computer in bundles of eight bits, rather than one bit at a time.) The SFS 481 stores up to 170K of data on one side of a 5¼-inch floppy disk, a format compatible with the older 1541, 4040, and 2031 drives, as well as the new 1542 disk drive. Although there is no way to plug the SFS 481 into a VIC or 64, it's possible that an independent company could design an adapter.

The new 1542 drive is a slightly redesigned 1541. Colored charcoal gray to match the 264/364V, it works with the VIC and 64, too. Disks are compatible with the 1541, SFS 481, 4040, and 2031.

The DPS 1101 daisy wheel printer works at 18 characters per second, uses friction feed, is bidirectional, and has spacing modes of 10, 12, and 15 characters per inch, plus proportional. Although no price was released, it is expected to be relatively inexpensive for a daisy wheel printer

At last, a letter-quality printer for tightwads.

And we don't mean a bargain-basement special, either.

Not by a long shot. The Abati LQ-20 is a top-quality printer, all the way. Offering quiet, bidirectional operation, an 18 characters per second printing speed, single sheet or optional continuous form tractor feed, and a full one-year warranty. All at a price even Ebenezer Scrooge would love.

And you'll love it, too.

Especially when you consider that the Abati LQ-20 is compatible with IBM, Apple, or any other microcomputer you might own.

Plus, it's incredibly easy to configure for word processors and spreadsheets, as well as most other software. And it's available in either serial or parallel formats.

At $479,* it's easy to see why anyone looking for a great buy in letter-quality printers is looking at the Abati LQ-20. So should you. After all, you don't have to be a tightwad to buy the Abati LQ-20. Just act like one. Call 1-800-447-4700.

Abati

*Parallel model.

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(probably well under $1000).

The MPS 802 dot-matrix printer uses an 8x8 matrix, has all the PET graphics characters, dot-addressable graphics, prints at 60 characters per second, and prints up to 80 columns. It is bidirectional and has tractor feed only.

The MCS 801 color dot-matrix printer can produce dot-addressable graphics in black, yellow, purple, cyan, green, red, and blue. It can reproduce all the PET graphics characters. It is unidirectional only, prints at 38 characters per second, and has both friction and tractor feed.

Commodore has redesigned its popular 1701/1702 color monitor, now called the 1703. Specifications are virtually identical: 13-inch screen; built-in speaker; audio/video inputs on the front; separate chrominance, luminance, and audio inputs on the rear; and compatibility with video cassette recorders.

Peripherals That Talk And Feel

One of the more interesting Commodore peripherals at CES was the C64850 Magic Voice Speech Module for the Commodore 64. It has a built-in vocabulary of 235 words, and more can be loaded from optional cartridges or disks. The voice is pleasant and female, a relief from the usual robotized computer voices. You can vary the voice's speed from .65 to 1.4 times normal. It is programmable in BASIC or machine language so you can write your own talking programs. The module plugs into the cartridge slot, and has an additional slot so you can piggyback a program cartridge at the same time. There's also an audio output jack so you can hook it up to a TV or sound system.

Since the voice module doesn't monopolize the 64's SID chip, you can program voice and music simultaneously. Talking can even be synchronized with graphics. A special line of software designed to work with the module is on its way, including talking versions of *Gorf*, *Wizard of Wor*, *A Bee C's*, and *Counting Bee*. The module will sell for only $59.95.

Another fascinating peripheral is still on the drawing boards, but an experimental prototype was demonstrated at CES. It's a clear plastic touch-sensitive mat that overlays your TV or monitor screen. When perfected, this would bring touch-screen technology to existing home computers. The mat is wired so you can simply touch your finger to the screen to pick an option, select an answer, or whatever the program calls for. One problem to be overcome is designing different-sized mats to work with TV screens of varying sizes. It will probably be at least a year before the touch-screen is ready for sale.

One long-awaited peripheral we won't see for a while is the add-on synthesizer keyboard for the Commodore 64. First shown a year ago at the last Winter CES, it was supposed to include three additional SID chips and sophisticated music software, all for under $100. Unfortunately, a Commodore spokesperson said this project is on a back burner. We heard that Commodore is thinking about reworking it as a stand-alone synthesizer, possibly in addition to the Commodore 64 add-on version.

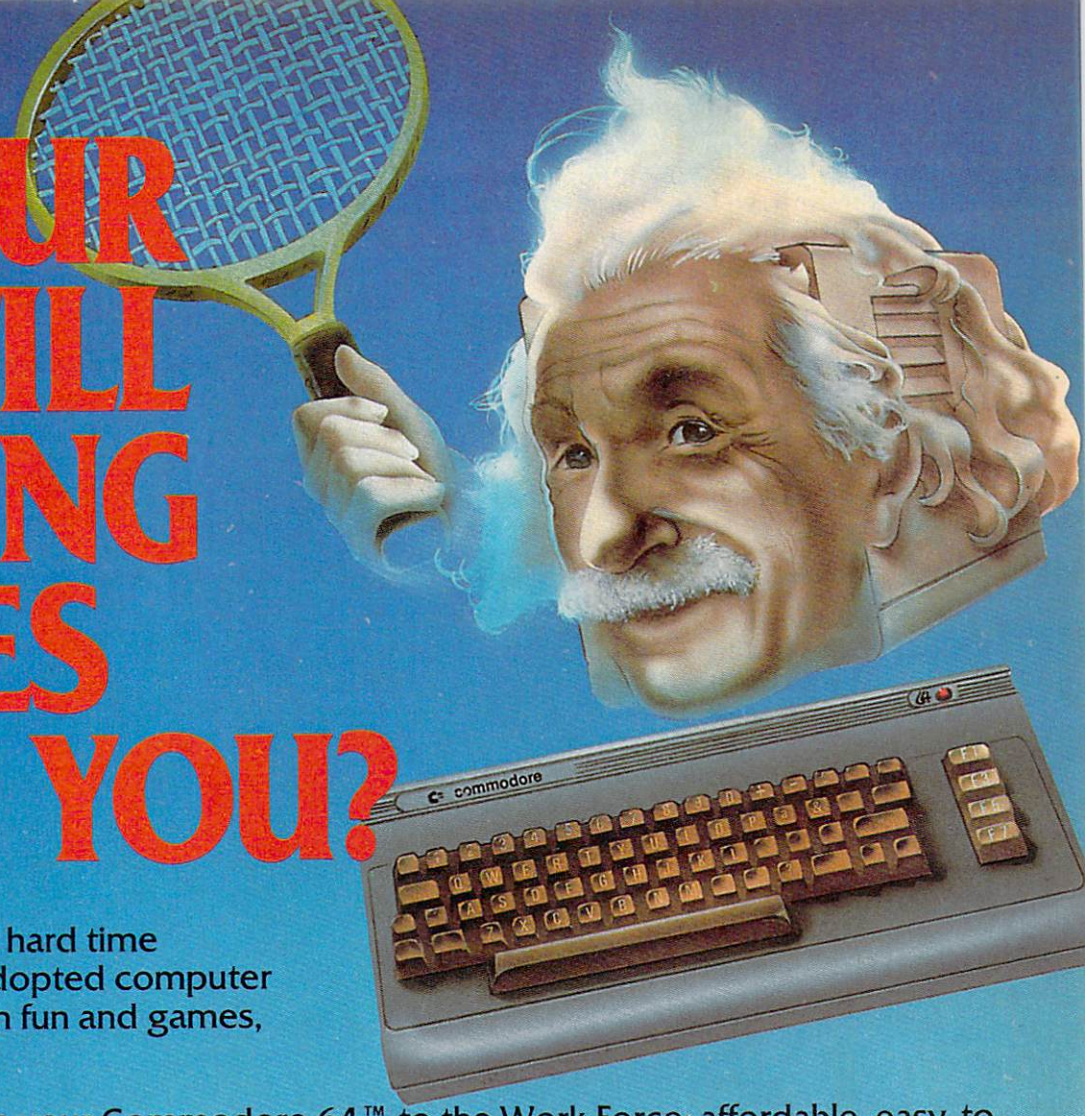
Another new product announced at the Winter CES a year ago is just now becoming available: the transportable version of the Commodore 64. It showed up at this CES renamed again as the SX64 (previously known as the SX-100 and Executive 64). Specifications are the same—basically it's a Commodore 64 built into a carrying case. It has a built-in 5-inch color monitor and 1541-type disk drive. The detachable keyboard (which forms the top of the carrying case) has all the same keys as the 64. The SX64 works with all Commodore 64 software and peripherals. Retail price is $995.

More Commodore Software

Here's a summary of the new Commodore software at CES. Most was developed for Commodore by outside software companies and will be sold under Commodore's name:

- *Commodore Logo.* Designed for the Commodore 64 and 264 by Terrapin, this Logo has all the features of Terrapin's Apple Logo plus more commands, seven programmable sprites, music, and 30 percent more usable memory. It's available on disk for $80.
- *Micro Illustrator.* Designed by Island Graphics for the 64 and 264, this drawing program works with a joystick or light pen and has a magnification mode for fine details. Commodore says the 64 version will be available by the time you're reading this. The 264 version will use all 128 colors and be available when the computer reaches the market. No price yet.
- *Micro Cookbook.* Developed by Virtual Combinatics for the Commodore 64, this program helps plan meals (including leftovers), comes up with recipes using odds and ends in an understocked kitchen, suggests how to combine supermarket specials into recipes, and supplies calorie and nutritional information. Available immediately for about $40.
- *International Soccer.* We played this on a 64 at CES and it's great. Three-dimensional graphics, realistic animation, and options for one or two players. The winning team even gets a trophy to the cheers of a crowd. Available immediately for $34.95.
- *Viduzzles, Jack Attack,* and *Solar Fox.* There will be versions of these games for the 64 and 264. *Viduzzles* is a video jigsaw puzzle—great for kids—

IS YOUR 64™ STILL PLAYING GAMES WITH YOU?



If you've been having a hard time teaching your newly-adopted computer there's more to life than fun and games, you're not alone.

Now, you can introduce your Commodore 64™ to the Work Force: affordable, easy-to-use software and hardware that will unleash the power you always expected from your Commodore 64™, but thought you might never see.

PaperClip™

is simply the best word processing program of its kind—loaded with advanced features, yet so easy to use even a novice can get professional results. With **SpellPack™,** it even corrects your spelling! Once you've tried it, you'll never use a typewriter again.

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is like a computerized filing cabinet with a brain. Organize files for recipes, albums, or the membership of your service club. Then search, sort, arrange and analyze your information with speed and flexibility that's simply astounding.

SpellPack™

teaches your 64 to spell. It checks an entire document in 2 to 4 minutes against a dictionary of over 20,000 words. And you can add up to 5,000 of your own specialized terms. Type letter perfect every time!

BusCard II™

is a magic box that lets you transform your humble home computer into a powerful business machine. It gives you the added power of BASIC 4.0, and lets you add IEEE disk drives, hard disk, virtually any parallel printer, and other peripherals without extra interfaces. Completely software invisible.

B.I.-80™ *Column Adaptor*

gives you crystal clear 80 column display. Using the highest quality hardware, we've eliminated the problems of snow, fuzziness and interference. Basic 4.0 commands greatly simplify disk drive access. Switches easily from 40 to 80 column display.

Discover the true power of your Commodore 64™. Ask your dealer about the Commodore 64™ Work Force, from Batteries Included—the company that doesn't leave anything out when it comes to making things simple for you.

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64 AND COMMODORE 64 ARE REGISTERED TRADE MARKS OF COMMODORE BUSINESS MACHINES

and the other two are action games. Available in the spring; no prices yet.

- *Vidtex.* This terminal program, developed by the CompuServe Information Service, lets you download files into a 32K buffer with the Commodore 64. There's also a printer option, ten programmable function keys, and color graphics support. No price yet.
- Ten educational programs on disk and cartridge for the VIC and 64, including the *Milliken Edufun!* series developed under National Science Foundation grants, and the *Kinder Koncepts* series.

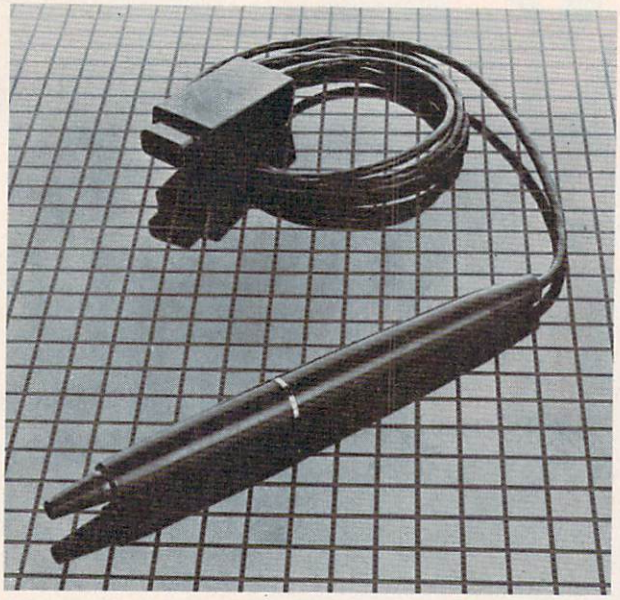
Atari's Revised Line-Up

Instead of introducing loads of new products, at this CES Atari seemed to be retrenching from recent losses and concentrating on getting previously announced products to market.

The new XL line of home computers, introduced at last summer's CES, has been revised slightly. Originally composed of the 600XL, 800XL, 1400XL, and 1450XLD, the line now consists of only the 600XL and 800XL. The 1400XL has been quietly dropped, and the 1450XLD sounds iffy. The 1400XL, remember, was the successor to the ill-fated 1200XL and included 64K RAM; four special function keys in addition to START, SELECT, and OPTION; a HELP key; and a built-in modem and speech synthesizer. Atari officials had little to say about why the 1400XL was dropped before it reached the marketplace, but the company's recent financial and production troubles probably had something to do with it. Atari seems to be scaling down its ambitions somewhat in an effort to recover its fiscal health.

The 1450XLD was displayed at CES, but Atari officials would not say when it would go into production or how much it would cost. Said one official, "The fact that we're displaying the computer here indicates our intentions to eventually produce such a product. But we cannot give any details at this time."

Atari fans eagerly await the 1450XLD because it's the flagship of the XL series and luxuriously equipped. Besides all the features of the 1400XL—including the on board modem and speech synthesizer—the 1450XLD also has a built-in, double-sided, double-density disk drive with direct memory access for high speed. Retail prices in the $1000 range have been kicked around. The deciding factor in whether the 1450XLD survives its gestation period may be whether Atari wants to enter the high-end home/low-end personal market. And that might depend on how the competition fares—such as the IBM PCjr and the Apple IIe.



The Atari light pen plugs into a joystick port.

Pascal And Super PILOT

Instead of new computers, Atari showed up at CES with some new accessories and software. Almost everything works with original-model Atari computers as well as the XL series.

The Atari 1064 Memory Module plugs into the rear expansion port of the 600XL to upgrade its memory from 16K to 64K RAM. No price was announced, but it should be in the $100 range.

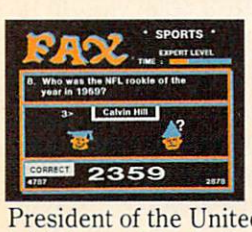
The Atari Translator is a two-sided disk with an operating system more like the old one instead of the XL operating system. This allows a greater percentage of software written for older Ataris to work on the XLs. It requires 64K RAM. It's available from Atari Customer Service and the Atari Program Exchange for $9.95. Atari also released DOS 3, which supports the new double-density 1050 disk drives, and announced that copies of DOS 3 will be free to those who'd already bought 1050 drives. It will be packed with all future 1050s.

A perfected version of the long-awaited Atari light pen was shown, along with its new *Atari-Graphics* software. At CES, an artist was using the pen to draw very nice impromptu portraits of showgoers. It requires only 16K and retails for $99.95, including software.

AtariLab, the first in a series of electronic science kits, is aimed at students aged 9 to 18 and adults. The AtariLab is a module that plugs into the computer, allowing you to add various sensors and probes. The idea is to turn the computer into a science station. Accompanying software demonstrates science theories and lets you run experiments. The AtariLab Starter Set with temperature sensor retails for $89.95. The add-on light module will cost $49.95.

AtariLab is the first product from Atari Learning Systems, a newly formed group within Atari which will concentrate on educational software.

FAX.™
WHO DISCOVERED AMERICA?*



Chances are, you got the answer right. But not all the questions in this computer version of the popular Exidy Arcade Quiz-game are so easy. Can you name the only bachelor to become the President of the United States? Or identify what the initials stand for in O. J. Simpson's name? (If you guessed "Orange Juice," you *won't* score any points.)

Remember, FAX isn't just a thinking game—it's a fast thinking game. FAX pits your knowledge and reflexes against the clock…or an opponent. The faster you respond, the more points you score.

So get the FAX. You'll find over 3700 questions and answers on Football, Baseball, Television, Movies, Music, History, Science, Art, Literature and other subjects. FAX is multiple choice, multiple fun. If only school could be like this.

One or two players, keyboard controlled.

EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

**Christopher Columbus*

Other new products from the group include Atari Pascal 2.0, a programming language available on disk for $69.95; Atari Super PILOT, another language with extended sound and graphics commands, $39.95; *Player Maker*, a utility for creating player-missile graphics, $39.95; and *Screen Maker*, a utility for mixing text, graphics, and combining up to 15 different graphics modes on the screen simultaneously, $39.95. All require 48K RAM.

More Atari Software

Here are highlights of the new Atari software introduced at CES. Most is compatible with both the XL and older computers:

- *AtariMusic I* and *AtariMusic II*, music instruction programs which combine tutorials, simulations, drills, and tests with a videogame. Both were developed by a university computer music professor. *AtariMusic I* covers note-reading and whole and half steps; *AtariMusic II* covers major scales and keys. Each is available on disk for $39.95 and requires 24K.
- *Captain Hook's Revenge*, a two-part game that is the result of a joint venture between Atari and Walt Disney Productions. The game is designed to teach map, math, and strategy skills. Available on disk for $44.95; 32K required.
- *SynFile*, *SynCalc*, and *SynTrend*, three integrated programs for home management. Not only are they compatible with each other, but the last two also work with *AtariWriter*. For example, spreadsheets created with *SynCalc* and mailing lists compiled on *SynFile* can be combined with documents on *AtariWriter*. *SynTrend* is a two-part graphics and statistics package. All were developed for Atari by Synapse Corp. They are available on disk for $99.95 each and require 48K.
- New videogames include *The Legacy*, placed in a world decimated by nuclear war; *Mario Bros.*, a sequel to *Donkey Kong; Donkey Kong Jr.*; and *Millipede* (all for $49.95 each).

AtariSoft, Atari's third-party software division, also announced seven new games for the Commodore 64, VIC-20, IBM PC, Apple II, and TI-99/4A. These are *Joust*, *Battlezone*, *Pole Position*, *Ms. Pac-Man*, *Moon Patrol*, *Galaxian*, and *Jungle Hunt*. (*Battlezone* and *Galaxian* are not available on the TI.) Each game costs $34.95 on disk or $44.95 on cartridge.

IBM Emulator For Adam?

Coleco, which stole the show at the Summer CES with its introduction of the Adam, announced several new peripherals for its all-in-one system—including hints that some sort of IBM PC emulator might be on the way.

Coleco officials were rather vague about this device. They said only that an accessory which would allow the Adam to run PC programs was in planning stages, and that it probably wouldn't be ready until later this year. They gave no indication of how it would work or how much it would cost.

Since the Adam and PC are completely different computers, right down to their CPUs, a PC emulator would be quite a trick. Basically it would require shrinking down a PC to an add-on board or box. This could easily end up costing more than the Adam itself. Observers greeted Coleco's announcement with skepticism.

More Than 170 Programs

The more conventional peripherals announced were a second Digital Data Drive for installation in the Adam's Memory Console (under $150); a 5¼-inch double-sided, double-density disk drive which stores up to 360K per disk (under $350); the AdamLink 1200 direct-connect modem, which has automatic 300/1200 baud switching and its own telecommunications software (under $175); the 64K Memory Expander, which upgrades the Adam from 80K to 144K RAM (under $150); the SmartWriter Printer Tractor Feed, which snaps onto the Adam's printer (under $100); and the Adam Accessory Kit, which includes three extra daisy wheels and a carbon ribbon cartridge for the printer, plus a blank data pack and tape head cleaner (under $35).

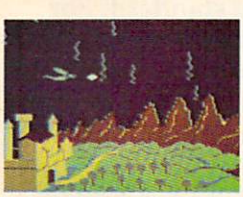
Coleco and CompuServe jointly announced a new information service for Adam users—Adam On-Line. It will contain new product developments, the latest news on the Adam, hints and tips on use and maintenance, a message center/bulletin board, a CB radio simulation for conversing with other users, a software exchange for uploading and downloading programs, a Consumer Feedback Forum, and an Adam Electronic Mail Hotline. Two hours of free use come with the purchase of the AdamLink 1200 modem.

Coleco and Honeywell Information Systems, Inc., jointly announced a new service arrangement for the Adam. Honeywell already has six service centers operating, and 35 are planned to be opened by this spring. Adam owners can locate the nearest one by calling Coleco's toll-free information number.

Coleco and Digital Research announced that Digital's Personal CP/M operating system will be available for the Adam for under $75. This is an easy-to-use version of the standard CP/M (Control Program for Microcomputers) operating system. It will be sold on data packs and disks. As CP/M programs are transferred to the Adam's disk format and data packs, a large pool of software will become available.

Coleco also announced more than 170 new programs for the Adam. Only a few were ready for CES. They fall into four categories: Family

DRAGONRIDERS OF PERN™. FLY THE UNFRIENDLY SKIES.



Shooting down the menacing and constantly multiplying Threads isn't easy, but it's only one of the challenges in this official computer game version of Anne McCaffrey's famous book series.

Your strategy will be put to the test as you try to negotiate alliances with Pern's Lord Holders in an attempt to form the most powerful Weyr on the planet. Should you take a firm stance or compromise? Will asking a Craftmaster for assistance increase your chances for success? Maybe you should invite prospective allies to a Wedding or even a Dragon Hatching. Remember to check the Lord Holders personality traits first. It may be critical to your success.

Numerous screens combine to create truly unique and challenging game play. There's even a practice screen to sharpen your Thread Fighting skills.

If you liked the books, you'll love the game. After all, how often do you get the chance to actually fly a dragon?

One to four players, joystick and keyboard controlled.

EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

Learning, Languages/Programming Aids, Home Information Management, and Entertainment. Examples are *Dr. Seuss' Word Factory, Smurf Paint 'N' Play Theatre, Presidential Campaign, Electronic Flashcards,* SmartLogo, SmartBASIC II, *Smart-Picture Processor, SmartWriting Checker, SmartFiler, SmartSheet, SuperCalc, Dragon's Lair, Star Trek, Donkey Kong, Mr. Do's Castle, Omega Race, Gorf, The Official Zaxxon, Rocky Super Action Boxing, The Dukes of Hazzard, Password, Jeopardy,* and *Cabbage Patch Kids.*

SpectraVideo Joins MSX Movement

Besides the absence of new home computers in general, something else missing from this CES was the expected Japanese invasion of MSX-standard machines. What is MSX? It's a hardware/software configuration developed by Microsoft which several Japanese companies have adopted for their forthcoming home computers. The idea is to introduce into the U.S. market a number of Japanese computers using MSX as their standard. The companies hope MSX will become the standard for home computers in the same way that the MS-DOS (PC-DOS) operating system seems to be taking over the business-computer market. MSX backers believe a home computer standard will simplify choices for consumers and help create a pool of software compatible with several different machines. Among the Japanese companies reportedly supporting MSX are Fujitsu, Hitachi, Mitsubishi, Pioneer, Sony, and Yamaha.

Some people were expecting a Japanese invasion of MSX computers at this CES, but it looks like we'll have to wait until the Summer CES in Chicago. The only company exhibiting an MSX computer was SpectraVideo, which had prototypes of the SVI-728 MSX. Billed as "the first American MSX computer," the SVI-728 is designed around the eight-bit Z80A CPU and contains 80K RAM expandable to 144K, 32K ROM expandable to 96K, MSX BASIC in ROM, and CP/M capability. Other features include a full-stroke, 87-key keyboard with numeric keypad, ten programmable special function keys, and a topside cartridge slot. SpectraVideo announced no definite price or release date.

The company did confirm that its SV-318 home computer, widely advertised since it was announced at the last Winter CES, will no longer be sold in the U.S. Only a few of these computers actually reached the marketplace. A higher model, the also-unavailable SV-328, has been redesigned as the SVI-328 Mark II to replace both models. Again, no definite price or release date. The Mark II is similar to SpectraVideo's MSX computer but has Microsoft BASIC instead of MSX BASIC. The Mark II also has 32 sprites and a three-channel sound chip with an eight-octave range and programmable sound envelopes. Since the Mark II does not adhere to the MSX standard, it won't be compatible with the SVI-728.

SpectraVideo is offering the Mark II in two bundled packages with peripherals and software: the Family Pak and the Pro System.

The Family Pak ($599) includes the Mark II computer; the Single Slot Expander (a peripheral interface); a fast 1800-baud cassette recorder; an 80-column dot-matrix printer with graphics capability; a parallel printer interface; two SpectraVideo Quickshot joysticks; the *Spectra Word* cartridge (a word processor); the arcade game *Spectron*; and another program called *Spectra Diary.*

The Pro System (no price announced) includes the Mark II; a six-slot expansion box with two 5¼-inch disk drives, disk controller card, 80-column video card, and parallel printer interface; an 80-column dot-matrix printer; a 12-inch green-screen monitor; Microsoft Business BASIC on disk; CP/M 2.2 disk; and four programs from Perfect Software—*Perfect Writer, Perfect Speller, Perfect Filer,* and *Perfect Calc.*

A Sleek Computer From Britain

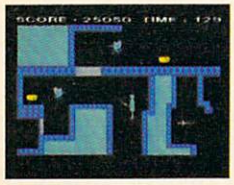
If nothing else, the new Elan Enterprise computer ought to win a prize for sleek design. Elan Computers Ltd., a new British company, showed prototypes of the Enterprise at CES. It is enclosed in a low-profile black case with black, red, green, and blue keys, plus a built-in joystick.

But most interesting are the specs. How about stereo sound? The four-channel, eight-octave sound chip is wired to a stereo output port that connects to your sound system or headphones. It also has low/high-pass filtering and ring modulation like the Commodore 64. Then there's a text mode which can display up to 84 columns by 56 lines on the screen at once—plus smooth scrolling.

Do you need lots of memory? The Enterprise comes with 64K or 128K of RAM, and Elan says a sophisticated bank-selection system allows expansion up to 4000K (four megabytes). The 64K model leaves 58K free for BASIC. There's a built-in word processor, and a level meter to help you adjust settings when loading cassettes. Both parallel and serial interfaces are standard. For educational applications, 32 Enterprises can be wired together to talk to each other and share peripherals.

Are you into graphics? The Enterprise has a hi-res mode of 672 by 512 screen dots, more than twice the resolution of an Atari or Commodore 64. Like the Atari, the Enterprise has 256 colors, but unlike the Atari, all 256 colors can be displayed at once. And the BASIC includes graphics commands like PLOT, CIRCLE, PAINT, DESK,

WELCOME TO APSHAI. YOU'RE JUST IN TIME FOR LUNCH.



Boy, have you taken a wrong turn. One moment you're gathering treasure and the next you're being eyed like a side of beef.

You're in the Gateway to Apshai.™ The new cartridge version of the Computer Game of the Year,* Temple of Apshai.™

Gateway has eight levels. And over 400 dark, nasty chambers to explore. And because it's joystick controlled, you'll have to move faster than ever.

But first you'll have to consider your strategy. Is it treasure you're after? Or glory? You'll live longer if you're greedy, but slaying monsters racks up a higher score.

The Apshai series is the standard by which all other adventure games are judged. And novices will not survive.

They'll be eaten.

One player; Temple of Apshai, disk/cassette; Gateway to Apshai, cartridge, joystick control.

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Elan says the Enterprise will debut in the U.K. this April, and will be available in the U.S. this fall. U.S. prices are expected to be about $290 for 64K, $435 for 128K. A dual microfloppy disk drive (Sony 3½-inch standard) should cost around $450.

Is it all too good to be true? So many computers we've seen at previous CES shows, especially those from start-up companies, never make it on the market. Maybe Elan—and its refreshingly different machine—will have better luck. ©

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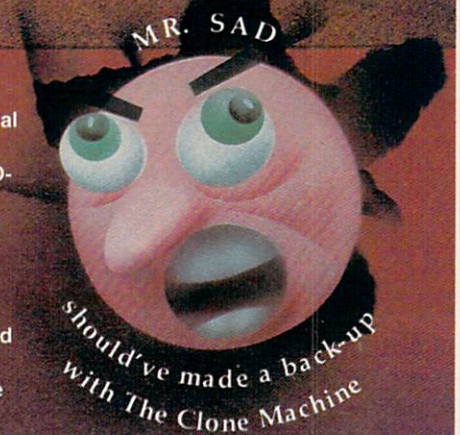

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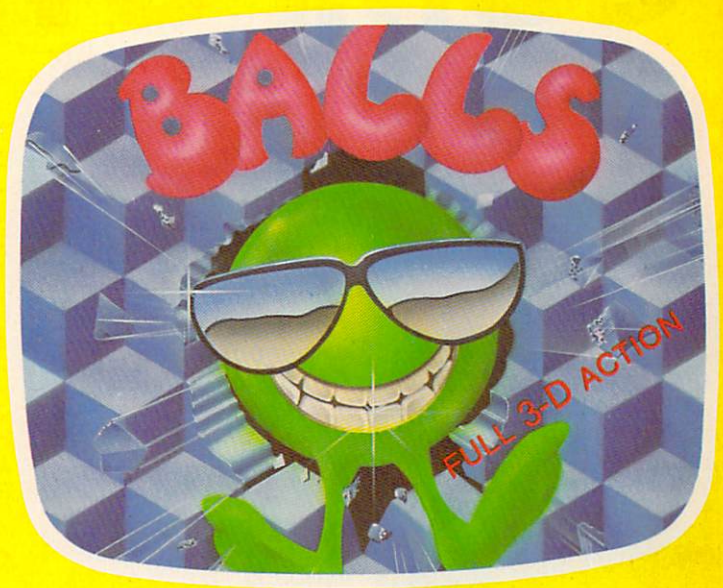

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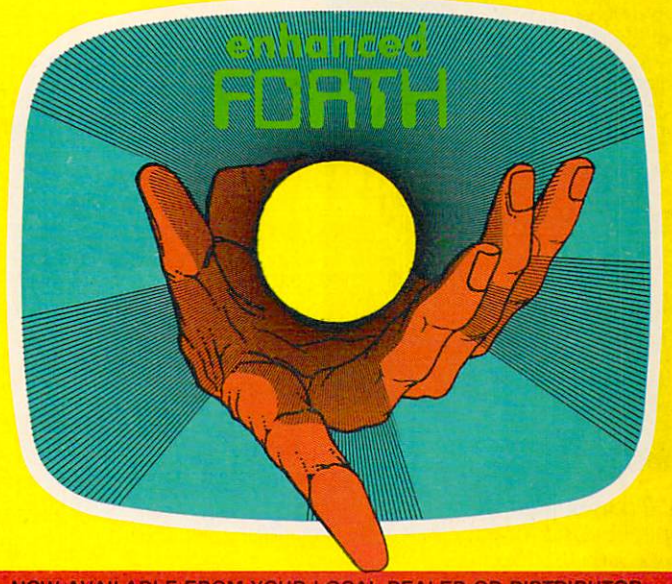

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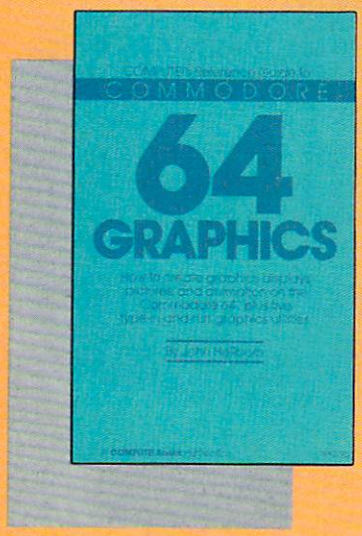

COMPUTE!'s Reference Guide To Commodore 64 Graphics

A complete tutorial on Commodore 64 graphics. Noted Commodore author John Heilborn explains how to program sprites, multicolored screens, animation, custom characters, and more. Beginners will like the step-by-step instructions and clear example programs. Advanced programmers can build up their tool kit with the character editors, sprite editors, screen design program, and other useful utilities.

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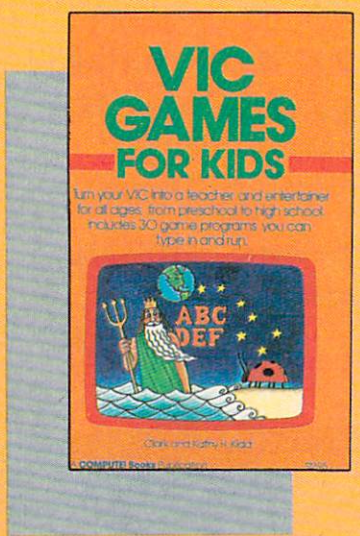

VIC Games For Kids

Contains 30 games written just for kids (although adults will enjoy them too). This book is an inexpensive source of educational software for children. The games are designed to teach math, geography, history, and other topics. Children learn while they're having fun. They will return to these games again and again.

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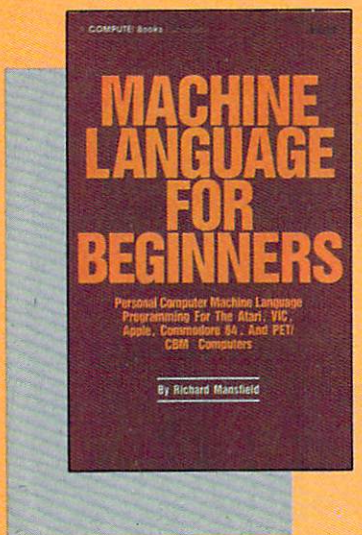

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Much commercial software is written in machine language because it's faster and more versatile than BASIC. *Machine Language For Beginners* is a step-by-step introduction to the subtleties of machine code. Includes an assembler, a disassembler, and utilities, to help beginners write programs more quickly and easily. Covers many popular home computers.

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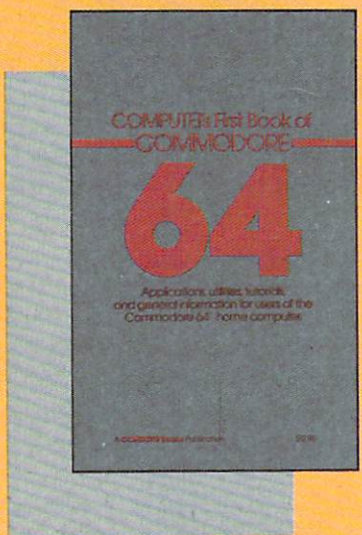

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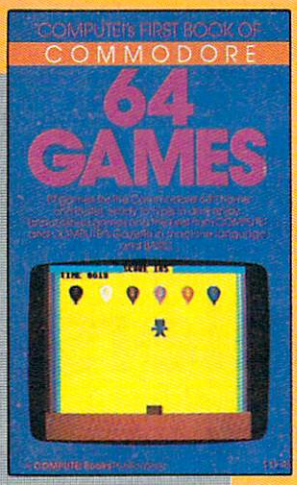

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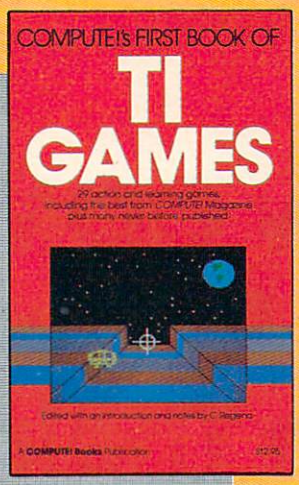

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Although this book is packed with ready-to-type-in games (29 in all), it is more than just a book of games. It is designed to teach game programming techniques. Introductory chapters explain the special features of the TI-99/4 and 99/4A, giving advice on coding techniques. Most games include an explanation of how the program works. Contains mazes, chase games, old favorites, thinking games, creative challenges, and more.

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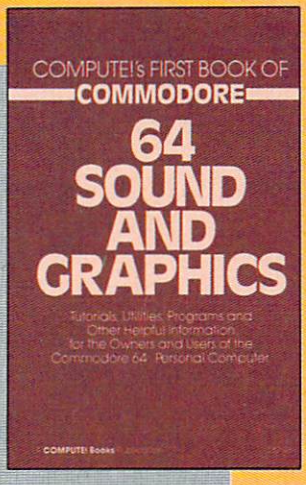

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How COMPUTE! Readers Use Personal Computers In Their Businesses

Bernie Ghiselin

Home computers have their place in business, too. In our latest reader survey, subscribers tell how they use their computers to save lives, increase personal productivity on the job, help with farm chores, and more.

Eight miles off the coast of Texas a fire breaks out on an oil rig. By 2:30 a.m. workers have lost control and begin piling into standby boats. Some are burned. Others have suffered fractures and need to be lifted to a hospital.

When the call comes into Rockport, near Corpus Christi, Jerry Evans goes through a well-practiced routine. He checks for a weather briefing. Checks a map of the gulf. Calls a doctor. Files a flight plan with the FCC. He's ready to scramble.

But just before he runs out the door, he punches a few keys on his Commodore 64. Between Grand Island, Louisiana, and Corpus Christi there might be 1000 oil or gas platforms. A sequential file in his disk drive gives him the exact distance and time to any pickup point.

Saving Precious Time

As he fires up the helicopter, he also switches the LORAN (Long Distance Radio Navigation), which gives him time and destination coordinates. But Evans doesn't have to wait for the LORAN. He's already steering the course. Long hours programming his own computer have paid off. He has shaved a few precious minutes off an emergency flight. And 75 percent of Evans' missions are medical emergencies.

"My normal reaction time is 20 minutes or less," he said. "If I already know the coordinates, then I can tell instantly if the LORAN is working."

Now, Professional Helicopters, Inc. doesn't require its pilots to be programmers and Evans doesn't have to bring his own computer to work. It gives him a professional edge. "Maybe I'm looking for a little bit shorter shortcut. I pride myself on being a professional and being prepared," he said from his home in San Antonio.

This is not to suggest the business uses of a home computer are always as dramatic as helicopter rescue flights at sea in the dark of night. But telephone interviews with several dozen people suggest that all kinds of COMPUTE! subscribers are finding very creative business uses for their home computers. There are salesmen and accountants, engineers and professors, sergeants, seamen, and comic book collectors, all of whom have other uses for a computer besides *Star Raiders* or teaching Johnny how to spell.

Meat Packing And Hairdressing

In Norman, Oklahoma, Richard Adkins, a student at Oklahoma State University Technical Institute, has written business software for a meat packing firm. His wife, Tina, works full time as a hairdresser and uses a data base management program on their VIC-20 to list clients, services, and various mixtures for permanents. "She's virtually the breadwinner right now," said Adkins.

In Garden City, New York, a publishing company executive bought a computer for his children, but also wrote a personnel program to keep track of his staff, their performance, salary history, and attendance. A systems analyst in Mesa, Arizona, bought a home computer just out of curiosity. But his wife also uses it to keep track of expenses in her sideline businesses—distributing cosmetics

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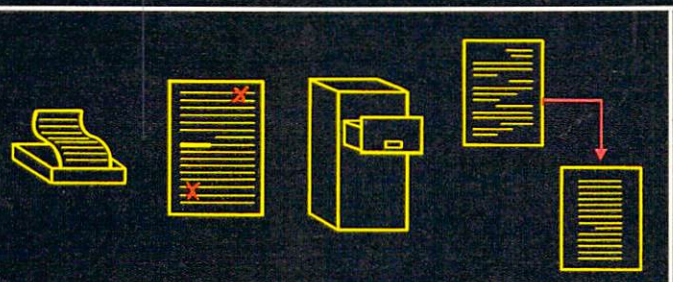

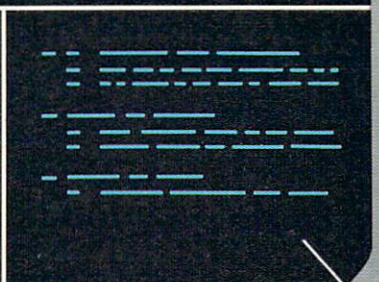

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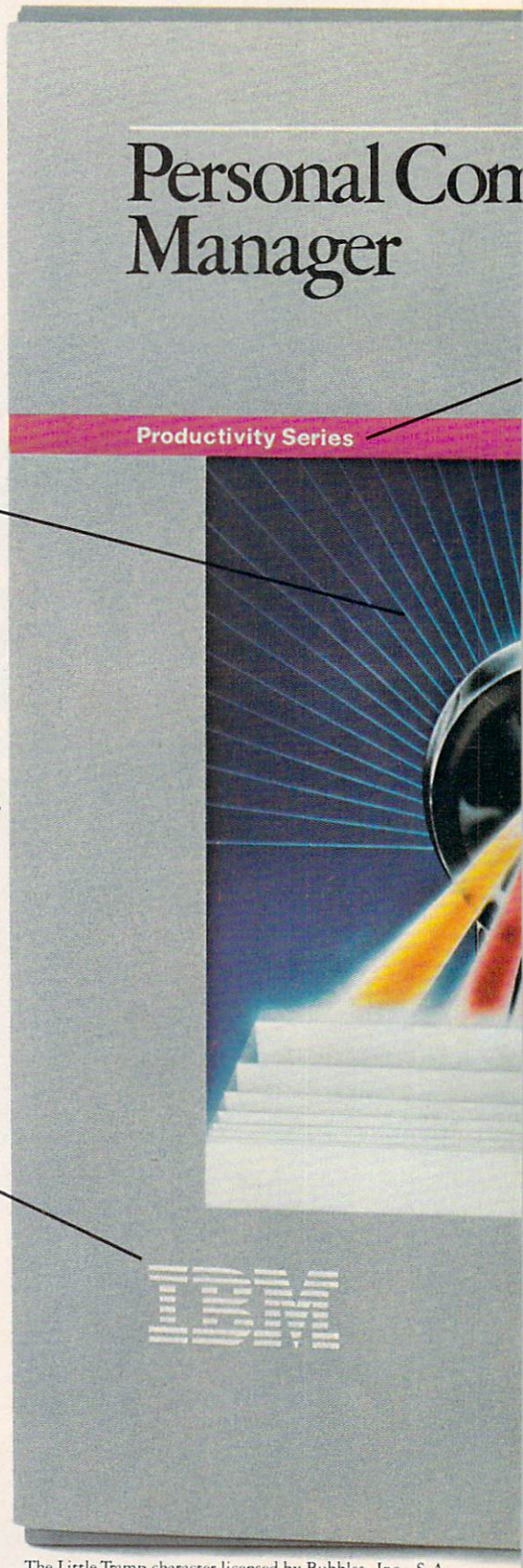

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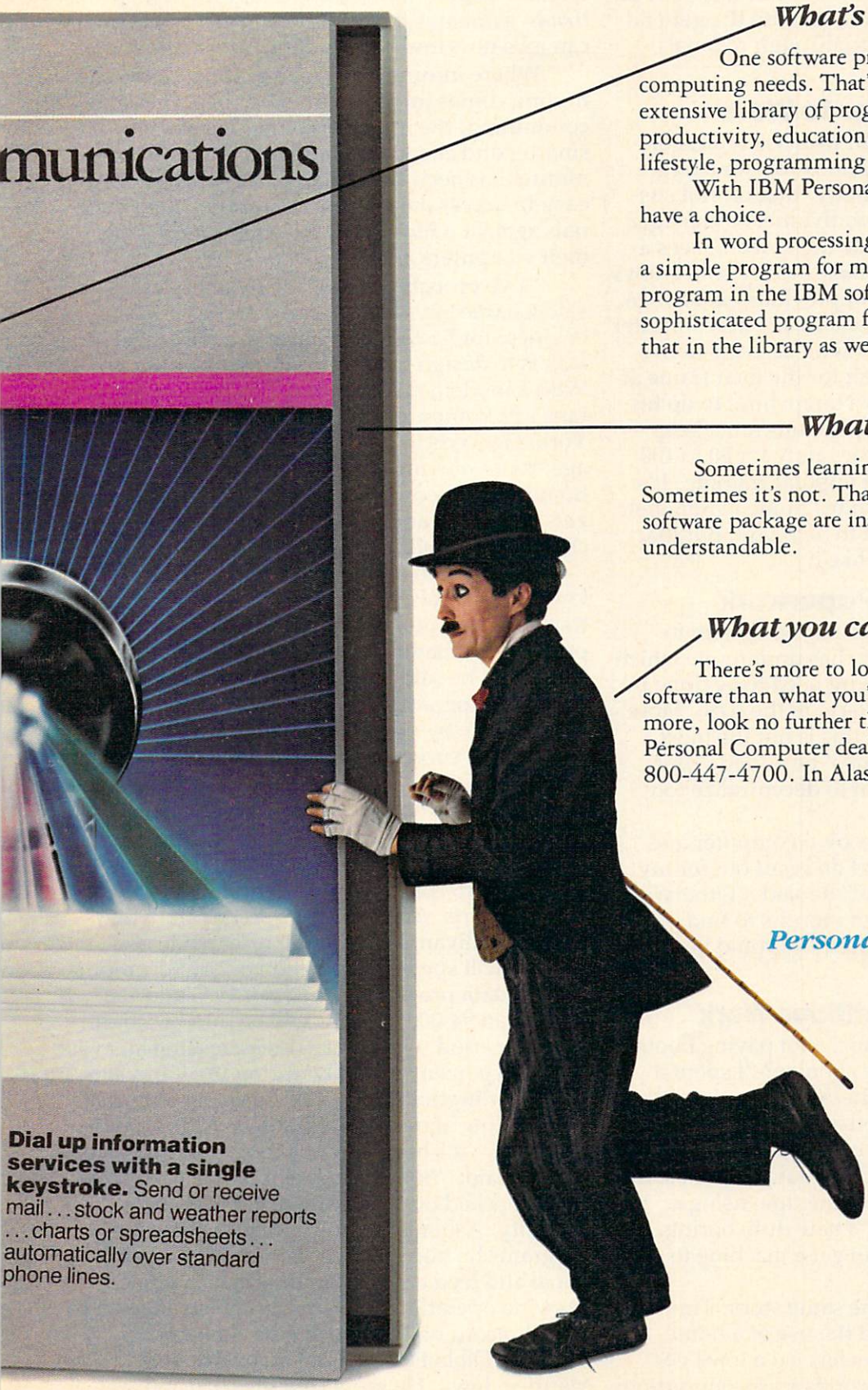

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and selling flower arrangements. And in Brooklyn, New York, Jim McQuade, an accountant in private practice who's been hacking with computers for 20 years, is very up-to-date. On his home computer the various packages—such as accounts payable and accounts receivable—are all integrated; that is, "they all feed into the general ledger without having to go through manual entries."

Taking The Computer To Work

In several respects, though, Evans is typical of the home computer user who works for a large company, perhaps the military, that cannot customize programs for each individual or manager. This kind of user takes pride in his work, sees a better way to do things or make money, and enjoys programming, regardless of previous experience.

Like Evans, David Loomis takes his computer to work. A master sergeant with 22 years in the Air Force, Loomis can't wait for the mainframe at Pease Air Force Base, New Hampshire, to do his work. Among other things, Loomis must keep track of retraining in nuclear safety for 80 to 100 airmen each year. "It's not popular training. It's like flu shots," he said from his home in Somersworth. "They're supposed to help you. But that doesn't mean you have to like it."

Decentralizing The Paperwork

As it happens, the Air Force has no system to keep Loomis abreast of who has undergone which stage of training. "Everything used to be done by a central computer some place on the base. More and more they're realizing this is not the most modern way of doing things," he added. "But the Air Force does not want to decentralize too much."

So Loomis trots out his own computer and does it himself. "The work I do is cut out for my use and comes on a whistle," he said. "Otherwise, it would take me a couple of months to find out where someone is and when they would be available for retraining."

A Machine For Repetitious Work

Since the Air Force is obviously not paying Loomis for this work, why does he agonize? "I spent a year at a remote island in the Aleutians doing punch cards to put into a busy file system." He was listing test equipment on 5x8 cards. "About 98 percent of the work I did on that program could have been done in a tenth of the time using a microcomputer," he said. "I hate dull, boring, repetitious work and if I can get a machine to do it, I will."

Again and again it's the same story. Time. Money. Convenience. And the use of a home computer for business tasks has led a few COMPUTE! subscribers into the world of telecommuting: They don't have to go to the office.

Of course, not all work can be done at home. Steel must be forged in blast furnaces. Autos come off assembly lines. But the U.S. economy is changing, depending less on heavy industry and more on information. John Naisbitt, author of *Megatrends*, estimates that around 60 percent of American jobs now involve handling information.

Where information is the product, telecommuting comes into its own. And the father of telecommuting, the microcomputer, is growing smarter and cheaper. Another boost for telecommuting has been the rapid growth of organized, easy-to-access data bases, the semifinished materials against which many telecommuters apply their computers and energy.

"I've probably tripled my business in a year," said Charlie Seyffer of Albany, New York, a sales engineer for Eastern Heating and Cooling. Seyffer's task is to design heating and cooling systems. With a modem attached to a Commodore 64, he taps into computers at large firms like Carrier or York. He feeds in the dimensions—square footage, types of windows, perhaps 15 inputs for homes, 100 for office buildings. And then Seyffer gets a full load analysis on his terminal: the cheapest fuel, all the costs.

But it doesn't stop there. Seyffer and his fellow salesmen also manage their inventories and track each job much more closely, the costs, taxes, profits. "We have a much more in-depth look at each job," he said. "We're even writing some of our own programs now."

The use by salesmen of computers at home has been so successful the company is paying for them. "We're knocking the heck out of the other businesses in this area," said Seyffer.

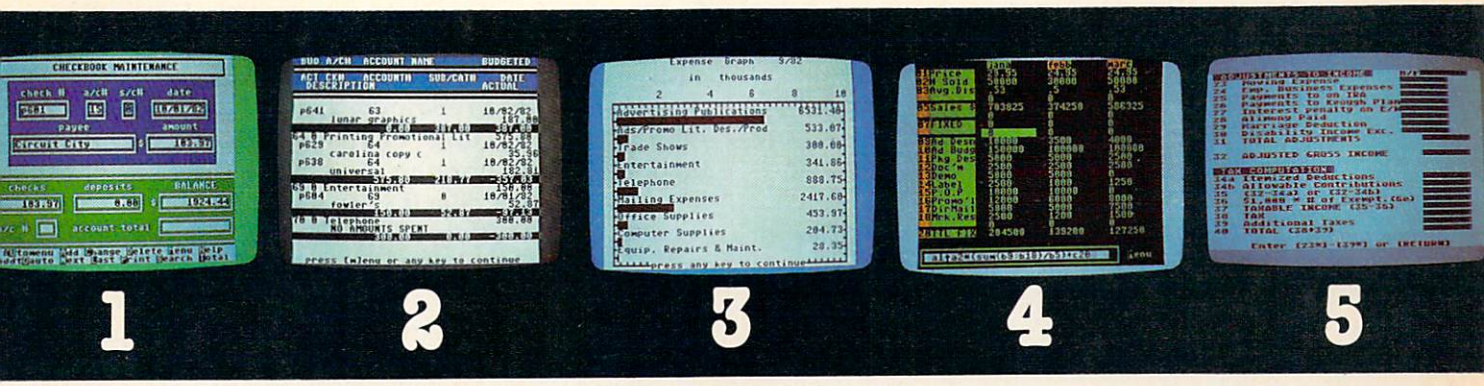
Customized Farming Software

On the farm, computers are keeping track of hogs and soybeans. According to a recent study by Frost & Sullivan, a marketing research firm, farmers will spend $428 million on microcomputers and data processing between 1983 and 1987. More than 94,000 systems will be purchased during this period, with unit sales increasing an average of 35 percent annually during the four years.

In Arlington, Texas, Bill Asher set out on his own, selling agricultural products during a recession year. "It's been sort of a tough year on all of us," he said. "Some 30 percent of the acreage has been knocked out. This killed chemical sales." To diversify, Asher is writing agriculture-related programs he hopes to sell. For example, nutritional and feed conversion programs are needed in swine operations. "My program lets you keep a herd record on the rate of gain," he said.

Stan Dibbet owns a 240-acre farm near Maurice, Iowa. He grows mainly corn and soy-

Five Easy Ways To Clean Up Your Finances.



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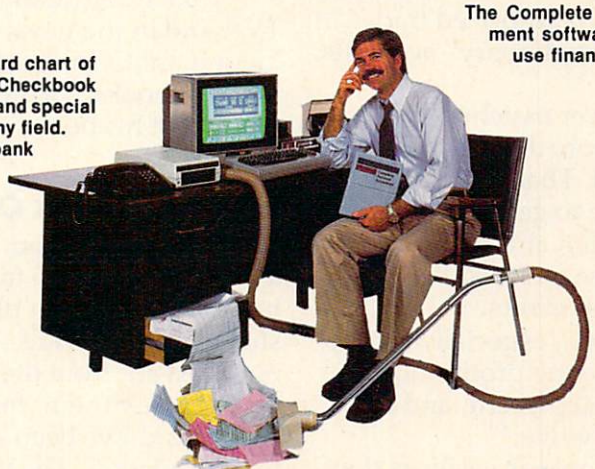

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beans, sometimes breeds livestock, and currently has some hogs. To help keep his farming operations competitive, Dibbet bought a Commodore 64.

Each year a consultant from the Northwest Iowa Farm Business Association drops by to help Dibbet with his books and do his taxes. Dibbet gets a tax return from this, but the service costs him $400 each year. However, now that Dibbet has software customized for farm business, he can program his own inventory, depreciation, and figure his own taxes. He's not only saved $400, he says, he's also having fun learning about computers, "just [enjoying] the fact that you can take a relatively dumb machine and make it do what you want it to do."

Unlike people who buy a home computer for games or education, people who use their microcomputers in their work often watch the bottom line. By and large, they seek a return on their investment, either in hard cash, greater efficiency on the job, or both.

Accountants, bookkeepers, and financial and stock market wizards are especially interested in return on investment. Andy Larson of Jupiter, Florida, first bought a VIC-20, then a Commodore 64, mainly for his son. But Larson tracks about ten stocks and has put his entire system on a spreadsheet "primarily to tell me when to sell and buy," he said. He tracks the stock's moving average over a three-week period. He watches the cash positions of mutual funds, the advance-decline line, the Standard & Poor 500, and other barometers.

Stock Profits Pay For Computer

James Welker, a professor of finance and management information systems at the Indiana campus of the University of Pennsylvania, goes even deeper. Aside from his teaching, Welker does private accounting for small businesses, some financial consulting and systems design. One of his more creative projects last year was to compile evidence needed in a court case on mail fraud. A dealer had allegedly made unauthorized trades in options on IBM stock in "discretionary" accounts. There were six indictments.

Since the dealer had never matched the trades, someone needed to pore through the books and match each buy and sell. That's when they called on Welker. "You have to go through, find out when he opened a position and when he covered it. It took about three months. I worked from copies of brokerage statements.

"I had to design a program especially for the option transactions, compute the profit; those over 20 percent, those over 60 percent, and so on," he said. "It took a little while."

Computers can trace people as easily as they trace money. And increasingly, managers, supervisors, or administrators are using home computers to do personnel work. There is a bundle of personnel software on the market.

Nearly everyone interviewed found uses for word processing. In the last few months, though, perhaps no one has had greater use for it than Richard Carls of Racine, Wisconsin. A partner in an insurance agency, Carls also prepares taxes for about 950 clients. He's been running his own show for about 25 years, and the tax business has gotten so large Carls' daughter pitches in to help. Using a service bureau, Carls became discouraged after his first attempt to computerize and went back to figuring all those taxes by hand. But last October he bought a 64, a printer, and a disk drive, and began building a data file on all his clients.

"We will start on a limited scale on the computer at first, just to get our feet wet. No business returns at first. There are too many carry-over figures from one schedule to another, too much chance of missing some information."

And how does Carls stay in touch with those 950 clients? Word processing. There are 11 different tax classifications and 11 different letters. For example, Carls' letter to a person who is single, does not own a home, and does not itemize deductions will be different from his letter to a couple making mortgage payments and itemizing. And so on.

Mailing Lists In 22 Categories

If he chooses, Carls can segregate his mailing list by any of 22 categories, for example, by phone exchange, by zip code, month of birth, social security number, and so on.

Here again is a man looking at the bottom line as he plugs away at his home computer. But there is something else on that bottom line besides money, profits, efficiency, and clean data guiding logical decisions.

Regardless of age, geographical location, or profession, there is also plain, old-fashioned enjoyment.

Take D. Anthony Valentine, an engineer for TVA and in the naval reserve for Uncle Sam. Lieutenant Commander Valentine collects all kinds of books, including comic books. He has so many that his hobby is almost becoming a sideline business.

Keeping Track Of Collections

"When you get about 10,000 comic books, they're a little hard to keep track of," he said. Valentine has them packed in plastic bags, lined along four shelves 15 feet wide. A few date back to the 40s, but most are from the 60s and 70s.

"I enjoy them, for one thing. I like the art work. And I've been collecting for quite a while, for speculation. The value goes up and down."

Valentine paid 12 cents for the first issue of *Conan* and today the issue sells for about $65. But

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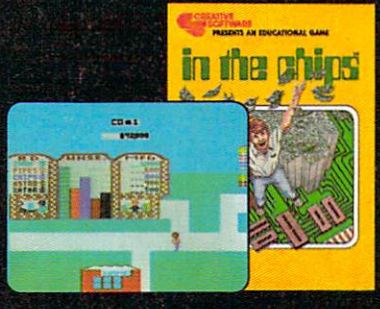

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his prize is the first issue of *Fantastic Four*, a Marvel Publication which came out in 1962. Valentine paid five cents for the comic at a flea market. The catalogue value is now between $900 and $1000. "That's the one I keep in my safe deposit box," he said.

To cope with *Conan, The Fantastic Four*, the science fiction, the hardbacks, the paperbacks, the coins and stamps and what-all, Valentine realizes, "They need to be catalogued. I'm trying to come up with a program to catalogue all that."

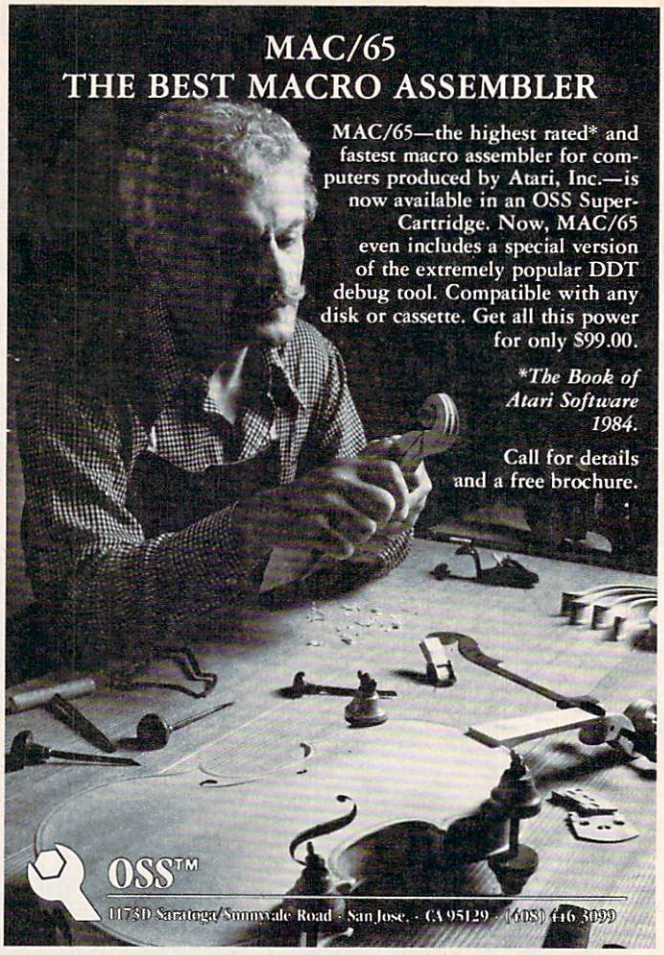
For Valentine, the fun far outweighs the profits.

"I Just Enjoy The Thing"

Late one night last October, Jerry Evans was already airborne on a routine flight when the radio alerted him. Two drilling platforms joined by a catwalk were in trouble. "They were both ablaze when we got there," he said. "We carried 83 people to the beach. No one was injured."

In this case, Evans' flight navigation program wouldn't have done any good because his computer is not on the helicopter and the LORAN was doing its job. In other words, there will not always be a payoff for his long hours programming his Commodore.

"But it doesn't matter if it pays or not," said Evans (and many others interviewed). "I just enjoy the thing." ©



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Apple's Macintosh Unveiled

Fred D'Ignazio, Associate Editor

Fred D'Ignazio was there when Apple's new Macintosh computer introduced itself to the world.

The Apple Macintosh had its coming-out party at the monthly meeting of the Boston Computer Society on Monday evening, January 30.

The atmosphere was a cross between a football pep rally and a gala rock concert. People jammed into the elegant John Hancock Hall and filled it to the chandeliers. Everyone was talking loudly and pointing up at the stage.

On the stage was a dark brown podium and a table with a fabric bag on top.

High-Tech Rock Video

The lights dimmed. Huge speakers on the stage blasted the audience with a hard, driving rock beat. The audience began clapping to the beat.

Two giant video screens above the stage lit up, showing pictures of men, women, kids, old people, young people, black, and white people using Apple's new Macintosh computer. The pictures appeared on the screen, one after another, accompanied by the theme from *Flashdance*.

The music stopped. The clapping grew louder. Steve Jobs, the inventor of the Apple computer and the project manager of the Macintosh, climbed onto the stage, smiling and waving. People began cheering. The noise was deafening.

And Now A Word From Mac

"The Macintosh is the third milestone in the personal computing revolution," Jobs said, as he walked over to the table at the center of the stage. "First came the Apple II in 1977." An Apple II appeared on the giant screen overhead.

"Next came the IBM PC in 1981." A PC appeared on the video screen. The audience began laughing. The image of the PC on the screen was out of focus and almost unrecognizable.

"And now, in 1984," Jobs said, as he reached the table and put his hands on the box, "we have the Macintosh, the third milestone and definitely the greatest. It is so great it is insanely great." People laughed. The words "INSANELY GREAT" appeared in giant letters over Jobs' head.

"This machine eats 8088s for breakfast," Jobs continued. "Its Motorola 68000 cranks along at 8 megahertz and processes over a million instructions a second. It has four musical voices and a speech synthesizer built-in. Its screen has twice the dots of an Apple II or a PC. Yet the whole computer weighs only a third of an IBM box.

"Now it's time to meet Mac in person."

With a theatrical flourish, Jobs unzipped the fabric case and lifted the Macintosh out of the bag. An instant later he had connected the power cord, the keyboard, and the mouse.

He switched on the computer. The screen over Jobs' head turned sky blue. "All the images you see," he said, "are generated by the Mac."

Jobs looked at the blank screen. "Ah, yes," he said. "We need a disk." He reached in his shirt pocket and pulled a tiny 3½-inch disk out and waved it at the audience.

Jobs inserted the disk in the computer. The letters M - A - C - I - N - T - O - S - H marched, one by one, across the Mac's screen and across the giant screen above the stage. The letters marched in time to the theme from *Chariots of Fire* that blared from the stage's gigantic speakers.

"And now," Steve said, "a word from Mac." He gestured to the computer.

Mac came suddenly to life. "Thank you,

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Steve," it said. Its voice was mechanical and computer-like, but it was easy to understand and strangely imbued with personality.

Mac gave a quick, crisp introduction to itself. It showed the audience how to access files and how to use its *MacWrite* and *MacPaint* programs. Then it gave a dazzling graphics display. It finished its performance with words of advice: "Never trust a computer you can't lift."

"And now," said Mac, when the audience finished clapping, "back to Steve."

The Second Desktop Appliance

Jobs then spoke about the potential market for the new computer. "The Mac is a desk appliance," he said, "the first since the telephone.

"Up until now computers have been like telegraphs. Over a century ago, when the telegraph was invented, people predicted the day when telegraph terminals would be on everyone's desk. But telegraphs were too difficult to use.

"Then the telephone was invented. It was easy to use so everyone could use it. It brought people in touch with other people so it was useful to everyone. Soon everyone was using the telephone and the telegraph virtually disappeared.

"The same thing will happen with personal computers. Only a fraction of the 235 million people in this country can use personal computers. But the Mac is different. Like the telephone, it is a desk appliance. It is the computer for the rest of us."

A Means To An End

Earlier in the evening, at the press reception, I had been talking with Mike Murray, marketing manager for the Macintosh. Like Jobs, Murray called the Macintosh an appliance. "I looked up appliance in the dictionary," Murray said, "and it said that an appliance was 'a means to an end.' That's the Mac. It's a means to an end."

That night, filled with the thrill of the occasion, I just nodded at Mike and grinned. "A means to an end," I thought. "That's neat."

At that time, it looked to me that Apple had solved the problem of making computers useful and attractive to everybody. In the Mac they had created the first mass-market computer appliance.

The following morning I returned home to Roanoke. That afternoon I looked up appliance in my own dictionary. *My* dictionary defined appliance as "a machine designed for a particular use."

All of a sudden I realized that Apple had cleared only one of the two hurdles that have prevented the average person from using a computer. First, despite manufacturers' claims, computers have never been easy to use. Second, no one has yet come up with a computer with a *particular use* which makes everyone want to use it.

The Mac isn't as easy to use as a telephone, but it is still easy to use, so I'd say Apple has cleared the first hurdle. Unfortunately, unlike the telephone, the Mac does not have a clearly defined use that is obvious to everybody. The telephone puts people in touch with each other. But what does the Mac do that is comparable?

The Mac is clearly a milestone in the personal computing revolution. It does *everything* more easily than almost any other affordable computer. But it does nothing new.

The First Activity Appliance

Yet Mac is special, so special that it still may eventually become an appliance on everyone's desk.

One way for Mac to become a mass-market computer is to eliminate the whole question of "What do I do with it?" One way to sidestep this question is to replace it with another question: "What kind of appliance is Mac?"

Some people say Mac is an information appliance. Others say it is a knowledge appliance. Still others say it is a graphics arts appliance. Like the phone, it is also a communications appliance. So what kind of appliance is Mac?

I think it is an appliance unlike any appliance we've seen before. I think it is an *activity appliance*. It lets you do activities. *You* decide which activities you want to do using Mac.

This is a disappointing definition—until you look at *how* Mac lets you do activities. What Mac does is less important than how it does it.

First, Mac lets you individualize everything you do. You can personalize the way you play, the way you work, the way you interact with the rest of the world. Mac becomes an extension of yourself. It lets you put your stamp, your personal image, on everything you do. This is a supremely satisfying feeling.

Second, and most important of all, Mac makes whatever activity you do exciting.

If this sounds like gobbledygook, good! I advise you to be skeptical. Don't take my word for it. Go down to your local Apple dealer and try Mac for yourself. Then reread this article and see if I'm not right.

Apple will be able to sell tens of millions of Macs if it can just convey these two simple qualities to people. Mac cannot do anything new. But it can make whatever you do more joyful, and more exciting. It makes everything you do a personal statement of who you are and how you see the world.

What Makes Mac Exciting?

The excitement you feel when using Mac is difficult to describe because it comes from lots of little,

intangible, almost subconscious features.

These are the things I noticed when I first played with the Macintosh:

First, using Mac is *intuitive*. At most points when you want to do something, you can guess how to do it. Mac does things the way you feel they ought to be done.

Second, Mac is a graphic arts machine. Everything the computer can do is represented pictorially. There are no exotic commands, no unintelligible error messages, and no control characters. When you do something, you see the end result on the screen, almost instantly.

Third, the Mac is manageable. When you take it out of its box, you are not overwhelmed with snakelike cables, power cord adapters, disk drives, and hefty manuals. It was easier to set up the Mac than it was to set up the new TV my family got for Christmas.

Fourth, the Mac's keyboard is unlike all other computer keyboards. It looks familiar—like a small typewriter keyboard. There are no rows of intimidating function keys and ominous keys like HELP, ESCAPE, BREAK, and RUN.

Fifth, even a simplified keyboard is still too much for many people. This is where the Mac's mouse comes in. Believe it or not, the mouse really *is* easy to use. For many applications, the mouse completely replaces the keyboard.

Sixth, the Mac's menus are very friendly *and* they do not slow you down. After only a couple of minutes practice I was zipping around inside an activity, using the menus without breaking my stride.

Seventh, like a nice person, the Mac is "user forgiving." The Mac lets you get out of any mistake by selecting the UNDO function. No matter how disastrous your last action was, you can immediately undo it.

Eighth, the Mac is light (only 20 pounds). Its bag (at $100), its few parts and cables, and its light weight make it easy to carry around with you. To be personal a computer should be portable. Now, wherever you go, you can take your computer with you.

Last, the Mac does away with some of computers' most irritating habits. For example, many computers are extremely sensitive to voltage fluctuations and momentary brownouts in household electrical current. The Mac is not.

Also, the Mac is tall and skinny. Unlike most computers, it does not hog your whole desk or kitchen table.

This Crazy Group Of People

After Jobs and Mac completed their presentations in John Hancock Hall that night in Boston, Jobs called his core team of Mac engineers and programmers up on the stage to demonstrate the Mac and to answer the audience's questions.

The Mac team ran down the aisles and poured up on the stage. People in the audience began clapping wildly. The team responded by waving and grinning.

The Mac team—twelve men and one woman—were as diverse in their dress and personalities as they could be. Some wore ties, others wore blue jeans and T-shirts. Some were shy and withdrawn. Others were just as outgoing and theatrical as Jobs and Mac.

Jobs spoke of his team as "artists." He presented a slide show of the team members at work on the Mac. "We prepared this slide show," he said, "to try to capture some of the energy of this crazy group of people."

At the conclusion of the slide show, one of the programmers, Bill Atkinson, speaking for the team, said, "We are hoping that through the Mac we can leverage our energy into the world at large."

The last slide showed the inside of the case that covers the Mac's monitor, disk drive, and circuit boards. On the side of the case of every Macintosh are inscribed the names of the members of Mac's team.

The Right Stuff

Many people have begun comparing the team to the original astronauts. The members of the team are called the "astronauts of computing." Their idealism, their individual genius, their devotion to their work, and their standards of excellence are like the manned space program astronauts' highly touted "right stuff."

There's no question that the Mac team has the right stuff. But I'm not sure they should be called astronauts. In fact, there is no direct comparison with the manned space program.

The small number of astronauts in the space program were just the top of a pyramid of thousands of anonymous individuals whose efforts made the astronauts' great achievements possible.

With Apple this pyramid is upside down. The right stuff demonstrated by the team of Mac programmers and engineers has been infused into the Macintosh computer. This team represents the small point at the bottom of the upside-down pyramid. The Macintosh will perhaps eventually be used by millions of us. We represent the broad base at the upside-down pyramid's top.

The team, unlike their counterparts in the space program, have received well-deserved recognition and praise for their efforts.

And who are the astronauts of computing? We are, all of us. New generations of computers like Mac will give all of us the right stuff. With new computers like Mac we can all soar. ©

Securities Analysis

Fred Schobert, Jr.

The home computer is ideally suited for the task of investment analysis and can quickly perform calculations that would take hours to do by hand, even with a calculator. This program provides you with some of the same powerful tools used by professional financial analysts in evaluating stocks and bonds and the companies that issue them. Versions are included for the 64 and VIC with 3K or more expansion, Atari, and IBM PC and PCjr.

In today's financial environment, even the most modest investor can participate in a wide variety of investment opportunities through discount brokers or stock accumulation plans like Merrill Lynch's Sharebuilder account.

If you're interested in the stock market but don't know anything about investing, you should know that most brokers will be happy to assist you. Also, there are many excellent sources of investment information available. Some of the best are: the PBS television program *Wall Street Week, The Wall Street Journal, Barron's, Forbes, Fortune, Business Week,* Moody's Investors Service, the Value Line Investment Survey, and Standard and Poor's *Outlook* and *Stock Guide*. These sources are available in most libraries and brokerage houses.

You must clearly understand, however, that the market is risky and that usually the higher the profit potential, the higher the accompanying risk. This program is not a get-rich-quick scheme. It merely gives you a set of fundamental analytical tools that you can use to make informed, intelligent investment decisions.

The program is written for the average person. However, if you are completely unfamiliar with fundamental analysis, it would be helpful if you first read two free pamphlets distributed by the nation's largest stockbroker, Merrill Lynch. They are *How to Read a Financial Report* and *The Bond Book*. Familiarity with these and the notes in this article should allow you to use this program correctly and evaluate its output even though you've never been exposed to investments or financial matters before.

The program is divided into five main subroutines. Two are used for stock valuation, one for fundamental analysis, one for bond valuation, and the final one for printing to the screen.

The Gordon Valuation Model

The Gordon stock valuation model is located in lines 205–580. Although limited in its usefulness, it is academically sound and is the basis for the more complex models used by professional securities analysts. It is based on the premise that stock prices are determined as the present value of a stream of cash flows (dividends). The major drawback of the model is that it assumes that the growth rate and dividend policy of the company are perpetual and unchanged.

The subroutine asks you to estimate the company's annual growth rate in earnings. Due to the importance of accurately estimating earnings growth, it is best to use the estimates of professional analysts who have the most up-to-date objective and subjective information at their fingertips. These estimates can often be found in the sources listed earlier. However, if no growth estimates are available, the program will request more data from you and estimate a growth rate itself.

In line 230 the model also defines what is known as the market risk premium as 5.5 percent over the long term Treasury rate, adjusted for risk. This is an estimate and differs slightly from year to year and from stock to stock. The figure was derived, however, from a study which calculated the average market risk premium for Standard and Poor's 400 Industrials over the past 20 years. Another study, based on figures from 1926–1978 found the market risk premium to average 6.2 percent over the U.S. T-bill rate. If you feel more comfortable dealing with the T-bill rate, you can make the appropriate changes in lines 220–230. A quick comparison of the two figures shows that they are approximately equivalent.

Another, more general, model is located in lines 750–940. This is a revision of the famous Graham valuation model and was designed to yield a value closely approximating the values obtained from much more complex models. An earnings multiple is obtained and then multiplied by normalized earnings to obtain the price of the stock.

Although this method leaves something to be desired, namely subjective input, you can normalize earnings by fitting a least squares linear trend line to the last five years' earnings per share in lines 790–820 and then pick off the current year's normalized earnings per share (EPS).

To obtain a growth rate, calculate a mean

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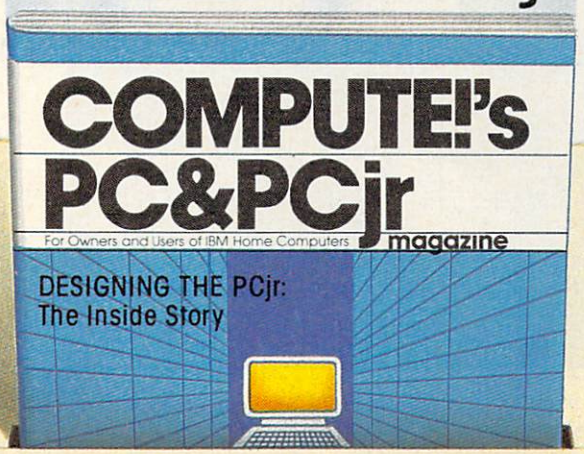

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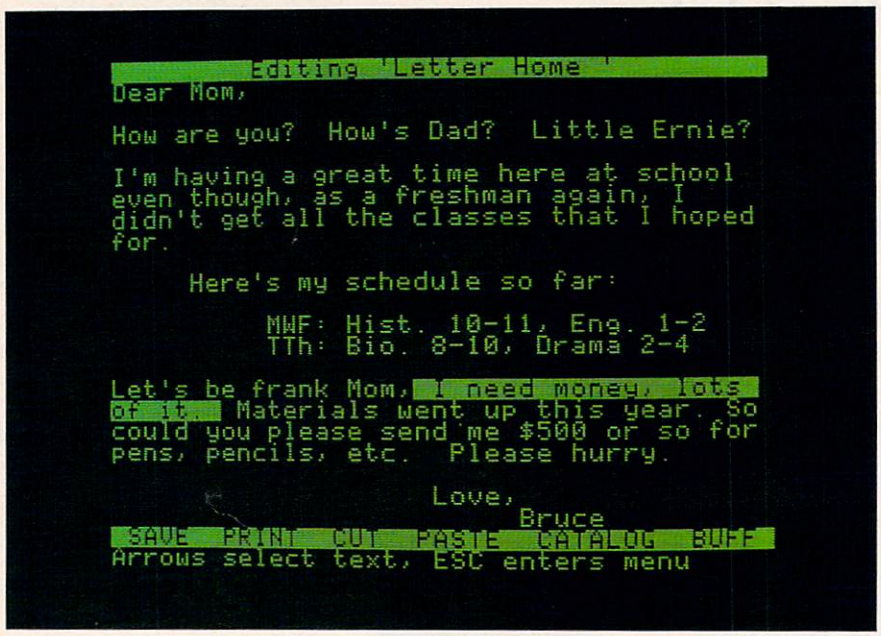
If you can learn to use this word processor in 90 seconds, can it really be any good?



CUT & PASTE™ *displays its commands on a single line at the bottom of the screen. This makes working with it easier and also gives you more usable space on the screen.*

Of all word processors on the market today, Cut & Paste may well be the easiest to use. In fact, by the time you finish reading this section of the ad, you'll know how to work with Cut & Paste. So read on.

START TYPING. Working with Cut & Paste is like working with a typewriter. If you know how to use a typewriter, you already know how to type in your draft with Cut & Paste. The only real difference is, with Cut & Paste it's easier to correct typos.

MAKING CHANGES. Let's say you've decided to make a cut in your rough draft. To do this you put the cursor (the bright block) at the start of the text you want to delete, and stretch it through to the end of your cut. Then you send the cursor down to the "CUT" command on the bottom of the screen. Done.

If, on the other hand, you want to keep that line, but put it in a different part of your draft, you use the "PASTE" command. You mark the point of insert with the cursor. Then you put the cursor over "PASTE." That's all there is to it.

PRINTING IT OUT. When you like the way your work looks, you print it. Put the cursor on the "PRINT" command. Then set your margins, in inches. That's it.

You now know how to use Cut & Paste.

OKAY, IT'S SIMPLE. BUT HOW GOOD IS IT? Cut & Paste has all the features you'll ever need to use at home. Here are a few of them:

1. Scrolling dynamic menus
2. Automatic word wrap
3. Simple cut & paste editing
4. Block indenting
5. Set margins and paper size in inches
6. Tabs
7. Automatic page numbering
8. Controllable page breaks
9. Headings
10. Scrolling text windows
11. Automatic widow and orphan control
12. Clear and concise manual

In other words, Cut & Paste will do just about everything other word processors do. But Cut & Paste will do it more easily. Without complex commands and modes.

If you think about a word processor in terms of what it replaces (typewriters, pens and paper, files), Cut & Paste begins to look very good indeed.

And when you consider that *all this power can be had for approximately* $50, we think you'll see why we believe Cut & Paste is something of an achievement.

A PHILOSOPHY OF DESIGN. The people who designed, developed and programmed Cut & Paste have some fairly heavy credentials.

They are people who worked on the internationally-famous user interface designs that led to the Xerox Star® and Apple's Lisa.® They are also

NOW AVAILABLE FOR ATARI AND IBM HOME COMPUTERS

THE CHANGING OF THE GUARD. *Until quite recently we used pens and paper and typewriters to write with, mostly because we knew how to use them. They have been good tools, but limited. You tend to make messes when you work with them, and getting rid of those messes makes extra work. Cut & Paste is an inexpensive and practical alternative. Because it is as easy to use as a typewriter, you really will use it. Which may make it the first sensible word processor for the home. Thus an alleged labor-saving device has come to a position where it really can save a significant amount of labor, i.e., yours.*

THE MEN WHO MADE CUT & PASTE. *The Linotype machine pictured here was the 19th century's most important contribution to word processing technology. It let typesetters compose and rearrange text in the form of metal castings. The importance of Cut & Paste, of course, must await the judgment of history. Nevertheless, the seven men who developed it look confident here. Standing left to right, they are: Norm Lane, Steve Shaw, David Maynard, Dan Silva, Steve Hayes and Jerry Morrison. Seated at the console is Tim Mott, whose idea this was in the first place.*

people who have in common a very lucid philosophy of design.

Computers and the programs they run are tools, they believe. Tools are never noticed unless they are bad tools. When they're good, they become, in effect, invisible. And if you want to make a good tool—an invisible tool—you'd best study the way people use the tools they already have.

As a result of this thinking, Cut & Paste was designed to work much in the same way that you already work with a typewriter or with pen and paper. The most complex and powerful parts of the program are hidden from view. The work they do takes place deep in the machine. All you get to see are the results.

But beyond that, there is something almost indefinable about a good design. Things about it just seem to work crisply. Little touches and features that you notice make you want to smile. If it's really good, it *feels* good.

Cut & Paste feels good.

ELECTRONIC ARTS™

THE PRODUCTS *of Electronic Arts can be found in your favorite computer stores, software centers, and in leading department stores throughout the country. Both Cut & Paste and Financial Cookbook™ are now available at a suggested retail price of $50 for the Apple IIe and the Commodore 64 and will soon be available for the IBM-PC and Atari.*

OUR COMMITMENT TO HOME MANAGEMENT.

Cut & Paste is just one of a growing number of products we're publishing within the category of "home management software." These products are all built around the same program architecture, making them all equally "friendly," as well as remarkably straightforward and practical. We believe that designs like these will soon make home computers as functional and efficient as today's basic appliances.

Our next product in this line is called *Financial Cookbook*. It's a realistic alternative to the complex, pre-programmed financial calculators we all wish we knew how to use. With a few, simple keystrokes, *Financial Cookbook* lets you make more than 30 key time-value-of-money computations—just about all the ones you'd ever use for personal finances—like calculating mortgages with changing interest rates, compounding the interest on IRA and savings accounts, and buy-versus-lease comparisons for automobile purchases.

To find out more about these home management products and about what we have planned for the future, call or write: Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (415) 571-7171.

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growth rate and add one standard deviation to obtain a high value and subtract one standard deviation to obtain a low value in lines 830–860. The program prints out the last four years' growth rates to allow you to determine if growth is accelerating, declining, or remaining stable.

The program allows you to make your own growth and normalized earnings estimates, but since it is difficult to find seven- to ten-year growth estimates, it might be best to allow the program to calculate these for you.

Before leaving stock valuation, one word of caution. These models only approximate the theoretical value of stock. Although useful in arriving at a "buy, sell or hold" recommendation, it is important to bear in mind that something is worth only as much as people are willing to pay for it.

The subroutine located in lines 600–720 will give you an abbreviated fundamental analysis of the corporation. The data input stage requires a large amount of data to be entered which can be obtained from a variety of easily accessible sources. The company's yearly or quarterly financial reports are the best sources of information here, and these are readily available from the company itself. Even if it takes a week or two for the information to arrive, it will be well worth the wait. Other sources of this information are brokers' Standard and Poor's sheets and Moody's Investors Service.

You can get printouts of both the entered data and the calculated ratios. Enter the requested data carefully and check it. If the data is incorrect, your ratios will also be incorrect. Be sure to keep your units equivalent. For example, if you start out in millions, stay with millions. If you switch from millions to hundreds of thousands, the affected ratios will be meaningless, unless you entered all of the significant digits throughout. And that's both unnecessary and time-consuming. For example, 327,700,000 would be entered 327.7.

A Few Definitions

The prompts should be self-explanatory, but a few notes are in order.

- Interest expense and income tax are normally entered as positive numbers, even though they are negative numbers on the income statement. If the company receives a net tax benefit, however, income tax should be entered as a negative number. Naturally, if the company loses money, then net income and income before tax would show up and be entered as negative numbers.
- COGS means *cost of goods sold*, but may also be *cost of sales* if it is a service industry where inventory turnover is of less importance.
- *Sinking fund* is the principal repayment of long-term debt. It is usually found in the "notes to the financial statements" section of the company's annual report. But if no figure is available, the program calculates it as 5 percent of the long-term debt, which is usually not far from the truth.
- *Stockholder's equity* is sometimes referred to as *net worth* or *shareholder's equity*.
- Retained earnings means accumulated retained earnings.
- The *burden coverage ratio* is a measure of risk and represents how well the company is able to service its total debt burden.
- If you don't know the beta of a stock, use 1, which is the beta of the market as a whole.

It is important to remember that the ratios themselves are of little value unless they are compared to something, such as the industry averages or the firm's leading competitors. Also, historical trends can be identified if the ratios for the same firm are calculated over a period of years using historical data.

Finally, this subroutine calculates a bankruptcy score in lines 625–630 based on the Altman bankruptcy model. It's very accurate in forecasting impending financial troubles for companies with total assets of between $1–$25 million. Its applicability for firms outside that range is disputed, but it ought to be a good indicator of trouble for firms of any size.

Bond Valuation

In the bond valuation subroutine located in lines 1000–1130, the user is asked to enter the appropriate interest rate for the bond. This rate is your required rate of return for the bond, and you should consider these factors before determining this crucial figure: interest rate risk, inflation risk, maturity risk, default risk, callability risk, and liquidity risk. These are obviously subjective evaluations, but are no less important than the equation itself.

To help you with this, you can quickly and easily determine a proxy for this figure by looking on the credit page of *The Wall Street Journal* to see what the coupon rate (or current yield) is for newly issued bonds of equivalent rating. This figure is what professional analysts, investment bankers, and individual investors are currently using for an appropriate rate for newer, but similar, bonds. Also, when the appropriate rate you enter yields a bond value closely approximating that day's selling price of the bond, that rate is the bond's yield to maturity and is your yearly rate of return should you buy the bond at that price and hold it to maturity.

Finally, there is no substitute for common sense in interpreting the results of the program. Remember that the program was designed to be a set of investment tools and cannot guarantee financial success.

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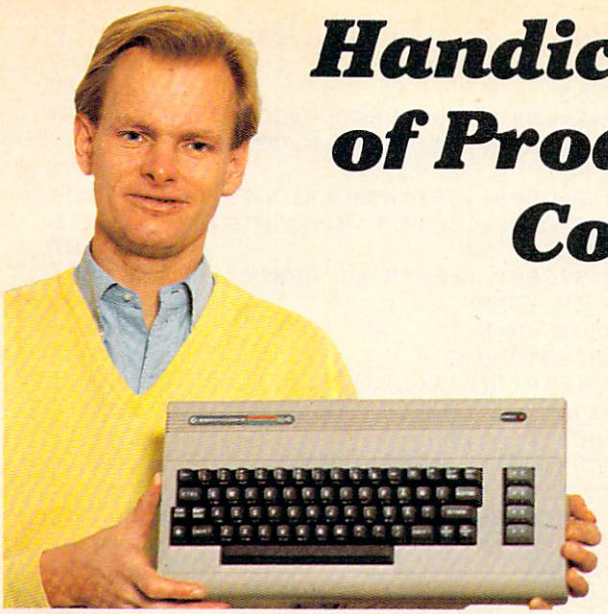
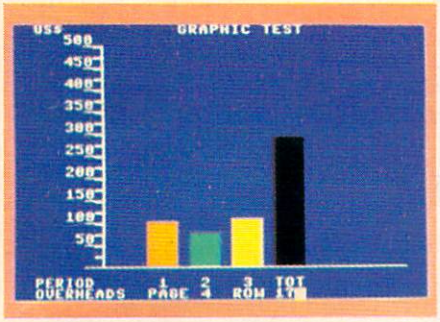


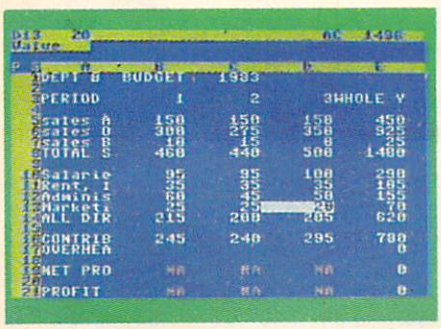
Handle your home budget, stock portfolio, loans and mortgages with Calc Result

Calc Result Easy is a simple-to-use spreadsheet program for the Commodore 64. It includes 254 lines × 64 columns, built-in graphics, and flexible printout formats. Plug-in cartridge... just plug it in and its ready. Perfect for cash flow analysis, personal net worth, IRA analysis, travel expenses, credit card expenditures, gas and electricity bills, etc.



Calc Result Easy $49.95

Calc Result Advanced gives you 32 pages of interrelated information. The three-dimensional feature allows you to consolidate calculations in summary format. Calc Result Advanced comes on plug-in cartridge and disk. Disk drive required.



Calc Result Advanced $99.95

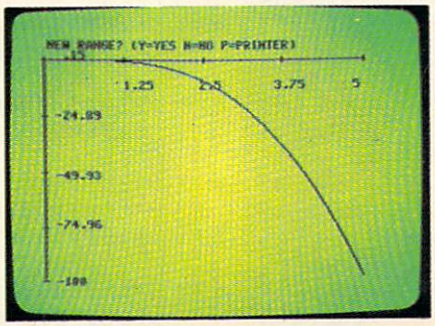
A complete database for the home

Addresses, telephone numbers, appointments, birthdays, or records–whatever you want to remember–put it on DIARY, an electronic notebook for home use. DIARY comes on a plug-in cartridge. It's easy to use and easy to learn, giving you the flexibility to design a personal calendar or address book.

Diary $29.95

Turn statistical information into graphic format

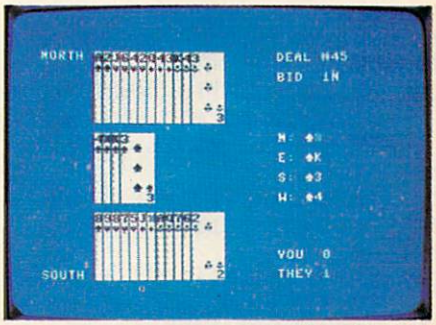
GRAF 64 converts mathematical functions into graphical analysis on the Commodore 64. An ideal program for studying math. Define a function, set the limits of an axis, plot a graph and display the extreme points, intersection values, etc.



Graf 64 $29.95

Develop your bridge skills

Whether you're an experienced bridge player or a beginner, polish your skills or learn the game with BRIDGE 64. Play North-South, then switch to East-West in the same deal, the return to that deal again and test your skill with a different strategy.



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Program 1: VIC And 64 Securities Analysis

Refer to the "Automatic Proofreader" article before typing this program in.

```
10 GOSUB 5000                          :rem 166
20 PRINT"{CLR}{10 DOWN}{RIGHT}SECURITIES
   {SPACE}ANALYSIS"                    :rem 241
30 FORI=1TO1500:NEXTI                  :rem 44
40 DEFFNR(X)=INT(((10↑2)*X)+.5)/(10↑2)
                                       :rem 79
50 PRINT"{CLR}{9 RIGHT}{2 DOWN}{RVS}MENU
   {OFF}"                              :rem 201
52 PRINT"{2 DOWN}USE DECIMALS TO":PRINT"E
   XPRESS PERCENTAGES."                :rem 192
55 PRINT"OMIT DOLLAR SIGNS &":PRINT"KEEP
   {SPACE}UNITS EQUIVALENT.{DOWN}"
                                       :rem 220
57 PRINT"CHOOSE:{DOWN}"                :rem 73
60 PRINT"{RVS}1.STOCK VALUATION{OFF}
   {DOWN}":PRINT"{RVS}2.FUNDAMENTAL ANALY
   SIS{OFF}"                           :rem 36
62 IFCP=2THENPRINT                     :rem 181
65 PRINT"{RVS}3.BOND VALUATION{OFF}{DOWN}
   ":PRINT"{RVS}4.END{OFF}"            :rem 16
70 GETA$                               :rem 172
75 ONVAL(A$)GOTO200,600,1000,3000      :rem 11
90 GOTO70                              :rem 9
200 PRINT"{CLR}{8 DOWN} {RVS}F5 FOR GORDO
    N MODEL.{OFF}":PRINT"{DOWN} {RVS}F7 F
    OR GRAHAM MODEL.{OFF}"             :rem 95
201 GETA$                              :rem 216
202 IFA$=CHR$(135)THEN205              :rem 118
203 IFA$=CHR$(136)THEN750              :rem 125
204 GOTO201                            :rem 98
205 PRINT"{CLR}{RVS}{5 RIGHT}GORDON MODEL
    {OFF}"                             :rem 106
210 INPUT"STK SYMBOL";S$               :rem 225
220 INPUT"LT US TREAS";RF              :rem 2
230 INPUT"BETA";B:KI=RF+B*.055         :rem 4
240 INPUT"CURRENT DIV";D(0):IFD(0)=0THENP
    RINT"{RVS}PRICE INDETERMINATE{OFF}":G
    OTO435                             :rem 90
280 PRINT"EST AVG ANNUAL GROWTH":PRINT"RA
    TE (Y/N)"                          :rem 45
282 GETA$                              :rem 225
284 IFA$="Y"THEN340                    :rem 50
286 IFA$="N"THEN295                    :rem 50
290 GOTO282                            :rem 112
295 INPUT"CURRENT EPS";EPS:IFEPS=0THENPRI
    NT"{RVS}PRICE INDETERMINATE{OFF}":GOT
    O435                               :rem 175
300 PRINT"CURRENT NET INCOME"          :rem 41
305 INPUTNI                            :rem 191
310 PRINT"STOCKHOLDERS EQUITY"         :rem 219
315 INPUTNW                            :rem 206
320 ROE=NI/NW:RET=1-(D(0)/EPS)         :rem 16
330 G=RET*ROE:GOTO400                  :rem 28
340 INPUTG                             :rem 110
350 PRINT"GRWTH CONSTANT(Y/N)"         :rem 134
352 GETA$                              :rem 223
354 IFA$="Y"THEN400                    :rem 45
356 IFA$="N"THEN470                    :rem 43
360 GOTO352                            :rem 108
400 D1=D(0)*(1+G)                      :rem 41
410 IFKI=<GTHEN470                     :rem 66
420 P=D1/(KI-G)                        :rem 32
430 DEFFNR(X)=INT(((10↑2)*X)+.5)/(10↑2):P
    RINT"{RVS}GORDON MODEL VALUES"
                                       :rem 169
432 PRINT"{RVS}"S$" AT $"FNR(P)        :rem 119
435 PRINT"F1-MENU, F3-PRINT"           :rem 165
437 PRINT"F5 FOR GORDON MODEL":PRINT"F7 F
    OR GRAHAM MODEL";                  :rem 214
440 GETA$                              :rem 221
445 IFA$=CHR$(133)THENCLR:GOTO40       :rem 158
450 IFA$=CHR$(134)THENCLR:GOSUB2000
                                       :rem 64
452 IFA$=CHR$(135)THENCLR:GOTO205:rem 209
455 IFA$=CHR$(136)THENCLR:GOTO750:rem 218
460 GOTO440                            :rem 107
470 PRINT"EST LENGTH OF GRWTH":PRINT"PERI
    OD IN YEARS"                       :rem 36
480 INPUTN:N=N-1                       :rem 235
500 FORI=0TON                          :rem 35
510 D(I+1)=(D(0)*(1+G)↑(I+1))*(1/(1+KI)↑(
    I+1))                              :rem 5
520 DI=DI+D(I+1)                       :rem 83
530 DMAX=D(0)*(1+G)↑(I+1)              :rem 54
540 NEXTI                              :rem 33
550 PRINT"SUBSEQUENT GRWTH RATE?";:PRINT"
    MUST BE <"KI                       :rem 87
560 INPUTNG                            :rem 192
570 C=(DMAX*(1+NG)/(KI-NG))            :rem 217
580 P=C*(1/(1+KI)↑(I))+DI:GOTO430      :rem 67
600 PRINT"{CLR}":PRINTTAB(3)"{RVS}DATA IN
    PUT STAGE{OFF}"                    :rem 34
601 INPUT"STOCK SYMBOL";S$             :rem 119
602 INPUT"AVG MKT PRICE";MP            :rem 129
603 INPUT"NET SALES";NS                :rem 168
604 INPUT"COGS";CG                     :rem 95
605 INPUT"INTEREST EXP";I              :rem 78
606 INPUT"INC BEFORE TX";IB:E=IB+I:rem 42
607 INPUT"INCOME TAX";TP               :rem 248
608 INPUT"NET INCOME";NI               :rem 230
609 INPUT"CURRENT ASSETS";CA           :rem 40
610 INPUT"CURRENT LIAB";CL             :rem 112
611 INPUT"TOTAL ASSETS";TA             :rem 147
612 INPUT"RET EARNINGS";RE             :rem 129
613 INPUT"# SH OUTSTDG";SH             :rem 44
614 INPUT"LT DEBT";LT                  :rem 9
615 INPUT"INVENTORIES";IV              :rem 160
616 PRINT"SINKING FUND-0 IF UNK"       :rem 136
617 INPUTSF:IFSF=0THENSF=.05*LT        :rem 248
618 PRINT"PRINT ENTRIES (Y/N)?";       :rem 184
619 GETA$                              :rem 229
620 IFA$="Y"THENGOSUB2000              :rem 215
621 IFA$="N"THEN625                    :rem 40
622 GOTO619                            :rem 115
625 X1=((CA-CL)/TA)*100:X2=(RE/TA)*100:X3
    =(E/TA)*100                        :rem 67
627 X4=((SH*MP)/(LT+CL))*100:X5=NS/TA
                                       :rem 106
630 Z=.012*X1+.014*X2+.033*X3+.006*X4+.99
    9*X5                               :rem 74
635 TR=1-(TP/IB)                       :rem 142
640 CR=CA/CL:PM=NI/NS*100:RI=X5*PM:BR=E/(
    (I)+(SF/TR)):IT=CG/IV              :rem 10
650 PRINT"{CLR}{RVS}FUNDAMENTAL ANALYSIS
    {OFF}":PRINT"{RVS}FOR "S$"{OFF}{DOWN}
    "                                  :rem 152
660 PRINT"BANKRUPTCY ANALYSIS ":PRINT"FOR
     "S$" YIELDS":PRINT"A SCORE OF"FNR(Z)
                                       :rem 57
670 PRINT">2.68 NON-BANKRUPT":PRINT"<1.81
     BANKRUPT":PRINT"=1.81-2.68 UNCERTAIN
    "                                  :rem 35
680 PRINTTAB(6)"{RVS}LIQUIDITY{OFF}":PRIN
    T"CURRENT RATIO="FNR(CR)           :rem 229
690 PRINTTAB(6)"{RVS}ACTIVITY{OFF}"
                                       :rem 223
695 PRINT"ASSET TURNS="FNR(X5):PRINT"INVE
    NTORY TURNS="FNR(IT)               :rem 24
```

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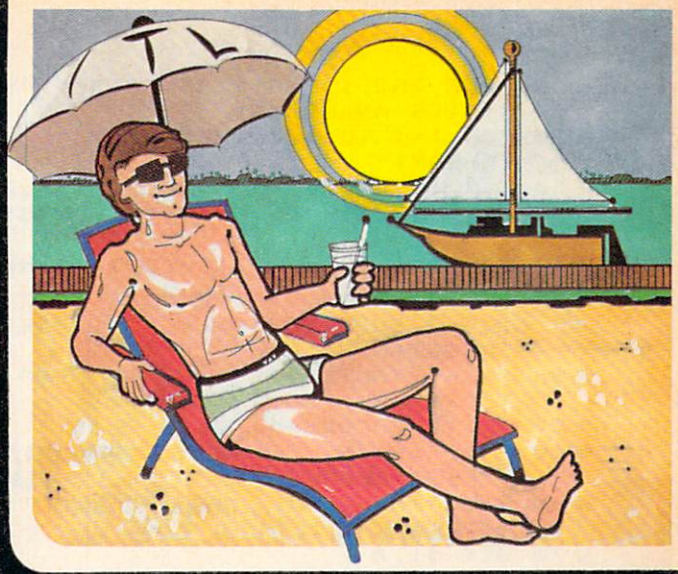
```
700 PRINTTAB(4)"{RVS}PROFITABILITY{OFF}"
                                    :rem 74
705 PRINT"PROFIT MARGIN="FNR(PM)"%":PRINT
    "ROI="FNR(RI)"%"                :rem 230
710 PRINTTAB(9)"{RVS}RISK{OFF}":PRINT"BUR
    DEN COVERAGE="FNR(BR)           :rem 198
720 GOTO435                         :rem 110
750 PRINT"{CLR}{RVS}REVISED GRAHAM MODEL
    {OFF}":INPUT"STOCK SYMBOL";S$:rem 241
755 INPUT"AAA CORP YLD";AA:DEFFNR(X)=INT(
    ((10↑2)*X)+.5)/(10↑2):AA=AA*100
                                    :rem 109
760 PRINT"EST ANNUAL GROWTH RATE";:IFCP=2
    THENPRINT                       :rem 226
761 PRINT"OVER 7-10 YRS{2 SPACES}(Y/N)"
                                    :rem 149
762 GETA$                           :rem 228
764 IFA$="Y"THEN870                  :rem 61
766 IFA$="N"THEN780                  :rem 52
770 GOTO762                         :rem 118
780 PRINT"{DOWN}LIST CURRENT YR FIRST.";
                                    :rem 124
781 IFCP=2THENPRINT                 :rem 237
782 PRINT"SEPARATE ENTRIES WITH COMMAS"
                                    :rem 221
785 PRINT"{RVS}YEAR{3 SPACES}EPS{OFF}"
                                    :rem 50
790 X(1)=2:X(2)=1:X(3)=0:X(4)=-1:X(5)=-2
                                    :rem 85
800 FORN=1TO5:INPUTR(N),Y(N)        :rem 242
805 IFY(N)=0THENPRINT"DIV BY 0.ENTER AGAI
    N":N=N-1:NEXTN                  :rem 131
810 YT=YT+Y(N):XY=XY+Y(N)*X(N):NEXTN
                                    :rem 55
820 A=YT/5:B=XY/10:NE=A+B*X(1)      :rem 223
830 FORN=1TO4                       :rem 21
831 IFY(N+1)<Y(N)ANDY(N+1)<0THENG(N)=(Y(N
    )-Y(N+1))/ABS(Y(N+1))*100       :rem 199
832 IFY(N+1)<Y(N)ANDY(N+1)<0THENGT=GT+G(N
    ):GOTO836                       :rem 14
833 IFY(N+1)>Y(N)ANDY(N)<0THENG(N)=(Y(N)-
    Y(N+1))/ABS(Y(N+1))*100         :rem 111
834 IFY(N+1)>Y(N)ANDY(N)<0THENGT=GT+G(N):
    GOTO836                         :rem 182
835 G(N)=(Y(N)-Y(N+1))/Y(N+1)*100:GT=GT+G
    (N)                             :rem 137
836 NEXTN                            :rem 46
840 GM=GT/4                         :rem 107
850 FORN=1TO4:GS=(G(N)-GM)↑2+GS:NEXTN
                                    :rem 60
860 SD=SQR(GS/3):GOTO880            :rem 200
870 INPUTGM:GM=GM*100                :rem 29
875 INPUT"NORMALIZED EPS";NE         :rem 35
880 HI=(37.5+8.8*(GM+SD))/AA*NE:LO=(37.5+
    8.8*(GM-SD))/AA*NE              :rem 206
885 ME=(37.5+8.8*GM)/AA*NE          :rem 135
890 PRINT"{CLR}{RVS}REVISED GRAHAM MODEL
    {OFF}":PRINT"{RVS}CALCULATIONS FOR "S
    $:PRINT                         :rem 160
895 IFNE<0THENPRINT"VALUE UNCERTAIN.
    {2 SPACES}NEG NORMALIZED EPS.":GOTO91
    0                               :rem 122
900 IFGM+SD=>-4.2614THENPRINT"HI VALUE=$"
    FNR(HI):GOTO904                 :rem 156
902 PRINT"HI VALUE UNCERTAIN"        :rem 35
904 IFGM=>-4.2614THENPRINT"MEAN VALUE=$"F
    NR(ME):GOTO908                  :rem 115
906 PRINT"MEAN VALUE UNCERTAIN"      :rem 183
908 IFGM-SD=>-4.2614THENPRINT"LO VALUE=$"
    FNR(LO):GOTO910                 :rem 183
909 PRINT"LO VALUE UNCERTAIN"        :rem 52
910 PRINT"AVG ANNUAL GROWTH RATE";:IFCP=2
    THENPRINT                       :rem 209
912 PRINT"FOR "S$"="FNR(GM)"%"       :rem 128
915 PRINT"STD DEV="FNR(SD)"%"        :rem 174
920 PRINT"GROWTH RATES WERE:"        :rem 51
930 FORN=1TO4:PRINTR(N),FNR(G(N))"%":NEXT
    N                               :rem 71
935 PRINT"NORMALIZED EPS=$"FNR(NE)
                                    :rem 122
940 GOTO435                         :rem 114
1000 PRINT"{CLR}":PRINTTAB(4)"{RVS}BOND V
     ALUATION{OFF}":                :rem 64
1010 PRINT"FOR $ 1,000 PAR VALUE":PRINT"B
     ONDS. INTEREST PAID"           :rem 38
1015 PRINT"SEMI-ANNUALLY.{DOWN}"    :rem 150
1020 INPUT"BOND NAME";B$            :rem 124
1030 INPUT"COUPON RATE";C:CI=C/2    :rem 189
1040 PRINT"APPROPRIATE INTEREST":INPUT"RA
     TE FOR BOND";K:KD=K/2          :rem 199
1050 PRINT"# OF FULL PERIODS TO"     :rem 59
1055 INPUT"BOND MATURITY";NY         :rem 35
1060 IST=CI*1000                    :rem 107
1070 PRINT"NUMBER DAYS UNTIL NEXT";
                                    :rem 153
1072 IFCP=2THENPRINT                 :rem 23
1074 PRINT"INTEREST PAYMENT.{2 SPACES}IF"
                                    :rem 230
1075 PRINT"UNKNOWN, USE 0."          :rem 69
1080 INPUTD:IFD=0THENPRINT"PRICE MAY VARY
      BY AS"                        :rem 226
1085 IFD=0THENPRINT"MUCH AS THE COUPON"
                                    :rem 132
1090 PA=(1-(1/(1+KD)↑NY))/KD        :rem 247
1100 PF=1/(1+KD)↑NY                  :rem 54
1110 V=IST*PA+1000*PF:IFD<>0THENV=(V+IST)
     *(1/(1+KD))↑(D/183)            :rem 189
1120 PRINT"{RVS}PRICE OF "B$"=$"FNR(V)"
     {OFF}"                         :rem 29
1130 GOTO435                        :rem 154
2000 OPEN4,4:SYS 828:RETURN         :rem 125
3000 END                            :rem 154
5000 FOR I=828 TO 919:READ A:CK=CK+A:POKE
      I,A:NEXT:IF CK=13169 THEN RETURN
                                    :rem 239
5010 PRINT"{DOWN}CHECK DATA STATEMENTS":P
     RINT"ERROR IN TYPING.":END     :rem 110
5020 DATA 162,004,032,201,255,169   :rem 78
5030 DATA 013,032,210,255,169,000   :rem 70
5040 DATA 133,253,173,136,002,133   :rem 78
5050 DATA 254,032,237,255,134,251   :rem 88
5060 DATA 152,170,134,252,160,000   :rem 73
5070 DATA 177,253,041,127,133,195   :rem 96
5080 DATA 041,064,010,005,195,041   :rem 76
5090 DATA 191,133,195,041,032,073   :rem 89
5100 DATA 032,010,005,195,032,210   :rem 62
5110 DATA 255,200,196,251,208,226   :rem 87
5120 DATA 169,013,032,210,255,024   :rem 76
5130 DATA 165,253,101,251,133,253   :rem 80
5140 DATA 165,254,105,000,133,254   :rem 79
5150 DATA 166,252,202,208,199,032   :rem 93
5160 DATA 204,255,169,004,032,195   :rem 92
5170 DATA 255,096                   :rem 78
```

Program 2: Atari Securities Analysis

Refer to the "Automatic Proofreader" article before typing this program in.

```
NC 10 ? "{CLEAR}":OPEN #1,4,0,"K:"
AH 15 GOSUB 1300:REM REMOVE IF YOU DON
      'T HAVE A PRINTER
```

April 15th. is just around the corner...



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```
BO 20  POKE 752,1:POSITION 10,5:? "SECU
       RITIES ANALYSIS"
GB 30  FOR I=1 TO 1000:NEXT I:? "
       {CLEAR}"
NH 50  CLR :? "{CLEAR}":DIM S$(85),D(85
       ),A$(192),X(5),R(5),Y(5),G(5),B$
       (85)
LK 52  FOR I=1 TO 5:R(I)=0:G(I)=0:NEXT I
PD 55  POSITION 18,3:? "{INVERSE}MENU":POSITION
       2,5:? "USE DECIMALS TO EXPRESS P
       ERCENTAGES."
NP 56  PRINT "OMIT $ SIGNS AND KEEP UNI
       TS":PRINT "EQUIVALENT."
CG 57  ? :? "CHOOSE 1, 2, 3 OR 4:"
NO 60  ? :? :PRINT "{INVERSE}1) STOCK VALUATION"
       :? :? "{INVERSE}2) FUNDAMENTAL ANALYSIS"
GJ 65  ? :PRINT "{INVERSE}3) BOND VALUATION":? :
       ? "{INVERSE}4) END PROGRAM"
AI 70  GET #1,A
KF 73  IF A=49 THEN 200
KD 75  IF A=50 THEN 600
ML 80  IF A=51 THEN 1000
OF 83  IF A=52 THEN END
AJ 90  GOTO 70
BF 200  ? "{CLEAR}":POSITION 10,6:? "{INVERSE}1
       {INVERSE} FOR GORDON MODEL.":POSITION 10
       ,10:? "{INVERSE}2{INVERSE} FOR GRAHAM MODEL."
DE 201  GET #1,A
NE 202  IF A=49 THEN 205
NC 203  IF A=50 THEN 750
CA 205  ? "{CLEAR}":POSITION 14,2:? "{INVERSE}GO
       RDON MODEL"
KO 210  POSITION 14,4:PRINT "STOCK SYMB
       OL";:INPUT S$
OI 220  POSITION 8,6:? "LONG TERM U.S.
       TREASURY";:INPUT RF
CH 230  POSITION 16,8:? "BETA";:INPUT B
       :KI=RF+B*0.055
GL 240  POSITION 12,10:? "CURRENT DIVID
       END";:INPUT D
BI 245  D(0)=D:IF D(0)=0 THEN POSITION
       10,12:? "{INVERSE}PRICE INDETERMINATE":G
       OTO 435
JL 280  ? :? " EST AVG ANNNUAL GROWTH R
       ATE (Y/N)"
DN 282  GET #1,A
OC 284  IF A=89 THEN 340
OL 286  IF A=78 THEN 295
HA 290  GOTO 282
FL 295  POSITION 7,14:? "CURRENT EARNIN
       GS PER SHARE";:INPUT EPS
MP 297  IF EPS=0 THEN ? "{CLEAR}":POSIT
       ION 12,4:? "{INVERSE}PRICE INDETERMINATE
       ":GOTO 435
LJ 300  POSITION 10,16:? "CURRENT NET I
       NCOME";
LP 305  INPUT NI
GN 310  POSITION 10,18:? "STOCKHOLDERS
       EQUITY";
MO 315  INPUT NW
BA 320  ROE=NI/NW:RET=1-(D(0)/EPS)
BM 330  G=RET*ROE:GOTO 400
GO 340  INPUT G
PP 350  POSITION 8,14:? "GROWTH CONSTAN
       T (Y/N)"
DL 352  GET #1,A
NN 354  IF A=89 THEN 400
OE 356  IF A=78 THEN 470
GM 360  GOTO 352
CJ 400  D1=D(0)*(1+G)
EC 410  IF KI<=G THEN 470
CA 420  P=D1/(KI-G)
LG 430  X=P:GOSUB 1200:? :? "
       {3 SPACES}GORDON MODEL VALUES "
       ;S$;" AT $";X
EP 435  POSITION 11,23:? "{INVERSE}PRINT ENTRIES
       (Y/N)"
DJ 440  GET #1,A
IK 443  IF A=89 THEN GOSUB 2000
BN 445  IF A<>78 THEN 440
HB 450  ? "{CLEAR}":GOTO 50
MB 470  ? :? "EST. LENGTH OF GROWTH PER
       IOD IN YEARS"
OL 480  INPUT N:N=N-1
CD 500  FOR I=0 TO N
AF 510  D(I+1)=(D(0)*(1+G)^(I+1))*(1/(1
       +KI)^(I+1))
FD 520  DI=DI+D(I+1)
DG 530  DMAX=D(0)*(1+G)^(I+1)
CB 540  NEXT I
IH 550  ? :? "SUBSEQUENT GROWTH RATE MU
       ST BE <";KI
MA 560  INPUT NG
NJ 570  C=(DMAX*(1+NG)/(KI-NG))
ED 580  P=C*(1/(1+KI)^(I))+DI:GOTO 430
CB 600  ? "{CLEAR}":POSITION 12,2:? "{INVERSE}DA
       TA INPUT STAGE"
GC 601  POSITION 12,4:? "STOCK SYMBOL";
       :INPUT S$
GB 602  POSITION 10,6:? "AVERAGE MARKET
        PRICE";:INPUT MP
JK 603  POSITION 15,8:? "NET SALES";:IN
       PUT NS
MG 604  POSITION 11,10:? "COST OF GOODS
        SOLD";:INPUT CG
JD 605  POSITION 12,12:? "INTEREST EXPE
       NSE";:INPUT I
GH 606  POSITION 11,14:? "INCOME BEFORE
        TAX";:INPUT IB:E=IB+I
LO 607  POSITION 15,16:? "INCOME TAX";:
       INPUT TP:POSITION 15,18:? "NET
       INCOME";:INPUT NI
IK 608  POSITION 12,20:? "{INVERSE}PRINT ENTRIES
       (Y/N)";
EA 609  GET #1,A
IG 610  IF A=89 THEN GOSUB 2000
BP 611  IF A<>78 THEN 609
EF 612  ? "{CLEAR}":POSITION 12,2:? "CU
       RRENT ASSETS";:INPUT CA
GP 613  POSITION 10,4:? "CURRENT LIABIL
       ITIES";:INPUT CL
IF 614  POSITION 14,6:? "TOTAL ASSETS";
       :INPUT TA
IB 615  POSITION 12,8:? "RETAINED EARNI
       NG";:INPUT RE
KG 616  POSITION 6,10:? "NUMBER OF OUTS
       TANDING SHARES";:INPUT SH
ON 617  POSITION 11,12:? "LONG TERM DEB
       T";:INPUT LT
MB 618  POSITION 14,14:? "INVENTORIES";
       :INPUT IV
KO 620  POSITION 4,16:? "SINKING FUND,
       TYPE {INVERSE}0{INVERSE} IF UNKNOWN"
BL 621  ? "{3 SPACES}";:INPUT SF:IF SF=
       0 THEN SF=0.05*LT
FB 622  POSITION 11,18:? "{INVERSE}PRINT ENTRIES
       (Y/N)"
DM 623  GET #1,A
IL 624  IF A=89 THEN GOSUB 2000
CA 625  IF A<>78 THEN 623
EJ 626  X1=((CA-CL)/TA)*100:X2=(RE/TA)*
       100:X3=(E/TA)*100:X4=((SH*MP)/(
       LT+CL))*100:X5=NS/TA
KN 630  X=0.012*X1+0.014*X2+0.033*X3+6.
       0E-03*X4+0.999*X5
IO 635  TR=1-(TP/IB)
```

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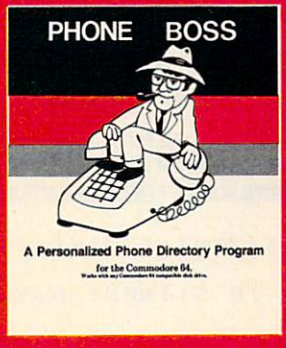

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```
AK 640 CR=CA/CL:PM=NI/NS*100:RI=X5*PM:
       BR=E/((I)+(SF/TR)):IT=CG/IV
KH 650 ? "{CLEAR}":POSITION 6,2:? "FUN
       DAMENTAL ANALYSIS FOR ";S$
ED 660 POSITION 10,4:? "BANKRUPTCY ANA
       LYSIS":POSITION 10,6:? "YIELDS
       A SCORE OF ";:GOSUB 1200:? X:?
ND 670 ? "   > 2.68 IS NON-BANKRUPT":?
       "   < 1.81 IS BANKRUPT":? "  BET
       WEEN 1.81 & 2.68 IS UNCERTAIN"
JM 680 POSITION 15,12:? "LIQUIDITY":PO
       SITION 14,14:? "RATIO EQUALS ";
       :X=CR:GOSUB 1200:? X
NJ 690 POSITION 15,16:? "ACTIVITY":POS
       ITION 12,18:? "ASSET TURNS =";:
       X=X5:GOSUB 1200:? X
GL 695 POSITION 12,19:? "INVENTORY TUR
       NS =";:X=IT:GOSUB 1200:? X
FG 696 POSITION 11,21:? "PRINT ENTRIES
       (Y/N)"
EH 697 GET #1,A
JG 698 IF A=89 THEN GOSUB 2000
DG 699 IF A<>78 THEN 697
PJ 700 ? "{CLEAR}":POSITION 13,2:? "PR
       OFITABILITY":POSITION 12,4:? "P
       ROFIT MARGIN =";:X=PM:GOSUB 120
       0:? ;X;"%"
MH 705 POSITION 9,6:? "RETURN ON INVES
       TMENT=";:X=RI:GOSUB 1200:? X;"%
       "
DH 710 POSITION 18,8:? "RISK":POSITION
        9,10:? "BURDEN COVERAGE =";:X=
       BR:GOSUB 1200:? X
IM 718 POSITION 12,20:? "PRINT ENTRIES
       (Y/N)";
EC 719 GET #1,A
II 720 IF A=89 THEN GOSUB 2000
CC 721 IF A<>78 THEN 619
IO 722 ? "{CLEAR}":CLR :GOTO 50
DK 750 ? "{CLEAR}":POSITION 10,2:? "RE
       VISED GRAHAM MODEL"
GL 752 POSITION 14,4:? "STOCK SYMBOL";
       :INPUT S$
DN 755 POSITION 11,6:? "AAA CORPORATE
       YIELD";:INPUT AA:AA=AA*100
IF 760 POSITION 6,8:? "ESTIMATED ANNUA
       L GROWTH RATE":POSITION 9,9:? "
       OVER 7-10 YEARS (Y/N)"
EA 762 GET #1,A
ON 764 IF A=89 THEN 870
CJ 765 IF A<>78 THEN 762
CB 780 POSITION 3,11:? "INPUT CURRENT
       YEAR FIRST. SEPARATE ":POSITION
        10,12:? "ENTRIES WITH COMMAS."
EC 785 ? "YEAR  EPS (EARNINGS PER SHAR
       E)"
FF 790 X(1)=2:X(2)=1:X(3)=0:X(4)=-1:X(
       5)=-2
DG 800 FOR N=1 TO 5:INPUT R,Y:R(N)=R:Y
       (N)=Y
MF 805 IF Y(N)=0 THEN ? "  DIVISION BY
        ZERO,ENTER AGAIN":N=N-1:NEXT N
DH 810 YT=YT+Y(N):XY=XY+Y(N)*X(N):NEXT
        N
NP 820 A=YT/5:B=XY/10:NE=A+B*X(1)
EM 822 POSITION 11,20:? "PRINT ENTRIES
       (Y/N)"
DO 823 GET #1,A
IN 824 IF A=89 THEN GOSUB 2000
CE 825 IF A<>78 THEN 823
BF 830 FOR N=1 TO 4
IL 831 IF Y(N+1)/Y(N) AND Y(N+1)<0 THE
       N G(N)=(Y(N)-Y(N+1))/ABS(Y(N+1)
       )*100:GT=GT+G(N):GOTO 835
DP 832 IF Y(N+1)>Y(N) AND Y(N)<0 THEN
       G(N)=(Y(N)-Y(N+1))/ABS(Y(N+1))*
       100:GT=GT+G(N):GOTO 835
IH 833 G(N)=(Y(N)-Y(N+1))/Y(N+1)*100:G
       T=GT+G(N)
CN 835 NEXT N
GL 840 GM=GT/4
DM 850 FOR N=1 TO 4:GS=(G(N)-GM)^2+GS:
       NEXT N
MI 860 SD=SQR(GS/3):GOTO 880
GD 870 PRINT "{10 SPACES}";:INPUT GM:GM
       =GM*100
BF 875 ? :? "{11 SPACES}NORMALIZED EPS"
       ;:INPUT NE
MO 880 HI=(37.5+8.8*(GM+SD))/AA*NE:LO=
       (37.5+8.8*(GM-SD))/AA*NE
IH 885 ME=(37.5+8.8*GM)/AA*NE
EE 890 ? "{CLEAR}":POSITION 10,1:? "RE
       VISED GRAHAM MODEL":POSITION 10
       ,2:? "CALCULATIONS FOR ";S$
DP 895 IF NE<0 THEN POSITION 2,4:? "VA
       LUE UNCERTAIN. NEG NORMALIZED E
       PS":GOTO 910
MC 900 IF GM+SD=-4.2614 OR GM+SD>-4.26
       14 THEN POSITION 11,4:? "HIGH V
       ALUE =$";:X=HI:GOSUB 1200:? X:G
       OTO 904
NE 902 POSITION 10,4:? "HIGH VALUE UNC
       ERTAIN"
EK 904 IF GM>-4.2614 OR GM=-4.2614 THE
       N POSITION 11,6:? "MEAN VALUE =
       $";:X=ME:GOSUB 1200:? X:GOTO 90
       8
NL 906 POSITION 10,6:? "MEAN VALUE UNC
       ERTAIN"
KL 908 IF GM-SD=-4.2614 OR GM-SD>-4.26
       14 THEN POSITION 11,8:? "LOW VA
       LUE =$";:X=LO:GOSUB 1200:? X:GO
       TO 910
LB 909 POSITION 10,8:? "LOW VALUE UNCE
       RTAIN"
CC 910 POSITION 4,10:? "AVERAGE ANUUAL
        GROWTH RATE =";:X=GM:GOSUB 120
       0:? X;"%"
FL 915 POSITION 7,12:? "STANDARD DEVIA
       TION =";:X=SD:GOSUB 1200:? X;"%
       "
FH 920 POSITION 2,14:? "GROWTH RATES W
       ERE:"
KI 930 FOR N=1 TO 4:? R(N);"  ";:X=G(N
       ):GOSUB 1200:? X;"%":NEXT N
OH 931 POSITION 10,20:? "NORMALIZED EP
       S =$";:X=NE:GOSUB 1200:? X
FB 933 POSITION 11,22:? "PRINT ENTRIES
       (Y/N)"
EC 935 GET #1,A
JC 937 IF A=89 THEN GOSUB 2000
CO 939 IF A<>78 THEN 935
JA 940 ? "{CLEAR}":CLR :GOTO 50
OF 1000 ? "{CLEAR}":POSITION 13,2:? "B
       OND VALUATION"
PA 1010 ? :? "{4 SPACES}FOR $ 1,000 PA
       R VALUE BONDS.":? "{4 SPACES}I
       NTEREST PAID SEMI-ANNUALLY."
GN 1020 POSITION 15,7:? "BOND NAME";:I
       NPUT B$
JH 1030 POSITION 14,9:? "COUPON RATE";
       :INPUT C:C1=C/2
KO 1040 ? :? "APPROPRIATE INTEREST RAT
       E FOR BOND";:INPUT K:KD=K/2
AL 1050 POSITION 8,13:? "NUMBER OF FUL
       L PERIODS":POSITION 11,14:? "T
       O BOND MATURITY"
PK 1055 ? "{13 SPACES}";:INPUT NY
```

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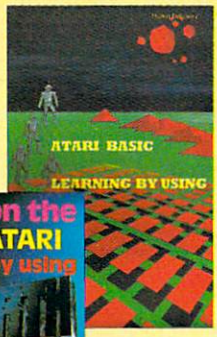

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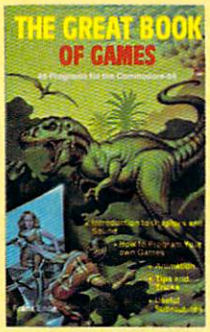

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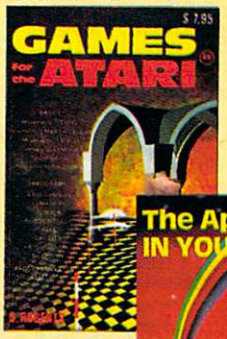

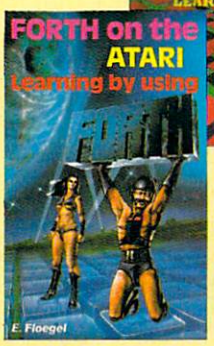

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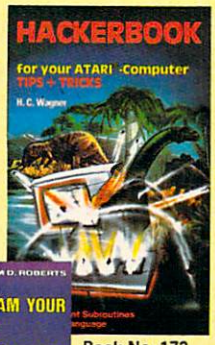

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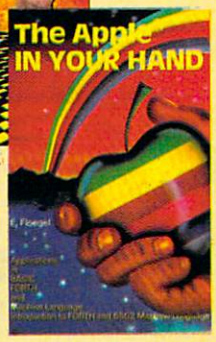

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```
FD 1060 IST=C1*1000
DK 1070 POSITION 7,16:? "NUMBER OF DAY
        S UNTIL NEXT":POSITION 11,17:?
         "INTEREST PAYMENT."
CN 1075 POSITION 12,18:? "IF UNKNOWN,
        USE 0."
OE 1080 ? "{10 SPACES}";:INPUT D:IF D=0
         THEN ? :? "PRICE MAY VERY AS
        MUCH AS THE COUPON"
PH 1090 PA=(1-(1/(1+KD)^NY))/KD
DG 1100 PF=1/(1+KD)^NY
LN 1110 V=IST*PA+1000*PF:IF D<>0 THEN
        V=(V+IST)*(1/(1+KD))^(D/183)
BM 1120 POSITION 10,20:? "PRICE OF ";B
        $;" = $";:X=V:GOSUB 1200:? X
HI 1122 POSITION 11,22:? "PRINT ENTRIE
        S (Y/N)"
GI 1123 GET #1,A
LH 1124 IF A=89 THEN GOSUB 2000
HI 1125 IF A<>78 THEN 1123
LI 1130 ? "{CLEAR}":CLR :GOTO 50
PC 1200 X=INT(((10^2)*X)+0.5)/(10^2):R
        ETURN
JK 1300 OPEN #2,4,0,"S:":OPEN #3,8,0,"
        P:":RETURN
KF 1310 RETURN
JD 2000 PRINT #3;CHR$(10)
HI 2010 FOR Y=0 TO 23
IB 2020 FOR X=2 TO 39
BH 2030 POSITION X,Y
GO 2040 GET #2,G
DL 2045 IF G>127 THEN G=G-128
IJ 2050 PUT #3,G
FP 2060 NEXT X
KM 2070 PRINT #3
GC 2080 NEXT Y
MM 2090 POSITION 0,0
KD 2100 RETURN
```

Program 3: PC And PCjr Securities Analysis

```
10 DEF SEG=0:POKE 1047,PEEK(1047) OR 64:
WIDTH 40:KEY OFF
20 CLS:LOCATE 12,11,0:PRINT"Securities A
nalysis"
30 FOR I=1 TO 1000 : NEXT I
40 CLS:DEF FNR(X)=INT(((10^2)*X)+.5)/(10
^2)
50 COLOR 0,7:LOCATE 3,18:PRINT"Menu":COL
OR 7,0: LOCATE 6,1:PRINT"(Use decimals t
o express percentages."
55 PRINT"Omit $ signs and keep units equ
ivalent.)"
60 LOCATE 11,8:PRINT"Choose 1, 2, 3, or
4:"
62 LOCATE 14,8:PRINT"1) Stock valuations
":LOCATE 16,8:PRINT"2) Fundamental analy
sis"
64 LOCATE 18,8:PRINT"3) Bond valuation":
LOCATE 20,8:PRINT"4) End"
70 A$=INKEY$
75 ON VAL(A$) GOTO 200,600,1000,3000
90 GOTO 70
200 CLS:LOCATE 8,9:PRINT "Choose:":COLOR
 0,7:LOCATE 12,10:PRINT"(1) For Gordon m
odel":LOCATE 16,10:PRINT"(2) For Graham
model":COLOR 7,0
201 A$=INKEY$
202 ON VAL(A$) GOTO 205,750
204 GOTO 201
205 CLS:COLOR 0,7:LOCATE 1,14:PRINT"Gord
on model":COLOR 7,0
210 PRINT:INPUT"Stock symbol";S$
220 INPUT"Long term U.S. Treasury rate";
RF
230 INPUT"Beta";B:KI=RF+B*.055
240 INPUT"Current dividend";D(0):IF D(0)
=0 THEN COLOR 0,7:LOCATE 12,1:PRINT"Pric
e indeterminate":COLOR 7,0:FOR I=1 TO 20
00:NEXT I:GOTO 435
280 PRINT"Estimated average annual growt
h rate    (Y/N)";
282 A$=INKEY$
284 IF A$="Y" THEN 340
286 IF A$="N" THEN 295
290 GOTO 282
295 PRINT:INPUT"Current earnings per sha
re";EPS
297 IF EPS=0 THEN COLOR 0,7:LOCATE 12,1:
PRINT"Price indeterminate":COLOR 7,0:FOR
 I=1 TO 2000:NEXT I:GOTO 435
300 INPUT"Current net income";NI
310 INPUT"Stockholders equity";NW
320 ROE=NI/NW:RET=1-(D(0)/EPS)
330 G=RET*ROE:GOTO 400
340 INPUT G
350 PRINT"Growth constant (Y/N)";
352 A$=INKEY$
354 IF A$="Y" THEN 400
356 IF A$="N" THEN 470
360 GOTO 352
400 D1=D(0)*(1+G)
410 IF KI=<G THEN 470
420 P=D1/(KI-G)
430 DEF FNR(X)=INT(((10^2)*X)+.5)/(10^2)
433 PRINT:COLOR 0,7:PRINT"Gordon model v
alues "S$" at $"FNR(P):COLOR 7,0
435 LOCATE 20,1:PRINT"1) Menu
2) Print":PRINT"3) Gordon Model   4) Gra
ham Model"
440 A$=INKEY$
442 IF VAL(A$)<1 OR VAL(A$)>4 THEN 440
445 IF A$="1" THEN CLEAR:GOTO 40
450 IF A$="2" THEN CLEAR:GOSUB 2000:GOTO
 440
455 IF A$="3" THEN CLEAR:GOTO 205
460 IF A$="4" THEN CLEAR:GOTO 750
470 PRINT:PRINT"Estimated length of grow
th period in    years"
480 INPUT N:N=N-1
500 FOR I=0 TO N:D(I+1)=(D(0)*(1+G)^(I+1
))*(1/(1+KI)^(I+1))
520 DI=DI+D(I+1)
530 DMAX=D(0)*(1+G)^(I+1):NEXT I
550 PRINT"Subsequent growth rate?":PRINT
 "(must be <"KI")";
560 INPUT NG
570 C=(DMAX*(1+NG)/(KI-NG))
580 P=C*(1/(1+KI)^(I))+DI:GOTO 430
600 CLS:LOCATE 1,12:COLOR 0,7:PRINT"Data
 input stage":COLOR 7,0
601 PRINT:INPUT "Stock symbol";S$
602 INPUT "Average market price";MP
603 INPUT "Net sales";NS
604 INPUT "Cost of goods sold";CG
605 INPUT "Interest expense";I
606 INPUT "Income before tax";IB:E=IB+I
607 INPUT "Income tax";TP
608 INPUT "Net income";NI
609 INPUT "Current assets";CA
610 INPUT "Current liability";CL
```

```
611 INPUT "Total assets";TA
612 INPUT "Retained earnings";RE
613 INPUT "# shares outstanding";SH
614 INPUT "Long term debt";LT
615 INPUT "Inventories";IV
616 INPUT "Sinking fund (0 if unknown)";
SF:IF SF=0 THEN SF=.05*LT
618 PRINT:PRINT"Print entries (Y/N) ?";
619 A$=INKEY$
620 IF A$="Y" THEN GOSUB 2000
621 IF A$="N" THEN 625
622 GOTO 619
625 X1=((CA-CL)/TA)*100:X2=(RE/TA)*100:X
3=(E/TA)*100:X4=((SH*MP)/(LT+CL))*100:X5
=NS/TA
630 Z=.012*X1+.014*X2+.033*X3+.006*X4+.9
99*X5
635 TR=1-(TP/IB)
640 CR=CA/CL:PM=NI/NS*100:RI=X5*PM:BR=E/
((I)+(SF/TR)):IT=CG/IV
650 CLS:COLOR 0,7:PRINT"Fundamental Anal
ysis for "S$:COLOR 7,0
660 PRINT:PRINT"Bankruptcy Analysis for
"S$" yields":PRINT"a score of "FNR(Z)"."
670 PRINT"(>2.68 non-bankrupt, <1.81 ban
krupt"
675 PRINT "1.81-2.68 uncertain)"
680 PRINT:PRINT TAB(6);:COLOR 0,7:PRINT"
Liquidity":COLOR 7,0:PRINT"Current ratio
= "FNR(CR)
690 PRINT TAB(6);:COLOR 0,7:PRINT"Activi
ty":COLOR 7,0:PRINT"Asset turns="FNR(X5)
:PRINT"Inventory turns="FNR(IT)
700 PRINT TAB(4);:COLOR 0,7:PRINT"Profit
ability":COLOR 7,0:PRINT"Profit margin="
FNR(PM)"%":PRINT"Return on investment="F
NR(RI)"%"
710 PRINT TAB(8);:COLOR 0,7:PRINT "Risk"
:COLOR 7,0:PRINT"Burden coverage="FNR(BR
)
720 GOTO 435
750 CLS:COLOR 0,7:PRINT"Revised Graham M
odel":COLOR 7,0:PRINT:INPUT"Stock symbol
";S$
755 INPUT"AAA corp yield";AA:DEF FNR(X)=
INT(((10^2)*X)+.5)/(10^2):AA=AA*100
760 PRINT"Estimated annual growth rate o
ver 7-10  yrs (Y/N) ";
762 A$=INKEY$
764 IF A$="Y" THEN 870
766 IF A$="N" THEN 780
770 GOTO 762
780 PRINT"List current yr first (Separat
e entries":PRINT"with commas)":COLOR 0,7
:PRINT"Year     EPS (Earnings per share)"
:COLOR 7,0
790 X(1)=2:X(2)=1:X(3)=0:X(4)=-1:X(5)=-2
800 FOR N=1 TO 5:INPUT R(N),Y(N)
805 IF Y(N)=0 THEN PRINT"Division by zer
o - Enter again":N=N-1:GOTO 815
810 YT=YT+Y(N):XY=XY+Y(N)*X(N)
815 NEXT N
820 A=YT/5:B=XY/10:NE=A+B*X(1)
830 FOR N=1 TO 4
831 IF Y(N+1)<Y(N) AND Y(N+1)<0 THEN G(N
)=(Y(N)-Y(N+1))/ABS(Y(N+1))*100:GT=GT+G(
N):GOTO 835
832 IF Y(N+1)>Y(N) AND Y(N)<0 THEN G(N)=
(Y(N)-Y(N+1))/ABS(Y(N+1))*100:GT=GT+G(N)
:GOTO 835
833 G(N)=(Y(N)-Y(N+1))/Y(N+1)*100:GT=GT+
G(N)
835 NEXT N
840 GM=GT/4
850 FOR N=1 TO 4:GS=(G(N)-GM)^2+GS:NEXT
N
860 SD=SQR(GS/3):GOTO 880
870 INPUT GM:GM=GM*100
875 INPUT"Normalized Earnings per share"
;NE
880 HI=(37.5+8.8*(GM+SD))/AA*NE:LO=(37.5
+8.8*(GM-SD))/AA*NE:ME=(37.5+8.8*GM)/AA*
NE
890 CLS:COLOR 0,7:PRINT"Revised Graham M
odel":PRINT"Calculations For "S$:COLOR 7
,0:PRINT
895 IF NE<0 THEN PRINT "Value uncertain.
 Neg. normalized EPS.":GOTO 910
900 IF GM+SD=>-4.2614 THEN PRINT"High va
lue=$"FNR(HI):GOTO 904
902 PRINT"Hi value uncertain"
904 IF GM=>-4.2614 THEN PRINT"Mean value
=$"FNR(ME):GOTO 908
906 PRINT"Mean value uncertain"
908 IF GM-SD=>-4.2614 THEN PRINT"Low Val
ue=$"FNR(LO):GOTO 910
909 PRINT"Low value uncertain"
910 PRINT"Avg. annual growth rate for "S
$"="FNR(GM)"%":PRINT"Standard Deviation=
"FNR(SD)"%"
920 PRINT"Growth rates were:"
930 FOR N=1 TO 4:PRINT R(N),FNR(G(N))"%"
:NEXT N
935 PRINT"Normalized EPS=$"FNR(NE)
940 GOTO 435
1000 CLS:LOCATE 1,10:COLOR 0,7:PRINT"Bon
d valuation":COLOR 7,0
1010 PRINT:PRINT "For $1,000 par value b
onds. Interest":PRINT"paid semi-annually
."
1015 PRINT
1020 INPUT"Bond name";B$
1030 PRINT:INPUT "Coupon rate";C:CI=C/2
1040 PRINT:INPUT"Appropriate interest ra
te for bond";K:KD=K/2
1050 PRINT:PRINT"Number of full periods
to bond maturity":INPUT NY
1060 IST=CI*1000
1070 PRINT:PRINT"Number days until next
interest":PRINT"payment. If unknown, use
 0."
1080 INPUT D:IF D=0 THEN PRINT:PRINT"Pri
ce may vary as much as the coupon."
1090 PA=(1-(1/(1+KD)^NY))/KD
1100 PF=1/(1+KD)^NY
1110 V=IST*PA+1000*PF:IF D<>0 THEN V=(V+
IST)*(1/(1+KD))^(D/183)
1120 COLOR 0,7:PRINT:PRINT"Price of "B$"
=$"FNR(V):COLOR 7,0
1130 GOTO 435
2000 LOCATE 23,1:PRINT"Press {Shift-PrtS
c} to print entries.":PRINT"Press {ENTER
} when printer is done.";
2003 A$=INKEY$:IF A$<>CHR$(13) THEN 2003
2005 LOCATE 23,1:PRINT STRING$(38,32):PR
INT STRING$(38,32);
2010 RETURN
3000 END
```

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Computers And Society

David D. Thornburg, Associate Editor

Beyond BASIC

One topic that can always be counted on to fill my mailbox with angry responses is the replacement of BASIC by other languages. Based on the responses I received last March, many personal computer users seem convinced that BASIC is the only computer language we will ever need, and that attempts to replace BASIC with something else will somehow destroy the nature of personal computing.

If I had a dime for each letter I receive telling me how "good" BASIC is, I could probably retire soon. To pick just one example of blind support for BASIC, I overheard a salesman at a major computer retailer tell a customer that he should buy Logo for his kids and use BASIC for his own programming. After the confused (and seriously misinformed) customer left, I asked the salesman if he knew what he had done. I told him that he might as well have said that the customer should buy a Porsche for his kids and a rusty bike for himself.

I think one reason people get so defensive about BASIC is that they don't want to feel that their own investment of time and energy has been wasted. This is a natural and completely understandable response.

Not A Wasted Investment

It is important that BASIC users realize that their investment won't be wasted as they learn new languages. A knowledge of BASIC (or any other computer language) not only eases the learning of new languages, but also helps the user grasp the features of new languages.

I know this to be true because I, too, was once a BASIC enthusiast. My initial enthusiasm for BASIC arose from my reluctance to learn machine language (I'm really not a bit-twiddler at heart), and from the absence of any other high-level language for personal computers.

While the use of BASIC on personal computers is largely an accident of history, it offered the beginning personal computer user a smorgasbord of features—a little arithmetic, a little string manipulation, a little screen formatting, etc. In fact, BASIC was designed to be a jack-of-all-trades (and a master of none). When compared with FORTRAN (the language from which BASIC was derived), BASIC was clearly the better choice for first-time programmers—especially if they were *not* going to become computer scientists.

Freedom Of Choice, Finally

But, like almost everything else, languages do not stand still. Since 1978, quite a few alternatives to BASIC have appeared on personal computers. One of the highlights of the personal computer industry occurred when Atari decided to sell computers *without* a built-in language. The freedom of choice this offered the user was most refreshing. Unfortunately, most other manufacturers of home-based personal computers still give BASIC "free" (you pay for it—don't worry about that!) with the purchase of the computer.

As I became more interested in languages like PILOT, Logo, and PROLOG, I kept trying to identify one aspect of these languages that made them more appealing to me than BASIC. On the surface they are all quite similar: Programs in all four of these languages are collections of words and symbols. Each of these languages has a vocabulary and a grammar, and, on this basis, one may be tempted to argue that all languages are equivalent.

But this is not true. Without trying to be too philosophical, there is much to be said for the idea that the very nature of the things we think about is influenced by the language in which we do our thinking.

Languages Encourage Versatility

When this idea is applied to the computer, it suggests that the types of programs we create are influenced by the computer languages we use. This implies that, to be a versatile programmer, one benefits from knowing several computer languages. From my own experience, I find that this is true. I use Logo for most of my mathematical calculations, PILOT for text programming, and PROLOG for data base programs.

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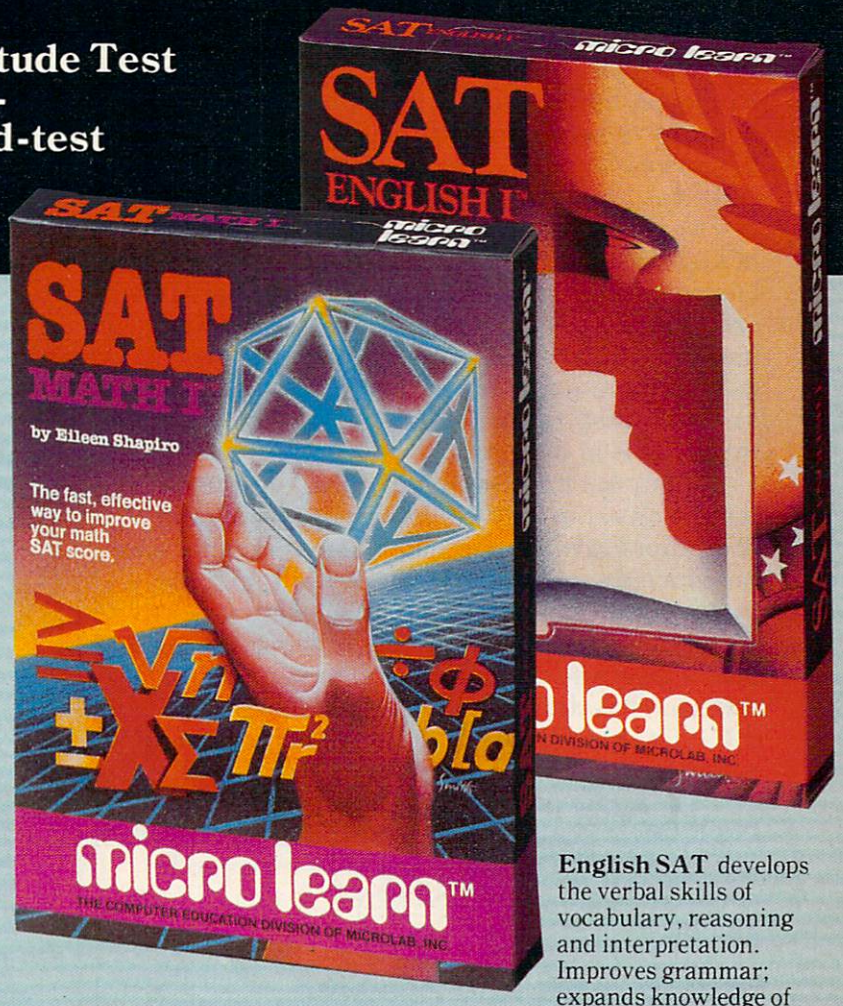

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But my desire to be multilingual was not what pulled me from BASIC. Until recently, I had only a vague idea why I preferred other languages, or why I preferred parts of these languages over other parts.

I think I have finally found the key to understanding the fundamental differences between various computer languages, and their "ease of use" by casual programmers. Computer programs can be classified as either *prescriptive* or *descriptive*. A prescriptive program (or procedure) is one that tells the computer *how* to perform a computational task, and a descriptive program or procedure tells the computer *what* task to perform, without specifying how it is to be done.

Fundamental Distinctions

To my way of thinking, these distinctions are fundamental. By examining various computer languages on the basis of their prescriptive or descriptive nature, we can begin to see why some languages (or parts of languages) may be perceived as "friendlier" than others.

For example, the turtle graphics component of Logo is so popular that many Logo users remain blissfully unaware that Logo contains a very powerful list processing environment suitable for many exciting programming tasks. On closer examination, one finds that turtle graphics programs consist largely of *descriptions* of the tasks the turtle is to perform.

Many list processing programs, on the other hand, consist mainly of *prescriptions* telling the computer *how* to manipulate the text or other data on which the program operates. In PILOT, the match command (M:) allows the programmer to search for any set of characters or words inside a user's response without having to specify *how* this search is done. Neither BASIC, Logo, nor PROLOG has this feature. The match command is descriptive, not prescriptive.

The entire predicate calculus portion of PROLOG is descriptive. Not surprisingly, this aspect of PROLOG is starting to be explored by children with the ease and facility of Logo's turtle graphics.

Easy To Learn And Powerful

This all suggests that descriptive languages are easier to learn than prescriptive languages. Based on the kinds of programs that can be created with PILOT, Logo, and PROLOG, it is also clear that a descriptive environment is no less powerful than a prescriptive one.

While all languages presently used with personal computers have prescriptive components, it is exciting to imagine the creation of purely descriptive languages. By freeing us from the arduous task of telling the computer *how* to perform the chores we want it to carry out, we become free to tell the computer *what* we want it to do instead.

This descriptive component of newer languages will, more than anything else, allow us to move well beyond BASIC in the future. I once predicted that BASIC would be displaced as the language of choice for nonprofessional programmers within five years. One year has passed, and there are indications that this prediction is still on target.

I realize that many of you may remain unconvinced. You should try PILOT or Logo for a while (I would encourage you to try a nonprocedural language like PROLOG, but it is still hard to find in the United States). Once you have spent a few days away from BASIC, let me know what you think. Remember that there is no perfect computer language, but PILOT, Logo, and PROLOG may be pointing to a new model for computer programming that will make the power of the computer accessible to all who care to use it.

David Thornburg's other column "Friends of the Turtle" will reappear later this year. ©

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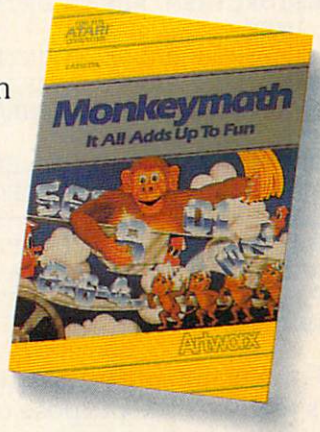

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THE BEGINNER'S PAGE

Richard Mansfield, Senior Editor

Size, Speed, Or Clarity

As you progress as a programmer, you'll start to notice that there are several ways to write a given program. Sometimes dozens of ways. Is it better to have the program use up as little memory as possible? Should it run at maximum speed? Or should you include extensive REMarks and subroutines to make the program LISTing easy to read and understand?

The following three programs all accomplish the same thing. They print the words *one two three four five* 100 times on screen. However, there are significant differences. They use up varying amounts of the computer's RAM memory; they run at different speeds; and they are of differing degrees of comprehensibility. This program emphasizes clarity:

Program 1: Clarity

```
10 TI$="000000":REM TIMER SET AT ZERO
20 DATA ONE,TWO,THREE,FOUR,FIVE:REM ITEMS
    TO BE PRINTED
30 FORI=1TO5:REM START OF LOOP
40 GOSUB 400:REM SUBROUTINE FOR READ AND
   {SPACE}PRINT
50 NEXT:REM REDO LOOP
60 RESTORE:REM RESET DATA POINTER TO FIRS
   T ITEM
70 X=X+1:REM RAISE COUNTER
80 PRINT:REM PRINT CARRIAGE RETURN
90 IFX<100THEN30:REM CHECK TO SEE IF 100
   {SPACE}IS REACHED
100 PRINTTI$:REM PRINT ELAPSED TIME
110 END:REM FINISH OF PROGRAM
120 REM----------------------
400 REM SUBROUTINE TO READ AND PRINT DATA
410 READ D$:REM GET DATA ITEM
420 PRINTD$" ";:REM PRINT DATA ITEM
430 RETURN
```

This version includes extensive REMark statements to define the purpose of each action. It also has a *subroutine* between lines 400–430. A subroutine is a portion of a program which is used more than once and is set apart from the main program. The subroutine in this example first READs, then PRINTs one of the words we're putting on screen, and then it RETURNs to the main program. The subroutine is set apart from the main program visually by the REM in line 120. Putting a subroutine off by itself like this contributes to the readability of the program's LISTing.

REMs Have Disadvantages

REMarks have no effect on what a program actually does. They do slow it down slightly when it RUNs, and they take up extra space in RAM memory. However, REMs make reading a program LISTing easier. You might want to modify your program at a later date and might then find the REMarks helpful when trying to follow the logic of the programming. Likewise, if someone else is trying to understand your program, REMarks can be of great assistance.

The TI$ in lines 10 and 100 is specific to Commodore computers. It first clears and then prints out the computer's internal clock. We've included it so that we can easily see how fast these different versions RUN.

But let's go for brevity now. We'll strip off all the REMarks, put the subroutine back inside the main program, and see how this changes things:

Program 2: Brevity

```
10 TI$="000000"
20 DATA ONE,TWO,THREE,FOUR,FIVE
30 FORI=1TO5:READ D$:PRINTD$" ";:NEXT:PRI
   NT:RESTORE:X=X+1:IFX<100THEN30
50 PRINTTI$
```

This version is far shorter than the first version: Program 1 uses up 507 bytes in RAM memory; this one uses only 104 bytes. It's easy to see that overly enthusiastic REMarking could use up too much memory. Each character in a REMark takes up one byte in RAM memory. If you are writing a long program on, say, a VIC computer with only 3583 bytes of RAM, you have to be con-

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servative about REMarking. If you REMarked to the same degree as in Program 1, you'd have only about 700 bytes of RAM in which to write your actual program.

Maximizing Speed

Program 2 runs faster than Program 1: seven seconds versus twelve. In our little illustration program, this doesn't much matter. But if you are programming a game or writing an inventory program, for example, where you have to manipulate large amounts of data, speed can matter a great deal. Each REMark, each additional line number, each jump from a main program to a subroutine (and back) is one more thing for the computer to interpret during the execution of a program.

Here's the same program maximized for speed:

Program 3: Speed

```
10 TI$="000000"
20 PRINT"ONE TWO THREE FOUR FIVE"
30 X=X+1:IFX<100THEN20
40 PRINTTI$
```

We've eliminated many actions here: DATA reading, RESTOREing, multiple PRINTing, and FOR-NEXT looping. Execution speed is now 5 seconds. And in the act of reducing and simplifying the actions the computer must take during its RUN, we've shortened the program as well. It now uses up 79 bytes in RAM. Although maximizing speed will not always maximize brevity, it often does.

Which is the best program? They're each fine, they simply emphasize different things. While you're a novice, it's often helpful to comment your programs heavily. You'll be writing short practice programs anyway. Then, as you become more familiar with reading LISTings, you can restrict your REMarks to the less obvious things. And as you gain programming experience, you'll discover ways to improve execution speed and conserve memory too. ©

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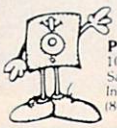

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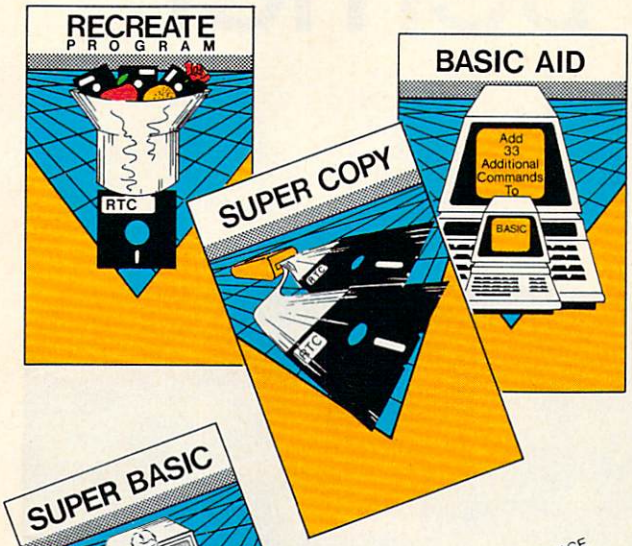

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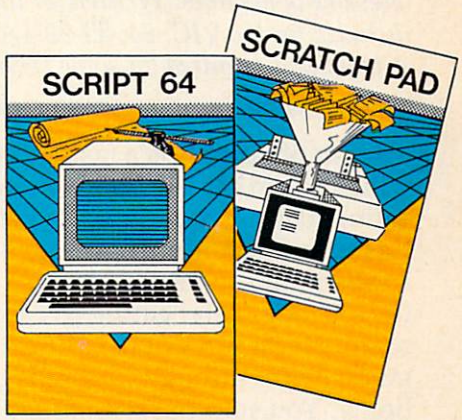

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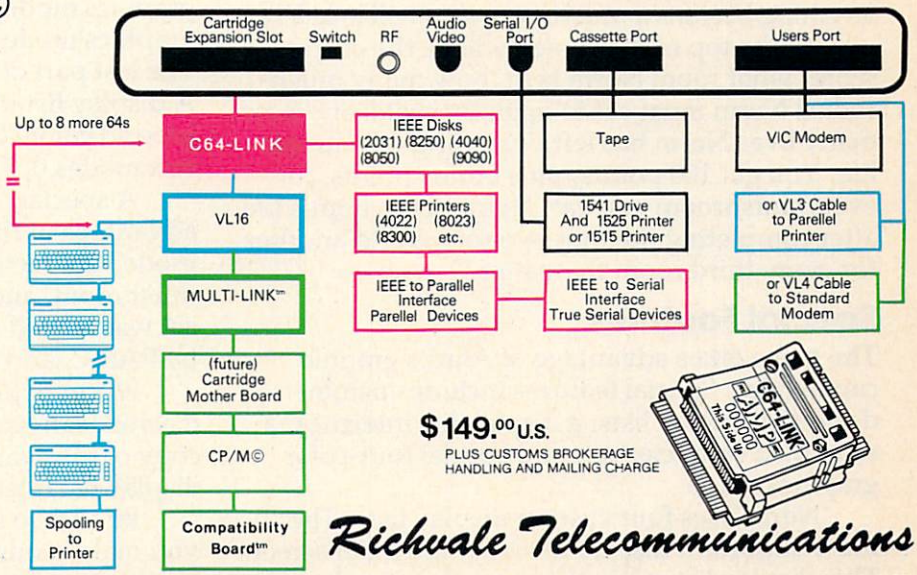

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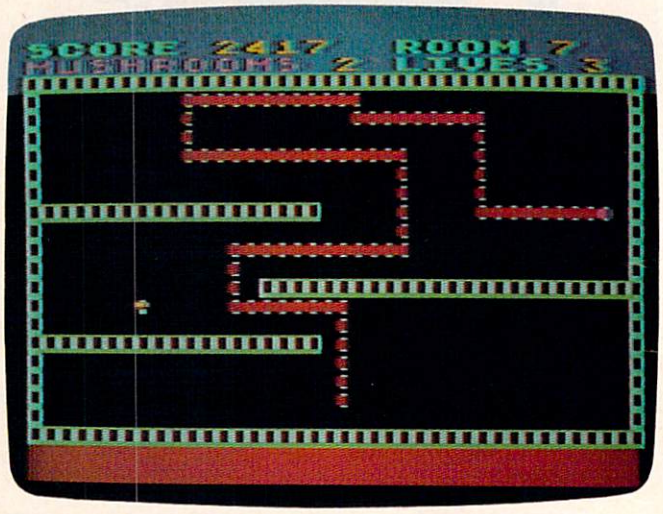
Worm Of Bemer

Stephen D. Fultz

Nerm the worm is lost in Bemer Castle and needs your help to get home. You must guide him through 11 rooms and help him find magic mushrooms to eat along the way. The journey is a navigator's nightmare, because you never know where the next mushroom will grow, and if Nerm hits a wall or gets trapped by his tail, he loses one of his lives. Written for the Atari, versions are included for the VIC, 64, TI-99/4A, and IBM PC/PCjr. A joystick is required for some versions.



The player has reached Room 7 in the Atari version of "Worm of Bemer."

"Worm of Bemer" is a fast-paced arcade game in which Nerm the Worm travels through rooms eating magic mushrooms. Nerm is lost in Bemer Castle and wants to return home. Guide Nerm to a mushroom so he can keep up his strength for the journey. After eating five mushrooms in a room, Nerm can exit to the next room. You must guide Nerm through 11 rooms before he finds his home. You start out with four lives. If you touch anything besides a mushroom you will lose a life.

At the top of the screen will be the current score, what room Nerm is in, how many mushrooms Nerm must eat to open the exits, and how many lives Nerm has left, including the current life. You get 100 points, plus bonus points, for every mushroom you eat. Nerm gets a bonus life after completing the first two rooms and another for every third room thereafter.

Special Features

The game takes advantage of Atari's graphic capabilities. Special features include custom-designed display lists, a display list interrupt, a redefined character set, and special four-color graphics mode.

Nerm uses four custom display lists. The most important display list is for the main screen. This display list mixes three graphics modes on one screen. The first two display lines are in graphics mode 2. The next ten lines are in a special graphics mode that allows four-color characters. The last part of the screen is in graphics mode 0. A display list interrupt is used to change the background color. The other three custom display lists mix modes 0, 1, and 2.

A special character set was needed to take advantage of the four-color character graphics mode. Characters were redesigned for walls, the mushroom, and the body of Nerm. The original set was copied to a location in memory not used by BASIC, and the new characters added.

Worm of Bemer is written in BASIC with two machine language subroutines; one makes a fast copy of the character set, and the other is the display list interrupt.

Be sure to save the game before running it. If you make a mistake in entering the two machine language subroutines, it is likely that your system will crash and you will have to reboot.

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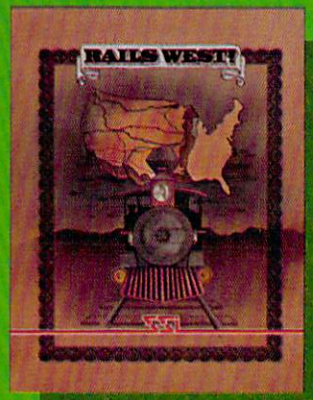

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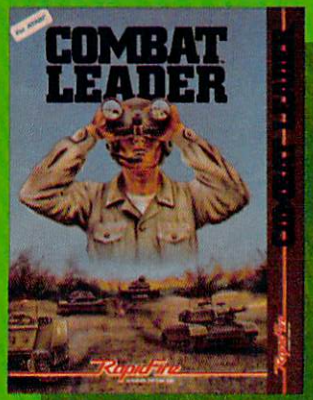

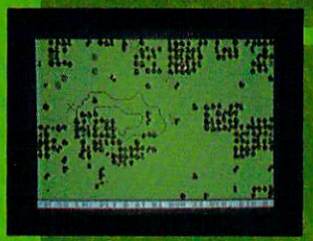

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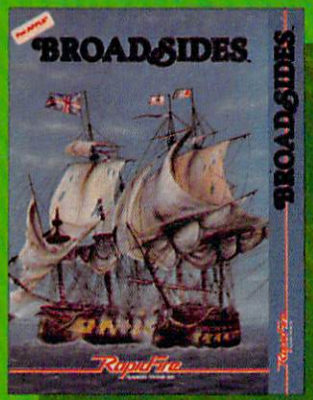

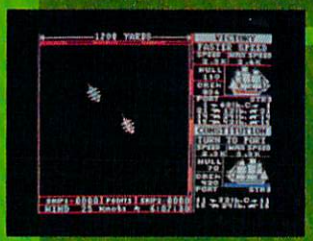

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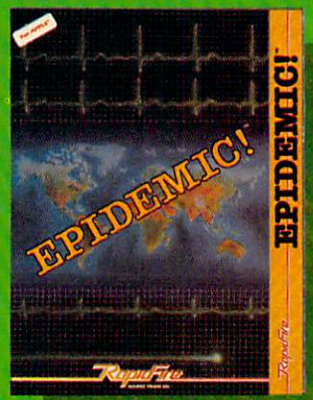

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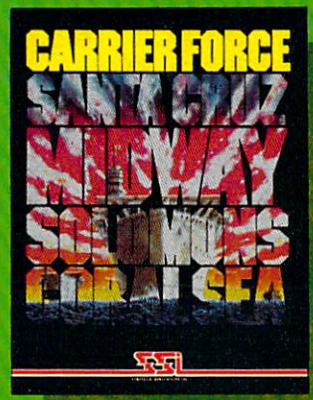

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You can learn a lot about programming and games by modifying the action and settings in Worm of Bemer. Some features you might add include a routine to save the high score to disk, adding more players, or having Nerm go to a different room depending on which exit he takes. Simpler enhancements would be changing the number of mushrooms that Nerm must eat or changing his speed.

Program 1: Worm Of Bemer—Atari Version

Refer to the "Automatic Proofreader" article before typing this program in.

```
PB 5 SCREEN=PEEK(88)+256*PEEK(89)
FP 10 GOTO 5000
IP 100 POKE 53761,0:S=STICK(0):FOR D=1
    TO SPEED:NEXT D
FF 110 IF S=7 OR S=6 OR S=5 THEN DXA=1
    :DYA=0:DIR=1:IF ODIR=2 THEN DXA
    =-1:DYA=0:DIR=2
KP 120 IF S=11 OR S=10 OR S=9 THEN DXA
    =-1:DYA=0:DIR=2:IF ODIR=1 THEN
    DXA=1:DYA=0:DIR=1
LN 130 IF S=14 THEN DYA=-1:DXA=0:DIR=4
    :IF ODIR=3 THEN DIR=3:DYA=1:DXA
    =0
LO 140 IF S=13 THEN DYA=1:DXA=0:DIR=3:
    IF ODIR=4 THEN DIR=4:DYA=-1:DXA
    =0
NL 145 COLOR 42:PLOT XA,YA:ODIR=DIR
DN 150 XA=XA+DXA:YA=YA+DYA:L=LEN(XA$):
    XA$(L+1)=CHR$(XA):YA$(L+1)=CHR$
    (YA):LOCATE XA,YA,Z:IF Z<>32 TH
    EN 200
IB 162 SOUND 0,40,8,6:COLOR 170:PLOT X
    A,YA:IF L<WORMZ THEN 100
NM 190 COLOR 32:PLOT ASC(XA$),ASC(YA$)
    :XA$=XA$(2):YA$=YA$(2):GOTO 100
PD 200 SOUND 0,200,10,16:POKE SCREEN+Y
    A*40+XA,132:GOSUB 6600:IF Z<>BU
    G THEN 260
DD 210 WORMZ=WORMZ+15+(3*LOC):IF WORMZ
    >240 THEN WORMZ=240
AD 220 XX=RND(2)*36+2:X=RND(1)*18+2:CO
    LOR BUG:LOCATE XX,X,Y:IF Y<>32
    THEN 220
HO 221 SCORE=SCORE+100+LOC*7:FOR DEL=8
    TO 16:SOUND 0,55,10,17-DEL:NEX
    T DEL
HD 226 HIT=HIT-1:IF HIT<1 THEN COLOR 1
    60:PLOT 20,1:PLOT 19,20:PLOT 0,
    12:POKE SCREEN+12*40+39,128:HIT
    =0:GOTO 100
GE 227 GOSUB 6600:PLOT XX,X:SOUND 0,10
    0,10,16
FP 230 GO TO 100
HP 260 IF Z<>160 AND LIVES>1 THEN CNT
    =CNT-1:GOSUB 7500:GOTO 290
GK 265 IF Z<>160 THEN CNT=CNT-1:GOTO
    7500
MG 270 FOR DEL=1 TO 16:SOUND 0,90,10,1
    7-DEL:NEXT DEL
FB 271 GOSUB 7000:POSITION 0,23
PE 275 FOR DEL=1 TO 24:PRINT :SOUND 0,
    DEL,10,10:NEXT DEL
MG 280 LOC=LOC+1:WORMZ=5:CNT=0
EH 285 IF LOC>EXTRA THEN GOSUB 9100
EL 290 GRAPHICS 0:COLOR 35:POKE 752,1:
    POKE 710,0:GOSUB 6500:POKE 712,
    162
OH 291 POKE 710,ASC(BOL$(LOC))
PD 300 ON LOC GOTO 5020,400,500,550,60
    0,700,800,450,550,1000,1100,1200
KJ 399 GO TO 5015
PE 400 REM SECOND SCREEN
JG 410 PLOT 5,10:DRAWTO 35,10
JG 420 GO TO 5020
DN 450 REM SCREEN
OA 460 PLOT 5,10:DRAWTO 35,10:PLOT 18,
    5:DRAWTO 18,20
JL 470 GO TO 5020
KA 500 REM THE FOUTH SCREEN
DP 510 PLOT 5,5:DRAWTO 35,5
KE 520 PLOT 5,16:DRAWTO 35,16
JI 530 GO TO 5020
BO 550 REM FRAME 5
EG 560 PLOT 7,6:DRAWTO 33,6
KO 575 PLOT 18,7:DRAWTO 18,20
JN 580 GO TO 5020
NG 600 REM FRAM 6
AC 610 PLOT 1,10:DRAWTO 18,10:PLOT 22,
    10:DRAWTO 38,10
JI 620 GOTO 5020
NI 700 REM FRAM 7
EB 710 FOR I=6 TO 14:PLOT 6,I:DRAWTO 1
    2,I:PLOT 20,I:DRAWTO 32,I:NEXT I
JJ 720 GOTO 5020
NK 800 REM FRAM 8
EG 811 PLOT 1,8:DRAWTO 18,8
KD 812 PLOT 1,15:DRAWTO 18,15
NF 813 PLOT 15,12:DRAWTO 38,12
KB 890 GOTO 5020
AB 900 REM THE 8 FRAME
KG 910 FOR I=5 TO 12 STEP 3:PLOT 11,I:
    DRAWTO 30,I:NEXT I
JL 920 GO TO 5020
DM 1000 FOR I=2 TO 19:PLOT 1,I:DRAWTO
    38,I:NEXT I:COLOR 32:FOR I=2 T
    O 19:PLOT 1,I:DRAWTO 22,I:NEXT
    I:GOTO 5020
CD 1100 FOR I=2 TO 19:PLOT 1,I:DRAWTO
    38,I:NEXT I:COLOR 32:FOR I=2 T
    O 19:PLOT 1,I:DRAWTO 30,I:NEXT
    I:COLOR 35
JA 1101 GOTO 400
JC 1200 REM YOU WIN
JO 1205 FOR QZ=1 TO 3
HO 1210 GRAPHICS 18
ED 1211 POSITION 4,5:PRINT #6;"NERM'S
    HOME"
JO 1212 PRINT #6;"{5 SPACES}THANK YOU"
DN 1215 FOR G=1 TO 5
GH 1220 FOR I=1 TO 10
FA 1229 SOUND 1,I+200,10,16-I
MA 1230 SOUND 0,I+6,10,I+5:POKE 712,I*
    16
AP 1240 NEXT I:NEXT G
OI 1245 FOR I=1 TO 200:SOUND 0,I,10,15
    :NEXT I
PD 1250 NEXT QZ:GOTO 7700
PE 5000 GOSUB 10000:REM UP THE GAME
PI 5005 GOSUB 11100:BUG=33
EN 5010 DIM XA$(250),YA$(250),XB$(250)
    ,YB$(250),A$(15),B$(15)
EB 5011 SPEED=35:LIVES=4:SCORE=0:LOC=1
    :GOSUB 5500:HIT=5:WORMZ=5:EXTR
    A=2
BC 5015 GRAPHICS 0:POKE 752,1:POKE 710
    ,0:GOSUB 6500:POKE 710,ASC(BOL
    $(LOC)):POKE 77,0:POKE 712,162
FA 5020 XA$="":YA$="":XB$="":YB$="":XA
```

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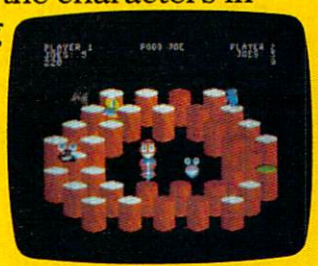

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```
      =20:YA=19:XB=25:YB=20:DXA=0:DX
      B=0:DYA=-1:DYB=-1:T=0:IF HIT<0
       THEN HIT=0
BB 5021 IF LOC=3 THEN YA=15
LP 5030 DIR=4:IF HIT>5 THEN HIT=5
PB 5050 COLOR 35:PLOT 0,1:DRAWTO 39,1:
      DRAWTO 39,20:DRAWTO 0,20:DRAWT
      O 0,1
AP 5056 IF HIT<1 THEN COLOR 160:PLOT 2
      0,1:PLOT 19,20:PLOT 0,12:POKE
      SCREEN+12*40+39,128:HIT=0:GOTO
       150
HB 5060 XX=RND(2)*36+2:X=RND(1)*18+2:C
      OLOR BUG:LOCATE XX,X,Y:IF Y<>3
      2 THEN 5060
ED 5065 PLOT XX,X
KB 5085 GOTO 150
JL 5090 GO TO 220
DM 5500 REM START
BK 5510 GRAPHICS 18:POKE 712,15
ML 5520 POSITION 5,5:PRINT #6;"get rea
      dy"
LM 5530 RESTORE 5600
LL 5540 FOR X=1 TO 14:READ NN:SOUND 0,
      NN,10,10:SOUND 1,NN+1,10,5:FOR
       D=1 TO 25:NEXT D:NEXT X
KI 5545 SOUND 0,0,0,0:SOUND 1,0,0,0
KP 5550 RETURN
KE 5600 DATA 121,91,0,91,81,0,81,72,60
      ,72,60,72,91,0,121,91,0,91
KN 6500 DL=PEEK(560)+256*PEEK(561)
JJ 6501 SOUND 0,0,0,0
AN 6502 POKE 756,CHSET/256
HC 6550 FOR I=0 TO 20
MF 6560 POKE DL+6+I,4
FK 6570 NEXT I
PJ 6572 POKE 712,0
FK 6573 POKE DL+6+20,4:POKE DL+6+1,132
GD 6574 POKE DL+6+25,65:POKE DL+6,6:PO
      KE DL+3,6+64:POKE 54286,192
CD 6575 GOSUB 6600
LD 6580 RETURN
LJ 6600 REM PRINT SCORE
LA 6605 POSITION 0,0:PRINT "score ";SC
      ORE
OH 6606 POSITION 12,0:PRINT "room ";LO
      C
AA 6610 POSITION 19,0:PRINT " mushroom
      s ";HIT;" lives ";LIVES
KO 6620 RETURN
CF 7000 REM CLEAN UP THE CENTIPEDE
EK 7002 SPEED=SPEED-5
KI 7004 GOSUB 6600:HIT=5
EC 7005 L=LEN(XA$)
LD 7010 FOR I=1 TO L-1
OI 7020 SOUND 0,I,12,6
AP 7190 COLOR 32:PLOT ASC(XA$),ASC(YA$
      ):XA$=XA$(2):YA$=YA$(2)
FB 7200 NEXT I
KK 7210 RETURN
PB 7500 REM OOPS
AO 7510 GRAPHICS 18:POKE 712,ASC(BOL$(
      LOC))
FD 7515 SPEED=SPEED-5
NM 7520 POSITION 7,5:PRINT #6;"OOPS!"
HA 7521 LIVES=LIVES-1
FA 7525 FOR DEL=1 TO 20:NEXT DEL
LI 7530 FOR DEL=1 TO 10:SOUND 0,DEL*20
      ,10,DEL+4:NEXT DEL
EO 7550 FOR DEL=1 TO 20:NEXT DEL
EO 7560 IF LIVES<1 THEN 7700
LO 7599 RETURN
DM 7700 REM THE GAMES OVER
KA 7705 SOUND 0,0,0,0
OF 7710 GRAPHICS 17:POKE 710,0
GA 7715 IF SCORE>HSCORE THEN HSCORE=SC
      ORE:GOSUB 9000:GRAPHICS 17:POK
      E 710,0
LH 7716 DL=PEEK(560)+256*PEEK(561)
DE 7717 POKE DL+6+8,2:POKE DL+7,7:POKE
       DL+8,7
LC 7718 POSITION 7,2:PRINT #6;"NERM "
DJ 7720 POSITION 2,5:PRINT #6;"your sc
      ore ";SCORE
DF 7730 POSITION 2,7:PRINT #6;"high sc
      ore ";HSCORE
FK 7735 GOSUB 7800:RESTORE 7790
PN 7736 PRINT #6:PRINT #6;"{3 SPACES}P
      RESS TRIGGER"
KC 7737 PRINT #6;"{3 SPACES}TO PLAY AG
      AIN,"
IJ 7738 PRINT #6;"{3 SPACES}ANY KEY TO
       END"
OI 7740 FOR X=1 TO 10:READ PN:SOUND 0,
      PN,10,10:SOUND 1,PN+1,10,10:FO
      R D=1 TO 20:NEXT D:NEXT X
KM 7745 SOUND 0,0,0,0:SOUND 1,0,0,0
AL 7780 IF STRIG(0)=0 THEN GO TO 5011
FE 7783 IF PEEK(53775)<255 THEN POKE 7
      64,255:GRAPHICS 0:END
OK 7785 GOTO 7780
BA 7790 DATA 91,0,121,128,121,108,121,
      0,96,91
CM 7800 REM RANK THE GAMER
DP 7810 PRINT #6:PRINT #6;"{7 SPACES}Y
      OU NEW RANK IS ";
IA 7820 IF LOC=1 THEN PRINT #6;"ZERO"
AL 7830 IF LOC=2 THEN PRINT #6;"ROOKIE
      "
AM 7835 IF LOC=3 THEN PRINT #6;"NOVICE
      "
EF 7836 IF LOC=4 THEN PRINT #6;"AVERAG
      E"
BI 7837 IF LOC=5 THEN PRINT #6;"MASTER
      "
IG 7838 IF LOC=6 THEN PRINT #6;"GRAND
      MASTER"
CB 7839 IF LOC=7 THEN PRINT #6;"WIZARD
      "
IG 7840 IF LOC=8 THEN PRINT #6;"GRAND
      WIZARD"
BE 7841 IF LOC=9 THEN PRINT #6;"SUPER
      STAR"
BM 7842 IF LOC>9 THEN PRINT #6;"HALL O
      F FAME"
LF 7860 RETURN
DD 9000 REM NEW HIGH SCORE
IF 9002 GRAPHICS 18
PK 9003 POSITION 3,5:PRINT #6;"NEW HIG
      H SCORE"
FC 9005 FOR Y=1 TO 3
EF 9010 FOR N=1 TO 5
NH 9020 FOR D=1 TO 5:SOUND 1,D*20,10,5
      :NEXT D
JP 9025 POKE 712,N*20
HM 9030 SOUND 0,N*30,10,7
FL 9050 NEXT N
GH 9060 NEXT Y
DA 9065 FOR D=1 TO 30:NEXT D
HJ 9070 POKE 712,163:RETURN
FC 9100 REM EXTRA LIFE
IE 9110 GRAPHICS 17
CB 9115 POSITION 5,5:PRINT #6;"BONUS L
      IFE"
AB 9130 FOR J=100 TO 200
AC 9140 SOUND 0,J,10,5:SOUND 1,200-J,1
      0,5
```

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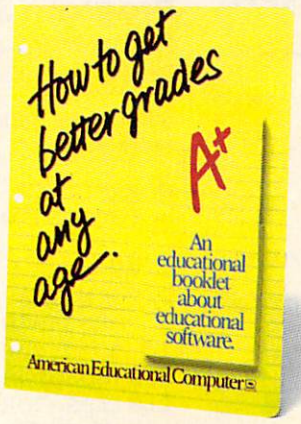

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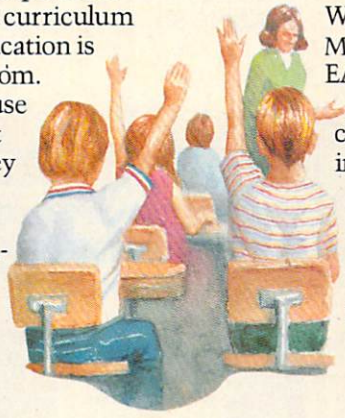

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```
BC 9145 POKE 712,J
FI 9150 NEXT J
KF 9160 SOUND 0,0,0,0:SOUND 1,0,0,0
HE 9170 EXTRA=EXTRA+3
HB 9180 LIVES=LIVES+1
LD 9190 RETURN
GF 10000 DIM DUM(10),BOL$(100):GRAPHIC
         S 17
GF 10001 RESTORE 10015:FOR I=1 TO 19:R
         EAD A:BOL$(I,I)=CHR$(A):NEXT
         I
GA 10015 DATA 196,52,164,198,18,54,50,
         196
ML 10016 DATA 52,50,180,196,74,79,76,7
         6,76,76,76
NL 10017 DL=PEEK(560)+256*PEEK(561)
KI 10018 POKE DL+10,7
EG 10020 POSITION 2,2:PRINT #6;"  WELC
         OME TO"
DE 10025 POSITION 3,7:PRINT #6;"nerm o
         f bemer"
FI 10035 POSITION 0,14:PRINT #6;"HIT T
         RIGGER TO START"
CK 10045 IF STRIG(0)=1 THEN 10045
IF 10060 GOSUB 20110:RETURN
DD 11100 CHBAS=756
DC 11110 CHSET=(PEEK(106)-8)*256
PD 11143 DIM E$(50)
ND 11144 RESTORE 11160:FOR I=1 TO 41:R
         EAD A:E$(I,I)=CHR$(A):NEXT I
JP 11145 CD=USR(ADR(E$),CHSET,4)
PK 11160 DATA 104,104,133,207,104,133,
         206,104
KH 11162 DATA 104,133,212,169,0,133,20
         4,169
EB 11164 DATA 224,133,205,162,1,160,0,
         177
AM 11166 DATA 204,145,206,200,208,249,
         230,205
EA 11168 DATA 230,207,232,228,212,208,
         240,96,0
DL 11180 POKE 756,CHSET/256
AN 11190 RESTCRE 11240:GRAPHICS 19
LC 11200 FOR I=0 TO 31:READ A:POKE CHS
         ET+I,A:NEXT I
BN 11205 FOR I=0 TO 7:READ A:POKE CHSE
         T+80+I,A:NEXT I
LG 11240 DATA 0,00,00,00,00,00,0,0
KH 11250 DATA 0,20,85,85,255,40,40,000
LA 11251 DATA 85,85,85,85,85,85,85,85
BD 11252 DATA 170,190,190,190,190,190,
         170,170
PM 11260 DATA 000,020,255,255,255,255,
         020,000
NL 11270 RETURN
OL 20110 RESTORE 20150:FOR I=0 TO 10
FE 20120 READ C
NH 20130 POKE 1536+I,C
HP 20140 NEXT I
CG 20150 DATA 72,169,0,141,10,212,141,
         26,208,104,64
JL 20170 POKE 512,0:POKE 513,6:RETURN
```

Program 2: Worm Of Bemer—VIC Version (Program Loader)

Translation by Kevin Martin, Editorial Programmer

Refer to the "Automatic Proofreader" article before typing this program in.

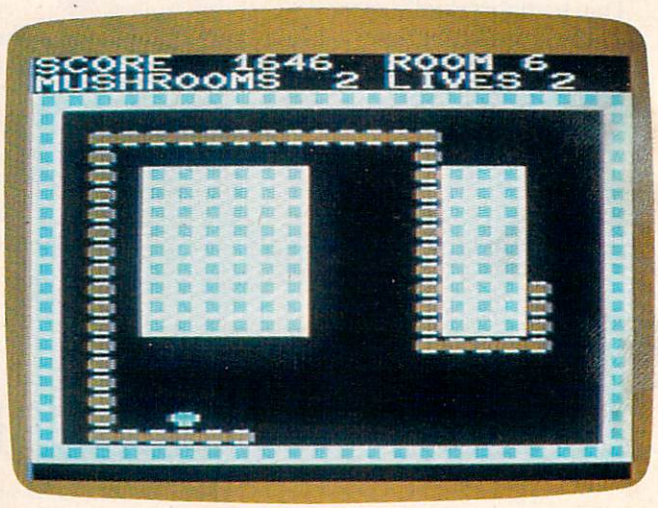
```
10 POKE631,13:POKE198,1              :rem 34
11 REM POKE631,131:POKE198,1         :rem 56
15 REM WITH TAPE, DELETE LINES 10 AND 40,
    AND REMOVE THE REM IN LINE 11 :rem 85
20 POKE43,1:POKE44,32:POKE8192,0  :rem 80
30 POKE36869,240:POKE36866,150:POKE648,30
                                     :rem 54
35 PRINT"{CLR}"                     :rem 204
40 PRINT"{2 DOWN}LOAD";CHR$(34);"NM";CHR$
   (34);",8":PRINT"{4 DOWN}RUN{HOME}"
                                     :rem 179
50 NEW                               :rem 79
```

Program 3: Worm Of Bemer—VIC Version (Main Program)

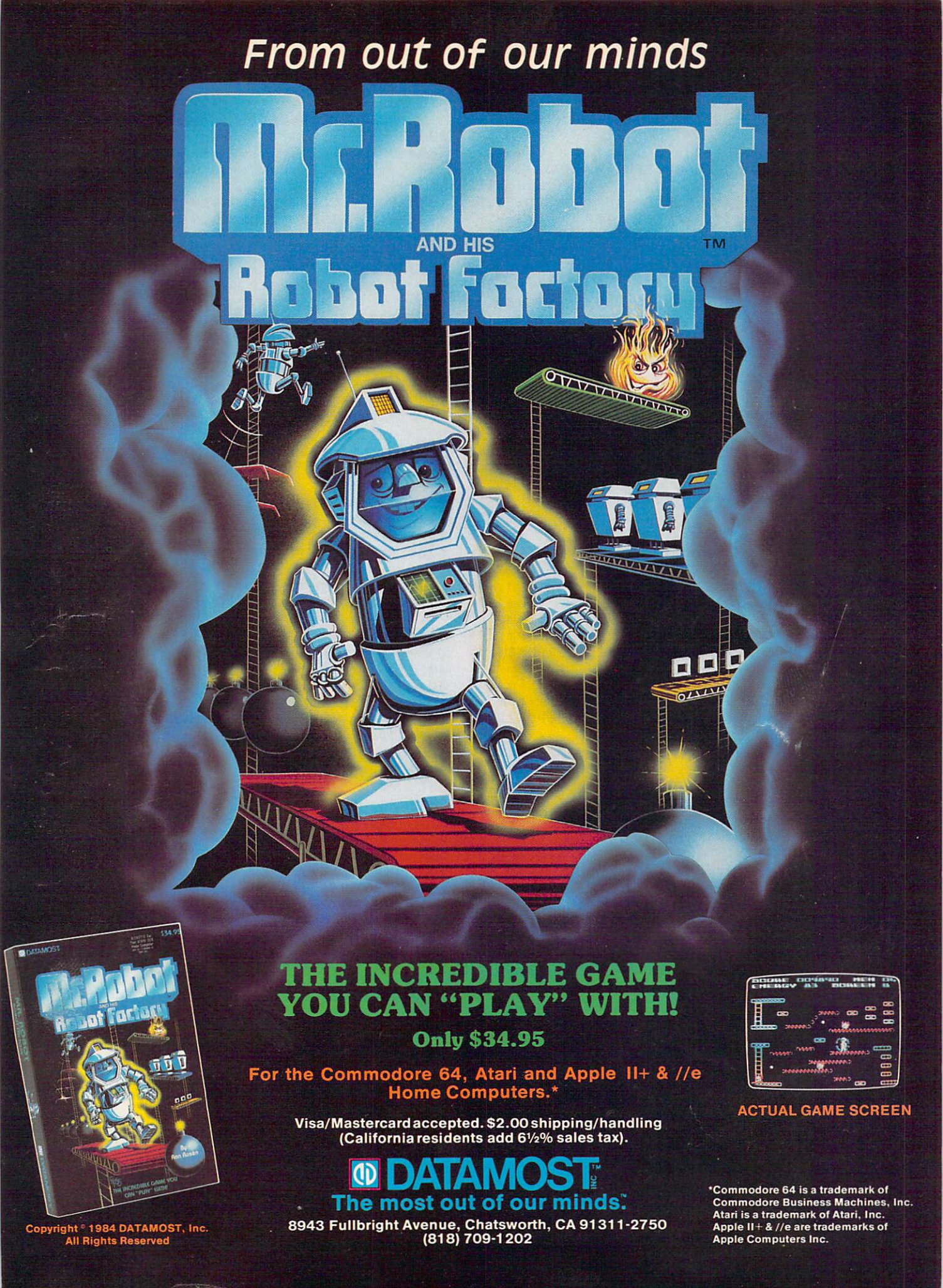
Translation by Kevin Martin, Editorial Programmer

Refer to the "Automatic Proofreader" article before typing this program in.

```
0 REM THIS PROGRAM MUST BE SAVED AS "NM"
  {SPACE}TO LOAD WITH THE LOADER PROGRAM
                                     :rem 201
1 VS=7680                            :rem 236
2 POKE37139,0                        :rem 196
5 POKE36879,8                        :rem 217
10 GOTO5000                           :rem 95
100 GOSUB4000:FORD=1TOSP:NEXT        :rem 103
110 IFS=7ORS=6ORS=5THENDX=1:DY=0:DI=1:IFO
    D=2THENDX=-1:DY=0:DI=2           :rem 18
120 IFS=11ORS=10ORS=9THENDX=-1:DY=0:DI=2:
    IFOD=1THENDX=1:DY=0:DI=1         :rem 108
130 IFS=14THENDY=-1:DX=0:DI=4:IFOD=3THEND
    I=3:DY=1:DX=0                    :rem 122
140 IFS=13THENDY=1:DX=0:DI=3:IFOD=4THENDI
    =4:DY=-1:DX=0                    :rem 123
145 PO=VS+XA+YA*22:OD=DI:POKEPO,42:POKEPO
    +SO,9                            :rem 161
150 XA=XA+DX:YA=YA+DY:L=LEN(XA$):XA$=XA$+
    CHR$(XA):YA$=YA$+CHR$(YA)          :rem 0
155 Z=PEEK(VS+XA+YA*22):IFZ<>32THEN200
                                     :rem 43
162 POKE36876,150:POKE36876,0:PO=VS+XA+YA
    *22:POKEPO,36:POKEPO+SO,13:IFL<WOTHEN
    100                              :rem 250
190 PO=VS+ASC(XA$)+22*ASC(YA$):LL=LEN(XA$
    )-1:XA$=RIGHT$(XA$,LL)           :rem 208
191 POKEPO,32:POKEPO+SO,0             :rem 43
195 YA$=RIGHT$(YA$,LL):GOTO100        :rem 19
200 POKE36876,200:FORQQ=1TO20:NEXT:rem 60
201 POKE36876,0:PO=VS+XA+22*YA:POKEPO,36:
    POKEPO+SO,13:GOSUB6600:IFZ<>BUTHEN260
                                     :rem 133
```



VIC version of "Worm of Bemer."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```
210 WO=WO+5+3*LO:IFWO>127THENWO=127
                                    :rem 146
220 XX=INT(RND(1)*18+2):X=INT(RND(1)*18+3
    ):IFPEEK(VS+XX+22*X)<>32THEN220
                                    :rem 235
221 SC=SC+100+LO*7                  :rem 225
225 HI=HI-1:GOSUB6600:IFHI>0THEN229
                                    :rem 112
226 PO=VS+11+22*2:POKEPO,160:POKEPO+SO,0:
    PO=VS+11+21*22:POKEPO,160       :rem 198
227 POKEPO+SO,0:PO=VS+22*12:POKEPO,160:PO
    KE36876,175                     :rem 120
228 PO=VS+22*12+21:POKEPO,160:POKEPO+SO,0
    :GOTO100                        :rem 203
229 PO=VS+XX+X*22:POKEPO,BUG:POKEPO+SO,13
                                    :rem 133
230 GOTO100                         :rem 95
260 IFZ<>160ANDLI>1THENGOSUB7500:GOTO290
                                    :rem 242
265 IFZ<>160THEN7500                :rem 146
270 POKE36876,140                   :rem 151
271 GOSUB7000:PRINT"{HOME}{23 DOWN}"
                                    :rem 134
275 FORDE=1TO23:PRINT:POKE36876,DEL*2+140
    :NEXT:POKE36876,0               :rem 43
280 LO=LO+1:WO=5:IFLO=12THEN1200    :rem 177
282 PP=PEEK(36879):IFPP=15THENPP=10
                                    :rem 121
283 POKE36879,PP+1                   :rem 5
285 IFLO>EXTHENGOSUB9100            :rem 29
290 PRINT"{CLR}":GOSUB6600          :rem 133
300 ONLO GOTO5020,400,500,550,600,700,800
    ,450,550,1000,1100,1200         :rem 176
399 GOTO5015                        :rem 169
400 REM SECOND SCREEN               :rem 244
410 FORI=VS+3+10*22TOVS+18+10*22:POKEI,35
    :POKEI+SO,9:NEXT                :rem 192
420 GOTO5020                        :rem 150
450 REM SCREEN                      :rem 61
460 FORI=VS+4+10*22TOVS+17+10*22:POKEI,35
    :POKEI+SO,9:NEXT                :rem 197
465 FORI=VS+10+6*22TOVS+10+20*22STEP22:PO
    KEI,35:POKEI+SO,9:NEXT          :rem 102
470 GOTO5020                        :rem 155
500 REM THE FOURTH SCREEN           :rem 242
510 FORI=VS+3+5*22TOVS+18+5*22:POKEI,35:P
    OKEI+SO,9:NEXT                  :rem 105
520 FORI=VS+3+18*22TOVS+18+18*22:POKEI,35
    :POKEI+SO,9:NEXT                :rem 210
530 GOTO5020                        :rem 152
550 REM FRAME 5                     :rem 30
560 FORI=VS+5+6*22TOVS+16+6*22:POKEI,35:P
    OKEI+SO,9:NEXT                  :rem 112
575 FORI=VS+9+7*22TOVS+9+20*22STEP22:POKE
    I,35:POKEI+SO,9:NEXT            :rem 25
580 GOTO5020                        :rem 157
600 REM FRAME 6                     :rem 27
610 FORI=VS+1+10*22TOVS+9+10*22:POKEI,35:
    POKEI+SO,9:NEXT                 :rem 144
615 FORI=VS+13+10*22TOVS+20+10*22:POKEI,3
    5:POKEI+SO,9:NEXT               :rem 241
620 GOTO5020                        :rem 152
700 REM FRAME 7                     :rem 29
710 FORJ=6TO14:FORI=VS+4+J*22TOVS+9+J*22:
    POKEI,35:POKEI+SO,9:NEXT        :rem 76
715 FORI=VS+15+J*22TOVS+17+J*22:POKEI,35:
    POKEI+SO,9:NEXT:NEXT            :rem 69
720 GOTO 5020                       :rem 153
800 REM FRAME 8                     :rem 31
811 FORI=VS+1+8*22TOVS+10+8*22:POKEI,35:P
    OKEI+SO,9:NEXT                  :rem 105
812 FORI=VS+1+15*22TOVS+10+15*22:POKEI,35
    :POKEI+SO,9:NEXT                :rem 198
813 FORI=VS+9+12*22TOVS+21+12*22:POKEI,35
    :POKEI+SO,9:NEXT                :rem 203
890 GOTO5020                        :rem 161
1000 FORJ=4TO19:FORI=VS+1+J*22TOVS+19+J*2
     2:POKEI,35:POKEI+SO,9:NEXT:NEXT
                                    :rem 31
1005 FORJ=4TO19:FORI=VS+1+J*22TOVS+11+J*2
     2:POKEI,32:POKEI+SO,9:NEXT:NEXT
                                    :rem 25
1010 GOTO5020                       :rem 194
1100 FORJ=4TO19:FORI=VS+1+J*22TOVS+19+J*2
     2:POKEI,35:POKEI+SO,9:NEXT:NEXT
                                    :rem 32
1105 FORJ=4TO19:FORI=VS+1+J*22TOVS+14+J*2
     2:POKEI,32:POKEI+SO,9:NEXT:NEXT
                                    :rem 29
1110 GOTO400                        :rem 144
1200 REM YOU WIN                    :rem 146
1205 FORZZ=1TO3                     :rem 167
1210 PRINT"{CLR}{6 DOWN}{5 RIGHT}NERM'S H
     OME"                           :rem 244
1212 PRINT"{5 DOWN}{6 RIGHT}THANK YOU"
                                    :rem 13
1215 FORG=1TO5                      :rem 61
1220 FORI=1TO10                     :rem 103
1230 POKE36876,I+130                :rem 55
1240 NEXT:NEXT                      :rem 127
1245 FORI=1TO127:POKE36876,I+128:NEXT
                                    :rem 210
1250 NEXT:GOTO7700                  :rem 72
4000 POKE37154,127:S3=-((PEEK(37152)AND12
     8)=0)::POKE37154,255           :rem 75
4010 P1=PEEK(37137):S1=-((P1AND8)=0):S2=(
     (P1AND16)=0):S0=((P1AND4)=0)   :rem 24
4020 S=JP(S2+S3+1,S0+S1+1)          :rem 141
4030 FR=-((P1AND32)=0):RETURN       :rem 171
5000 REM UP THE GAME                :rem 73
5005 GOSUB10000:GOSUB11100:BUG=33:rem 163
5011 SP=35:LI=4:SC=0:LO=1:GOSUB5500:HI=5:
     WO=5:EX=2                      :rem 40
5012 POKE36879,10                   :rem 149
5015 PRINT"{CLR}":GOSUB6500         :rem 180
5020 XA$="":YA$="":XB$="":YB$="":XA=11:YA
     =19:DX=0                       :rem 161
5021 IFLO=3THENYA=18                :rem 209
5025 DY=-1:T=0:IFHI<0THENHI=0       :rem 242
5030 DI=4:IFHI>5THENHI=5            :rem 197
5050 FORI=VS+22*2TOVS+21+22*2:POKEI,35:PO
     KEI+19*22,35:POKEI+SO,9        :rem 35
5051 POKEI+SO+19*22,9:NEXT          :rem 17
5055 FORI=VS+22*2TOVS+22*20STEP22:POKEI,3
     5:POKEI+21,35:POKEI+SO,9       :rem 213
5056 POKEI+SO+21,9:NEXT:IFHI>0THEN5060
                                    :rem 67
5057 I=VS+11+22*2:POKEI,160:POKEI+SO,0:I=
     VS+11+21*22:POKEI,160:POKEI+SO,0
                                    :rem 42
5058 POKEVS+12*22,160:POKEVS+12*22+SO,0
                                    :rem 224
5059 POKEVS+12*22+21,160:POKEVS+12*22+SO+
     21,0:GOTO150                    :rem 6
5060 XX=RND(1)*19+2:X=RND(1)*18+3:IFPEEK(
     VS+XX+X*22)<>32THEN5060        :rem 226
5065 POKEVS+XX+X*22,BU:POKEVS+XX+X*22+SO,
     13                             :rem 178
5085 GOTO150                        :rem 161
5500 PRINT"{CLR}"                    :rem 46
5510 PRINT"{11 DOWN}{6 RIGHT}GET READY"
                                    :rem 90
```

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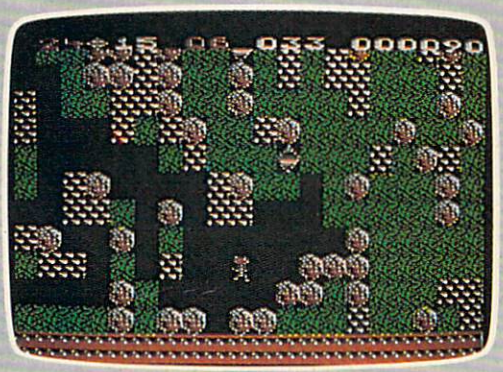

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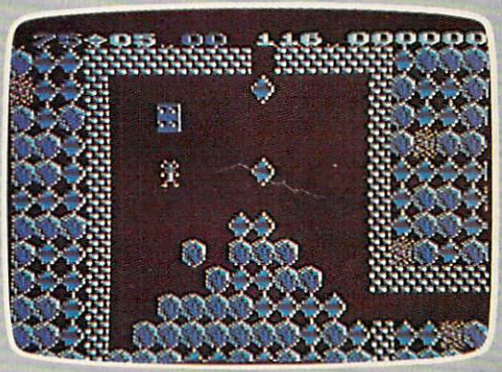

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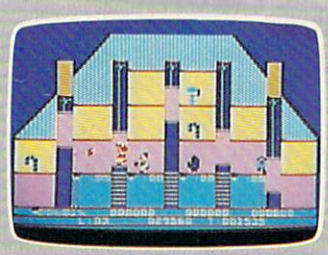

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```
5540 FORX=1TO14:POKE36876,NN(X):FORD=1TO1
     20:NEXT:NEXT:POKE36876,0      :rem 57
5550 RETURN                        :rem 175
6500 REM REDEFINING SCREEN         :rem 74
6575 GOSUB 6600                    :rem 35
6580 RETURN                        :rem 179
6600 REM PRINT SCORE               :rem 185
6605 PRINT"{YEL}{HOME}SCORE ";SC   :rem 160
6606 PRINT"{HOME}{13 RIGHT}ROOM";LO
                                   :rem 66
6610 PRINT"MUSHROOMS ";HI;"LIVES";LI
                                    :rem 9
6620 RETURN                        :rem 174
7000 REM CLEAN UP THE CENTIPEDE    :rem 37
7002 SP=SP-5                       :rem 174
7004 GOSUB 6600:HI=5               :rem 84
7005 L=LEN(XA$):IFL>127THENL=127   :rem 129
7010 FORI=1TOL-1                   :rem 179
7020 POKE36876,I+128:FORQQ=1TO10:NEXT
                                   :rem 239
7190 PO=VS+ASC(XA$)+22*ASC(YA$):LL=LEN(XA
     $)-1:XA$=RIGHT$(XA$,LL)       :rem 7
7195 YA$=RIGHT$(YA$,LL):POKEPO,32:POKEPO+
     SO,1                          :rem 17
7200 NEXT:POKE36876,0              :rem 219
7210 RETURN                        :rem 170
7500 REM OOPS                      :rem 241
7510 PRINT"{CLR}{PUR}"             :rem 205
7515 SP=SP-5                       :rem 183
7520 PRINT"{10 DOWN}{9 RIGHT}OOPS"
                                   :rem 143
7521 LI=LI-1                       :rem 148
7525 FORDE=1TO20:NEXT              :rem 47
7530 FORDE=1TO10:POKE36876,DE*10+150:FORQ
     Q=1TO10:NEXT:NEXT:POKE36876,0:rem 35
7550 FORDE=1TO20:NEXT              :rem 45
7560 IFLI<1THEN7700                :rem 96
7599 RETURN                        :rem 190
7700 REM THE GAMES OVER            :rem 60
7705 POKE36876,0                   :rem 108
7710 PRINT"{CLR}"                  :rem 51
7715 IF SC>HSTHENHS=SC:GOSUB9000:PRINT"
     {CLR}{8}"                     :rem 43
7718 PRINT"{2 DOWN}{9 RIGHT}NERM"  :rem 1
7720 PRINT"{YEL}{4 DOWN}YOUR SCORE ";SC
                                   :rem 31
7730 PRINT"{6}{5 DOWN}HIGH SCORE ";HS
                                    :rem 2
7735 GOSUB 7800                    :rem 37
7736 PRINT"{WHT}{DOWN}PRESS TRIGGER TO PL
     AY,Q TO QUIT"                 :rem 155
7740 FORX=1TO15:POKE36876,PN(X):FORD=1TO1
     00:NEXT:NEXT:POKE36876,0      :rem 62
7780 GOSUB4000:IFFR<>0THEN5011     :rem 27
7783 IFPEEK(197)=48THENPOKE198,0:PRINT"
     {CLR}{BLU}";:POKE36879,27:POKE36869,
     240:END                       :rem 215
7785 GOTO 7780                     :rem 234
7800 REM RANK THE GAMER            :rem 44
7810 PRINT"{CYN}{2 DOWN}{3 SPACES}YOUR NE
     W RANK IS "                   :rem 99
7820 IFLO=1THENPRINT"{9 SPACES}ZERO"
                                   :rem 169
7830 IFLO=2THENPRINT"{8 SPACES}ROOKIE"
                                   :rem 52
7840 IFLO=3THENPRINT"{8 SPACES}NOVICE"
                                   :rem 49
7850 IFLO=4THENPRINT"{7 SPACES}AVERAGE"
                                   :rem 106
7860 IFLO=5THENPRINT"{8 SPACES}MASTER"
                                   :rem 61
7870 IFLO=6THENPRINT"{5 SPACES}GRAND MAST
     ER"                           :rem 171
7880 IFLO=7THENPRINT"{8 SPACES}WIZARD"
                                   :rem 70
7890 IFLO=8THENPRINT"{5 SPACES}GRAND WIZA
     RD"                           :rem 180
7900 IFLO=9THENPRINT"{6 SPACES}SUPER STAR
     "                             :rem 57
7910 IFLO>9THENPRINT"{5 SPACES}HALL OF FA
     ME"                           :rem 65
7920 RETURN                        :rem 178
9000 REM NEW HIGH SCORE            :rem 51
9002 PRINT"{CLR}"                  :rem 47
9003 PRINT"{CYN}{6 DOWN}{7 RIGHT}NEW HIGH
     "                             :rem 119
9004 PRINT"{4 DOWN}{8 RIGHT}SCORE":rem 70
9005 FORY=1TO3                     :rem 82
9010 FORN=1TO5                     :rem 69
9020 FORD=1TO5:NEXT                :rem 181
9030 POKE36876,N*20+150            :rem 208
9050 NEXT                          :rem 13
9060 NEXT:POKE36876,0              :rem 225
9065 FORD=1TO30:NEXT               :rem 236
9070 RETURN                        :rem 176
9100 REM EXTRA LIFE                :rem 82
9110 PRINT"{CLR}"                  :rem 47
9115 PRINT"{CYN}{10 DOWN}{6 RIGHT}BONUS L
     IFE"                          :rem 63
9120 FORJ=100TO200                  :rem 0
9140 POKE36876,J+50                :rem 17
9150 NEXT                          :rem 14
9160 POKE36876,0                   :rem 105
9170 EX=EX+3                       :rem 166
9180 LI=LI+1                       :rem 149
9190 RETURN                        :rem 179
10000 DIM PN(15),NN(18),JP(2,2):PRINT"
     {CLR}{8}"                     :rem 130
10005 SO=38400-VS                  :rem 170
10010 PRINT"{RED}{6 DOWN}{6 RIGHT}WELCOME
      TO"                          :rem 162
10020 PRINT"{CYN}{6 DOWN}{4 RIGHT}NERM OF
      BEMER"                       :rem 111
10030 PRINT"{YEL}{4 DOWN}{RIGHT}HIT TRIGG
     ER TO START"                  :rem 238
10045 GOSUB4000:IFFR<>0THENRETURN :rem 88
10060 GOTO10045                    :rem 42
11100 PRINT"{CLR}{CYN}{10 DOWN}REDEFINING
     {2 SPACES}CHARACTERS"         :rem 91
11105 FORI=0TO2:FORJ=0TO2:READJP(J,I):NEX
     TJ,I                          :rem 79
11110 FORI=7168TO7168+64*8:POKEI,PEEK(I+2
     5600):NEXTI                   :rem 46
11180 FORI=0TO39:READA:POKE7168+I+32*8,A:
     NEXT                          :rem 201
11185 FORI=0TO7:READA:POKE7168+I+42*8,A:N
     EXT                           :rem 154
11190 POKE36869,255                 :rem 3
11195 POKE36878,14*16+15           :rem 243
11200 FORI=1TO18:READNN(I):NEXT    :rem 163
11210 FORI=1TO15:READPN(I):NEXT    :rem 163
11230 DATA 10,14,6,11,15,7,9,13,5 :rem 62
11240 DATA 0,0,0,0,0,0,0,0         :rem 198
11250 DATA 0,40,170,170,255,60,60,0
                                   :rem 163
11260 DATA 85,85,85,85,85,85,85,85
                                   :rem 176
11261 DATA 170,190,190,190,190,190,170,17
     0                             :rem 19
11262 DATA 0,60,170,170,170,170,60,0
                                   :rem 214
11263 DATA 0,40,85,85,85,85,40,0   :rem 39
```

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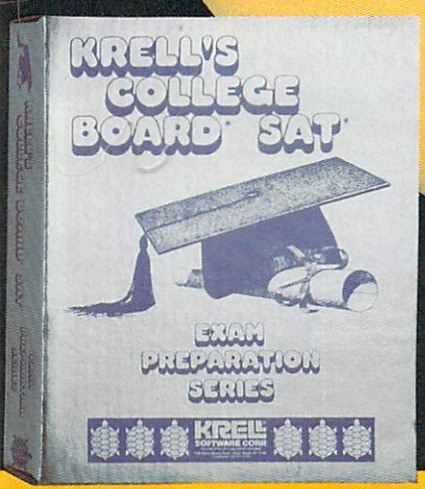

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```
11270 RETURN                              :rem 219
12000 DATA 195,209,0,209,215,0,215,219,22
      5,219,225,219,209,0,195,209,0,209
                                          :rem 52
12100 DATA 209,0,0,195,191,195,201,201,19
      5,0,0,0,207,207,209                 :rem 108
```

Program 4: Worm Of Bemer—64 Version

Translation by Kevin Martin, Editorial Programmer

Refer to the "Automatic Proofreader" article before typing this program in.

```
1 POKE52,48:POKE56,48:CLR                 :rem 230
2 POKE53270,PEEK(53270)AND15              :rem 62
5 POKE53280,0:POKE53281,0                 :rem 138
10 GOTO5000                               :rem 95
100 S=PEEK(56320)AND15:FORD=1TOSP:NEXT
                                          :rem 98
110 IFS=7ORS=6ORS=5THENDX=1:DY=0:DI=1:IFO
    D=2THENDX=-1:DY=0:DI=2                :rem 18
120 IFS=11ORS=10ORS=9THENDX=-1:DY=0:DI=2:
    IFOD=1THENDX=1:DY=0:DI=1              :rem 108
130 IFS=14THENDY=-1:DX=0:DI=4:IFOD=3THEND
    I=3:DY=1:DX=0                         :rem 122
140 IFS=13THENDY=1:DX=0:DI=3:IFOD=4THENDI
    =4:DY=-1:DX=0                         :rem 123
145 PO=1024+XA+YA*40:OD=DI:POKEPO,42:POKE
    PO+SO,L1                              :rem 3
150 XA=XA+DX:YA=YA+DY:L=LEN(XA$):XA$=XA$+
    CHR$(XA):YA$=YA$+CHR$(YA)             :rem 0
155 Z=PEEK(1024+XA+YA*40):IFZ<>32THEN200
                                          :rem 73
161 POKESO+1,40:POKESO+4,17               :rem 83
162 PO=1024+XA+YA*40:POKEPO,42:POKEPO+SO,
    10:POKESO+4,16:IFL<WOTHEN100          :rem 3
190 PO=1024+ASC(XA$)+40*ASC(YA$):LL=LEN(X
    A$)-1:XA$=RIGHT$(XA$,LL)              :rem 238
191 POKEPO,32:POKEPO+SO,0                 :rem 43
195 YA$=RIGHT$(YA$,LL):GOTO100            :rem 19
200 POKESO+1,20:POKESO+4,17:POKESO+4,16
                                          :rem 72
201 PO=1024+XA+40*YA:POKEPO,42:POKEPO+SO,
    10:GOSUB6600:IFZ<>BUTHEN260           :rem 202
210 WO=WO+15+3*LO:IFWO>240THENWO=240
                                          :rem 187
220 XX=INT(RND(1)*36+2):X=INT(RND(1)*18+3
    ):IFPEEK(1024+XX+40*X)<>32THEN220
                                          :rem 9
221 SC=SC+100+LO*7:POKESO+4,55:POKESO+4,1
    7                                     :rem 223
225 HI=HI-1:GOSUB6600:IFHI>0THEN229
                                          :rem 112
226 PO=1024+20+40*2:POKEPO,160:POKEPO+SO,
    0:PO=1024+20+21*40:POKEPO,160         :rem 2
227 POKEPO+SO,0:PO=1024+40*12:POKEPO,160:
    POKEPO+SO,0:POKESO+1,100:POKESO+4,17
                                          :rem 169
228 PO=1024+40*12+39:POKEPO,160:POKEPO+SO
    ,0:GOTO100                            :rem 242
229 PO=1024+XX+X*40:POKEPO,BUG:POKEPO+SO,
    13                                    :rem 163
230 GOTO100                               :rem 95
260 IFZ<>160ANDLI>1THENGOSUB7500:GOTO290
                                          :rem 242
265 IFZ<>160THEN7500                      :rem 146
270 POKESO+1,90:POKESO+4,17               :rem 89
271 GOSUB7000:PRINT"{HOME}{24 DOWN}"
                                          :rem 151
275 FORDE=1TO24:PRINT:POKESO+1,DEL:POKESO
    +4,17:NEXT:POKESO+4,16                :rem 40
280 LO=LO+1:WO=5:IFLO=12THEN1200          :rem 177
281 L1=L1+1:IFL1>15THENL1=11              :rem 99
285 IFLO>EXTHENGOSUB9100                  :rem 29
287 PRINT"{CLR}":GOSUB 4100               :rem 132
290 GOSUB6600                             :rem 231
300 ONLO GOTO5020,400,500,550,600,700,800
    ,450,550,1000,1100,1200               :rem 176
399 GOTO5015                              :rem 169
400 REM SECOND SCREEN                     :rem 244
```

VIC, 64, And TI-99/4A Notes

Patrick Parrish, Programming Supervisor

The object of all versions of "Worm of Bemer" is to safely guide Nerm the Worm through 11 levels, or rooms, to his home. Each room, of course, offers a different arrangement of obstructing walls. To advance from one room to another, you must eat five magic mushrooms. If you bump into a wall or into your own trail along the way, you lose a life. Fortunately, you have four lives. Every third room, you are awarded another life.

The VIC-20 version of Worm of Bemer is a two-part program requiring at least 8K of additional memory. Type in Program 2 and SAVE it. If you are using tape, delete lines 10 and 40 in the program and remove the REM in line 11 before you SAVE it. Then enter Program 3 and SAVE it just after Program 2 on the tape. On the other hand, if you are using a disk drive, type in and SAVE Program 2 as it is. Next, enter Program 3 and SAVE it as "NM".

To LOAD the VIC version of Worm of Bemer from tape, LOAD Program 2 and RUN it. Program 2 will automatically LOAD and RUN Program 3. To LOAD Worm of Bemer from disk, LOAD and RUN Program 2. Program 2 will automatically LOAD Program 3 and place the cursor over the RUN command. When the disk drive stops spinning, press RETURN (to execute the RUN command) to start the game.

The VIC version of Worm of Bemer, like the Atari version, is played with a joystick. The 64 version (Program 4) is also played with a joystick. If you have a 64, plug your joystick into port 2 to play.

Written with single statement lines, the TI-99/4A version of Worm of Bemer (Program 5) RUNs in either regular or Extended BASIC. With this version, use keyboard control (E, S, D, and X keys, with the arrows on them) to maneuver Nerm through each room.

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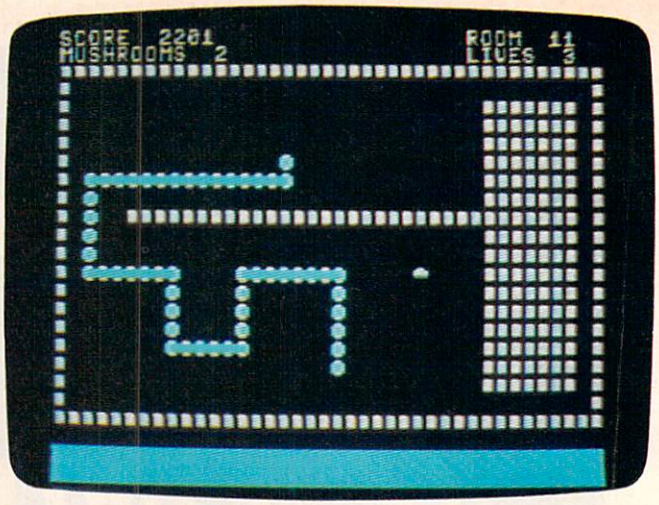
```
410 FORI=1024+5+10*40TO1024+35+10*40:POKE
    I,35:POKEI+SO,9:NEXT          :rem 253
420 GOTO5020                      :rem 150
450 REM SCREEN                    :rem 61
460 FORI=1024+5+10*40TO1024+35+10*40:POKE
    I,35:POKEI+SO,9:NEXT          :rem 2
465 FORI=1024+18+5*40TO1024+18+20*40STEP4
    0:POKEI,35:POKEI+SO,9:NEXT    :rem 177
470 GOTO5020                      :rem 155
500 REM THE FOURTH SCREEN         :rem 242
510 FORI=1024+5+5*40TO1024+35+5*40:POKEI,
    35:POKEI+SO,9:NEXT            :rem 166
520 FORI=1024+5+18*40TO1024+35+18*40:POKE
    I,35:POKEI+SO,9:NEXT          :rem 15
530 GOTO5020                      :rem 152
550 REM FRAME 5                   :rem 30
560 FORI=1024+7+6*40TO1024+33+6*40:POKEI,
    35:POKEI+SO,9:NEXT            :rem 173
575 FORI=1024+18+7*40TO1024+18+20*40STEP4
    0:POKEI,35:POKEI+SO,9:NEXT    :rem 181
580 GOTO5020                      :rem 157
600 REM FRAME 6                   :rem 27
610 FORI=1024+1+10*40TO1024+18+10*40:POKE
    I,35:POKEI+SO,9:NEXT          :rem 252
615 FORI=1024+22+10*40TO1024+38+10*40:POK
    EI,35:POKEI+SO,9:NEXT         :rem 54
620 GOTO5020                      :rem 152
700 REM FRAME 7                   :rem 29
710 FORJ=6TO14:FORI=1024+6+J*40TO1024+12+
    J*40:POKEI,35:POKEI+SO,9:NEXT:rem 180
715 FORI=1024+20+J*40TO1024+32+J*40:POKEI
    ,35:POKEI+SO,9:NEXT:NEXT      :rem 122
720 GOTO 5020                     :rem 153
800 REM FRAME 8                   :rem 31
811 FORI=1024+1+8*40TO1024+18+8*40:POKEI,
    35:POKEI+SO,9:NEXT            :rem 173
812 FORI=1024+1+15*40TO1024+18+15*40:POKE
    I,35:POKEI+SO,9:NEXT          :rem 10
813 FORI=1024+15+12*40TO1024+38+12*40:POK
    EI,35:POKEI+SO,9:NEXT         :rem 60
890 GOTO5020                      :rem 161
1000 FORJ=4TO19:FORI=1024+1+J*40TO1024+37
     +J*40:POKEI,35:POKEI+SO,9:NEXT:NEXT
                                  :rem 91
1005 FORJ=4TO19:FORI=1024+1+J*40TO1024+22
     +J*40:POKEI,32:POKEI+SO,9:NEXT:NEXT
                                  :rem 87
1010 GOTO5020                     :rem 194
1100 FORJ=4TO19:FORI=1024+1+J*40TO1024+37
     +J*40:POKEI,35:POKEI+SO,9:NEXT:NEXT
                                  :rem 92
1105 FORJ=4TO19:FORI=1024+1+J*40TO1024+30
     +J*40:POKEI,32:POKEI+SO,9:NEXT:NEXT
                                  :rem 87
1110 GOTO400                      :rem 144
1200 REM YOU WIN                  :rem 146
1205 FORZZ=1TO3                   :rem 167
1210 PRINT"{CLR}{8 DOWN}{14 RIGHT}NERM'S
    {SPACE}HOME"                  :rem 27
1212 PRINT"{5 DOWN}{15 RIGHT}THANK YOU"
                                  :rem 18
1215 FORG=1TO5                    :rem 61
1220 FORI=1TO10                   :rem 103
1229 POKESO+1,I+6:POKESO+4,17     :rem 207
1240 NEXT:NEXT                    :rem 127
1245 FORI=1TO200:POKESO+1,I:POKESO+4,17:N
    EXT                           :rem 242
1250 NEXT:GOTO7700                :rem 72
4100 FORI=56216TO56295:POKEI,L1:POKEI-SO,
    36:NEXT:RETURN                :rem 232
5000 REM UP THE GAME              :rem 73
```



64 version of "Worm of Bemer."

```
5005 GOSUB10000:GOSUB11100:BUG=33:rem 163
5011 SP=35:LI=4:SC=0:LO=1:GOSUB5500:HI=5:
    WO=5:EX=2:L1=11               :rem 126
5012 POKE53270,PEEK(53270)OR16    :rem 163
5015 PRINT"{CLR}":GOSUB6500       :rem 180
5020 XA$="":YA$="":XB$="":YB$="":XA=20:YA
    =19:DX=0                      :rem 161
5021 IFLO=3THENYA=18              :rem 209
5025 DY=-1:T=0:IFHI<0THENHI=0     :rem 242
5030 DI=4:IFHI>5THENHI=5          :rem 197
5050 FORI=1024+40*2TO1024+39+40*2:POKEI,3
    5:POKEI+19*40,35:POKEI+SO,9   :rem 104
5051 POKEI+SO+19*40,9:NEXT        :rem 17
5055 FORI=1024+40*2TO1024+40*20STEP40:POK
    EI,35:POKEI+39,35:POKEI+SO,9  :rem 26
5056 POKEI+SO+39,9:NEXT:IFHI>0THEN5060
                                  :rem 76
5057 I=1024+20+40*2:POKEI,160:POKEI+SO,0:
    I=1024+20+21*40:POKEI,160:POKEI+SO,0
                                  :rem 102
5058 POKE1024+12*40,160:POKE1024+12*40+SO
    ,0                            :rem 28
5059 POKE1024+12*40+39,160:POKE1024+12*40
    +SO+39,0:GOSUB4100:GOTO150    :rem 211
5060 XX=RND(1)*36+2:X=RND(1)*18+3:IFPEEK(
    1024+XX+X*40)<>32THEN5060     :rem 255
5065 POKE1024+XX+X*40,BU:POKE1024+XX+X*40
    +SO,13                        :rem 238
5070 GOSUB4100                    :rem 17
5085 GOTO150                      :rem 161
5500 PRINT"{CLR}"                 :rem 46
5510 PRINT"{11 DOWN}{15 RIGHT}GET READY"
                                  :rem 95
5540 FORX=1TO14:POKESO+1,NN(X):POKESO+4,1
    7:FORD=1TO120:NEXT:NEXT       :rem 84
5545 POKESO+4,16                  :rem 150
5550 RETURN                       :rem 175
6500 REM REDEFINING SCREEN        :rem 74
6510 POKESO+4,16                  :rem 143
6575 GOSUB 6600                   :rem 35
6580 RETURN                       :rem 179
6600 REM PRINT SCORE              :rem 185
6605 PRINT"{YEL}{HOME}SCORE ";SC  :rem 160
6606 PRINT"{HOME}{30 RIGHT}ROOM ";LO
                                  :rem 47
6610 PRINT"MUSHROOMS ";HI;"{17 SPACES}LIV
    ES ";LI                       :rem 9
6620 RETURN                       :rem 174
7000 REM CLEAN UP THE CENTIPEDE   :rem 37
7002 SP=SP-5                      :rem 174
7004 GOSUB 6600:HI=5              :rem 84
```

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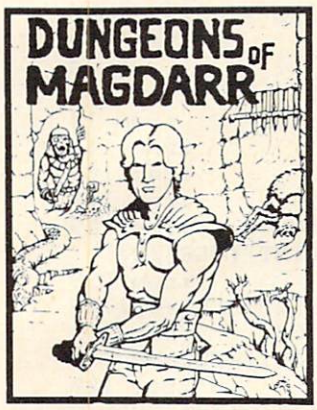

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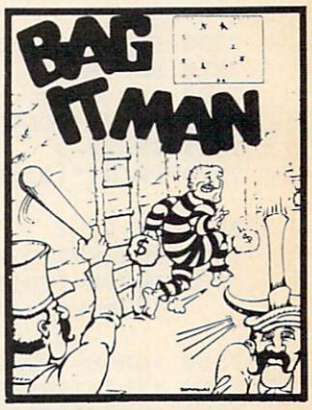

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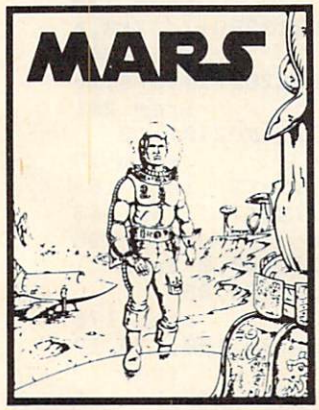

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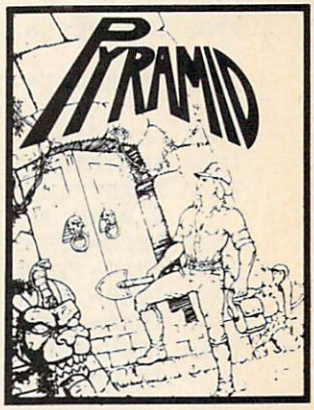

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```
7005 L=LEN(XA$)                          :rem 66
7010 FORI=1TOL-1                         :rem 179
7020 POKESO+1,I:POKESO+4,17:FORQQ=1TO10:N
     EXT                                 :rem 23
7190 PO=1024+ASC(XA$)+40*ASC(YA$):LL=LEN(
     XA$)-1:XA$=RIGHT$(XA$,LL)           :rem 37
7195 YA$=RIGHT$(YA$,LL):POKEPO,32:POKEPO+
     SO,1                                :rem 17
7200 NEXT:POKESO+4,16                     :rem 5
7210 RETURN                              :rem 170
7500 REM OOPS                            :rem 241
7510 PRINT"{CLR}{PUR}"                   :rem 205
7515 SP=SP-5                             :rem 183
7520 PRINT"{12 DOWN}{18 RIGHT}OOPS"
                                         :rem 182
7521 LI=LI-1                             :rem 148
7525 FORDE=1TO20:NEXT                    :rem 47
7530 FORDE=1TO10:POKESO+1,DE*20:POKESO+4,
     17:FORQQ=1TO10:NEXT:NEXT:POKESO+4,16
                                         :rem 123
7550 FORDE=1TO20:NEXT                    :rem 45
7560 IFLI<1THEN7700                      :rem 96
7599 PRINT"{CLR}":RETURN                 :rem 92
7700 REM THE GAMES OVER                  :rem 60
7705 POKESO+4,16                         :rem 150
7710 PRINT"{CLR}":POKE53270,PEEK(53270)AN
     D15                                 :rem 121
7715 IF SC>HSTHENHS=SC:GOSUB9000:PRINT"
     {CLR}[8]"                           :rem 43
7718 PRINT"{6 DOWN}{18 RIGHT}NERM":rem 74
7720 PRINT"{YEL}{4 DOWN}YOUR SCORE ";SC
                                         :rem 31
7730 PRINT"[6]{4 DOWN}HIGH SCORE ";HS
                                         :rem 241
7735 GOSUB 7800                          :rem 37
7736 PRINT"{WHT}{2 DOWN}PRESS THE TRIGGER
      TO PLAY AGAIN, Q=QUIT"            :rem 135
7740 FORX=1TO15:POKESO+1,PN(X):POKESO+4,1
     7:FORD=1TO100:NEXT:NEXT             :rem 89
7745 POKESO+4,16                         :rem 154
7780 S=PEEK(56320)AND16:IFS=0THEN5011
                                         :rem 149
7783 IFPEEK(197)=62THENPOKE198,0:SYS2048
                                         :rem 135
7785 GOTO7780                            :rem 234
7800 REM RANK THE GAMER                   :rem 44
7810 PRINT"{CYN}{2 DOWN}{7 SPACES}YOUR NE
     W RANK IS ";                        :rem 158
7820 IFLO=1THENPRINT"ZERO"               :rem 169
7830 IFLO=2THENPRINT"ROOKIE"              :rem 52
7840 IFLO=3THENPRINT"NOVICE"              :rem 49
7850 IFLO=4THENPRINT"AVERAGE"            :rem 106
7860 IFLO=5THENPRINT"MASTER"              :rem 61
7870 IFLO=6THENPRINT"GRAND MASTER"
                                         :rem 171
7880 IFLO=7THENPRINT"WIZARD"              :rem 70
7890 IFLO=8THENPRINT"GRAND WIZARD"
                                         :rem 180
7900 IFLO=9THENPRINT"SUPER STAR"          :rem 57
7910 IFLO>9THENPRINT"HALL OF FAME":rem 65
7920 RETURN                              :rem 178
9000 REM NEW HIGH SCORE                   :rem 51
9002 PRINT"{CLR}"                         :rem 47
9003 PRINT"{CYN}{8 DOWN}{16 RIGHT}NEW HIG
     H"                                  :rem 158
9004 PRINT"{4 DOWN}{17 RIGHT}SCORE"
                                         :rem 75
9005 FORY=1TO3                           :rem 82
9010 FORN=1TO5                           :rem 69
9020 FORD=1TO5:POKESO+1,D*20:POKESO+4,17:
     NEXT                                :rem 22
9030 POKESO+1,N*30:POKESO+4,17           :rem 254
9050 NEXT                                 :rem 13
9060 NEXT                                 :rem 14
9065 FORD=1TO30:NEXT                     :rem 236
9070 RETURN                              :rem 176
9100 REM EXTRA LIFE                       :rem 82
9110 PRINT"{CLR}"                         :rem 47
9115 PRINT"{CYN}{12 DOWN}{15 RIGHT}BONUS
     {SPACE}LIFE"                        :rem 102
9120 FORJ=100TO200                         :rem 0
9140 POKESO+1,J:POKESO+4,17              :rem 111
9150 NEXT                                 :rem 14
9160 POKESO+4,16                         :rem 147
9170 EX=EX+3                             :rem 166
9180 LI=LI+1                             :rem 149
9190 RETURN                              :rem 179
10000 DIM PN(15),NN(18):PRINT"{CLR}[8]"
                                         :rem 219
10005 SO=54272:POKESO+24,15:POKESO+5,17:P
     OKESO+6,241:POKESO,100              :rem 253
10010 PRINT"{6 DOWN}{15 RIGHT}WELCOME TO"
                                         :rem 139
10020 PRINT"{CYN}{4 DOWN}{14 RIGHT}NERM O
     F BEMER"                            :rem 111
10025 PRINT"[1]{3 DOWN}{13 RIGHT}USE JO
     YSTICK #2"                          :rem 168
10030 PRINT"[6]{6 DOWN}{11 RIGHT}HIT TR
     IGGER TO START"                      :rem 45
10045 S=PEEK(56320)AND16:IFS=0THENRETURN
                                         :rem 210
10060 GOTO10045                           :rem 42
11100 PRINT"{CLR}{CYN}{12 DOWN}{9 RIGHT}R
     EDEFINING{2 SPACES}CHARACTERS"
                                         :rem 130
11109 POKE56334,PEEK(56334)AND254:POKE1,P
     EEK(1)AND251                         :rem 29
11110 FORI=12288TO12288+64*8:POKEI,PEEK(I
     +40960):NEXTI                       :rem 146
11120 POKE1,PEEK(1)OR4:POKE56334,PEEK(563
     34)OR1                              :rem 228
11180 FORI=0TO39:READA:POKE12288+I+32*8,A
     :NEXT                               :rem 248
11185 FORI=0TO7:READA:POKE12288+I+42*8,A:
     NEXT                                :rem 201
11190 POKE53272,(PEEK(53272)AND240)+12
                                          :rem 27
11200 FORI=1TO18:READNN(I):NEXT          :rem 163
11210 FORI=1TO15:READPN(I):NEXT          :rem 163
11240 DATA 0,0,0,0,0,0,0,0               :rem 198
11250 DATA 0,20,85,85,255,40,40,0 :rem 71
11260 DATA 85,85,85,85,85,85,85,85
                                         :rem 176
11261 DATA 170,190,190,190,190,190,170,17
     0                                    :rem 19
11262 DATA 255,255,255,255,255,255,255,25
     5                                    :rem 42
11263 DATA 0,20,255,255,255,255,20,0
                                         :rem 223
11270 RETURN                             :rem 219
12000 DATA 33,44,0,44,50,0,50,56,67,56,67
     ,56,44,0,33,44,0,44                 :rem 114
12100 DATA 44,0,0,33,31,33,37,37,33,0,0,0
     ,42,42,44                           :rem 108
```

Program 5: Worm Of Bemer—TI Version

Translation by Patrick Parrish, Programming Supervisor

```
3 DIM NN(29),RANK$(12)
5 GOSUB 11000
10 GOTO 5000
20 FOR I=1 TO LEN(H$)
```

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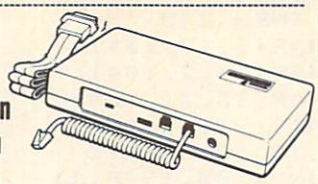

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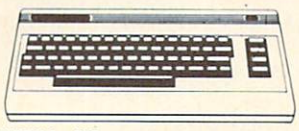

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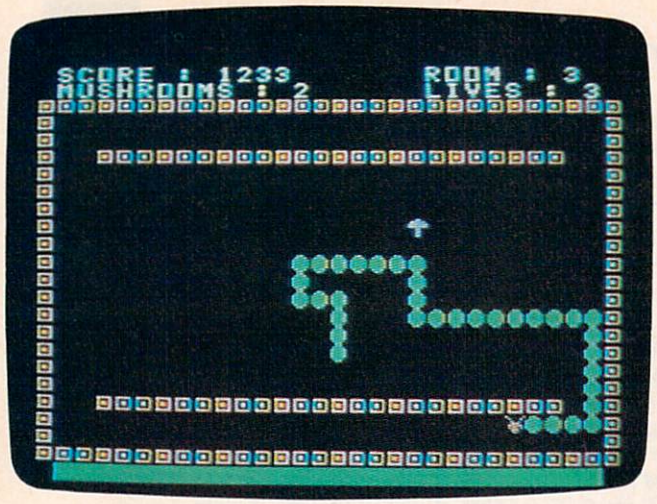

TI version of "Worm of Bemer."

```
30 CALL HCHAR(ROW,COL+I,ASC(SEG$(H$
   ,I,1)))
35 NEXT I
40 RETURN
100 CALL KEY(0,K,ST)
105 IF (K<>68)+(OD=2)THEN 110
106 DX=1
107 DY=0
108 DI=1
110 IF (K<>83)+(OD=1)THEN 115
111 DX=-1
112 DY=0
113 DI=2
115 IF (K<>69)+(OD=3)THEN 120
116 DY=-1
117 DX=0
118 DI=4
120 IF (K<>88)+(OD=4)THEN 140
125 DY=1
130 DX=0
135 DI=3
140 CALL HCHAR(YA,XA,136)
145 OD=DI
150 XA=XA+DX
152 YA=YA+DY
154 L=LEN(XA$)
156 XA$=XA$&CHR$(XA)
158 YA$=YA$&CHR$(YA)
160 CALL GCHAR(YA,XA,Z)
162 IF Z<>32 THEN 200
164 CALL HCHAR(YA,XA,128)
166 CALL SOUND(1,622,2)
168 IF L<WO THEN 100
170 CALL HCHAR(ASC(YA$),ASC(XA$),32)
172 LL=LEN(XA$)-1
174 XA$=SEG$(XA$,2,LL)
176 YA$=SEG$(YA$,2,LL)
180 GOTO 100
200 CALL SOUND(100,311,2)
201 CALL HCHAR(YA,XA,128)
203 GOSUB 6600
205 IF Z<>MUSH THEN 260
210 WO=WO+15+2*LO
212 IF WO<185 THEN 215
214 WO=185
215 RANDOMIZE
216 XX=RND*28+3
218 X=RND*19+4
220 CALL GCHAR(X,XX,H1)
222 IF H1<>32 THEN 216
224 SC=SC+100+LO*7
228 HI=HI-1
230 GOSUB 6600
232 IF HI>0 THEN 245
234 CALL HCHAR(3,17,104)
236 CALL HCHAR(13,2,104)
238 CALL HCHAR(13,31,104)
240 CALL HCHAR(23,17,104)
241 FOR I=3 TO 30 STEP 3
242 CALL SOUND(100,1900,I)
243 NEXT I
244 GOTO 100
245 CALL HCHAR(X,XX,MUSH)
250 GOTO 100
260 IF Z=104 THEN 270
261 IF LI=1 THEN 7500
264 GOSUB 7500
266 GOTO 290
270 CALL HCHAR(YA,XA,136)
272 GOSUB 7000
275 FOR DE=110 TO 880 STEP 32
277 PRINT
279 CALL SOUND(1,DE,2)
280 CALL SOUND(-1,DE,2)
281 NEXT DE
282 LO=LO+1
283 IF LO=12 THEN 1200
284 WO=5
285 L1=L1+1
286 IF LO>EX THEN 9100
287 CALL COLOR(14,L1,1)
288 CALL CLEAR
289 GOSUB 1300
290 GOSUB 6600
300 ON LO GOTO 5080,400,500,550,600
    ,700,800,450,550,1000,1100,1200
399 GOTO 5080
400 REM  SECOND SCREEN
410 CALL HCHAR(13,5,120,24)
420 GOTO 5080
449 REM  SCREEN
450 CALL VCHAR(7,15,120,16)
455 CALL HCHAR(9,6,120,22)
460 GOTO 5080
499 REM  FOURTH SCREEN
500 CALL HCHAR(6,5,120,24)
505 CALL HCHAR(20,5,120,24)
510 GOTO 5080
549 REM  FIFTH SCREEN
550 CALL HCHAR(7,6,120,22)
555 CALL VCHAR(8,15,120,16)
560 GOTO 5080
599 REM  FRAME 6
600 CALL HCHAR(12,3,120,13)
610 CALL HCHAR(12,19,120,12)
620 GOTO 5080
699 REM  FRAME 7
700 FOR I=8 TO 18
710 CALL HCHAR(I,7,120,7)
715 CALL HCHAR(I,18,120,8)
720 NEXT I
725 GOTO 5080
799 REM  FRAME 8
800 CALL HCHAR(8,3,120,13)
805 CALL HCHAR(14,12,120,19)
810 CALL HCHAR(18,3,120,13)
815 GOTO 5080
999 REM  FRAME 9
1000 GOSUB 1400
1015 FOR T=5 TO 21
1020 CALL HCHAR(T,4,32,16)
```

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```
1025 NEXT T
1030 GOTO 5080
1100 GOSUB 1400
1110 FOR T=5 TO 21
1115 CALL HCHAR(T,4,32,20)
1120 NEXT T
1125 GOTO 400
1199 REM  YOU WIN!!
1200 CALL CLEAR
1205 CALL SCREEN(3)
1206 FOR I=4 TO 8
1207 CALL COLOR(I,2,1)
1208 NEXT I
1210 PRINT TAB(9);"NERM'S HOME!"
1220 PRINT
1230 PRINT
1240 PRINT TAB(10);"THANK YOU!"
1250 FOR T=1 TO 9
1260 PRINT
1270 NEXT T
1275 FOR T=1 TO 3
1280 FOR I=110 TO 880 STEP 30
1283 CALL SOUND(1,I,2)
1284 CALL SOUND(-1,I,2)
1285 NEXT I
1286 FOR I=880 TO 110 STEP -30
1287 CALL SOUND(1,I,2)
1288 CALL SOUND(-1,I,2)
1289 NEXT I
1290 NEXT T
1291 CALL SCREEN(2)
1293 GOTO 7700
1300 CALL CLEAR
1305 PRINT "SCORE :";TAB(20);"ROOM
     :"
1310 PRINT "MUSHROOMS :";TAB(20);"L
     IVES :"
1320 FOR T=1 TO 21
1330 PRINT
1340 NEXT T
1350 RETURN
1400 FOR T=5 TO 21
1410 CALL HCHAR(T,4,120,26)
1420 NEXT T
1430 RETURN
4999 REM  UP THE GAME
5000 GOSUB 10000
5005 MUSH=112
5010 LI=4
5015 SC=0
5020 LO=1
5035 HI=5
5040 WO=5
5045 EX=2
5050 L1=3
5055 GOSUB 5500
5060 CALL CLEAR
5065 CALL SCREEN(2)
5066 FOR I=3 TO 8
5067 CALL COLOR(I,16,1)
5068 NEXT I
5070 GOSUB 1300
5075 GOSUB 6600
5080 XA$=""
5081 YA$=""
5085 XA=17
5086 YA=18
5091 DX=0
5093 DY=-1
5103 IF HI<6 THEN 5107
5105 HI=5
5107 IF HI>-1 THEN 5110
5109 HI=0
5110 DI=4
5115 FOR I=2 TO 31 STEP 29
5120 CALL VCHAR(3,I,120,21)
5125 NEXT I
5130 FOR I=3 TO 23 STEP 20
5135 CALL HCHAR(I,3,120,28)
5140 NEXT I
5145 CALL HCHAR(24,3,137,28)
5150 IF HI>0 THEN 5174
5155 CALL HCHAR(3,17,104)
5160 CALL HCHAR(12,2,104)
5165 CALL HCHAR(12,31,104)
5167 CALL HCHAR(23,17,104)
5171 GOTO 150
5174 RANDOMIZE
5175 XX=RND*28+3
5178 X=RND*19+4
5180 CALL GCHAR(X,XX,H1)
5185 IF H1<>32 THEN 5174
5190 CALL HCHAR(X,XX,MUSH)
5200 GOTO 150
5500 CALL CLEAR
5505 PRINT TAB(10);"GET READY!"
5510 FOR T=1 TO 12
5515 PRINT
5520 NEXT T
5525 FOR I=1 TO 14
5530 CALL SOUND(100,NN(I),2)
5535 NEXT I
5540 RETURN
6599 REM  PRINT SCORE
6600 H$=STR$(SC)
6603 ROW=1
6604 COL=10
6605 GOSUB 20
6607 H$=STR$(LO)
6608 COL=28
6609 GOSUB 20
6610 H$=STR$(HI)
6611 ROW=2
6620 COL=14
6625 GOSUB 20
6630 H$=STR$(LI)
6635 COL=29
6640 GOSUB 20
6650 RETURN
6999 REM  NERM LEAVES
7000 SP=SP-5
7005 GOSUB 6600
7010 HI=5
7015 L=LEN(XA$)
7020 FOR I=1 TO L
7025 CALL SOUND(2,110+I*2,2)
7030 CALL HCHAR(ASC(YA$),ASC(XA$),3
     2)
7035 LL=LEN(XA$)-1
7040 XA$=SEG$(XA$,2,LL)
7045 YA$=SEG$(YA$,2,LL)
7050 NEXT I
7060 RETURN
7499 REM  OOP!!
7500 CALL CLEAR
7505 PRINT TAB(13);"OOPS"
7510 FOR I=1 TO 12
7515 PRINT
7520 NEXT I
7525 LI=LI-1
7547 FOR I=14 TO 24
7549 CALL SOUND(10,I*40,2)
7551 NEXT I
7553 FOR I=1 TO 30
```

```
7555 NEXT I
7560 IF LI<1 THEN 7700
7575 GOSUB 1300
7600 RETURN
7699 REM  THE GAME ENDS
7700 CALL CLEAR
7704 FOR I=3 TO 8
7705 CALL COLOR(I,16,1)
7706 NEXT I
7710 IF HS>SC THEN 7750
7720 HS=SC
7721 FOR I=1 TO 5
7722 PRINT
7723 NEXT I
7725 PRINT TAB(8);"NEW HIGH SCORE"
7728 FOR T=110 TO 1760 STEP 50
7729 CALL SOUND(2,T,2)
7730 NEXT T
7740 FOR I=1 TO 5
7743 PRINT
7745 NEXT I
7750 PRINT TAB(7);"YOUR SCORE: ";SC
7755 PRINT
7760 PRINT TAB(7);"HIGH SCORE: ";HS
7770 FOR I=1 TO 3
7775 PRINT
7780 NEXT I
7785 PRINT TAB(5);"YOUR NEW RANK IS
     :"
7790 PRINT
7795 PRINT TAB(9);RANK$(LO)
7796 FOR I=15 TO 29
7797 CALL SOUND(100,NN(I),2)
7798 NEXT I
7800 PRINT
7805 PRINT
7806 PRINT
7810 PRINT "(C TO CONTINUE  Q TO QU
     IT)"
7815 FOR T=1 TO 4
7816 PRINT
7817 NEXT T
7820 CALL KEY(0,K,ST)
7830 IF ST=0 THEN 7820
7840 IF (K<>67)*(K<>81)THEN 7820
7845 IF K=67 THEN 5000
7850 STOP
9099 REM  EXTRA LIFE
9100 CALL CLEAR
9110 PRINT TAB(11);"BONUS LIFE"
9120 FOR I=1 TO 12
9125 PRINT
9130 NEXT I
9132 FOR I=1 TO 30 STEP 2
9134 CALL SOUND(100,1175,I)
9136 NEXT I
9140 EX=EX+3
9145 LI=LI+1
9150 GOTO 287
10000 CALL CLEAR
10001 FOR T=3 TO 8
10003 CALL COLOR(T,2,1)
10006 NEXT T
10010 CALL COLOR(14,3,1)
10015 CALL SCREEN(15)
10020 PRINT TAB(10);"WELCOME TO"
10021 FOR T=1 TO 4
10022 PRINT
10023 NEXT T
10025 PRINT TAB(8);"NERM OF BEMER"
10028 FOR T=1 TO 9
10030 PRINT
10032 NEXT T
10034 PRINT "USE E,S,D, & X KEYS TO
      MOVE"
10036 PRINT
10040 CALL HCHAR(21,3,136,4)
10042 CALL HCHAR(21,8,128)
10045 FOR I=1 TO 22
10047 CALL HCHAR(21,6+I,136)
10050 CALL HCHAR(21,7+I,128)
10052 CALL SOUND(10,622,2)
10055 CALL HCHAR(21,2+I,32)
10057 FOR T=1 TO 20
10058 NEXT T
10060 NEXT I
10065 FOR T=1 TO 100
10070 NEXT T
10075 RETURN
10999 REM  REDEFINE CHARS
11000 FOR I=104 TO 136 STEP 8
11015 READ A$
11020 CALL CHAR(I,A$)
11025 NEXT I
11030 DATA FFFFFFFFFFFFFFFF,187EFFF
      F18181818,FF81BDA5A5BD81FF
11032 DATA 8142243C7E5A3C18,387CFEF
      EFEFE7C38
11033 CALL COLOR(10,2,2)
11035 CALL COLOR(11,14,1)
11040 CALL COLOR(12,2,10)
11045 CALL COLOR(13,7,1)
11050 CALL CHAR(137,"FFFFFFFFFFFFFF
      FF")
11060 FOR I=1 TO 9
11065 READ RANK$(I)
11070 NEXT I
11075 FOR I=10 TO 12
11080 RANK$(I)="HALL OF FAME"
11085 NEXT I
11090 DATA ZERO,ROOKIE,NOVICE,AVERA
      GE
11092 DATA MASTER,GRAND MASTER,WIZA
      RD,GRAND WIZARD
11094 DATA SUPER STAR
11100 FOR I=1 TO 29
11110 READ NN(I)
11120 NEXT I
11130 DATA 262,349,40000,349,392,40
      000,392,440,523,440,523,440,3
      49,40000
11135 DATA 349,40000,40000,262,247,
      262,294,294,262,40000,40000,4
      0000,330,330,349
11140 RETURN
```

Program 6: Worm Of Bemer—PC/PCjr Version

Translation by Patrick Parrish, Programming Supervisor

```
2 DEF SEG=0:POKE 1047,80:SCREEN 0,1
4 WIDTH 40:KEY OFF
5 DEF SEG=&HB800
7 DIM RANK$(12):GOSUB 11000
10 GOTO 5000
100 A$=RIGHT$(INKEY$,1):FOR D=1 TO SP:NE
XT D
110 IF A$=CHR$(77) THEN DX=1:DY=0:DI=1:I
F OD=2 THEN DX=-1:DY=0:DI=2
120 IF A$=CHR$(75) THEN DX=-1:DY=0:DI=2:
IF OD=1 THEN DX=1:DY=0:DI=1
130 IF A$=CHR$(72) THEN DY=-1:DX=0:DI=4:
IF OD=3 THEN DI=3:DY=1:DX=0
140 IF A$=CHR$(80) THEN DY=1:DX=0:DI=3:I
F OD=4 THEN DI=4:DY=-1:DX=0
```

Notes For PC And PCjr

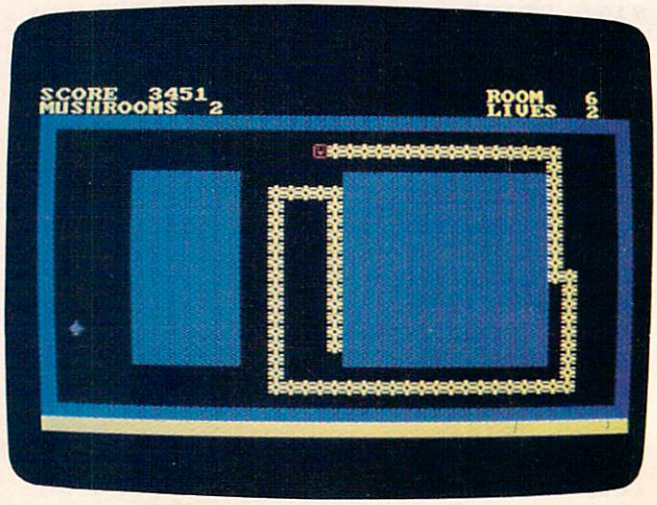
Program 6 is written for the IBM PC or PCjr with 64K of memory and will RUN on any BASIC (PCjr with disk requires Cartridge BASIC). With the PC, a Color Adaptor is necessary. If you have the PCjr, enhance the sounds produced in the game by adding the following line:

```
1 SOUND ON
```

This statement causes all sounds to be emitted from the TV or monitor speaker in addition to the PCjr's internal speaker.

The PC/PCjr version of "Worm of Bemer" is played with the keyboard. Use the arrow keys (found on the numeric keypad on the PC) to control Nerm's movements. In this program, two skill levels are featured—easy and difficult. The skill level you choose determines the speed of the game. If you find that the game loses its challenge for you even on the difficult level, set variable A2(2) to 0 in line 10000. This will further increase the speed, and thus, the challenge of the game.

```
145 PO=2*XA+YA*80:OD=DI:POKE PO,15:POKE
PO+1,L1
150 XA=XA+DX:YA=YA+DY:L=LEN(XA$):XA$=XA$
+CHR$(XA):YA$=YA$+CHR$(YA)
155 Z=PEEK(XA*2+YA*80):IF Z<>32 THEN 200
161 SOUND 500,.5
162 PO=XA*2+YA*80:POKE PO+1,12:POKE PO,1
:IF L<WO THEN 100
190 PO=ASC(XA$)*2+80*ASC(YA$):LL=LEN(XA$
)-1:XA$=RIGHT$(XA$,LL)
191 POKE PO,32:POKE PO+1,0
195 YA$=RIGHT$(YA$,LL):GOTO 100
200 PO=XA*2+YA*80:POKE PO+1,12:POKE PO,1
:GOSUB 6605:IF Z<>BU THEN 260
210 WO=WO+15+3*LO:IF WO>240 THEN WO=240
220 XX=INT(RND(1)*36+2):X=INT(RND(1)*18+
3):IF PEEK(XX*2+80*X)<>32 THEN 220 ELSE
A5=XX*2+80*X
225 SC=SC+100+LO*7:FOR I=1900 TO 1950 ST
EP 10:SOUND I,.5:NEXT
226 HI=HI-1:GOSUB 6605:IF HI>0 THEN 229
227 POKE 198,219:POKE 199,0:POKE 1878,21
9:POKE 1879,0:POKE 960,219:POKE 961,0:PO
KE 1038,219:POKE 1039,0
228 FOR I=900 TO 990 STEP 10:SOUND I,.5:
NEXT:GOTO 100
229 PO=2*XX+X*80:POKE PO,BU:POKE PO+1,5:
GOTO 100
260 IF Z<>219 AND LI>1 THEN GOSUB 7510:G
OTO 290
265 IF Z<>219 THEN 7510
270 GOSUB 7002:LOCATE 24,1:PRINT STRING$
(1,11)STRING$(24,31)
275 FOR DE=1 TO 24:PRINT:SOUND DE+99,.5
277 NEXT DE
280 LO=LO+1:WO=5:IF LO=12 THEN 1200
281 L1=L1+1:IF L1>15 THEN L1=9
285 IF LO>EX THEN GOSUB 9105
287 CLS:GOSUB 4100
290 GOSUB 6605
300 ON LO GOTO 5020,400,500,550,600,700,
800,450,550,1000,1100,1200
395 GOTO 5015
399 REM SECOND SCREEN
400 FOR I=10+13*80 TO 70+13*80 STEP 2:PO
KE I,178:POKE I+1,65:NEXT I
420 GOTO 5020
449 REM THIRD SCREEN
450 FOR I=10+13*80 TO 70+13*80 STEP 2:PO
KE I,178:POKE I+1,65:NEXT I
460 FOR I=40+5*80 TO 40+20*80 STEP 80:PO
KE I+1,65:POKE I,178:NEXT I:GOTO 5020
499 REM FOURTH SCREEN
500 FOR I=10+6*80 TO 70+6*80 STEP 2:POKE
 I,178:POKE I+1,65:NEXT I
520 FOR I=10+19*80 TO 70+19*80 STEP 2:PO
KE I+1,65:POKE I,178:NEXT I:GOTO 5020
549 REM FRAME 5
550 FOR I=14+6*80 TO 64+6*80 STEP 2:POKE
 I+1,65:POKE I,178:NEXT I
560 FOR I=36+7*80 TO 36+22*80 STEP 80:PO
KE I+1,65:POKE I,178:NEXT I:GOTO 5020
599 REM FRAME 6
600 FOR I=2+11*80 TO 32+11*80 STEP 2:POK
E I+1,65:POKE I,178:NEXT I
610 FOR I=44+11*80 TO 76+11*80 STEP 2:PO
KE I+1,65:POKE I,178:NEXT I:GOTO 5020
699 REM FRAME 7
700 FOR J=6 TO 19:FOR I=12+J*80 TO 24+J*
80 STEP 2:POKE I,178:POKE I+1,65:NEXT I
710 FOR I=40+J*80 TO 66+J*80 STEP 2:POKE
 I,178:POKE I+1,65:NEXT:NEXT:GOTO 5020
799 REM FRAME 8
800 FOR I=2+9*80 TO 36+9*80 STEP 2:POKE
I+1,65:POKE I,178:NEXT I
810 FOR I=2+17*80 TO 36+17*80 STEP 2:POK
E I+1,65:POKE I,178:NEXT I
815 FOR I=28+13*80 TO 76+13*80 STEP 2:PO
KE I+1,65:POKE I,178:NEXT I
820 GOTO 5020
999 REM FRAME 9
1000 FOR J=4 TO 21:FOR I=4+J*80 TO 74+J*
80 STEP 2:POKE I+1,65:POKE I,178:NEXT:NE
XT
1005 FOR J=4 TO 21:FOR I=4+J*80 TO 44+J*
80 STEP 2:POKE I+1,0:POKE I,32:NEXT:NEXT
```



PC/PCjr version of "Worm of Bemer."

BEGINNING PROGRAMMERS

If you're new to computing, please read "How To Type COMPUTE!'s Programs" and "A Beginner's Guide To Typing In Programs."

```
1010 GOTO 5020
1099 REM FRAME 10
1100 FOR J=4 TO 21:FOR I=4+J*80 TO 74+J*
80 STEP 2:POKE I+1,65:POKE I,178:NEXT:NE
XT
1105 FOR J=4 TO 21:FOR I=4+J*80 TO 60+J*
80 STEP 2:POKE I+1,0:POKE I,32:NEXT:NEXT
1110 GOTO 400
1199 REM YOU WIN
1200 FOR Z=1 TO 3:CLS:COLOR 5:LOCATE 10,
14:PRINT"NERM'S HOME !":COLOR 9:LOCATE 1
5,15:PRINT"THANK YOU !"
1205 FOR I=220 TO 660 STEP 20:SOUND I,.5
:NEXT I
1220 FOR G=1 TO 250:NEXT:NEXT:GOTO 7700
4100 LOCATE 25,1:COLOR L1:PRINT STRING$(
39,219);:POKE 1998,219:POKE 1999,L1:COLO
R 7:RETURN
4999 REM UP THE GAME
5000 GOSUB 10000:BU=6
5011 SP=35:LI=4:SC=0:LO=1:GOSUB 5500:HI=
5:WO=5:EX=2:L1=9
5015 CLS:GOSUB 6500
5020 XA$="":YA$="":XB$="":YB$="":XA=19:Y
A=19:DX=0
5021 IF LO=3 THEN YA=18
5025 DY=-1:IF HI<0 THEN HI=0
5030 DI=4:IF HI>5 THEN HI=5
5050 FOR I=160 TO 239 STEP 2:POKE I+1,65
:POKE I,178:NEXT I:FOR I=1840 TO 1919 ST
EP 2:POKE I+1,65:POKE I,178:NEXT I
5055 FOR I=240 TO 1839 STEP 80:POKE I+1,
65:POKE I,178:NEXT I:FOR I=318 TO 1917 S
TEP 80:POKE I+1,65:POKE I,178:NEXT I
5056 IF HI>0 THEN 5060
5057 POKE 198,219:POKE 199,0:POKE 1878,2
19:POKE 1879,0:POKE 960,219:POKE 961,0:P
OKE 1038,219:POKE 1039,0
5059 GOSUB 4100:GOTO 150
5060 XX=RND(1)*36+2:X=RND(1)*18+3:IF PEE
K(XX*2+X*80)<>32 THEN 5060
5065 POKE XX*2+X*80,BU:POKE XX*2+X*80+1,
5
5070 GOSUB 4100:GOTO 150
5500 CLS:COLOR 10:LOCATE 12,16:PRINT"GET
 READY !"
5510 FOR I=440 TO 880 STEP 10:SOUND I,1:
NEXT I
5550 RETURN
6500 REM REDEFINING SCREEN
6575 GOSUB 6605
6580 RETURN
6600 REM PRINT SCORE
6605 COLOR 14:PRINT STRING$(1,11)"SCORE
"SC
6606 PRINT STRING$(1,11)STRING$(30,28)"R
OOM  "LO;
6610 PRINT "MUSHROOMS "HI;:PRINT STRING$
(17,32)"LIVES "LI
6620 COLOR 7:RETURN
7000 REM CLEAN UP THE CENTIPEDE
7002 SP=SP+5*(SP>M2)
7004 GOSUB 6605:HI=5
7005 L=LEN(XA$)
7010 POKE PO+1,L1:POKE PO,15:FOR I=1 TO
L
7020 SOUND 220+3*I,1
7190 PO=2*ASC(XA$)+80*ASC(YA$):LL=LEN(XA
$)-1:XA$=RIGHT$(XA$,LL)
7195 YA$=RIGHT$(YA$,LL):POKE PO,32:POKE
PO+1,1
7200 NEXT I
7210 RETURN
7500 REM OOPS
7510 CLS:COLOR 5:SP=SP+5*(SP>M2)
7515 LOCATE 12,18:PRINT"OOPS !"
7521 LI=LI-1
7545 FOR T=250 TO 50 STEP -5:SOUND T,1:N
EXT
7550 FOR DE=1 TO 200:NEXT DE:FOR T=1 TO
10:A$=INKEY$:NEXT T
7560 IF LI<1 THEN 7700
7599 CLS:RETURN
7699 REM THE GAMES OVER
7700 CLS
7715 IF SC>HS THEN HS=SC:GOSUB 9000:CLS
7718 LOCATE 6,18:PRINT"NERM"
7720 COLOR 14:LOCATE 10,12:PRINT"YOUR SC
ORE "SC
7730 LOCATE 14,12:PRINT"HIGH SCORE "HS
7735 GOSUB 7800
7740 COLOR 7:LOCATE 22,1:PRINT"Press the
 space bar to play again,Q=quit"
7745 FOR T=220 TO 880 STEP 100:SOUND T,1
:NEXT:FOR T=880 TO 220 STEP -100:SOUND T
,.5:NEXT
7780 A$=INKEY$:IF A$="Q" THEN END
7784 IF A$=" " THEN 5000 ELSE 7780
7800 REM RANK THE GAMER
7810 COLOR 3:LOCATE 18,INT((22-LEN(RANK$
(LO)))/2):PRINT "YOUR NEW RANK IS "RANK$
(LO)".":RETURN
9000 REM NEW HIGH SCORE
9002 CLS:COLOR 3:LOCATE 9,16:PRINT"NEW H
IGH"
9004 LOCATE 13,17:PRINT"SCORE!"
9005 SOUND 261,5:SOUND 440,5:SOUND 392,1
5
9060 FOR DE=1 TO 1000:NEXT DE
9070 RETURN
9100 REM EXTRA LIFE
9105 CLS:LOCATE 12,15:COLOR 3:PRINT "BON
US LIFE !"
9120 FOR I=1500 TO 3000 STEP 50:SOUND I,
1:NEXT
9130 FOR T=1 TO 1000:NEXT
9170 EX=EX+3:LI=LI+1:RETURN
10000 A2(1)=30:A2(2)=20
10005 CLS:LOCATE 8,16,0:COLOR 9:PRINT"We
lcome to"
10020 COLOR 5:LOCATE 12,14:PRINT"NERM OF
 BEMER"
10021 GOSUB 12000
10022 LOCATE 17,8:COLOR 9:PRINT"Use curs
or keys to play."
10025 COLOR 6:LOCATE 20,11:PRINT"Choose
skill level:"
10030 LOCATE 22,8:PRINT"Easy (1)   Diffi
cult (2)"
10040 A$=INKEY$:IF A$="" OR (A$<>"1" AND
 A$<>"2") THEN X=RND(1):GOTO 10040
10050 M2=A2(VAL(A$)):RETURN
```

```
11000 G5=100:FOR I=1 TO 9:READ RANK$(I):
NEXT I:FOR I=10 TO 12:RANK$(I)="HALL OF
FAME":NEXT I
11090 DATA ZERO,ROOKIE,NOVICE,AVERAGE
11092 DATA MASTER,GRAND MASTER,WIZARD,GR
AND WIZARD,SUPER STAR
11100 RETURN
12000 LOCATE 18,1:COLOR 10:PRINT STRING$
(4,15);:COLOR 12:PRINT STRING$(1,1)
12010 FOR T=5 TO 35:LOCATE 18,T-4:COLOR
10:PRINT " ":LOCATE 18,T:PRINT STRING$(4
,15);
12015 SOUND 500,.5
12020 COLOR 12:PRINT STRING$(1,1):FOR G=
1 TO G5:NEXT G:NEXT T:LOCATE 18,32:PRINT
 STRING$(8,32):G5=G5+50*(G5>50):RETURN ©
```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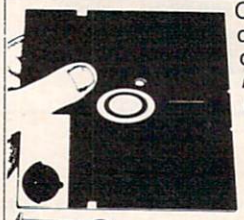

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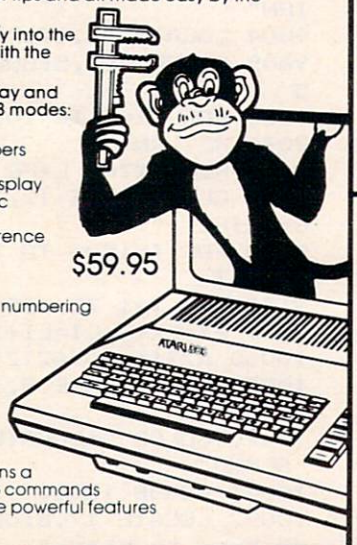

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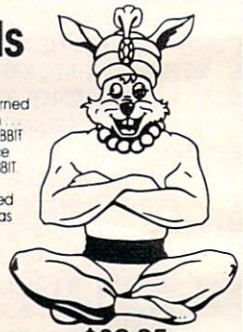

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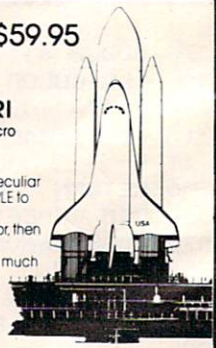

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B.C.'s Quest For Tires

James V. Trunzo

My three-year-old daughter, in her innocence, looked at the screen and asked, "What cartoon are you watching, Daddy?" My six-year-old daughter, with her newfound first grade sophistication, said, "Great graphics, huh Dad!" My wife said, "Maybe I can beat this one."

The subject of all this admiration and anticipation is a new arcade-style game released by Sierra On-Line entitled *Quest for Tires*. Each of the statements is accurate.

Eleven Screens

B.C.'s Quest for Tires is an eleven-screen visual delight based upon the cartoon script B.C. The cast of Thor, Fat Broad, Dooky Bird, the dinosaur, and Sweet Chick combine to make *Quest for Tires* a standard for future graphic arcade games. The program is available for Apple, Atari, Commodore 64, and Coleco computers.

The theme of *Quest for Tires* is as old as, well, prehistoric times. Thor, tooling around on his ancient, stone-made unicycle, must overcome a host of obstacles to rescue Sweet Chick from the dinosaur. Some of the obstacles are logs and low-hanging branches that threaten to unseat Thor unless he leaps or ducks in time to avoid disaster, lava pits that must be crossed with the aid of Dooky Bird, and an erupting volcano that spews boulders.

Pushing the joystick forward makes Thor jump, while pulling the stick towards you makes him duck. Moving the stick to the right moves Thor forward at increasing speed, while moving it to the left decreases Thor's forward speed, though it does not stop him.

A Different Speed Level

Those are the basics and they are accomplished with the fire button released. Depressing the fire button adds two more factors to the game play. With the fire button depressed, the results of right and left joystick movement are enhanced. Thor's speed will increase at a much greater rate and he will slow up much quicker too.

However, while the basic play procedures are very simple, after several plays one begins to realize that things aren't as simple as they seem. By moving the joystick towards the upper right diagonal, for example, you can make Thor jump longer distances rather than straight up and down. Mastering this tactic quickly becomes a necessity if you wish to conquer all the screens, especially at the more advanced levels of play.

For Beginners And Experts

How difficult is *Quest for Tires*? My wife's initial reaction was correct with respect to the game's easiest level. The game can be enjoyed by the casual gamer who really isn't interested in totally mastering games. At level one, it is also a game that younger children can play without becoming frustrated by its difficulty and complexity.

This isn't to say, however, that the game is unchallenging to true arcade addicts who have mastered the intricacies of those games requiring four hands. At its more advanced levels, *Quest for Tires* requires a refined sense of timing and quick reactions if one hopes to rescue Sweet Chick before losing all five wheels with which the player begins the game (each wheel equivalent to one "life," of course).

The game has well-planned variety in its levels of difficulty. It's versatile. But the highlight isn't the play of the game itself. It's the great graphics that make the program something special.

Excellent Graphics

Simply put, *Quest for Tires* has graphics and animation which approach cartoon standards. The scrolling of the different screens is done so smoothly that the illusion of movement is complete, and the colors and highlighting of each scene are sharp and vivid.

The game's creators used small details to good effect, such as the way Thor's hair waves in the wind as he pedals his wheel and builds up speed; the look on his face when he fails to jump a pit; and the way Sweet Chick blows Thor a kiss that turns into a heart and floats to Thor when he successfully completes a level.

Quest for Tires has the usual features found in all first-rate arcade programs. It offers four levels of play, one or two player option, and a pause feature. It also provides a vanity board which allows the player to record his initials for posterity upon achieving one of the ten top scores to date. Scoring, inciden-

tally, is based upon avoiding obstacles; the more difficult the obstacle the more points earned by overcoming it. More variation in the scoring is achieved by awarding greater point values to obstacles when they are cleared at higher speeds.

B.C.'s Quest for Tires
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Radiotap For VIC And 64

Dan Carmichael, Assistant Editor

The Radiotap by Kantronics is an impressive package that allows you to interface your Commodore 64 or VIC to a shortwave or ham radio receiver. It will automatically interpret communications such as Morse code and radioteletype (RTTY) and display them on your monitor. RTTY is used by various services, from foreign embassies to news wire services. The Radiotap can interpret both standard RTTY and the newer ASCII RTTY.

Several Modes Are Available

In the Morse code mode, the Radiotap reads the incoming signals, and automatically adjusts the receiving speed of the computer. It has the ability to adjust to speeds ranging from 0 to 99 words per minute. All you have to do is turn on the Radiotap, tune in your radio, sit back, and "read the mail."

In the RTTY and ASCII modes, you also have the ability to decipher coded or scrambled messages. These options include bit switching, inverting bit patterns, and the ability to vary the baud rate (receiving speed) to nonstandard settings. In these modes, however, receiving speeds must be set manually.

The Radiotap also has a *scope* feature. It is very useful when analyzing RTTY signals coming in at nonstandard baud rates or which are encoded. You can display the incoming signals on your screen in graphics form, which allows you to measure the timing of the incoming signals (bits) and helps you determine which ciphering techniques, if any, are being used.

Another nice feature is the printer option. By pressing a single key, you can produce a printout in addition to the monitor display. This feature, however, has hardware limitations. It is designed for the Commodore 1525 printer, and may not work with other printer/interface combinations. It did not work with the Epson printer interfaced to a 64 with a Micro-Electronix serial interface. However, it is reported to work with the Cardco interface. For more information, contact Kantronics at the address below.

The Radiotap also has a 24-hour clock, set by the user, that is always displayed at the top of the screen.

Small Inconveniences

There were a few small inconveniences encountered while setting up the Radiotap. First, you must construct the patch cord to connect the Radiotap interface to the shortwave receiver. This requires a little light soldering to attach two plugs to the cord. Second, the dual voltage power supply included with the Radiotap is switch-selectable to either six or nine volts. However, no mention was made of this in the instruction manual. After experimenting for some time with both voltages, we selected nine volts, the correct setting.

The Radiotap comes with the radio-to-computer interface, software in cartridge form, and all the necessary wiring and plugs to connect it up (except the cord to the radio).

Also included is a complimentary copy of the book *Confidential Frequency List* published by Gilfer Associates in Parkridge, New Jersey. But because this book deals largely with items that are not related to either Morse code or RTTY, a better choice might have been *RTTY Frequencies*, also published by Gilfer Associates.

All in all, the Radiotap is a fine product, and you can spend many enjoyable hours reading foreign embassy and wire service messages. The Radiotap is for receiving only; there are no transmit options.

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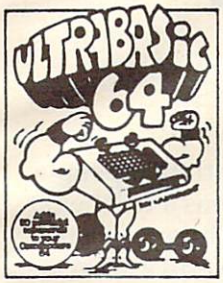

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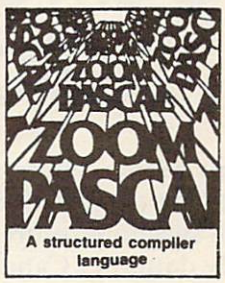

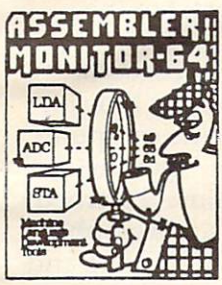

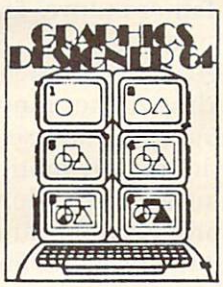

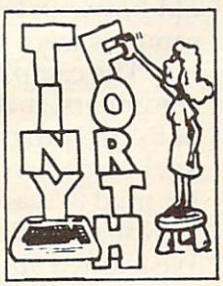

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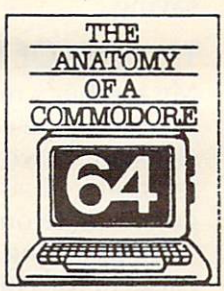

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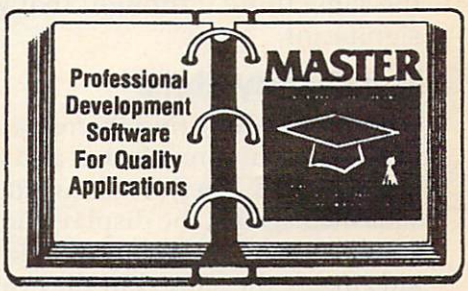

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Catie's Grandmother Goes To Camp

Last summer my mom went to computer camp. The camp, The Computer Tutor, was located in Avalon, a small seashore resort town in southern New Jersey. My daughter Catie was also enrolled in a computer camp—Computer FUNdamentals, at Hollins College here in Roanoke, Virginia. (See my column "The World Inside Computer Camps," in last month's COMPUTE! for more on computer camps for children.)

My mom is 58. My daughter Catie is 7. Catie and her grandmother are more than half a century apart in age. Yet, by coincidence, they were enrolled in computer camp at the same time, learning the same thing. I thought that was neat. And significant.

The Candy Store

Millions of adults find themselves on the outside of the computer revolution and they don't know how to get in. They are like a little kid with his face squashed against the display window of a fantastic candy store. They would love to join the other kids inside the store, but they can't find the door.

Computer camps can be one door into computer literacy and computer intimacy for fearful but interested adults. Full-fledged camps for adults are springing up all over the U.S. Adults enroll in the camps for a period of one or two weeks. Many of the camps combine indoor computer instruction with outdoor exercise.

Adult campers usually begin computing slowly, but they quickly pick up the pace. By the end of camp they spend up to ten hours a day in marathon keyboard sessions. And they get hooked. According to the daughter of one 68-year-old camper, "We had to drag mom away from the machine just to make sure she got nourishment."

Computer Day Camp

Not all computer camps are so intense. My mother's computer camp, The Computer Tutor, was only a day camp. My mother attended the camp for three hours a day for five days. Each night when she finished computing, she returned home to my father.

There were four computers, with two people on each computer. The instructor was a teacher at Avalon's lone elementary school. There was one 9-year-old girl enrolled in the camp and a 14-year-old-boy with his father in tow. The rest of the campers were women.

The camp's goal was to teach the basics of computers, including the terminology, a little bit of BASIC programming, and use of the computer keyboard. According to my mother: "Our instructor tried to teach us a lot in a short time. I learned how to do some programming and some graphics. We learned about the disk and about copying and saving."

The Joy Of Flying Solo

My mother's most exciting day came when she got to use the computer on her own. "One day," she said, "I worked by myself. That was great! I felt that if I had done that every day I would have gotten more out of the class."

According to my mother, one of the drawbacks of the course was that the instructor had so much to teach and so little time. "You're trying to jam so much into a few hours that it gets very confusing. Having a computer to practice things on would have made things easier."

It was interesting for my mother to watch her classmates' reaction to computers and compare their reactions with her own. "My college secretarial courses on touch-typing helped me a lot," she said. "Being a typist eliminated some of my fear of computers right away. But I was still cautious.

"There were others who were more willing to jump right in," she admitted. "Some of the people got right to work on the computer and tried to invent things right away. Others were quite leery and wouldn't do things until they were taught. This group included me."

Life After Computer Camp

"Computer camp was great," my mother said. "It whetted my appetite for computers. After it was over, I wanted to continue learning more.

"The only problem was I couldn't find any

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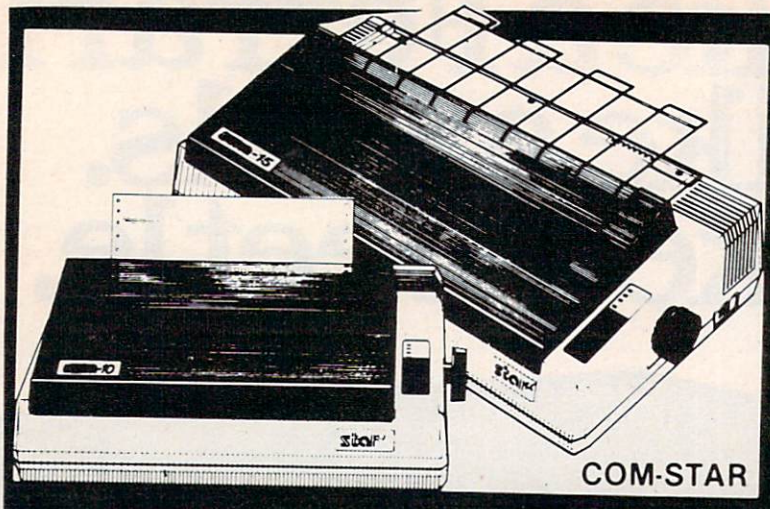

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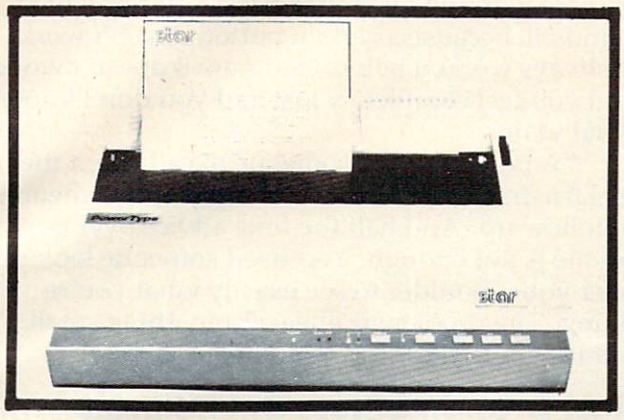

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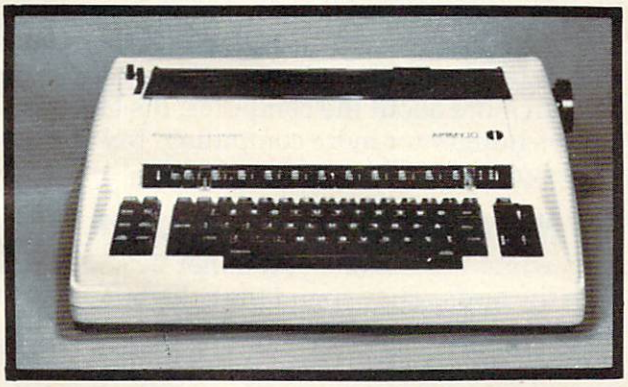

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more courses that fit my schedule. I began to worry that I would forget everything I had learned at camp. I decided that the only way to keep learning was to get my own computer. My husband was very supportive. He said he'd get me a low-cost computer as a combined birthday and anniversary gift. He was so proud that I had gone to the camp and that I was learning about computers and having fun."

Grandmother Computer Chic

When my mother got her computer home, at first she couldn't decide where to put it. She ended up putting it on the kitchen table. With its software, manuals, and electric cables, the computer took up almost the whole table.

My mother and father now have to eat their meals on a tiny corner of the table opposite the computer. My mother eats her meals while she is studying the gift certificates she got with her computer. While my father is eating, he just stares at the back of the computer.

My mother is very proud of her new computer. When she first got it, she invited all her friends and family over to see it. The reactions were diverse.

Her grandchildren, Shannon (8) and Laurel (5), were fascinated with the computer's voice synthesizer and the Sesame Street computer games my mother bought. Both grandchildren use computers at school and arrived with the impression that they were "way ahead of Mom Mom" on the computer. But Mom Mom held her own. She got a great deal of pleasure out of being an honorary Whiz Kid.

Mom's friends have had all sorts of reactions. They are proud of her and are amazed that she went out and bought a computer. They are even more amazed that she actually seems to be using it—to write letters using *Bank Street Writer* and to create Christmas-card mailing labels using *PFS:File*.

This year Mom's friends are bragging that they all got Christmas cards addressed by Mom's computer. "I could tell it was a computer that did it," one friend told me, "because it put my last name first on the envelope."

Mom's friends think that she uses her computer all the time. When they call her on the phone, if she sounds vague or distracted, they say, "Libby, are you playing with your computer again?"

Most of Mom's friends are very proud of what she is doing, but they are reluctant to follow in her footsteps. "I know computers are the up and coming thing," one friend told her. "But I could never work one. I'd be lost."

My mother laughs at this kind of reaction. "The biggest thing I have found," she says, "is how easy computers are. I thought they would be much harder."

Then she shrugs and frowns. "It's funny, though," she says. "They are easy, but you still need someone to call on—just for help on the simple things. The most frustrating part is when you are working by yourself and you come to a standstill because a certain button doesn't work. It always worked before, but now it doesn't work, and you feel completely lost and you don't know what to do.

"A person needs someone to call when they feel frustrated—someone to help them, someone to follow up. And half the time advice over the phone is not enough. You need someone looking over your shoulder to see exactly what you're doing. The problem is always something small, but it's enough to stop you in your tracks."

How Grandmothers Get Intimate With Their Computers

According to my mother, "The most exciting time I had with my computer was when I made the mailing labels come out on the printer. 'Look!' I shouted. 'It works! I figured it out myself!'

"Using a computer is like eating Chinese food," my mother told me. "You eat Chinese food, and it tastes great. Then, soon after you are done eating, you are hungry for more.

"Computers are the same way. You do something on it, and it feels great. Then you run out of things to do and you say, 'What can I do now?' It's very frustrating. I have so much fun working on it, but then I finish, and I think I have to invent something new. But to do something new I have to learn more about the computer. It's like I am always hungry for more computing. My appetite keeps growing."

I'm Not Leaving My Computer!

Each winter my mother and father fly south along with the birds. They spend the cold, bitter months in a little resort town tucked away in the Florida keys. My mother flees the Philadelphia area around Thanksgiving, usually after the first cold, soggy November rainstorm.

But this year is different. When Thanksgiving came and went and my mother was still in the Philadelphia area, her friends became puzzled and asked her why she wasn't heading south.

"I'd like to get away from this cold weather," my mother replied. "But I'm not going to leave my computer!"

Mom's Bright Idea

By mid-November my mother had so many manuals, cables, software boxes, and add-ons she would have needed to rent a U-Haul trailer to get her computer down to Florida.

She checked into renting a station wagon and having my brother drive her computer to Florida. Then she realized that her cottage there was barely large enough for her and my father. She and my father have a loving but stormy relationship. She could imagine what would happen if my father arrived in Florida and found that he had been replaced by a computer.

What was my mother to do? She really wanted to go to Florida, but she couldn't bear to leave her computer in Pennsylvania. Yet she didn't dare take it with her.

My mother is no dumb bunny. She wanted a computer in Florida, so if her Pennsylvania computer wouldn't fit, the answer was obvious: She needed a new computer—a smallish kind of computer that she could squeeze into the Florida cottage along with her and my father.

Once my mother has a good idea she doesn't waste any time putting it into action. As I write this article, she is busy saving up for a new computer—a portable.

And she's keeping busy on her old computer, using her spreadsheet to chart her stocks and bonds and keeping an inventory of furniture and other household possessions. And she's churning out a snowstorm of letters to me on her word processor.

It All Started With Computer Camp

I've been away from home for seventeen years, yet I have gotten more letters from my mother in the last couple of months than in all those seventeen years combined. And all the letters are chock full of motherly advice (not to mention nagging).

Each morning I go to the mailbox and find two more letters from my mother—all generated on her infernal (excuse me, Mom) word processor.

I'm beginning to wonder if I did the right thing. Was it really such a good idea to get my mother turned on to computers?

She's beginning to talk about electronic mail and linking us up on a Bulletin Board System. This way she can download ideas and advice anytime she wants, maybe even several times a day. It will be just as if she lived next door.

I'm very proud of Mom. And I'm glad that she went to computer camp. The only thing that worries me is where is this going to end?

My advice to those of you out there with mothers and grandmothers is simple: Once you start them computing, watch out! ©

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What's A Cassette Buffer?

What is the cassette buffer used for?

James Kenny

A buffer is a temporary storage area. The cassette buffer is a special set of Random Access Memory (RAM) locations where the computer's operating system places information which is to be transferred to or from a cassette storage device. Because the operating system only uses this buffer during tape operations, it is available for other uses between tape operations.

If you switch from tape to disk storage, the cassette buffer no longer has a special function, and memory in the buffer can be used the same as other RAM locations.

In Commodore computers the cassette buffer is in locations 828–1019. In Atari, locations 1021–1151 are used.

Changing The 1541 Device Number

I just purchased my second Commodore 1541 disk drive. I want to change the device number using the hardware method, but I am having trouble doing it.

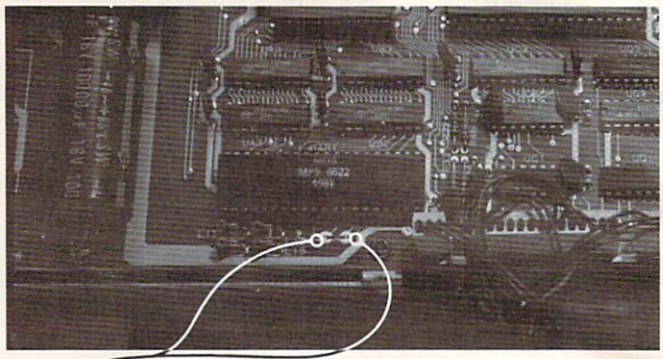
The directions in the 1541 user's manual give ten steps to follow, but they leave out the most important part. Step number seven states: "Locate device number jumpers. If facing the front of the drive, it's on the left edge in the middle of the board." Direction number eight states: "Cut either or both of jumpers 1 and 2."

But once you have removed the case as directed, you find five plugs labeled P4 through P8 with a total of 21 wires. The instructions don't tell which wire is which.

Can you tell me which are the correct two wires to cut so I can change the device number?

Pat Cardinal

Some of this confusion is due to the fact that the jumpers which are to be cut are not wires. The jumpers are actually two mounds of solder, each about ¼ inch in diameter. If you face the front of the disk drive, they are located on the left edge of the circuit board behind the plugs and wires you described. As shown in the picture, each round drop of solder is separated into halves, with a thin strand of solder connecting each half. You cut the jumpers by taking a sharp, pointed object and scraping away, or breaking, the connecting strand. Be careful to avoid damaging any other components on the circuit board.



The jumpers to be cut can be found on the left side of the circuit board.

As stated in the user's manual, cutting jumper one or jumper two, or both, produces different device numbers. Here is a chart showing which device number is produced when the jumpers are cut:

Jumper Cut	New Device Number
None	8
1	9
2	10
1 and 2	11

One important note about changing the disk drive device number: Once the jumpers are cut, it's difficult to reverse. Also, this sort of modification should be left to an experienced electronics technician unless you know exactly what you are doing. And be sure the drive is not plugged into the wall if you remove the cover to attempt this fix.

Commodore 6502 And 6510 Chips

I am somewhat confused. Is a 6510 microprocessor compatible with the 6502 microprocessor? The box my Commodore 64 came in says that this is true, but I have read differently. If this is true, can I buy a book on programming the 6502 and use it with the 6510 that is in the 64?

Shawn Carnell

Yes, you can. The only differences between the 6502 and the 6510 are locations 0 and 1. In the 6510, these two locations act as an eight-bit parallel input/output port. By POKEing values into memory locations 0 and 1 on the 64, you can do such things as switch out BASIC and Kernal ROM and turn them into usable RAM. For more details on the memory bank-switching technique,

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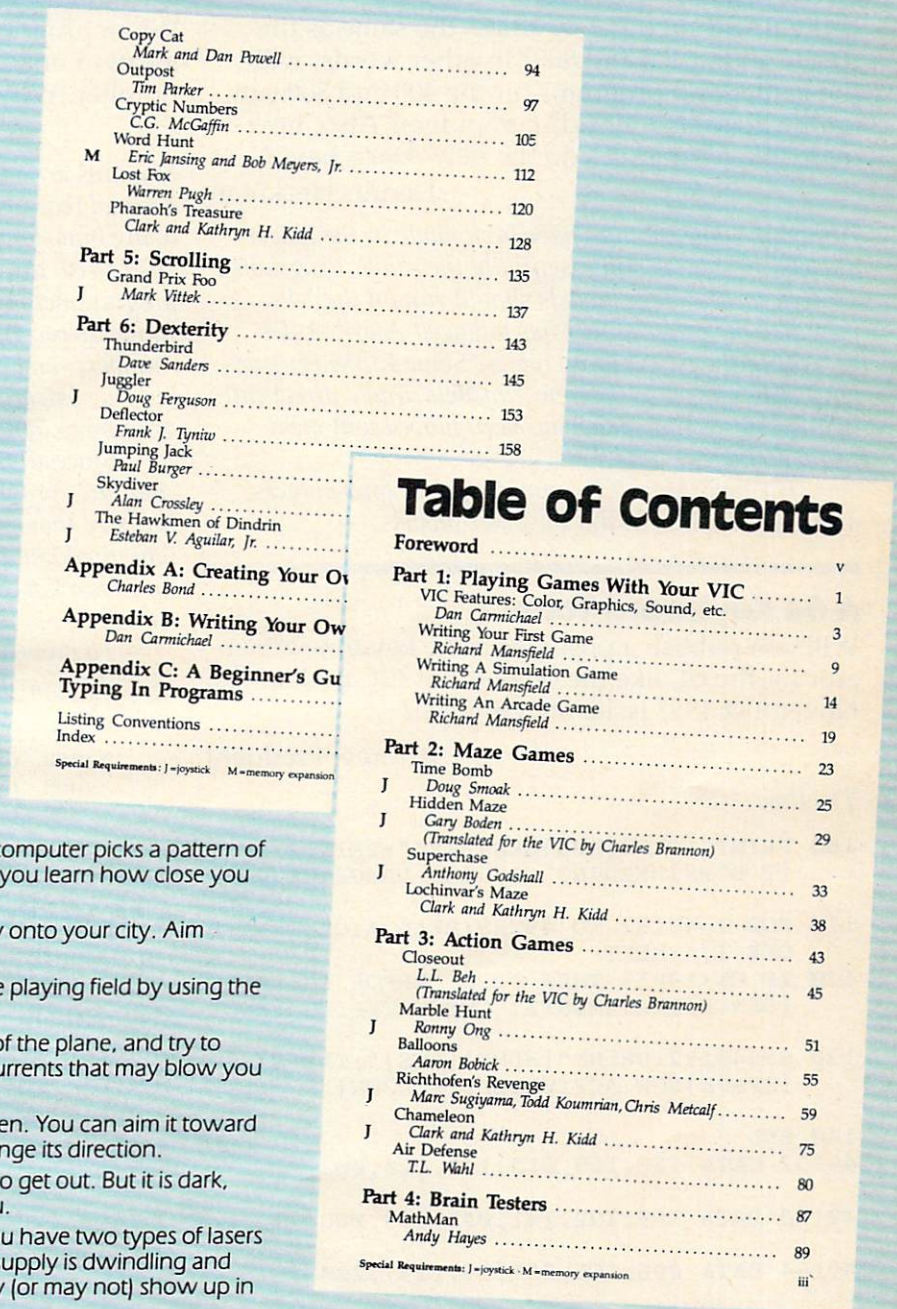
Sky Diver — Put on your parachute, jump out of the plane, and try to land on one of the targets. Watch out for wind currents that may blow you off course.

Deflector — A ball is bouncing around the screen. You can aim it toward targets by strategically placing deflectors that change its direction.

Hidden Maze — Lost in a maze, you're trying to get out. But it is dark, and you can see only a few spaces in front of you.

Outpost — Your small fortress is under siege. You have two types of lasers and some torpedoes. Unfortunately, the energy supply is dwindling and the computer is on the blink. The supply ship may (or may not) show up in time to make repairs.



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Special Requirements: J=joystick M=memory expansion

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see "6510 Microprocessor Chip Specifications" (Appendix L), and "Memory Management on the Commodore 64," page 260 of the Commodore 64 Programmer's Reference Guide.

Other than these two locations, the 6502 and the 6510 are the same.

Atari Compatibility

Is the BASIC in the new Ataris the same as the BASIC in the 400 and 800? In other words, will the games and programs for the 400 and 800 run on the new XL and XLD computers? Also, how many player/missiles do the new Ataris have?

Dennis Heckman

Although some changes have been made in the newer models, BASIC is still essentially the same. Programs written for the older models should run on the XLs, provided the programmer has followed Atari's rules regarding the ROM jump tables. Some ROM routines have been moved in the newer models, and a direct call to a ROM routine which has been moved will yield unpredictable results.

The new Atari XL computers have four players and four missiles, as did the older models.

A 64 Keyboard Tone

Will you publish a positive stroke key tone generator for the 64, like the one for the VIC in the November 1983 issue of COMPUTE!?

Andrew Predoehl

Try this:

```
100 PRINT"{CLR}{RVS}BEEP-KEY":PRINT"
    {2 DOWN}READING MACHINE LANGUAGE..."

110 FOR I=49152 TO 49228:READ A:CK=CK+A:P
    OKE I,A:NEXT
120 IF CK<>9872 THEN PRINT"ERROR IN DATA
    {SPACE}STATEMENTS. CHECK TYPING":END

130 SYS49152:PRINT"{HOME}{RVS}";TAB(8);"
    {SPACE}NOW ACTIVATED.{6 DOWN}"

140 END
49152 DATA 120,169,013,141,020,003

49158 DATA 169,192,141,021,003,088

49164 DATA 096,165,251,197,197,208

49170 DATA 004,201,064,208,026,165

49176 DATA 197,201,064,240,020,162

49182 DATA 006,189,070,192,157,000

49188 DATA 212,202,016,247,169,015

49194 DATA 141,024,212,169,004,133

49200 DATA 252,165,197,133,251,198

49206 DATA 252,165,252,208,008,173

49212 DATA 004,212,041,254,141,004

49218 DATA 212,076,049,234,000,050

49224 DATA 000,000,129,064,244
```

Different Number Systems

When programming books mention a memory location, many times they put a $ in front of the number. Why is this done?

Marc Foglia

Humans are accustomed to counting by tens, using decimal (base 10) numbers. Computers count by twos, using binary numbers. But binary numbers, such as 10111010, are not easy to read, so machine language programmers commonly use hexadecimal (base 16) numbers because they are easier to read than binary numbers, and easier to translate into the computer's binary system than are decimal numbers. BASIC programmers, however, stick with ordinary decimal.

Since all three number systems can be used in computer programming, we must be able to differentiate between them. For example, if you see the number 0100, you must know if it means 100 (as a decimal number) or 4 (as a binary number) or 256 (as a hexadecimal number).

To prevent this confusion, programmers commonly identify binary and hexadecimal numbers with special symbols:

%0100 (binary)
$0100 (hexadecimal)
100 (no symbol for decimal)

A 1540 Disk Formatting Disaster

I apparently made a big mistake! I own a VIC-20 and a 1540 disk drive. I accidentally reformatted a disk that already had programs on it. I used the following syntax: OPEN 15,8,15,"N0:DISK1 SD1,1B". I noticed that I didn't hear the usual "rattling" sound. I want to know if there is any way of recovering the lost or erased files. I almost had that disk full.

Jeff Lovell

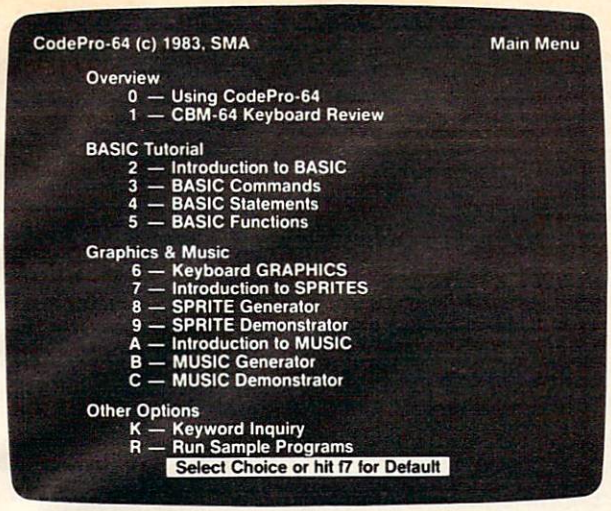
Unfortunately, your programs were erased.

A number of things happen when you format a disk. First, the entire disk is erased, then the directory and BAM (Block Availability Map) are created. Next, timing and block markers are created, and the two-character disk identification code is written on every block of the disk.

To format a disk, use the syntax:

```
OPEN 15,8,15: PRINT#15,"N0:DISK NAME,ID":
  CLOSE 15
```

where DISK NAME is any name up to 16 characters



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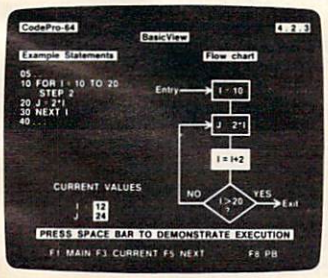

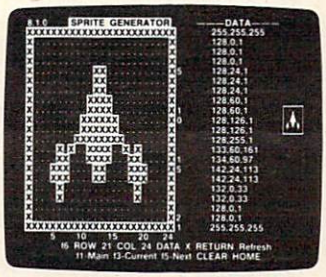

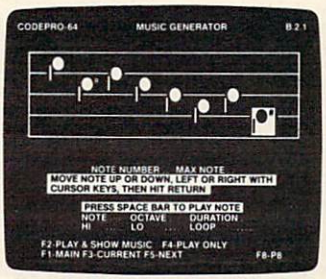

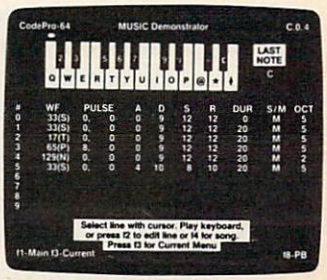

SMA SYSTEMS MANAGEMENT ASSOCIATES

long and ID is a two-character identification code. Because of the way the format command works, this should be done only when the disk is new, or when the files on the disk are no longer needed.

As you can see, when a disk is formatted, any programs that were on that disk are lost.

TI LIST And RUN Protector

I would like to know if there is a way to put an access code on a program for the TI-99/4A. In my family I do all the work and everybody else does all the playing; but they cannot play if it has a code on it.

Aaron Rawn

C. Regena replies:

At the beginning of your program you could try these lines:

```
100 A$="HELLO"
110 INPUT "ENTER CODE: ":C$
120 IF C$=A$ THEN 200
130 PRINT "SORRY, CODE NOT ACCEPTED
    ."
140 STOP
200 PRINT "PROGRAM CONTINUES."
```

When you RUN your program, the computer first asks you to enter the code. If you type in the correct code name the program will continue; otherwise, the program will stop. We used HELLO for the code name. Note that anybody can just LIST the program and get your code name. Instead of HELLO between the quote marks type in your own code word, but hold down the CONTROL key (to the left of the space bar) while you are typing. Now if someone LISTs the program they can't read what your word is—it's either spaces or some funny-looking characters.

VIC Memory Requirements

Say a VIC program requires 11K, and you have only a 16K memory expansion cartridge. Will the program run with the extra memory, or are you required to use the exact memory needed?

My second question is about word processing. When typing with or using a word processor, do you actually need a printer? All I'd really like to do is store my information on disk.

Dwain Young

When a program or article states requires 11K, *this means it needs 11K bytes of memory* or more. *Both the VIC and 64 have pointers that manage BASIC memory. Examples are memory locations 45 and 46, which point to the start of BASIC variables (the end of the BASIC program proper), and bytes 55 and 56, which point to the highest address used by BASIC. These pointers automatically manage the extra memory for you.*

However, on the VIC you have another thing to consider—screen and color memory locations. In the unexpanded VIC, the screen, color, and BASIC memory areas start at locations 7680, 38400, and 4096, respectively. When you plug in a 3K expander (like the Super Expander cartridge), these locations do not change. However, when you plug in one of the larger expansion cartridges (like the 8K or the 16K), these memory locations do change, to 4096, 37888, and 4608, respectively.

This is important with programs that perform POKEs or PEEKs to color or screen memory. For example, a program that POKEs or PEEKs screen or color memory and states needs 3K expansion *might not work with an 8K expander because of the relocation of these memory blocks.*

On the other hand, a program written for the unexpanded VIC that contains no POKEs or PEEKs to screen or color memory should run with any memory expansion. If you LOAD a program and it doesn't run properly, simply turn off your VIC, change memory expansion cartridges, and reLOAD your program. This will not harm the BASIC program. Just be sure you SAVE your BASIC programs before turning off your VIC.

No, you don't need a printer to use that word processor, if onscreen viewing and storing the text to disk or tape are all you require.

Extra Functions For SuperBASIC 64

The "SuperBASIC 64" program (COMPUTE!, December 1983) is very interesting and helpful. One of its good features is the clarity with which it is laid out. This makes it easy to write and test modifications.

Two sample modifications are given below. To use them, simply LOAD and RUN SuperBASIC 64, then enter and RUN the modification as a normal BASIC program.

The first program creates a new function, [SCRN. [SCRN sets the background, border, and text colors in one operation. For example, [SCRN12,11,1 sets up a light gray background, dark gray border, and white letters.

```
1 REM CREATE [SCRN FUNCTION
10 FORI=0TO9:READA:POKE52168+I,A:NEXT

20 DATA32,57,195,32,66,195,32,218,197,96

30 FORJ=0TO5:READA:POKE49892+J,A:NEXT

40 DATA83,67,82,78,199,203
```

The second program modifies the [DRAW command, allowing it to either draw or erase lines. In its new version, [DRAW must be followed by either 1 or 0. [DRAW1,x1,y1,x2,y2 will draw a line from x1,y1 to x2,y2. [DRAW0,x1,y1,x2,y2 will erase the line between those coordinates.

```
1 REM MODIFY [DRAW TO ALLOW ERASURE
```

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```
10 FORI=0TO32:READA:POKE52128+I,A:NEXT

20 DATA32,0,192,165,20,141,174,203,32

30 DATA0,192,76,101,199,0,32,14,198,174

40 DATA174,203,240,3,76,132,200,73,255

50 DATA49,251,76,134,200
60 J=51042:K=51329
70 POKEJ,76:POKEJ+1,160:POKEJ+2,203

80 POKEK,76:POKEK+1,175:POKEK+2,203
```

Charles Tyson

Atari Mystery Commands

I frequently see statements in programs that just don't seem to make sense. For example, in "Diamond Drop," Atari version (COMPUTE!, September 1983), lines 5430 and 5750 have the statement Q=1^1. As I understand it, that means 1 raised to the first power, which is 1 times 1, which is just 1. So why write it this other way? Also, if you remove it, and just change the statements to Q=1, then the diamonds drop faster, but why?

Also, in some programs there will be a loop FOR X=0 TO 1 STEP 0. What is the meaning of this? If you start at zero with a STEP of 0, what happens?

Roy R. Valantine

The Atari takes a significant amount of time to calculate powers and roots. Matt Giwer, the author of "Diamond Drop," took advantage of this and used Q=1^1 in place of a delay loop to slow down the game. This statement takes up less memory than an empty FOR-NEXT loop. To answer your second question, remember that the STEP value is added to the original value in a FOR-NEXT loop at every NEXT. With a STEP of zero, X will never become equal to one. This is just a faster way of writing an endless loop. Instead of:

```
10 PRINT I:I=SQR(I)
20 GOTO 10
```

you can use:

```
5 FOR X=0 TO 1 STEP 0
10 PRINT I:I=SQR(I)
20 NEXT X
```

Execution will continue until you press BREAK or SYSTEM RESET.

64 SID Register Images

In the 64 memory map there is a sizable chunk of memory labeled "SID Images" ($D500–$D7FF). Presumably the audio synthesizer needs this memory to function, but no explanation is offered by any manual. Could this memory be used to further manipulate SID or is it strictly hands-off?

Rob House

The 64 uses a method known as memory-mapped I/O *to let you access a hardware chip's registers with PEEK and POKE (or load and store in machine language). This is convenient and fast, but some portion of your computer's memory must be dedicated to the chip. No actual memory (RAM or ROM) is used or needed, but the memory addresses are set aside for the chip's use only. The SID chip has only 26 registers, but to make interfacing easy, Commodore allocated it 1K of address space. It's a quirk of the interface chips which causes "reflections" of the SID chip's actual registers to appear from $D500–$D7FF. You can read or change these locations, and they will be redirected to the SID chip. This is not recommended simply because it is non-standard—no one else, perhaps even you at a later date, will be able to figure out why you are POKEing to these image locations. Also, there is RAM beneath the ROMs and hardware chips, so you can switch out the SID chip to make full use of the underlying 1K of RAM if you want.*

Machine Language To BASIC?

I would like to know if there is a program to translate a machine language program into BASIC. I realize that this sounds a bit impractical, but I think it would be a tremendous aid to us BASIC programmers who are trying to learn machine language.

It seems to me that if a BASIC Interpreter can translate BASIC instructions into machine language, that the opposite is equally possible. If it cannot be done, please explain why.

D. W. Bruce

The BASIC Interpreter doesn't actually translate BASIC into machine language. All the operations that can be performed from BASIC are permanently stored as machine language routines in Read Only Memory (ROM). The Interpreter first converts each BASIC keyword into a one-byte number called a token. *Then, depending on the value of the token, certain of the permanent machine language routines are executed in a predetermined order.*

It is not possible to automatically translate machine language programs into BASIC equivalents. You could look at a machine language program and design a BASIC version of the same thing, but BASIC runs so much slower that it would serve no purpose other than being the educational exercise you mention.

Listing The 1541 Directory

I own a Commodore 64 and a 1541 disk drive, and I have a question: How do I go about listing the directory of a disk?

Danny Chu

After making sure that your computer and disk drive are on, and no BASIC programs are in memory, insert

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your disk into the drive, and type LOAD "$",8 and press RETURN. The disk drive will whir and spin a bit. After the drive has stopped and the READY with the blinking cursor is displayed on the screen, type LIST and press RETURN. The directory will be displayed on the screen. To slow down the listing, press CTRL on the keyboard.

However, there is one thing to watch out for. Listing the directory using this method puts it in the BASIC programming area, so any BASIC program in memory will be overwritten. Also, when you're through looking at the directory, enter NEW to clear the BASIC memory pointers before loading a BASIC program.

If you are searching through several disks for a particular filename, you can have the LOAD command display only that filename. Let's say you're looking for a game called "Space Game." Here's the format:

```
LOAD "$0:SPACE GAME",8
```

Type LIST, and if the filename is found it will be displayed on the screen. If the filename is not on that disk, only the disk header (name of the disk) will be displayed. If you forget how you spelled the name of the file you want, use the wildcard feature, represented by an asterisk. For example, if you enter LOAD "$0:SPACE ",8 it will display all filenames starting with the letters SPACE such as SPACE GAME, SPACEMAN, etc. If you enter LOAD "$0:S*",8 you'll get all the filenames starting with an S.*

PEEKing The VIC SHIFT Keys

I own a VIC and would like to know the PEEK command for the right SHIFT key. I know the left SHIFT key is PEEK(145). I realize PEEK(653) could be used, but I only want to know when the right SHIFT key is pressed, not the left. Also, what is the PEEK command for the RESTORE key?

Chris Stroud

The following information, excerpted from the upcoming COMPUTE! book Mapping the VIC-20 *by G. Russ Davies, should be of help.*

"Each time the jiffy clock TIME is updated by the Kernal, the contents of VIA2PA2 (VIA2—Port A) are copied to location 145.

"Every other key on the bottom row of the keyboard may be tested for in this location, without using a GET command in BASIC.

"Here's an explanation of the different values you'll find in this location:

PEEK	Hex Number
255	($FF) = no key pressed
254	($FE) = STOP key pressed; STOP routine will find and act on
253	($FD) = left SHIFT key pressed. This may be the most useful returned value, especially for game programmers. It allows the program to distinguish between the left and right SHIFT keys by checking location 653, then location 145, bit 1 for left/not left.
251	($FB) = X key pressed
247	($F7) = V key pressed
239	($EF) = N key pressed
223	($DF) = comma key pressed
191	($BF) = slash key pressed
127	($7F) = cursor-down/up key pressed

"You can examine the values in this location when the bottom row keys are pressed by entering and running this short program:"

```
10 ?PEEK(145):GOTO 10
```

In other words, if location 653 says SHIFT is down, but location 145 doesn't, then the right SHIFT key is down. Otherwise, the left SHIFT key is down (or both left and right SHIFT keys together).

The RESTORE key is not a normal keyboard key. It is not wired through the VIA, but directly to the 6502's NMI line. When RESTORE is pressed, a Non-Maskable Interrupt is generated, which makes the 6502 jump to a special NMI routine. This routine checks to see if the RUN/STOP key is being held down, and if so, executes the soft reset normally performed by RUN/STOP—RESTORE. If RUN/STOP is not held down, the interrupt will occur when you press RESTORE, but nothing will seem to happen. It's not easy to trap and re-vector the RESTORE key, but the vector for the routine we've mentioned is at 792 and 793.

The Atari Speaker

I would like to know if it is possible to easily turn the Atari internal speaker off and on, without opening the computer case.

Paul Stach

On the XL series, you can toggle the speaker off and on by holding down the Control key and pressing the F3 key. There is no easy way to turn off the internal speaker on the 400 or 800.

Screen POKEs On The 64

I recently bought a second Commodore 64 and found that if you try to POKE a character to the screen, it won't appear. For example, POKE 1024,1 should put the letter A in the first position of the screen, but it doesn't. I took the new 64 back and got another one, but it had the same bug. My old 64 from December 1982 works OK. Has Commodore changed the design of the new units? If so, why not put an addendum in the user's manual? In the meantime, I've returned both defective 64s. Can you elaborate on these differences in the 64s?

Neil Hoover

Commodore has made design changes since the very first versions of the 64, but by no means is this a bug.

In the early versions of the 64, color memory was automatically filled with 1's—the value for the color white. You could then POKE characters to the screen without worrying about the color.

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In the newer versions of the 64, there is no default filling of color memory. When you POKE characters to the screen (locations 1024–2047) in the newer 64s, you also have to POKE values to the corresponding location in color RAM (bytes 55296–56319). For example, if you POKE 1025,1 (the second position in screen RAM) you also need to POKE 55297,x (the corresponding second position in color RAM). The x can be a value from 0 to 15, corresponding to the 16 character colors available on the 64.

It's good practice to always POKE color memory when POKEing screen memory. That way, your programs will run on any version of the Commodore 64.

Modem Tariff Update

I am happy to report that Southwestern Bell has eliminated the requirement that modem users obtain Information Terminal Service for their modems. While the problem has been taken care of here in Oklahoma, I have not heard anything which rescinds rumors of similar tariffs in other states. Therefore, I would like to extend an invitation to your readers to telephone me should they experience similar problems with their local telephone company.

Robert Braver
MCI Mail: RBRAVER
Source: STY801
Telex: 650-116-9625
Telephone: (405) 360-7462

Robert Braver is the author of "Guest Commentary: The High Cost Of Personal Telecommunications" (COMPUTE!, November 1983). His commentary dealt with the then-unresolved question of whether Southwestern Bell, and other telephone companies, should charge home computerists a higher rate (tariff) to connect modems to their residential telephone lines.

Automatic LOAD And RUN For Commodore

I own a Commodore 64 and would like to know if, after LOADing a program from tape or disk, there is a way to make it automatically RUN without having to actually type in the RUN command?

Jeffrey Stevens

On Commodore computers, you can LOAD and automatically RUN a program from disk or tape. For tape LOADs, simply hit the RUN/STOP key while the SHIFT key is depressed. The first program that is found on the tape will LOAD and RUN. If you wish to LOAD and RUN a program other than the first one, type in LOAD "Program Name",1: and then press the RUN/STOP key with the SHIFT key down. In this case, the program designated by Program Name will LOAD and automatically RUN.

A similar procedure can be followed if you are using a disk drive. Type LOAD "",8: and then press SHIFT RUN/STOP to LOAD and RUN the last program accessed (if no program resides in memory, the first program listed in the directory will be LOADed). For programs other than the first one on the disk, type LOAD "Program Name",8: and press SHIFT RUN/STOP.*

TI Cartridge Loading Problem

In answer to Charles Smith's inquiry (COMPUTE!, January 1984) regarding difficulty in repeated loading of TI-99/4A cartridges, several of us in a user group have had the same problem. It is the result of TI's use of a right-angle adapter for the cartridge socket.

The horizontal socket is mounted 90 degrees to a vertical connector board, which then plugs downward into the motherboard. Continued horizontal motion eventually loosens the pin tension in the motherboard socket. Unfortunately, the solution requires disassembly of the computer to gain access to the motherboard socket.

Charles Smith will have to decide whether he wants to tackle this on his own (possibly voiding his warranty), or refer the job to an authorized service center.

Donald C. McMahon

Long Commodore Tape Saves

With long programs it is often not possible to finish typing in a listing in one sitting. I have been saving part of the program on tape and when I continue the second part, I erase the first part on the tape and rerecord the whole thing.

I would like to just continue recording with the next line number of the program. Please advise if there is a way.

J. R. Blundin

When you SAVE to tape, the computer first writes a header which contains information such as program name and starting address. Then the program is saved twice, and an end-of-file marker is written when the tape file is closed. (Commodore computers save programs twice as a safety measure.)

These SAVE procedures make it impossible to position the tape and append the second half of the program onto the first. Attempting this would probably result in a DATA error, and both halves might be lost.

During long typing sessions, you should SAVE your incomplete program occasionally (every hour or so). This way, if some sort of catastrophe happens, you won't lose the entire program. You can load the last version you saved and continue typing.

Also, it's not a good idea to continually rewind the tape and keep saving programs over the same section of the tape. Saving programs consecutively will afford another safety measure—you'll always have backup

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versions. If, for example, a tape becomes crinkled in one spot, you can rewind to the previously saved version.

Finally, when you SAVE a program, the cassette will perform the save, then stop. The place where it stops is where you want to start the next SAVE. Knowing this, you can save the time and worry involved in positioning or rewinding the tape.

Saving Incomplete Programs

I recently purchased a Commodore 64 along with a 1541 disk drive. I know how to format a disk, SAVE a program, LOAD a program, and RUN it. However, I'm not sure how to SAVE a program that is not complete, then LOAD it back in to finish work on it. Also, if I LOAD a program and it has mistakes in it, I'm not clear on exactly how to correct these errors.

William H. Boothe

An incomplete program is SAVEd the same way a complete program is:

```
SAVE "filename",devno
```

(on Commodore computers, for example) where filename is a name you assign to the file (it can contain up to 16 characters), and devno *is the device number (1 = tape, 8 = disk). The computer does not know (or care) if your program is complete or not.*

To correct errors and make other changes to program lines, display the line you wish to change on the screen by typing LIST followed by the line number. When the line is displayed, move the flashing cursor to the desired place on the BASIC line using the cursor movement keys in the lower right of the keyboard.

To insert a character or characters into the line, move the cursor to the position where you want to insert, then hold down SHIFT and press INST/DEL. This will insert a space each time you press the INST/DEL key. Now type your change, and press RETURN. To delete an unwanted character, move the cursor one character past the one to be removed, press DEL (without SHIFT), then press RETURN.

When you edit a program line and press RETURN, the corrected line is entered into the BASIC program in its proper place. Consult your user manual or Programmer's Reference Guide *for further details.*

Using A VIC Printer With Atari

I own a Commodore VIC-20 and a 1525 Graphic Printer. I am contemplating purchasing a second computer. I realize I could use my printer with a Commodore 64, but is there any way to interface it with another brand of computer, like the Atari 800XL? If so, where can I get such an interface?

Chris Hill

Unfortunately, Commodore and Atari use proprietary serial interfaces. They cannot talk to each other or to each other's peripherals. An interface to convert from Commodore serial and Atari serial is conceivable, but we know of none.

There is one way the two computers can communicate—over a common interface, such as RS-232. Both Commodore and Atari computers can send and receive data over an RS-232 cable or through a modem. All that's required is an RS-232 interface for each computer. You could set up a program on the VIC that sends anything coming in from the RS-232 port right to the printer. The Atari would then send things out to the VIC over its RS-232 port. You could even operate the VIC 1540 disk drive (with the right program in the VIC) to handle the Atari requests for program saves and loads. The latter method would be rather more difficult to implement, however.

Clearing The 64 Screen From ML

Our machine language class has been working on several small routines written in machine language for the 64. One of the subroutines we've written to clear the screen is somewhat lengthy—49 bytes. We feel there must be a shorter way. Can you help?

Art Lipina

Yes, there is a shorter, and an easier, way. There are many routines in both the 64's BASIC ROM ($A000–$BFFF) and Kernal ROM ($E000–$FFFF) that you can use. For example, there is a screen clearing routine at $E544 (decimal 58692). Here are two ways to clear the screen using ROM routines:

```
JSR $E544
```

This Kernal ROM routine clears both screen and color memory, and then resets the screen line link table. Clearing the screen using this technique uses only three bytes.

```
LDA  #$93
JSR  $FFD2
```

This method (which uses five bytes) first loads the accumulator with the ASCII character that clears the screen, then calls the Kernal PRINT routine ($FFD2). This is equivalent to the BASIC statement PRINT "{CLR}".

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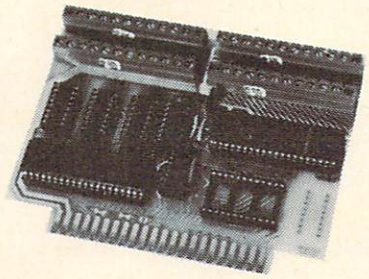

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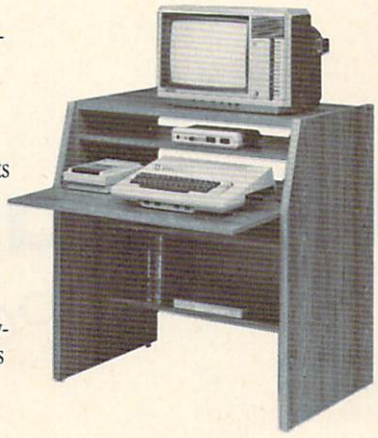

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MACHINE LANGUAGE

Jim Butterfield, Associate Editor

A Program Critique

Part 1

Over the next few columns, I'll be going through a program by Bud Rasmussen. This program performs a single disk file copy on the Commodore 64. It works well; I'll abridge the program slightly to save space.

The program is exceedingly well organized; it's a pleasure to read. It has good operator interface (there are lots of messages) and performs many useful functions in machine language that readers may wish to study and use.

The program was written using an assembler, in this case the PAL assembler by Brad Templeton. Other assemblers would do the job equally well, but they might require slight changes in syntax.

My role here will be (with Rasmussen's permission) to critique and comment. Since the program works, the criticism is one of style rather than of substance.

Different But Still Right

I should note that Rasmussen wrote this program, not for commercial purposes or publication, but for his own satisfaction and use. I'll be somewhat unfairly criticizing his program based on its appropriateness for general usage. For example, I may comment adversely on such things as his use of a BRK instruction to terminate the program on certain error conditions, because this would be undesirable in a public program. But in the final analysis, it's Rasmussen's personal program and it works the way he planned it.

Accept these comments as ideas on how to organize your own work. You'll find a lot of good machine language programming techniques in the program.

```
;
;ML FILE COPIER
;
;
;IMMEDIATE VALUES
;
;
RK      = 13        ;RETURN KEY
H10     = 16        ;HEX TEN
DK      = 20        ;DEL KEY
C       = 44        ;',' (COMMA)
EOFI    = 64        ;END OF FILE INDICATOR
W       = 87        ;'W' (WRITE)
CH      = 147       ;CLEAR/HOME
;
```

Many programmers like to *equate* constant values to labels. This way, if you want to print RETURN, you can write LDA #RK instead of LDA #$0D followed by JSR $FFD2 to print.

My preference is to skip the symbol and use the $0D value, as long as it is the same on all machines. It seems to me that the symbolic values are useful only when different machines use different values for the same function. In such a case, you would indeed equate the appropriate value to a label and save yourself work.

The next section (not given here) defines zero page, working storage, and Kernal addresses. You will be able to pick these out directly from the program, as needed.

```
C000    *=  $C000
```

A Program Counter

Many assemblers use the asterisk character (*) as a *program counter*. In this case, the program will start at hexadecimal C000. The asterisk is often read as "here"; so a programmer may verbalize this line as "Here is hex C000."

```
;
;
;SCREEN ROUTINE
;
```

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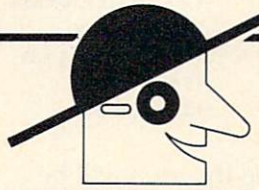

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```
                    ;
                    ;CLEAR SCREEN
                    ;
                    ;
                    CS   =   *
                    ;
C000  A9 93         LDA  #CH       ;LOAD CLR/HOME
C002  20  D2 FF     JSR  CHROUT    ;PUT IT
                    ;
                    ;
                    ;CHG COLORS
                    ;
                    ;
                    CC   =   *
                    ;
C005  A9 07         LDA  #7        ;SET
C007  8D 20  D0     STA  BCA       ;BORDER COLOR
C00A  A9 05         LDA  #5        ;SET
C00C  8D 21  D0     STA  BGCA      ;BACK GROUND COLOR
C00F  A9 01         LDA  #1        ;SET
C011  8D 86  02     STA  CCA       ;CHARACTER COLOR
                    ;
```

As you can see, the documentation is extensive. The program is placed at address $C000, the spare RAM block in high memory.

"CS=*" means "label CS is this point," or "CS is here"; it's a way of defining symbolic locations so that they stand out. Rasmussen uses this type of label definition extensively. Placing the label on the next program line will work just as well; to save space, I'll do this in most cases.

Character color could also be set by calling the CHROUT routine, $FFD2, with the appropriate ASCII color character in the A register.

```
                    ;
                    ;POSITION CURSOR
                    ;
                    ;
C014  A2 03      PC     LDX  #3        ;ROW=3
C016  A0 00             LDY  #0        ;COLUMN=0
C018  18                CLC            ;AND
C019  20  F0 FF         JSR  PLOT      ;SET CURSOR
                    ;
```

I'd just as soon print three cursor-down or return characters.

```
                    ;
                    ;CLEAR FILE NAME AREA
                    ;
                    ;
C01C  A9 00      CFNA   LDA  #0        ;SET 'A'=0
C01E  AA                TAX            ;SET 'X'=0
                    ;
C01F  9D 40  03  CFNL   STA  FNA,X     ;CLEAR FILE NAME
C022  E8                INX            ;INCR INDEX
C023  E0 15             CPX  #21       ;IS X=21 (16+4+1)
C025  F0 02             BEQ  PM        ;IF SO, EXIT
C027  D0 F6             BNE  CFNL      ;ELSE, LOOP
                    ;
```

This is probably overkill, since the area will be filled with appropriate characters before it is used. I would opt for insertion of a prefix "0:" which here would appear ahead of the file name. Sometimes the disk seems to work better if drive 0 is explicitly identified.

BNE Alone Also Works

I would have put the BNE ahead of the BEQ. Then I would have dropped the BEQ since the program would proceed to the next statement, PM, anyway.

```
                    ;
                    ;PUT MESSAGE
                    ;
                    ;
C029  A2 F4      PM     LDX  #ML       ;LOAD LENGTH
C02B  A0 C0             LDY  #>IM      ;LOAD HI BYTE
C02D  A9 35             LDA  #<IM      ;LOAD LO BYTE
C02F  20  75  C1        JSR  PR        ;PRINT MSG
                    ;
C032  4C  29  C1        JMP  GI        ;GOTO GET INPUT
                    ;
                    ;
                    ;INFORMATION MESSAGE
                    ;
                    ;
C035  12         IM     .BYTE$12
C036  20  20  4B        .ASC"KEY IN THE FILE NAME OF"
C050  0D  0D  12        .BYTE$0D,$0D,$12
C053  20  20  54        .ASC"THE FILE TO BE COPIED,"
C06C  0D  0D  12        .BYTE$0D,$0D,$12
C06F  20  20  41        .ASC"AS N.....,T-"
C081  0D  0D  12        .BYTE$0D,$0D,$12
C084  20  20  4E        .ASC"N=NAME, T=TYPE (P OR S)"
C09E  0D  0D  12        .BYTE$0D,$0D,$12
C0A1  20  20  4D        .ASC"MAXIMUM NAME=16 BYTES"
C0BB  0D  0D  12        .BYTE$0D,$0D,$12
C0BE  20  20  4B        .ASC"KEY <RET> WHEN FINISHED."
C0D8  0D  0D  12        .BYTE$0D,$0D,$12
C0DB  20  20  49        .ASC"IF YOU MAKE A MISTAKE;"
C0F5  0D  0D  12        .BYTE$0D,$0D,$12
C0F8  20  20  55        .ASC"USE THE DELETE KEY."
C10E  0D  0D  12        .BYTE$0D,$0D,$12
C111  20  20  20        .ASC"C H E E R S!!!"
C126  0D  0D  0D        .BYTE$0D,$0D,$0D
                    ML     =   *-IM
                    ;
                    ;
                    ;GET INPUT
                    ;
                    ;
C129                GI     =   *
                    ;
```

Note how the message length is calculated automatically by the assembler (ML=*-IM). The end of message plus one ("here") minus the start of message gives the length.

Subroutine PR is shown later. As can be seen from the program segment above, the high and low parts of the message address are loaded into registers Y and A respectively, the length into register X; then PR is called. We'll look at that subroutine when it comes up.

An Unusual Place For Messages

The message text is thrown in-line directly behind the program segment that uses it. This is unusual: It's more common for all text, tables, and variables to be placed at the end of the program. During the program development phase things might be out of order, but it's usual to clean that up later. No big deal: It costs us a JMP instruction leap over

the message to get to address GI. In the meantime, it's convenient for us, the readers, since as we read the code which prints the message, the message is right there for us to see.

Rasmussen shows exceptional modesty. Even though the user sees a lengthy opening message, the author's identity is not included.

Next comes a "friendly" input routine:

```
                    ;
                    ;
                    ;GET INPUT
                    ;
                    ;
C129  A2 00     GI  LDX #0          ;SET INDEX=0
C12B  8E A8 02  SI  STX SIV         ;STORE INDEX VALUE
                    ;
                    ;
                    ;GET NEXT CHARACTER
                    ;
                    ;
C12E  20 E4 FF  GNC JSR GETIN       ;GET A CHARACTER
C131  F0 FB         BEQ GNC         ;IF NONE, TRY AGAIN
C133  AE A8 02      LDX SIV         ;LOAD INDEX VALUE
C136  C9 0D         CMP #RK         ;IS THIS RETURN
C138  F0 1C         BEQ FNE         ;KEY
C13A  C9 14         CMP #DK         ;IS THIS DEL.
C13C  F0 03         BEQ PDR         ;KEY
C13E  4C 4C C1      JMP AI          ;GOTO ACCEPT INPUT
                    ;
```

We look for a character, and go back to try again if no character is there. If the character is RETURN (RK), we're finished and go to FNE. If it's DELETE (DK), we go the special delete routine. Otherwise, we go to "accept input." The Accept Input (AI) routine could have been inserted at this point to save the JMP instruction.

```
                    ;
                    ;PROCESS DEL REQUEST
                    ;
                    ;
C141  E0 00     PDR CPX #0          ;INDEX VS ZERO
C143  F0 E6         BEQ SI          ;IF SO, BYPASS
C145  CA            DEX             ;DEL.
C146  20 D2 FF      JSR CHROUT      ;CHARACTER
C149  4C 2B C1      JMP SI          ;GOTO STORE INDEX
                    ;
```

X counts the input characters. If we see a DELETE character, we must decrease X provided it's greater than zero. We should print the delete using CHROUT ($FFD2) in order to erase the previous character on the screen.

```
                    ;
                    ;ACCEPT INPUT
                    ;
                    ;
C14C  9D 40 03  AI  STA FNA,X       ;STORE FILE NAME BYTE
C14F  20 D2 FF      JSR CHROUT      ;PUT IT
C152  E8            INX             ;INCR POINTER
C153  4C 2B C1      JMP SI          ;GOTO STORE INDEX
                    ;
```

An Alternative To JMP

An "ordinary" character is stored and printed. The X counter is increased and we return to get more input. It would be safe to use BNE instead of JMP here, since X will always be nonzero.

```
                    ;
                    ;FILE NAME END
                    ;
                    ;
C156  20 D2 FF  FNE JSR CHROUT      ;DOUBLE
C159  20 D2 FF      JSR CHROUT      ;SPACE
                    ;
                    ;
                    ;
                    ;ADD THE REST OF THE
                    ;FILE NAME FOR WRITE ( ,W )
                    ;
                    ;
C15C  A9 2C         LDA #C          ;LOAD AND
C15E  9D 40 03      STA FNA,X       ;STORE COMMA
C161  E8            INX             ;INCR POINTER
C162  A9 57         LDA #W          ;LOAD AND
C164  9D 40 03      STA FNA,X       ;STORE 'W'
C167  E8            INX             ;INCR POINTER
C168  8E AB 02      STX OFNL        ;STORE OUTPUT FILE NL
C16B  38            SEC             ;SUBTRACT 4
C16C  8A            TXA             ;FOR
C16D  E9 04         SBC #4          ;INPUT FILE
C16F  8D AA 02      STA IFNL        ;NAME LENGTH
C172  4C 8A C1      JMP DIOR        ;GOTO DISK I/O ROUTN
                    ;
```

The program trusts the user to correctly type in a name such as DFILE,S or LPROG,P. It's dangerous to depend upon a user to input exactly the right thing: At the very least, I'd have the program check that the last two characters typed in were a comma followed by P or S.

Indirect Addressing

Now we reach the print subroutine previously used by the program.

```
                    ;
                    ;PRINT ROUTINE
                    ;
                    ;
C175  8E A9 02  PR  STX SLV         ;STORE LENGTH
C178  85 22         STA LB          ;STORE LO BYTE
C17A  84 23         STY HB          ;STORE HI BYTE
C17C  A0 00         LDY #0          ;SET INDEX=0
                    ;
C17E  B1 22     PRL LDA (LB),Y      ;GET CHARACTER
C180  20 D2 FF      JSR CHROUT      ;PUT IT
C183  C8            INY             ;INCR INDEX
C184  CE A9 02      DEC SLV         ;DECR LENGTH
C187  D0 F5         BNE PRL         ;IF NOT 0, CARRY ON
C189  60            RTS             ;RETURN
                    ;
```

A quite straightforward use of indirect addressing for a print subroutine. I might have used CPY SLV instead of DEC SLV, but it works out the same.

```
C18A  A9 00     DIOR =*
```

In the next session, the program opens the command channel and an input data file, and reads the selected file into memory. We'll continue with critical comments on this program. ©

64 EXPLORER

Larry Isaacs

In this column I will show how to create line drawings on a bitmapped display. In addition, we will look at an example written in BASIC and begin converting it to machine language routines which you can use in your programs. For the line-drawing routine to be really effective, conversion to machine language is required. The BASIC routine is much too slow.

There are a number of different methods for drawing lines in machine language. One way appeared in the August 1981 issue of *BYTE* magazine. In the article (page 414), Mike Higgins presented an algorithm which requires only integer adds and subtracts to generate the point along a line specified by two end points. The algorithm was an improvement on one presented in the book *Principles of Interactive Computer Graphics* by Newman and Sproull, which is widely known in the field of computer graphics.

Basically, the method involves setting up a loop which will compute each point along the line. Since we would expect to generate one point each time through the loop, the number of points in the line gives us the number of times the loop should be executed. Remember that the display coordinates are always integer values. The horizontal or vertical step between adjacent dots is always 1. To calculate the number of points in the line, simply take the absolute value of the larger of the differences between the X coordinates and the Y coordinates.

The Primary Axis

To identify the axis with the larger difference in a general way, we will call it the primary axis. For example, if we were drawing a line from 0,0 to 100,50, the X axis has the larger difference and would be the primary axis. The number of points in the line, after plotting the first one, would be 100.

Since there are two possibilities for the primary axis, we will need two loops. At this point, we could write some of the statements that will be required in our BASIC line-drawing routine:

```
‹plot first point›
DX=X1-X0:DY=Y1-Y0
IF ABS(DX) ‹ ABS(DY) THEN ‹1›
FOR I=1 TO ABS(DX)
...
NEXT
...
‹1› FOR I=1 TO ABS(DY)
...
NEXT
```

where X0,Y0 is the starting point, X1,Y1 is the ending point, and ‹1› is a symbolic replacement for an appropriate line number. The first point must be plotted first since the loops generate successive points based on the preceding one.

Setting The Increment

Since the number of points is equal to the coordinate difference on the primary axis, that coordinate should be incremented by one each time through the loop. The coordinate for the other axis, which has a smaller difference, is incremented at a rate smaller than one. If the differences along each axis are the same, either axis can be used as the primary axis, and both coordinates are incremented by one each time through the loop.

The next step in implementing our drawing routine is to come up with a method of properly incrementing the nonprimary axis. We'll want the loop to generate integer values for both Y and X. The loop could be written:

```
X=X0:Y=Y0:SX=1:R=.5*SX
FOR I=1 TO ABS(DX)
X=X+1
R=R+DY/DX*SX
IF R›=SX THEN Y=Y+1:R=R-SX
PLOT X,Y
NEXT
```

Easier Conversion

In this version of the loop, I have the variable SX to show where the X increment of 1 is involved in the incrementing of Y. The variable R is initialized to .5 so that rounding will occur as it is incremented by DY/DX. It is also important to note that Y will be properly incremented even if SX isn't the normal value of 1. The very handy improvement Mike Higgins suggested was, in effect, to replace SX with DX. When you do this, note what happens to the loop.

```
X=X0:Y=Y0:R=DX/2
FOR I=1 TO ABS(DX)
X=X+1
R=R+DY
IF R›=DX THEN Y=Y+1:R=R-DX
PLOT X,Y
NEXT
```

Only addition and subtraction are required within the loop, making it much more suitable for conversion to machine language. The only division is a division by 2, which is also easily done in machine language. Naturally, a similar loop could be written to handle the case when Y is the primary axis.

Now that we have a routine for calculating the points along a line, we need a routine to plot these points. There are a number of books which discuss this in detail: the *Commodore 64 Programmer's Reference Guide*, and two recent releases from COMPUTE!, *COMPUTE!'s Reference Guide to Commodore 64 Graphics* and *COMPUTE!'s First Book of Commodore 64 Sound and Graphics*.

The Plotting Routine

Before getting into a short discussion of the point-plotting routine, we will have to decide whether we will be plotting points in the hi-res bitmap mode or the multicolor bitmap mode, or both. To help simplify the discussions, I will be looking at just the hi-res bitmap mode. In next month's column, I will tie up loose ends from this article and include discussion of the multicolor mode.

Briefly, the point-plotting routine must calculate the byte address and the bit within the byte for the point to be plotted. The address of the byte will be dependent on the location of the bit-mapped graphics RAM and the X,Y coordinates of the point. Once the byte and bit have been identified, there are three things we can do with the point.

First, we can set the bit to a 1, causing the point on the screen to take on the foreground color. Second, we can set the bit to a 0, causing the point on the screen to take on the background color. This is equivalent to erasing the point. Third, we can change the bit to the opposite of its current state. This is called "flipping" the point. Applying these to line drawing, we can get three drawing modes, DRAW, ERASE, and FLIP.

Erasing With FLIP

For those who have not encountered FLIP mode before, it has a couple of unique properties. First, lines drawn in FLIP mode are always visible. If a line is drawn through an area that is already set to the foreground color, you can still see the path of the line because that portion of the line will be set to the background color. Second, if a line drawn in FLIP mode is redrawn in FLIP mode, the line will be erased. The screen will be exactly the same as if the line had never been drawn.

The disadvantage of FLIP mode is that gaps appear where lines intersect. FLIP mode is probably most useful when the object being drawn will undergo editing. Once the editing is complete, the screen can be redrawn in the normal DRAW mode, filling the gaps in the lines.

Also described in the books mentioned above are the details on how to initialize the bitmap RAM and the associated screen memory. Program 1 illustrates what we have discussed so far. There is one slight addition to the drawing loop which was shown last. For ERASE and FLIP mode drawing to be most effective, it is desirable that a given line be drawn the same way regardless of which end is its starting point.

To this end, the line-drawing subroutine at line 1000 always draws from left to right. The X increment will always be +1 with the Y increment being +1 or –1, depending on the sign of DY. Also, the point-plotting routine at line 800 does not handle changing the foreground or background colors when plotting a point. This could be easily added if desired. Unfortunately, changing the colors for one point changes the colors for all points within that bitmap cell.

Selecting The Commands

In the example program, the drawing mode is specified by the variable M. If M=0, ERASE mode is selected. M=1 selects DRAW mode, and M=2 selects FLIP mode. The main routine at line 2000 is a simple loop which performs commands specified by DATA statements. Each command consists of a command number followed by one or two argument numbers. A command number of 1 performs a move to the X,Y coordinates specified by the two arguments which follow. Command number 2 performs a draw to the X,Y coordinates specified by the two arguments which follow.

Command number 3 sets the drawing mode to the value of the number that follows. Command number 0 terminates execution of the commands. The graphics display will remain on the screen until a key is pressed. Running this example program should make it clear that BASIC isn't suited for the task of drawing lines. For iterative tasks which require many calculations, the fact that BASIC is interpreted will severely slow up the task.

Conversion To Machine Language

Now we are ready to begin the conversion to machine language. First we will need two routines to replace the BASIC subroutines at lines 100 and 900, which save and restore the text screen, respectively. These will be called SVSCRN and RSSCRN. Next come the BASIC subroutines at lines 200, 300, 400, and 700 which set up the bitmap display. We will combine these into a single routine called GRSCRN to enable the graphics screen.

Since we are working with machine language, we can place the bitmapped memory under the OS ROM and screen memory just below where the

DOS Wedge goes, at $E000 and $C800, respectively. This way no user memory is lost from BASIC. Also, the text screen will not be disturbed by drawing in the graphics screen. A slight disadvantage of this arrangement is that interrupts must be turned off while the OS ROM is disabled. This will cause the 64 clock timer to be slightly off.

The final routine we will look at this month will be the one which clears the bitmap and screen memories. This will replace the BASIC subroutines at lines 500 and 600 and will be called CLRSCR. Actually, this routine will rely on another routine called FILL to do the clearing. Rather than fetch arguments from BASIC, this routine fills the screen memory with a constant. This constant sets the background to white and the foreground to red. Next month we'll upgrade this routine to accept arguments specifying the colors.

The result of this set of machine language routines is shown in Program 2. As written, these routines would assemble at location $C000. Like the location of the graphics RAM, this doesn't reduce BASIC user RAM. It also won't interfere with the DOS Wedge. This may conflict with some other machine language routines you find handy, but finding locations which don't conflict has become impossible.

A Jump Table

There are a couple of things worth noting in the machine language listing. First, a jump table is placed at the beginning. This table will contain JMP instructions to each of the routines that will be called from BASIC. Even though the starting locations of the various routines may change, the jump table and the locations to SYS to will stay put. To call one of the routines from BASIC, simply set a variable equal to $C000 (49152), then SYS to this variable plus the appropriate offset. For example: TB=49152:SYS TB+9 would call the CLRSCR routine.

Second, you may want to take a look at the FILL routine. Its function is to fill an area of memory with a specified byte. This function could have been implemented a number of different ways. For example, it could have been written a little more simply by using a single loop. Instead I implemented it using two loops, one to fill whole pages (groups of 256 bytes) and the other to fill the final partial page. By doing this, the core loops can be written with just STA, INY, and BNE instructions, making them very fast. It would be difficult to make the routine much faster without increasing its size quite a bit and making it more complex.

When implementing almost any routine, you will usually be faced with trade-offs between size, simplicity, and speed. Here I tried to maximize speed without sacrificing size and simplicity too

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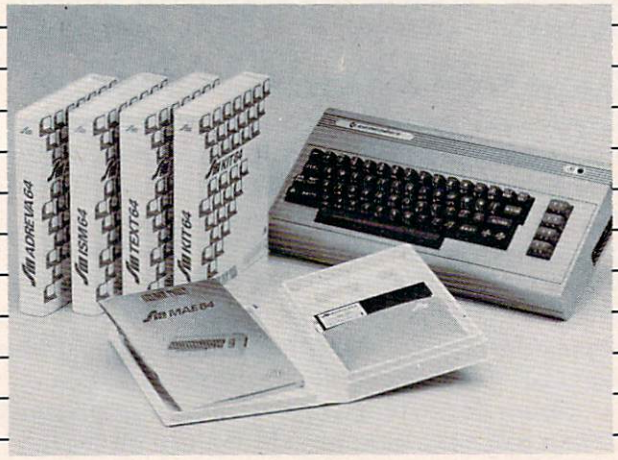

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much.

Next month we'll continue with the conversions of the point-plotting and line-drawing routines, and look into the multicolor bitmap mode. I want to provide information you can put to some use. Please write me with any comments or suggestions concerning topics you would like to see discussed.

Program 1: BASIC Drawing Program

```
10 REM DRAW PROGRAM                    :rem 139
20 V1=56576:V2=53272:V3=53265          :rem 58
30 M(7)=1:M(6)=2:M(5)=4:M(4)=8         :rem 34
40 M(3)=16:M(2)=32:M(1)=64:M(0)=128
                                       :rem 21
50 GOTO 2000                           :rem 96
100 REM SAVE DISPLAY BYTES             :rem 65
110 S1=PEEK(V1)                        :rem 80
120 S2=PEEK(V2)                        :rem 83
130 S3=PEEK(V3)                        :rem 86
140 RETURN                             :rem 117
200 REM SET GRAPHICS RAM BANK          :rem 175
210 REM BASED ON BITMAP ADDRESS, BA
                                       :rem 229
220 T=INT(BA/16384):T=3-T              :rem 152
230 POKE V1,(PEEK(V1)AND252)OR T       :rem 38
240 RETURN                             :rem 118
300 REM SET BITMAP 8K OFFSET           :rem 106
310 REM BASED ON BITMAP ADDRESS, BA
                                       :rem 230
320 T=BA:IF T>32767 THEN T=T-65536:rem 87
330 T= -((T AND 8192) <> 0)            :rem 155
340 POKE V2,(PEEK(V2)AND247)OR (T*8)
                                       :rem 225
350 RETURN                             :rem 120
400 REM SET COLOR MEMORY OFFSET        :rem 131
410 REM BASE ON COLOR ADDRESS, CA:rem 102
420 T=INT(CA/16384):T=CA-T*16384       :rem 28
430 T=INT(T/1024)                      :rem 174
440 POKE V2,(PEEK(V2)AND15)OR (T*16)
                                       :rem 218
450 RETURN                             :rem 121
500 REM CLEAR BITMAP MEMORY            :rem 118
510 FOR A=BA TO BA+7999                :rem 177
520 POKE A,0:NEXT                      :rem 220
530 RETURN                             :rem 120
600 REM CLEAR SCREEN MEMORY            :rem 122
610 REM FC=ON COLOR, BC=OFF COLOR:rem 165
620 T=FC*16+BC                         :rem 243
630 FOR A=CA TO CA+999                 :rem 127
640 POKE A,T:NEXT                        :rem 3
650 RETURN                             :rem 123
700 REM ENABLE BITMAP GRAPHICS          :rem 48
710 POKE V3,PEEK(V3) OR 32             :rem 129
720 RETURN                             :rem 121
800 REM PLOT POINT X,Y WITH MODE M
                                       :rem 208
810 TY=199-Y:RO=INT(TY/8):CO=INT(X/8)
                                        :rem 24
820 YB=TY AND 7:XB=X AND 7             :rem 156
830 A=BA+RO*320+CO*8+YB                 :rem 12
840 B=PEEK(A)                          :rem 210
850 IF M=1 THEN POKE A,B OR M(XB):RETURN
                                       :rem 231
860 IF M=0 THEN POKE A,B AND (255-M(XB)):
    RETURN                             :rem 51
870 IF B AND M(XB) THEN POKE A,B-M(XB):RE
    TURN                                :rem 7
```


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```
880 POKE A,B OR M(XB):RETURN      :rem 113
900 REM RESTORE DISPLAY           :rem 183
910 POKE V1,S1                     :rem 0
920 POKE V2,S2                     :rem 3
930 POKE V3,S3                     :rem 6
940 RETURN                        :rem 125
1000 REM THE LINE DRAWING ROUTINE:rem 224
1010 REM DRAWS FROM X0,Y0 TO X1,Y1
                                  :rem 122
1020 DX=ABS(X1-X0):DY=ABS(Y1-Y0) :rem 124
1030 IF DX=0 AND DY=0 THEN RETURN :rem 72
1040 X=X0:Y=Y0:IY=SGN(Y1-Y0)      :rem 205
1050 IF DX < DY THEN 1300         :rem 189
1200 IF X1<X0 THEN X=X1:Y=Y1:IY=-IY
                                   :rem 46
1210 GOSUB 800:R=DX/2             :rem 162
1220 FOR I=1 TO DX                :rem 162
1230 X=X+1:R=R+DY                 :rem 242
1240 IF R>=DX THEN Y=Y+IY:R=R-DX  :rem 142
1250 GOSUB 800:NEXT                :rem 89
1260 X0=X1:Y0=Y1:RETURN           :rem 187
1300 IF Y1<Y0 THEN X=X1:Y=Y1:IY=-IY
                                   :rem 49
1310 GOSUB 800:R=DY/2             :rem 164
1320 FOR I=1 TO DY                :rem 164
1330 Y=Y+IY:R=R+DX                :rem 101
1340 IF R>=DY THEN X=X+1:R=R-DY    :rem 30
1350 GOSUB 800:NEXT                :rem 90
1360 X0=X1:Y0=Y1:RETURN           :rem 188
2000 REM THE MAIN ROUTINE         :rem 210
2010 BA=16384:CA=BA+8192:FC=2:BC=1:M=1
                                   :rem 90
2020 GOSUB 100:GOSUB 200:GOSUB 300
                                  :rem 110
2030 GOSUB 400:GOSUB 700           :rem 42
2040 GOSUB 600:REM CLEAR COLOR MEM
                                  :rem 191
2050 GOSUB 500:REM CLEAR BITMAP    :rem 30
2060 REM LOOP DRAWING DATA         :rem 12
2070 READ S:ON S GOTO 2200,2300,2400
                                   :rem 66
2100 REM END PROGRAM              :rem 150
2110 GET Z$:REM CLEAR KEYBOARD QUE
                                  :rem 227
2120 IF Z$<>"" THEN 2110          :rem 131
2130 GET Z$:IF Z$="" THEN 2130    :rem 225
2140 GOSUB 900:END                :rem 241
2200 REM MOVE                     :rem 223
2210 READ X0,Y0:GOTO 2060          :rem 89
2220 X=X+IX:R=R+DY                 :rem 98
2230 IF R>=DX THEN Y=Y+IY:R=R-DX  :rem 142
2240 GOSUB 800                    :rem 224
2250 NEXT                          :rem 8
2260 X0=X1:Y0=Y1:RETURN           :rem 188
2300 REM DRAW                     :rem 215
2310 READ X1,Y1:GOSUB 1000:GOTO 2060
                                  :rem 215
2400 REM SET MODE                 :rem 187
2410 READ M:GOTO 2060             :rem 107
3000 DATA 3,2                     :rem 110
3010 DATA 1,50,50                  :rem 49
3020 DATA 2,100,100               :rem 139
3030 DATA 1,50,100                 :rem 95
3040 DATA 2,100,50                 :rem 97
3050 DATA 2,100,100               :rem 142
3060 DATA 2,50,100                 :rem 99
3070 DATA 2,50,50                  :rem 56
3080 DATA 2,100,50                :rem 101
3090 DATA 2,50,100                :rem 102
3100 DATA 0                        :rem 14
```

Program 2:
Machine Language Drawing Routines

```
;
; MACHINE LANGUAGE DRAWING ROUTINES
;
; EQUATES
;
TIMACT  = $DC0E ;TIMER A CONTROL
MEMCTL  = $DD00 ;C64 MEMORY CONTROL
VICCTL  = $D011 ;VIC CONTROL REGISTER
VICMCT  = $D018 ;VIC MEMORY CONTROL
BMBASE  = $E000 ;BIT-MAP BASE
BMOFFS  = $08   ;8K OFFSET BYTE
SMBASE  = $C800 ;SCREEN MEMORY BASE
SMOFFS  = $20   ;SCREEN MEMORY OFFSET
BMMODE  = $20   ;BIT-MAP ENABLE BIT
;
; PAGE ZERO EQUATES
;
ROMCTL  = $1  ;ROM CONTROL REGISTER
TMP1    = $FB ;TEMP 1
TMP2    = $FD ;TEMP 2
;
; JUMP TABLE
;
        *= $C000
        JMP SVSCRN ;SAVE SCREEN PARMS
        JMP RSSCRN ;RESTORE PARMS
        JMP GRSCRN ;ENABLE GRAPHICS
        JMP CLRSCR ;CLEAR GR. SCREEN
;
; LOCAL STORAGE
;
S1      .BYTE 0 ;SAVE MEMCTL
S2      .BYTE 0 ;SAVE VICMCT
S3      .BYTE 0 ;SAVE VICCTL
;
; SAVE SCREEN PARMS
;
SVSCRN  LDA MEMCTL
        STA S1
        LDA VICMCT
        STA S2
        LDA VICCTL
        STA S3
        RTS
;
; RESTORE SAVED SCREEN PARMS
;
RSSCRN  LDA S1
        STA MEMCTL
        LDA S2
        STA VICMCT
        LDA S3
        STA VICCTL
        RTS
;
; ENABLE GRAPHICS SCREEN
;
GRSCRN  LDA MEMCTL ;SET GRAPHICS BANK
        ORA #$03
        EOR #BMBASE/$4000
        STA MEMCTL
        LDA VICMCT  ;SET OFFSETS
        AND #$07    ;CLEAR OLD BITS
        ORA #BMOFFS ;SET BIT-MAP OFFSET
        ORA #SMOFFS ;SET SCREEN OFFSET
        STA VICMCT
        LDA VICCTL  ;ENABLE BIT-MAP
        ORA #BMMODE
        STA VICCTL
```

```
        RTS
;
; SUBROUTINE: TURN OS ROM OFF
;
OSOFF    PHA
        LDA TIMACT ;TURN OF IRQ'S
        AND #$FE
        STA TIMACT
        LDA ROMCTL ;TURN OF OS ROM
        AND #$FD
        STA ROMCTL
        PLA
        RTS
;
; SUBROUTINE: TURN BASIC ROM ON
;
OSON     PHA
        LDA ROMCTL ;TURN ON OS ROM
        ORA #$02
        STA ROMCTL
        LDA TIMACT ;ENABLE IRQ'S
        ORA #$01
        STA TIMACT
        PLA
        RTS
;
; SUBROUTINE: FILL AN AREA OF MEMORY
;
; ON ENTRY: A= FILL BYTE
; TMP1 = POINTER TO AREA
; TMP2 = # BYTES TO FILL
;
; ON RETURN: A AND X PRESERVED.
; Y, TMP1, AND TMP2 CLOBBERED.
;
FILL     LDY TMP2+1 ;FILL WHOLE PAGES
        BEQ FILL3  ;BR IF NONE
FILL1    LDY #0
FILL2    STA (TMP1),Y
        INY
        BNE FILL2
        INC TMP1+1 ;INCREMENT POINTER
        DEC TMP2+1 ;DECREMENT # PAGES
        BNE FILL1  ;BR IF MORE PAGES
FILL3    LDY TMP2   ;CHECK PARTIAL PAGE
        BEQ FILL6  ;BR IF DONE
        DEY        ;CLEAR PARTIAL PAGE
        BEQ FILL5  ;GO CLEAR LAST BYTE
FILL4    STA (TMP1),Y
        DEY
        BNE FILL4
FILL5    STA (TMP1),Y ;THE LAST BYTE
FILL6    RTS
;
; CLEAR BIT-MAP AND SCREEN MEMORY
;
CLRSCR  LDA #<SMBASE ;CLEAR SCREEN MEM
        STA TMP1
        LDA #>SMBASE
        STA TMP1+1
        LDA #<1000 ;1000 BYTES
        STA TMP2
        LDA #>1000
        STA TMP2+1
        LDA #$21   ;GET COLORS
        JSR FILL
        LDA #<BMBASE ;CLEAR BIT-MAP
        STA TMP1
        LDA #>BMBASE
        STA TMP1+1
        LDA #<8000 ;8000 BYTES
        STA TMP2
        LDA #>8000
        STA TMP2+1
        LDA #0
        JSR OSOFF  ;TURN OS ROM OFF
        JSR FILL   ;CLEAR
        JMP OSON   ;TURN OS ROM ON
                   ;AND RETURN
.END
```

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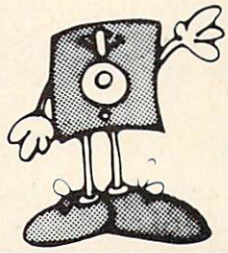

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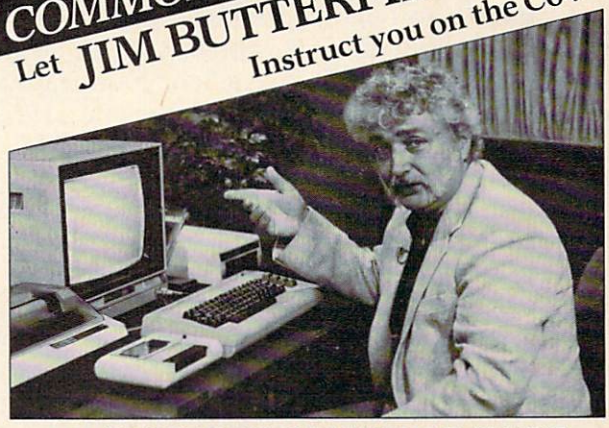

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INSIGHT: Atari

Bill Wilkinson

Well, here it is April again. Those of you who read my April column last year may recall that I devoted much of my space to an April Fool announcement of the "new Atari COBOL." Would it surprise you to learn that this year I will also "announce" some new products from Atari?

We're going to be exploring some medium hefty programming logic (in machine language) next month: How to use your 1050 disk drive in enhanced density with Atari DOS 2.0s. For now, though, let's plunge into some wild speculations, rumors, and April fun.

Incredible Integration

Since last year's April announcement was about some literally unbelievable software, it seems only fitting that this year we make a hardware announcement that's almost as doubt-provoking.

By the time you read this article, Atari will be shipping at least the first two of three magnificent new machines. These machines, while maintaining almost full compatibility with existing Atari hardware and software, add the full power of an intelligent peripheral expansion bus. Imagine an Atari computer hooked up to a 5- or 10-megabyte hard disk drive, a true parallel printer interface, a high-speed modem, and maybe even a CP/M emulation package.

I mean, we're talking about possibly moving data to and from a disk drive at 30,000 to 60,000 bytes per second! Imagine taking less than two seconds to load the largest possible programs. And perhaps talking via a serial interface (or, better yet, a local network) to one or more other computers at the same time—at data rates perhaps three to ten times what an 850 Interface Module is capable of.

Software Compatibility, Too

Of course, if you are a realist, you will say, "Okay for the hardware. But what about software and software compatibility?" Would you settle for a smart peripheral bus that intercepts the OS (CIO) if you are trying to do I/O via the old serial bus. You know, the cable that links your 400/800/1200 to the disk, printer, etc.? Could you accept the fact that it checks to see if you have (for example) moved "D1:" to your hard disk drive and sends the request there instead of to your 810? All automatically?

Not enough? How about if these new machines even provided ways for third-party hardware vendors to add their own boards and automatically link in device handlers for them? Imagine a music synthesizer accessed as simply "M:", thus easily callable from even Atari BASIC. Could *any* computer manufacturer possibly design such a well-integrated system?

How about if the new machines even came with a faster math package, so that they were the fastest computers in the home computer marketplace? (I choose to define a home computer as one which costs less than $1000, including at least a disk drive.)

April Fool

Well, you knew it couldn't last, didn't you? Sigh. But it was nice to dream for a paragraph or two, wasn't it? Now, are you ready for the bitter reality?

Surprise! This is my April Fool gag for this year: Almost everything you just read about the new machines is the absolute truth. Honest. No gag.

In fact, as I write this article in January, the machines I have described to you are arriving in stores by the truckfuls. And why, you ask, haven't you seen these wonder computers advertised? Ah, but you have. They are called the 600XL and the 800XL (with big brother 1450XLD still to come). But if all I claimed is true, why hasn't Atari proclaimed it to the computer world as the greatest advance ever in home computers? Now *there* is the April Fool question.

If Atari can solve some advertising and delivery problems, I think you will see a wealth of capabilities added to the new XL machines second only to the selection available to Apple II owners.

Oh, yes. I did throw one April Fool joke into the description above. Can you guess what it is?

Final Foolishness

The descriptions of the Atari super machines were accurate except for one April Fool joke. Sigh. Unfortunately, the part about the advanced, fast BASIC being built-in is still just a dream. ©

PROGRAMMING THE TI

C. Regena

Part 2: File Processing

I have had *lots* of requests for programs that use TI Extended BASIC and peripherals (printers, the RS-232 interface, and disk drives). In these next two columns I will try to satisfy those readers, plus the readers who have requested file processing, by discussing a report writer that uses disk files and a printer.

Keep in mind that there are many ways to program (as many ways as there are programmers). I'm going to show you one method I use to set up a file, then generate several reports from that file. For an example, I'm going to use a hypothetical situation—a teacher has divided the class into three reading groups. The students are given the goal of presenting one oral book report each week of the term (for this example the term is ten weeks). The teacher will grade the students on how well the goal is attained. These reports keep a tally of the book presentations. As part of the necessary school paperwork, the teacher also needs to keep track of each student's address and phone number. As a personal touch, the teacher also wants to be able to acknowledge the students on their birthdays. We'll get to these last two programs next month.

Writing A Data File

First, a data file is set up using Program 1. The student information is listed in DATA statements within this program, and the program will generate a data file on diskette. You could use DATA statements within a regular program which also writes the report, but with many students a shortage of computer memory could be a problem. Also, I'm going to use this data for several programs, and I'll only have to type it once—in this data file generator program. All reports will use this one data file.

Program 1 READs the information in from DATA statements, then writes it directly out on a disk file. Line 130 is the key statement to set up the disk system for storing the data. The OPEN statement says device #3 (you can use any number) is disk drive number one, and the file of data will be called SAMPLE. The data will be stored in internal format as output and can have a variable length of 192.

To use this program with cassette instead of diskette, use this line:

```
130 OPEN #3:"CS1",INTERNAL,OUTPUT,F
    IXED 192
```

In later programs change any DSK1 and titles to CS1 within quotes, and change the VARIABLE to FIXED since cassettes can handle only FIXED-length files.

Reading The Data

Line 140 reads the data in the following order for our situation: group G, last name N$, first name F$, address A$, phone number P$, birthday expressed as a number BD, report R$, and comments C$. Line 150 prints the same information onto the diskette. Lines 160–180 stop the process if the name read is "ZZZ", which indicates the end of the file. Line 170 counts the names.

Lines 190–490 contain the data. Notice that the last DATA statement contains "ZZZ" for N$, the last name. These names are sample names only and are not meant to represent any real people. The other information is also made up for purposes of illustration. The DATA statements are in order by last name.

The first number in the DATA statement is a group number—the sample class is divided into three reading groups. We're assuming the students all live in the same city, so only the street address is stored as A$. The phone number P$ is stored as a four-digit number because they all have the same prefix. You can change this if you wish. Since the variable name is P$, you may include a hyphen in the phone number. The birthday BD is expressed as a number which consists of the month number then two digits representing the day number. For example, September 24 is month 9 and day 24 for 924. November 25 is 1125. October 5 is 1005 for month 10 and day 05.

Encode The Special Cases

The next series of numbers represents whether the student presented a book report or not. I combined all the weeks into one ten-digit number. A 1 means the student gave a report that week and 0 means he or she did not. A dash means the student was not enrolled. You may have a report that uses other symbols for other purposes—an

asterisk for a different assignment, for example. The comments C$ are just to illustrate more versatility in later reports. I used AUDIT to represent a student who will not be counted for credit, and MOVED indicates the student is no longer in the class.

To try the sample programs this month, start with a new initialized diskette. Type in Program 1 then save it with a command such as SAVE DSK1.LIST1 or SAVE DSK1.NAMES or whatever label you wish. Next RUN this program with the diskette in the disk drive. The drive light will blink on and off as data is being recorded. The screen shows how many names have been processed. This program only sets up the data files—it does not write any reports.

Generating A Roster

Now go on to Program 2. This program will read information from the data file we created previously with Program 1 and print out a roster of information—the student, which group the student is in, the address, the phone, the birthdate, and any comments.

Lines 130–150 contain a procedure that reads the month names, which are later used in printing the birthdays. Line 160 initializes some variables. Note that Extended BASIC allows several variables at once to be set equal to zero. The variable I is used to count the total number of names. N is the number of auditing students, and MM is the number of students who have moved. L is a line counter.

Printer Features

My printer has a feature that will skip over perforations at the end of a page. In case your printer does not automatically do that, I have included this method. L is used to count the lines that have been printed. Line 360 can then check to see if it is time to change pages. PRINTing CHR$(12) goes to the top of a new page. If your printer cannot PRINT CHR$(12), you can put in a pause so you can reset to the top of a new page. (The sample data included here does not go more than one page. Add more names if you want to see this part work.)

Line 180 defines the printer configuration for device #2 (use any device number). Use the parameters you need for your particular printer. Consult the RS-232 manual and your printer manual to figure out your configuration. Line 190 is the OPEN statement for device #3 (any number) to read in the data. Notice that this statement matches the OPEN #3 statement in Program 1, except we use INPUT instead of OUTPUT because we will be reading in data.

Lines 200–240 print the heading. Line 250 is an INPUT #3 statement that tells the computer to READ data from device #3. This statement is just like using READ and DATA statements within the program, only we use data files instead of program statements to store the data. The items listed may be read in as needed or all on one line, but must be in the same order as we previously saved them.

Ordering The Data

Line 260 skips the name on the roster if the student has moved and counts the number of people who have moved. Line 270 skips a line when the name starts with a different letter of the alphabet. By listing the original data in alphabetical order, this roster and other reports will automatically be in alphabetical order. A blank line is printed between groups of names starting with different letters. Line 280 checks for the last data item.

Line 290 combines the last and first names. Lines 300–310 determine the birthday from the number BD. Line 330 combines the common prefix 586- with the data P$ for the phone number.

Lines 320 and 410 are IMAGE statements, a feature of Extended BASIC which makes the module worth its price if you do lots of reports. An IMAGE statement allows you to specify how a line will be printed.

You can also use IMAGE statements PRINT USING statements to line up columns of money. For example, $###.## will print a number in dollar format with the cents rounded off. Line 340 uses line 320 to print the information.

Lines 350 and 360 increment the number of names and number of lines printed. Line 370 checks for a student who is just auditing the class. Line 380 causes the computer to branch back to the INPUT statement to read the next data items.

Typing Errors

If you get a data error, the most likely cause would be mistyping the DATA statements in Program 1. When the program stops with an error, you can PRINT N$ to see which was the last name that was accepted. Use that information to try to pinpoint a typing error in Program 1. (Be sure to SAVE Program 2 before you go back to Program 1.) You also need to make sure the data items in line 250 of Program 2 are in the same order as the data items in line 150 of Program 1. You may use different variable names if you wish, as long as the strings and numeric variables are in the right order.

Lines 390–460 print the totals information. Line 470 uses CHR$(12) to tell the printer to go to a new page. Line 480 CLOSEs both devices used in the program.

Program 1: Write Data Files

```
80 REM TI EXTENDED BASIC
90 REM DISK, PRINTER
```

```
100 REM WRITE DATA FILES
110 CALL CLEAR
120 DISPLAY AT(12,5):"WRITING DATA
    FILES"
130 OPEN #3:"DSK1.SAMPLE",INTERNAL,
    OUTPUT,VARIABLE 192
140 READ G,N$,F$,A$,P$,BD,R$,C$
150 PRINT #3:G,N$,F$,A$,P$,BD,R$,C$
160 IF N$="ZZZ" THEN 180
170 I=I+1 :: DISPLAY AT(23,3):I ::
    GOTO 140
180 CLOSE #3 :: STOP
190 DATA 1,ADAMS,JENNIFER,1207 W 80
    0 S,2314,924,1001110111,""
200 DATA 2,ALLEN,MICHAEL,204 N 300
    W,3273,1125,0010001101,""
210 DATA 3,ANDERSON,PAM,112 S 350 E
    ,1122,129,1101101101,""
220 DATA 2,BAKER,MICHELLE,310 S 350
     E,4054,1005,1101110111,""
230 DATA 2,BROWN,JUSTIN,971 EVERGRE
    EN,9656,212,1111111111,""
240 DATA 1,CARTER,JODI,918 JUNIPER,
    8803,502,0111011111,""
250 DATA 3,CHRISTENSEN,WES,1804 S 8
    00 W,3102,726,1101111011,""
260 DATA 1,DAINES,BRETT,123 S 350 E
    ,4765,1020,1001110111,""
270 DATA 1,GIFF,BEAU,222 CABBAGE LA
    NE,5733,901,--11011111,""
280 DATA 2,HANSEN,GRANT,209 N 300 W
    ,8996,425,111100111-,MOVED
290 DATA 3,JENSEN,CINDY,932 EVERGRE
    EN,7532,415,1011101101,""
300 DATA 2,JENSEN,NATALIE,420 S 100
     E,3487,512,,""
310 DATA 1,JOHNSON,ROCHELLE,355 S 1
    00 E,0217,110,1101111100,""
320 DATA 1,JONES,CHERY,1502 CEDAR,0
    157,802,1111111111,""
330 DATA 3,LARSEN,BOB,120 S 350 E,8
    674,510,---1111111,""
340 DATA 1,LARSEN,BILL,56 S 300 E,1
    299,520,1111111111,""
350 DATA 3,MORRIS,TERRY,375 E 100 N
    ,5607,114,1111011110,AUDIT
360 DATA 2,NELSON,ROGER,1362 N 1700
     E,4355,1005,1100111--,MOVED
370 DATA 1,NIELSEN,TOM,236 E 500 N,
    5670,806,0111111011,""
380 DATA 2,OLSON,RICHARD,801 W 300
    S,4587,0,1100001111,""
390 DATA 3,PETERSON,RANDY,233 E 500
     N,9007,302,1111111111,""
400 DATA 2,RICH,BRITTANY,725 E 525
    S,5683,407,1110110111,AUDIT
410 DATA 2,SAWYERS,JILL,806 W 200 N
    ,,611,1010101011,""
420 DATA 3,SMITH,JEFF,305 S 350 E,7
    789,315,1110111110,""
430 DATA 2,SMITH,TROY,855 S 300 E,6
    834,722,111--11111,""
440 DATA 3,SORENSON,GREG,315 E 525
    S,4379,104,1111111111,""
450 DATA 2,TAYLOR,CAMILLE,225 E 525
     S,3225,826,1110011101,""
460 DATA 1,THATCHER,DON,534 SPRUCE,
    2758,627,1110011101,""
470 DATA 1,WHITE,DEANNA,289 CEDAR,8
    453,121,1110100100,""
480 DATA 3,WILSON,ED,342 S 300 E,21
    55,0,1001111011,""
490 DATA 5,ZZZ,ZZZ,,,,0,,""
```

Program 2: Roster

```
80 REM TI EXTENDED BASIC
90 REM DISK, PRINTER
100 REM ROSTER
110 CALL CLEAR
120 DISPLAY AT(12,5):"PRINTING ROST
    ER"
130 DIM M$(12)
140 FOR I=1 TO 12 :: READ M$(I):: N
    EXT I
150 DATA JAN,FEB,MAR,APR,MAY,JUN,JU
    L,AUG,SEP,OCT,NOV,DEC
160 I,N,MM,L=0 :: L$="A"
170 REM PRINTER CONFIGURATION
180 OPEN #2:"RS232.BA=600"
190 OPEN #3:"DSK1.SAMPLE",INTERNAL,
    INPUT ,VARIABLE 192
200 PRINT #2:TAB(34);"SAMPLE CLASS"
210 PRINT #2: :TAB(37);"ROSTER"
220 PRINT #2: :TAB(33);"APRIL 15, 1
    984"
230 PRINT #2: : :"{3 SPACES}NAME";T
    AB(25);"PHONE";TAB(34);"ADDRESS
    ";TAB(61);"BIRTHDAY";TAB(71);"C
    OMMENTS"
240 PRINT #2:"-  ----";TAB(25);"---
    --";TAB(34);"-------";TAB(61);"
    --------";TAB(71);"--------": :
250 INPUT #3:G,N$,F$,A$,P$,BD,R$,C$
260 IF C$="MOVED" THEN MM=MM+1 :: G
    OTO 250
270 IF SEG$(N$,1,1)<>L$ THEN PRINT
    #2 :: L$=SEG$(N$,1,1):: L=L+1
280 IF N$="ZZZ" THEN 390
290 N$=N$&", "&F$
300 IF BD=0 THEN BD$="---" :: D=0 :
    : GOTO 330
310 BD$=STR$(BD):: D=VAL(SEG$(BD$,L
    EN(BD$)-1,2)):: M=VAL(SEG$(BD$,
    1,LEN(BD$)-2)):: BD$=M$(M)
320 IMAGE #  ##################  ##
    ######  ########################
    ##{3 SPACES}### ##{3 SPACES}###
    #######
330 P$="586-"&P$
340 PRINT #2,USING 320:G,N$,P$,A$,B
    D$,D,C$
350 I=I+1
360 L=L+1 :: IF L=49 THEN PRINT #1:
    CHR$(12):: L=0 :: GOTO 200
370 IF SEG$(C$,1,5)="AUDIT" THEN N=
    N+1
380 GOTO 250
390 PRINT #2: : :
400 T=I-N
410 IMAGE ###  ##################
420 PRINT #2,USING 410:I,"NAMES"
430 PRINT #2
440 PRINT #2,USING 410:N,"AUDIT"
450 PRINT #2,USING 410:MM,"MOVED"
460 PRINT #2,USING 410:T,"PRESENTLY
     ENROLLED"
470 PRINT #2:CHR$(12)
480 CLOSE #2 :: CLOSE #3
490 END
```

©

The Automatic Proofreader
For VIC, 64, And Atari

Charles Brannon, Program Editor

At last there's a way for your computer to help you check your typing. "The Automatic Proofreader" will make entering programs faster, easier, and more accurate.

The strong point of computers is that they excel at tedious, exacting tasks. So why not get your computer to check your typing for you?

With "The Automatic Proofreader" nestled in your VIC-20, Commodore 64, or Atari computer, every line you type in will be verified. It displays a special code, called a *checksum*, at the top of the screen. The checksum, either a number (VIC/64) or a pair of letters (Atari), corresponds to the line you've just typed. It represents every character in the line summed together. A matching code in the program listing lets you compare it to the checksum which the Proofreader displays. A glance is all it takes to confirm that you've typed the line correctly.

Entering The Automatic Proofreader

Commodore (VIC/64) owners should type in Program 1. Program 2 is for Atari users. Since the Proofreader is a machine language program, be especially diligent. Watch out for typing extra commas, or a letter O for a zero, and check every number carefully. If you make a mistake when typing in the DATA statements, you'll get the message "Error in DATA statements" when you RUN the program. Check your typing and try again.

When you've typed in The Automatic Proofreader, SAVE it to tape or disk at least twice *before running it for the first time.* If you mistype the Proofreader, it may cause a system crash when you first run it. By SAVEing a copy beforehand, you can reLOAD it and hunt for your error. Also, you'll want a backup copy of the Proofreader because you'll use it again and again—every time you enter a program from COMPUTE!.

When you RUN the Proofreader, the program will be POKEd safely into memory, then it will activate itself. If you ever need to reactivate it (RUN/STOP—RESTORE or SYSTEM RESET will disable it), just enter the command SYS 886 (VIC/64) or PRINT USR(1536) for the Atari.

Using The Proofreader

Now, let's see how it works. LIST the Proofreader program, move the cursor up to one of the lines, and press RETURN. If you've entered the Proofreader correctly, a checksum will appear in the top-left corner of your screen.

Try making a change in the line and hit RETURN. Notice that the checksum has changed. All VIC and 64 listings in COMPUTE! now have a number appended to the end of each line, for example, :rem 123. *Don't enter this statement.* It is just for your information. The rem is used to make the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will cause the checksum displayed at the top of the screen to be different, even if you entered the rest of the line correctly.

The Atari checksum is found immediately to the left of each line number. This makes it impossible to type in the checksum accidentally, since a program line must start with a number.

Just type in each line (without the printed checksum), and check the checksum displayed at the top of the screen against the checksum in the listing. If they match, go on to the next line. If they don't, there's a mistake. You can correct the line immediately, instead of waiting to find the error when you RUN the program.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. Occasionally proper spacing is important, but the article describing the program will warn you to be careful in these cases.

Nobody's Perfect

Although the Proofreader is an important aid, there are a few things to watch out for. If you enter a line by using abbreviations for commands, the checksum will not match up. This is because the Proofreader is very literal: It looks at the individual letters in a line, not at tokens such as PRINT. There is a way to make the Proofreader check such a line. After entering the line, LIST it. This makes the computer spell out the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way. Atari users should beware of using ? as an abbreviation for PRINT—they're not the same thing in the Proofreader's eyes.

The checksum is a sum of the ASCII values of the characters in a line. VIC and 64 owners may wonder why the numbers are so small, never exceeding 255. This is because the addition is done only in eight bits. A result over 255 will roll over past zero, like an odometer past 99999. On the Atari, the number is turned into two letters, both for increased convenience and to make the Proofreader shorter. For the curious, the letters correspond to the values of the left and right nybbles added to 33 (to offset them into the alphabet). This number is then stored directly into screen memory.

Due to the nature of a checksum, the Proofreader will not catch all errors. Since $1+3+5=3+1+5$, the Proofreader cannot catch errors of transposition. In fact, you could type in the line in any order, and the Proofreader wouldn't notice. Anytime the Proofreader

seems to act strange, keep this in mind. Since the ASCII values of the number 18 (49+56) and 63 (54+51) both equal 105, these numbers are equal according to the Proofreader. There really is no simple way to catch these kinds of errors. Fortunately, the Proofreader will catch the majority of the typing mistakes most people make.

If you want the Proofreader out of your way, just press SYSTEM RESET or RUN/STOP—RESTORE. If you need it again, enter SYS 828 (VIC/64) or PRINT USR(1536) (Atari). You must disable the Proofreader before doing any tape operations on the VIC or 64.

Hidden Perils

The Proofreader's home in the VIC and 64 is not a very safe haven. Since the cassette buffer is wiped out during tape operations, you need to disable the Proofreader with RUN/STOP—RESTORE before you SAVE your program. This applies only to tape use. Disk users or Atari owners have nothing to worry about.

Not so for VIC and 64 owners with tape drives. What if you type in a program in several sittings? The next day, you come to your computer, LOAD and RUN the Proofreader, then try to LOAD the partially completed program so you can add to it. But since the Proofreader is trying to hide in the cassette buffer, it is wiped out!

What you need is a way to LOAD the Proofreader after you've LOADed the partial program. The problem is, a tape load to the buffer destroys what it's supposed to load.

After you've typed in and RUN the Proofreader, enter the following lines in direct mode (without line numbers) *exactly* as shown:

```
A$="PROOFREADER.T": B$="{10 SPACES}": FOR
   X = 1 TO 4: A$=A$+B$: NEXTX
FOR X = 886 TO 1018: A$=A$+CHR$(PEEK(X)):
   NEXTX
OPEN 1,1,1,A$:CLOSE1
```

After you enter the last line, you will be asked to press record and play on your cassette recorder. Put this program at the beginning of a new tape. This gives you a new way to load the Proofreader. Anytime you want to bring the Proofreader into memory without disturbing anything else, put the cassette in the tape drive, rewind, and enter:

```
OPEN1:CLOSE1
```

You can now start the Proofreader by typing SYS 886. To test this, PRINT PEEK(886) should return the number 173. If it does not, repeat the steps above, making sure that A$ ("PROOFREADER.T") contains 13 characters and that B$ contains 10 spaces.

You can now reload the Proofreader into memory whenever LOAD or SAVE destroys it, restoring your personal typing helper.

Incidentally, you can protect the cassette buffer on the Commodore 64 with POKE 178,165. This POKE should work on the VIC, but it has caused numerous problems, probably due to a bug in the VIC operating system. With this POKE, the 64 will not wipe out the cassette buffer during tape LOADs and SAVEs.

Program 1: VIC/64 Proofreader

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Program 2: Atari Proofreader

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:READ A:POKE I
    ,A:CK=CK+A:NEXT I
120 IF CK<>19072 THEN ? "Error in DA
    TA statements. Check typing":END

130 A=USR(1536)
140 ? :? "Automatic Proofreader now
    activated."
150 END
1536 DATA 104,160,0,185,26,3
1542 DATA 201,69,240,7,200,200
1548 DATA 192,34,208,243,96,200
1554 DATA 169,74,153,26,3,200
1560 DATA 169,6,153,26,3,162
1566 DATA 0,189,0,228,157,74
1572 DATA 6,232,224,16,208,245
1578 DATA 169,93,141,78,6,169
1584 DATA 6,141,79,6,24,173
1590 DATA 4,228,105,1,141,95
1596 DATA 6,173,5,228,105,0
1602 DATA 141,96,6,169,0,133
1608 DATA 203,96,247,238,125,241
1614 DATA 93,6,244,241,115,241
1620 DATA 124,241,76,205,238,0
1626 DATA 0,0,0,0,32,62
1632 DATA 246,8,201,155,240,13
1638 DATA 201,32,240,7,72,24
1644 DATA 101,203,133,203,104,40
1650 DATA 96,72,152,72,138,72
1656 DATA 160,0,169,128,145,88
1662 DATA 200,192,40,208,249,165
1668 DATA 203,74,74,74,74,24
1674 DATA 105,161,160,3,145,88
1680 DATA 165,203,41,15,24,105
1686 DATA 161,200,145,88,169,0
1692 DATA 133,203,104,170,104,168
1698 DATA 104,40,96
```

©

1540/1541 Disk Housekeeping

Michael Maione

This simple utility will help you clean up the clutter on your 1540 or 1541 disk drive. For VIC and Commodore 64.

If you experiment with different programming techniques and save each enhancement along the way, your disks tend to get cluttered with outdated routines. Using programming techniques employed by Jim Butterfield (COMPUTE!, April 1982 and March 1983) and Steven Smith (COMPUTE!, March 1983), this short program will help with your housekeeping chores.

Type in the program, SAVE it to disk, and then give it a try. To prevent a disaster, try it first on a disk which does not include any important programs or files.

Scratching And Unscratching Files

If you choose the Scratch option, a portion of the disk directory will be displayed—just enough to fit comfortably on the VIC screen along with the query "Scratch program?" If you do not wish to scratch any of the programs listed, press the N key and another portion of the directory will be presented. Repeat this procedure until the entire directory has been displayed.

If you want to scratch a file on the list, press the Y key. Then, type in the name of the file to be scratched and press RETURN. The file will be scratched automatically, and the program will restart from the beginning. Continue this process until all unwanted files have been removed from the disk.

When the entire disk directory has been presented, you can end the program by pressing the N key in response to the scratch question.

If the Unscratch option is chosen, the program collects all free blocks off the disk and displays the names of any previously scratched files. You are then prompted with a scratched file. Enter Y to unscratch it. Sometimes the file will be partially scrambled because other files have been written over the original file. In that case, a message is displayed indicating that the file is unrecoverable.

Abbreviated Directory Listing

Lines 10–40 set the screen color, display the title and begin the program. Lines 50–190 read eight filenames from the disk directory and print them to the screen. The file sizes and types have been eliminated from the screen display to make it clearer and more concise. If you wish to include them, make the necessary changes by referring to Jim Butterfield's article "The Confusing Catalog" (COMPUTE!, March 1983).

Lines 200–240 branch the program depending on whether or not you wish to scratch a file. Line 250 ends the program when all files have been displayed and the N key is pressed. Line 260 returns to the directory for more filenames.

Line 270 gets the filename which is to be scratched and ends the program if you accidentally hit RETURN before you type a filename.

The subroutine in lines 340–380 examines the filename you enter. If the filename is longer than ten characters, it abbreviates the name and adds "*" to the end. This is done so that the filename and the scratch command together will not be longer than one VIC screen line.

Finally, lines 290–330 use the "dynamic keyboard" technique described by Steven Smith

in "Automatic Commodore Program Selector" (COMPUTE!, March 1983), to scratch the file and run the program again from the beginning.

Use PRINT# Abbreviation

If you have a VIC, be sure to abbreviate the command PRINT# (P,SHIFT-R) in line 310, to insure that the filename and the command together do not exceed the 22-character line length of the VIC screen. If they are too long, the RETURNs which are POKEd into memory in line 330 are not entered properly when the END statement is reached.

The Scratch portion of the program runs on the VIC (any memory configuration) and 64. Since the line length of the 64 screen is 40 characters, abbreviating the filename when it is longer than 10 characters should not be necessary. You may wish to modify or simply eliminate the subroutine in lines 340–380. Commodore 64 users who wish to display more than eight filenames on the screen at one time can adjust line 190 accordingly.

With a little experimentation, VIC users should be able to eliminate the necessity for the subroutine which abbreviates the longer filenames. Try using branch statements and a second routine for printing the "OPEN," "scratch," "RUN," and "cursor up" instructions in lines 290–330. Also try adding lines to validate the disk and reorganize the directory. Finally, add a few lines to read the error channel, to make the program more complete.

1540/1541 Disk Housekeeping

Refer to the "Automatic Proofreader" article before typing this program in.

```
0 REM IF YOU HAVE AN UNEXPANDED VIC, DELE
  TE 10, 11, AND 400-10020          :rem 162
10 DIMA(255),C%(77,28),D%(1),T%(224,1),S%
   (224,1),L%(224),R%(77)           :rem 38
11 D%(0)=58:D%(1)=42:Z$=CHR$(0):B$=CHR$(3
   ):D$="0"                         :rem 234
20 PRINT"{CLR}{6 DOWN}{8 SPACES}SCRATCH":
   PRINT                            :rem 251
30 PRINT"{6 DOWN}S=SCRATCH, U=UNSCRATCH"
                                    :rem 155
40 GETQ$:IFQ$=""THEN40              :rem 11
45 IFQ$="U"THEN400                   :rem 6
46 IFQ$<>"S"THEN40                  :rem 18
50 PRINT"{CLR}{DOWN}{RVS}DISK"      :rem 23
60 OPEN1,8,0,"$0"                   :rem 77
70 N$=CHR$(0)                      :rem 152
80 GET#1,A$,A$                     :rem 190
90 F$="":B=0:GET#1,A$,A$           :rem 205
95 IFC=0THENPRINT"{RVS}";          :rem 250
100 IFA$=""THENX=1:GOTO200           :rem 0
110 GET#1,A$,B$                    :rem 233
120 PRINTTAB(5);                   :rem 184
130 GET#1,A$                        :rem 89
140 IFA$=""THENPRINT:A=A+1:GOTO190:rem 40
150 IFA$=CHR$(34)THENB=1:A$=""     :rem 127
160 IFB=1THENF$=F$+A$:PRINTA$;      :rem 13
170 IFLEN(F$)>16THENC=C+1:GOTO90   :rem 144
180 GOTO130                        :rem 102
190 IFA<8THEN90                    :rem 118
200 PRINT"SCRATCH PROGRAM? Y/N"    :rem 152
210 GETZ$:IFZ$=""THEN210           :rem 123
220 IFZ$="Y"THEN270                 :rem 67
230 IFZ$="N"THEN250                 :rem 55
240 GOTO210                         :rem 98
250 IFX=1THENCLOSE1:GOTO390        :rem 209
260 PRINT"{CLR}{2 DOWN}":A=0:GOTO90
                                   :rem 226
270 CLOSE1:INPUT"{DOWN}WHICH PROGRAM";P$:
    IFP$=""THENEND                  :rem 93
280 GOSUB340                       :rem 177
290 PRINT"{CLR}{8 DOWN}"           :rem 135
300 PRINT"OPEN15,8,15"             :rem 242
310 PRINT"{2 DOWN}PR15,"CHR$(34)"S0:"X$CH
    R$(34)"                         :rem 76
320 PRINT"{2 DOWN}RUN":PRINT"{10 UP}"
                                    :rem 50
330 POKE631,13:POKE632,13:POKE633,13:POKE
    198,3:END                      :rem 147
340 FORA4=1TOLEN(P$):R$=MID$(P$,A4,1)
                                    :rem 86
350 X$=X$+R$                       :rem 110
360 NEXT                           :rem 216
370 IFLEN(X$)>10THENX$=LEFT$(X$,10)+"*"
                                   :rem 158
380 RETURN                         :rem 123
390 CLOSE15:RUN                    :rem 167
400 PRINT"{3 DOWN}LOADING FREE SECTORS":O
    PEN15,8,15,"I"+D$:GOSUB3020    :rem 110
410 OPEN3,8,3,"$"+D$:GOSUB3020      :rem 99
420 A0=1:GET#3,A$:A=ASC(A$+Z$)     :rem 100
430 READA1:IFA=A1THEN470           :rem 168
440 F%=F%+1:IFF%=3THEN510          :rem 112
450 READA1:IFA1=0THEN430           :rem 149
460 GOTO450                        :rem 108
470 READA1:IFA1=0THEN490           :rem 157
480 READB1:FORJ=A0TOA1:R%(J)=B1:NEXTJ:A0=
    J:GOTO470                       :rem 88
490 IFA=1ORA=65THEND1=1:T9=35:S9=3:D9=18
                                   :rem 118
500 IFA=67THEND1=257:T9=77:S9=4:D9=39
                                   :rem 151
510 IFT9=0THENCLOSE3:PRINT"?? DISK NOT RE
    COGNIZED ??":STOP              :rem 132
520 FORJ=1TOD1:GET#3,A$:NEXTJ       :rem 18
530 FORJ=1TOT9:T1=0                :rem 147
540 IFJ=51THENGET#3,A$,A$,A$,A$    :rem 190
550 GET#3,A$:C=ASC(A$+Z$)           :rem 81
560 K1=0:FORK=0TOS9-1:GET#3,A$:A=ASC(A$+Z
    $)                             :rem 217
570 FORL=0TO7:A%=A/2:D1=A-A%*2:IFK1<=R%(J
    )THENC%(J,K1)=D1                :rem 13
580 A=A%:T1=T1+D1:K1=K1+1:NEXTL,K:rem 169
590 NEXTJ                          :rem 39
600 CLOSE3                          :rem 63
610 OPEN2,8,2,"#0":GOSUB3020       :rem 255
900 K=0:PRINT"{CLR}LOOKING FOR SCRATCHED"
    :PRINT"FILES..."               :rem 130
910 T=D9:S=1                       :rem 163
920 GOSUB 2000                     :rem 221
930 FORD=2TO255STEP32:IFA(D)<>0ORA(D+1)=0
    THEN980                        :rem 111
940 IFK=0THENPRINT"DO YOU WANT TO RECOVER
    :"                             :rem 161
950 GETX$:FORK=D+3TOD+18:PRINTCHR$(A(K));
    :NEXTK:PRINT"? ";              :rem 58
960 GETX$:IFX$<>"Y"ANDX$<>"N"THEN960
                                   :rem 128
```

```
970 PRINTX$:IFX$="Y"THEN1010      :rem 185
980 NEXTD                          :rem 36
990 T=A(0):S=A(1):IFT=D9THEN920    :rem 35
1000 PRINT"THAT'S ALL ":GOTO1270   :rem 83
1010 T6=T:S6=S:D6=D:T=A(D+1):S=A(D+2):L%(
     0)=A(D+28)+A(D+29)*256:L%=0   :rem 169
1020 GETX$:PRINT"IS THIS FILE:"    :rem 88
1030 PRINT" 1. SEQUENTIAL"         :rem 239
1040 PRINT" 2. PROGRAM"            :rem 14
1050 PRINT" 3. USR"                :rem 242
1060 IFA(D+19)=0THEN1080           :rem 38
1070 PRINT" 4. RELATIVE"           :rem 87
1080 PRINT"{2 SPACES}WHICH NUMBER? ";
                                   :rem 80
1090 GETX$:IFX$=""THEN1090         :rem 229
1100 X=ASC(X$)-48:IFX<1ORX>4GOTO1090
                                   :rem 144
1110 PRINTX$:X=X+128               :rem 185
1120 IFX=132THENT%(0,1)=A(D+19):S%(0,1)=A
     (D+20):IFT%(0,1)=0THEN1020    :rem 91
1130 IFT>T9ORS<0THENT=0            :rem 195
1140 IFT<1ORS>R%(T)THENPRINT" BAD CHAIN!"
     :GOTO1260                     :rem 235
1150 IFC%(T,S)=0THENPRINT" ALLOCATED BLOC
     KS!":GOTO1260                 :rem 243
1160 GOSUB3000:L%=L%+1             :rem 192
1170 FORJ=0TO1:PRINT#15,"M-R";CHR$(J);B$:
     GET#15,A$                     :rem 115
1180 A(J)=ASC(A$+Z$):NEXTJ         :rem 220
1190 T4=T:S4=S:T=A(0):S=A(1):IFT<>0THEN11
     30                            :rem 10
1200 T=T%(0,1):S=S%(0,1):T%(0,1)=0:IFT<>0
     THEN1130                      :rem 132
1210 IFL%<>L%(0)THENPRINT" INCORRECT BLOC
     K COUNT!":GOTO1260            :rem 42
1220 T=T6:S=S6:D=D6                :rem 104
1230 GOSUB 3000                    :rem 9
1240 PRINT#15,"M-W";CHR$(D);B$;CHR$(1);CH
     R$(X)                         :rem 51
1250 PRINT#15,"U2:2,";D$;T;S:GOSUB3020:GO
     TO1300                        :rem 227
1260 PRINT"SORRY - IT WON'T WORK":rem 181
1270 CLOSE2                        :rem 114
1300 CLOSE2:PRINT#15,"V0":CLOSE15:FORQW=1
     TO10000:NEXT:RUN              :rem 59
2000 REM GRAB FULL DISK BLOCK      :rem 139
2010 GOSUB3000                     :rem 6
2020 FORJ=0TO255:PRINT#15,"M-R";CHR$(J);B
     $:GET#15,A$                   :rem 217
2030 A(J)=ASC(A$+Z$):NEXTJ:RETURN:rem 241
3000 REM READ BLOAD                :rem 37
3010 PRINT#15,"B-R"2;VAL(D$);T;S   :rem 49
3020 REM GET ERROR STATUS          :rem 247
3030 INPUT#15,E,E$,E1,E2           :rem 42
3040 IFE<>0THENPRINT"{RVS}DISK ERROR:
     {OFF}"E;E$,E1;E2              :rem 21
3050 RETURN                        :rem 168
10000 DATA 1,17,20,24,19,30,17,35,16,0
                                   :rem 44
10010 DATA 65,17,20,24,18,30,17,35,16,0
                                   :rem 102
10020 DATA 67,39,28,53,26,64,24,77,22,0
                                   :rem 126 ©
```


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Hidden Atari DOS Commands

Jason Lex Thomas

Even if you have only one disk drive, you can use COPY FILE and a few one-line programs to add power and convenience to your Atari DOS. There are a number of short examples to type in and try out.

The Atari Disk Operating System (DOS) menu is a very powerful tool. It provides many selections to help both the beginner and the advanced user get the most out of the Atari computer system. This article explores some special uses of selection C, COPY FILE.

COPY FILE is mainly used by owners of two or more disk drives who wish to transfer a file or series of files between drives. This is a powerful alternative to using the DUPLICATE FILE selection (option O). But COPY FILE also can be used in other ways, even if you have only one drive.

The Key Is Device Names

Before we get into the details, though, let's examine a few aspects of Atari DOS. When you select COPY FILE from the menu, the system asks you for source and destination filenames. The interesting fact is that you can also enter a device name here. (Not all device names are legal, but quite a few are.) This is not that surprising, because the Atari is an input/output based machine. To prove it, this BASIC program

```
10 PRINT "enter your name"
20 INPUT A$
```

can easily be written as

```
10 OPEN #1,4,0,"E:"
20 PRINT #1;"enter your name"
30 INPUT #1;A$
40 CLOSE #1
```

The result is about the same. And the Atari BASIC interpreter translates the two programs into similar code. The Atari uses these input/output control blocks (also called channels) for the editor (E:), keyboard (K:), and screen (S:) without the user having to know anything about them.

Confidential Input

Note that in line 10 of the second program above, the input and output are processed through the editor. We could have opened the keyboard (K:) instead, but then the name we keyed in would not have appeared on our screen. If we were incorporating a password routine into our program, we could open the keyboard rather than the editor, so that the password we enter will not be echoed to the screen.

To relate all this to COPY FILE, you can get a listing of a program or a printout of a sequential disk file if you select COPY FILE and then type:

D:*filename*,P:

when it asks you for the source and destination filenames. This will print the information that is in D:*filename* on the printer. This works well for programs you have LISTed to a diskette.

It also works for sequential text files that you have created for uploading or downloading on data base networks like CompuServe. Unfortunately, the cassette handler (C:) is not supported by the COPY FILE selection.

Copy Keyboard Entries To Disk

Perhaps the most intriguing device combination that you can enter is

E:,D:*filename*

which will let you copy anything that you type into a disk file.

The power of this technique derives from the fact that Atari has a direct-mode BASIC. That is, some BASIC instructions can be entered and executed immediately without a line number. Of course, instructions such as GOTO, GOSUB, and a few others which require line numbers are not as useful as if they are within a program.

The next few programs must be typed in using the abbreviations. To type these in, do the following:

1. Type DOS to go into the DOS menu.
2. Select option C. COPY FILE.
3. When it asks for filenames, type in E:,D:filename (for the programs that follow).
4. Type in the one-line program, followed by a carriage return.
5. Type a CTRL 3 to tell the system that you have finished.
6. At this point, you return to the DOS menu.

To use these programs from BASIC, simply type in

```
EN."D:filename
```

and the program will begin execution automatically. The best thing of all about these programs is that they occupy only one disk sector each and simulate many of the DOS commands without actually going to the DOS menu. Also, they require little memory and leave your program intact. It's great to be in the middle of program editing and only need to type EN. "D:DIR to get a directory.

These examples are all one-line programs, but you can have multiple lines. You'll have to be a little careful. Remember, no GOTOs or GOSUBs allowed!

Following is a series of programs which are keyed in using the COPY FILE function to copy from the editor to the disk. These programs are just a few examples of what can be done. All of the programs are to be keyed in followed by a single carriage return and a CTRL 3 as explained in the body of the text.

Disk Directory

This program displays a directory of the files on the disk in drive 1. Note that an Error 136 will occur at the end of the listing if you have fewer than 64 files on the diskette. This occurs because you have reached the end of file and can't TRAP anywhere. Simply type END and ‹RETURN› when through. Here's D:DIR:

```
CLR:T.40000:CL.#1:O.#1,6,0,"D:*.*":
DIMA$(30):F.X=1TO64:I.#1;A$:?A$:N.X:
 CLR:CL.#1:END
```

Erase File

This program will ask you which file you wish to delete from the disk, and then delete it without going to DOS. The program D:KILL follows:

```
CLR:T.40000:CL.#1:O.#1,4,0,"E:": DIM
A$(30):?"killfile-":I.#1;A$: CL.#1:
O.#1,4,0,A$:XIO33,#1,0,0,A$:CL.#1:CL
R:END
```

Protect File

This program, D:LOCK, performs the LOCK FILE function of the DOS menu:

```
CLR:T.40000:CL.#1:O.#1,4,0,"E:": DIM
A$(30):?"lockfile-":I.#1;A$:CL.#1: O
.#1,4,0,A$:XIO35,#1,0,0,A$:CL.#1:CLR
:END
```

Disable File Protection

D:UNLOCK will perform the UNLOCK FILE selection of the DOS menu:

```
CLR:CL.#1:O.#1,4,0,"E:":DIMA$(30): ?
"unlockfile":I.#1;A$:CL.#1:O.#1,4,0,
A$: xio36,#1,0,0,A$:CL.#1:CLR:END
```

Format Disk

D:FORMAT performs the FORMAT DISK option of the DOS menu:

```
CLR:CL.#1:O.#1,4,0,"E:":?"insert dis
k to format and hit any key":GET#1,A
:CL.#1:XIO254,#1,0,0,"D1:":END
```

Write DOS

This program performs the WRITEDOS function of the DOS menu. However, D:WRITEDOS will write DOS.SYS only:

```
CLR:CL.#1:O.#1,4,0,"E:":?"Insert dis
k to write DOS & hit any key":GET#1,
A:CL.#1:O.#1,8,0,"D:DOS.SYS":CL.#1
```

Change Colors

This program will allow you to alter the screen color as you desire. Try different number combinations for the POKEs into the color registers until you find a combination that suits you. This is D:COL:

```
POKE 709,0:POKE 710,10:POKE 712,114
```

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Function Keys For The Apple

Ilan Reuben

Frequently used commands (or sequences of commands) can be input more easily by function keys defined by the programmer. This machine language program lets you define up to five function keys for the Apple; you can enter the program using the Apple's monitor or the BASIC loader provided.

A standard feature of many newer computers (for example, the Commodore 64, the VIC-20, and many Japanese computers) is the function key. It allows the user to easily enter frequently used commands, or even sequences of commands, and get it right every time. (How many times have you rushed your fingers over the keyboard, only to see you've typed CATALOF or LISY?)

Since the Apple has no special function keys, the only way to get them is through software. "Function Keys" is a machine language utility which provides up to five programmable function keys. A little over half a page (128 bytes) in length, the program resides at location $300 (decimal 768). It also uses a range of memory from $9000 to $94FF. It can be entered directly using the Apple's built-in monitor (Program 1) or with a BASIC loader (Program 2).

Defining Functions

Function Keys allows you to define or use up to five function keys in direct mode. Each function can represent a series of commands of up to 256 characters in length. When you press CTRL-F, the computer will wait for you to press the number of the function you would like to use (1 through 5) or press 0 to define a function. Pressing any other number will produce a CTRL-X.

Once you have indicated what function you want to use, press RETURN and the computer will act as if you'd typed in the function you used. Pressing the key of an undefined function will just give a carriage return.

To define a function, press 0. The computer will respond with the message FN#? (1–5, 0 = EXIT). It is asking you what function number you would like to define. Pressing 0 here will abort the define procedure. When the appropriate function number is pressed, the computer will input what you want it to record as that function. Type it in as if you were actually giving the computer that command. When you are done, press RETURN. If you wish to abort while you are typing it in, just press RESET.

Here is a step-by-step example of how to use function keys. Suppose you want to turn CATALOG into a function key:

1. Type CTRL-F.
2. Press 0 since you want to define a function.
3. When you see the computer's prompt (FN#?...), press 1, since you want to define function number one.
4. Type CATALOG and press RETURN.
5. Now, whenever you press ‹CTRL-F› 1 ‹RETURN› you should get a disk catalog.

Putting The Program On Disk

Entering Function Keys through the monitor will be a lot quicker than typing in the whole BASIC loader. In any case, when you are done, save it by typing:

```
BSAVE FUNCTION KEYS 1.2,A$300,L$9C
```

However, if you do use the BASIC loader, make sure you SAVE it before trying it out, in case you made any mistakes.

Once you have the machine language for "Function Keys 1.2" saved on disk, enter the setup routine (Program 3) and save it. Now, whenever you want to use Function Keys, run the setup program. It's a good idea to use the setup program as part of a HELLO program so that every time you boot that disk, Function Keys will be auto-

matically enabled. If for some reason you want to disable Function Keys, enter 9D04:BD 9E from the monitor if DOS is enabled, and if it isn't, enter 36:F0 FD. You might need to disable Function Keys before running certain programs.

Program 1: Data For Function Keys

```
0300- C9 86 D0 1C 18 20 5B 03
0308- B0 19 A0 FF C8 C0 FF F0
0310- 42 B1 06 99 00 02 C9 8D
0318- D0 F2 84 06 A6 06 CA 60
0320- 4C BD 9E A0 10 B9 8B 03
0328- 20 F0 FD 88 10 F7 38 20
0330- 5B 03 A9 F0 8D 04 9D A9
0338- FD 8D 05 9D 20 67 FD A9
0340- 00 8D 04 9D A9 03 8D 05
0348- 9D A0 00 B9 00 02 91 06
0350- C8 D0 F8 A2 00 A9 88 8D
0358- 00 02 60 08 20 0C FD C9
0360- B6 B0 10 C9 B0 90 0C F0
0368- 18 E9 21 85 07 A9 00 85
0370- 06 28 60 28 A9 87 20 F0
0378- FD A9 98 9D 00 02 68 68
0380- 60 28 B0 02 38 60 68 68
0388- 4C 53 03 A9 D4 C9 D8 C5
0390- BD B0 AC B5 AD B1 A8 A0
0398- BF A3 CE C6
```

Program 2: BASIC Loader

```
10  FOR ADDR = 768 TO 923
20  READ BYTE
30  POKE ADDR,BYTE
40  NEXT
50  DATA 201,134,208,28,24,32,91
60  DATA 3,176,25,160,255,200,192
70  DATA 255,240,66,177,6,153,0,2
80  DATA 201,141,208,242,132,6
90  DATA 166,6,202,96,76,189,158
100  DATA 160,16,185,139,3,32,240
110  DATA 253,136,16,247,56,32,91
120  DATA 3,169,240,141,4,157,169
130  DATA 253,141,5,157,32,103
140  DATA 253,169,0,141,4,157,169
150  DATA 3,141,5,157,160,0,185,0
160  DATA 2,145,6,200,208,248,162
170  DATA 0,169,136,141,0,2,96,8
180  DATA 32,12,253,201
185  DATA 182,176,16
190  DATA 201,176,144,12,240,24
200  DATA 233,33,133,7,169,0,133
210  DATA 6,40,96,40,169,135,32
220  DATA 240,253,169,152,157,0,2
230  DATA 104,104,96,40,176,2,56
240  DATA 96,104,104,76,83,3,169
250  DATA 212,201,216,197,189,176
260  DATA 172,181,173,177,168,160
270  DATA 191,163,206,198
```

Program 3: Setup Routine

```
10 D$ =  CHR$ (4): REM   CTRL-D
20  PRINT D$"BLOADFUNCTION KEYS 1.2"
30 OUTVEC = 9 * 4096 + 13 * 256 + 4: REM
     $9D04
40  POKE OUTVEC,0: POKE OUTVEC + 1,3
50  PRINT : PRINT "FUNCTION KEYS ENABLE
    D."
```


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VARIABLE LISTER

Kenneth D. Day

"Variable Lister" displays a list of current values for all variables and array elements, while your program is running. This can be a most valuable debugging tool. This relocatable subroutine is written in machine language for VIC. Versions are also included for the 64 and Atari. Refer to the "Automatic Proofreader" article before typing in these programs.

"Variable Lister" is a 6502 machine language subroutine which prints the values of variables in BASIC programs. The program makes it easy to inspect the values of all variables in a BASIC program at various preselected points during execution or after the program has been aborted by the BASIC interpreter. The subroutine is called by SYS followed by the decimal address of the entry point into the subroutine (SYS 65336). The subroutine does not interfere with the execution of the BASIC program, so it may be called several times within a program.

When called, the subroutine clears the screen and prints the Variable Lister heading. It then begins to scroll through the values of all simple (nonarray) variables. The order in which the variables are listed is determined by their order of occurrence during the BASIC program's execution.

The variable name is printed, followed by an equal sign and the value of the variable. String variable values are enclosed in quotes so the user can distinguish blank strings (" ") from the *null string* (""). Integer (numbers with no decimal point) and floating-point values are printed exactly as they would be from BASIC, because the subroutine uses the output routines of the BASIC interpreter.

Each Array Element Is Listed

After simple variables are displayed, the program begins scrolling through arrays. A listing of an array begins with a display of the array name and its dimensions. The program then scrolls through each element, printing the element name followed by an equal sign and the value of the element. Values are printed using the same conventions as those for simple variables. Array elements are printed with leftmost subscripts changing the most quickly.

A pause feature is included so you can temporarily halt the scrolling display. To pause, press any key except HOME and the down arrow. Scrolling is restarted by pressing RETURN or any printable character key.

To speed up your search through long variable lists, you can press the down-arrow key for a rapid scroll rate. To clear the screen and skip to the next array, press the HOME key. You can also use this feature while examining simple variables, to skip to the first array.

RETURN Ends The Listing

When you're ready to return from the subroutine, simply press the RETURN key.

Please note that the special functions of the HOME and RETURN keys are not available while the subroutine is in pause mode. Pressing these keys while the program is pausing only restarts the scrolling.

The relocating loader (Program 1) will load Variable Lister into any VIC-20 with or without memory expansion. Variable Lister requires 867 bytes, so the BASIC loader program will just fit into memory on an unexpanded VIC-20. The DATA statements in the loader program contain the hexadecimal equivalent of the unrelocated machine code for the Variable Lister subroutine. Had I separated the pairs of hexadecimal numbers representing each byte in memory with commas, the loader program could not have been run on an unexpanded VIC-20.

Memory Pointers Are Reset

Lines 6–7 move the top-of-memory pointers so that the Variable Lister subroutine will be protected from the operating system and BASIC interpreter.

Lines 9–13 POKE the unrelocated machine language into the area made available at the top of memory.

Lines 14–17 relocate addresses within the subroutine to be consistent with its location in the machine on which it is loaded.

Line 18 tells you how to call Variable Lister by printing SYS followed by the decimal address of the entry point of the machine language subroutine. This line also POKEs the entry point address into the address area used by the USR function. If you forget the decimal address of the entry point for Variable Lister, SYS PEEK(1)+PEEK(2)*256 instead.

You can also call the subroutine with a statement like X=USR(0), but on return from the sub-

routine the BASIC interpreter will abort with a TYPE MISMATCH error. (However, it's not good programming style to call this subroutine as if it were a function which returns a value.) Line 18 also deletes the loader by issuing the NEW command, so be sure to SAVE a copy before you RUN the program.

To use VIC Variable Lister, first LOAD and RUN the loader (Program 1), then LOAD and RUN the program for which you wish the variables listed. After the program has run, give the SYS to start Variable Lister. If you need to check the value of variables at some point before the end of the program, simply include a SYS*xxxx* statement at the desired point in your program, where xxxx is the proper SYS address for your memory configuration.

If you would rather not enter the program yourself, I will send you a cassette tape copy (VIC version *only*). Send $3, a blank cassette tape, and a self-addressed, stamped mailer to:

Prof. Kenneth D. Day
Baldy 537
Department of Communication
SUNY at Buffalo
Buffalo, NY 14260

Program 1: VIC Variable Lister

```
6 L=PEEK(644)*256+PEEK(643)-867:POKE644,I
  NT(L/256):POKE643,L-PEEK(644)*256
                                    :rem 183
7 FORI=56TO52STEP-2:POKEI,PEEK(644):POKEI
  -1,PEEK(643):NEXT                 :rem 110
8 PRINT"{CLR}{6 DOWN}{3 SPACES}LOADING PR
  OGRAM"                            :rem 24
9 P=L+34:FORI=1TO21:READS$:FORJ=1TO40:C$=
  LEFT$(S$,2):S$=RIGHT$(S$,80-J*2):V=0
                                    :rem 62
10 IFLEFT$(C$,1)="X"THEN14          :rem 193
11 D1=ASC(LEFT$(C$,1)):D2=ASC(RIGHT$(C$,1
   ))                               :rem 108
12 V=-(D1>64)*(D1-55)*16+-(D1<65)*(D1-48)
   *16+-(D2>64)*(D2-55)+-(D2<65)*(D2-48)
                                    :rem 39
13 POKEP,V:P=P+1:NEXT:NEXT          :rem 202
14 P=P-1:IFP=L+43THEN18             :rem 108
15 IFPEEK(P)<48ORPEEK(P)>51THEN14   :rem 2
16 IFP=L+80ORP=L+108ORP=L+405ORP=L+412THE
   N14                              :rem 174
17 V=PEEK(P)*256+PEEK(P-1)+L-12288:POKEP,
   INT(V/256):POKEP-1,V-PEEK(P)*256:P=P-1
   :GOTO14                          :rem 99
18 L=L+43:PRINT"{CLR}TYPE ";"{RVS}SYS";L;
   "{OFF} TO USE":POKE2,INT(L/256):POKE1,
   L-PEEK(2)*256:NEW                :rem 85
50 DATA0D504D554420524156A99320D2FFA207A9
   1D20D2FFCAD0FAA209BD213020D2FFCAD0F7A9
   0D20D2FF                         :rem 132
51 DATAA52F8D0930A5308D0A30A52D8D0030A52E
   8D0130189035AD0030C52FD00AAD0130C530D0
   034C8C31                         :rem 223
52 DATA20AD30A93D20D2FF200C31A90D20D2FF20
   D2FFA205AC0030C8D003EE0130CAD0F78C0030
   A9042082                         :rem 43
53 DATA32201D331890C0AE01308E0A30AE00308E
   0930A0008C08308C0230AD00308526AD013085
   27B12610                         :rem 101
54 DATA05297FEE02308D06302 0D2FFC8B1261008
   297FEE0230EE02308D07302 0D2FFAE0230F013
   CAF010CA                         :rem 27
```

Commodore 64 And Atari Version Notes To Variable Lister

Kevin Martin, Editorial Programmer

The 64 version of "Variable Lister" works just like the VIC version, except that it is stored in the free memory above address $C000, safe from BASIC. Install the lister by loading and running Program 2. You can initiate the listing of variable values by typing SYS 50000. As an aid in program debugging, you can also include SYS 50000 as a statement in your program wherever you want to see the current values of all the variables.

If you have typed in the "MLX" machine language editor program from a previous issue of COMPUTE!, you can use it to make a copy of the machine language portion of Variable Lister. LOAD and RUN Program 2, then LOAD and RUN MLX. Specify 49991 as the starting address and 50824 as the ending address, then use the MLX Save option to store the machine language on tape or disk. The program thus created can be reloaded without erasing a BASIC program already in memory by typing:

LOAD "filename",1,1 for tape

or

LOAD "filename",8,1 for disk.

As before, the variable listing is initiated with SYS 50000.

The Atari version of Variable Lister is a combination of two programs from *The Atari BASIC Sourcebook* (COMPUTE! Books). The programs are found on pages 123 and 125–26.

Before typing this program in, be sure to type NEW. Type this program in and, instead of SAVEing it, LIST the program to disk (LIST"D:VARLIST") or to cassette (LIST"C:"). Then type NEW in again and LOAD the program for which you want to list variables. Finally, use ENTER to add the Variable Lister subroutine from disk (ENTER"D:VARLIST") or cassette (ENTER"C:"). Then type GOTO 32700 to obtain the listing of the variables.

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```
55 DATAF005A925189002A9248D083020D2FFAE00
   30E8D003EE0130E88E0030D003EE013060AE02
   30D014AC                              :rem 218
56 DATA0130AD003020A2DB20DDDDA001A900201E
   CB60CAD00160CACAF041A92220D2FFAD003085
   26AD0130                              :rem 23
57 DATA8527A000B1268D0D30C8B1268529C8B126
   852AAC0D30B1298D0530A9009129A42AA52920
   1ECBAC0D                              :rem 9
58 DATA30AD0530 9129A92220D2FF60A000AD0030
   8526AD01308527B1268D0530C8B126A8AD0530
   2091D318                              :rem 168
59 DATA908EA902208232AD0030C531D008AD0130
   C532D0016020A130A92020D2FFA94420D2FFA9
   4920D2FF                              :rem 228
60 DATAA94D20D2FFA92020D2FFA92820D2FFA000
   AD00308526AD01308527B126186D09308D0930
   C8B1266D                              :rem 13
61 DATA0A308D0A30C8B1268D0B300AAAA003B126
   990B30C8CAD0F7AD0B300AAABD0D30A8CA8E03
   30BD0D30                              :rem 108
62 DATA88208631AE0330CAD00DA92920D2FFA90D
   20D2FF189008A92C20D2FF1890D6AD0B300A18
   69036D00                              :rem 50
63 DATA308D0030A9006D01308D0130A904208232
   20933220A432200C31A90D20D2FF201D33C91F
   F005A902                              :rem 109
64 DATA20823220 1D33A90538ED0230186D00308D
   0030A9006D01308D0130CD0A30D0CCAD0030CD
   0930D0C4                              :rem 162
65 DATAA90D20D2FF4C8C31A2FFA0FF88D0FDCAD0
   F838E901D0F11860AD0B300AA8A200A9009D18
   30E888D0                              :rem 172
66 DATAF960AD063020D2FFAD073020D2FFAD0830
   20D2FFA92820D2FFAD0B300AAACABD1830A8CA
   BD18308E                              :rem 187
67 DATA0C30208631AE0C30F008A92C20D2FF1890
   E4A92920D2FFA93D20D2FFAD0B300AAACABD18
   30186901                              :rem 99
68 DATA9D1830CAA9007D18309D1830DD0E30F001
   60E8BD1830DD0E30F00160A9009D1830CA9D18
   30D00160                              :rem 243
69 DATA1890CEA5C5C91FD00160A6C6F0FB20E4FF
   CAD0FAC911D003A90060C90DD003686860C913
   D016AD09                              :rem 122
70 DATA308D0030AD0A308D0130A99320D2FF6868
   4C8C31A6C6F0FC20E4FFCAD0FAA9006 0XXXXXX
   XXXXXXXX                              :rem 29
```

Program 2: 64 Variable Lister

```
10 I=49991                               :rem 247
20 READ A:IF A=256 THEN 40               :rem 54
30 POKE I,A:CK=CK+A:I=I+1:GOTO 20        :rem 129
40 IF CK<>108449 THEN PRINT"CHECK FOR ERR
   OR IN DATA STATEMENTS":STOP           :rem 61
50 PRINT"{DOWN}DATA LOADED . . .":PRINT"
   {DOWN}TYPE {RVS}SYS 50000{OFF} TO STAR
   T":END                                :rem 204
49991 DATA 13,84,83,73,76,32             :rem 125
49997 DATA 82,65,86,169,147,32           :rem 240
50003 DATA 210,255,162,16,169,29         :rem 40
50009 DATA 32,210,255,202,208,250        :rem 77
50015 DATA 162,9,189,70,195,32           :rem 208
50021 DATA 210,255,202,208,247,169
                                         :rem 136
50027 DATA 13,32,210,255,165,47          :rem 243
50033 DATA 141,46,195,165,48,141         :rem 46
50039 DATA 47,195,165,45,141,37          :rem 6
50045 DATA 195,165,46,141,38,195         :rem 57
50051 DATA 24,144,53,173,37,195          :rem 252
50057 DATA 197,47,208,10,173,38          :rem 4
50063 DATA 195,197,48,208,3,76           :rem 218
50069 DATA 177,196,32,210,195,169:rem 112
50075 DATA 61,32,210,255,32,49           :rem 196
50081 DATA 196,169,13,32,210,255         :rem 44
50087 DATA 32,210,255,162,5,172          :rem 246
50093 DATA 37,195,200,208,3,238          :rem 252
50099 DATA 38,195,202,208,247,140:rem 103
50105 DATA 37,195,169,4,32,167           :rem 209
50111 DATA 197,32,66,198,24,144          :rem 1
50117 DATA 192,174,38,195,142,47         :rem 56
50123 DATA 195,174,37,195,142,46         :rem 54
50129 DATA 195,160,0,140,45,195          :rem 250
50135 DATA 140,39,195,173,37,195         :rem 56
50141 DATA 133,38,173,38,195,133         :rem 47
50147 DATA 39,177,38,16,5,41             :rem 110
50153 DATA 127,238,39,195,141,43         :rem 51
50159 DATA 195,32,210,255,200,177        :rem 94
50165 DATA 38,16,8,41,127,238            :rem 157
50171 DATA 39,195,238,39,195,141         :rem 61
50177 DATA 44,195,32,210,255,174         :rem 49
50183 DATA 39,195,240,19,202,240         :rem 44
50189 DATA 16,202,240,5,169,37           :rem 205
50195 DATA 24,144,2,169,36,141           :rem 202
50201 DATA 45,195,32,210,255,174         :rem 38
50207 DATA 37,195,232,208,3,238          :rem 254
50213 DATA 38,195,232,142,37,195         :rem 50
50219 DATA 208,3,238,38,195,96           :rem 218
50225 DATA 174,39,195,208,20,172         :rem 49
50231 DATA 38,195,173,37,195,32          :rem 4
50237 DATA 162,187,32,221,189,160        :rem 99
50243 DATA 1,169,0,32,30,171             :rem 86
50249 DATA 96,202,208,1,96,202           :rem 203
50255 DATA 202,240,65,169,34,32          :rem 248
50261 DATA 210,255,173,37,195,133        :rem 94
50267 DATA 38,173,38,195,133,39          :rem 13
50273 DATA 160,0,177,38,141,50           :rem 195
50279 DATA 195,200,177,38,133,41         :rem 52
50285 DATA 200,177,38,133,42,172         :rem 45
50291 DATA 50,195,177,41,141,42          :rem 251
50297 DATA 195,169,0,145,41,164          :rem 6
50303 DATA 42,165,41,32,30,171           :rem 185
50309 DATA 172,50,195,173,42,195         :rem 53
50315 DATA 145,41,169,34,32,210          :rem 242
50321 DATA 255,96,160,0,173,37           :rem 200
50327 DATA 195,133,38,173,38,195         :rem 61
50333 DATA 133,39,177,38,141,42          :rem 253
50339 DATA 195,200,177,38,168,173:rem 111
50345 DATA 42,195,32,145,179,24          :rem 2
50351 DATA 144,142,169,2,32,167          :rem 249
50357 DATA 197,173,37,195,197,49         :rem 77
50363 DATA 208,8,173,38,195,197          :rem 15
50369 DATA 50,208,1,96,32,198            :rem 163
50375 DATA 195,169,32,32,210,255         :rem 50
50381 DATA 169,68,32,210,255,169         :rem 57
50387 DATA 73,32,210,255,169,77          :rem 9
50393 DATA 32,210,255,169,32,32          :rem 248
50399 DATA 210,255,169,40,32,210         :rem 43
50405 DATA 255,160,0,173,37,195          :rem 251
50411 DATA 133,38,173,38,195,133         :rem 47
50417 DATA 39,177,38,24,109,46           :rem 215
50423 DATA 195,141,46,195,200,177        :rem 99
50429 DATA 38,109,47,195,141,47          :rem 10
50435 DATA 195,200,177,38,141,48         :rem 52
50441 DATA 195,10,170,160,3,177          :rem 245
50447 DATA 38,153,48,195,200,202         :rem 47
50453 DATA 208,247,173,48,195,10         :rem 53
50459 DATA 170,189,50,195,168,202:rem 110
50465 DATA 142,40,195,189,50,195         :rem 58
50471 DATA 136,32,171,196,174,40         :rem 47
50477 DATA 195,202,208,13,169,41         :rem 51
50483 DATA 32,210,255,169,13,32          :rem 247
50489 DATA 210,255,24,144,8,169          :rem 6
```

```
50495 DATA 44,32,210,255,24,144  :rem 248
50501 DATA 214,173,48,195,10,24  :rem 245
50507 DATA 105,3,109,37,195,141  :rem 249
50513 DATA 37,195,169,0,109,38   :rem 210
50519 DATA 195,141,38,195,169,4   :rem 13
50525 DATA 32,167,197,32,184,197  :rem 62
50531 DATA 32,201,197,32,49,196  :rem 255
50537 DATA 169,13,32,210,255,32  :rem 247
50543 DATA 66,198,201,31,240,5   :rem 199
50549 DATA 169,2,32,167,197,32   :rem 216
50555 DATA 66,198,169,5,56,237   :rem 228
50561 DATA 39,195,24,109,37,195   :rem 11
50567 DATA 141,37,195,169,0,109    :rem 6
50573 DATA 38,195,141,38,195,205  :rem 59
50579 DATA 47,195,208,204,173,37  :rem 63
50585 DATA 195,205,46,195,208,196:rem 118
50591 DATA 169,13,32,210,255,76  :rem 255
50597 DATA 177,196,162,255,160,255
                                 :rem 167
50603 DATA 136,208,253,202,208,248
                                 :rem 142
50609 DATA 56,233,1,208,241,24   :rem 197
50615 DATA 96,173,48,195,10,168   :rem 12
50621 DATA 162,0,169,0,157,61    :rem 145
50627 DATA 195,232,136,208,249,96:rem 114
50633 DATA 173,43,195,32,210,255  :rem 44
50639 DATA 173,44,195,32,210,255  :rem 51
50645 DATA 173,45,195,32,210,255  :rem 49
50651 DATA 169,40,32,210,255,173  :rem 42
50657 DATA 48,195,10,170,202,189  :rem 55
50663 DATA 61,195,168,202,189,61  :rem 60
50669 DATA 195,142,49,195,32,171  :rem 64
50675 DATA 196,174,49,195,240,8   :rem 19
50681 DATA 169,44,32,210,255,24  :rem 252
50687 DATA 144,228,169,41,32,210  :rem 50
50693 DATA 255,169,61,32,210,255  :rem 52
50699 DATA 173,48,195,10,170,202  :rem 54
50705 DATA 189,61,195,24,105,1   :rem 204
50711 DATA 157,61,195,202,169,0  :rem 251
50717 DATA 125,61,195,157,61,195  :rem 59
50723 DATA 221,51,195,240,1,96   :rem 199
50729 DATA 232,189,61,195,221,51  :rem 55
50735 DATA 195,240,1,96,169,0    :rem 159
50741 DATA 157,61,195,202,157,61  :rem 50
50747 DATA 195,208,1,96,24,144   :rem 213
50753 DATA 206,165,197,201,31,208 :rem 96
50759 DATA 1,96,166,198,240,251   :rem 13
50765 DATA 32,228,255,202,208,250 :rem 95
50771 DATA 201,17,208,3,169,0    :rem 146
50777 DATA 96,201,13,208,3,104   :rem 200
50783 DATA 104,96,201,19,208,22  :rem 252
50789 DATA 173,46,195,141,37,195  :rem 70
50795 DATA 173,47,195,141,38,195  :rem 69
50801 DATA 169,147,32,210,255,104 :rem 89
50807 DATA 104,76,177,196,166,198:rem 122
50813 DATA 240,252,32,228,255,202 :rem 87
50819 DATA 208,250,169,0,96,256   :rem 10
```

Program 3: Atari Variable Lister

```
JE 32500 Q=WW-1
JD 32505 Q=PEEK(134)+256*PEEK(135)+(Q-
         128)*8
OL 32510 PRINT :PRINT "VARIBLE NUMBER
         ";PEEK(Q+1),
JJ 32515 ON INT(PEEK(Q)/64) GOTO 32600
         ,32650
IO 32520 PRINT "IS A NUMBER, ":PRINT ,
         "VALUE ";
KC 32525 QEXP=PEEK(Q+2):IF QEXP>127 TH
         EN PRINT "-";:QEXP=QEXP-128
LA 32530 QNUM=0:FOR QQ=Q+3 TO Q+7
FB 32535 QNUM=QNUM*100+PEEK(QQ)-6*INT(
         PEEK(QQ)/16):NEXT QQ
PJ 32540 QEXP=QEXP-68:IF QEXP=0 THEN 3
         2555
AB 32545 FOR QQ=QEXP TO SGN(QEXP) STEP
          -SGN(QEXP)
AM 32550 QNUM=(QEXP>0)*QNUM*100+(QEXP<
         0)*QNUM/100:NEXT QQ
LD 32555 PRINT QNUM:PRINT :RETURN
MH 32570 IF PEEK(Q)/2<>INT(PEEK(Q)/2)
         THEN 32580
MH 32575 PRINT ,"AND IS NOT YET DIMENS
         IONED":POP :RETURN
DB 32580 PRINT ,"ADDRESS IS ";PEEK(Q+2
         )+256*PEEK(Q+3):RETURN
FN 32600 PRINT "IS AN ARRAY, ":GOSUB 3
         2570
BK 32610 PRINT ,"DIM 1 IS ";PEEK(Q+4)+
         256*PEEK(Q+5)
CE 32615 PRINT ,"DIM 2 IS ";PEEK(Q+6)+
         256*PEEK(Q+7)
NN 32620 RETURN
GM 32650 PRINT "IS A STRING, ":GOSUB 3
         2570
NG 32660 PRINT ,"LENGTH IS ";PEEK(Q+4)
         +256*PEEK(Q+5)
PH 32665 PRINT ,"{3 SPACES}DIM IS ";PE
         EK(Q+6)+256*PEEK(Q+7)
OC 32670 RETURN
IC 32700 WW=128
IL 32710 FOR W=PEEK(130)+256*PEEK(131)
          TO PEEK(132)+256*PEEK(133)-1
JH 32720 IF PEEK(W)<128 THEN PRINT CHR
         $(PEEK(W));:NEXT W:STOP
KG 32730 PRINT CHR$(PEEK(W)-128):WW=WW
         +1:GOSUB 32500:NEXT W:STOP ©
```


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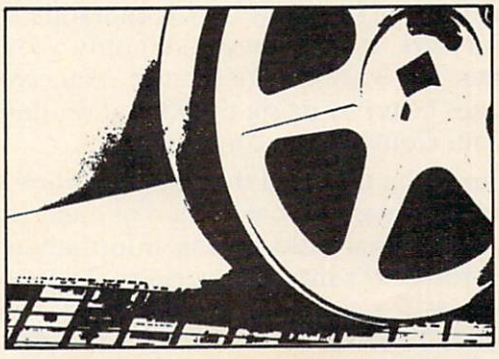

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Qwikload/Save For VIC And 64

Richard L. Witkover

Here is a BASIC program which can drastically reduce your waiting time when loading or saving large blocks of data.

Have you ever sat staring at your television set while saving or loading large blocks of data? If you use the GET# or INPUT# commands, chances are you have. It may have taken only a few minutes, but it seems like forever. You can do it ten times faster by using the Kernal routines built into your Commodore computer.

First, you must tell the Kernal routine where to load the data, or what section of memory to save. The Kernal looks for this information in the microprocessor's internal registers. These registers can be accessed from BASIC via memory locations 780–782. The SYS command transfers the contents of these locations into the registers before it jumps to the machine language routine. Location 780 corresponds to the accumulator, 781 to the X register, and 782 to the Y register. So, all we need to do is POKE the information into these locations and SYS to the Kernal routine. "Qwikload/Save" uses this technique to access the Kernal routines SETLFS, SETNAM, LOAD, and SAVE.

Qwikload/Save allows you to save any section of memory in the 64 and up to location 32766 ($7FFE) in the VIC. Any files saved by Qwikload/Save can also be loaded by the program into any area in RAM. Either tape or disk may be used. Just type in the program, SAVE it, and RUN it.

How It Works

Lines 100–110 ask the user whether to use tape or disk and store the answer in B$. Lines 120–130 ask whether to save or load, storing the answer in A$. Line 140 INPUTs the filename and stores it in F$. Line 144 INPUTs the starting address of the block to be saved or loaded. Then the high byte (AH) and low byte (AL) of the starting address are calculated. Line 147 branches to line 500 if disk was chosen. Line 150 branches to line 300 if load was chosen.

Lines 160–200 save a block of memory to tape. Line 160 INPUTs the end address of the block and calculates the high byte (BH) and low byte (BL). Line 190 jumps to the subroutine at line 400 to open a file. Then the high byte and low byte of the starting address are POKEd into zero page. Line 200 POKEs location 780 (accumulator) with the zero-page address of the low byte used in line 190. This creates a pointer which tells the computer where to find the starting address. The low byte of the end address is POKEd into location 781 (X register) and the high byte into location 782 (Y register). Then the block is saved by SYSing to the SAVE routine in the Kernal. The file is then closed by jumping to line 330.

Lines 300–330 load a file from tape. Line 300 opens the file. Line 310 specifies a LOAD by

POKEing 0 into location 780 (0 = LOAD; 1 = VERIFY). The low byte and high byte of the starting address are POKEd into locations 781 and 782, respectively. Then the file is loaded by SYSing to the LOAD routine. Line 320 checks bits 4 and 5 of the STATUS variable. If either bit is set, the file was not loaded correctly and the message ?LOAD ERROR is printed. Line 330 closes the file and ends the program.

Lines 400–440 comprise a subroutine which opens a file to the cassette recorder similar to the BASIC command OPEN 1,1,0,F$. Line 400 POKEs the length of the filename into location 183. The end-of-arrays pointer is calculated and stored in S. Line 410 POKEs the filename into the free RAM area just above the arrays. Line 420 sets up the logical file by POKEing the file number into location 780, POKEing the device number into location 781, POKEing the secondary address into location 782, and SYSing to the SETLFS routine. Line 430 sets up the filename by POKEing the filename length into location 780, POKEing the low byte of the end-of-arrays pointer into location 781, POKEing the high byte into location 782, and SYSing to the SETNAM routine. Line 440 turns on the tape messages (SEARCHING, FOUND, etc.) by setting bit 7 of location 157.

Line 500 branches to line 700 if a disk load is chosen. Lines 530–660 save a block of memory to disk. Line 530 INPUTs the end address, adds 1 to it, and calculates the low byte and high byte. It is necessary to add 1 to the end address in order to save the last byte of the block. Line 540 OPENs the disk error channel. Line 550 OPENs a program file for writing. Line 560 checks for errors by reading the error channel. Line 570 branches to line 650 if no error occurs. Line 580 prints the error information and jumps to line 760 to end the program if the error number is not 63 (FILE EXISTS ERROR).

Lines 590–610 ask whether the user wants to replace the file on disk with the new file. If not, the program ends by jumping to line 760. Otherwise, the file is replaced by scratching the file on disk and saving the new file. Line 620 scratches the old file. Line 630 returns to line 540 to save the new file. Lines 650–660 save the file by POKEing the starting and ending addresses and SYSing to the SAVE routine.

Lines 700–760 load a file from disk. Line 700 OPENs the error channel. Line 710 OPENs the program file for reading. Line 720 reads the error channel. If any error occurs, line 730 prints the error information and ends the program. Line 750 enables a relocatable load by POKEing a 0 into location 185. Then the file is loaded by POKEing the necessary information and SYSing to the LOAD routine as described for tape. Line 760 closes the files and ends the program.

Qwikload/Save For VIC And 64

Refer to the "Automatic Proofreader" article before typing this program in.

```
100 PRINT"{CLR}TAPE OR DISK (T/D)?";
                                    :rem 125
105 GETB$:IFB$=""THEN105            :rem 81
110 IFB$<>"T"ANDB$<>"D"THEN105      :rem 153
120 PRINTB$:PRINT"{DOWN}SAVE OR LOAD (S/L
    )?";                            :rem 43
125 GETA$:IFA$=""THEN125            :rem 83
130 IFA$<>"S"ANDA$<>"L"THEN125      :rem 162
140 PRINTA$:INPUT"{DOWN}FILENAME";F$
                                    :rem 140
144 INPUT"{DOWN}STARTING ADDRESS";X:AH=IN
    T(X/256):AL=X-AH*256            :rem 188
147 IFB$="D"THEN500                 :rem 26
150 IFA$="L"THEN300                 :rem 25
159 REM TAPE SAVE                   :rem 220
160 INPUT"{DOWN}END ADDRESS";X:X=X+1:BH=I
    NT(X/256):BL=X-BH*256           :rem 171
190 GOSUB400:POKE251,AL:POKE252,AH:rem 31
200 POKE780,251:POKE781,BL:POKE782,BH:SYS
    65496:GOTO330                   :rem 247
299 REM TAPE LOAD                   :rem 210
300 GOSUB400                        :rem 167
310 POKE780,0:POKE781,AL:POKE782,AH:SYS65
    493                             :rem 131
320 IF(ST AND 48)THENPRINT"{DOWN}?LOAD":P
    RINT"ERROR"                     :rem 96
330 CLOSE1:END                      :rem 78
399 REM OPEN TAPE CHANNEL           :rem 222
400 L=LEN(F$):POKE183,L:S=256*PEEK(50)+PE
    EK(49)                          :rem 174
410 FORX=1TOL:POKES+X-1,ASC(MID$(F$,X,1))
    :NEXT                           :rem 53
420 POKE780,1:POKE781,1:POKE782,0:SYS6546
    6                               :rem 209
430 POKE780,L:POKE781,PEEK(49):POKE782,PE
    EK(50):SYS65469                 :rem 77
440 POKE157,128:RETURN              :rem 69
500 IFA$="L"THEN700                 :rem 28
529 REM DISK SAVE                   :rem 222
530 INPUT"{DOWN}END ADDRESS";X:X=X+1:BH=I
    NT(X/256):BL=X-BH*256           :rem 172
540 OPEN15,8,15,"I0"                :rem 16
550 OPEN3,8,1,"0:"+F$+",P,W"        :rem 157
560 INPUT#15,EN,EM$,ET,ES           :rem 222
570 IFEN=0THEN650                   :rem 245
580 IFEN<>63THENPRINTEN;EM$;ET;ES:GOTO760
                                    :rem 153
590 PRINT"FILE EXISTS.{2 SPACES}REPLACE (
    Y/N)?";                         :rem 58
600 GETA$:IFA$=""THEN600            :rem 79
610 PRINTA$:IFA$<>"Y"THEN760        :rem 154
620 PRINT#15,"S0:"+F$+",P,W"        :rem 222
630 CLOSE15:CLOSE3:GOTO540          :rem 100
650 POKE157,128:POKE251,AL:POKE252,AH
                                    :rem 159
660 POKE780,251:POKE781,BL:POKE782,BH:SYS
    65496:GOTO760                   :rem 8
699 REM DISK LOAD                   :rem 215
700 OPEN15,8,15,"I0"                :rem 14
710 OPEN3,8,0,"0:"+F$+",P,R"        :rem 149
720 INPUT#15,EN,EM$,ET,ES           :rem 220
730 IFENTHENPRINTEN;EM$;ET;ES:GOTO760
                                    :rem 179
750 POKE157,128:POKE185,0:POKE780,0:POKE7
    81,AL:POKE782,AH:SYS65493       :rem 187
760 CLOSE3:CLOSE15:END              :rem 109
```

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VIC/64 Screenprint

Frank C. Gutowski

To copy the contents of your screen to the printer, just insert "Screenprint" into your program as a one-line subroutine. Refer to the "Automatic Proofreader" article before typing these programs in.

Using just one line of BASIC and less than 80 bytes of memory, "Screenprint" opens the needed files, captures the entire screen, sends it to the printer, and closes the files.

Most screen print routines follow this logic:

1. Find where the screen memory is.
2. Start PEEKing screen locations.
3. Convert screen code to ASCII.
4. Assemble an ASCII line and send it to the printer.
5. Repeat until the entire screen has been displayed.

Screenprint takes a different approach. By treating the screen as an input device, we can combine the first three steps into one, creating a compact yet powerful subroutine that is easy to insert into any program.

Input From Screen Memory

The screen is normally the default output device. The VIC and 64 operating systems automatically send keyboard input to the screen unless you redirect it with a CMD command. However, you also can OPEN a screen file for input and read data from screen memory, using some of the same commands and statements which control input from tape or disk.

Screenprint opens a screen file with OPEN3,3. This does not in any way affect normal PRINTs to the screen; it just opens another path (File 3) to the screen (device 3). Now, statements like GET#3 or PRINT#3 can direct input or output from or to the screen. Once the screen file is OPENed, Screenprint uses GET#3,A$ to input a screen character. The character under the cursor at the time of the GET#3 is assigned to the string variable A$, and the cursor moves one space to the right.

Dealing With Screen Wraparound

A good feature of this screen GET is that when it gets to the end of a line, it will read a CHR$(13), and cause a carriage return to be sent to the printer. This means that a line that wraps around on the screen will appear as one line on the printer. If this is not desired, it can be eliminated by inserting an IF-THEN statement that will cause carriage returns to be ignored.

This version of One-Line Screenprint is for VIC:

```
10 OPEN3,3:OPEN4,4:PRINT"{HOME}";:FORI=0T
   0505:GET#3,A$:PRINT#4,A$;:NEXT:CLOSE3:
   CLOSE4
```

Program Explanation

OPEN3,3: opens the screen file.
OPEN4,4: opens the print file.
PRINT"[HOME]";: places the cursor in the home position for the screen read.
FORI=0TO505: sets the number of characters to capture from the screen.
GET#3,A$: captures a character from the screen and moves the cursor right one space.
PRINT#4,A$;: prints the captured screen character with no RETURN.
NEXT:CLOSE4:CLOSE3:RETURN: ends the loop, closes the files and returns to the caller.

For the 64, use this version of One-Line Screenprint:

```
10 OPEN3,3:OPEN4,4:PRINT"{HOME}";:FORI=0T
   0999:GET#3,A$:PRINT#4,A$;:NEXT:CLOSE3:
   CLOSE4
```

To get all this on one line in the 64, you'll need to abbreviate some of the BASIC keywords. For example, O SHIFT-P can stand for OPEN, a question mark can be substituted for PRINT, P SHIFT-R for PRINT#, etc.

Printing Reversed Characters

The GET statement puts ASCII numbers into A$, not the screen code, so you can send the characters to the printer without translation. However, reversed characters do not have distinct ASCII numbers; these are returned as normal characters. If you must have a screen print with reversed characters, you will need another, longer routine. We must find where screen memory is (on the VIC), then look at each screen code to see if it is greater than 127 (reversed character). If the character is reversed, we have to send the appropriate commands to make the printer go into, then out of, reverse mode.

Those of you who want an exact copy of the screen, including low-resolution graphics and reversed characters, can use the screen copy routines below. The control characters sent are set up for the 1515 and 1525 printers, but may be changed for other printers.

VIC Screen Copy

```
100 PRINT"{HOME}";:SS=(PEEK(210))*256:OPE
    N3,3:OPEN4,4                    :rem 236
110 FORR=0TO22:B$=""                 :rem 96
120 FORC=0TO21:A$=""                 :rem 80
130 IFPEEK(SS+((R*22)+C))>127THEN:GET#3,A
    $:B$=B$+CHR$(18)+A$+CHR$(146):GOTO160
                                     :rem 61
140 GET#3,A$:IFA$=CHR$(13)THEN:A$=" "
                                    :rem 204
150 B$=B$+A$                         :rem 47
160 NEXTC:PRINT#4,B$:NEXTR:CLOSE4:CLOSE3
                                     :rem 91
```

64 Screen Copy

```
100 PRINT"{HOME}";:SS=(PEEK(210))*256:OPE
    N3,3:OPEN4,4                    :rem 236
110 FORR=0TO24:B$=""                 :rem 98
120 FORC=0TO39:A$=""                 :rem 89
130 IFPEEK(SS+((R*40)+C))>127THEN:GET#3,A
    $:B$=B$+CHR$(18)+A$+CHR$(146):GOTO160
                                     :rem 61
140 GET#3,A$:IFA$=CHR$(13)THEN:A$=" "
                                    :rem 204
150 B$=B$+A$                         :rem 47
160 NEXTC:PRINT#4,B$:NEXTR:CLOSE4:CLOSE3
                                     :rem 91
```

Lines 100–120: put the cursor to home position, find the start of screen memory (SS), open the needed files, and set the row and column pointers.

Line 130: look at the screen memory. When a screen character greater than 127 is found, it must be a reversed character. The character is then captured and added to string B$ between a [RVS] and [OFF] character.

Lines 140–150: capture all nonreversed characters, remove CHR$(13), and add the captured character to the print string B$.

Line 160: send the strings to the printer, close the files and return.

Screenprint In Action

Programs 1 and 2 are demonstration programs which use both subroutines. Once LOADed and RUNning, just key in anything you wish, even create a graphics picture using graphics characters. When you desire a copy, the f1 key will call One-Line Screenprint. The f3 key will call Screen Copy. This will print the screen including reversed characters and no line wrap.

Necessary Changes

To add either routine to your existing programs, add these lines any place you want the Screenprint option:

```
100 GETA$:IFA$=CHR$(133)THEN GOSUBxxx:A$=
    " "
110 IFA$=""THEN100
```

These lines call the Screenprint subroutine if the f1 key is depressed. Any other key will cause the program to continue. Replace the xxx with the line number of the selected Screenprint subroutine.

Don't forget, you can use the disk or tape as an output or input device just as easily as the screen. With a few modifications to Screenprint, you could be transferring screens of data to and from any device. That could make for some interesting and powerful applications, using only a few program lines.

Program 1: VIC Screenprint Demo

```
200 OPEN3,3:OPEN4,4:PRINT"{CLR}KEY IN ANY
    THING"                          :rem 214
210 PRINT"{RVS}F1=ONE LINE SCREEN":PRINT"
    {3 RIGHT}{RVS}PRINT SUB{OFF}":rem 113
220 PRINT"{RVS}F3=SCREEN COPY{OFF}"
                                    :rem 186
230 GETA$:IFA$=CHR$(133)THENGOSUB260:A$="
    "                               :rem 149
240 IFA$=CHR$(134)THENGOSUB270:A$=""
                                     :rem 25
250 PRINTA$;:A$="":GOTO230          :rem 236
260 PRINT"{HOME}";:FORI=0TO505:GET#3,A$:P
    RINT#4,A$;:NEXT:RETURN           :rem 73
270 PRINT"{HOME}";:SS=(PEEK(210))*256
                                    :rem 246
280 FORR=0TO22:B$=""                :rem 104
290 FORC=0TO21:A$=""                 :rem 88
300 IFPEEK(SS+((R*22)+C))>127THEN:GET#3,A
    $:B$=B$+CHR$(18)+A$+CHR$(146):GOTO330
                                     :rem 59
310 GET#3,A$:IFA$=CHR$(13)THEN:A$=" "
                                    :rem 203
320 B$=B$+A$                         :rem 46
330 NEXTC:PRINT#4,B$:NEXTR:RETURN:rem 173
```

Program 2: 64 Screenprint Demo

```
200 OPEN3,3:OPEN4,4:PRINT"{CLR}KEY IN ANY
    THING"                          :rem 214
210 PRINT"{RVS}F1=ONE LINE SCREEN PRINT S
    UB{OFF}"                        :rem 253
220 PRINT"{RVS}F3=SCREEN COPY{OFF}"
                                    :rem 186
230 GETA$:IFA$=CHR$(133)THENGOSUB260:A$="
    "                               :rem 149
240 IFA$=CHR$(134)THENGOSUB270:A$=""
                                     :rem 25
250 PRINTA$;:A$="":GOTO230          :rem 236
260 PRINT"{HOME}";:FORI=0TO999:GET#3,A$:P
    RINT#4,A$;:NEXT:RETURN           :rem 90
270 PRINT"{HOME}";:SS=(PEEK(210))*256
                                    :rem 246
280 FORR=0TO24:B$=""                :rem 106
290 FORC=0TO39:A$=""                 :rem 97
300 IFPEEK(SS+((R*40)+C))>127THEN:GET#3,A
    $:B$=B$+CHR$(18)+A$+CHR$(146):GOTO330
                                     :rem 59
310 GET#3,A$:IFA$=CHR$(13)THEN:A$=" "
                                    :rem 203
320 B$=B$+A$                         :rem 46
330 NEXTC:PRINT#4,B$:NEXTR:RETURN:rem 173
```

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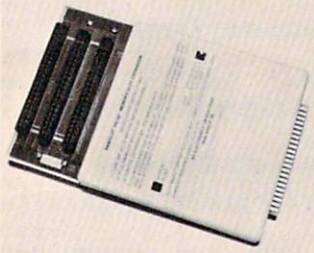

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Advanced Disk Logging On The 64

Jim Butterfield, Associate Editor

"Disk Log 64" provides you with access to some useful data in the disk directory which is not available via the usual BASIC commands.

There's information on disk that you can't get with an ordinary catalog sequence

```
LOAD "$",8
LIST
```

Often it doesn't matter. At other times, you find yourself wishing that you could get at the data.

"Disk Log 64" allows you to do that. It's set up specifically for the 64, and will give you a lot of information.

Programs

On program files, you'll get start and end addresses, in hexadecimal. That's the most convenient way to read them. You might use these addresses to help you make a copy of special overlay files that are often used in music and graphics. (See "Complex Disk Copies For The 64" in this issue.) Note that the "end" address is actually one location higher than the true end; that's the way they are most commonly used. So if you see that a program goes from $0801 to $1039, you know that the last byte is actually at $1038; $1039 is the first available memory location. Don't forget that these are hexadecimal numbers.

If you have a mixed disk of programs, you can often guess what type of systems the programs were written on. PET/CBM programs will start at $0401; programs written on the minimum VIC will start at $1001. A VIC with a 3K expansion will write programs that start at $0401, like the PET; but if 8K or more is added, then programs will start at $1201. You'll note that conventional 64 programs begin at $0801, but there can be exceptions. Character sets, high-resolution graphics, music, and machine language programs can be loaded into unusual memory locations with a LOAD "NAME",8,1 type of command; and then it will be useful to know where such data blocks or programs are being used.

In normal circumstances, programs relocate when loaded into the 64 (or VIC, for that matter). If you use a conventional LOAD from disk, the start address doesn't matter too much: The program will be moved over to the start-of-BASIC location—normally $0801.

Sequential And User Files

On this type of file, Disk Log 64 counts the bytes for you. No big deal, but sometimes this is more useful than the related coarse measure, block count. There are about 254 characters stored in each disk sector, but the last sector is often partially full. An exact character count can also help you refine file estimates.

A user (USR) file is identical to a sequential (SEQ) file, except that it is named as type USR when it is written. Why would a programmer bother? Usually to mark that there is something unusual about this file. For example, a file written as *packed binary* should probably be written as a USR file to warn programmers that they cannot list it in the usual way.

Relative Files

Relative files may be written on the 1541, and if they are found there, Disk Log 64 gives some very useful information which is not available elsewhere. First, it gives the file's *record length*—the standard size set for each record of this file. For example, L=45 would mean that each record is

set to not more than 45 characters on the relative file. Following this, the program gives the number of records existing on the file.

Machine Language Aids

This program builds machine language aids into the cassette buffer. It then calls them in two different ways.

Relative file records are counted using the SYS command in line 740. The machine language program places the record count that it finds in locations 139 and 140, where BASIC picks it up.

Files which are not relative are measured for size using the USR command in line 760. The machine language program carefully places the answer—the number of characters in the file—into a series of locations called the Floating Point Accumulator. This value is given to BASIC the moment that the USR function returns. Note that the USR vector is set up in line 760 with POKEs to addresses 785 and 786: The Commodore 64 differs from all previous machines in this area, since PET, CBM, and VIC would use addresses 1 and 2 for the same purpose.

The program has been checked out with a standard 64 equipped with disk and printer. It should work on interfaces which give access to the IEEE bus, but not all combinations have been tested.

Disk Log 64

```
100 DIMT$(4)                          :rem 104
110 PRINT"DISK FILE LOG"              :rem 144
130 C$=CHR$(0)                        :rem 186
140 DATA169,0,162,4,149,98,202,16,251
                                      :rem 78
145 DATA169,160,133,97,162,2,32,198,255
                                      :rem 192
150 DATA230,101,208,10,230,100,208,6,230,
    99                                :rem 91
155 DATA208,2,230,98,32,228,255,165,144
                                      :rem 185
160 DATA240,235,32,204,255,198,97:rem 146
165 DATA6,101,38,100,38,99,38,98,16,244,9
    6                                 :rem 91
170 DATA169,0,133,139,133,140         :rem 190
180 DATA230,139,208,2,230,140         :rem 183
190 DATA162,15,32,201,255,169,80,32,210,2
    55                                :rem 111
200 DATA169,4,32,210,255,165,139,32,210,2
    55                                :rem 109
205 DATA165,140,32,210,255             :rem 38
210 DATA169,1,32,210,255,32,204,255
                                      :rem 221
215 DATA162,15,32,198,255,32,228,255
                                       :rem 37
220 DATA72,32,204,255,104,201,48,240,200,
    96                                :rem 101
230 FORJ=860TO977:READX:T=T+X:POKEJ,X:NEX
    TJ                                 :rem 53
240 IFT<>16312THENSTOP                :rem 101
250 DATA"XXX","SEQ","PRG","USR","REL"
                                      :rem 108
260 FORJ=0TO4:READT$(J):NEXT          :rem 239
270 INPUT"PRINTER";Z$                  :rem 74
280 Z=3:IFASC(Z$)=89THENZ=4:INPUT"DATE";D
    $                                  :rem 74
290 U=8:REM UNIT 8                    :rem 251
300 D=0:REM DRIVE 0                    :rem 12
330 OPEN4,Z:OPEN1,U,15,"I"+CHR$(D+48):CLO
    SE1                                :rem 36
340 G$="{17 SPACES}"                  :rem 131
350 OPEN15,U,15                        :rem 67
360 OPEN1,U,3,"$"+CHR$(D+48)          :rem 200
370 GET#1,A$:A=ASC(A$+" ")             :rem 19
380 IFA=10RA=65THENL1=141:L2=89:GOTO410
                                       :rem 80
390 IFA=67THENL1=3:L2=735:GOTO410:rem 206
400 CLOSE1:PRINT"???":STOP            :rem 131
410 PRINT#4,"*** DISK LOG ***{2 SPACES}";
    D$                                 :rem 149
420 FORJ=1TOL1:GET#1,A$:NEXTJ          :rem 23
430 PRINT#4,"{2 SPACES}";:FORJ=1TO23:GET#
    1,A$:PRINT#4,A$;:NEXTJ             :rem 179
440 PRINT#4:FORJ=1TOL2:GET#1,A$:NEXTJ
                                       :rem 56
450 M=M+1:GET#1,K$,T$,S$               :rem 28
460 L7=-1:Z$=CHR$(160):F$="":FORJ=1TO16:G
    ET#1,A$                            :rem 157
470 IFA$=Z$THENL7=0                    :rem 105
480 IFL7THENF$=F$+A$                   :rem 126
490 NEXTJ                              :rem 38
500 GET#1,A$,A$,A$:L%=ASC(A$+C$)      :rem 131
510 FORJ=1TO6:GET#1,A$:NEXTJ           :rem 208
530 GET#1,A$:L=ASC(A$+C$)              :rem 63
550 GET#1,A$:L=L+256*ASC(A$+C$):IFM<8THEN
    GET#1,A$,A$:GOTO570                :rem 157
560 M=0                                :rem 85
570 SW=ST:IFK$=""GOTO820               :rem 182
580 K=ASC(K$)-128:IFK<10RK>4THENK=0
                                       :rem 74
620 PRINT#4,T$(K)                      :rem 188
630 PRINT#4,RIGHT$(" "+STR$(L),3);" ";
                                       :rem 222
640 PRINT#4,LEFT$(F$+G$,17);           :rem 25
650 IFK=0GOTO810                       :rem 180
660 IFK=4THENPRINT#4,"L=";MID$(STR$(L%),2
    );                                 :rem 245
670 OPEN2,U,4,CHR$(D+48)+":"+F$+","+T$(K)
                                       :rem 83
680 A=0:IFK<>2GOTO730                  :rem 223
690 GET#2,A$,B$:A=ASC(A$+C$)           :rem 206
700 B=ASC(B$+C$)                       :rem 54
710 GOSUB840                           :rem 180
730 IFK<>4GOTO760                      :rem 248
740 SYS915:A=PEEK(139)+PEEK(140)*256-1
                                       :rem 95
750 PRINT#4,",";MID$(STR$(A),2);"R";:GOTO
    800                                :rem 202
760 POKE785,92:POKE786,3:A=A+USR(0)
                                       :rem 19
770 IFK<>2THENPRINT#4,A;"BYTES";:GOTO800
                                       :rem 240
780 PRINT#4," ";:A%=A/256:A=A-A%*256:B=B+
    A%                                 :rem 247
790 GOSUB840                           :rem 188
800 CLOSE2                              :rem 64
810 PRINT#4                            :rem 125
820 IFSW=0GOTO450                       :rem 18
830 INPUT#15,A:CLOSE1:PRINT#4,CHR$(13):CL
    OSE4:CLOSE15:END                   :rem 13
840 X=B/16:GOSUB850:X=A/16              :rem 6
850 FORJ=1TO2:X%=X:X=(X-X%)*16:IFX%>9THEN
    X%=X%+7                            :rem 149
860 PRINT#4,CHR$(X%+48);:NEXTJ:RETURN
                                       :rem 44
```

COMPLEX DISK COPIES For The 64

Jim Butterfield, Associate Editor

Copying unusual disk files is easier if you know what to look for and where to find it.

Conventional programs can be easily copied, even if you have only one disk drive. You just LOAD the program, insert another disk, and SAVE. But sometimes it doesn't work quite that easily.

For example, the 64 DOS Wedge seems to give trouble. The LOAD goes easily, but the SAVE seems to hang up. Many demonstration programs come in pieces—and one program, often labeled BOOT in the name, does the job of bringing in all the various chunks so the whole program can be staged.

If you have a dual disk, the job is easy. You give the COPY command, and the disk moves the program you have named from one drive to the other. You don't need to know where the program will be located when it loads—an identical copy will be made.

On a single drive, a backup program might be used. It copies everything and takes quite a while to run. Then you'd need to delete the stuff you didn't want, and you'd need to start with a fresh disk. But you could work it that way.

You could use a copying utility. With a pair of 1541 disks, you might run COPY-ALL64. With one disk, you'd need some other kind of program.

Or you could learn a little more about how programs are loaded into memory, and arrange to do your own custom copying.

Special Cases

The first thing you'd need to do is to spot the special programs which need to be copied with care. Often, the word BOOT in the name suggests that something is afoot (no pun intended). If you are instructed to LOAD in nonrelocatable format (LOAD "PROG",8,1), you may be sure that there's something nonstandard about the memory addresses involved. If, when you run a program, the disk starts to run, there's a good chance that the program is loading other "overlay" program segments. Or, if you make a copy with LOAD and SAVE and it doesn't work, it's a safe bet that there's something you need to look into.

I don't plan to talk about protection schemes here. If you have a piece of commercial software that won't copy, this article won't help. If you're unhappy about not being able to make a backup copy, write the software supplier, because I'm not going to help you on that problem.

First, you need to identify if there is one program or a group that needs special treatment. If there's a BOOT program, load it and list it. You'll see that this program's job is to load in the whole set of programs to do the job. For example, the program CHAR BOOT on the Commodore Disk Bonus Pack shows that three other programs are to be loaded in:

```
LOAD " ROTATE.DATA",8,1
LOAD " STANDARD.SET",8,1
LOAD " CHAR EDITOR",8
```

Note that the first two in the list are to be loaded without relocation (the extra ,1). CHAR BOOT and CHAR EDITOR are to be loaded in the normal, relocatable way.

Conclusion: We may copy CHAR BOOT and CHAR EDITOR with conventional LOAD and SAVE commands (be careful of the names). But we must use special techniques to copy ROTATE.DATA and STANDARD.SET.

Extracting Vital Statistics

Once you've found a program that needs special handling to copy, you must find out more about it.

The best approach is to use the program "Disk Log 64" (elsewhere in this issue). It will neatly give you the start and end addresses that you will need to make a good copy. The addresses are in hexadecimal. Don't worry about the alphabetic letters: Just note the details down carefully.

If for some reason you can't use Disk Log 64, you can try the following quick procedure. Enter this program:

```
100 INPUT "PROGRAM NAME";N$
110 OPEN 1,8,2,N$
120 GET#1,A$,B$:CLOSE 1
130 C$=CHR$(0)
140 A=ASC(A$+C$)/4096+ASC(B$+C$)/16
150 PRINT "PROGRAM START ADDRESS IS:"
160 FOR J=1 TO 4
170 A%=A:A=(A-A%)*16:IF A%>9 THEN
    A%=A%+7
180 PRINT CHR$(48+A%);:NEXT J
```

This will give you the start address, which is half of the story.

To get the end address, you must have a monitor loaded into your system (you'll need one later, anyway).

LOAD the program in question and go directly to the monitor (SYS 8 usually does the trick). Now inspect hexadecimal addresses 002D and 002E. You do this with the command ".M 002D 002E" which will give you a line starting with address $002D and containing eight two-digit hexadecimal numbers. Write down the first two numbers, but in reverse order. In other words, if the numbers are 33 4A, write down 4A33. That's the end address—one location past the end of the program.

But it's much easier to use Disk Log 64.

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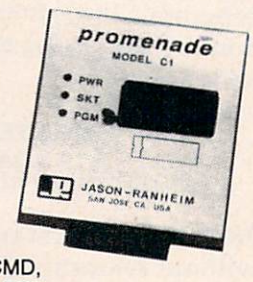

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Making The Copy

Now you have the vital start and end addresses, the rest is easy. Be sure you have a machine language monitor in place.

Load the program in question, using the nonrelocate ",1" suffix (LOAD "NAME",8,1). Place the new disk into the drive, and be sure it's formatted. Go to the monitor. Save the program using the start and end addresses. The format for saving to disk on most monitors is:

```
.S '0:PROGNAME",08,1234,4A33
```

The 0: ahead of the program name specifies drive 0; this doesn't hurt, and sometimes it helps. Make sure you get the program name right. The disk device number, 8, must be typed in as two digits, 08. The start and end addresses should be typed in as shown.

That's all there is to it. Return to BASIC with the command ".X".

Wrinkles

Once in a while, you get a program that resides in exactly the same part of memory as the monitor. For example, Supermon64 normally takes up residence at addresses $97ED to $9FFF. If you are using this monitor and a program is loaded to the same memory area, you'll have trouble with the monitor. Change monitors or set up the monitor in a new place (Supermon can be moved by doing a little intelligent fiddling with addresses 55 and 56 [decimal] before running the Supermon builder).

You may run across programs on cassette tape that you'd like to transfer to disk using the same techniques. Not hard: LOAD the cassette tape program (use the extra ",1" again), and then PEEK addresses 829, 830, 831, and 832. Ask someone who knows about hexadecimal numbers to translate these decimal contents into hex for you; the first two give the start address, the last two give the end address. Or use the machine language monitor to display addresses $033D to $0340—it's the same place and you'll get the hex values right away. Again, reverse each pair of bytes. If the locations show as 24 68 25 69, then start is at $6824 and end is at $6925. If the program won't LOAD without automatically running, it's probably copy-protected and you shouldn't try to copy it anyway.

If you don't have a monitor, get one. Supermon64, for example, has been published in COMPUTE!, is on the Disk Bonus Pack, and is in many club libraries. Other monitors are available for sale. Even if you don't quite know how to use it yet, it's handy to have around.

We've looked at methods of spotting and copying difficult programs. And we've also had a chance to look a little further into the inner workings of the computer. ©

Atari Display List Interrupts

Karl E. Wiegers

This tutorial explains how to use the Atari Display List Interrupt to create sophisticated graphics displays, with multicolored screens and special character sets.

The Display List Interrupt (DLI) is one of the most powerful graphics features of the Atari 400/800/1200 computers. DLIs can be used to create sophisticated displays, with elaborate vertical screen architecture and the simultaneous display of many colors. DLIs also permit the display of multiple character sets in different parts of the screen, and they can also be used to create sound effects. Creative use of DLIs is the reason for the complexity of many Atari games.

The Display List Interrupt takes advantage of the way the television display operates. After the TV's electron beam scans horizontally across the width of the screen, it is turned off very briefly while it returns to the opposite edge and moves down slightly to draw the next scan line. During the few microseconds that the electron beam is off, it is possible to execute a very short machine language program, a Display List Interrupt routine. In this brief time, such routines can do little more than change the value stored in a color or sound register, but this can create some exciting effects.

DLI From BASIC

Atari computers control video output with a special microprocessor chip called ANTIC. ANTIC obtains its instructions from a small area in RAM containing the *display list*. The display list is simply a list of numbers which tells ANTIC what graphics mode to use for each of the 192 TV scan lines in the standard Atari display, where to find the information to be displayed, and so on.

As an example, the display list for graphics mode 0 contains 32 numbers, of which the seventh through twenty-ninth are instructions to display a mode 0 *mode line*, each of which consists of eight TV scan lines.

The display list instructions are not the same as the BASIC graphics mode numbers; for BASIC mode 0, the display list instruction is a "2". The display list is different for each graphics mode, and unique display lists can be designed to combine graphics modes in a single display (see "How to Design Custom Graphics Modes," *COMPUTE!'s First Book of Atari Graphics*). The address of the beginning of the display list in RAM is located by:

```
DL=PEEK(560)+256*PEEK(561)
```

Setting Up The Interrupt

To tell ANTIC that a Display List Interrupt is to be performed, several things must be done.

1. Select the vertical screen position where you want the interrupt to take place, for example, where you want the background color to change. Setting bit 7 of a number in the display list tells ANTIC to perform a DLI following the display of that mode line. Setting bit 7 can be done by simply adding 128 to the value in any memory location. Suppose you wish to have a DLI take place at line 10 of a graphics mode 0 display. You need to add 128 to the display list instruction for line 9, which happens to be in the memory location 13 bytes past the beginning of the display list:

```
POKE DL+13,PEEK(DL+13)+128
```

Do not add 128 to any number in the display list before DL+6, which corresponds to the second mode line.

2. Write your DLI routine and store it someplace safe in memory. The familiar READ/DATA/POKE combination works well for storing ML routines from within a BASIC program. I like to use Page 6 of RAM (locations 1536–1791) for the DLI, although other RAM locations or character strings can also be used.

3. Load the starting address of the DLI routine into locations 512 (low-byte) and 513 (high-byte). For a routine at the beginning of Page 6 this is accomplished with POKE 512,0 and POKE 513,6.

4. POKE 54286,192 to enable the DLI.

Writing The DLI Routine

There are several rules to be followed when

writing the DLI routine.

First, it must be short. Only 14 to 61 machine cycles are available for execution, depending on the graphics mode, so keep your total routine down to about 25–30 cycles.

The first operation in your routine must be to save on the stack any of the 6502 registers (accumulator, X, and/or Y) which you use in the DLI. You must also restore these registers by pulling them off the stack at the end of the routine. In between, they can be used for executing the DLI instructions. Also, the final machine language instruction must be a ReTurn from Interrupt (RTI).

You will want to insure that any changes your DLI makes in the video display are properly synchronized with the TV electron gun's operation. A register is provided for this purpose at location 54282 ($D40A). Addressing this location, called WSYNC (Wait for horizontal SYNChronization), will provide a sharp separation between pre- and post-interrupt regions on the screen. So, early in your DLI routine, you should store some number in WSYNC (any number will do).

Use ROM For Changes

Another point is that changes in color registers, audio registers, and the like should be made directly into the hardware locations in ROM, rather than into the corresponding shadow locations in RAM. For example, the five playfield color registers are at locations 53270 through 53274 ($D016–$D01A) in ROM, and their shadows are at locations 708 through 712 in RAM. Your DLI should store values only in locations 53270–53274.

A Simple Color Change

Program 1, in BASIC, calls a DLI to change the screen background color from blue to red after six mode lines have been displayed. The POKE 512,0 and POKE 513,6 in line 70 load the DLI into the beginning of Page 6 of RAM. The DLI routine is stored as decimal numbers in the DATA statement. You can change the third number in this DATA statement to any number less than 256, to change the color displayed in the bottom portion of the screen. This color number is the same value you would POKE into location 710, the color register 2 shadow location, to change the background color. It is computed by taking 16* HUE + LUMINANCE. To return to the normal background from this modified display, simply type GRAPHICS 0.

A Two-Tone Text Window

Graphics modes 1 through 8 are really mixed mode displays, with a mode 0 text window of four lines at the bottom of the screen.

Program 2 shows a way to get three background colors on the screen. The default black for mode 2 is displayed at the top, green goes into the top two lines of the text window, and the bottom half of the text window is yet a different color (pink). In addition, the DLI sets color register 1, which controls the luminance of characters in mode 0, to zero, so the characters are now black.

These techniques will work with any custom-mixed mode display list, allowing almost unlimited variation in graphics displays.

All This And Sound, Too

DLIs need not be used only to brighten up your TV screen. Program 3 shows a way to get a repeating sound using a DLI and audio channel 1. (See *Mapping the Atari*[COMPUTE! Books] by Ian Chadwick, p. 121, for more information about directly addressing the audio registers.) In this program, the loop in line 50 sets the DLI instruction on several lines in the mode 0 display list; the exact number depends on the STEP size. A smaller step size gives a higher rate of sound repetition because the DLI is called more often.

The DLI routine in this example uses an additional RAM byte at location 1600 ($0640) to store a value which governs the pitch of the sound being generated. This location is initially set to 121 (middle C) by line 60.

The DLI decrements this value, then stores it in location 53760 ($D200) to produce a sound on audio channel 1. This value is then compared to a preset limiting pitch value, decimal 60 ($3C) in this example, corresponding to one octave above middle C. If not equal, then the routine terminates. If equal, then 121 ($79) is loaded back into location 1600 to restart the cycle the next time the DLI is called. This routine can be changed, as shown in the REM statements, to give increasing or decreasing pitch, fast or slow repeat rate, and any desired starting and ending pitches.

DLI For Special Characters

Many programs use specially designed character sets in place of the standard Atari characters. A DLI can be used to simultaneously display characters from more than one set on different lines of the screen.

This technique is used in some character set generation programs, such as "SuperFont" (COMPUTE!, January 1982). Program 4 shows how it works, without getting into the details of alternate character set creation (see *COMPUTE!'s First Book of Atari Graphics*, Chapter 3, for more information).

First, 1084 bytes are reserved for the redefined characters, and a DLI is set on line 10 of the graphics mode 0 display. The first five DATA statements contain redefined values of capital letters A, B, C, D, and E, which are loaded into the correct locations in the reserved RAM space. The DLI routine loads the most significant byte of

the starting address of the new character set (156, $9C) into both WSYNC and location 54281 ($D409), the hardware character base address (RAM shadow is 756, which would be used by BASIC).

The routine also changes the color of the lower part of the screen. You will see both the regular ABCDE and the redefined ABCDE on the screen simultaneously.

Moving The Invisible Cursor

If you delete the last line in Program 4, you can move the invisible cursor and print in immediate mode in either the top (regular) or bottom (redefined) part of the screen. With this limited sample, only the letters A–E will be shown as nonblanks in the redefined screen area. However, this concept obviously allows great flexibility for creating elaborate screen displays with multiple character sets.

A Demonstration Of Multiple DLIs

So far, our examples have used one DLI routine per BASIC program. But you can also show several colors at once, or change both character sets and colors in separate operations. Obviously, multiple DLIs are needed in such cases. A problem arises, because you can only tell the operating system about one DLI at a time using locations 512 and 513.

There are several possible solutions to this problem. Perhaps the simplest is to load several DLIs into memory, and have each routine load the starting address of the next one to be called into locations 512 and 513. This chaining of DLIs is illustrated in Program 5.

This program will place five bands of color in a mode 1 screen, together with different-colored characters. The same basic DLI is used four times, stored 32 bytes apart in Page 6. The only changes are to the actual color value stored in the background color register 53274 ($D01A) and to the low byte of the Page 6 address of the next DLI to use, which gets stored in location 512 ($0200).

Avoiding Screen Flicker

DLI instructions are placed on four mode lines (line 40). The BASIC program contains a POKE 559,0 in line 30 and a POKE 559,34 in line 230. These statements simply turn off the TV display briefly while the DLI routines are stored and changed, to avoid screen flicker. You can remove these statements and watch the action, if you like.

By experimenting with the BASIC programs and DLI routines in these five programs, you can better understand the principles involved and the ease of using DLIs in your own programs. The book *Mapping the Atari* contains the most detailed available memory map of the Atari, and is an invaluable reference for the programmer wishing to use DLIs effectively.

Program 1: Color Change Using DLI

```
OC 10 GRAPHICS 0
JI 20 DL=PEEK(560)+PEEK(561)*256:REM F
      ind start of display list
MI 30 POKE DL+10,PEEK(DL+10)+128:REM E
      nable DLI for desired line in di
      splay list
JA 40 FOR I=0 TO 10:READ A:POKE 1536+I
      ,A:NEXT I:REM Poke DLI routine i
      nto page 6
PM 50 REM Change 68 to desired color v
      alue
NA 60 DATA 72,169,68,141,10,212,141,24
      ,208,104,64
HO 70 POKE 512,0:POKE 513,6:REM Set ad
      dress for DLI (LSB,MSB)
KG 80 POKE 54286,192:REM Enable DLI
KF 90 LIST
```

Program 2: Two-Tone Text Window

```
OE 10 GRAPHICS 2
JI 20 DL=PEEK(560)+256*PEEK(561):REM F
      ind start of display list
OM 30 POKE 710,198:REM Set color regis
      ter 2 to green
KC 40 POKE DL+18,130:REM set DLI for m
      iddle of text window
JK 50 FOR I=0 TO 19:READ A:POKE 1536+I
      ,A:NEXT I:REM Poke DLI routine i
      nto page 6
AN 60 REM Change 88 to desired color v
      alue for bottom of text window
NA 70 DATA 72,138,72,169,0,162,88
HP 80 DATA 141,10,212,141,23,208
EO 90 DATA 142,24,208,104,170,104,64
GI 100 POKE 512,0:POKE 513,6:REM Set a
       ddress for DLI
NA 110 POKE 54286,192:REM Enable DLI
MI 120 PRINT #6;" GRAPHICS mode [INVC]"
GF 130 PRINT "Top half of text window"
PG 140 PRINT :PRINT "Another color for
        the bottom half!"
CH 150 PRINT "(Press any key to go on)";
NK 160 OPEN #1,4,0,"K:":GET #1,A:GRAPH
       ICS 0:LIST
```

Program 3: Creating Sound With DLI

```
OC 10 GRAPHICS 0
JI 20 DL=PEEK(560)+PEEK(561)*256:REM F
      ind start of display list
KM 30 POKE 53768,0:POKE 53775,3:REM Eq
      uivalent of SOUND 0,0,0,0
PA 40 POKE 53761,168:REM Set audio cha
      nnel 1 volume=8, distortion=10
OI 50 FOR I=6 TO 23 STEP 3:POKE DL+I,1
      30:NEXT I:REM Change step to cha
      nge speed
NJ 60 POKE 1600,121:REM Change 121 to
      desired initial pitch
JE 70 FOR I=0 TO 20:READ A:POKE 1536+I
      ,A:NEXT I:REM Poke DLI routine i
      nto page 6
BE 80 REM Change 206 to 238 to decreas
      e pitch from intial setting
EJ 90 REM Change 60 to desired ending
      pitch
KN 100 DATA 72,206,64,6,173,64,6,141,0
AF 110 DATA 210,201,60,208,5,169,121,1
       41
NA 120 DATA 64,6,104,64
```

```
KL 130 POKE 512,0:POKE 513,6:REM Set a
      ddress for DLI (LSB,MSB)
ND 140 POKE 54286,192:REM Enable DLI
JL 150 PRINT "PRESS ANY KEY TO GO ON"
LE 160 OPEN #1,4,0,"K:":GET #1,A:CLOSE
       #1:SOUND 0,0,0,0
NE 170 LIST
```

Program 4: Special Characters Using DLI

```
EG 10 CHRBASE=256*(PEEK(106)-4):REM Re
      serve 4 pages below RAMTOP
PD 20 POKE 106,156:REM Set new RAMTOP
      (156 is for 48K machine)
HP 30 GRAPHICS 0:REM Put new RAMTOP in
      to effect
JE 35 POKE 710,198:REM Change backgrou
      nd color to green
BB 40 POKE 752,1:REM Inhibit cursor
JL 50 DL=PEEK(560)+256*PEEK(561):REM F
      ind start of display list
GA 60 POKE DL+14,PEEK(DL+14)+128:REM S
      et DLI
PH 70 FOR I=1 TO 40:REM Load bit maps
      for redefined characters (A,B,C,
      D,E)
JA 80 READ A:POKE CHRBASE+264+I,A:NEXT
       I
MH 90 DATA 60,102,198,198,198,102,59,0
HB 100 DATA 62,99,99,99,126,99,126,0
AP 110 DATA 60,99,96,96,96,99,62,0
GJ 120 DATA 60,99,99,99,99,102,124,0
FO 130 DATA 60,98,96,124,96,127,60,0
LB 140 FOR I=0 TO 15:READ A:POKE 1536+
      I,A:NEXT I:REM Load DLI into pa
      ge 6
KL 150 DATA 72,169,156,141,10,212,141,
      9,212,169,148,141,24,208,104,64
JG 160 POKE 512,0:POKE 513,6:POKE 5428
      6,192:REM Enable DLI
AD 170 POSITION 15,4:? "ABCDE":REM Nor
      mal characters at top of screen
GN 180 POSITION 15,12:? "ABCDE":REM Re
      defined characters below DLI li
      ne
DL 190 POSITION 7,8:? "PRESS ANY KEY T
      O GO ON"
JM 200 OPEN #1,4,0,"K:":GET #1,A:CLOSE
       #1:POKE 106,160:GRAPHICS 0:LIS
       T
```

Program 5: Multiple DLI Routines

```
KE 10 GRAPHICS 17:REM Mode 1 screen wi
      ll have 5 separate colored secti
      ons
JI 20 DL=PEEK(560)+PEEK(561)*256:REM F
      ind start of display list
OJ 30 POKE 559,0:REM Turn off video di
      splay while loading DLI routines
DB 40 POKE DL+9,134:POKE DL+14,134:POK
      E DL+20,134:POKE DL+25,134
AF 50 REM Set DLI instruction on all d
      esired mode lines (134=128+6 for
       mode 1)
HP 60 FOR I=0 TO 20:READ A:POKE 1536+I
      ,A:NEXT I:REM First DLI routine
DE 70 REM 68 means red:32 sets address
       for start of next DLI routine
FI 80 DATA 72,169,68,141,10,212,141,26
      ,208,169,32,141,0,2,169,6,141,1,
      2,104,64
PF 90 RESTORE 80
AD 100 FOR I=0 TO 20:READ A:POKE 1568+
      I,A:NEXT I:REM Second DLI routi
      ne
ND 110 POKE 1570,198:REM Change color
      to green
MI 120 POKE 1578,64:REM Change startin
      g address for next DLI routine
CA 130 RESTORE 80
JJ 140 FOR I=0 TO 20:READ A:POKE 1600+
      I,A:NEXT I:REM Third DLI routin
      e
AE 150 POKE 1602,102:REM Change color
      to lavender
ME 160 POKE 1610,96:REM Change startin
      g address for next DLI routine
CE 170 RESTORE 80
BP 180 FOR I=0 TO 20:READ A:POKE 1632+
      I,A:NEXT I:REM Fourth DLI routi
      ne
CP 190 POKE 1634,28:REM Change color t
      o yellow
BL 200 POKE 1642,0:REM Change starting
       address back to first DLI rout
      ine
LP 210 POKE 512,0:POKE 513,6:REM Set a
      ddress back to first DLI
NC 220 POKE 54286,192:REM Enable DLI
DM 230 POKE 559,34:REM Turn video disp
      lay back on
MP 240 POSITION 1,2:? #6;"look at all
      the"
LA 250 POSITION 1,7:? #6;"COLORS YOU C
      AN MAKE"
NM 260 POSITION 1,12:? #6;"in mode one
      "
HH 270 POSITION 1,18:? #6;"PRESS ANY K
      EY NOW"
DG 280 POSITION 1,21:? #6;"TO GO ON"
CH 290 OPEN #1,4,0,"K:":GET #1,A:CLOSE
       #1:LIST
```

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TI Tricks And Tips

Michael A. Covington

Here are 13 ways to get more out of your TI-99/4A and Extended BASIC.

Here is a collection of handy hints for TI-99/4A programmers.

1. You can get white characters on a black screen, for the duration of a program run, by executing statements such as:

```
10 FOR J = 1 TO 14
20 CALL COLOR(J,16,1)
30 NEXT I
40 CALL SCREEN(2)
```

The results look rather good on a color TV, but bad on a black-and-white set, because scan lines break each letter up into separate dots. (The most readable black-and-white display is obtained by executing a CALL SCREEN(15), making the screen gray while leaving the characters black.)

2. In both TI BASIC and Extended BASIC, you can use * for the logical operator AND and + for OR. For instance, the statement IF (X=0)+(Y=0) THEN 1500 means "if X = 0 or Y = 0 then go to line 1500." The parentheses are essential to show that you don't want to add 0 to Y. Extended BASIC allows you to use the alternative notation IF X=0 OR Y=0 THEN 1500.

3. In Extended BASIC, but not in TI BASIC, pressing any key while a program is being LISTed temporarily halts the listing; pressing any key then causes the listing to resume. In each case the key must be held down for half a second or so in order to get any response.

4. If you RESEQUENCE a program that contains references to nonexistent lines, those references will be changed to references to line 32767. For instance, if you have a GO TO 500 and there isn't a line 500, a RES command will change that statement to GO TO 32767.

5. In Extended BASIC, the command RUN "CS1" loads a program from the cassette drive and immediately runs it. It is equivalent to OLD CS1 followed by RUN. With a disk drive and Extended BASIC, you can use RUN "DSK1.filename", where *filename* is the name of the program on disk that you want to LOAD and RUN.

6. TI BASIC gives you 608 more bytes of available memory than Extended BASIC. However, you can usually write your program more compactly in Extended BASIC, so the difference is of little practical consequence.

7. Built-in subprograms that require integer arguments, such as CALL HCHAR, CALL VCHAR, CALL SOUND, and the CHR$ function, will in fact accept numbers that are not integers. The argument is rounded to the nearest integer before being used, so that for instance CHR$(10.8) is the same as CHR$(11). CHR$(10.4) would be equivalent to CHR$(10).

8. In TI BASIC, you can include multiple colons (for example, :::::) in PRINT statements to produce multiple line skips. A TI BASIC program using this feature which is loaded from disk or cassette under Extended BASIC will run correctly, but you cannot type multiple colons while in Extended BASIC unless you want them to be taken as statement separators (::). Put spaces between the colons, as in PRINT A : : B rather than PRINT A :: B, and they will work correctly.

9. In Extended BASIC, you cannot have more than four sprites visible on the same line at the same time; additional sprites will be temporarily invisible. The problem is worse with double-size sprites (CALL MAGNIFY(3) or (4)), since then only part of the sprite generally disappears, distorting its appearance.

10. When you execute a CALL SPRITE statement, the sprite will sometimes momentarily pop

into existence at a random screen location and then jump to the location that you specified. To prevent this, create the sprite with a color of 1 (transparent) and then alter its color with a CALL COLOR statement.

11. The loss of resolution on the screen that occurs with certain color combinations is inherent in the way color is encoded onto the video signal and does not represent a defect in the TV set or modulator. For greatest sharpness, use black on gray or cyan.

12. The TI-99 sound generator will produce frequencies from 110 to 44733 hertz (cycles per second), well above the limit of human hearing. However, the response of the sound section of most TV sets falls off markedly above 2000 (or, at best, above 10,000) hertz. This means that you cannot, as is sometimes suggested, use the TI-99 to test the upper frequency limit of your hearing. It also means that tones above 2000 Hz—still well within the range of human hearing—will sound markedly different on different TV sets.

13. If you want to transmit lines of more than 80 characters to the printer, open it as "RS232.CR" (or "PIO.CR") rather than "RS232" (or "PIO"). You must still end your line of output (by executing a PRINT statement that does not end in a comma or semicolon) before more than 80 characters have been transmitted, but doing so will not cause the printer to start a new line; the printer will stay on the same line until you explicitly transmit a carriage return, CHR$(13), and a line feed, CHR$(10).

This is particularly useful when you are using a dot-matrix printer in graphics mode, using each character code for a single vertical row of dots and putting hundreds of them on a line. ©

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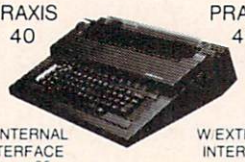

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Commodore

Disk Datamaker

A confusing and tedious aspect of machine language programming, sprite making, or character set redefinition is converting the contents of memory into BASIC DATA statements that can be typed in easily. This program—for any Commodore computer with a disk drive—will do all the work for you. It also provides valuable insight into how the computer stores program files on disk.

In the past there have been programs that created DATA statements by PEEKing the contents of memory and using the dynamic keyboard technique to fool the computer into thinking that someone had typed in the lines. The problem with these programs was that occasionally the resulting DATA statements, or perhaps even the datamaker program itself, would need to occupy the area of memory being PEEKed, destroying the data that needed to be transformed.

If, however, the data is stored on disk, it would not need to be in memory as well. It could just be read from a file. Then I decided there was no reason to use the dynamic keyboard technique either, since a BASIC program could be created right on the disk. The result is "Disk Datamaker" (Program 1); it causes no memory conflicts—because neither the original chunk of data, nor the BASIC program created by Datamaker, is ever in the computer's memory.

In addition to creating DATA statements, the Datamaker program creates the necessary lines of BASIC to READ and POKE the DATA items back into memory. Program 2 is a short example of a program created by the Datamaker. It consists of the DATA statements for one sprite shaped like a Commodore 64.

Applications

Suppose you have written a machine language (ML) program. Sophisticated assembler programs such as MAE, the Commodore assembler, and the PAL assembler all allow you to store the object code on disk. If you use a simple assembler like Supermon or Micromon, you can SAVE a copy of the section of memory that contains your ML program. Then all you have to do is LOAD the Disk Datamaker program, give it the name of your object and program files, and it will take care of everything.

Suppose you have just created sprite data with a sprite editor. If you have the Commodore Sprite Editor, all you have to do is press the S key to invoke the SAVE command, which puts your sprite data on disk. If you are using some other editor, you could use a monitor to SAVE a copy of the section of memory containing the sprite data. Disk Datamaker could then turn that file into DATA statements.

Manipulating PRG Files

All this is possible because PRG (program) files on disk can be OPENed and used just like SEQ (sequential) data files. To OPEN a PRG file for writing, you can either put a ",P,W" after the filename, or you can OPEN with a secondary address of 1, which is reserved for SAVE. These two lines produce identical results:

```
OPEN 8,8,1,"filename"
OPEN 8,8,8,"filename,P,W"
```

To OPEN a PRG file for reading, just OPEN another ",P" file or use a secondary address of 0. These two lines are also identical:

```
OPEN 8,8,0,"filename"
OPEN 8,8,8,"filename,P,R"
```

Using this knowledge, it is possible to read the PRG file that holds the data, and to write a PRG file that contains a BASIC program.

BASIC Basics

The other knowledge necessary to understand Disk Datamaker is the structure of a BASIC program. Each line of BASIC contains four header bytes. The first two are a pointer to the beginning of the next BASIC line in memory. The address is in standard low-byte/high-byte format. The next two bytes are the line number, also in low-byte/high-byte format. Next is the tokenized version of the BASIC line, followed by a zero to denote the end of the line in memory. If the pointer to the next line is two zeros in a row, the computer knows it has reached the end of the program.

Program Operation

Lines 10–90 OPEN the PRG file from which the data will come and the one to which the BASIC program will be written. The subroutine at 10000 will print the appropriate error message if either of the files cannot be OPENed.

Line 100 GETs the first two bytes from the file containing the data. In Commodore PRG files, these bytes always contain the starting address (again in low-byte/high-byte format) of the area of memory where the data was located when it was originally saved. Line 110 writes the first two bytes to the file which will be the new BASIC program. The numbers chosen, 1 and 4, specify a starting address of 1 + (4*256) or 1025. This starting address will allow the BASIC program created to LOAD correctly into a PET/CBM. The starting address is not critical for the VIC and 64 since they automatically relocate any program to their particular starting addresses when it is LOADed.

Line 120 defines the values for the pointer bytes to the next program line. Rather than attempting to calculate the proper addresses for each pointer, Datamaker arbitrarily sets all these bytes to ones. This can be done because Commodore computers automatically redo these pointers whenever a BASIC program is LOADed. Line 130 writes the pointer for the first BASIC line to the disk, and line 140 writes the first four numbers from the DATA statement in line 170. These provide the line number (10) and the tokens for I=. Line 150 uses the value for the starting address found in line 100 to write the value for I to the disk. If you want to relocate your data, simply change the value for I in line 10 of the BASIC loader program once it is created.

Line 160 reads the rest of the DATA from lines 170–200 of Program 1 and writes it to the disk, which creates lines 20 and 30 of the new BASIC program (see Program 2, for example). These lines READ the DATA statements created from your data and POKE the values back into memory.

Line 210 calculates the line number to be used for the first DATA statement. This is the same as the address in memory of the first DATA item. Note this feature of Datamaker: The line number of each DATA line is equal to the address into which the first number in that line will be POKEd, unless you change the value of I to relocate the data. Line 220 writes out the pointer bytes and the line number for each DATA line, and line 230 writes the tokens for DATA and a space.

Lines 250–300 constitute a loop to read eight bytes from the data file and write them as eight DATA items, separated by commas, to the BASIC program file. Line 310 checks the variable S, set in line 250 to the value of the built-in status variable ST, to detect whether the end of the data file on disk has been reached. (See Larry Isaacs' "64 Explorer" column in the October and November 1983 issues of COMPUTE! for more information on detecting an end-of-file with the ST variable.)

If the end has not been reached, line 320 calculates the next DATA line number, and line 330 writes out a zero to mark the end of the current BASIC line. If the end has been reached, line 340 adds a DATA item with the value of 256 to the end of the DATA statements. This is the value checked for as an end-of-data marker in line 20 of the created BASIC program. The three zeros in a row written by line 340 mark the end of the BASIC program. Line 350 CLOSEs the two PRG files and logical file 15, used to detect disk errors, for a clean exit from the program.

Program 1: Disk Datamaker

Refer to the "Automatic Proofreader" article before typing this program in.

```
10 PRINT"{CLR}MAKE BASIC LOADER OUT OF"
                                    :rem 137
20 PRINT"DISK OBJECT FILE.{3 DOWN}"
                                    :rem 150
30 INPUT"{DOWN}ENTER FILENAME";FL$
                                    :rem 248
40 OPEN15,8,15                      :rem 242
50 OPEN8,8,8,FL$+",P,R"             :rem 226
60 GOSUB 370                        :rem 128
70 INPUT"FILENAME TO CREATE";FC$    :rem 187
80 OPEN9,8,9,"0:"+FC$+",P,W"        :rem 188
90 GOSUB 370                        :rem 131
100 GET#8,LO$,HI$                   :rem 152
110 PRINT#9,CHR$(1)+CHR$(4);         :rem 22
120 LINK$=CHR$(1)+CHR$(1)            :rem 83
130 PRINT#9,LINK$;                   :rem 54
140 FOR I=1 TO 4:READ BYTE:PRINT#9,CHR$(B
    YTE);:NEXT I                    :rem 102
150 PRINT#9,MID$(STR$(ASC(LO$+CHR$(0))+AS
    C(HI$+CHR$(0))*256),2);          :rem 17
160 FOR I=1 TO42:READ BYTE:PRINT#9,CHR$(B
    YTE);:NEXT I                    :rem 154
170 DATA 10,0,73,178,0,31,4,20      :rem 171
180 DATA 0,135,32,65,58,139          :rem 50
190 DATA 32,65,178,50,53,54,32,167,32,128
                                    :rem 233
200 DATA 0,52,4,30,0,151,32,73,44,65,58,7
    3,178,73,170,49,58,137,32,50,48,0
                                    :rem 51
```

```
210 LO=ASC(LO$+CHR$(0)):HI=ASC(HI$+CHR$(0
    ))                              :rem 145
220 PRINT#9,LINK$+CHR$(LO)+CHR$(HI);
                                    :rem 92
230 PRINT#9,CHR$(131)CHR$(32);     :rem 131
240 COUNT=1                         :rem 141
250 GET#8,BYTE$:S=ST                :rem 199
260 PRINT#9,MID$(STR$(ASC(BYTE$+CHR$(0)))
    ,2);                            :rem 48
270 COUNT=COUNT+1                   :rem 68
280 IF COUNT=9 OR S<>0 THEN 310     :rem 137
290 PRINT#9,",";                    :rem 91
300 GOTO 250                        :rem 99
310 IF S THEN 340                   :rem 60
320 LO=LO+8:IF LO>255 THEN LO=LO-256:HI=H
    I+1                             :rem 10
330 PRINT#9,CHR$(0);:GOTO220       :rem 111
340 PRINT#9,",256"+CHR$(0)+CHR$(0)+CHR$(0
    );                              :rem 251
350 CLOSE8:CLOSE9:CLOSE15           :rem 69
360 END                            :rem 112
370 INPUT#15,E1,E2$,E3,E4          :rem 101
380 IF E1=0 THEN RETURN             :rem 28
390 PRINT"ERROR - "E1;E2$;E3;E4    :rem 215
400 CLOSE8:CLOSE9:CLOSE15           :rem 65
```

Program 2:
Sample Program Created By Datamaker

```
10 I=12864
20 READ A:IF A=256 THEN END
30 POKE I,A:I=I+1:GOTO 20
```

```
12864 DATA 0,0,0,0,0,0,0,0
12871 DATA 0,0,0,0,0,0,15,255
12878 DATA 255,23,224,49,16,0,1
12885 DATA 35,102,51,102,219,51,75
12892 DATA 108,103,199,254,102,128,0
12899 DATA 14,255,255,252,255,255,248
12906 DATA 0,0,0,0,0,0,0,0
12913 DATA 0,0,0,0,0,0,0,0
12920 DATA 0,0,0,0,0,0,0,0
12927 DATA 0,165,256
```

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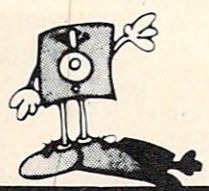

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Super Directory

Michael Contino

"Super Directory" is an invaluable utility which displays the disk directory on the screen and allows you to use the cursor control keys to automatically select, LOAD, and RUN any program. Originally written for 64 and PETs with Upgrade and 4.0 ROM; versions are also included for VIC, Atari, and IBM PC/PCjr.

As much as we might not want to admit it, there are still many people who have had little or no experience with computers. And many of them still harbor a fear of the machines. In writing programs, most of us keep this in mind and attempt to make the programs as friendly as possible. Of course, there is still the problem of getting the program loaded and running.

Since menus are the standard solution for friendly programs, it is natural to write a menu program that will: present the user with the choice of programs; allow for the selection of a program, usually by number; and then load the program. Problems with this approach include the updating of disks every so often and typing all those names into DATA lines.

"Super Directory" solves these problems, providing menu selection using the cursor controls, with an automatic LOAD and RUN of the selected program.

I developed the program on my CBM 8032 with an 8050 disk. However, it also works on PETs with Upgrade and 4.0 BASIC, with any of the three Commodore disk formats, and with the 64.

This program must be the first program on the disk. If you don't know how to do that, simply COPY the first file or program on the disk back to the same disk under another name, and then save this program. Don't forget to then rename the copied file back to its correct name (or do another copy).

Once the program is properly located, a simple ‹shift RUN› (on the PET) will load and execute the program. If you do not have the 4.0 PET, you will have to LOAD "*",8 and then type RUN for other Commodore machines. The program will read through the entire disk and store all PRG files into an array, skipping all nonprogram files. It then presents a menu in two columns (four on the 8032) of all programs on that disk. The first option is "next page," in case there are more programs than can fit on one page. If this choice is continually taken until there are no more selections, you're offered a choice to go back to the beginning, to access a different disk, or to end the process.

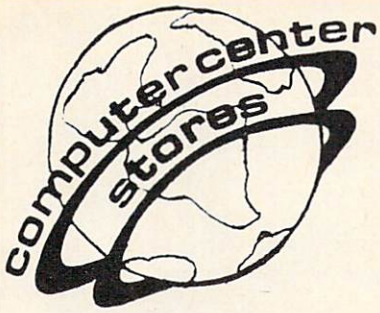
Selection By Cursor

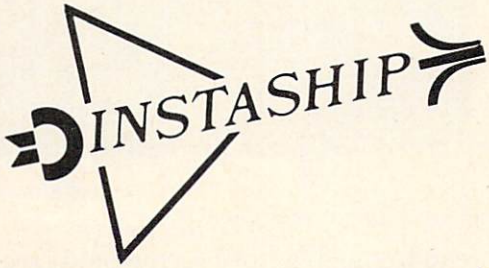
It is in selecting your choice that this menu program is different from most. I have often seen students hesitate for a long time in converting their choice to a number, pressing the correct number, and then pressing RETURN. I have also seen the opposite problem: people moving quickly, watching the screen, and hitting the wrong number. To correct for this in another program, I developed a subroutine which allows for menu selection by control of the cursor keys. When the menu appears, one default choice is highlighted (in RVS reverse print). Pressing the cursor control keys causes the highlight to move up or down, right or left, through the list. I added a wraparound, so that a cursor down from the last item in a column will send the highlight to the top of that column. This provides an almost foolproof method of input. To make it just about perfect you might want to also disable the STOP key.

I like to refer to this subroutine as a light pen—without the pen. I have used it in many programs, and I encourage you to excerpt the subroutine for use in your programs. After we have looked at the program in some detail, I will explain the initialization steps needed before calling the routine.

Simulated WHILE Loop

Before we look at the details of the program, a word about another interesting feature you may want to use in your programs. In structured programming, WHILE and UNTIL loops are considered very nice. Unfortunately, the FOR/NEXT loop does not quite fill the gap in BASIC. It controls a loop where a variable is counting for a specified number of executions, but it does not work as





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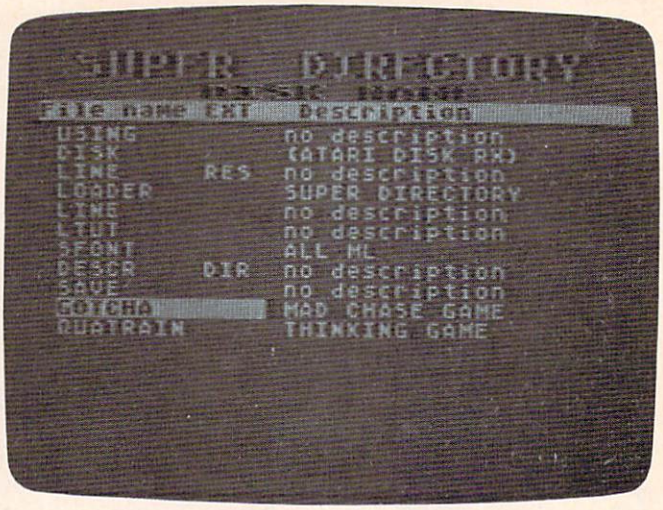
In this 64 directory, the cursor is on "TINDCAD.VIC". Pressing RETURN will load and run that program.



Atari "Super Directory" allows you to store descriptions along with the program names.

well when some other condition is meant to control the repetition. We usually settle this problem by adding a line such as: IF condition THEN GOTO line nn. That works, but can lead to an unclosed FOR/NEXT loop, which brings on its own problems. You can simulate the WHILE structure by a line such as

```
300 FOR I=0 TO 1 STEP 0
```

which will count by zeros for a very long time, until it reaches one. The real way out is tested for in the body of the loop. When discovered, simply set I equal to 1. For example,

```
360 IF Z=13 THEN I=1: REM CARRIAGE RETURN
```

Getting Around GET

As the program was originally written, the GET statement was used to retrieve the characters of the program names one at a time from the directory sectors of the disk. This made the program rather slow. In a worst case, a Commodore 8050 disk drive containing the maximum 224 programs for that format took almost two minutes to read the directory. I tried writing RETURN characters, CHR$(13), into the directory so that I could use the faster INPUT statement instead. However, this caused funny-looking directories and created problems where there were 13's in the directory that were not RETURNs (such as references to track 13 or sector 13).

I considered storing the directory entries in a sequential file on the disk, and then having my program read the file instead of the directory sectors. This approach would have required an additional program to create the sequential file and to update the file whenever a new program was saved on the disk. In addition to these complications, it seemed unappealing to use up disk space with a file containing information that was already on the disk.

The only other approach in BASIC was to read in the directory sectors and create DATA statements to be added to the Super Directory program, but this again required a second program to generate the DATA statements and update them as new programs were saved to the disk.

The only way to achieve a truly significant increase in speed was to read the directory information from the disk with machine language. Fortunately, I did not have to write the machine language program to do this. Jim Butterfield's "String Thing" (COMPUTE!, November 1982) is a machine language (ML) routine which reads information from the disk into a variable. It functions like a very fast INPUT#. I modified the routine to read the entire contents of a disk sector into a string variable (lines 6000–6100). Lines 6000–6010 create a 254 character-long variable called IN$. The ML routine puts data into the first variable in the program, so it's important that IN$ be set up before any other variables are mentioned. Lines 6020–6030 let the program know whether it's operating in a 64 or a PET/CBM, then lines 6040–6060 load the DATA for the modified String Thing, adjusting it as necessary for the particular computer.

The increase in speed using this approach is dramatic. With a typical PET disk, the time required to load the directory was cut from about 45 seconds to only 8 seconds. The worst case (full 8050 disk) time dropped from 2 minutes to less than 15 seconds. Loading times are slightly longer for the 1541 disk used with the 64, due to its serial communications, but the increase in speed provided by the machine language is even more significant.

On To The Directory

First a quick run-through of the program blocks. The first line jumps to line 1000. This is designed as a time-saver, allowing room at the top for frequently used subroutines. It also mimics the Pascal requirement that all routines and proce-

dures be defined before the body of the program. The most common routine, lines 1 and 2, is the get-character routine. Disk error check, lines 10–20, is next and uses the error channel, not DS$, in order to be compatible with earlier versions.

The main video selector (or penless light) starts at line 100. It in turn calls supportive routines at line 500 and line 600. Before this can be used, the clear display routine at line 900 is called by the main program.

Two other routines are called only once and they have been placed after the program body, to help with readability. The routine at line 2000 reads the disk header and determines the type of disk being used. It then goes to the beginning of the directory and reads the program names into an array. If you have an 8050 disk drive, you'll need to replace the following lines:

```
2040 FO=ASC(IN$):IF (FO AND 3)=3 THEN 210
     Ø
2100 HE$=MID$(IN$,5,16)+", 8050 FORMAT"
2110 SYS 896:SYS 896
2120 SE=28
```

Line 2900 allows you to define the disk drive to be used. This defaults to drive 0, unit 8. If you delete line 2910, lines 2920–2940 will then allow you to select the device and drive number each time the program is run.

The program has two possible outcomes, and thus concludes in the sections beginning at either line 3000 or line 5000. If the search was unsuccessful, lines 3000–3050 give the options of restarting the current disk (the directory does not have to be read again from disk, as the array with program names has not been disturbed); of starting over with a new disk; or of quitting the search. A successful search takes us to line 5000, which loads and runs the chosen program via the dynamic keyboard method.

If you don't want to type in the program, I'll make copies (PET/CBM/64 version only). Send $3, a disk (8050 or 4040/1541 format), and a stamped, self-addressed mailer to:

Michael A. Contino
Dept. of Mathematics & Computer Science
Cal State University, Hayward
Hayward, CA 94542

Program 1: Super Directory For PET/64

64 users should refer to the "Automatic Proofreader" article before typing this program in. PET/CBM owners should ignore the :rem at the end of each line.

```
Ø GOTO 1ØØØ                                :rem 42
1 GETZ$:IF Z$="" THEN 1                    :rem 183
2 RETURN                                   :rem 18
1Ø INPUT#15,ER,ER$:IF ER=Ø THEN RETURN
                                           :rem Ø
2Ø PRINT"DISK ERROR #"ER:PRINT ER$:END:RE
   TURN                                    :rem 79
1ØØ PRINT"{HOME}{3 DOWN}":FOR I=Ø TO 15:F
    OR J=Ø TO NC:PRINTTAB(J*2Ø);V$(I+J*16
    );                                     :rem 233
11Ø NEXT J:PRINT:NEXT I                    :rem 164
12Ø POKE XB,Ø:RL=Ø:CL=Ø:GOSUB 6ØØ:rem 131
13Ø FOR I=Ø TO 1 STEP Ø:GOSUB 1:Z=ASC(Z$)
    :TC=CL:TR=RL:FOR J=Ø TO 1 STEP Ø
                                           :rem 67
14Ø IF(ZAND127)=29 THEN CL=(CL+1+2*(Z=157
    ))AND NC                               :rem 139
15Ø IF(ZAND127)=17 THEN RL=(RL+1+2*(Z=145
    ))AND 15                               :rem 121
16Ø IF Z=13 THEN I=1                        :rem 7
17Ø IF V$(RL+CL*16)<>B$ THEN J=1 :rem 162
18Ø NEXT:IF(TC<>CL)OR(TR<>RL) THEN GOSUB
    {SPACE}5ØØ                             :rem 134
19Ø NEXT:RETURN                            :rem 243
5ØØ POKE XA,TR+3:PRINT:PRINTTAB(TC*2Ø);V$
    (TR+16*TC)                             :rem 1Ø1
6ØØ POKE XA,RL+3:PRINT:PRINTTAB(CL*2Ø);"
    {RVS}";V$(RL+16*CL):RETURN             :rem 241
9ØØ FOR I=1 TO NV:V$(I)=B$:NEXT:RETURN
                                           :rem 2
1ØØØ PRINT"{2 HOME}{CLR}":GOSUB 6ØØØ
                                           :rem 2Ø3
1Ø1Ø NC=1:IF PEEK(213)=79 THEN NC=3
                                           :rem 115
1Ø2Ø NV=(NC+1)*16-1:GOSUB 2ØØØ:B$="
     {19 SPACES}":DIMV$(NV)                :rem 241
11ØØ NP=Ø:SL=1:V$(Ø)="NEXT PAGE":PRINT"
     {CLR}{DOWN}{RVS}"HE$                  :rem 152
1111 SL=SL+NP:NP=MA-SL+1:IF NP>NV THEN NP
     =NV                                   :rem 2Ø1
1121 IF NP=Ø THEN 3ØØØ                      :rem 8Ø
1131 GOSUB 9ØØ:FOR I=1 TO NP:V$(I)=PR$(SL
     +I-1):NEXT                            :rem 131
1141 GOSUB 1ØØ:IF CL+RL=Ø THEN 1111
                                           :rem 87
1151 GOTO 5ØØØ                             :rem 197
2ØØØ GOSUB 29ØØ:MA=Ø                       :rem 66
2Ø1Ø OPEN 15,UN,15,"I"+DR$:GOSUB 1Ø
                                           :rem 117
2Ø2Ø OPEN 1,UN,3,"$"+DR$                   :rem 2Ø6
2Ø3Ø SYS 896                               :rem 1Ø7
2Ø4Ø FO=ASC(IN$):IF (FO AND 3)=1 THEN 21Ø
     Ø                                     :rem 144
2Ø5Ø CLOSE 1:CLOSE 15:PRINT"BAD DISK FORM
     AT":END                               :rem 91
21ØØ HE$=MID$(IN$,143,16)                  :rem 18
2111 IF FO>1 THEN SE=18:HE$=HE$+", 1541/4
     Ø4Ø FORMAT":GOTO 22ØØ                 :rem 25Ø
2121 IF FO=1 THEN SE=19:HE$=HE$+", 2Ø4Ø F
     ORMAT"                                :rem 2ØØ
22ØØ DIM PR$(SE*8):FOR I=1 TO SE:SYS 896
                                           :rem 162
2211 FOR J=1 TO 254 STEP 32:A=ASC(MID$(IN
     $,J)) AND 127                         :rem 16
2221 IF A=2 THEN MA=MA+1:PR$(MA)=MID$(IN$
     ,J+3,16)                              :rem 118
2231 NEXT J                                :rem 8Ø
2241 IF ST THEN I=SE                       :rem 75
2251 NEXT I                                :rem 81
2261 CLOSE 1:CLOSE 15:RETURN               :rem 161
29ØØ UN=8:DR=Ø:DR$="Ø"                     :rem 197
2911 RETURN                                :rem 172
2921 PRINT"UNIT #{2 SPACES}";UN;:INPUT"
     {4 LEFT}";UN                          :rem 122
2931 PRINT"DRIVE #{2 SPACES}";DR;:INPUT"
     {4 LEFT}";DR:IF DR*(DR-1) THEN 2931
                                           :rem 1Ø2
2941 DR$=STR$(DR):RETURN                   :rem 228
3ØØØ GOSUB 9ØØ:PRINT"{CLR}{DOWN}NO MORE P
     ROGRAMS ON DISK.{2 SPACES}OPTIONS AR
     E:                                    :rem 216
```

```
3020 V$(0)="SEE NEW DISK":V$(2)="RESTART
     {SPACE}THIS DISK":V$(4)="QUIT"
                                    :rem 112
3030 GOSUB 100:IF RL=0 THEN RUN    :rem 207
3040 IF RL=2 THEN 1100             :rem 84
3050 PRINT"{CLR}":END              :rem 61
5000 PRINT"{CLR}{2 DOWN}LOAD";CHR$(34);V$
     (RL+16*CL);CHR$(34);",";UN:PRINT"
     {4 DOWN}RUN{HOME}";           :rem 93
5010 IF XA=214 THEN POKE 631,13:POKE 632,
     13:POKE XB,2:END              :rem 80
5020 POKE 623,13:POKE 624,13:POKE 158,2:E
     ND                            :rem 44
6000 IN$="ZZ":FOR I=1 TO 6:IN$=IN$+IN$:NE
     XT                            :rem 179
6010 IN$=MID$(IN$,2):IN$=IN$+IN$   :rem 250
6020 IF PEEK(65535)=255 THEN XA=214:XB=19
     8:GOTO 6040                   :rem 58
6030 XA=216:XB=158                 :rem 231
6040 FOR I=896 TO 929:READ X$:IF LEFT$(X$
     ,1)<>"A" THEN 6060            :rem 51
6050 X$=STR$(VAL(RIGHT$(X$,LEN(X$)-1))+3*
     (XA=216))                     :rem 19
6060 POKE I,VAL(X$):NEXT           :rem 153
6070 RETURN                        :rem 173
6080 DATA 160,2,177,A45,153,A137,0,200,19
     2,6,208,246,162               :rem 226
6090 DATA 1,32,198,255,32,228,255,164,A14
     2,145,A140,200                :rem 179
6100 DATA 132,A142,196,A139,208,242,76,20
     4,255                         :rem 254
```

Program 2: Super Directory For VIC

Refer to the "Automatic Proofreader" article before typing this program in.

```
0 GOTO1000                         :rem 42
1 GETZ$:IFZ$=""THEN1               :rem 183
2 RETURN                           :rem 18
10 INPUT#15,ER,ER$:IFER=0THENRETURN:rem 0
30 PRINT"DISK ERROR #"ER:PRINTER$:END:RET
   URN                             :rem 80
50 FORI=1TOSK:GET#1,A$:NEXT:RETURN
                                   :rem 214
70 NA$="":FORK=1TO16:GET#1,A$:NA$=NA$+A$:
   NEXTK:RETURN                    :rem 201
100 PRINT"{HOME}{3 DOWN}":FORI=0TO15:PRIN
    TV$(I):NEXT                    :rem 220
180 POKE198,0:RL=0:GOSUB600        :rem 91
300 FORI=0TO1STEP0:GOSUB1:Z=ASC(Z$):TR=RL
    :FORJ=0TO1STEP0                :rem 165
340 IF(ZAND127)=17THENRL=(RL+1+2*(Z=145))
    AND15                          :rem 122
360 IFZ=13THENI=1                   :rem 9
370 IFV$(RL)<>B$THENJ=1            :rem 89
380 NEXT:IF(TR<>RL)THENGOSUB500    :rem 246
410 NEXT:RETURN                    :rem 238
500 POKE214,TR+3:PRINT:PRINTV$(TR)
                                   :rem 138
600 POKE214,RL+3:PRINT:PRINT"{RVS}"V$(RL)
    :RETURN                        :rem 235
900 FORI=1TONV:V$(I)=B$:NEXT:RETURN:rem 2
1000 PRINT"{2 HOME}{CLR}":IFPEEK(50003)=0
     THENNEW                       :rem 8
1030 NV=15:GOSUB2000:B$="{19 SPACES}":DIM
     V$(NV)                        :rem 43
1150 NP=0:SL=1:V$(0)="NEXT PAGE":PRINT"
     {CLR}{DOWN}{RVS}"HE$          :rem 157
1200 SL=SL+NP:NP=MA-SL+1:IFNP>NVTHENNP=NV
                                   :rem 201
1220 IFNP=0THEN3000                :rem 81
1250 GOSUB900:FORI=1TONP:V$(I)=PR$(SL+I-1
     ):NEXT:GOSUB100:IFCL+RL=0THEN1200
                                   :rem 81
1650 GOTO5000                      :rem 202
2000 GOSUB2900:MA=0:OPEN15,UN,15,"I"+DR$:
     GOSUB10:OPEN1,UN,3,"$"+DR$    :rem 114
2060 GET#1,FO$:FO=ASC(FO$+""):SK=141:IFFO
     =67THENSK=3                   :rem 45
2110 GOSUB50:GOSUB70:HE$=NA$:SK=96:SE=19+
     (FO>1):IFFO=67THENSK=742:SE=28
                                   :rem 74
2140 GOSUB50:SK=11:DIMPR$(SE*8)    :rem 72
2330 FORI=1TOSE:FORJ=1TO8:IFSTTHENI=SE:J=
     8:GOTO2440                    :rem 72
2360 GET#1,B$:GET#1,A$:GET#1,A$:GOSUB70:I
     FB$=CHR$(130)THENMA=MA+1:PR$(MA)=NA$
                                   :rem 181
2420 GOSUB50:IFJ<>8THENGET#1,A$:GET#1,A$
                                   :rem 101
2440 NEXTJ,I:CLOSE1:CLOSE15:RETURN
                                   :rem 217
2900 INPUT"UNIT #{2 SPACES}8{3 LEFT}";UN
                                   :rem 239
2950 INPUT"DRIVE #{2 SPACES}0{3 LEFT}";DR
     :IFDR*(DR-1)THEN2950          :rem 230
2960 DR$=STR$(DR):RETURN           :rem 230
3000 GOSUB900:V$(4)="QUIT":PRINT"{CLR}
     {DOWN}NO MORE PROGRAMS ON DISK.
     {2 SPACES}OPTIONS ARE:        :rem 213
3030 V$(0)="SEE NEW DISK":V$(2)="RESTART
     {SPACE}THIS DISK":GOSUB100:IFRL=0THE
     NRUN                          :rem 183
3080 IFRL=2THEN1150                 :rem 93
3090 PRINT"{CLR}":END               :rem 65
5000 PRINT"{CLR}{2 DOWN}LOAD"CHR$(34)V$(R
     L)CHR$(34)","UN:PRINT"{5 DOWN}RUN
     {HOME}";                      :rem 252
5020 POKE631,13:POKE632,13:POKE198,2:END
                                   :rem 46
```

Program 3: Super Directory For Atari

Refer to the "Automatic Proofreader" article before typing this program in.

```
JJ 100 REM SUPER DIRECTORY
OB 105 DIM DN$(19)
BL 107 DN$="DISK NAME"
DC 110 GRAPHICS 0:ENT=0:CHANGED=0
NM 115 GOSUB 5000
NE 120 DL=PEEK(560)+PEEK(561)*256+4
GD 130 POKE DL-1,7+64:POKE DL+2,6:POKE
       DL+4,13:POKE DL+24,13
LI 140 SETCOLOR 4,9,4:SETCOLOR 1,0,10
HP 150 SETCOLOR 0,1,10:POKE 752,1
BO 160 ? "super  directory"
IL 170 DIM FL$(40*64),T$(40),F$(40),DS
       C$(40*64),CDN$(20),FREE$(17)
GC 180 TRAP 200
LJ 190 OPEN #1,6,0,"D:*.*":TRAP 40000:
       GOTO 210
OP 200 ? "Can't read directory.  Error
        #";PEEK(195):END
PG 210 INPUT #1,T$:IF LEN(T$)<17 THEN
       250
FF 220 NF=NF+1
GH 230 FL$(NF*40-39,NF*40-26)=T$:FL$(N
       F*40-25)="{30 SPACES}"
GC 240 GOTO 210
JG 250 CLOSE #1:FREE$=T$
MC 260 TRAP 270:OPEN #1,4,0,"D:DESCR.D
       IR":TRAP 40000:GOTO 280
```

Super Directory For Atari

Charles Brannon,
Program Editor

"Super Directory" is an easy-to-use menu program for selecting and running BASIC programs from disk. In addition, it alleviates the limitations of Atari's eight-character filename by storing a 20-character description of each filename.

Type in Program 3 and SAVE a copy of Super Directory on every disk you want to use it with (you may want to call it MENU). You can change line 107 to name your disk. This name will appear at the top of the menu program when RUN.

When you first RUN Super Directory, it will read in the disk directory and display it on the screen. A large, wide cursor will be resting on top of the first filename in the directory. You can move the cursor up or down with the arrow keys, but you do not have to hold down CTRL. You can also use a joystick to move the cursor up or down.

If the directory will not fit on one screen, it will scroll upward as you push the cursor "past" the bottom of the screen. You can also scroll the screen down when the cursor is at the top of the screen. Press any key to select the file, or use the joystick trigger button.

You will switch to another screen, where you are given three choices: press START to RUN the program, press SELECT to change the description, and OPTION to save the descriptions. You can also press RETURN to skip these choices and return to the menu.

Making Sense Of Filenames

You probably noticed that the second column on the screen said "no description" for all the filenames. This is because you haven't entered any yet. If you press SELECT while you are on the other screen, you can enter a description, up to 20 characters. You can enter anything you want here that will help you make sense of filenames like ASKRD.TXT, WMAKER, HAWKMEN, or EASMD.COM.

The description file is saved to the disk under the filename DESCR.DIR. If you delete it, your descriptions are gone. Every time you RUN Super Directory, it will match up each description with each directory entry. If you move a file around on the directory, it will still be matched up with the proper description. Super Directory also has to skip over descriptions that once applied to deleted files. This correlation process takes a few seconds before the menu first appears.

Verify Your Update

You can press OPTION on the second screen to insure that the description file is updated after you change it. It will also be automatically written out if you press START to run a program.

There are some files, like DOS.SYS, that you cannot run, obviously. Super Directory only lets you run BASIC programs that have been SAVEd (not LISTed) to disk. If you try to run any other kind of file, or if there is some kind of disk error, Super Directory will so inform you, then reRUN itself.

Thanks to the description file, Super Directory is more than a mere menu program. It can help you catalog your disks, and get around the eight-character filename limitation.

```
OJ 270 FOR I=1 TO NF:FL$(I*40-22,I*40)
       ="no description  ":NEXT I:CLOS
       E #1:GOTO 310
NJ 280 TRAP 290:INPUT #1,F$:ENT=ENT+1:
       DSC$(ENT*40-39)="{38 SPACES}"
FB 285 DSC$(ENT*40-39,ENT*40)=F$:GOTO
       280
GF 290 CLOSE #1
KM 291 FOR I=1 TO NF:IX40=I*40:IX2=IX4
       0-39
CM 292 T$=FL$(IX2)
MH 293 FOR J=1 TO ENT
AG 294 F$=DSC$(J*40-39)
HM 295 IF T$(1,13)<>F$(1,13) THEN NEXT
        J:GOTO 297
FJ 296 FL$(IX2,IX40)=F$:GOTO 300
HC 297 FL$(IX40-22,IX40)="no descripti
       on"
BL 300 NEXT I
EE 310 ENT=NF:LIM=NF:IF LIM>19 THEN LI
       M=19
HJ 311 CDN$="  ":CDN$(19)="  ":CDN$(2)=C
       DN$:Z=11-LEN(DN$)/2:CDN$(Z,Z+LE
       N(DN$))=DN$
HG 330 POSITION 20,0:? CDN$;
BE 335 ? "File name EXT{3 SPACES}Descr
       iption{10 SPACES}"
NN 337 COLOR 21:PLOT 2,2:DRAWTO 38,2:P
       LOT 2,22:DRAWTO 38,22:POSITION
       2,3
LK 340 FOR I=1 TO LIM
LG 350 F$=FL$(I*40-39)
KO 360 ? "  ";F$(3,10);"  ";F$(11,13);"
        ";F$(18,38)
AG 370 NEXT I:CURR=1
GE 380 Y=3
```

```
ME 390  F$=FL$(CURR*40-39):T$=F$(3,10):
        T$(9)=" ":T$(10)=F$(11,13):T$(1
        3)="   ":T$(15)=F$(18,38):F$=T$
FC 400  A=USR(ADR(M$),ADR(T$),13)
DH 425  POSITION 2,Y:? " ";T$
NH 430  ST=STICK(0):S=PEEK(764):IF S=25
        5 AND PEEK(53279)=7 AND ST=15 A
        ND STRIG(0) THEN 430
NE 435  SOUND 0,20,10,8
CG 440  POSITION 2,Y:? " ";F$
JK 445  IF PEEK(53279)<7 OR S=12 OR STR
        IG(0)=0 THEN POKE 764,255:GOTO
        500
DB 450  IF (S=15 OR ST=13) AND CURR+1<=
        ENT THEN Y=Y+1:CURR=CURR+1:IF Y
        >LIM+2 THEN ? "{INS LINE}";:POS
        ITION 2,3:? "{DEL LINE}":Y=Y-1
IF 460  IF (S=14 OR ST=14) AND CURR>1 T
        HEN Y=Y-1:CURR=CURR-1:IF Y<3 TH
        EN POSITION 2,3:? "{INS LINE}";
        :POSITION 2,22:? "{DEL LINE}";:
        Y=Y+1
DK 470  SOUND 0,0,0,0:POKE 764,255
HC 490  GOTO 390
GC 500  SOUND 0,0,0,0
MD 505  ? "{CLEAR}";F$(1,12):POSITION 2
        ,20:? FREE$:POSITION 2,8
OL 510  ? :? "Press START to run pro
        gram."
CI 520  ? :? "Press SELECT to do desc
        ription."
JF 525  ? :? "Press OPTION to save de
        scriptions."
BA 527  ? :? "Press RETURN to return
        to menu."
CN 530  POKE 53279,0
EC 540  CONSOLE=PEEK(53279):K=PEEK(764)
AA 550  IF CONSOLE<7 OR K=12 THEN 600
GJ 560  IF PEEK(20)<30 THEN 540
AO 570  POKE 755,2-PEEK(755)
JF 580  POKE 20,0:GOTO 530
JG 600  POKE 755,2:POKE 764,255
NM 605  IF K=12 THEN 710
LD 610  IF CONSOLE<>6 THEN 650
NC 620  T$="D:":T$(3)=F$(1,8)
EL 625  FOR I=1 TO LEN(T$):IF T$(I,I)<>
        " " THEN NEXT I
LO 627  POP :IF ASC(F$(10))>32 THEN T$(
        I)=".":T$(I+1)=F$(10,12)
EJ 628  GOSUB 1000:IF T$="D:DOS.SYS" TH
        EN DOS
MM 630  TRAP 640:GRAPHICS 0:RUN T$
OL 640  T$="Can't run program. Error #"
        :T$(LEN(T$)+1)=STR$(PEEK(195)):
        A=USR(ADR(M$),ADR(T$),LEN(T$))
CE 645  POSITION 2,18:? T$;:FOR W=1 TO
        500:NEXT W:RUN
LE 650  IF CONSOLE<>5 THEN 720
FC 660  ? "{CLEAR}";F$(1,12)
LB 670  ? "{5 DOWN}Edit message below (
        max 20 characters)":POKE 752,0
DC 680  T$=F$(15,34):? " ";T$:? " -----
        ----------{2 UP}":INPUT T$
PG 685  IF T$="" THEN 660
PB 690  IF LEN(T$)<20 THEN T$(LEN(T$)+1
        )="{20 SPACES}"
OH 695  IF LEN(T$)>20 THEN T$=T$(1,20)
GC 697  IF T$<>F$(15,34) THEN CHANGED=1
AI 700  FL$(CURR*40-22,CURR*40)=T$:POKE
         752,1
KF 710  ? "{CLEAR}super  directory":GOT
        O 330
DF 720  GOSUB 1000:IF  NOT CHANGED THEN
         POSITION 2,4:? "Descriptions U
        nchanged"
GP 725  GOTO 530
GL 1000 REM SAVE DESCRIPTIONS
DP 1005 IF  NOT CHANGED THEN RETURN
LN 1010 TRAP 1030
BC 1020 OPEN #1,8,0,"D:DESCR.DIR":TRAP
         40000:GOTO 1040
HD 1030 CLOSE #1:T$="Error #":T$(8)=ST
        R$(PEEK(195)):A=USR(ADR(M$),AD
        R(T$),LEN(T$)):POSITION 2,6:?
        T$:RETURN
EH 1040 FOR I=1 TO ENT:CURR=I-1
JM 1050 PRINT #1;FL$(CURR*40+1,CURR*40
        +39)
EP 1060 NEXT I
KM 1070 CLOSE #1:RETURN
MF 5000 DIM M$(40)
LJ 5010 M$="h{B}{I}{E}hh{E}{A}'h
        {E}h{E}K"
KI 5020 M$(LEN(M$)+1)="hh{E}M{,}{I}
        {I}{}{Q}KHDMPL'{2 ,}"
KI 5030 RETURN
```

Program 4: Super Directory For PC And PCjr

```
100 'Super Directory for The IBM Persona
l Computer
110 'for monochrome or color adaptor, 80
 columns
120 SCREEN 0,0,0:WIDTH 80:COLOR 7,0:CLS:
DEFINT A-Z:KEY OFF:FOR I=1 TO 10:KEY I,"
":NEXT
130 CR$=CHR$(17)+CHR$(196)+CHR$(217)
140 PRINT"Welcome to ";:COLOR 15:PRINT"S
uper Directory":COLOR 7
150 'Remove the word REM from following
line for automatic use with drive A
160 REM DRIVE$="A:":FSPEC$="A:*.*":GOTO
200
170 PRINT:PRINT "Select Drive: (";:COLOR
 16,15:PRINT"A B";:COLOR 7,0:PRINT CHR$(
29);CHR$(29);"/";CHR$(28);")"
180 DRIVE$=INKEY$+":":A=ASC(DRIVE$):IF (
A OR 32)<97 OR (A OR 32)>98 THEN 180
190 DRIVE$=CHR$(A AND 223)+":":FSPEC$=DR
IVE$+"*.*"
200 GOSUB 5000:CLS:COLOR 23:PRINT"Readin
g description file"
210 DIM D$(ENTRIES):FOR I=0 TO ENTRIES:D
$(I)=CHR$(9)+"--" :NEXT
220 ON ERROR GOTO 310
230 OPEN DRIVE$+"DESCR.DIR" FOR INPUT AS
 #1
240 LINE INPUT #1,DISKNAME$:LINE INPUT#1
,A$:NUMREC=VAL(A$)
250 FOR ITEMS=0 TO NUMREC
260   LINE INPUT #1,F$:LINE INPUT#1,D$
270   FOR I=0 TO ENTRIES
280     IF F$=F$(I) THEN D$(I)=D$
290     NEXT:NEXT
300 GOTO 320
310 RESUME 320
320 CLOSE#1:ON ERROR GOTO 0
330 PAGES=INT(ENTRIES/10)
340 CURR=0
350 START=CURR*10:FINISH=START+9:IF FINI
SH>ENTRIES THEN FINISH=ENTRIES
```

IBM Notes: Super Directory

Charles Brannon, Program Editor

To use Super Directory, you'll need an IBM PC with at least 64K, and either a monochrome or color adaptor. Super Directory will also work on the Expanded PCjr with Cartridge BASIC.

If you're not a programmer, you may find working with your PC to be a bit perplexing at times. You turn on your system, wait 45 seconds, face the cryptic A› prompt, enter BASIC, then RUN "filename" to start a BASIC program. It would be much easier if you had a list of all the programs and could run any one by just pressing a function key.

Super Directory is your solution. When you RUN it, it will give you a list of all the files on your disk. To run any displayed program, press the appropriate function key, then press the enter key (designated with a crooked arrow). Super Directory only displays ten files at a time. If there are more than ten files, you can press Pg Dn (the number 3 on the numeric keypad, if you have NUMLOCK on) to go on to the next page. You can also page backwards with Pg Up.

There's more to Super Directory, though. The 11-character filename length offered by PC-DOS does not allow very descriptive names for your files. How can you make sense of names like QTESTV1.BAS? Using Super Directory, you can label each filename with a 61 character description. Super Directory keeps the description with the filename, and displays it every time you go back to Super Directory.

To enter a description, press the appropriate function key for the file you wish to describe, then press the SPACE bar. The last line of the screen will always tell you what to do. The first time you try to describe a file, you will be asked for the disk name. Once you've entered a descriptive name for the disk, Super Directory remembers it and will no longer ask you for it. You can then enter or edit the description.

After you enter a description, the screen will be re-drawn, and you will be able to see the description you've given to a file name. If you go back to redo a description, it will be displayed. You can type over it, or move the cursor to edit the description. Remember to put the cursor at the end of the line when you are through editing (you can use the END key to skip to the end of the line).

When you run a program from the menu, the descriptions will be written to disk first. If you just want to write out the descriptions without running a program, you can press ESC from the main menu. You will see the line:

1. Exit to BASIC 2. Exit to DOS 3. Re-Run
4. Save Descriptions 5. Menu

Press 4 to save the descriptions to disk. The descriptions will be saved to disk under the filename "DESCR.DIR". Don't DELete this or you will lose your descriptions. You can also use the other options to return to BASIC, DOS, or re-RUN Super Directory. Pressing 5 will take you back to the main menu (if you pressed ESC by mistake, say).

Super Directory will detect errors and prompts you to press ENTER. You'll usually be returned to the main menu. Don't try to run a program which is not BASIC, however. You'll probably get the message "Direct Statement in File" and find that Super Directory has disappeared.

You can make Super Directory completely automatic. If you don't have BASIC on your disk, you can use COPY from DOS. Then enter this one line command to have BASIC and Super Directory come up automatically when you turn on your PC:

```
OPEN "AUTOEXEC.BAT" FOR OUTPUT AS
#1:PRINT#1,"BASIC SUPERDIR":CLOSE#1
```

This assumes that you've saved Super Directory to the same disk with the command SAVE "SUPERDIR". Super Directory will normally ask you which drive you want to list from. If you only have one drive, or want to always look at drive A:, remove the keyword REM from line 160. Leave the rest of the line in place. Now you can add a flexible, easy to use menu to any disk. Super Directory makes it easy enough for a child to use!

```
360 CLS:COLOR 0,15:PRINT STRING$(80,32):
LOCATE 1,2:PRINT"Super Directory";TAB(70
);"Drive ";DRIVE$:LOCATE 1,40-LEN(DISKNA
ME$)/2:PRINT DISKNAME$:PRINT
370 FOR I=START TO FINISH
380 COLOR 0,15:PRINT "F";LEFT$(MID$(STR$
(1+I-START),2)+" ",2);:COLOR 15,0:PRINT
" ";F$(I);TAB(18);:COLOR 7:PRINT D$(I):P
RINT STRING$(80,196);
390 NEXT
```

```
400 LOCATE 25,1:COLOR 15,0:PRINT"Press "
;:COLOR 0,15:PRINT"F1";:COLOR 15,0:PRINT
" to ";:COLOR 0,15:PRINT "F";MID$(STR$(1
+FINISH-START),2);:COLOR 15,0:PRINT" to
select program.  Press PgUp or PgDn to p
age, ESC to quit.";
410 LOCATE 23,32:PRINT"Page #";CURR+1;"o
f";PAGES+1
420 A$=INKEY$:IF A$="" THEN 420
430 IF A$<>CHR$(27) THEN 540
440 LOCATE 25,1:PRINT SPACE$(79);:LOCATE
 25,1:PRINT"  1. Exit to BASIC  2. Exit
to DOS  3. Re-RUN  4. Save descriptions
 5. Menu";
450 A$=INKEY$:IF A$<"1" OR A$>"5" THEN 4
50
460 ON VAL(A$) GOTO 470,480,490,500:GOTO
 350
470 COLOR 7:CLS:END
480 SYSTEM
490 RUN
500 ON ERROR GOTO 510:GOSUB 1000:GOTO 35
0
510 BEEP:LOCATE 25,1:PRINT SPACE$(79);:L
OCATE 25,1:COLOR 31:PRINT"Can't save des
criptions.  ";:COLOR 7:PRINT"Press ";CR$
;" to continue.";
520 IF INKEY$<>CHR$(13) THEN 520
530 RESUME 350
540 IF A$=CHR$(0)+CHR$(81) THEN CURR=-(C
URR+1)*(CURR<PAGES):GOTO 350
550 IF A$=CHR$(0)+CHR$(73) THEN CURR=CUR
R-1:CURR=CURR-(PAGES+1)*(CURR<0):GOTO 35
0
560 A=ASC(MID$(A$+"0",2))-59:IF A<0 OR A
>FINISH-START THEN BEEP:GOTO 420
570 LOCATE 25,1:PRINT SPACE$(79);:LOCATE
 25,1:PRINT"Press ";CR$;" to run program
, ESC to return to menu, SPACE to do des
cription.";
580 LOCATE 3+A*2,5:COLOR 31:PRINT F$(STA
RT+A);:COLOR 15
590 A$=INKEY$:IF A$<>CHR$(13) AND A$<>CH
R$(27) AND A$<>CHR$(32) THEN 590
600 IF A$=CHR$(27) THEN LOCATE 3+A*2,5:P
RINT F$(START+A);:GOTO 400
610 IF A$<>CHR$(32) THEN 670
620 IF DISKNAME$="" THEN LOCATE 25,1:PRI
NT SPACE$(79);:LOCATE 25,1:LINE INPUT;"E
nter name of disk : ";DISKNAME$ :GOTO 62
0
630 LOCATE 25,1:PRINT SPACE$(79);:LOCATE
 25,1:Z=START+A:PRINT "Description :";D$
(Z);:LOCATE 25,15:LINE INPUT ;D$(Z):D$(Z
)=LEFT$(" "+D$(Z),62):GOTO 350
640 LOCATE 25,1:PRINT SPACE$(79);:BEEP:C
OLOR 31:LOCATE 25,1:PRINT"Cannot save de
scriptions to disk.  ":COLOR 7:PRINT"Run
 program anyway? (Y/N):";:COLOR 7
650 A$=INKEY$:IF A$<>"y" AND A$<>"Y" AND
 A$<>"n" AND A$<>"N" THEN 650
660 IF A$="y" OR A$="Y" THEN RESUME 680
ELSE RESUME 350
670 ON ERROR GOTO 640:GOSUB 1000
680 ON ERROR GOTO 690:COLOR 7:CLS:RUN DR
IVE$+F$(START+A)
690 LOCATE 25,1:PRINT SPACE$(79):COLOR 2
3:BEEP:PRINT"Cannot run ";F$(A);".  ";:C
OLOR 7:PRINT"Press ";CR$;" to continue..
.";
700 IF INKEY$<>CHR$(13) THEN 700
710 RESUME 350
720 END
1000 'Save descriptions to disk
1010 OPEN DRIVE$+"DESCR.DIR" FOR OUTPUT
AS #1
1020 PRINT#1,DISKNAME$;CHR$(13);ENTRIES;
CHR$(13);
1030 FOR I=0 TO ENTRIES:PRINT#1,F$(I);CH
R$(13);D$(I);CHR$(13);:NEXT
1040 CLOSE #1:ON ERROR GOTO 0:RETURN
1050 '
5000 'This subroutine reads disk directo
ry into a string array
5010 'Enter with FSPEC$, the file spec f
or the FILES command
5020 'Exits with array F$, and NUMFILES,
 the number of files
5030 'uses a temporary array, TT$, which
 is ERASEd after use
5040 '
5050 DEF SEG=0:WIDTH 80
5060 HEAD=1050:TAIL=1052:BUFFER=1054
5070 CLS:COLOR 23,0,0:PRINT"Reading disk
 directory"
5080 COLOR 0:ON ERROR GOTO 5100
5090 FILES FSPEC$:ON ERROR GOTO 0:GOTO 5
110
5100 BEEP:COLOR 31:CLS:PRINT"Cannot read
 directory":COLOR 7:ON ERROR GOTO 0:END
5110 DIM TT$(24):LOCATE 3,1:COLOR 7:ROWS
=0
5120 'Put code for End, Enter into keybo
ard buffer:
5130 POKE HEAD,30:POKE TAIL,34:POKE BUFF
ER,0:POKE BUFFER+1,79:POKE BUFFER+2,13:P
OKE BUFFER+3,28
5140 LINE INPUT TT$(ROWS)
5150 IF TT$(ROWS)<>"" THEN ROWS=ROWS+1:G
OTO 5130
5160 IF NOT DIMMED THEN DIM F$(ROWS*4-1)
:DIMMED=1
5170 ROWS=ROWS-1
5180 FOR I=0 TO ROWS
5190  FOR J=0 TO 3
5200    T$=MID$(TT$(I),J*18+1,12)
5210    IF T$<>"" THEN F$(ENTRIES)=T$:EN
TRIES=ENTRIES+1
5220  NEXT J
5230 NEXT I
5240 ERASE TT$:ENTRIES=ENTRIES-1
5250 DEF SEG:RETURN
```

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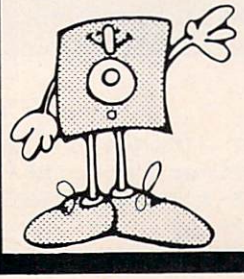

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VISA

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE! are written in a computer language called BASIC. BASIC is easy to learn and is built into most computers (on some computers, you have to purchase an optional BASIC cartridge).

BASIC Programs

Each month, COMPUTE! publishes programs for many machines. To start out, type in only programs written for your machine, e.g., "TI Version" if you have a TI-99/4. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from one computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as {DOWN}. Anything within a set of braces is a special character or characters that cannot easily be listed in a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How To Type COMPUTE!'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always SAVE a copy of your program before you RUN it. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.

2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type COMPUTE!'s Programs" elsewhere in the magazine).

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in COMPUTE! *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on the CAPUTE! page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!, *please send them to Readers' Feedback, P.O. Box 5406, Greensboro, NC 27403.* ©

How To Type COMPUTE!'s Programs

Many of the programs which are listed in COMPUTE! contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: 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.

Commodore PET/CBM/VIC/64

Generally, any PET/CBM/VIC/64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five 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 listings. For example, S would mean to type the S key while holding the shift key. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's). Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

For the VIC and 64, if a key is enclosed in special brackets, [< >], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as indicated.

Rarely, you'll see in a Commodore 64 program a solitary letter of the alphabet enclosed in braces. These characters can be entered by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A.

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following tables when entering special characters:

VIC And 64

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME		{GRN}	CTRL + 6	
{HOME}	CLR/HOME		{BLU}	CTRL + 7	
{UP}	SHIFT + CRSR ↑		{YEL}	CTRL + 8	
{DOWN}	CRSR ↑		{F1}	f1	
{LEFT}	SHIFT + CRSR →		{F2}	f2	
{RIGHT}	CRSR →		{F3}	f3	
{RVS}	CTRL + 9		{F4}	f4	
{OFF}	CTRL + 0		{F5}	f5	
{BLK}	CTRL + 1		{F6}	f6	
{WHT}	CTRL + 2		{F7}	f7	
{RED}	CTRL + 3		{F8}	f8	
{CYN}	CTRL + 4		←	←	
{PUR}	CTRL + 5		↑	SHIFT + ↑	

All Commodore Machines

Clear Screen	{CLR}	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}

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in braces, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

Texas Instruments 99/4

The only special characters used are in PRINT statements to indicate where two or more spaces should be left between words. For example, ENERGY {10 SPACES} MANAGEMENT means that ten spaces should be left between the words ENERGY and MANAGEMENT. Do not type in the braces or the words 10 SPACES. Enter all programs with the ALPHA LOCK on (in the down position). Release the ALPHA LOCK to enter lowercase text.

CAPUTE!

Modifications Or Corrections To Previous Articles

Calorie Cop For Atari And TI

In the Atari version of this activity planning program from the December 1983 issue (p. 52), the GOTO 470 in lines 540 and 552 should be changed to GOTO 475. Also, lines 250 and 420 can be deleted.

In the TI version (Program 3), line 360 can be deleted and the following lines should be added or changed:

```
445 PRINT : :
447 PRINT "(OR HIT ENTER FOR MORE)"
750 IF MIN=0 THEN 870
```

Atari Quatrainment

The characters which appear as ¦ ¦ in line 20020 of Program 1 (February 1984, p. 78) should be the vertical line character, obtained by pressing SHIFT and the = key.

The Beginner's Page: Program Forms

Line 560 from Program 1 of this February column (p. 102) should read:

```
560 DATA GALLONS,3.785,LITERS
```

VIC 3-D Drawing Master

Users of this program (February 1984, p. 146) will encounter a syntax error in line 1803 when attempting to load a picture file from tape. The line should read:

```
1803 IFLEFT$(IN$,1)="T"THENIN=1:GOTO1805
```

64 Sound Tester

There were typographical errors in the corrections to this program (November 1983, p. 187) which appeared in the February "CAPUTE!" page. The modified program lines should have read:

```
310 FOR I=1TO15STEP2: POKEW,X: POKEHF,SO(I
    ,A(2)): POKELF,SO(I+1,A(2))
311 O=O+1: FORN=1TOD(O): NEXT: POKEW,X-1:
    NEXT: FORI=1TO10000: NEXT
```

Hidden 64 Memory

If you use the techniques outlined in this article (January 1984, p. 172) to access the RAM under the Kernal ROM, you should be aware that at least one of the 64's Kernal routines writes to the RAM beneath it. Raymond Quiring notes that the Kernal routine RESTOR at address 65418 ($FF8A) writes to the RAM from 64816–64846 ($FD30–$FD4E). The RESTOR routine is called when the RESTORE key is pressed, or when a BRK instruction is encountered in machine language.

Making Cents

The February "Readers' Feedback" suggestion for a program line which formats numbers as dollars and cents (p. 10) produces improper values in those cases where the number is negative or zero. David Gamache suggests instead the following line, which works for both positive and negative numbers and zero:

```
V$=STR$(X+(.001*SGN(X))):V$=LEFT$(V$,LEN(
V$)-1):IFX=.THENV$="0.00"
```

Program Line Addresses For VIC And 64

The instructions given in January "Readers' Feedback" (p. 10) for appending this program to an existing BASIC program work only for the Commodore 64. For the unexpanded VIC, you should use POKE 44,16 instead of POKE 44,8 in step 4. The proper value for the 3K expanded VIC is POKE 44,4, and with 8K or more expansion you should use POKE 44,18.

VIC Modem Save And Download

There are still bugs in this program (November 1983, p. 215) after the corrections in the January "CAPUTE!" page. Load your version of the terminal program (Program 2 with the data from Program 1 added). Type POKE 45,49:POKE 46,20 and RETURN, then make the following changes and additions, suggested by Larry Flohaug:

```
130 PRINT"{CLR}{DOWN}1-SAVE TO TAPE":PRIN
    T"2-PRINTER":PRINT"3-TAPE & PRINTER"
140 PRINT:PRINT"WHICH?"
170 OPEN4,4:FORK=6656TOPEEK(0)*256+PEEK(1
    ):PRINT#4,CHR$(PEEK(K)AND127);:NEXT
175 PRINT#4:CLOSE4
200 GOTO225
```

After making the modifications, type POKE 45,1:POKE 46,26 and save a copy of the revised program. The test of the Program 1 data in the original article (p. 216) will insure that the data has not been affected by these changes.

Colorbot

When you lose your last man in the VIC or 64 version of this game from the January issue (p. 84), the screen clears immediately. Cliff Tener suggests adding the following line to either version to create a sufficient delay to check your final score:

```
352 FOR T=1 TO 2000: NEXT
```

Atari XL Compatibility Problems

Based on mail we have received, we suspect that the "Polycopy" program from the November 1983 issue will not run properly on any of the new Atari XL computers. The following programs work on the 1200XL, but apparently not on the 600 or 800XL: "Chopperoids" (December 1983), "Demons Of Osiris" (January 1984), and "Circus" (February 1984).

©

NEWS&PRODUCTS

Color Computer Cassette-Based Games

Radio Shack has produced several cassette-based computer games for the TRS-80 Color Computer with Extended BASIC for children seven years of age and older. The three games require joysticks and encourage players to work together.

Peanut Butter Panic! is a two-person game in which players jump for stars to make peanut butter sandwiches. By working together, players are able to catch the most valuable stars.

In *Taxi*, players get behind the wheel of a cab. By maneuvering around the street grids based on city maps, players try to deliver as many passengers as possible before time runs out. When played cooperatively, the game encourages communication and division of labor.

Star Trap is a maze game in which players attempt to trap stars by blocking their paths. Two players working as a team are more effective than one player.

Each of these games is priced at $19.95.

Another game now available from Radio Shack for the Color Computer on tape is *ZAXXON*. The player becomes the pilot of a fighter spacecraft on a mission to meet and destroy the deadly *ZAXXON* robot. Points are scored by destroying a variety of threats from enemy planes, base missiles, firing gun emplacements, and radar towers.

The game sells for $34.95 and requires a joystick.

Tandy Corporation/Radio Shack
1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3300

Games For Apple II, Atari

Kangaroo, Inc., has released two new games, *Jeepers Creatures* and *My House My Home*, both for the Apple II and Atari.

Jeepers Creatures takes children through a zoo of 30 basic animals, with interchangeable heads, torsos, legs, and tails. More than 20,000 different combinations are possible for children to create.

My House My Home is an electronic playhouse. A moving conveyor belt with furniture, pets, and people can be controlled by either a joystick or the keyboard. The user can furnish a cutaway view of a house in a variety of different ways.

Jeepers Creatures and *My House My Home* are priced at $34.95 on disk.

Kangaroo, Inc.
322 South Michigan Avenue
Suite 700
Chicago, IL 60604
(312) 987-9050

Atari Tape Interfaces

RC Systems, Inc., has introduced two models of tape interfaces which allow a standard cassette recorder to be used for loading and saving programs with any of the Atari computers.

The models are the AA-2 and AA-1, the second of which operates with the Atari 400 and 800 computers. The AA-1 has all the features of the AA-2, but incorporates additional circuitry to duplicate and rejuvenate program tapes (a second recorder is required for this).

The assembled and tested AA-2 cassette interface board is priced at $27.95. In kit form, it is available for $19.95. The AA-1 is priced at $39.95; in kit form, $29.95.

RC Systems, Inc.
121 West Winesap Road
Bothell, WA 98012
(206) 771-6883

Filing, Mailing Systems For TI

TI File, *TI Mail*, and *TI File Junior* are three packages developed for the TI-99/4A computer system by Kinetic Designs.

TI File is a multipurpose filing system which allows the user to construct, sort, maintain, and print out a variety of files for home or business.

TI File requires Extended BASIC, 32K memory expansion, and cassette deck. Options include disk drive and printer. It is available on tape for $14.95 and on disk for $17.95. A $2 postage fee should be added.

TI Mail is a mailing list management system which also requires Extended BASIC, 32K memory expansion, and cassette deck. An optional heading allows the user to keep track of expiration dates, scores, or anything else related to those listed. *TI Mail* is available on cassette

for $10.95 or on disk for $13.95. A postage fee of $2 is additional.

TI File Junior is similar to the *TI File*, but requires only a standard 16K TI-99/4A and a cassette deck. It is available on cassette for $9.95, plus a $2 postage fee.

Kinetic Designs
P.O. Box 1585
Orange Park, FL 32067
(904) 264-6777

Desert Game For Apple

Sands of Egypt, a desert adventure game from Datasoft, has been introduced for the Apple II, IIe, and II+ computers.

The game incorporates action with riddles using a split screen image. It follows Lord Charles Buckingham III, a desert traveller, as the player attempts to find hidden treasure by answering a series of riddles and by dodging dangers and obstacles.

The game is priced at $29.95, and is also available for the Atari 400, 800, and 1200 computers.

Datasoft, Inc.
9421 Winnetka Avenue
Chatsworth, CA 91311
(213) 701-5161

Basketball Simulation Game

Electronic Arts has introduced *One-on-One*, a basketball simulation game that pits Boston Celtics star Larry Bird against Julius (Dr. J) Erving of the Philadelphia 76ers.

It is available on disk for the Apple II, II+, and IIe, and will be available this year for the Atari and Commodore 64 computers.

Statistical tables reflecting the players' strengths all over the court have been built into the game. The two players also advised the game creators on their individual strategies and maneuvers. Among the features are a 24-second-shot clock, a game clock, and a scoreboard that shatters when a slam dunk is made. The game also has hot and cold shooting functions, instant replays, and visible measures of player fatigue.

One-on-One has a suggested retail price of $40.

Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7171

Commodore 64 Checkwriting, Accounts Package

COMP-U-CHECK is a checkwriting and accounts servicing package designed for personal or small business applications by Hot Data Software Development.

The package requires a Commodore 64 computer, disk drive, and a printer.

COMP-U-CHECK provides checkwriting, check account balancing, credit account management, letter writing, automatic bill paying, and form letters. Also included are tax time reports, constant balance and totals paid to date, new year accounts reset, and user support through a direct-help phone number.

The package is available on disk for $64.95.

Hot Data Software Development
1021 Lincoln Boulevard
Santa Monica, CA 90403
(213) 393-6405

Popular Games Released

Atari, Inc., has released 12 of its games for competing computers and videogame consoles in a new line of software called ATARISOFT.

The initial entries in the new line include *Centipede, Defender, Dig-Dug, Donkey Kong,*

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Pac-Man, Robotron, Stargate, Picnic Paranoia, Protector, Shamus, Super Storm, and *Galaxian.*

The first seven games will run on the Apple II and IIe, IBM PC, Commodore 64, VIC-20, and Texas Instruments 99/4A computers. The remaining games, except *Galaxian*, will operate on the Texas Instruments machine. *Galaxian, Centipede,* and *Defender* will run on ColecoVision, while *Centipede, Defender,* and *Pac-Man* will operate on Intellivision.

The computer games carry suggested retail prices of $34.95 for disks and $44.95 for cartridges. Suggested retail for the ColecoVision and Intellivision versions is $40.95.

Atari Incorporated
1265 Borregas Avenue
P.O. Box 427
Sunnyvale, CA 94086
(408) 743-4810

War Strategy Games For Apple, Atari, 64

Strategic Simulations Inc. has produced several war strategy games for the Apple, Atari, and Commodore 64 computers.

Carrier Force is a simulation of the four major aircraft carrier battles fought in the Pacific during World War II—Coral Sea, Midway, Eastern Solomons, and Santa Cruz. Every major warship and plane is accounted for and rated in the game. Weather, time of day, visibility, inaccurate sightings, and other aspects of actual naval warfare conditions are recreated.

The game comes with two maps, rule book, and 48K disk for the Apple II with Applesoft ROM, II+, IIe, and III. It is also available on 40K disk for the Atari 400/800/1200. The price is $59.95.

Battle for Normandy is a simulation of the D-Day invasion and the 24 days that followed. Now available for the Commodore 64 computer in a 64K disk and a cassette format, the game includes all historical details. The player may be the Supreme Allied Commander or commander of the German defenses. A solitaire option is available, with the computer directing the German defenses.

The game comes with two player-aid cards, maps and rule book. Versions are also available for Atari, TRS-80 models I and III, Apple, and IBM PC computers. *Battle for Normandy* is priced at $39.95.

Tigers in the Snow is a recreation of the World War II Battle of the Bulge, Germany's last major counteroffensive. The game is now available for the Commodore 64 computer.

In the simulation, the Germans attempt to destroy the Allies' stronghold while the outnumbered Allies try to hold until their reinforcements arrive. The forces are division/regiment scale. Both sides command infantry, artillery, and air power.

The price for the game is $39.95 on 64K disk for the Commodore 64. It is also available for the Apple, Atari, and TRS-80 computers.

Strategic Simulations Inc.
883 Stierlin Road, Building A-200
Mountain View, CA 94043
(415) 964–1353

Color Graphics Packages For 64

Sophisticated Software of America has released *Grafix-Artist*, a high-resolution color-graphics package for the Commodore 64, and *Grafix-Printer*, a high-resolution graphics printer-dump for use with printers/interfaces which emulate the Commodore 1525E printer.

Grafix-Artist was created to introduce children and adults to computer graphics and to programming by allowing them to use either a specially designed language or a joystick to control the onscreen graphics capabilities. The product can be used to create detailed screens which can then be included with other programs written in either BASIC or machine language. Design layouts, storyboarding, and ad displays are among the uses of *Grafix-Artist.*

Available on disk, *Grafix-Artist* has a price of $39.95. *Grafix-Printer* is available for $29.95.

Another Sophisticated Software product, *Lesson Designer,* which allows free-form lesson design, will be available this spring.

Sophisticated Software of America
198 Ross Road
King of Prussia, PA 19406
(215) 265-2277

Educational Games On Disk

Unicorn Software has produced four educational games available on disk for the Atari, Commodore 64, IBM PC, and Apple computers.

Ten Little Robots is composed of five learning games that introduce children, from ages two to seven, to the computer. They include Little Robot Story, an interactive nursery tale that presents the concept of subtraction and aids in reading preparation; Robot Letter Match, which teaches upper- and lowercase letters; Count The Robots; Robot Addition; and Robot Sketch.

Ships Ahoy is a series of four games for children from 5 through 13 years of age. These four games include Ships Ahoy and Mine Sweeper, two math skills programs; Treasure Hunt, a maze game included as a reward; and Sailing Sketch, a screen painting program.

Race Car 'Rithmetic, for those five years old to adult, is a math game designed for the entire

family to play together. An action race game is included as a reward.

Funbunch is a language arts program available on three levels—*Elementary* (grades 1–6), *Intermediate* (junior high school), and *College Prep* (high school to adult). Each level includes over 2000 words and phrases with which to work.

The four games sell for $39.95 each.

Unicorn Software
Liberace Plaza, Suite 8
1775 East Tropicana Avenue
Las Vegas, NV 89109
(702) 798-2727

Word Processing Program

HomeWord, a word processing program produced by Sierra On-Line, has been introduced on disk for the Apple, Commodore 64, and Atari computers.

The program uses icons, or symbols, as a guide to the writer. There are six major options with appropriate icons that are shown on the screen—filing (a file cabinet), editing (a page of print), printing (a printer), format design (an unorganized page with an arrow pointing to an organized page), customizing (a question mark), and disk utilities (a floppy disk). Within each of these categories there are subcategories, also with icons.

Another feature of the program is the ability to divide the screen into three sections. The upper and largest portion reveals the working text, while the lower right side provides a replica of the entire page as it will be printed. To the left of this insert is a chart which keeps the user appraised of available memory and disk space.

Other standard features include optional joystick control, an outline format, boldface and underlining, text block movement, file merging, headers and footers, and other functions.

HomeWord is priced at $49.95.

Sierra On-Line, Inc.
36575 Mudge Ranch Road
Coarsegold, CA 93614
(209) 683-6858

New Product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

COMPUTE! *welcomes notices of upcoming events and requests that the sponsors send a short description, their name and phone number, and an address to which interested readers may write for further information. Please send notices at least three months before the date of the event, to: Calendar, P.O. Box 5406, Greensboro, NC 27403.* ©

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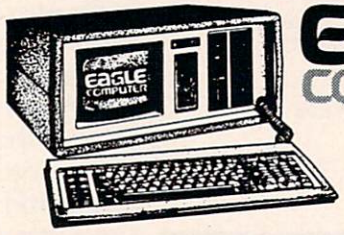

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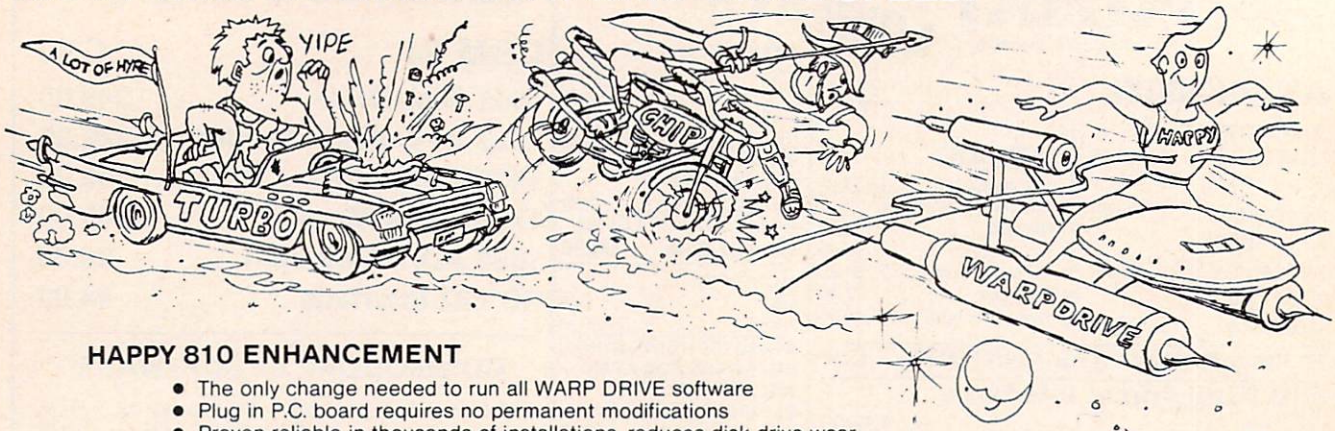

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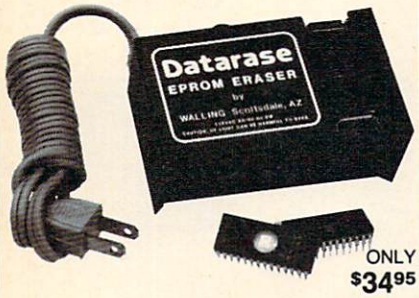

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An excellent time saver, CARDCO OFFERS THE CØ2 "Write Now" program with built-in 80 column display. You see exactly what will print. All special codes can be transmitted to printers maintaining justification. Easy full-screen editing; works with any printer.

"MAIL NOW" MAILING LIST SOFTWARE

CARDCO D/Ø1 quickly (in memory) sorts by zip, category, name and state; fully compatible with "WRITE NOW". Other fine features include: User-oriented; menu-driven operation; each disk supports 600 entries. Format can print single, double or triple labels across.

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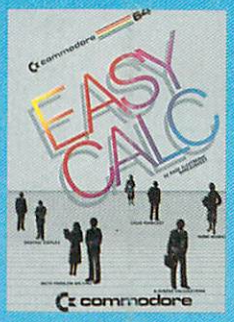
EasyScript 64
Displays 764 lines × 240 characters. Prints to 130 columns. Works with EasySpell 64.

EasySpell 64
20,000 word Master Dictionary and automatic spelling checker. Works with EasyScript 64.



EasyCalc 64
Multiple electronic spreadsheet with color bar graph feature. 63 columns × 254 rows.

The Manager
Sophisticated database system with 4 built-in applications, or design your own. Text, formulas, graphics.

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21 special commands. Combine text with high resolution graphics. Music and game sounds.

Easy Finance I—Loan Analysis
12 loan functions. Bar graph forecasting as well as calculation.

Easy Finance II—Basic Investment Analysis
16 stock investment functions. Investment bar graph.

Easy Finance III—Advanced Investment Analysis
16 capital investment functions. Bar graphs.

Easy Finance IV—Business Management
21 business management features. Bar graphs.

Easy Finance V—Statistics and Forecasting
Assess present/future sales trends with 9 statistics and forecasting functions.

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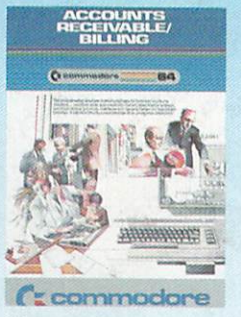
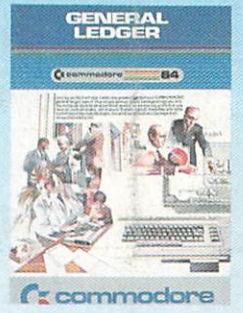
11 functions. Automatic billing. 50 vendors/disk.



Accounts Receivable/Billing
11 billing functions. Printed statements.



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1000 inventory items. Full reports.

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