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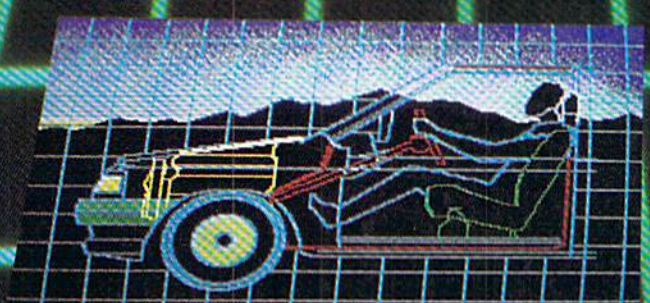

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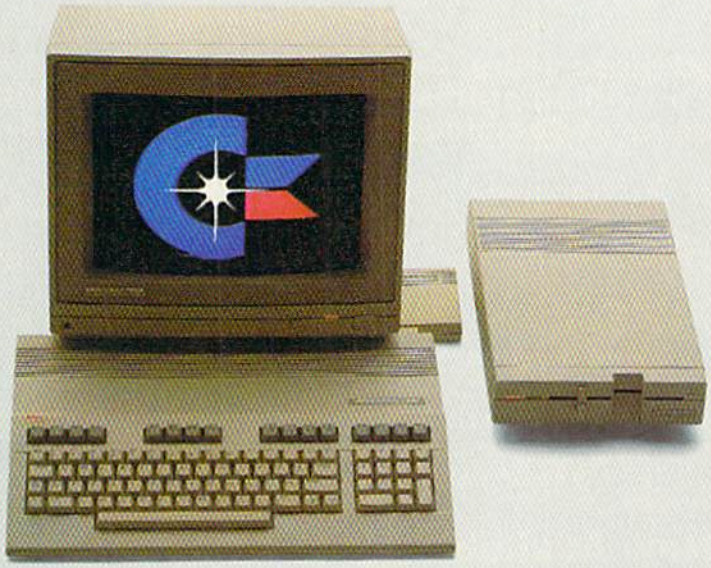

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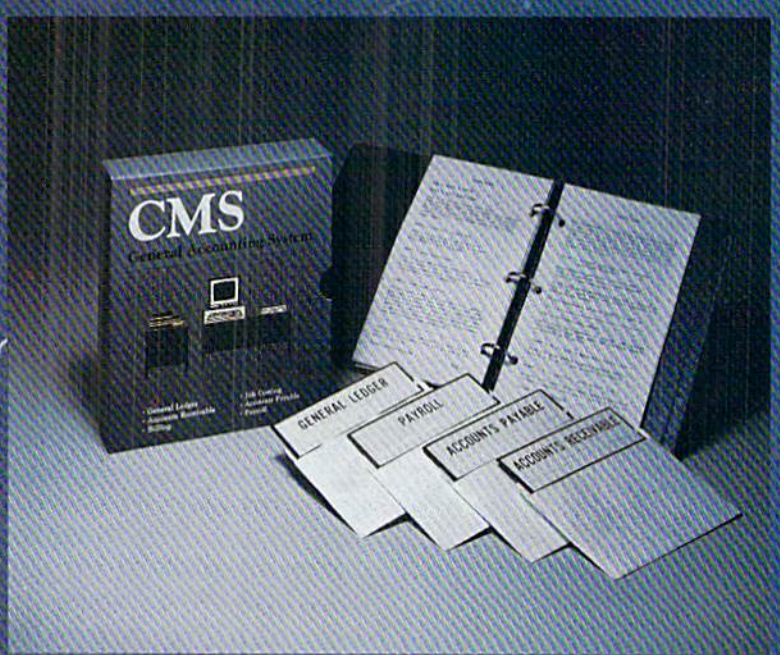

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VOLUME 6, NUMBER 5, ISSUE 37

SEPTEMBER/OCTOBER 1985

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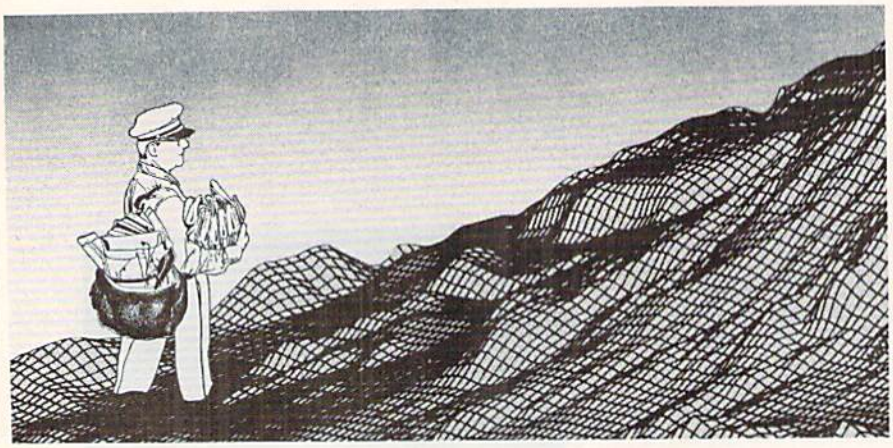

BARBARA KLEY

PROMAL

To the Editor:

Thank you for your informative and generally accurate review of PROMAL by Walt Lounsbery in the May/June *Commodore Microcomputers.* However, I would like to point out a few errors in the article that might cause confusion to readers.

The Sieve of Eratosthenes program in the article is a potential area of confusion. Your readers will get a compilation error if they try to compile the program as given in Listing 1 of the article, apparently due to a typographical error. Specifically, the fourth line of the program should read WORD ITER, not BYTE ITER. A person familiar with PASCAL might also get the erroneous impression that the semicolons in the listing are required. They are not; semicolons are PROMAL's comment character, which the author apparently used just for spacing (he could have used blank lines).

Finally, it is important to note that the author's version of the Sieve program will not produce the same test results given in Table 3 of the article, because a different array size was used.

Although Walt Lounsbery correctly pointed out that there isn't enough room in a four-page review to cover all the features of PROMAL, I would like to delineate a couple of items that were not discussed that readers might find significant. First, there is the "smart editor," which, after a compilation error, will automatically place the cursor on the offending line of the program for correction. Since the editor is co-resident in memory and therefore instantly available, it is exceptionally easy to correct mistakes and develop programs rapidly.

When purchased directly from Systems Management Associates, PROMAL is sold with a 15-day money-back satisfaction guarantee. Finally, PROMAL is not copy protected, and a utility is provided for making backup diskettes.

PROMAL users can look forward to the release of our new high performance libraries for high-resolution graphics and database management, which will be available as inexpensive options to owners of the standard package. We are also porting PROMAL to additional target computers such as the new generation Commodore machines, as well as "brand X" computers (blue and fruit-type). This insures that a user's investment in programs written for the Commodore 64 is protected for the future, since standard PROMAL programs will compile and run on all supported machines.

Thanks again for your excellent article.

Bruce D. Carbrey
Director, Software Development
Systems Management Associates
Raleigh, North Carolina

Your Personal Net Worth

To the Editor:

I was completely shocked when I read Tom Benford's review of *Your Personal Net Worth,* in which he stated that it was the "best personal finance package I've seen to date." Mr. Benford should have been more concerned about what the software should do, rather than the easel-type case, silver dollar rebate, and the money-manager booklet.

I know that there can be a differ-

Continued next page

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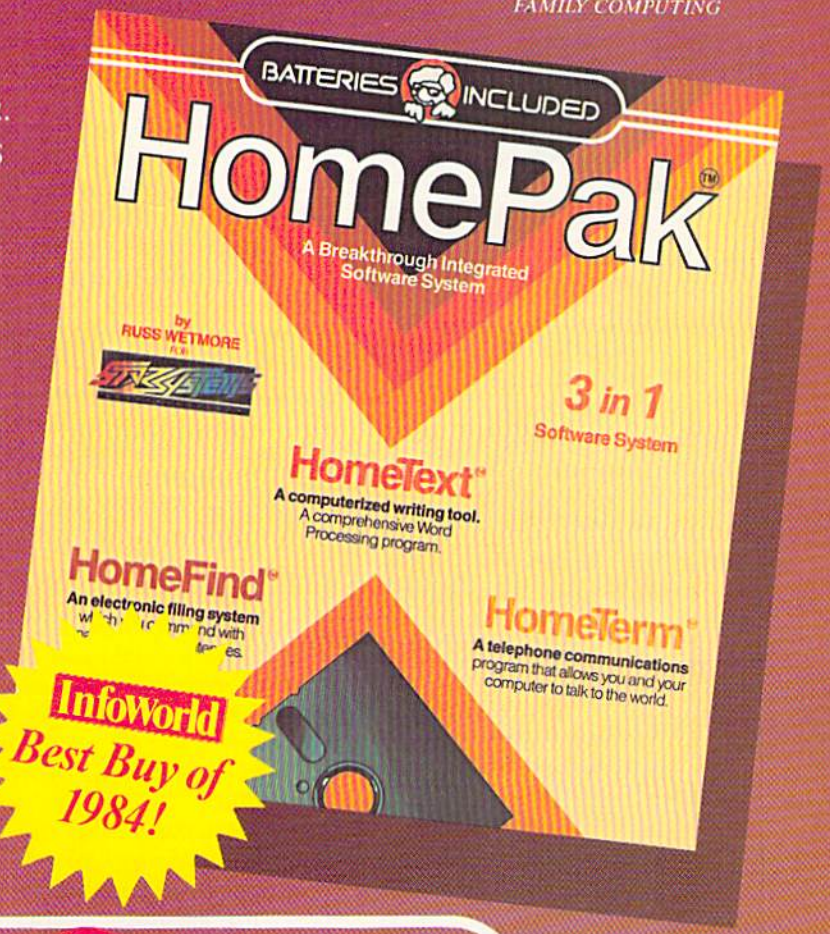

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"The File Manager allows individualized file formats...A wide variety ranges from the ability to create printed lists...to a selective report feature that lets you access a certain group of records." RUN, April 1985.

"Worth the money, if only for the spreadsheet." InfoWorld, Dec. 17, 1984.

"As a marriage of convenience and value, the program succeeds handsomely...Tri Micro's spreadsheet possesses impressive features." Commodore Microcomputer, May-June 1985.

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"Colorful graphics, sprightly music, and a variety of obstacles help keep the game lively." COMPUTE!'s Gazette, December 1984.

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LETTERS

ence of opinion, but having firsthand knowledge of this program's inadequate printed records makes me believe that Mr. Benford really is a "shoe box accountant," as he stated in his article. If he thought his accountant was pulling his hair out before, his accountant will go bald when he sees the records from *Net Worth*. The severe limitations in reference and check number areas make this program almost completely worthless for concise record reference.

I should be surprised that Touche Ross would allow their name to be used in connection with this program. I am sure that no executive of Touche Ross would allow his personal accounting records to be documented in the extremely poor manner allowed by *Net Worth*.

Larry W. Zeigler
Seven Hills, Ohio

Author Tom Benford replies:

A commercial software product such as Your Personal Net Worth *is designed to appeal to the broadest possible number of users. This program is specifically targeted at the "average" home user—not a business user. My reviews reflect a product's usefulness and worth from the "average" user's point of view. From the sound of your letter and the inadequacies you mention, I'm led to believe your needs are not average. I stand by my original recommendation of the product for the average user.*

Secondly, I never stated I was a "shoe box accountant." I am not an accountant nor did I state or imply that I was. I did state, however, that I keep my receipts in a shoe box; the program lets me print out a record of the data contained on these receipts.

I also never said my accountant was pulling his hair out. He is quite delighted, in fact, that my financial record keeping is now organized, rather than haphazard, as in the past.

I stated that Your Personal Net Worth *was one of the best personal finance programs I've seen to date. I did not say it was* the *best program, although I can think of several similar programs of equal price that do not provide as many features and are harder to use.*

In addition to being a worthwhile program, several nice "extras" are included with the disks. I would be remiss in my obligations as a reviewer if I did not *mention these little extras that contribute to the overall value of the product.*

I'm sorry the product did not prove adequate for your needs. I'm sure that the majority of users, however, will be as delighted with it as I was.

The Print Shop

To the Editor:

In the May/June issue, there is a software review of *The Print Shop* by Broderbund. The article states that the software will work with any dot matrix printer.

Broderbund has told me that the program will *not* work with a 1526/MPS-802 printer. The box the program comes in states that it is for the 1515, 1525/MPS-801, and MPS-803 dot matrix printers only.

John P. Hamshaw
Fullerton, California

Cathy Carlston, vice president at Broderbund, explains that the following printers are supported by The Print Shop: *Epson RX-80/MX-80 and 100/FX-80 and 100/JX-80, Star Micronics 10X and 15X, Legend 880, Panasonic KX-P1090/1091, Blue Chip, Mannesmann Tally Spirit 80, C-Itoh 8510 (Prowriter), NEC 8023A, Okidata 92/93, and Commodore VIC 1525 and MPS-801. The list is updated periodically as new printers are introduced. A label is displayed prominently on the outside of the package to reflect all technical changes made to the program.*

Commodore Microcomputers welcomes letters from readers. Do you have an unusual application for your Commodore computer? Do you wish to comment on an article? Would you like to make a suggestion on how we can better serve our readers? Please send them to:

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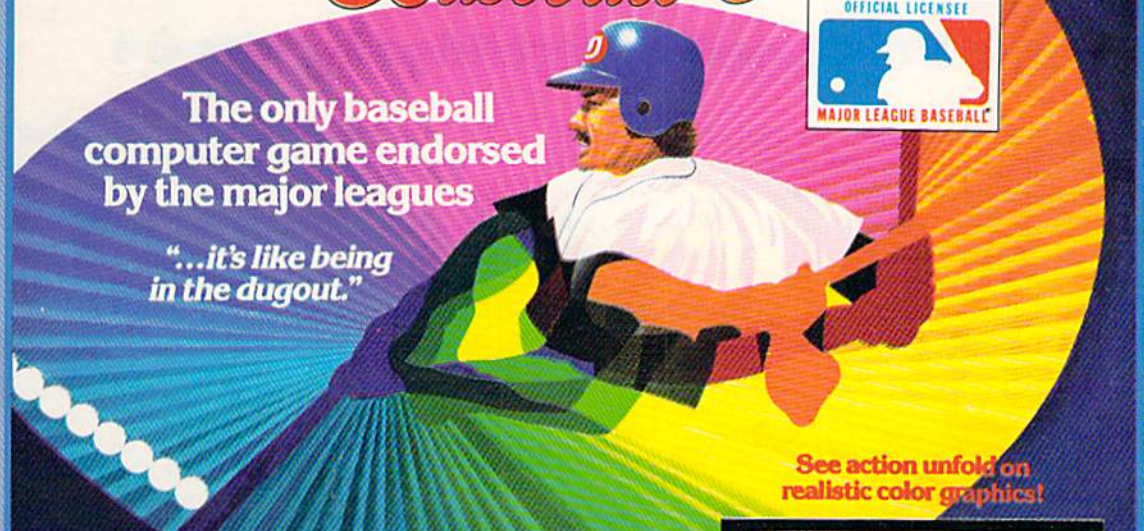

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NEWS

Business Management Simulation

Blue Chip Software (6740 Eton Avenue, Canoga Park, CA 91303) has released *American Dream*, a robotics manufacturing business simulation for the Commodore 64.

You are CEO of the company with seven department heads reporting to you. General economic as well as industry-specific trends fluctuate independently of your business decisions. These factors include the gross national product, inflation, interest rates, competitors' prices, industry demand, labor rates, raw material prices, and lead times.

Your two objectives are to increase market shares and profitability. Your performance is measured at the end of each session by calculating peak monthly profit, revenue, and shareholder's equity.

Price was unavailable at press time.

Automatic Boot-Loader Cartridge for the 64

Those who work with computer bulletin boards, security systems, or other constant-use applications for the Commodore 64 will be interested in Input Systems' (15600 Palmetto Lake Drive, Miami, FL 33157) *ABL-64*, a program that will re-boot and run an essential program after a power failure, even if the computer is left unattended.

When *ABL-64* is installed in the expansion port and there is a power failure, *ABL-64* is re-activated the instant power is restored. There is a timer aboard which counts up to 15 seconds. During that time, if an operator is present, he or she may invoke manual control over the program through the keyboard. With no operator present, after 15 seconds *ABL-64* boots and runs a pre-selected program from the disk. It can also pick up where it left off before the power failure.

The package includes cartridge, instruction manual, and listings of two utility programs. The suggested list price is $39.95

Temperature Lab

Temperature Lab, the first offering in a new science laboratory software series for the Commodore 64, has been introduced by Hayden Software (600 Suffolk Street, Lowell, MA 01854). Designed to transform a home or classroom into an inexpensive science research center, *Temperature Lab* enables students to conduct scientific temperature experiments.

Temperature Lab features a unique temperature sensor, or "electronic thermometer," that plugs into an interface module connected to the computer's game port. Using this sensor, students can record temperatures and see them displayed on-screen. An alcohol-bulb thermometer is also included with the program to compare directly measured temperatures with readings taken by the electronic sensor interface.

The software itself enables the users to choose between Fahrenheit and Celsius temperature readings, to compare temperature scales on the same screen, to vary the time length for each experiment, and to display data in either graph or table form. In addition, testing data may be stored on disk either for printing or for later use.

A comprehensive Experimenter's Guide is provided which contains step-by-step detailed instructions for performing several different temperature experiments. Each experiment is designed to tie in with the scientific concepts outlined in the guide.

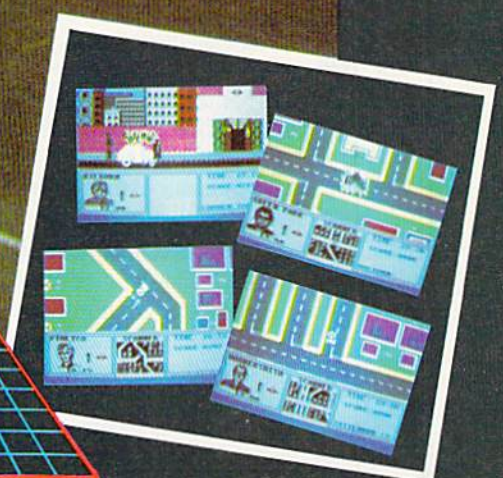
Temperature Lab has a suggested retail price of $99.95.

PAUL McCARTNEY'S

Give my regards to

BROAD STREET

FOR THE COMMODORE 64/128



What the critics said . . .

DAILY EXPRESS

England Feb 1985
"This game is the hit of the show and I'm sure it will be one of the biggest computer successes of 1985"

Daily Mail

England March 1985
"I wouldn't bet a penny against it being The game of 1985" . . . brilliant Entertainment.

Database – March 1985
A mind boggling game but is definitely one to persevere with. And you will, because its one of those frustrating addictive games with superb graphics that once into you can't stop playing . . . rating out of 10 . . . 9 .

Commodore User April 1985
It took six programmers three months to write and a superb job they made of it – the 900 screen map of London is a masterpiece!!

Home Computing Weekly – 9th April 1985
You've seen the film heard the song, now play the game! The graphics are excellent and consists of a large map of London which scrolls in the direction of travel. This game is excellent and highly recommended.

MASTERTRONIC

Mastertronic once again have brought you a world beating program for your Commmodore 64/128.

943 Action Filled Screens at an incredible price of **$9.99**. The package includes full colour posters and a large fold out map of the playing area. This amazing '**program of the year**' features music from **Paul McCartney's Band on the Run album.**

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NEWS

Commodore Announces Unix®-Compatible Business System

Commodore recently announced plans to market the Commodore 900, a multi-user, multi-tasking, Unix-compatible business system that can support up to eight work stations. The system uses the Coherent® operating system, which is fully compatible with AT & T's Unix System V, version 5.2

Two Configurations

The Commodore 900 is available in two configurations: as a personal work station with a 1024- by 800-pixel bit-mapped display, and as a multi-user business system supporting up to eight stand-alone terminals.

According to a company spokesperson, the system's 1024 × 800 high-resolution configuration allows you to create graphics previously found only on systems costing up to five times as much. In this configuration, the 900 can be mouse-driven and uses a sophisticated window manager for both text and graphics windows. Its "bit-blt" chip allows fast screen operations, so windowing is quick and easy. This configuration also allows the use of many different text fonts and proportional spacing for quick, accurate document processing.

The system's multi-user business configuration comes packaged with an integrated terminal, which acts as the first user terminal. Additional terminals are stand-alone, industry-standard, RS232 character-mode terminals.

Hardware and Software Features

The heart of the Commodore 900 is a Z8001 chip running at 10 MHz. Standard features are 512K of RAM (expandable to two megabytes); a 20-megabyte built-in hard disk drive; a 1.2-megabyte built-in 5-1/4" floppy disk drive; two RS232 ports (more ports can be added with an expansion card); an IEEE-488 port; a Centronics parallel printer port; and four expansion slots. A "C" compiler, business BASIC compiler and more than 50 utilities are also included with the system. The optional high-resolution monochrome monitor is available with either a 14- or 20-inch screen.

Other hardware options include a hard disk drive with 40- or 67-megabyte storage capacity, streaming cartridge tape for hard disk back up, an additional floppy disk drive, memory expansion up to two megabytes and a multi-user card with eight additional RS232 ports.

Software options for the system include a COBOL language environment, a Pascal compiler, a virtual device interface for handling graphics devices such as plotters and intelligent graphics terminals, and a plotting package for generating graphs.

Coherent Operating System

The Commodore 900's Coherent operating system is compatible with Unix System V, but is more compact. As a result, according to Commodore's engineers, it offers several advantages over the standard Unix operating system. For instance, because Coherent occupies less memory, more memory is available for programs. Programs also load and run faster and use less disk space. The Coherent system also allows a larger number of users than would be possible on an equivalent system running standard Unix.

—Diane LeBold

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NEWS

Screen Dump Utilities

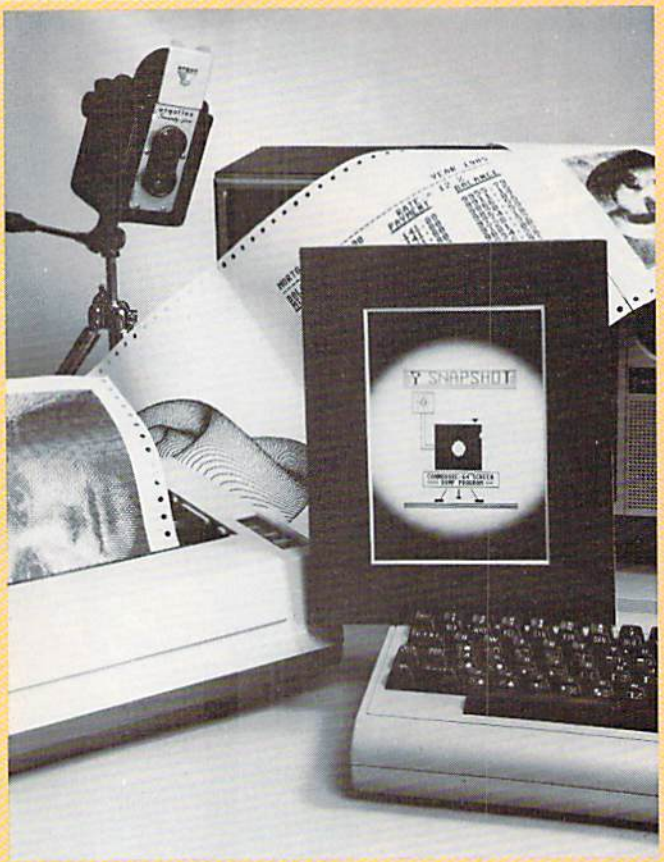
Snapshot, a universal screen-dumping utility program for the Commodore 64, is joined by two new versions written especially for Commodore printers. While the original *Snapshot* works with Epson- and Gemini-type printers, the *Snapshot-C1* works with the Commodore 1525 and MPS-801 printers, and the *Snapshot-C2* works with the Commodore 1526 and MPS-802.

All three versions operate identically and are controlled by only four keypresses. After loading, one keypress produces a quarter-page and another keypress produces a full-page printout of the entire screen (dot-for-dot, including sprites). The dumps may be made at any time, regardless of display mode or screen memory location. A third keypress produces a reversed picture and a fourth aborts the dump before completion.

With three different wedge locations, a clear memory-seeking system, and restore-button activation, *Snapshot* will produce printouts during a run without disturbing the program in memory. All but the most sophisticated and highly protected programs are compatible. Of course, the screen may also be dumped in direct "READY" mode.

Snapshot-C2 is particularly exciting because the printers it works with do not have a true graphics mode. The dump is fast and has a minimum of printhead shaking.

All three versions are available on disk for $24.95 each from Computer Revelations at 76 E. Ridgewood Avenue, Ridgewood, NJ 07450. Be sure to specify printer.



Education Software Using a Light Pen

MicroEd (P.O. Box 444005, Eden Prairie, MN 55344) has introduced a light pen series for the Commodore 64 consisting of 80 programs that teach youngsters beginning word-attack skills that are normally taught in kindergarten through third grade. Entitled *Point & Read*, the series is also popular with educators in special education. Using a light pen as a response device simplifies instructional procedures, an important consideration for individuals with learning disabilities.

The series can be purchased in four packages having a combined total of 14 disks. The suggested retail prices for these packages are $74.95 for package one (three disks), $74.95 for package two (three disks), $99.95 for package three (four disks), and $99.95 for package four (four disks).

Accounting Package

Financial Partner, a total bookkeeping system for small business and personal use, has been introduced by Practical Programs (P.O. Box 93104, Milwaukee, WI 53203). Designed for the Commodore 64, the system eliminates the need for tedious, manual recordkeeping.

For professionals and entrepreneurs writing under 150 checks a month, *Financial Partner* provides an easy but powerful system for keeping track of income and expenses. In the home, *Financial Partner* assists the user in organizing and managing household finances. A file of commonly used business and individual accounts can be stored and maintained.

Features of *Financial Partner* include automatic maintenance of the checkbook balance and easy reconciliation with bank statements. With the record retrieval feature, *Financial Partner* can search for information such as payee names, dates, account numbers, transaction numbers, and check numbers.

The program prints checks and also addresses labels and envelopes. It prepares and prints a list of financial transactions, ledger accounts, income statements, and balance sheets.

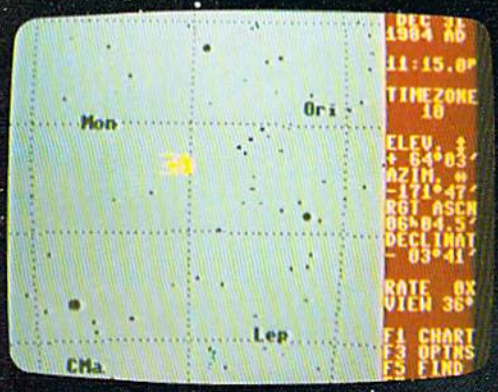
The program retails for $74.95.

More News on page 126

SKY TRAVEL

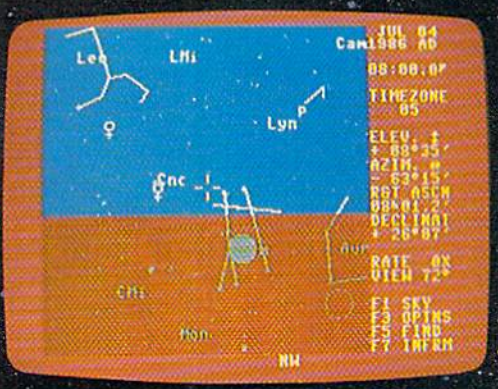
A WINDOW TO OUR GALAXY

Learn About the Stars



THE CHART MODE

THE MAP MODE



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YOUNG ASTRONAUT PROGRAM
UNITED STATES OF AMERICA

COMMODORE

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REVIEWED BY MARK COTONE

Injured Engine

Computer: Commodore 64
Publisher: Imagic
2400 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Retail Price: $34.99

As sure as the tick that becomes the tap that becomes the clank, it's inevitable that, sooner or later, each one of us will have our turn on the highway's shoulder, staring blankly at the cluster of components which lie smoldering beneath the car's gaping hood.

Label it this: learning the hard way.

Imagic would like to suggest a far easier lesson by presenting *Injured Engine:* a full-color computer simulation of a functional four-cylinder engine.

The program's main screen displays a precise cross-section of an operating engine. Pistons pump, belts churn, and fans spin in realistic fashion, while an instrument panel responds accordingly, monitoring revolutions per minute, oil pressure, running temperature, battery charge, and miles per gallon. Anyone who has ever been behind the wheel will immediately recognize these gauges, and need only briefly familiarize themselves with terms and layout before delving into this tutorial trilogy.

The first part of the program is the foundation. It features an encyclopedic outline where you can view the different engine systems and learn the function of each part, either individually or interactively within the engine.

For simplicity's sake, the designers have divided the engine into five separate systems: the lubrication system, the four-stroke cycle, the electrical/ignition system, the cooling system, and the fuel and carburetor system. You can request an overview of each area at any time, which includes a summary of overall execution, a detailed explanation of each part's function, and, more importantly, a discussion of the symptoms of engine difficulty. Here you can learn those diagnostic skills that will later be called upon to maintain a healthy engine. It's now time to put your newly acquired knowledge to the test with a full-scale simulation.

Choosing between a used engine christened with either 1,000 miles (easy), 40,000 miles (medium), or 80,000 miles (hard), the object is to throttle up, cruise along, and correctly troubleshoot engine-related problems as they arise. When you think you've come across a potential disorder, you then switch into a Repair Shop mode to first examine the car and then purchase replacement parts.

A cost-per-mile meter on the instrument panel will compute your efficiency. If you correctly identify the engine ailment, and don't misappropriate time and cash, your low expenditure will prove your competence.

This entire exercise is taken one step further in the Troubleshooter Challenge, the third leg of this program. Here, the would-be mechanic is clocked on his ability to spot and substitute worn or broken parts. The computer generates an engine with two broken parts, and continues generating faulty parts until the player has fixed five major maladies. The elapsed time becomes the score.

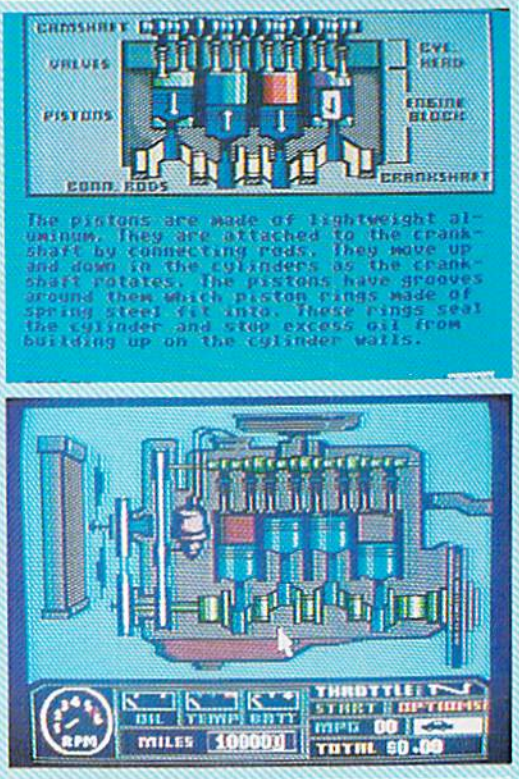
As an educational tool, this entire program works well. The complexities of a car engine are presented on a simple level, allowing the general user to comprehend the concepts without sacrificing realism.

The visuals are detailed and crisp. Each moving part is brightened with intense hues to facilitate inspection. The specifications, covering everything from engine operation to the price of parts and their longevity, are as accurate as one could expect.

The text which solidifies this whole package is both clear and concise, thoroughly explaining each system in detail, without getting tangled in automative jargon. To be sure, *Injured Engine* will not turn you into a gold-wrenched grease monkey overnight, nor will it replace such reliable options as Chilton's manuals or the local service station ace. What it will do is educate you on how to maintain and prolong the life of your car's engine.

And with the price of mechanics' labor upwards of $35 an hour, this program is not only educational and entertaining, but cost-effective as well. C

Injured Engine will not turn you into a gold-wrenched grease monkey overnight. What it will do is educate you on how to maintain and prolong the life of your car's engine.



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REVIEWED BY CHERYL PETERSON

Forecast!

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Retail Price: $49.95

Are those clouds threatening or will they blow over harmlessly? How much longer is it going to rain? Will it snow tomorrow?

Forecast! provides answers to these kinds of questions. The program helps you understand the principles used to predict the weather and teaches the methods meteorologists apply to define weather patterns and pressure systems. Should you become a true weather aficionado, *Forecast!* will track the weather on a daily basis and yield a printout of the month's pertinent weather data. If you're interested in tracking severe weather systems like hurricanes, *Forecast!* includes a mapping system that extrapolates a storm's future path by analyzing location plottings and travel velocity.

The program has a marvelously instructive manual that teaches everything from barometric pressure to the importance of wet-bulb thermometer readings. With a glossary and bibliography, it can be used to search out any weather-related information you'd like. The documentation reads just like a high school textbook, complete with italicized first-use definitions, and tables and illustrations galore.

Enter temperature and precipitation data for each day. The program requests the time, amounts and types of precipitation, minimum and maximum temperatures, cloud conditions, and special notes such as thunder and lightning, or hail and freezing rain. This data is then reviewed and printed out in standard weather report form.

Another option will give you temperature and precipitation averages and extremes for major cities in the United States. The tables used for compiling the reports include data for the last ten years. You can compare this information for any two large cities in the twelve geographic areas.

A weather calculator is included to allow you to easily change Celsius to Fahrenheit and vice versa, millibars to inches of mercury and vice versa, and miles per hour (or kilometers per hour) to knots and vice versa. The formulas for doing these calculations are included in the documentation.

The hurricane tracking program is especially nice because you don't have to enter latitude and longitude as numbers. As in other sections, you use the cursor keys to position a pointer. In this case, you move the little hurricane graphic to the correct point on the map. After plotting several locations, the computer can analyze the hurricane's track and predict its future motion.

Unfortunately, the program has few instructions regarding how to actually use it. Outside of the initial load command, the program manual expects you to benefit from the software's completely menu-driven structure.

But when you do make your menu choice and hit RETURN, you are greeted with the prompt "Hit any key to continue." This may be intended as a safety feature, but, because it appears repeatedly (after almost every input), it means entering one extra keystroke for each valid one.

Also, when you choose an option from the main menu, the program you want to use is loaded. But what happens when you realize that you don't know whether the barometer is rising or falling, which direction the wind is coming from, or whether your temperatures are Fahrenheit or Celsius? You may want to go back to the main menu and use the weather traveler to check typical temperatures for January in your area of the country, or do something else besides continue with the forecast. Where's the escape?

Once you get past that, though, each screen asks for some data relevant to its calculations. Usually that data can be entered by inputting a number or by raising or lowering a pointer. A thermometer is used to enter temperature, for instance. Using the up and down cursors, you position the column of "mercury" to the correct level. Unless of course, the temperature is 79 degrees Fahrenheit. For some reason, my *Forecast!* copy would skip from 78 to 80 no matter how carefully I pressed the cursor keys. I finally ended up just entering the numeric value.

While the graphics are very attractive, they slow the program down so much that I wonder how long youngsters will persist through one- to two-minute repeated access waits. Fortunately, only the forecaster module has this fascination for pictures.

Because of the many modules included with this program and the excellent graphics and documentation, I can't help but recommend *Forecast!*. Yes, it's a little complicated. But then, so is the weather. With the proper adult supervision, youngsters could also use this program to gain an understanding of what's going on in the evening weather report. C

PIANO ROLLS PLAYED ON A MIDI INSTRUMENT

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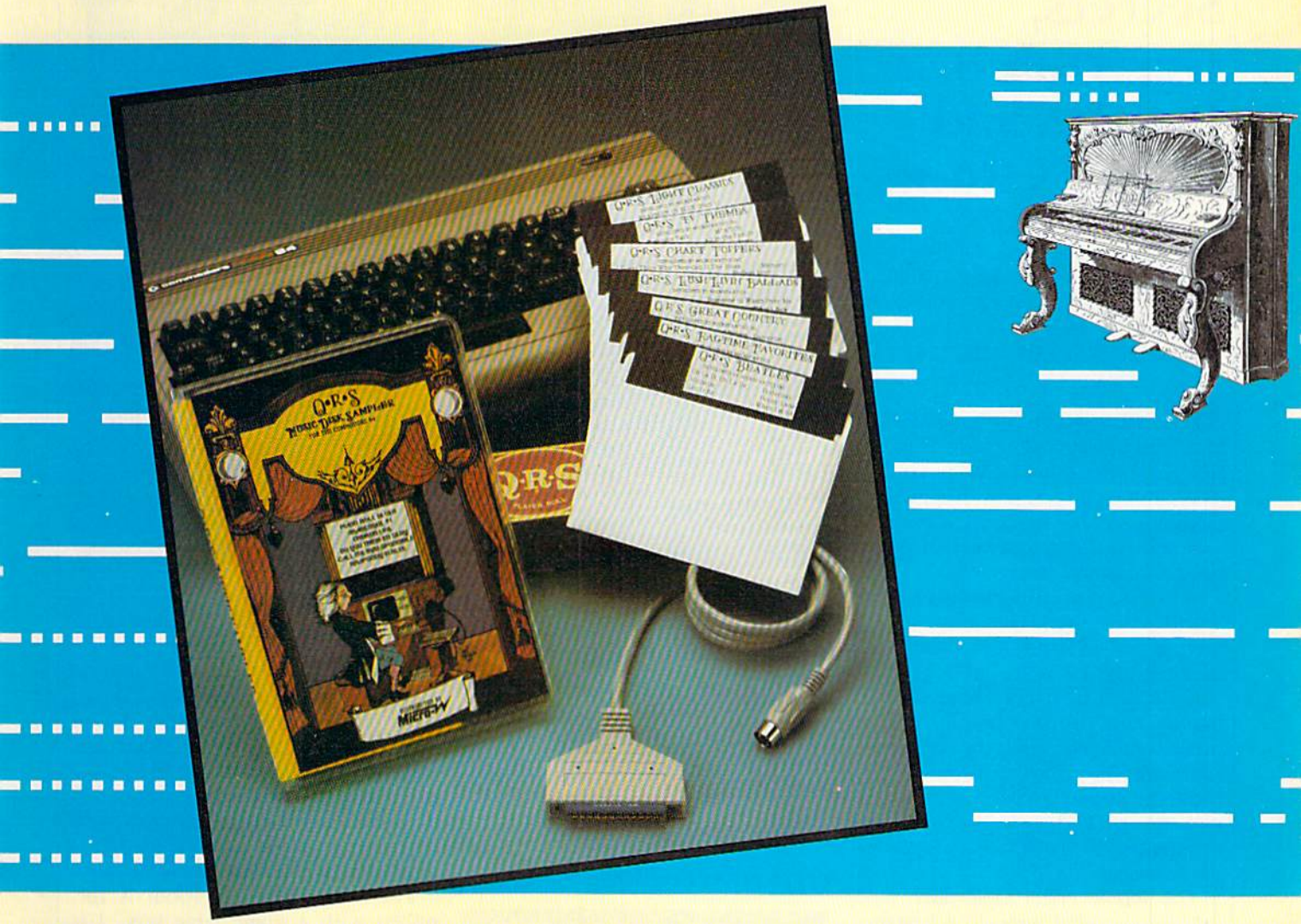

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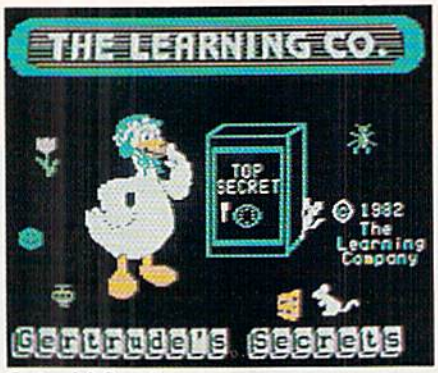
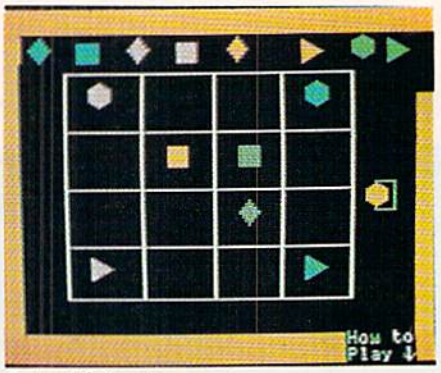
REVIEWED BY GEORGE BEEKMAN

Gertrude's Secrets, Gertrude's Puzzles and Rocky's Boots

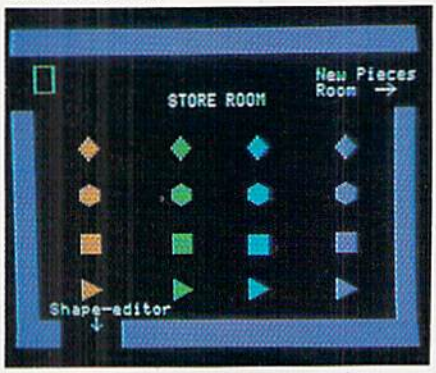
Computer: Commodore 64
Publisher: The Learning Company
545 Middlefield Road
Menlo Park, CA 94025
Medium: Disk
Retail Price: $29.95, $29.95, $34.95



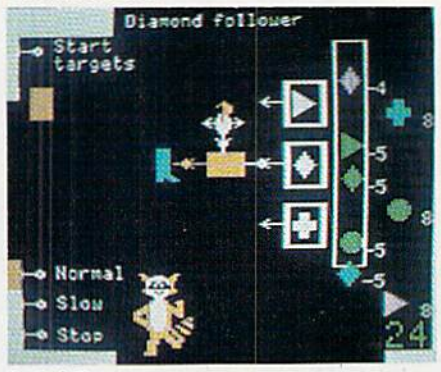
Gertrude's Secrets



Gertrude's Secrets



Gertrude's Puzzles



Rocky's Boots

Gertrude's Secrets, Gertrude's Puzzles, and *Rocky's Boots* work magic like few other educational programs. These three classics, now available for Commodore 64 owners, will make you and your children very glad you bought your computer.

All three programs create a simple world where the player moves a box around screen-sized rooms using either the joystick or the I-J-K-M keys. The borders of every room contain one or more magic doors that lead to other rooms, changing the screen the moment the player's box passes through. Rooms contain objects that can be picked up, moved, and dropped with the joystick button or the space bar.

The whole effect is intuitive and easy for kids of all ages to understand. The first few screen/rooms of each program are designed to teach new players the tools of the trade. They can be bypassed by experienced players who want to go straight to the game rooms.

The programs are forgiving. There are no nerve-wracking time limits or invading aliens in these games. More importantly, there are no losers. Every game allows children to keep trying until they succeed.

They're fun. Children love exploring the imaginary worlds created by these friendly programs. All three programs contain just the right mix of exploratory learning, animated play, and rewards to capture most any child's imagination and attention.

They're creative. Instead of serving up rapid-fire drills and exercises, these programs encourage exploratory learning. While most so-called educational programs take control of the student, these programs put the learner in charge. This kind of structured, creative play offers all kinds of educational benefits that electronic flash cards can't possibly deliver.

There are no nerve-wracking time limits or invading aliens in these games. More importantly, there are no losers.

Consider *Gertrude's Secrets,* a package of puzzle-solving games for children aged four to ten. (That's what the package says, anyway. But I've seen both 3 year-olds and 33 year-olds have a great time with this one!) The player takes Gertrude the Goose to one of several puzzle rooms and drops her there. Gertrude immediately flies off and returns with a string of puzzle pieces of various shapes and colors. The object of each game is to discover Gertrude's secret rules by picking up game pieces and putting them in boxes. If a piece sticks, it belongs in the box; if it falls out, it doesn't. When all of the pieces are placed where they belong, the player is rewarded with a brief flashing display and a graphic prize. After earning six prizes in a row, the little learner is crowned "Secret Master."

The simplest puzzle room is furnished with a single large box. The object is to come up with a rule for each shape to go in a box. All red shapes? All triangles? Next to this single-loop room is a double-loop room with two interlocking boxes. Each box has a secret rule, and the overlapping area is affected by both rules. For example, if only blue pieces go in one of the boxes and only squares go in the other box, then blue squares go in the *intersection* of the two boxes. Your child may not know it, but this is rudimentary mathematical set theory disguised as a game. The perception, categorization, and reasoning skills reinforced by this game are important in both reading and math.

In Gertrude's train rooms, the boxes are connected by lines in train-

Continued on page 20

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like sequence. In one train room, the connectors are single lines, and pieces must be put in boxes so each consecutive pair of pieces is different in one way (color or shape). Another train has double-line connectors, requiring that consecutive objects differ in two ways, and a third has a mixture of both kinds of connectors. There's no one right answer to any of these puzzles; the child is rewarded for any correct sequence.

Gertrude has another pair of puzzle rooms furnished with two-dimensional arrays (grids), one with three rows and three columns, and the other with four-by-four dimensions. Each row and each column represents a rule, so each box has two rules. That means that each puzzle piece has exactly one correct home. The object of the game is to bring everything home.

Gertrude knows that triangles and squares can get old, so she has another room full of alternate shapes. When a player wanders into the shape room and picks another shape, a whole new set of pieces (animals, spaceships, hats, nonsense characters) replaces the geometric shapes. And if she can't find the shapes she's looking for, she can go to the shape-editing room and build a custom set using a simple shape editor that works like many of the popular sprite editors for the 64.

If your children are eight or older, they can still learn something from Gertrude with *Gertrude's Puzzles,* a more advanced program designed for children between ages 8 and 13. The only real difference between these two programs is in the complexity of the puzzles. For example, while the two-loop puzzle was the most difficult loop puzzle in *Secrets,* it's the easiest of the loop puzzles in *Puzzles.* Two Loops is the only puzzle the two programs have in common. In addition to a three-loop puzzle, *Puzzles* also has a pair of box puzzles similar to the arrays in *Secrets.*

Rocky's Boots looks a lot like the Gertrude games, and it builds on the logical and perceptual foundation laid by those programs. But *Rocky's Boots* is a much more sophisticated learning game that teaches nothing less than the fundamentals of digital computer logic from the ground up. The target audience is the nine-and-up crowd, but younger children can enjoy it,

Programs like these, which teach logic, reasoning, problem-solving, and creative design are very special.

too, even if they don't understand everything they see. The program has a main menu offering six choices:

1. How to Move
2. Building Machines
3. Logic Gates
4. Rocky's Boots
5. Flip Flops
6. Rocky's Challenge

Choice one teaches basic movement skills used throughout the program, and shows the keystroke combinations that can be used to turn the sound off/on and bring help to the screen. The second option shows you how the machines in this tiny world run on orange-colored electricity. The player, who appears on-screen as an orange box, can turn anything on by touching its input socket.

This section also introduces the simple rules for building machines in Rocky's world: Arrows (outputs) from one object can be connected only to sockets (inputs) of other objects; electricity can flow only one way; sensors turn on and produce electricity when they're touched by the objects they're designed to sense; and so on. Instead of just listing or displaying each new concept, this carefully-devised tutorial allows and encourages the user to learn by *doing.* And at the end of the teaching tour, there's a practice room for experimenting with the ideas just introduced.

The third menu path uses the same techniques to introduce logic games—the important components at the heart of every computer. The NOT GATE turns ON to OFF or OFF to ON. The AND GATE and the OR GATE each have two input sockets and one output. For the AND GATE to produce electricity, it must receive electricity from both input sockets; the OR GATE only requires one charged input. But the importance of these simple tools is in the many ways they can be put together, and that's what the rest of *Rocky's Boots* is all about.

The "Rocky's Boots" level is where the actual game begins. The player chooses from games with names like "Diamonds or Green" and "Non-Circles." Each of these games assigns point values to all of the available game pieces according to color and shape. The player's goal is to design a circuit to "kick" (activate) only those objects with positive point values, using logic gates and Rocky's boot, an electric-powered kicker. Once the player builds a machine, he or she turns on the juice and watches the results. If the machine doesn't work as designed, experimentation, debugging, and rebuilding are in order.

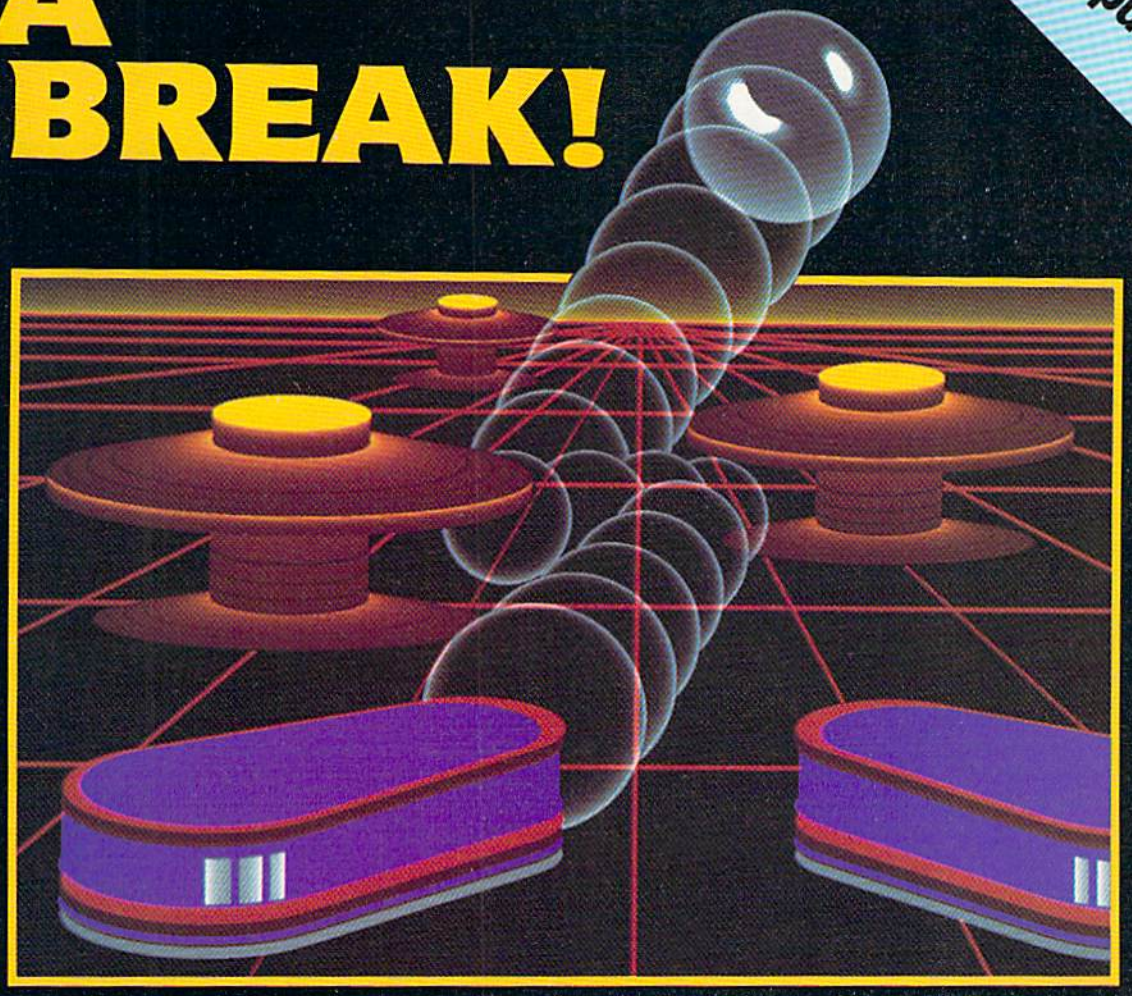
Level five introduces three new electronic components—FLIP FLOP, CLOCK, and DELAY—which are necessary to build the 32 more complex machines in the 15 rooms of the "Rocky's Challenge" level. "Rocky's Challenge" also has options for designing custom games and saving games in progress. And for those who don't want to play structured games at all, there's always the option of inventing and building machines just for fun.

On-screen instructions are always available in all three of these programs, but the manuals are still worth a look. They're all of the highest quality, with complete instructions, learning lists outlining educational objectives, and suggested additional learning activities. The *Rocky's Boots* manual also includes solutions to the puzzles in "Rocky's Challenge," a map of the 15 rooms on that level, and a glossary defining real-world electronic parts and those unique to this game.

All three programs have simple, but effective, graphics. SID fans won't be impressed with the sound, but kids playing the game aren't likely to complain. Every one of these programs is built on rock-solid educational principles that go beyond the primitive drill-and-practice that's so common in today's software. Programs that teach logic, reasoning, problem solving, and creative design are special. These three programs are very special. C

TAKE A BREAK!

For Commodore 64™ Computers



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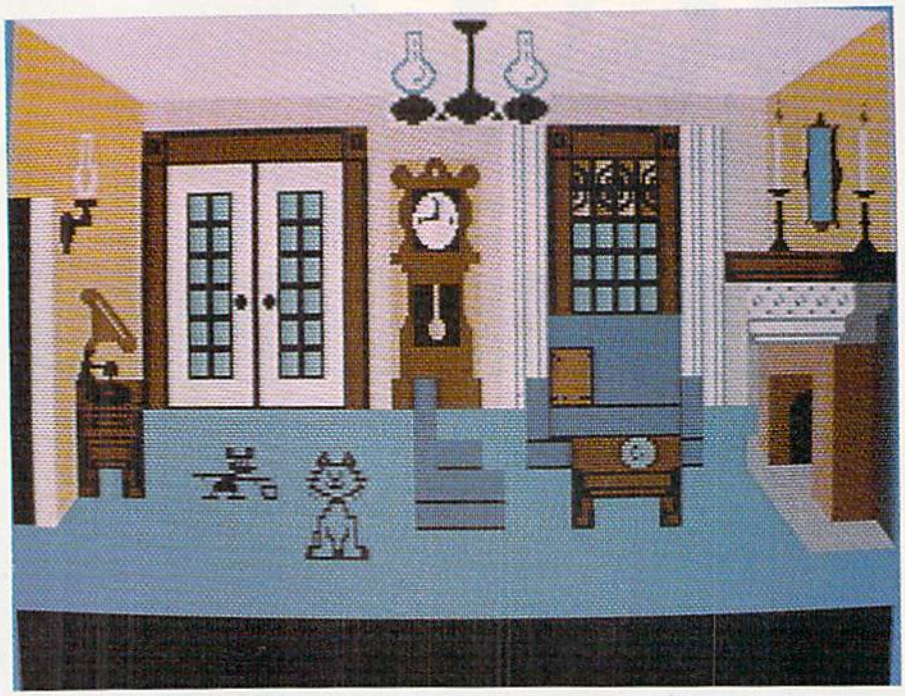
Circle Reader Service No. 27

REVIEWED BY KELLEY ESSOE

Dream House

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Retail Price: $39.95



Until the day when that final shingle is hammered into place on my house on a hill, I am always looking for some new and exciting tool to help me build my castles in the sky. This is not easy. After all, there are only so many kinds of graph paper, so many colors of pens, so many magazines, and so many hours in a day. It has been years since I found a new way to indulge my passion. But I have been patient. And patience has its rewards: namely, *Dream House* from CBS Software.

Dream House provides you with four different houses, each with its own floor plan, exterior view, and interior rooms. Hit your joystick button and you will be presented with a choice of three different ways to begin. The first, "Pick a House," lets you leaf through the blueprint floor plans of all the houses. The second and third options, "Interior Design" and "Exterior Design," take you directly to the inside or the outside of the house.

When you use the program for the first time, you will want to go with the first option to familiarize yourself with the layout, style and size of the different houses. Each has its own unique attraction: the San Francisco Victorian is a two-story, six-room classic, with the requisite bay windows and fancy woodwork; the Colonial farmhouse has the big airy rooms and salt-box charm of New England; the top-floor Manhattan penthouse reeks with the modern elegance of the New York jet setter; and the woodsy Hideaway Cottage comes complete with waterwheel, gingerbread roof, and a secret attic.

Picking one is no easy task. Use your joystick button to choose FORWARD ONE or BACK ONE, and cycle through the four blueprints until you decide upon the house you want to work with. For the sake of illustration, go with the San Francisco Victorian. Now you've got a choice of beginning with the exterior or the interior of the house. Place the cursor on LANDSCAPE THIS ONE, hit the fire button, and start outside.

Dream House *is not exactly a game, though it does require a joystick, but it is just as entertaining and challenging as any traditional game out there.*

Here you are, on a quaint San Francisco hillside street, overlooking the famous Golden Gate Bridge. Nestled comfortably between two other equally charming Queen Annes, stands your very own dream Victorian abode. At this point, however, everything is washed in shades of gray, except for the Golden Gate bridge, which is, of course, golden.

The bottom menu portion of the screen has four rectangular boxes labeled COLOR, MOVE, COPY and ERASE. Next to these are four rather cryptic-looking icons. The one that looks like either the center of a bullseye or a sugar donut, depending, I suppose, on your hunger status, is the ANIMATE ALL symbol. Yes, this program allows you to bring certain objects to life with both movement and sound effects. When you ANIMATE ALL, everything in your picture that *can* move, *will* move. The next icon, which looks like an abstract painting of questionable esoteric depth, is the SELECTIVE animation symbol. With this you can selectively choose which objects will or will not be animated.

The last two symbols are easier to relate to. The MOVING VAN takes you to any number of storage areas where you can find just about anything you need to furnish, decorate, and embellish both your interior and exterior. Trees, plants and fences, paintings, furniture and knick-knacks, dishes, pots, refrigerators and light fixtures, and even people and pets can be picked up by the truckload and transported back. And, if you've searched through all the storage areas and still can't find what you're looking for, the last icon, the HAMMER, will take you to the workshop, where you can build it yourself.

Let's get down to business. All that gray is rather lifeless and depressing,

Continued on page 124

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For Commodore 64™ Computers

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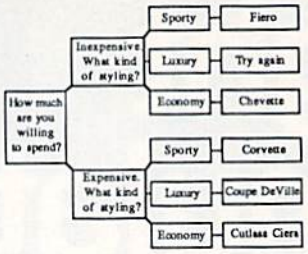
XPER - expert system



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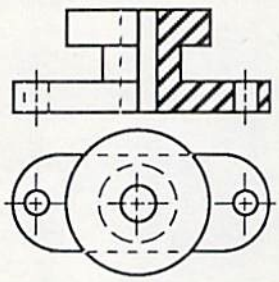
CADPAK Revised Version



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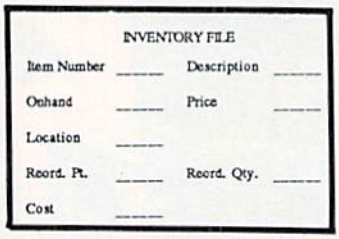

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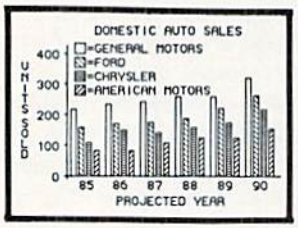

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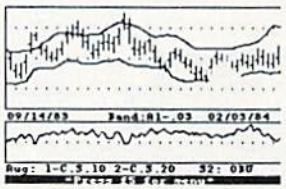
TAS - technical analysis



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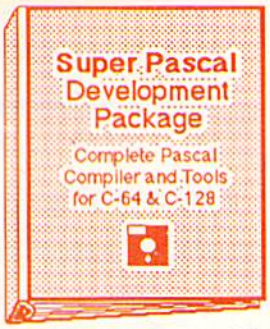

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BASIC-64 full compiler

```
ADVANCED DEVELOPMENT PACKAGE
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B = LOAD SYMBOL-TABLE:     OFF
C = SAVE SYMBOL-TABLE:     OFF
D = LINE-ADDRESS-TABLE:    OFF
E = MEMORY-TOP:            65536
F = CODE-START:            7557
G = RUNTIME-MODULE:        ON
H = EXTENSION:             SIMON'S BASIC
I = TOKEN-BYTES:           2
J = ELSE-CODE:             100 71
K = ERROR-LINE:            0
L = OVERLAY:               OFF
M = DISK-COMMAND:
```

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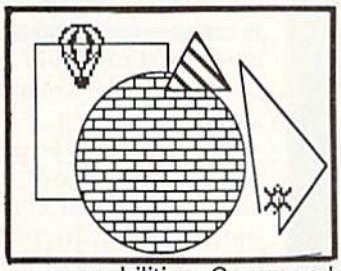

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FORTH Language

```
SCR # 20
 0 P ( RANDOM NUMBER TESTER .?RND )
 1 P FORTH DEFINITIONS DECIMAL
 2 P : ?RND
 3 P       ( INITIALIZE FIRST SCREEN)
 4 P       1024 1000 ASCII 0 FILL
 5 P       BEGIN
 6 P          1000 RND   ( RANDOM 0.999)
 7 P          40 /MOD    ( COLUMN, LINE)
 8 P          SWAP       ( EXCHANGE)
 9 P          2DUP 5# ( CHARACTER)
10 P          1+ -ROT    ( ADD 1)
11 P          5!         ( SAVE)
12 P       ?TERMINAL UNTIL
13 P ;
```

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BY TOM BENFORD

The Fast-Loader Gran Prix

Do fast-loader products really work? I held a race among four fast-loader products, and here are the results.

The 1541 disk drive is a reliable workhorse, but a slow one at that. Fast-loader products claim to load programs faster and offer other enhancement features to make life with the 1541 easier. But do these products really work? I held a race between four leading fast-loader products, and the accompanying chart shows how fast each product loaded nine commercial software products.

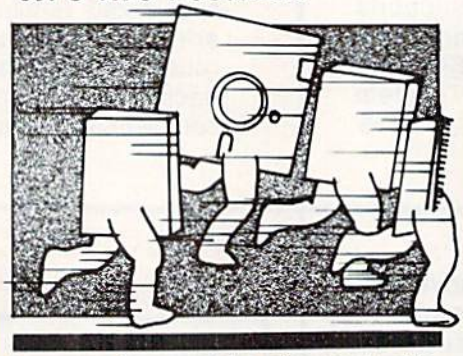
Fast Load

In addition to loading most programs significantly faster, *Fast Load* also provides several disk utilities. Press the English-pound key and access the utility menu, which includes the directory, return to BASIC, copy (file or disk), disable *Fast Load,* edit diskette, and file utility.

Selecting "file utility" brings a submenu which includes a directory, return to main menu, copy file, delete file, lock file, unlock file, and rename file. I found the lock-file function to be especially interesting, because it protects files from accidental deletion. In the event you decide to delete a "locked" file, you would need to first use the unlock utility.

Fast Load also provides a powerful monitor for editing and debugging assembly language programs. It is called by typing "!" and exited by typing "%."

Fast Load may be disabled from the keyboard by typing a "D" and hitting RETURN. Once it is disabled, however, it cannot be reinstated without turning the computer off and on again.



The cartridge is easy to use and comes with good documentation. Most commercial software products can be loaded by pressing the "C=" (Commodore logo) and RUN/STOP simultaneously. BASIC programs are loaded by typing "/Filename" and saved with "(left arrow) Filename."

Disk directories may be listed at any time without erasing the program in memory by typing a "$." There are also commands to read the error channel.

Fast Load performed well during testing and loaded every piece of software. It is available from Epyx at 1043 Kiel Court, Sunnyvale, California 94089, and has a suggested retail price of $39.95.

Kwik-Load!

Of the four products reviewed here, *Kwik-Load!* from Datamost is the only one that is disk-based. The program not only allows the use of two 1541 disk drives, but features a test to check the disk drive for proper operating speed. You can edit information on a diskette directly by track and sec-

The Fast-Loader Gran Prix Final Standings

Program Used For Test	Normal Load Time	Epyx Fast Load (Cartridge)	Access Mach 5 Cartridge)	Datamost Kwik-Load (Disk)	Skyles 1541 Flash (Hardware)
Easy Script	1:02	:58	:59	:58	:30
Music Construction Set	2:47	2:43	2:43	2:43	1:40
Sword of Fargoal	1:02	:16	:16	:16	:20
Flight Simulator	2:50	1:03	1:04	2:53	1:08
The Heist	1:27	:26	:29	:26	:33
Zaxxon	2:29	2:29	2:29	2:29	1:05
VIP Terminal	2:43	2:43	2:43	Won't Load	1:09
Beach Head	2:27	:43	:45	Won't Load	:45
Kwik-Write	:32	:32	:32	:30	:29

tor, and it formats, validates and copies disks as well.

There is no way to disengage *Kwik-Load!* once it is enabled other than turning the computer off and on again. The program "bombed" occasionally during testing, and there was no way to recover from these crashes. (The documentation booklet suggests typing SYS 52480 to revive it, but this did not work.)

During testing, *Kwik-Load!* failed to load two programs, *Beach Head* and *VIP Terminal.* The package notes that problems may be encountered when trying to load software with heavy copy protection. Evidently this is the case with these two programs.

The documentation is comprehensive and well written. *Kwik-Load!* is fairly easy to use, but isn't as direct or quick as the other two cartridge-based products. It is available from Datamost at 20660 Nordhoff Street, Chatsworth, California 91311, and has a suggested retail price of $19.95.

Mach 5

Access Software brings us the *Mach 5 Enhancement Package,* a combination fast-loader cartridge and disk-based enhancement program.

The *Mach 5* cartridge provides a command-reference screen by pressing the left-arrow and M keys. Disk directories may be listed by typing "$," and neither the disk directory nor the command summary will disturb any program currently in memory.

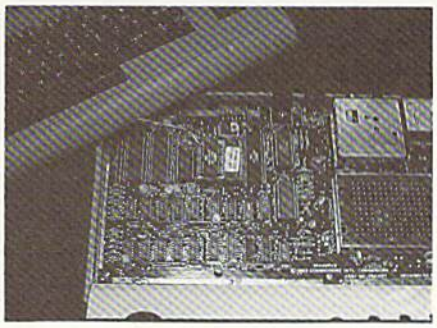
In addition to several combinations of load commands, *Mach 5* also allows the opening and closing of printer channels, screen dumping to printer, and a command for disabling the disk drive rattle when an error is encountered. *Mach 5* can be disabled and reinstated entirely from the keyboard.

In addition to the cartridge, the *Mach 5* package includes a disk with two enhancement programs, "Basic +4K" and "Mach Disk Organizer." Both programs require the *Mach 5* cartridge.

"Basic +4K" frees an additional 4,096 bytes of memory for use in the BASIC workspace and is completely compatible with all standard Commodore BASIC 2.0 commands. It relocates the BASIC ROM routines to other memory areas, so there is 43K available for BASIC instead of the usual 39K. The extra 4K is especially useful for storing variables.

"Mach Disk Organizer" catalogues your program disks and their files. Once the disks have been catalogued, the information is then stored on a data disk. The program keeps track of the file name, disk location, size of file, file type, and its location by track and sector.

Of the four products tested here, *Mach 5* was the easiest to use thanks to the built-in command summary screen. It loaded all test software, and comes with good documentation. It is available from Access Software, at 925 E. 900 South, Salt Lake City, Utah 84105, and has a suggested retail price of $34.95.



Skyles 1541 Flash

The 1541 Flash! is a hardware add-on assembly for the Commodore 64 and 1541 disk drive. The components are pre-wired, the documentation is excellent, and the unit may be switched in or out at will. A Phillips screwdriver, tape, and a flat-blade screwdriver or nail file are the only tools required. The installation should take about half an hour to complete, but may take longer if you've never done this sort of thing before.

A few words of caution: The installation of the 1541 Flash! assembly will void the warranties of both the 64 and the 1541 if they are still in effect. The kernal ROM of the computer and the operating ROM of the drive will have to be removed, as well as one of the drive's 6522 chips to insert the Flash! assembly boards. If you've never inserted or removed chips before, you may want to seek the help of a competent friend or technician.

Some early 64's have the kernal ROM soldered in place instead of in a socket. In such a case, I recommend letting a trained technician do the ROM removal and socket installation, or Skyles will do it for $28.50 if you wish.

Figure 1. Location of kernal ROM

The chips in both the computer and drive are surrounded by resistors and other components in close proximity (the boards are "densely populated," in tech jargon). Be gentle when doing the work and use a flat-bladed instrument (nail file, paring knife) to gently pry the chip up from the socket. If at all possible, work both ends of the chip, a little at a time, until it is out. If you are reasonably confident of your ability to do delicate work and follow directions, you can probably handle the installation without any problems. If you have any trepidations about doing it yourself, refer it to a service person.

And finally, the 1541 Flash! is not a cure for "sick" or "tired" 1541's! To reap the maximum benefits from the installation, you must start with a healthy disk drive.

Figure 1 shows the location of the 64 kernal ROM between the user and cassette ports (some 64's have this ROM soldered into the board—see warning above). This kernal ROM gets removed, the Flash! kernal ROM as-

sembly inserted, and the original 64 ROM inserted into that assembly.

Figure 1A shows the original kernal ROM in place on the Skyles assembly, piggy-back fashion. The slip-on connector assembly is routed through the user port opening.

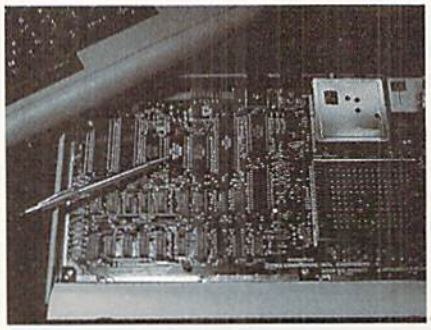


Figure 1A. Kernal ROM relocated after installation of 1541 Flash!

Figure 2 shows the CableCard assembly inserted into the user port. The exposed edge connectors act as an extension of the user port contacts, so you can still use your modem.

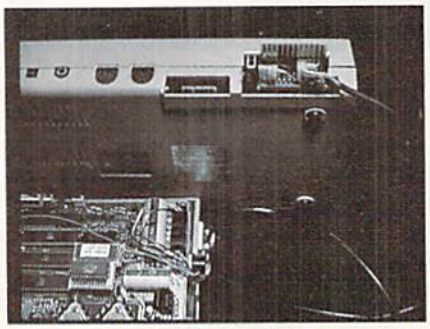


Figure 2. CableCard inserted in user port

Figure 3 shows Flash! operating ROM assembly in place of the original 1541's ROM chip. The original 1541 ROM gets inserted into the socket in this assembly. The slip-connector is routed through the back of the drive's case.

Figure 4 shows the 6522 with the "leg" of pin 19 bent straight out. Note the mini-clips in place in pins 18 and 19. The ground wire will be attached to the chassis ground screw in the rear left corner of the main circuit board.

Figure 5 shows the completed installation on the drive, waiting to be tested before reassembly. Selector switches are located on both the drive connector and at the user port connector. Note that you will still have to use the serial cable to connect the drive and the computer in conjunction with the 1541 Flash! cable.

Once the boards and chips have been inserted and tested, it's time to close the computer and drive. Then for the fun part—using it!

The 1541 Flash! allows a shorthand form of many "everyday" commands. For example LOAD"*",8,1 is replaced with the [SHIFT]/[RUN/STOP] and RETURN. Other useful commands include switching to fast or slow drive speeds through software control, soft reset of the drive, and warm start for the 64.

A useful set of DOS commands are also activated when you type SYS 65526/RETURN. These include initialization, directory, change drive number, copy, scratch, new, validate, and other commands. Most of the DOS commands are invoked with one or two keystrokes.

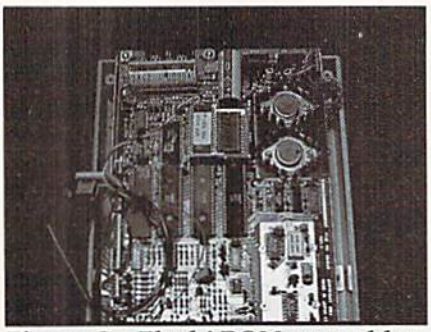


Figure 3. Flash! ROM assembly in place of original ROM

Ten editing commands include cursor control, pausable listings, and escape quotes. Several advanced programming commands for speed setting, linked loaders, and a run-time debugger are also present.

If you'd like, you can apply the brakes either through software or hardware control. The software method involves a few keystrokes, while the hardware method involves flipping a switch on the cable connector. In this way, the assembly can be engaged or disengaged instantly.

The features mentioned above are nice to have, but they really wouldn't justify the cost of the 1541 Flash!. The real strength of the unit is its speed—it really turns the 1541 into a "hot rod" disk drive.

The overall performance of the unit is excellent. It even speeded up the load of *VIP Terminal* and *Zaxxon,* as well as appreciable speed gains on some other loads. It worked reliably during extensive testing.

In addition to being the most impressive speed enhancement for the 1541 disk drive, it is also the most difficult to install and the most expensive: The 1541 Flash! has a retail price of $99.95. A model for dual drives is

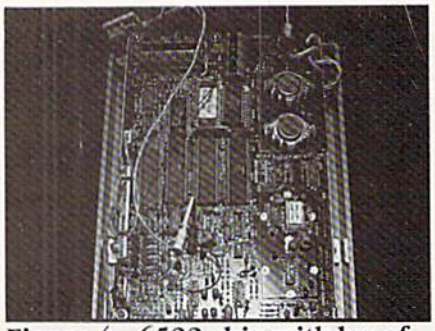


Figure 4. 6522 chip with leg of pin 19 bent out

also available from Skyles. If your 64's kernal ROM is soldered in, you can plan on paying another $28.50 to have Skyles install a ROM socket. If you elect to contract a technician to do the installation, it will probably cost between $15 to $30 for labor. Under the worst circumstances, this could set you back about $155 for the hardware and installation. Doing it yourself keeps the cost down to $99.95.

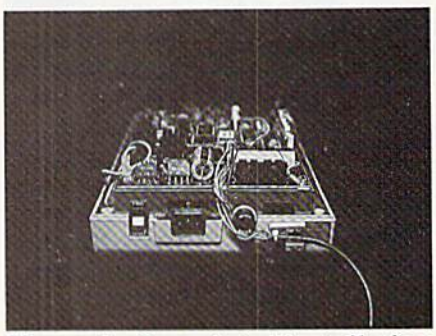


Figure 5. Completed installation

On the plus side, all the components are top quality, the documentation is thorough, and the excellent performance of 1541 Flash! makes the cost justifiable for "heavy" applications. If you want the Rolls Royce of the fast-loader Gran Prix, the 1541 Flash! is it.

The 1541 Flash! is available from Skyles Electric Works, 231E South Whisman Road, Mountain View, California 94041. C

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REVIEWED BY TED SALAMONE

SwiftCalc

Computer: Commodore 64
Publisher: Timeworks
444 Lake Cook Road
Deerfield, IL 60015
Medium: Disk
Retail Price: $49.95

Instead of creating integrated software that performs one function well and two or three not so well, Timeworks has produced a series of fine stand-alone products that can also work together. *SwiftCalc, Data Manager 1 and 2, Electronic Checkbook,* and *Word Writer* all interface with each other. Here we'll take a look at *SwiftCalc.*

From a spreadsheet introduction and a glossary of terms, to start-up and operating procedures, *SwiftCalc's* spiral-bound 150-page manual covers it all. Each feature is explained and illustrated in detail in the tutorial section. Working examples and sample spreadsheets are provided later on.

To help ease an electronic worksheet into your life, Timeworks has provided a nice medley of built-in mathematical functions, all accessible with a few keystrokes. Besides standard mathematical functions (addition, multiplication, subtraction, division, and exponentiation), *SwiftCalc* quickly determines the minimum or maximum values in a range, the average value or sum of a range, the number of values (headcount) in a range, and the absolute or integer value of a single cell.

Percentage-to-decimal conversions and financial analyses such as present and future values of a dollar or an annuity are included too. Every one of these features is thoroughly explained.

Cursor movement is as important in a spreadsheet as it is in a word processor. Knowing that, Timeworks has provided multiple means to manipulate the meandering marker: cursor key control, a GOTO function, and an automatic cursor-advance option.

The cursor-advance option is great when setting up row after row or column after column of entries. Just press the RETURN key to enter the information, and the cursor is on its way to the next data entry location.

SwiftCalc *can interface with Timeworks' other productivity software, or stand alone.*

News Flash

Timeworks Adds *Sideways to SwiftCalc*

As this issue was in production, Timeworks announced the release of a stand-alone *Sideways* program for use with *SwiftCalc. Sideways* enables the user to print an entire spreadsheet vertically on one sheet of paper. Users can print as wide a spreadsheet as they like and can choose from a variety of type sizes. Versions for the Commodore 64 and Commodore 128 will retail for $29.95.

Editing capabilities are also of primary importance in a worksheet. *SwiftCalc* lets you insert or delete individual characters as well as entire rows or columns. Information in groups of cells (blocks) can be deleted or moved to other spots at will. Cell widths can be set individually, even though text and figures (labels and numbers in spreadsheet jargon) spill over to the next space automatically.

An automatic recalculate function changes figures in a formula and views the results almost simultaneously. This "what-if" capability is the most powerful and most valuable offering any spreadsheet has to offer. You can disable and re-enable this function as you please.

Speaking of choice, you can independently change text, background, or status colors any time. This flexibility eliminates eyestrain. Other niceties include a search and a search-and-replace function for hunting down phrases, words and figures.

Through the disk commands, you initialize blanks as well as save or load spreadsheets. Other options include a free memory check, disk directory review, and a feature worth its weight in gold—escape or undo. This little gem allows you to abort procedures in process.

Believe it or not, 90 percent of these capabilities can be accessed through combinations of the Commodore or CTRL keys (in tandem) with the numeric keys. For instance, CTRL 2 activates the search function and Commodore 2 the copy function. Likewise, CTRL 4 allows you to insert a blank row or column and Commodore 4 allows you to format (decimal, scientific notation, or graphic display) a cell or a block.

The function keys change the screen colors, move the display one screen at a time up, down, left or right, and access the disk's load and save functions. Why there's even a warm boot (reset to BASIC) so you can continue computing without having to flick the power off and on again.

These key combinations are clearly illustrated on the handy, heavily laminated pull-out reference strips that come with *SwiftCalc.* Just tape them to the 64 and you're in business. You won't need to read the manual for much more than the between-program data transfers.

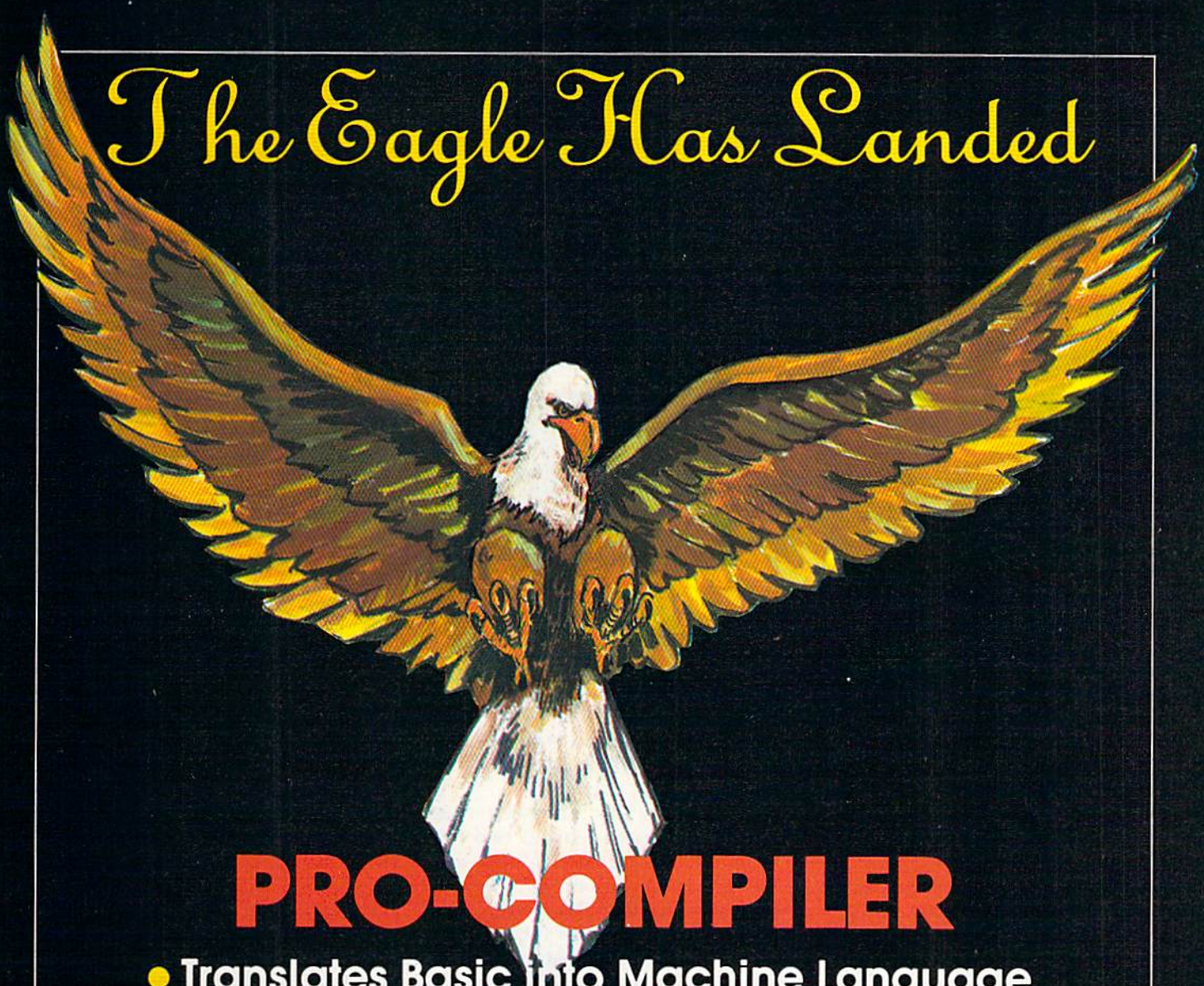
A significant deficiency is the fact that you can copy only one cell at a time, not a whole range. If you can move a range, you should be able to copy a range. When duplicating rows and columns of labels, this multi-cell copy feature is sorely missed.

In the version I reviewed, the search function didn't compensate for uppercase/lowercase. You had to know exactly what was and wasn't capitalized, otherwise the function would miss the mark. However, Timeworks says they are correcting this, so by the time you read this review, the new version should be available.

Also, when entering location coordinates, you can't move the cursor over them. They must be typed in separately. If it weren't for the integral sum function (which can be used as a subset of larger formulas), this situation would be extremely annoying.

Despite these minor objections, *SwiftCalc* is an excellent product at an outstanding price. Its value is there for all to see—and capitalize on. C

The Eagle Has Landed



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REVIEWED BY STEPHEN S. LEVEN

Loadstar

Computer: Commodore 64
Publisher: Loadstar
P.O. Box 30007
Shreveport, LA 71130
Medium: Disk
Retail Price: $9.95

I've been a subscriber to *Commodore Microcomputers and Commodore Power/Play* ever since I got my first VIC 20 almost three years ago. Needless to say, I read both magazines cover to cover. In fact, these magazines and the programs published in them have been instrumental in helping me learn to write my own programs for both the VIC and the Commodore 64. I have learned many tricks and techniques from studying the published programs, and have built an extremely large and useful program library in the process.

Of course, I'm a bit (no pun intended) lazy when it comes to typing in programs myself. Most useful programs are somewhat long, and I don't exactly enjoy doing the typing. It's just the means to get the programs into my computer. Then, after correcting all my typing errors, I'm ready to check out the program.

Loadstar to the Rescue

When I saw that Loadstar would begin providing the *Commodore Microcomputers* and *Commodore Power/Play* programs on its monthly disk, I grabbed my credit card, dialed the toll free number, and signed right up. Then I sat back and enjoyed reading the next issue of *Commodore Power/Play,* knowing that in a few days I'd receive a disk containing all the wonderful programs.

Boy, was I ever surprised! The Loadstar disk was more—much more—than I had expected.

Before I go on, I should mention that I subscribe to the disk service of one of the other popular Commodore-oriented magazines. That disk, which is also published monthly, contains all the programs from the corresponding issue. The magazine programs, plus a few advertisements, can be accessed from a menu. *Only* those programs are included on the disk, and all the instructions must be obtained from the printed issue, so I was expecting something similar from Loadstar.

Loadstar is more than just a collection of programs from Commodore Microcomputers *or* Commodore Power/Play. *Loadstar is a disk magazine with all the features found in any printed magazine.*

So why was I so surprised with Loadstar? Why did I spend two full evenings exploring, playing with, and reading Loadstar before I even looked at the *Commodore Power/Play* programs? Because Loadstar is more than just a collection of programs from a magazine. Loadstar itself is a magazine, a disk magazine, with all the features found in any printed magazine.

In addition to the *Commodore Microcomputers* and *Commodore Power/Play* programs included on it, Loadstar contains its own programs, called Payload programs, as well as several feature programs. Loadstar also includes features, editorials, columns, question-and-answer sessions, hardware and software reviews, a help column, tutorials, and even some (just a few!) ads. Let's take a look at a typical issue, number 11, which includes the programs from *Commodore Power/Play,* May 1985.

Star Gazing

Loadstar 11 contains programs on both sides of the disk, which is typical of all Loadstar issues. This disk fills 1268 out of a possible 1328 blocks, for a total of over 314K bytes of programs and text. Side one contains the *Commodore Power/Play* programs and the Payload programs. Side two contains the feature programs and all the other goodies.

An important feature of Loadstar is the documentation that accompanies each program. Of course you'd expect the Payload and feature programs to have documentation, but even the programs from *Commodore Microcomputers* and *Commodore Power/Play* have enough documentation on the Loadstar disk to get you started. And most programs, when you're finished running them, bring you back to either the main Loadstar menu or one of the sub-menus.

Starting Out

After inserting the disk in your drive, type LOAD"*",8 (that's how the disk got its name) and press RETURN. At the READY prompt, type RUN and press RETURN. After some introductory screens, you arrive at the main menu. Simply select the letter corresponding to your choice of menu item, and that item will be loaded into your Commodore 64. For example, to select the *Commodore Power/Play* programs from Loadstar 11, press the "B" key.

A new menu appears on your screen, with a hand pointing to the first in a list of program names. At the top left of the screen, another hand points to the word ABOUT. At the top right, the word RUN appears. Move the hand from ABOUT to RUN and back again with the joystick or left/right cursor key. Move the central hand to another program name with the joystick or up/down cursor key. When you've made your selection, press the fire button or space bar. (All these control instructions are displayed at the bottom of the screen, so you don't have to remember anything.)

If the upper hand is on RUN, the program listed will load and run. If the upper hand is on ABOUT, a text file will load that will tell you about the program. You can scroll through the text file with your joystick or cursor keys. Then, you can choose to either load the program or return to the menu, based on the position of another selection hand at the top of the screen.

The Payload programs work the

same way. If you select a menu item that is actually on the other side of the disk, you will be told to turn the disk over in the drive.

The Flip Side

Included on side two is a Pixel page—a graphics screen which can be thought of as the magazine's cover. Following this are the "paperless pages," which start off with a short editorial. Background music is available while you "read" Loadstar, or you can switch off the music at the touch of a key. Included in the "paperless pages" are a couple of ads for Loadstar and the Commodore publications, followed by the tutorials (Issue 11 contains "Do's and Don't's," and two installments of Alan Gardner's and Jim Weiler's "PEEK, POKE, and SYS"). A column correcting errors from previous issues is included here.

Also on side two is the section called "Influx," which is basically user-written. "Influx" includes a help section, written by subscribers who are experiencing problems. Questions submitted by readers are answered by the editors. This section also contains hardware and software reviews by subscribers who have used the products.

Perhaps the most unique feature of Loadstar is the "feedback disk maker." A feedback disk is for you to submit your comments, articles, reviews, questions, and programs for the editors to read, answer, or consider for publication (yes, you get paid if your article or program is published). Loadstar prepares the feedback disk, which contains the Starwriter word processor for your use in creating your electronic Letters to the Editor. A postage-paid sticker is provided for your disk mailer. The editors promise to return your disk as soon as they copy the information, so it doesn't cost you anything to send it in.

The Bad News

Every review must have a negative comment about the product: I don't like the colors chosen for the Loadstar main menu. They're too hard on the eyes.

A Best Buy

While the cost of Loadstar is not cheap, it is just about the same as the cost of some of those other magazine disk services. But those other services pale, almost even disappear, in comparison to Loadstar. While the other services include only the programs from the issue of the magazine they serve, Loadstar gives a whole lot more. It's truly a magazine in and of itself, and nicely complements my subscription to *Commodore Microcomputers* and *Commodore Power/Play*.

I'm not one to spend hard-earned money frivolously, whether it's mine or someone else's, but I highly recommend Loadstar. If you can afford only one disk service, make it Loadstar. If you can afford more than one, make sure Loadstar is one of them. You'll soon wonder why you bothered with the others! C

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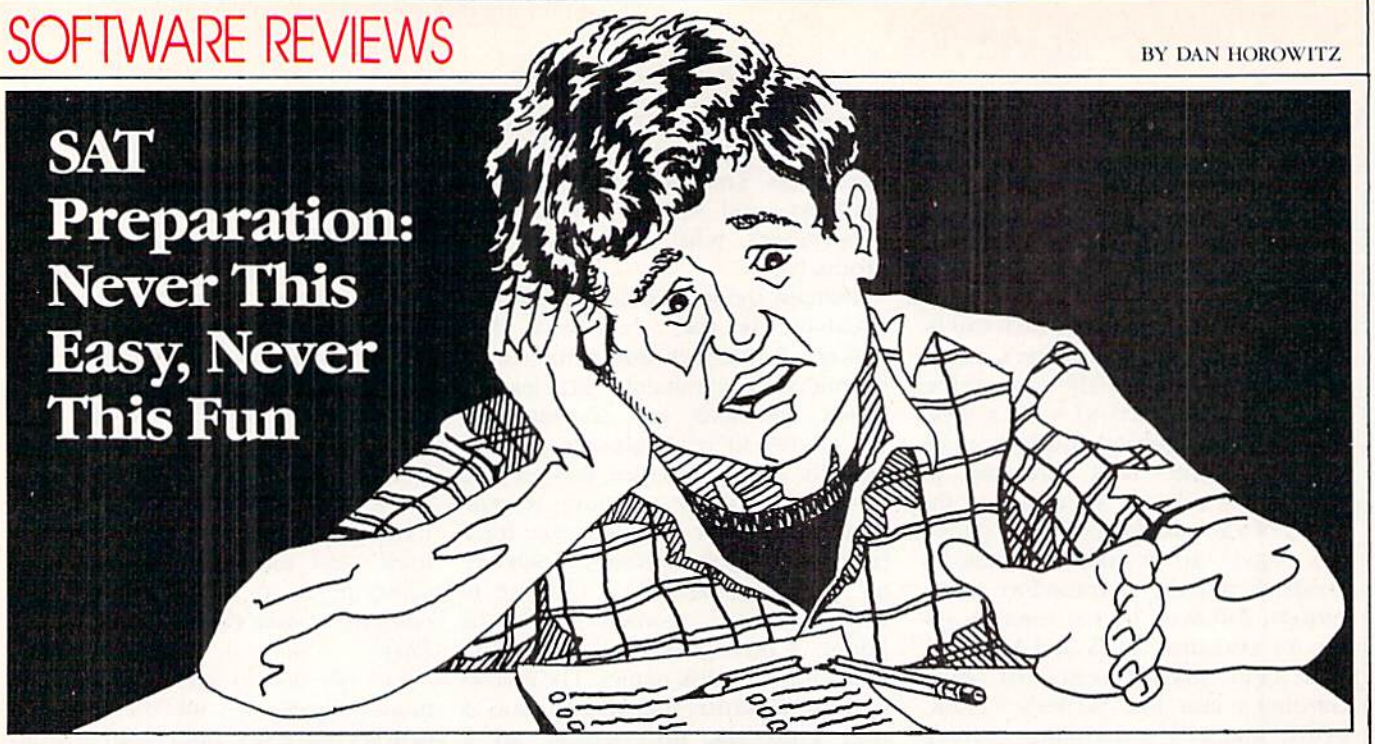


Steve Early

On November 2 and December 7, college-bound high school students will file nervously into quiet school rooms and auditoriums to take the crucial test on which their future hinges—the Scholastic Aptitude Test (SAT). Studies show that those students who have been coached will do significantly better than those who haven't. And your Commodore 64, used with an SAT preparation program, is an excellent coach.

If you're like most kids, you need more than a supply of number two pencils to prepare you for the Scholastic Aptitude Test (SAT). The more information you have before the test, the better your score will be. And that's where the computer comes in. SAT preparation is a perfect application of the computer. It acts as your private tutor—quizzing, explaining, and telling you where you went wrong. It can even keep track of your scores, so you can more effectively monitor your progress. Here are five SAT packages for the Commodore 64, and no matter which one you choose, you're almost sure to improve your score.

Krell's College Board SAT Exam Preparation Series

Krell Software, 1320 Stony Brook Road, Stony Brook, NY 11790, (516) 245-7355, $300.

If you don't mind spending big bucks for a little insurance, you'll probably be interested in the money-back guarantee that comes with *Krell's SAT* program. Krell will refund your purchase price if you don't raise your score by at least 80 points after using their program for six hours.

Krell's format is slightly different from other SAT computer study programs. Their program offers mainly practice questions and answers and optional simulated timed tests, which are scored. The questions are randomized and the wording is varied to avoid repetition. The feedback regarding right and wrong answers is excellent.

One unique feature of the Krell program is an automatic learning strategy. The computer will evaluate your responses and present you with a series of individualized questions in areas where improvement is most needed. The data can then be saved to disk, so you can concentrate your study in problem areas. Another interesting option is the worksheet generator. This takes questions from the programs and prints them out with a separate answer sheet.

The Krell program offers in-depth, individualized learning for the serious SAT student. If you follow their suggestions and use the program as directed, you're practically guaranteed of chalking up extra points when D-Day rolls around.

COMPUTER PREPARATION for the SAT

Harcourt Brace Jovanovich, 1250 Sixth Avenue, San Diego, CA 92101, (800) 543-1918 or (619) 699-6335, $79.95.

COMPUTER PREPARATION for the SAT is a computer-assisted study program which relies heavily on computer-administered drills, with immediate feedback. Four full-length tests are included in the 470-page text, rather than on disk. The primary function of the computer, as far as testing goes, is to act as a score sheet for the pre-test. It's a bit cumbersome to feed the answers into the computer, but the immediate feedback is helpful. The advantage, of course, is that you don't have to spend time looking up the correct answer in the back of the book.

The program scores your test and then creates an individualized study plan by indicating your weak areas and telling you what you need to concentrate on. To increase your performance in English, you can use the

1000 on-disk vocabulary flash cards. These are easy to use and extremely helpful.

COMPUTER PREPARATION for the SAT offers a basic approach to SAT studying. While it doesn't try to be entertaining, it definitely gives you practice and strategies that will help you keep your cool when taking the real thing.

Lovejoy's Preparation for the SAT

Simon and Schuster, 1230 Avenue of the Americas, New York, NY 10020, (212) 245-6400, $69.95.

Lovejoy's Preparation for the SAT contains two verbal and math exams, along with a Test of Standard Written English and 500 extra practice questions. There is an automatic scoring system, and both the exam and practice questions contain detailed explanations for every answer. The questions are easy to read and there is adequate time to answer each one.

The computer does it all. You never need to touch the guidebook, and there's even an on-disk scratch pad and calculator so you can use the computer to take notes and solve equations.

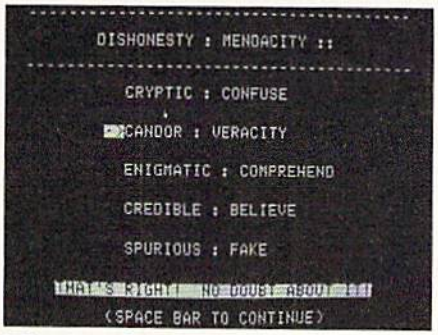
Lovejoy's also has a unique timing feature consisting of a built-in timer which allows 30 minutes for each section. The pressure mounts as the minutes tick by—just like the real thing.

The only disadvantage to *Lovejoy's Preparation for the SAT* is the fact that it uses separate disks for data storage. If you have only one disk drive, you'll have to do a bit of disk-switching.

The manual is necessary only if you're interested in test-taking strategy or study tips. In addition to the manual, the *Lovejoy* package also includes the *Lovejoy College Guide* which contains useful information about more than 350 colleges and universities. The *College Guide* is a handy little extra for comparing and choosing schools.

Lovejoy's unique features make it an extremely easy to use SAT study aid. It's a complete, well planned program containing everything you always wanted to know about the SAT, but were afraid to ask.

Improve your performance—and reduce anxiety—with these computerized SAT preparation packages for the Commodore 64.



The Perfect Score

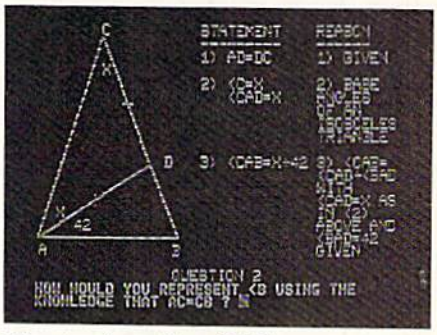
Mindscape, 3444 Dundee Road, Northbrook, IL 60062, (312) 480-7667, $69.95.

Along with all the SAT study basics, Mindscape's *Perfect Score* contains a bonus feature not found in other programs. Instead of the usual dry, serious responses, *Perfect Score's* feedback consists of witty little phrases that will make you chuckle. Sometimes they're a little on the corny side, but they do help you stay awake!

The Perfect Score has two modes of operation: testing and learning. The learning mode offers immediate feedback after each question, including full explanations of right and wrong choices. The test mode is more like the real thing, as it goes through a set of questions and scores them at the end. Both the full-length SAT exam and the Test of Standard Written English are timed so you get a realistic effect—sweaty palms and all!

Other *Perfect Score* features include randomizing so that no two tests are ever the same, and a scorecard-printing option for keeping records as you go along. The testing mode also offers the opportunity to return to any questions you got wrong the first time around. You now have a second chance to come up with the right answer

Unfortunately, *The Perfect Score* can't guarantee a perfect score. It can, however, offer a bit of fun to counteract the drudgery of studying for the SAT.



Mastering the SAT

CBS Software, One Fawcett Place, Greenwich, CT 06836, (203) 622-2500, $150.

Mastering the SAT is a complete approach to SAT study via computer. The package has four single-sided disks containing one pre-test and one post-test. Both the pre-test and the post-test include two verbal sections, two math sections, and one Test of Standard Written English. A booklet of SAT strategies and two simulated exams are also included.

The computer questions are easily readable and clearly differentiated from the "help" sections by assorted color bands, which also serve to break the monotony of the test. There are full explanations of right and wrong answers, and the program pinpoints areas needing improvement. To push your score even higher, there are supplementary math and English skill-building exercises.

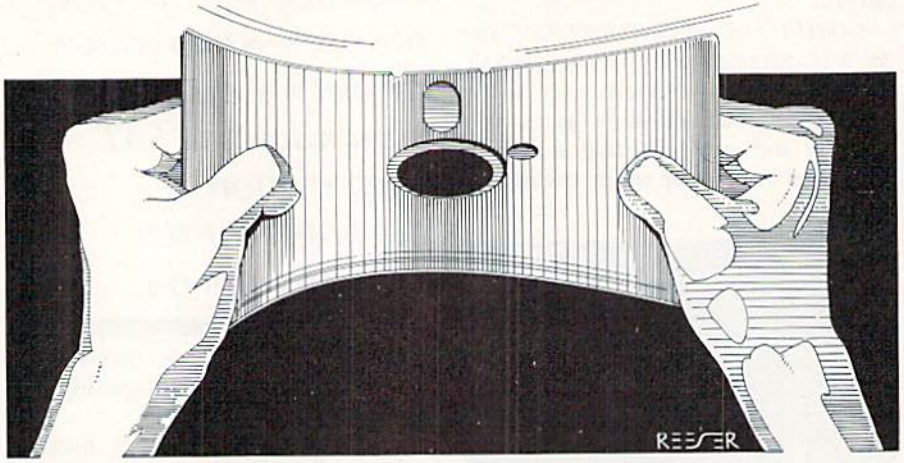
Scorecards are another interesting feature of *Mastering the SAT.* These can be saved on disk and displayed on the screen or printed out so you can keep a record of your progress.

All in all, the CBS program is a good, solid SAT study aid with no gimmicks. If you're a "just give the facts" person, you'll find all the facts you need in *Mastering the SAT.* C

REVIEWED BY TOM BENFORD

Vizastar

Computer: Commodore 64
Publisher: Solid State Software
1125 E. Hillsdale Blvd.
Foster City, CA 94404
Medium: Cartridge/Disk(s)
Retail Price: $119.97



Vizastar is three integrated programs: spreadsheet, data base and business graphics. Since all three programs reside in memory simultaneously, switching from one to another is immediate. Data may be freely transferred between the spreadsheet, data base or graphics modes without having to re-key it—it "shares" the data. The interactivity of the three modes, coupled with this data-sharing ability, makes *Vizastar* very flexible.

Vizastar packs so much muscle into the 64 that it is hard to believe you're running it on a 64K machine. A program with these capabilities usually requires a minimum of 128K to run. And *Vizastar* not only runs on the 64, but it runs fast. (It is written totally in machine language.)

Kelvin Lacy authored this program, as well as the excellent documentation that accompanies it. Users of *OmniWriter/OmniSpell* will immediately recognize his name, since he authored that word processor/spelling checker as well. *VizaStar* is compatible with *OmniWriter,* as well as most other popular word processing programs for the 64.

Solid State Software backs *VizaStar* with a 15-day full-refund guarantee. A guarantee of this nature is all but unheard of in the software industry. This guarantee shows Solid State's confidence in *VizaStar,* and it lets you purchase it with confidence, as well.

VizaStar comes on cartridge and disk. The cartridge must be in the 64 at all times to use the program, which is loaded from disk. A backup program disk is included in the package, and an excellent tutorial guide and a superb user reference guide are also supplied with the program. It all comes packaged in a vinyl "archive" case that provides protective storage.

VizaStar is very easy to use for a program of such power and capability. It aids the first-time user by presenting menus and sub-menus of options. If you follow the tutorial guide and work the examples provided, you'll be a *VizaStar* expert in a couple of hours.

The interactivity of the three modes, coupled with its data-sharing ability, makes VizaStar *very flexible.*

An especially impressive feature of the program is its windowing capability. Windowing allows you to call up portions of data from different sections of the worksheet to the current screen for comparison or reference. Up to nine windows may be "open" at a time.

All data entry originates from a gridded "worksheet." The grid is composed of 64 columns and 1,000 rows. Sixty-four times one thousand equals 64,000 cells—incredible capacity.

The spreadsheet supports all of the usual mathematical operators, in addition to date processing and calculations. The date features make *VizaStar* very effective for planning, scheduling and invoicing. The powerful calculation functions facilitate complex projections and forecasts, as well as simplifying many bookkeeping calculations.

An automatic keyboard "EXEC" facility permits you to predefine a sequence of commands that may be executed at any time with a single keystroke. This is another powerful feature that expands the possible uses of *VizaStar.*

The data base is also invoked from the worksheet. Up to 15 indexed files are possible, and each file may hold records up to 8,000 characters long. Each record can have up to 64 fields, and each field can be up to 120 characters. Disk access time for any random record averages a fast three seconds on the 1541, the only drive presently supported by the program.

Creating file layouts is easy, and you may have reversed headings with borders if you wish. Up to nine different screens per file may be configured. In addition, *VizaStar* supports direct file processing from within the program and single- or combined-field searches are possible.

Spreadsheet or database information can easily be transformed into line or bar graphs, and windowing is supported in graph mode. An extended graphics package is included which provides two impressive and sophisticated graph modes—color "pie charts" and three-dimensional four-way scrolling "skyscraper" graphs. I was most impressed with the graphs.

Playing the devil's advocate, I scrutinized, tested and experimented with *VizaStar* extensively, but could find no major weaknesses. It seems to be a 64 application program beyond reproach. When it comes to business application programs, *VizaStar* is an all-star! C

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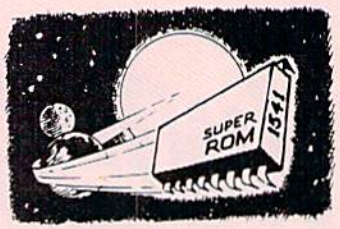

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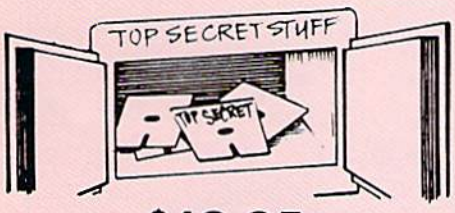

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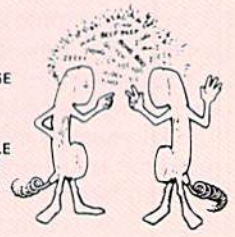

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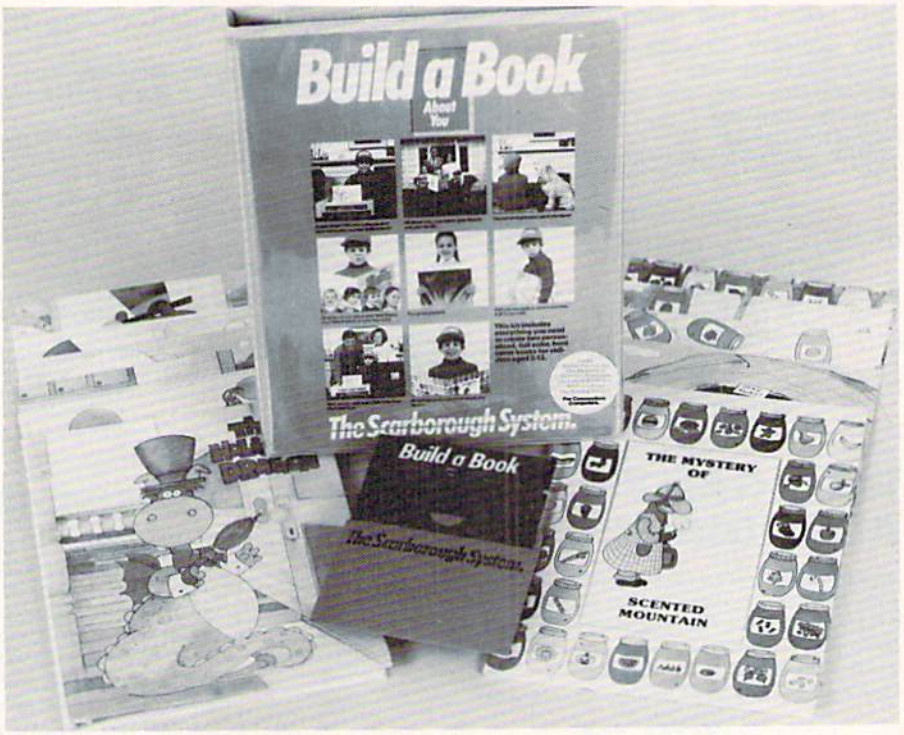
REVIEWED BY JOYCE WORLEY

Build a Book About You

Computer: Commodore 64
Publisher: Scarborough Systems
55 South Broadway
Tarrytown, NY 10591
Medium: Disk
Retail Price: $39.95



Build a Book About You is a combination software program and binding kit that lets children ages 2 to 12 publish personalized storybooks. Everything needed is included, along with step-by-step instructions.

The main menu directs the user to enter the child's name, age, gender, birthdate, and address, along with the names of three friends, the name and specie of the child's pet, and the name of the person who gave the book to the child. The program improvises if some of the information isn't available. For example, if three friends aren't available, they automatically become Teddy Bear, Superman and Robbie Robot. And petless children automatically receive a companionable little dog named Sparky. The data entered can be saved to disk to be recalled later for use in other stories.

The program then offers a selection of stories to be viewed on-screen. There are four tales included on the disk, although the kit includes bookmaking supplies for only two. (Bindings for the others can be purchased separately.) The stories are presented one page at a time, exactly as they'll be printed. Each has been personalized by integrating the information supplied previously. The youngster is now the protagonist, accompanied by his or her friends and pets.

The kit contains everything needed to produce two books: The Mystery of Scented Mountain and The Holiday Dragon. Each set includes hardcover bindings, end sheets, title page, and illustrated paper.

The production tasks are simple enough for youngsters under supervision or for grammar school children working alone. The two end sheets and storybook pages are all perforated. The child sews these to a plastic binding strip using the needle and thread that comes with the kit. The child then lines up the pages with the book jacket, exposes the sticky strip down the center of the binding, and presses the pages against it. After stripping the backing from the adhesive end pages, the child affixes them to the front and back covers. Voila!—a masterpiece.

Build a Book About You *produces personalized storybooks that make your child the star.*

The finished products are quite lovely. Each volume measures 11-1/2 by 9 inches, and contains 32 colorfully illustrated pages. More binding kits can be purchased, either for the original pair (to make additional copies for friends, or to replace any spoiled supplies), or for the other two tales on the disk ($12.95 each or $19.95 for two).

The Mystery of Scented Mountain, a detective adventure written and illustrated by Carol Howie Eldridge, features scratch-and-sniff stickers. In this story, the child must find the Nose Monster who stole the scents of Miss Strawberry, the Gingerbread Man, Little Skunk, and Evergreen. The Holiday Dragon, written by Ray Broekel and illustrated by Diana Noro, features a goody-gobbling dragon.

The two stories on disk that don't come with binding materials are equally exciting. Adventures on the Riddle Planet takes a trip to a planet where everyone talks in rhymes. The flowery inhabitants pose riddles which must be answered correctly so the protagonists can reach home in time for the child's birthday. The Greatest Circus Story Ever Told is about two runaway circus lions who must be coaxed back to their home. Scarborough plans to introduce additional adventure and fantasy stories to the *Build A Book* library.

Build a Book About You is a charming gift for a youngster. Though only the younger users will need parental assistance, this program is still an excellent all-family project. It's great fun to see the story on screen, personalized with the names of friends and family. It makes the child a star in his or her own book. Binding the printed pages into a hardcover volume is equally satisfying. The finished products will make proud additions to any child's library! C

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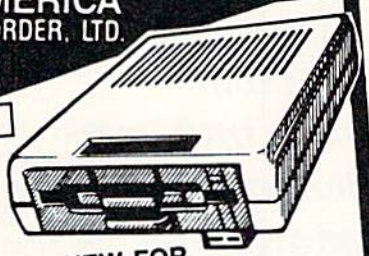

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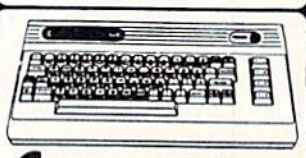

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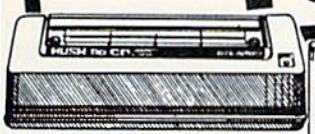

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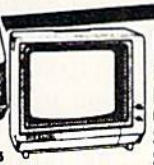

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REVIEWED BY SHLOMO GINSBURG

BASIC-64

Computer: Commodore 64
Publisher: Abacus Software
Medium: P.O. Box 7211
Grand Rapids, MI
49510
Retail Price: $39.95

Using machine language for programming is not easy. High-level languages, including BASIC, attempt to make programming as easy as possible. BASIC, for example, is relatively easy to learn and apply, and even the novice can use it. Machine language, on the other hand, requires a more advanced understanding of the computer to master the fairly complex set of rules. Yet, many people continue to study machine language so they can better use the capabilities of their computer.

BASIC-64 from Abacus is for the programmer who wishes to avoid learning and coding machine language but wants the speed and efficiency. By using this BASIC compiler, the programmer can write BASIC programs and *BASIC-64* will translate them into more efficient code. This code is saved and used for execution. *BASIC-64* provides several alternatives for compilation: pseudo-code, machine language, or a combination of both. As a result, several programs can be merged and compiled, and even programs like extended BASIC and *Simons' BASIC* can be compiled.

The main advantage of *BASIC-64* is the enhanced speed. In most cases, it is not possible to accelerate execution as much as with direct machine language coding, but the speeds are still quite impressive.

The package is easy to use, and the manual is well written. It should take only a few minutes to create a code from scratch, assuming that the BASIC source already exists. The codes may require a fairly large amount of disk space, but this is a reasonable price to pay for what we get in return. *BASIC-64* is most suitable for programs which require extensive run time. Also, it is great for instances in which response time is of the essence.

I tested *BASIC-64* by compiling several programs, and the package performed very well. As an example, consider a program for solving a system of linear equations (see "On Matrix Algebra and Computer Arrays," *Commodore Microcomputers,* May/June 1985). This problem involves repeated mathematical operations (addition, subtraction, multiplication, and division) applied to floating-point numbers. Such programs are for problems in science, engineering, and economics. The run time of these programs increases exponentially with the problem size. In other words, the increase depends on the number of unknowns.

By using this BASIC compiler, the programmer can write BASIC programs and BASIC-64 *will translate them into more efficient code.*

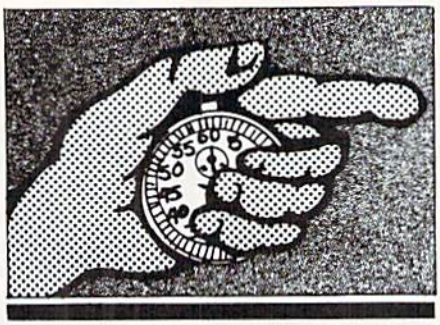
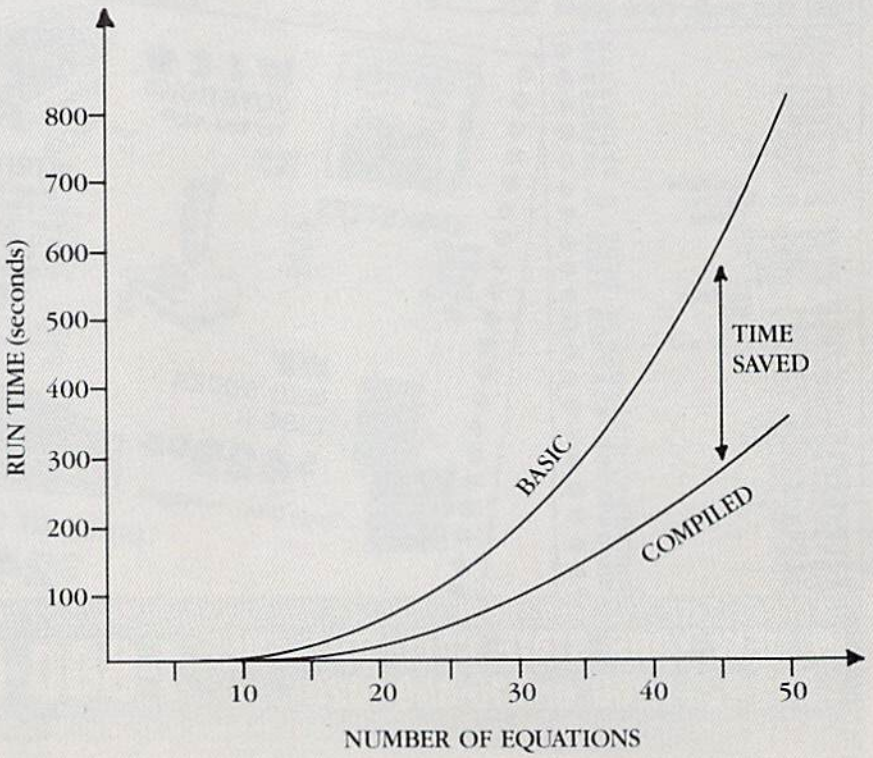


Figure 1 shows two curves that represent the run-time as a function of the problem size. The first curve (upper) is obtained by running a BASIC program. The savings in run time, which is often the time you just sit and stare at the screen hoping to get results, becomes more and more significant as the problem becomes larger.

In summary, *BASIC-64* enhances the performance of programs written in BASIC. It provides a good introduction to those programmers who intend to go on to use larger machines and other high-level languages. I enjoyed using it. C

Figure 1

Run time (seconds) vs. number of linear equations



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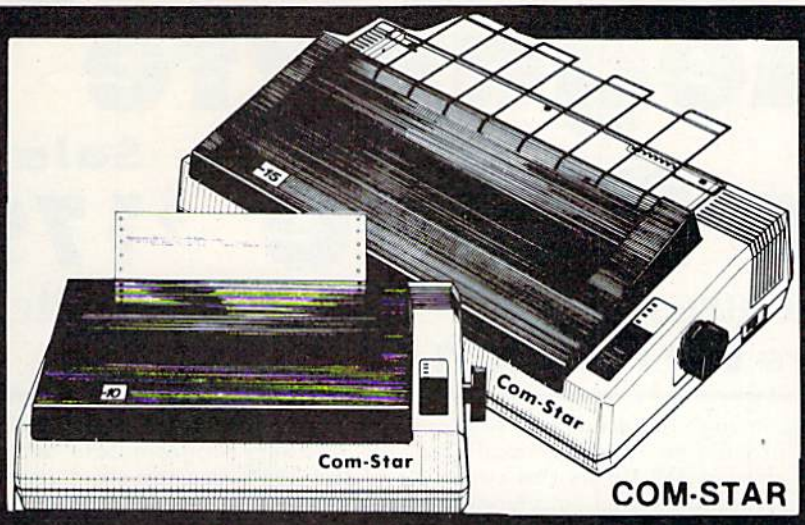

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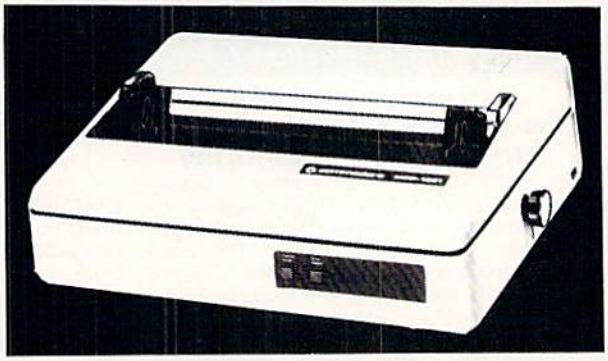

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REVIEWED BY ELIZABETH DEAL

WordPro 64

Computer: Commodore 64
Publisher: Pro-Line Software
755 Queensway East
Mississauga, Ontario
L4Y 4C5 Canada
Medium: Disk
Retail Price: $50.00

WordPro 64 is a splendid word processing program. It has many commands and many options, yet still remains manageable because the keystroke combinations are so natural. For editing and writing text, you use the cursor keys as you normally do. For other functions, you use a combination of, at most, two keys.

There is a chart in the manual, as well as a file that you can print yourself, that lists all the key combinations. The manual is bugfree, as far as I can tell. It is not quite a tutorial, but gives enough examples to make learning easy.

Writing and Editing

Write your text and correct the errors immediately, or correct them later, whether they are simple typos or require more elaborate editing. Need to move a paragraph or a sentence? It's simple—highlight it, then move it. The transfers are quick and economical.

If you have a line of dashes that needs to be placed in several spots in the text, a copy command comes in handy. You may delete a word, a sentence, or a whole paragraph. You aren't limited to merely deleting whole lines. All deleting automatically closes the text, so you do not have to do it manually. Large areas of text can be erased, but if you didn't mean to, an "ooops!" buffer can bring them back.

Need to find a phrase? No problem. Define it and ask *WordPro 64* to search for it. The cursor stops at each instance while scanning the text in memory, and, if desired, shows you the phrases located in all the files that you defined as being part of the larger document. This applies to replacing text, also.

Need to write the same word, phrase, sentence, or lines repeatedly?

The feature of WordPro 64 *that I treasure most is what I call the "hierarchy of trouble": The more damage a command can do, the more work you must do to activate it.*

Here is where *WordPro 64* really shines. There is an extra-text area called a scratchpad. You can use it for many things, but probably the most useful application takes the drudgery out of repetitive typing. You can define any key, at anytime, to type anything you wish, from one line to a whole paragraph.

WordPro 64 adapts to your work. It does not force you to foresee what you will be typing. It is ready when you are. You program *WordPro 64* to do what you need, not the other way around.

Similarly, you do not ever have to type file names for loading, saving, and disk utilities. The cursor is placed next to its name in the disk directory, and one keystroke copies the file name into the command you plan to use.

You can abort commands you entered by mistake. The exception is the LOAD and SAVE commands (they can never be interrupted). As a matter of fact, the feature of *WordPro 64* that I treasure most is what I call the "hierarchy of trouble." The more damage a command can do, the more work you must do to activate it. Insignificant commands usually are enabled with two keypresses, while important ones may require a carriage return.

The program strikes a good balance. Nothing is overdone. Bells don't ring, the screen doesn't clear, the program doesn't waste your time asking questions—it just unobtrusively protects you from your own errors.

SpellPro 64, co-authored by Jim Butterfield, is a spelling program that not only checks the spelling, but lets you modify vocabulary. You can then return to the *WordPro 64* file to make the corrections.

Using Large Files

The 64 memory can hold about 360 lines of 40 characters each. With the printer set at about 65 columns, the capacity is about six to seven pages. That's more than enough for a letter, but short for a college paper, so you can see that working linked files on a floppy is important. *WordPro 64* makes the work simple.

You can write very long text and if the text exceeds the computer's memory, you save that section and begin writing another. You can edit one section at a time, or the entire text on disk.

WordPro 64 provides the tools to manage the files. Basically, standard DOS commands are used. When you wish to scratch (delete) a file, for example, you'll see the "〉" prompt on the screen. You just fill it in to read "〉s0:scratchit." No confusion. Everybody knows the wedge. Well, almost. If you don't, you'll learn it from *WordPro 64.*

Standard Sequential Files

WordPro 64 allows you to read, edit, and write sequential files. It can print a document while inserting bits and pieces of information from another file. A mailing list program and a canned letter illustrate *WordPro's* file-merge capabilities.

Mailing lists aren't the only use. Your imagination is the limit. Writers may list BASIC programs on disk and insert comments between lines using *WordPro 64.* Machine language disassemblies can be so edited. In fact, BASIC programs can be edited using *WordPro 64.* The applications are unlimited.

Output

The editing and file handling would be pointless if you couldn't print the text on paper. Once you're satisfied with what you've written, it's time to tell *WordPro 64* how to print it. You must give specifications, page numbering, headers and footers, spacing between the lines, and so on.

This is done by using the imbedded

printer commands. These tell the printer to print uninterrupted from start to finish, or to pause after each page. Pause is useful if your printer is one of those that tend to eat its own paper—you'll have a chance to yank it out. It is also useful if you are printing on separate sheets.

Headers and footers can be placed at the top or bottom of the page. The text can contain anything: page numbers, copyright notices, or a continuation symbol.

The selection of output formats is overwhelming. You do not need to know them all, but it's good to know what's available. Just some of them include margin sizes, spacing, page numbers, page skipping, left and right justification, centering, margin release, pitch, form advance, user-defined characters, boldface, subscript, and superscript.

Probably the most advanced output features in *WordPro 64* are the proportional spacing, and alternating-page and double-column output. Proportional spacing is a favorite of most people, but double columns are the most useful to people printing news media.

Many output controls can be given in a relative format, a great convenience. For instance, you can set the overall left margin at ten just once, and then all subsequent changes are relative to that ten. So minus five will move the text five columns to the left, and five to the right. This is a true timesaver, because you no longer have to go through the whole text to edit the settings.

You can try the formatting on the screen, well before the printer goes into its noisy work, because there is a video output option. It is just for that purpose: to see exactly how a printed page will look. The video can be as wide as the paper, up to 132 columns. Normally, the size exceeds the limit of 40 columns on the screen, and you must pan left and right over the text.

This preview is most valuable where charts are concerned, because the 40-column display is difficult to work with. *WordPro 64* also has a variant of this theme: a map mode. It, too, is video output, but now you do not see the letters. Instead, a graphic representation of the text is shown. Words become thin lines separated by tiny spaces. Hence, the whole text gets compressed into a small screen area that permits you to see the chart as it will appear on paper.

Output can be stopped and started as needed. In case of linked files (long text), you can fix any printer problems and reprint from the top of the page where the problems started. This has saved my skin more than once.

Hardware Configurations

Up to four disk drives may be used with *WordPro 64*. They can be the standard 1541 drives or any Commodore IEEE drive, used with a program such as the RTC's Link or Batteries Included's Bus Card. Other IEEE cards should give no trouble, but you ought to check with your dealer.

WordPro 64 supports many printers. When you're ready to print, you load an output module. This module is a tiny piece of code designed for the particular printer you plan to use. It does not upset the text in memory, nor anything else.

Currently, *WordPro 64* has routines for 28 printers. Should you wish to use still another printer, or to redesign the output characteristics, there is a good deal of documentation describing how to build your individual printer modules. It's certainly not a job for everybody, since it requires knowing machine code. But it can be done.

The standard colors are white on grey, with a cyan status line and yellow highlighting of ranged areas. The color combination is superb. It is easy on the eyes. It is very clear on a black and white monitor, so there is no confusion. Should you, however, wish to change that setup, you can redefine the whole thing using a little program called Install.

In a similar fashion, you can reassign a device number for any disk drive. The whole combination can be saved on the system disk. I'd think twice about writing on the system disk, but you can get a backup from Pro-Line. I think everybody should order that backup just in case.

The Bottom Line

WordPro 64 is a full-fledged word processing system you're unlikely to outgrow. It is delightfully pleasant to use. I highly recommend it. C

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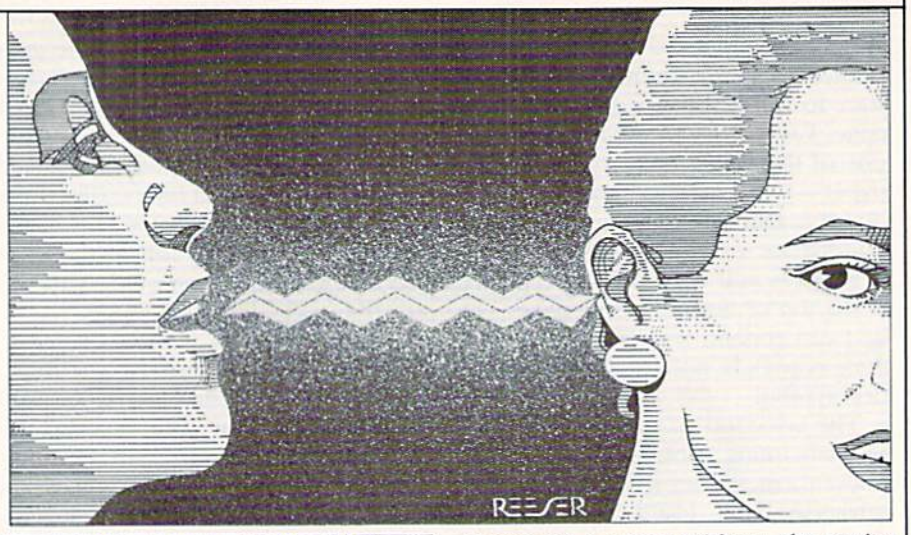
REVIEWED BY DAN RUSTIN

Trio

Computer: Commodore 64
Publisher: Softsync, Inc.
162 Madison Ave.
New York, NY 10016
Medium: Disk
Retail Price: $69.95



One of the latest integrated software packages for the 64 is *Trio,* a composite of a word processor, database manager, and financial spreadsheet.

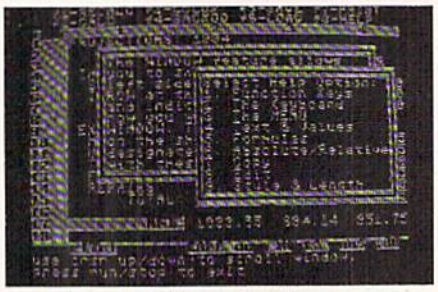
Trio allows you to exchange information among its three programs. Aside from producing form letters, the most common use of integrated software such as this is to imbed data from a spreadsheet into a written report. You do this with a link command at the printing stage, or you can physically rearrange the database file into the word processing file or load it at the end of a document in computer memory. By setting ranges, you can move it around like any written data. Of course, you can't squeeze a two-foot wide spreadsheet into an eight-inch page, but you can break it down into manageable chunks that can be manipulated as easily as paragraphs. You must be careful, though, not to overload memory.

When you load *Trio,* your screen presents a three-course menu: *Trio Word,* the word processor; *Trio Calc,* the spreadsheet program; and *Trio File,* the database manager.

Trio Word

Trio Word is a full featured writing program designed for ease of use and instant startup. On-screen function key directions are above the work area and the status line is below. Your text does scroll upward, as with most Commodore 64 word processors, though the program doesn't have word wrap, and you're asked right off to define the length of your text—100 or 400 lines. You're advised to enter 400, though the reason is never made fully apparent. When you hit 400, memory is full, giving you about seven double-spaced pages of output. This is an average allotment for a Commodore 64 word processor.

The function keys are put to good



use for scrolling, loading, saving, changing screen colors, entering an "erase" mode, and calling for help. However, I found that they could also be a nuisance. It's too easy to hit F3 when you're reaching for F1 or F5. Suddenly, your text disappears because you've changed its color, so you have to punch through 16 text colors and 16 background colors to get it back to the way you had it.

The F2 "erase" mode is one I hadn't ever encountered. You're presented with a number of options about erasing text, most in relation to where your cursor is. After you confirm your choice, hit F2 again before your unwanted text vanishes. It sounds like a lot just to get rid of a few lines, but since there's no retrieve feature in this program, it pays to be cautious.

To move text around, you must use a combination of CONTROL and "R" to define your target area. Go to the spot where you want to drop your text and insert another code. If you want to duplicate, respond now to the prompt. You will now be at the top of the file, and you must wade back to the place where you left off. Unfortunately, you can't define a range of less than a full screen line of text—in other words, you can't drop in a phrase or a name without the entire line going along for the ride.

A truly imaginative feature of *Trio Word* is a "Clipboard." This file is like a separate notebook where you can keep boilerplate paragraphs, and frequently-used phrases or technical terms. You can consign database entries here when you want to merge them with a document. Each entry is coded with a handle, and whenever you want to insert one into your document, regardless of its length, you simply enter the code. You can have multi-page drop-ins if you like, so long as the additions are confined to single paragraphs.

Trio's help screens are another asset. When you call for help, you get very chic-looking windows etched into your text. You scroll them up or down with the cursor keys. When the windows are open, *Trio* looks like the most graphically advanced word processor available. However, you can't access these windows unless the master disk is in the drive.

Disk-swapping is going to be a regular exercise with any program having the complexity of *Trio.* After all, it is three separate and complete programs which can't all reside in the 64's memory at once. Disk-swapping is not a major problem with *Trio Word,* but it could be with *Trio File,* as we'll see later.

Aside from the well done help screens, there are a number of other extremely useful features in *Trio Word.* These include a comfortable "insert" mode, painlessly accessed by the up arrow; the ability to save even part of a file; inclusion of sample text

Continued on page 52

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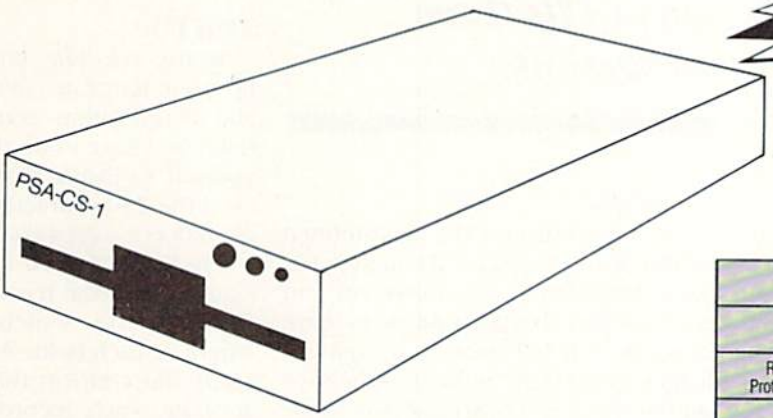

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Format Time	16 sec.	90 sec.	18 sec.	18 sec.
@ Save	YES	NO	YES	NO
Data Error Detection & Correction	YES	NO	NO	NO
Switchable Device #	YES	NO	NO	YES
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on the program disk to give you something to practice on; a pleasant audible "dong" to indicate that a function has been accomplished; ability to restart the program or load the others on the disk without turning off the computer; and a fast and accurate search-and-replace function.

Another nice touch is that you can contact certain disk functions from inside each of the programs. However, formatting a disk and renaming or scratching a file require the elaborate BASIC DOS commands.

A disadvantage of the program is the absence of a view-to-screen feature which is essential to any serious word processing program. There is not even a side-scrolling 40-character representation of what your finished document will look like. What you see on-screen bears no resemblance to what you get.

It also seems that if a sentence ends a line, the next line may not print flush at the left margin. Apparently, the program recognizes one space between the two sentences. If you leave two spaces between them, which is the proper procedure, your finished manuscript will have a one-space indent at the left margin at each of these occurrences. The result is a jagged margin. And, since you cannot view the finished document before you print it, there is no way to avoid this defect.

Softsync, the publisher, says it is not aware of this problem and has received no complaints about it, though the program has been on the market for a while. They are working on an updated version which will have a high-resolution, 80-column viewing mode. No date has been set for the release of this version. At the moment, there is no spelling checker available for *Trio Word.*

Another deficiency of the word processor is a rather complicated print-formatting procedure. Not only do you have to set up your own command line for margins and spacing each time you use the program, you have to include ASCII codes for such features as boldface, superscripts and subscripts if you want these and your printer can handle them. You can save and reuse these commands. There is no preset code for paragraph indents so you must set these manually too.

Trio is an integrated package that allows you to exchange information among any of its three programs.

Trio Calc

The spreadsheet is the most refined of the three programs. Though it has some limitations, it is powerful and easy to use. Even those who have never had their hands on a financial ledger can set up "what if" scenarios within an hour. The spreadsheet alone may be worth the price of this program.

But it, too, has its limitations. It can handle only 60 rows by 40 columns (fewer columns if you widen each to more than 22 characters). Columns can be anywhere from 2 to 36 characters wide.

Though professional number-jugglers may find these restrictions too narrow, for other uses *Trio Calc* is functional and fast. You can edit formulas easily by cherry-picking them into the command box with a press of the equal-sign key. Then you copy them into the entire layout with an easy-to-master copying routine or set them down in whatever cells you choose.

Setting up the formulas requires a little practice, because they must adhere to specific rules of syntax. But once you get the hang of it, it's quite easy.

The design of your spreadsheet is flexible, as you can expand and add columns any time, though it's not advisable to do this after your formulas have been set in place. Formulas don't travel with your columns if you enlarge the spreadsheet—you have to reassign them manually.

A nice feature of *Trio Calc* is the "fold over" column labels at any part of the layout so you can tell what section of the ledger you're working in. You simply hold down the arrow keys at the top of the keyboard to access the column headings.

Printing a spreadsheet is relatively simple. You're presented with a set-up box which lets you design a section's width and length. (These same parameters apply to rearranging the spreadsheet into a word processor file).

Trio File

To use *Trio File,* you must first set up your template—number of fields and identification, and characters per field. You have to do the mathematics yourself to insure that you don't exceed the 230-character limit (the program doesn't keep count for you).

Creating a record is also relatively simple. Type the record into a predefined matrix which delimits the length of each field. When you're finished and confirm that the record is accurate, each record goes immediately into memory. It takes a few seconds to commit each record, so after you've written a few, you may feel like you're spending more time staring at a red LCD than actually working on your files.

Because this is such a drive-intensive program, you must keep your data disk in the drive at all times. Therefore, if you need the help screens, which are on the master disk, the amount of disk swapping is going to be substantial.

Record size is limited in *Trio File,* as in *Trio Calc.* You can have no more than 17 fields per record, and each field is limited to 29 characters. Also, you can't have a record with more than 230 characters.

Documentation of all three programs is nicely presented in a 135-page comb-bound manual which clearly defines each program with a minimum of verbiage. The help windows in the program offer more information on the intricacies of file integration.

For the price of one program you get three. The tradeoff: Each of the programs stops short, to some degree, of what you might expect of a full-function program in each of its three categories. This tradeoff is understandable and probably unavoidable. To some users, the shortfall may be insignificant, and for them *Trio* is unquestionably a good value. C

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TH	AX	PAS	GG3	ER2	LL	PAS	IH	SS
29	15	04	34	52	45	04	12	55
			FEEDING					
PAS	FF	IY	PA3	DD2	IH	NG	PAS	BB1
04	40	19	02	33	12	44	04	28
		BREAD					TO	
RR1	EH	EH	PA1	DD1	PAS	TT2	UW2	
14	07	07	00	21	04	13	31	
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PAS	EY	PAS	DD2	AA	KK2	PAS		
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BY PAM HOROWITZ

The Man Behind the Muppets: *Christopher Cerf*

Combining his genius with the talents of Jim Henson, creator of the Muppets, and software designers like Joyce Hakansson, David Thornburg, and George Brackett, Chris Cerf turned Kermit, Miss Piggy, Gonzo and the rest of the Muppet mob into software stars.

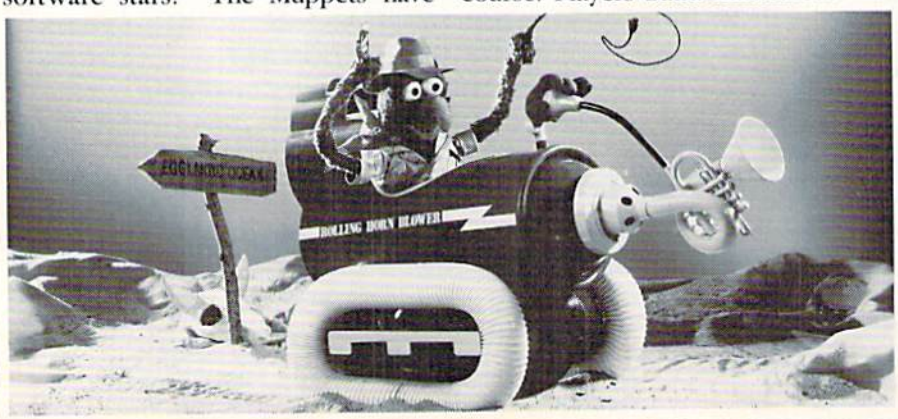
If there's a Muppet on your monitor, you can thank Christopher Cerf. He's the man responsible for combining Muppet magic with computer software. When computers first came out, Chris was unhappy with "user-friendly" software that only experienced programmers could use. He decided that a bit of Muppet mania could do a lot to lighten up the software scene. According to Chris, "Truly friendly software should have familiar characters and lots of humor. It should be fun and easy to use."

Chris met the Muppets in 1970 while he was working with the Children's Television Workshop (the folks who put Sesame Street on the map). When computers entered the home market, Chris saw Muppets as the perfect way to combine education and entertainment. "Our goal," says Chris, "was to help kids and their parents learn basic computer skills without the fear of making mistakes."

Chris combined his genius with the talents of Jim Henson, creator of the Muppets, and software designers like Joyce Hakansson, David Thornburg, and George Brackett. Together they turned Kermit, Miss Piggy, Gonzo, and the rest of the Muppet mob into software stars. "The Muppets have universal age appeal," explains Chris. "They have a sense of humor, and they don't talk down to kids."

Muppet fans can make up all sorts of silly stories using *Kermit's Electronic Storymaker,* published by Simon and Schuster. When the stories are finished, authors can make any Muppet the star and watch the stories come to life.

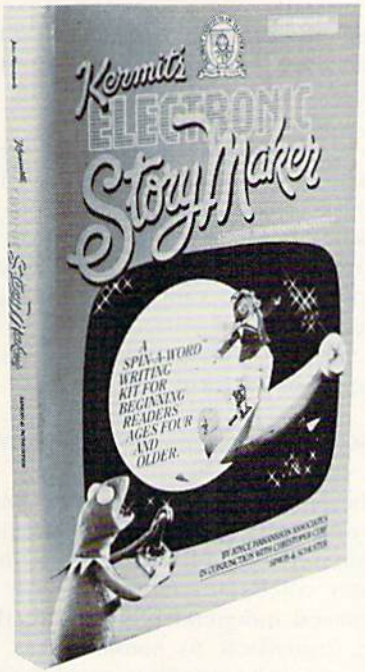
The Great Gonzo in Wordrider (also Simon and Schuster) has the thrill of an arcade game obstacle course. Players build miraculous machines with the help of nouns and verbs, and then use them to help Gonzo rescue his poultry pal, Camilla the Chicken, from the clutches of the Swedish Chef.



The newest addition to Muppet software, *Welcome Aboard* (Broderbund), takes users on a computer literacy cruise with Scooter manning the electronic mail room, Fozzie Bear on database management, and Captain Kermit in command of programming. The program also uses computer-aided design to glamorize Miss Piggy and provides computer recreation with grumpy Sam the Eagle in charge of the game room.

At 42, Chris Cerf is still very much a kid. Being a lover of toys and games, Chris has a knack for knowing what kids like. He sees youngsters using computers like adults use pencils, and he's made a personal project out of promoting computer literacy for all ages. To further his goal, Chris lectures to school groups, university students, and many other organizations. Many of his listeners have "computer-

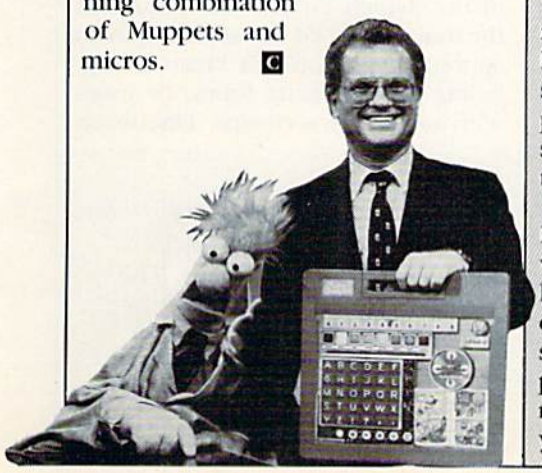
REVIEWED BY PAM HOROWITZ



phobia," and Chris overcomes these fears by showing them that computing can be fun.

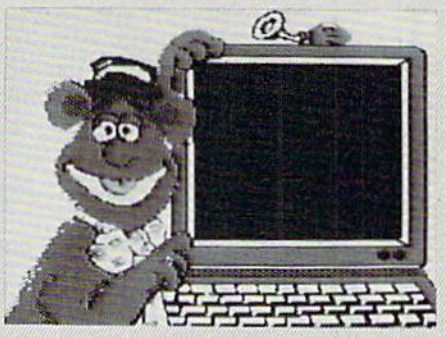
Chris is an idea man who seems to have a knack for finding humor in every situation. While attending Harvard University, he was vice-president of the *Harvard Lampoon,* a magazine that pokes fun at anything and everything. He also created and co-edited the *Not the New York Times* magazine in 1978.

The entire Cerf family has a history of talent and creativity. his father, Bennet Cerf, founder of Random House Publishing Company, was also a writer, comedian, and television celebrity. His mother, Phyllis Cerf Wagner, is a writer and an editor. With a background like that, it's no wonder that Chris created the winning combination of Muppets and micros. C



Welcome Aboard

Computer: Commodore 64
Publisher: Broderbund
17 Paul Drive
San Rafael, CA 94903
Medium: Disk



Muppet madness takes to the high seas in Broderbund's *Welcome Aboard.* The Great Gonzo, Fozzie Bear, Miss Piggy, and the rest of the Muppet gang make up the crew of the S.S. Microship. They're at your service as you embark on your cruise to computer literacy.

Welcome Aboard uses two disks to explain five major applications of the computer. The program takes a light, humorous look at word processing and electronic mail, database management, programming, and computer-aided design. There's even an arcade game to show the computer's entertainment function.

The *Welcome Aboard* menu allows you to visit different parts of the cruise ship. The bridge, for example, is manned by Captain Kermit. He'll be happy to teach you how to navigate the ship using a language called Slowgo. Your goal is to keep the S.S. Microship from sinking as you learn the basics of computer programming.

"What did the banana say to the hippopotamus?" For the answer to this and other equally stupid riddles, consult Fozzie Bear and his dumb joke data base. You'll get a humorous look at how a data base works, and you can even add your own jokes.

Scooter is in charge of the ship's message center. He'll demonstrate how electronic mail works and help send your own message to the Muppets. This is your chance to learn some simple word processing techniques.

To do a glamor makeover on Miss Piggy, head for the beauty salon where Monsieur Gonzo is in charge. He'll show you how computer-aided design tries to give Miss Piggy some style. (Well, even a computer can't perform miracles . . .) Miss Piggy may never make the best-dressed list, but you can have fun outfitting her in a ball gown which looks like a basketball or doing her hair in bangs—neat rows of firecrackers across her forehead.

For fun and games, try the ship's game room. If you're lucky, Sam the Eagle will let you play an arcade game. However, you'll have to learn to ignore his grumbling when he tells you to "get out and stop wasting your time on frivolous games."

After your guided tour of the ship's facilities, there's lots of opportunity to practice what you've learned in the open-ended parts of *Welcome Aboard.* The program also comes with a "travel brochure" highlighting the crazy crew of the S.S. Microship and describing the ship's many deluxe features. There's even a glossary containing computer lingo from A to Z. The glossary contains information like the Muppet's breakthrough in computer technology: *Welcome Aboard* is the first program to replace on-screen "windows" with portholes!

Welcome Aboard is Muppet magic at its best. Its lighthearted treatment of computer applications can turn even a grandma into a computer literate. It won't make her a master at every function, but at least she'll understand what a computer can do. The excellent graphics, ease of use, and whimsical presentation make *Welcome Aboard* nothing less than a five-star cruise. C

BY LOUIS F. SANDER

Simply Speaking: Commodore 128 Sound

The SOUND command in the 128's 7.0 BASIC makes creation of sound effects easy.

If you own a Commodore 128, this article will introduce you to the elementary aspects of BASIC 7.0 sound, and will build your confidence in working in that medium. If you *don't* own a 128, it will help you see what you're missing.

Our objective is to present the big picture on 128 sound, and we'll reach it by describing major capabilities and by providing simple examples. If your interest is in simple songs and sound effects, read on, and you will learn. On the other hand, if you're a Stradivarian sitar synthesist, or a third stream theremin theorist, our mutterings might be beneath you. (Even so, Amadeus, you *may* find our examples amusing!)

Assuming you're still with us, we want to make a point. While we provide the overview, your user's manual contains all the details. If you *really* want your Master of Arts in sound, you should study the manual and this article. Together, they'll give you a sound foundation in sound-related software. Point made. Now it's time for business.

Overview of Commodore 128 Sound

BASIC 7.0 has six special keywords to facilitate working with sound. They are:

VOL
SOUND
PLAY
TEMPO
ENVELOPE
FILTER

VOL is like a stereo's gain control—it sets the audio volume. SOUND produces tones and other simple sound effects, with an absolute minimum of programming. PLAY and TEMPO make song playing easy, while ENVELOPE and FILTER change the nature of the sounds produced. Taken together, these six little words are an easy-to-use, yet sophisticated, sound programming system. They let you do Commodore 64-like sound effects without the PEEK's and POKE's.

Before we start working with sound, let's be sure your computer/monitor setup can produce them successfully. The accompanying Test Tone program is used to set up your speaker and its associated volume control. Run it, get a comfortable tone level, then press the STOP key to kill the tone. Now if your sound experiments fail, you'll know it's not a hardware problem.

As an interesting sidelight for new and prospective 128 owners, Test Tone uses some non-sound BASIC 7.0 keywords: The TRAP in line 130 directs execution to line 170 when STOP is pressed, and the SLEEP in line 160 stops further execution until the SOUND has run its course. If the SLEEP were absent, the rest of the program would execute as soon as the SOUND was started.

VOL and SOUND

If you've ever tried to make a simple beep on the 64, you know how difficult that can be. On your 128, enter this in direct mode:

```
SOUND 1,22222,33
```

How's that for simplicity? (If you didn't hear anything, maybe your volume was turned down. Read the next paragraph, execute a VOL 8, and try again.) Now let's see how VOL and SOUND work.

VOL couldn't be simpler. To set the audio volume, just execute VOL n, where n is a number from 0 to 15. Spaces between VOL and n are ignored. If n = 0, all sounds will be silenced. Higher values produce higher levels of output.

SOUND always takes three arguments, of the form

SOUND *voice, frequency, duration*

The 128 can make up to three sounds at once, each produced by a circuit, or *voice,* numbered one, two or three. Each voice's waveform can be customized independently, but all three are initialized to sound alike. The voice argument indicates which of the three voices you've selected for this SOUND. Since all three have identical capabilities, it doesn't much matter which one you use for a particular purpose.

The *frequency* argument, which can range from 0 to 65535, determines the pitch of the sound produced. Roughly speaking, a frequency parameter of X produces a tone of X/10 cycles per second.

The *duration* argument, ranging from 0 to 32767, determines the number of jiffies for which the sound will be played. (In Commodore terminology, a jiffy is 1/60th of a second.) A sound with a duration of one will be played for 1/60 second; one with a duration of 32767 will go on for nine minutes!

SOUND also has five optional arguments, which control the nature of the tone produced. By selecting them appropriately, you can create rising, falling or oscillating tones, or tones with unusual waveforms. Discussion

Computer Wizard regularly presents elementary topics of interest to Commodore computerists. It emphasizes the needs of beginners, but is of use to advanced computerists as well. The column is written to be easily understood by all, and to be of lasting value to its readers. If you have comments or suggestions for Computer Wizard, please write to Louis F. Sander, in care of this magazine.

of these arguments is beyond our scope at present; you can read about them in your user's manual.

If you run the accompanying Sound 1 program, you'll hear a range of sounds from low frequencies to high. Notice that frequencies under 2000 or so make buzzes rather than tones. Also observe that in BASIC 7.0, program-mode LIST commands don't terminate the program. Feel free to experiment with Sound 1, changing the VOL and SOUND parameters however you see fit.

The Sound 2 program illustrates three voices playing at once. Once again, the SLEEP intervals are measured in seconds and SOUND intervals in sixtieths; it's not too difficult to get them working together. Delete the SLEEP and notice how line 160 is executed before its time.

Sound 3 shows a different way of coordinating voices. If you compare its sound with that of Sound 2, you'll find it has fewer clicks or thumps as the extra voices cut in. Notice how voice one is turned on once for the duration, and how voices two and three are activated at frequency zero until their sounds are wanted. I discovered this technique while playing with my 128, and I'm sure that you can discover similar tricks.

Along those lines, you'll see other things in these programs that you won't find in the manual. Namely:

- When a SOUND statement is executed, the required activity begins, and the program immediately attempts to execute the next statement, without waiting for the sound to finish. The sound goes on for its appointed duration, regardless of other program activity.
- Before executing a SOUND statement, the computer checks the status of the voice in question. If it is actively making a sound, further execution is delayed until that sound is finished. Only then does the next SOUND begin.
- SOUND with a duration of zero is a special case. it silences the indicated voice immediately, regardless of its previous status. Line 170 of Test Tone is an example of this phenomenon. The technique is also valuable for silencing the low-level residual tones that sometimes remain after sound sequences are finished.

The PLAY statement lets you code songs in strings, where the characters correspond to musical notes.

PLAY and TEMPO

To try your hand at 128 songmaking, enter this in direct mode:

PLAY "CCDCFE"

Pretty easy, isn't it? (If you didn't hear anything, increase the volume.) The PLAY statement lets you code songs as strings, where the characters correspond to musical notes. When you PLAY the string, the coded notes are converted to sounds. An A in the string plays a musical A, a B plays a musical B, and so on up through G. The TEMP statement governs how fast the notes are played. Enter TEMPO 40, then PLAY "CCDCFE". Next, try the same PLAY statement after entering TEMPO 3. For a little variety, enter A$ = "BAGFEDC", then PLAY A$.

By now you should have a beginner's feel for PLAY. It's a lot like the PRINT statement, except it plays things through the speaker rather than putting them on the screen. Its format is very simple:

PLAY *playstring*

where *playstring* can consist of characters contained in quotes, or of a string variable whose contents were previously defined. Only notes A through G, plus certain other characters, are legal in playstring; the details appear in your user's manual.

PLAY has tremendous flexibility, which you control by placing other characters in playstring. Here is what you can do: You can PLAY notes from seven octaves, numbered zero to six. (You change octaves by including the letter "O," plus the appropriate octave number.) Within each octave, the scale starts at C, so the notes progress CDEFGAB from low to high. Any note can be made sharp or flat, by preceding it with a "#" or "$," respectively. By using different prefixes, individual notes can be played for any duration, from sixteenth notes through dotted wholes.

The sound of the notes is also controllable, again by including the appropriate characters in playstring. You can PLAY any of the three voices, and any number of them can be playing at once. You can control the audio volume, and you can choose each voice's sound from a library of ten different waveforms. The ten are pre-defined to sound like musical instruments, but you can re-define them if you wish.

Your song's timing can be changed by the TEMPO command, by the use of rests (sixteenths through whole), and by a special character that stops further execution until all voices are silent. As with everything else but tempo, these final two are controlled by characters within the playstring.

All in all, PLAY gives tremendous flexibility in songmaking, and it's very easy to use. If you'll run the accompanying Play 1 program, you'll see and hear a cross section of this flexibility. You can experiment with PLAY by altering our program or by entering statements in direct mode. Spaces are disregarded in the playstrings, but many people insert them between notes or other commands. If you do all the examples in your user's manual, you'll be a PLAY expert in no time.

ENVELOPE and FILTER

These statements allow you to alter the character of the sound each voice produces when PLAYed. They are rather complex in their syntax, and although they're very powerful, few beginners have need to work with them. Essentially, ENVELOPE is used to alter the waveform library, and FILTER is used to pass or reject various bands of frequencies. ENVELOPE and FILTER are covered quite thoroughly in the user's manual, and we refer you there if you're interested in dabbling in waveforms.

Conclusion

Well, dear readers, that's our overview of sound. If you've done our little examples, you have a pretty good handle on using PLAY and SOUND. When you read further in the manual, the sound sections should be more meaningful than you found them

before.

We hope you enjoy your new knowledge, and just to make sure that you do, we'll give you a little song. It's a Country and Western Classic from Louis F. "Cowboy Lou" Sander, and the best thing about it is that you don't have to enter the notes! As amazing as it sounds, if you put its title in a PLAY statement, the 128 takes over from there, playing the melody from start to end. Don't believe it? Try it!

If you really want your Master of Arts in sound on the 128, study the user manual and this article.

For the musical thrill of a lifetime, do a VOL 15, a TEMPO 40, then PLAY "SHE FED HER FACE AT A FEEDBAG BUT SHE MOVED HIS HEART OF HEARTS". (We said it's a country classic!) If you think about it a while, you'll discover why it works. C

Test Tone

```
10 REM ** TEST TONE - LOUIS F. SANDER
20 :
100 PRINT"[CLEAR,DOWN3]
    A TEST TONE IS PLAYING AT MEDIUM
    VOLUME."
110 PRINT"[DOWN]YOU HAVE 30 SEC TO
    ADJUST YOUR SPEAKER."
120 PRINT"[DOWN]PRESS THE STOP KEY TO
    STOP THE TONE."
130 TRAP 170 : REM STOP KEY
140 VOL 8 : REM SET MEDIUM VOLUME
150 SOUND 1,5000,1800 : REM START TONE
160 SLEEP 30 : REM DELAY
170 SOUND 1,0,0 : REM TONE OFF
180 PRINT"[DOWN,RVS]THE TEST TONE HAS
    BEEN TURNED OFF."
```

Sound 1

```
10 REM ** SOUND 1 - LOUIS F. SANDER **
20 :
100 PRINT"[CLEAR]" : LIST : PRINT
110 VOL 15 : F=125 : REM INITIALIZE
120 :
130 SOUND 1,F,60
140 :
150 PRINT "F=";F : F=F*2
160 IF F<65536 THEN 130
```

Sound 2

```
10 REM ** SOUND 2 - LOUIS F. SANDER **
20 :
100 PRINT"[CLEAR]" : LIST : PRINT
110 VOL 8
120 SOUND 1,8000,60 : PRINT "1 VOICE"
130 SOUND 1,8000,60 : SOUND 2,16000,
    60 : PRINT "2 VOICES"
140 SOUND 1,8000,60 : SOUND 2,16000,
    60 : SOUND 3,32000,60
    : PRINT "3 VOICES"
150 SLEEP 1
160 PRINT"DONE!"
```

Sound 3

```
10 REM ** SOUND 3 - LOUIS F. SANDER **
20 :
100 VOL 8 : PRINT"[CLEAR]" : LIST
110 SOUND 1,8000,180 : REM SOUND V1
120 SOUND 2,0,60 : REM SILENCE V2
130 SOUND 3,0,120 : REM SILENCE V3
140 SOUND 2,16000,120 : REM SOUND V2
150 SOUND 3,32000,60 : REM SOUND V3
160 SLEEP 1
170 PRINT"DONE!
```

Play 1

```
10 REM ** PLAY 1 - LOUIS F. SANDER **
20 :
100 PRINT"[CLEAR]HEAR SOME SELECTED
    VOLUME LEVELS --
110 GOSUB 380  : REM INITIALIZE
120 FOR VO=3 TO 15 STEP 3
    : PRINT "VOLUME=" VO : VOL VO
    : PLAY "C G E G C"
130 SLEEP 1 : NEXT
140 :
150 PRINT"[DOWN]HEAR THE RANGE OF
    TONES --"
160 GOSUB 380   : REM INITIALIZE
170 FOR OC=0 TO 6 : PRINT "OCTAVE="
    OC : PLAY "O"+STR$(OC)+"C D E F G
    A B"
180 SLEEP 1 : NEXT
190 :
200 PRINT"[DOWN]HEAR SOME SELECTED
    TEMPOS --"
210 GOSUB 380 : TE=5 : REM INITIALIZE
220 PRINT "TEMPO="TE : TEMPO TE
    : GOSUB 330 : TE=2*TE
    : IF TE<255 THEN 220
230 :
240 PRINT"[DOWN]HEAR ALL THE PRE-SET
    ENVELOPES --"
250 GOSUB 380  : REM INITIALIZE
260 FOR EN=0 TO 9 : PLAY "T"+STR$(EN)
    : PRINT "ENVELOPE=" EN
    : GOSUB 330  : NEXT
270 :
280 REM FANFARE, SILENCE AND QUIT
290 GOSUB 380  : VOL 15
    : PLAY "V1 WC V2 WE V3 WG M"
300 SOUND 1,0,0 : SOUND 2,0,0
    : SOUND 3,0,0 : END
310 :
320 REM  SUBROUTINE TO PLAY A TUNE
330 PLAY "O4 C E G O5 C O4 G E C O5
    .C" : REM PLAY THE TUNE
340 SLEEP 1 : REM SHORT DELAY
350 RETURN
360 :
370 REM INITIALIZE ALL VOICES
380 FOR V=1 TO 3 : PLAY
    "V"+STR$(V)+"O4 T7 U9 X0 Q"
    : NEXT : TEMPO 16 : SLEEP 1
390 RETURN
```

END

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Simple Windowing for the Commodore 64

We often see the terms "windows" and "windowing" in computer articles and advertisements, but strangely enough, we seldom see the terms defined. Windowing is the practice of setting part of the computer's display screen aside for things like menu information, helpful hints, and the like, and then being able to restore the original screen with the temporary window removed. Powerful windowing software can allow combinations of graphics and text, scrolling of text inside the window, multiple windows on a screen, and sometimes even the operation of a separate program inside the window!

One of the most obvious and desirable uses of a window is to allow the program user to call up a help screen or menu list, all the while not losing the game/text/information that is on the original screen. The following program makes this possible.

After poking in the machine language routine that takes care of the windowing, the program clears the screen and displays a demonstration screen. I chose an excerpt from Abraham Lincoln's Gettysburg Address.

Then, a SYS 49152 saves the contents of the screen into another section of the 64's memory (starting at $C100). The screen's color memory is also saved (beginning at $C500).

With the contents of the original screen saved, we can then print anything at all over the original screen. We can overprint just a little section (as in the demonstration program), or we can erase the entire screen and print whatever information we want.

(NOTE: The machine language routine also re-links the screen pointers, so anything you print on the screen won't become "broken up," as can sometime happen when you print over a screen full of characters.)

Finally, when our purpose in putting up our window is finished, we can recall the entire original screen, including the original colors, with a SYS 49216.

Besides this simple windowing, the machine language routines at 49152 (save the screen) and 49216 (recall the screen) can also be used to store graphics (not high-resolution) and other text or forms for instant displays. C

Simple Windowing

Before typing this program, read "How to Enter Programs."

```
100 REM ************************'BXKY
110 REM    SIMPLE WINDOWING'BPPB
120 REM    FOR THE COMMODORE 64'BRBC
140 REM ************************'BXJD
160 REM'BARB
170 PRINT CHR$(147):POKE 53280,0
    :POKE 53281,0'EVVI
180 CC$=CHR$(19):FOR X=1 TO 23
    :CC$=CC$+CHR$(17):NEXT
    :REM CURSOR CONTROL'KNCS
190 BL$="[SPACE37]"'BDEK
200 FOR X=1 TO 39:LINE$=LINE$+CHR$
    (192):NEXT'HVFF
210 GOSUB 810 :REM POKE IN ML
    ROUTINE'CTPD
220 REM'BARX
230 REM ************************'BYBD
240 REM PRINT SAMPLE TEXT SCREEN'BVBG
250 REM ************************'BYBF
260 REM'BARC
270 PRINT CHR$(147);:REM CLEAR
    SCREEN'DSTJ
280 PRINT CHR$(5);:REM WHITE'DKGI
290 PRINT CHR$(14);:REM LOWERCASE'DPPK
300 PRINT"[SHFT T]HIS IS A SAMPLE
    TEXT SCREEN."'BASF
310 PRINT'BACX
320 PRINT CHR$(153);:REM LIGHT
    GREEN'DREF
330 PRINT"[SHFT F]OURSCORE AND SEVEN
    YEARS AGO OUR"'BAYK
340 PRINT"FATHERS BROUGHT FORTH ON
    THIS CONTI-"'BAEL
350 PRINT"NENT A NEW NATION CONCEIVED
    IN"'BALK
360 PRINT"LIBERTY AND DEDICATED TO
    THE PRO-"'BAQM
370 PRINT"POSITION THAT ALL MEN ARE
    CREATED"'BAGN
380 PRINT"EQUAL.[SPACE2,SHFT N]
    OW WE ARE ENGAGED IN A GREAT"'BAVP
390 PRINT"CIVIL WAR TESTING WHETHER
    THAT NATION,"'BAWR
400 PRINT"OR ANY NATION SO CONCEIVED
    AND SO"'BAIH
410 PRINT"DEDICATED, CAN LONG ENDURE.
    [SPACE2,SHFT W]E ARE"'BAAJ
420 PRINT"MET ON A GREAT BATTLEFIELD
    OF THAT WAR."'BAFK
430 PRINT"[SHFT W]E HAVE COME TO
    DEDICATE A PORTION OF"'BAJL
440 PRINT"THAT FIELD AS A FINAL
    RESTING-PLACE"'BAQL
450 PRINT"FOR THOSE WHO HERE GAVE
    THEIR LIVES"'BAUN
460 PRINT"THAT THAT NATION MIGHT
    LIVE.[SPACE2,SHFT I]T IS"'BAEO
470 PRINT"ALTOGETHER FITTING AND
    PROPER THAT"'BAXP
480 PRINT"WE SHOULD DO THIS..."'BABL
490 PRINT'BACH
500 PRINT CHR$(150);:REM LIGHT
    RED'DPHE
510 PRINT"([SHFT F]ROM [SHFT A].
    [SHFT L]INCOLN'S [SHFT G,SHFT E,
    SHFT T2,SHFT Y,SHFT S,SHFT B,
    SHFT U,SHFT R,SHFT G] [SHFT A,
    SHFT D2,SHFT R,SHFT E,SHFT S2]
    )"'BAFU
520 PRINT CC$;CHR$(18);CHR$(5);'DNSF
530 PRINT"[SHFT P]RESS ANY KEY FOR
    WINDOW.";'BBBK
540 PRINT CHR$(19)'CEBF
```

PROGRAMMERS' TIPS

```
550 POKE 198,0:WAIT 198,1:GET A$'DOJI
560 SYS 49152:REM MEMORIZE SCREEN'CUWL
570 REM'BARG
580 REM **********************'BWRL
590 REM PRINT WINDOW OVER TEXT'BTQO
600 REM **********************'BWRE
610 REM'BARB
620 PRINT LEFT$(CC$,8);'CIAE
630 PRINT CHR$(158);:REM YELLOW'DNVI
640 PRINT TAB(6);CHR$(18);CHR$(176);
    LEFT$(LINE$,19);CHR$(174)'GFIO
650 PRINT TAB(6);CHR$(18);CHR$(221);
    " [SHFT P]RESS ANY KEY TO[SPACE2]
    ";CHR$(221)'FUAR
660 PRINT TAB(6);CHR$(18);CHR$(221);
    " ELIMINATE WINDOW[SPACE2]";
    CHR$(221)'FUVS
670 PRINT TAB(6);CHR$(18);CHR$(221);
    " AND GO BACK TO[SPACE4]";
    CHR$(221)'FUMS
680 PRINT TAB(6);CHR$(18);CHR$(221);
    " THE TEXT SCREEN.[SPACE2]";
    CHR$(221)'FUKU
690 PRINT TAB(6);CHR$(18);CHR$(173);
    LEFT$(LINE$,19);CHR$(189)'GFLT
700 PRINT CC$;BL$;CHR$(19)'CMLE
710 POKE 198,0:WAIT 198,1:GET A$'DOJG
720 SYS 49216:REM RECALL SCREEN'CSXI
730 GOTO 520'BDGF
740 REM'BARF
750 REM'BARG
760 REM **********************'BXJL
770 REM STORE SAVE/SWAP ROUTINE'BVSO
780 REM SYS 49152 TO SAVE'BOAN
790 REM SYS 49216 TO RECALL'BQIO
800 REM **********************'BXJG
810 FOR J=49152 TO 49293:READ A
    :POKE J,A:NEXT:RETURN'HTML
820 DATA 32,128,192,162,0,189,0,4,157,
    0,193,189,0,5,157,0,194'BCMO
830 DATA 189,0,6,157,0,195,189,0,216,
    157,0,197,189,0,217,157,0'BDAP
840 DATA 198,189,0,218,157,0,199,202,
    208,217,162,231,189,0,7,157,0'BHRR
850 DATA 196,189,0,219,157,0,200,202,
    224,255,208,239,96,32,128,192,
    162'BLIT
860 DATA 0,189,0,193,157,0,4,189,0,
    194,157,0,5,189,0,195,157'BBXS
870 DATA 0,6,189,0,197,157,0,216,189,
    0,198,157,0,217,189,0,199'BDJT
880 DATA 157,0,218,202,208,217,162,
    231,189,0,196,157,0,7,189,0,
    200'BHXV
890 DATA 157,0,219,202,224,255,208,
    239,96,162,0,181,217,9,128,149,
    217'BKKX
900 DATA 232,224,25,208,245,96'BVCH END
```


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Circle Reader Service No. 10

BY BOB NADLER

Using the Modem/300 File Translator

The first thing I planned to do with my new Modem/300 was save about three days of typing. I had to translate a long (21K) program, written in another machine's BASIC, so that it would run on the Commodore 64. I had a choice: I could either sit down at the 64's keyboard and type in several hundred lines of very complicated code, translating as I went, or I could download the program from the other machine, via telephone lines and modems, and avoid the original typing completely. It shouldn't take you too long to figure out the option I chose. The download to the 64 went smoothly, and the program was saved to disk in under 20 minutes.

There was a complication, however. Reading the excellent instruction manual that came with the Modem/300, I learned that programs downloaded via the modem and the Higgyterm software supplied with it, are saved to disk as sequential files. Such files cannot be loaded and run as BASIC programs. They must first be converted to program files.

Not to worry! Commodore thought of everything. They not only supply an excellent disk full of communications software with their new modem, but they also provide a listing of a very short BASIC program that converts programs downloaded and saved as sequential files into BASIC program files that can be loaded and run normally.

Unfortunately, the good people at Commodore chose not to include this File Translator program on the disk supplied with the modem, but instead printed its listing in the Modem/300 user's manual. That's where my troubles began.

Typing the File Translator program presents no obvious problems. It is only 11 lines long, and it has no tedious data statements. Like any other program listing, it does have its complicated lines. But if you are careful, and if you do some proofreading before you save the program to disk or tape, you should have no difficulties.

Now it was time to try the File Translator program. I had deliberately downloaded a one-line BASIC program and saved it as a sequential file named ZILCH. Before I did the same thing for my 21K monster, I tried the File Translator on the short test file first. I'm no fool.

In response to the program's request for the file name, I typed ZILCH and pressed RETURN. Things began to happen! The following appeared on the screen . . .

```
PRINT"THIS IS A TEST"
THIS IS A TEST
GOTO 10600
READY
```

followed by the blinking cursor. The fellow who wrote the little one-line ZILCH program had forgotten to put a line number in front of the program's single line. The 64 had captured the data faithfully. But, when I checked the directory, I found ZILCH still listed as a sequential file.

Undaunted, I loaded and ran the File Translator program again. Again, I gave it ZILCH when asked for the file name. However, this time when the two lines appeared, I added line number 10 to ZILCH and pressed RETURN. On a hunch, I typed LIST and pressed RETURN. There was line 10 listed right along with the File Translator program. From that point on, I had a good idea of what the File Translator was supposed to do. It read each program line in the sequential file and "pressed" RETURN, which then entered it as a program line.

I got rid of line 10 and ran File Translator again. This time giving it the name my 21K program had saved under, "XMITTED." It was a pleasure to watch the file being translated. Each program line was printed slowly across the top of the screen. As soon as it was complete, the word READY flashed on the screen on the line above it, while simultaneously, the line GOTO 10600 flashed on the screen below the program line. Then the screen cleared and the next program line slowly began to be written across the top of the screen. The File Translator program was reading each program line out of the sequential file and automatically entering it into the 64's memory as a program line.

This went on for a while, until a garbled program line appeared on the screen. It was followed by the message SYNTAX ERROR, READY, and the blinking cursor, and the whole procedure ground to a halt. I found the garbled line in the original program's printed listing. Then I made the needed corrections on the 64's monitor screen, pressed RETURN, typed GOTO 10600, and the File Translator went right back to doing its thing. There were three or four syntax errors discovered, and similarly corrected and entered, and the program similarly restarted, before the program reached a fatal point. After the better part of an hour had passed, my program's line numbers caught up with those used in File Translator. That's all she wrote!

Still I was way ahead of where I was

File Translator

```
60100 REM FILE TRANSLATOR
60200 REM TRANSLATES A SEQ FILE INTO
      A PROGRAM FILE
60250 PRINT"[CLEAR]":PRINT:PRINT
60300 INPUT"FILENAME";N$:OPEN 1,8,8,"0
      :"+N$
60500 GET#1,C$:C$=CHR$(ASC(C$+CHR$(0))
      AND 127):IF ASC(C$)<>13 THEN
      60500
60600 POKE 152,1:PRINT"[CLEAR,DOWN2]";
      :S=6:GET#1,C$:C$=CHR$(ASC
      (C$+CHR$(0))AND 127)
60601 IF C$=CHR$(10)THEN 60900
60700 FOR L=1 TO 50:NEXT:PRINT C$;
      :IF C$=CHR$(13)THEN 60800
60750 GET#1,C$:C$=CHR$(ASC(C$+CHR$(0))
      AND 127):IF ST=0 THEN 60700
60800 IF ST=0 THEN 61000
60900 CLOSE 1:PRINT"FINISHED":END
61000 FOR I=631 TO 633:POKE I,13:NEXT
      :POKE 198,3:PRINT"[HOME,DOWN4]
      GOTO60600[HOME]";:END
```

END

an hour before. I had lines 15 through 10600 of "XMITTED" in memory. The last line in the program is numbered 13060, so I had the bulk of it translated. All that remained was to comb the remains of File Translator out of the listing and save what I had to disk by typing SAVE"CLRNGHS",8 and pressing RETURN. (CLRNGHS is the proper working name for the program.) That took only a few minutes. I checked the disk directory, and sure enough, there it was, CLRNGHS listed as a program.

It took a while, but I had learned enough about the File Translator program to straighten it out to make it more useful, and then to put it to proper use. I loaded and listed File Translator again. Then I proceeded to change all the line numbers so they began at 60100 rather than at 10100. I made sure to change all the line numbers within the program lines as well. That would keep File Translator from getting sucked into my long program files. The only other change I made was to get rid of the CLEAR/HOME in the print statement in the line now numbered 60300. I added line 60250 ?"CLEAR/HOME":?:? because when I ran File Translator the first few times, the program's initial request for the name of the file I wanted to translate appeared so high on my monitor screen that I had to bend down to read it.

All that done, I did a save-with-replace for File Translator and proceeded to run it again. This time it successfully converted all of "XMITTED's" program lines (with a little help from me with the ones having syntax errors). After the last line was converted, the word FINISHED appeared on the screen along with the word READY and the blinking cursor.

I listed the program and found all the lines properly converted. I got rid of the 11 lines of File Translator, still lurking in memory, by typing each of its line numbers and pressing RETURN. Then I did a save-with-replace for CLRNGHS, and a long evening's work came to an end.

Perhaps, if you have had the stamina to read this far, you will appreciate that the File Translator program is simplicity itself, although that may not be immediately apparent in the manual. C

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Circle Reader Service No. 31

BY ROGER S. MACOMBER

Getting SuperMon to Print

After reading a number of introductory articles in magazines and manuals dealing with machine language, you've decided to put fear and trepidation aside and jump right into assembly language programming. You've already procured a copy of *SuperMon,* a very useful assembly language monitor for use on Commodore systems, and you've been busy learning how to use it. You've gotten to the point where you can write assembly level sequences, decode them into hexadecimal machine language, edit, save and go your programs.

But one thing is missing. What if you want to print hard copy of the assembly code and its hex or decimal equivalent? You've tried the logical thing: OPEN 4,4,2: CMD4 in BASIC. But as soon as you run *SuperMon,* file four is closed. The question remains: How can you open a print file once inside *SuperMon*? The short program in Listing 1 is just what the doctor ordered.

We'll put the program in memory beginning at $11F0, just above the end of *SuperMon.* The program consists of two parts. Lines $11F0-$1206 open the print file, while lines $1207-$120A close it. To use the program, follow these steps:

1. Load and run *SuperMon.*
2. Enter the first line of the program by typing in
   A 11F0 LDA #$04 [RETURN]
3. Similarly, input the remaining lines after each prompt.
4. Once the program has been entered, save it on disk with the command
   S"PRNTSUP",08,11F0,120A
5. To use the new program, move the cursor to a new line and type
   G 11F0 [RETURN]
   The cursor will turn black and your printer (if you remembered to turn it on) will receive all the output normally appearing on the screen. See the *SuperMon* status list?
6. To list the new program on your printer, use the command
   P 11F0 120A
7. To return to screen display, use
   G 1207
   Now, everything is back to normal.

From now on, whenever you run *SuperMon,* also load the printing program with the command L"PRNTSUP",08. Then write your program, starting at some location beyond the end of PRNTSUP, say $1300 (decimal 4864).

Whenever you're ready to list your efforts, just repeat steps five through seven above, substituting your program's location in step six. If you'd like to print your program's machine code sequence in decimal on your printer, return to BASIC by typing an X, then use the short program in Listing 2. Change the "26" in line 10 to accommodate the number of bytes in your program.

One additional piece of advice. Since PRNTSUP is a machine code file, it should only be loaded and saved by *SuperMon.* Attempts to load or save it in BASIC, even with the 8,1 command, will either misplace the file in memory, or save ten extra blocks of garbage.

Now, in addition to all your other machine language capabilities, you can prepare hard copies of all your assembly language programs, just in case that disk crash ever occurs. C

Listing 1

```
.; 11F0 A9 04    LDA #$04
.; 11F2 A2 04    LDX #$04
.; 11F4 A0 FF    LDY #$FF
.; 11F6 20 BA FF JSR $FFBA
.; 11F9 A9 00    LDA #$00
.; 11FB 20 BD FF JSR $FFBD
.; 11FE 20 C0 FF JSR $FFC0
.; 1201 A2 04    LDX #$04
.; 1203 20 C9 FF JSR $FFC9
.; 1206 00       BRK
.; 1207 20 CC FF JSR $FFCC
.; 120A 00       BRK
.; 120B 3A       ??? END
```

Listing 2

```
5 OPEN 4,4:CMD 4
10 FOR I=4864 TO 4864+26
15 PRINT PEEK(I);:NEXT
20 PRINT#4:CLOSE 4:STOP
END
```


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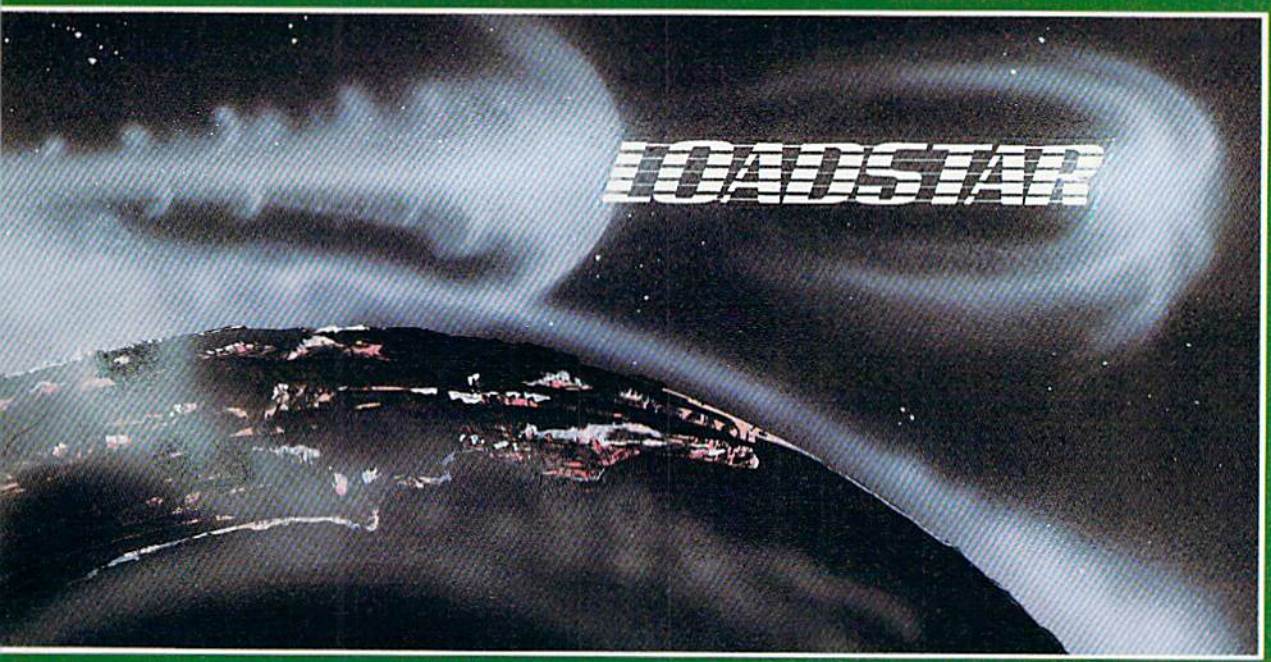

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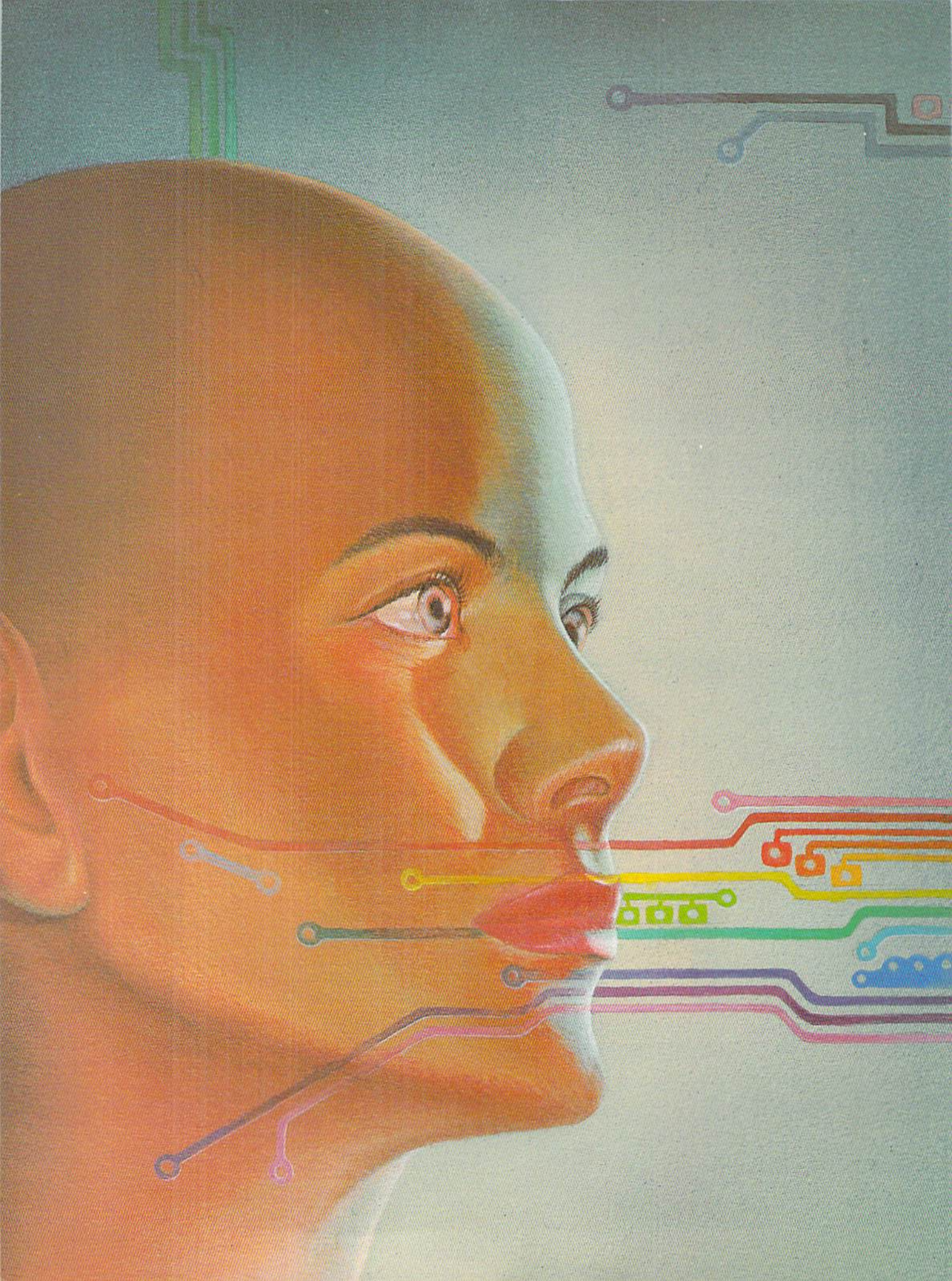


Voice Synthesis and Recognition on the 64

Your 64 can talk—and listen—using relatively inexpensive speech devices.

BY LOUIS R. WALLACE

The power of speech. Some scientists say it's what separates us from other animals. But we also have the power to listen, to hear, and to understand the speech of others. Until recently, we humans were the only ones on earth with that combination of talents. But that has now changed. Something else is talking. And it's listening, too.

Yes, I am talking about your Commodore 64 computer. There are now several different voice-synthesis devices available for you to choose from, each with its own unique properties. And there are at least two voice-recognition devices you can buy. With the proper programming, your 64 can be made a listening, speaking machine.

How can such a thing be possible? Just a few years ago speech synthesis required a great deal of computer power to generate. And speech recognition was unheard of (outside of movies). But the same electronic advances that have made computers rapidly increase in power while getting cheaper have enabled speech technology to make its own quantum jumps in quality and to drop in cost.

If you are thinking of adding a speech device to your 64, you should determine what your needs are and what systems are available. For instance, what software (if any) is available for the device? Is the device easy to program? (Especially important if the software availability is poor.) How understandable is the voice? Is the sound natural or machine-made? What's the documentation like? How much does it cost?

Before we begin looking at some of the main speech synthesizer systems for the 64, we should explain the differences among the techniques used. There are three major types of speech synthesis: phonetic, text-to-speech, and digitized. Phonetic is the most versatile, because it is based upon the 64 basic sounds that make up all English words. By the careful use of phonemes, you can make the computer say anything with almost any inflection you wish. The phonetic method produces much clearer speech than the text-to-speech method, but it is by far the hardest to use. You must learn the phonemes to use them properly, and each synthesizer has a different way of representing phonemes in a program. Luckily, most manufacturers include a dictionary with the most common words already in phonetic form.

Text-to-speech is just that, you type in the word and the computer says it. For example, if I type, SAY "I am the Commodore 64," the synthesizer will say, "I am the Commodore 64." But the quality of sound varies from system to system. Text-to-speech devices have a built-in set of rules that determines the correct phonemes to use. That means you don't have to break the words down into phonemes. This is great, except that to get really good clear words requires a very good internal set of rules. And some systems are better than (or worse than) others. But if you have a need for an unlimited vocabulary and you don't have time to figure out what phonemes will make each word sound right, then text-to-speech is for you. It's very easy to use, and in most cases, it produces speech of sufficient quality.

Digitized speech is the easiest, most understandable method of speech synthesis around. And that's because it's not really synthesized at all. It's an electronic recording of someone's voice, stored away in memory somewhere. When it is spoken by the machine, it sounds just like the original. It does have some problems, however. For one thing, it's not an unlimited vocabulary. In most cases, it is a few hundred words, and while you can add more, they eat up your memory fast. Also there is no way to change the inflection of the voice. As a result, it will always say the same word the same way. But if you need crystal clear speech and the vocabulary you need is available in digitized form, this is the way to go.

Personal Speech System

Votrax, in Troy, Michigan, produces the *Personal Speech System* for the 64. It is a separate box with its own power supply and speaker system, and is connected to the computer through the RS-232C port. Votrax speech synthesizers are treated like any external peripheral and can be programmed from BASIC much the same as a printer. You must open a channel to the device and send the

data to be spoken. For example, the statement

```
10 OPEN 1,2,0,CHR$(6):
PRINT#1,"Hello there":CLOSE1
```

would tell the 64 to say "Hello there."

As you can see, the Personal Speech System has text-to-speech capabilities, which means you simply enter the English spelling of the word you want and the voice synthesizer will convert it as best it can to sound. That can be quite difficult for English words, which often don't abide by any rules of pronunciation. For instance, words like "read" are pronounced differently depending on the context they are used in. And how do you differentiate between "though" and "rough?"

Votrax's Personal Speech System, nevertheless, has the best text-to-speech capability of the systems we looked at in this article. It was almost always clearer, sharper and more understandable when using direct-text input. Its phonetic capabilities are also very good, but are very difficult to get used to because they bear no resemblance to the sounds they represent. And at $395, it was the most expensive system we looked at.

But, to be fair, it also has several other features besides voice synthesis. For one thing, it has a 3.5K buffer, which means you can send quite a bit of data to it and it will continue to work after the computer quits transmitting information and is doing something else. And because it is a separate device like a printer, it takes no RAM from the computer. It also has a built-in clock, which many computers do not already have, and a reasonably good music synthesizer, so you can add simple music to your speech. However, since you are using a Commodore 64, the music from the Personal Speech System will seem very primitive to you. And we all know the 64 already has a clock built in.

Magic Voice

Magic Voice, produced by Commodore, is a voice module that plugs into the expansion port and gives you an auxiliary cartridge port that is even easier to use than the standard port. The voice is not synthesized; instead it is a digitized female voice that speaks 235 built-in words and phrases. These words require no memory, leaving the user with all of the BASIC work space free. You access the words by using the command SAY, and the computer speaks the word.

There are three major types of speech synthesis: phonetic, text-to-speech, and digitized.

There is no software supplied with the Magic Voice, but Commodore produces three cartridges that use it. One is an educational package called *ABC's*. My four year-old loved it, and was trying to answer the lady in the computer. The other two are arcade games: *Wizard of Wor* and *Gorf*. These two use the Magic Voice, but have robotic voices instead of the digitized female voice.

The documentation includes information for both BASIC and machine language programmers, so there will probably be quite a few software packages appearing soon. In addition to the SAY command, the Magic Voice adds the commands RATE (for speed of speech), RDY (to determine if the computer has finished talking), and VOC (for adding additional vocabularies, none of which have been released yet). The Magic Voice retails for $50.

Other Voice Synthesizers

Commodore 64 users also have a couple of other voice synthesis systems available. One is the *Comvoice* from Genesis Computer Corporation. Comvoice is a cartridge that plugs into the expansion slot, and gives you the new BASIC command SPEAK. You can use it with the phonetic codes or as a direct text-to-speech synthesizer. It is a Votrax chip-based system, which means it gives a good quality speech, although it is of the robotic style.

Comvoice is very good at speaking numbers, and will correctly say any number between −999,999,999 and +999,999,999 without special programming. You also have some control over the inflection by inserting commands into the phrase you wish Comvoice to say. However, the Comvoice does take away from the computer's RAM.

There are two versions of Comvoice available. One has a cable to plug into your monitor or TV, allowing the sound to come from its speaker. This retails for $99.95. The second version has an external speaker system with a volume control, and sells for $139.95.

One of the newer voice synthesizers for the 64 is the *Voice Messenger* from Currah Technology. The Voice Messenger sounds a little less robotic than the Votrax-style systems, but its text-to-speech is not quite as good as Comvoice. It is a cartridge device like the Comvoice, but does not take any BASIC RAM away from the computer. The cartridge adds five new BASIC commands: SAY, INIT, BYE, KON and KOFF.

SAY allows both direct text-to-speech and phonemes to be used in creating speech. INIT is the initialization command that activates the cartridge. BYE disables the cartridge. KON is an interesting command. It intercepts the keystrokes from the keyboard and will speak the key you have pressed. This has advantages for both handicapped and young children, and requires only the command KON to start it. KON also allows you to switch between two different voices. One is high pitched, while the other is a deeper voice. And KOFF simply deactivates the keyboard intercept started by KON.

The manual is small, but contains several demonstration programs you can type in. And it also has information for the machine language programmer. Currah is reportedly working on a program that will allow the Voice Messenger to speak Infocom adventure games like *Zork*. With that and the keyboard intercept, a blind person could play *Zork* with no outside assistance. The Currah Voice Messenger retails for $50.

There are other voice synthesizers on the market, but these are good examples of what types you will find. There are also some software voice synthesizers, and while they may be cheaper, most of them are not as good. You can also still find voice synthesizers that were produced by companies that are now out of business, and can often get a good price on

them. But don't expect to find new software or get any repair service if they fail to operate, because these are not likely to be available.

Voice Recognition

Now, let's take a look at a couple of really different voice products. These are the voice recognition systems—the *Voice Command Module* (VCM) from Eng Manufacturing, Inc. and the *VoiceMaster* from Covox, Inc.

Voice recognition is a totally different technical problem from voice synthesis. Here the machine must listen and capture a sample of your voice, compare it to a stored pre-recorded sample, and then decide if it matches. And to be useful, it must have a number of words that it can understand already in its vocabulary. Both the VCM and VoiceMaster are able to store up to 64 different words for later recall, but the more words you use, the harder it is for the computer to recognize them.

The VCM is a dedicated voice-recognition device. It plugs into the 64's RS-232 port with a supplied cable. It is a small calculator-shaped device that has a clip-on lapel microphone with a six-foot wire. You also get a disk and manual.

On the disk are a number of programs, including the Speech Operating System (SOS) for creating your own lexicons (user-created speech files). These can be any words you wish, but for best results each word in the lexicon should sound different, and be spoken very distinctly. By creating a number of these disk-based files, you can extend your vocabulary beyond the maximum 64 words in memory.

To allow you to use these voice files in your program, the disk has a program called "Chirpee." This is a machine language program which lets the VCM listen to the outside world, and then compare what it heard to the words in memory. So you could write a program that accepts your spoken commands and proceeds accordingly! To do this requires some degree of programming skill, but if you are comfortable, with a few simple peeks and pokes you should have no problem.

A number of interesting programs are supplied with the VCM. One is a voice-controlled card file or mini data base. It allows you to search, load and edit with the spoken word. Another program is a graphic voice-controlled game. Here you must guide a hot air balloon over trees and power poles to land safely on the landing pads. It has very nice, smooth-scrolling graphics, and is fun to play. It is also a good demonstration of real-time graphic control by voice.

Just a few years ago speech synthesis required a great deal of computer power to generate. And speech recognition was unheard of (outside of movies).

The VCM performed very well in our tests. It was able to correctly identify words more often than the VoiceMaster, which is not surprising when you consider it is designed solely for speech recognition. If your interest is strictly voice recognition, you will find the Voice Command Module a good buy at $49.95.

VoiceMaster from Covox is really a very interesting device. More of a voice digitizer than a synthesizer, it combines several features into one. It plugs into the joystick port, and has a headset microphone that you speak into. It can store these words or phrases in your own voice for later playback. The software included with the device provides 11 commands for recording and playing back the voices or sounds you have made. They are LEARN, SPEAK, PUT, FIND, FFIND (a fast file loader command), SCREEN, CLEAR, SPEED, PAUSE, VOLUME, and RATE.

By using the LEARN command, you can make the 64 say anything you wish. For instance, if you typed LEARN 1 and said, "Hello," the computer will say, "Hello" in your voice every time you type SPEAK 1. You can have a maximum of 64 words or phrases available at any one time. You can also save files of words to disk that can be loaded into programs, giving you almost unlimited speech capability. And you can use the speech without the hardware. In other words, I could write a program using the voice capability, and give you a copy that will work without the VoiceMaster hardware. That feature makes it stand out from the others.

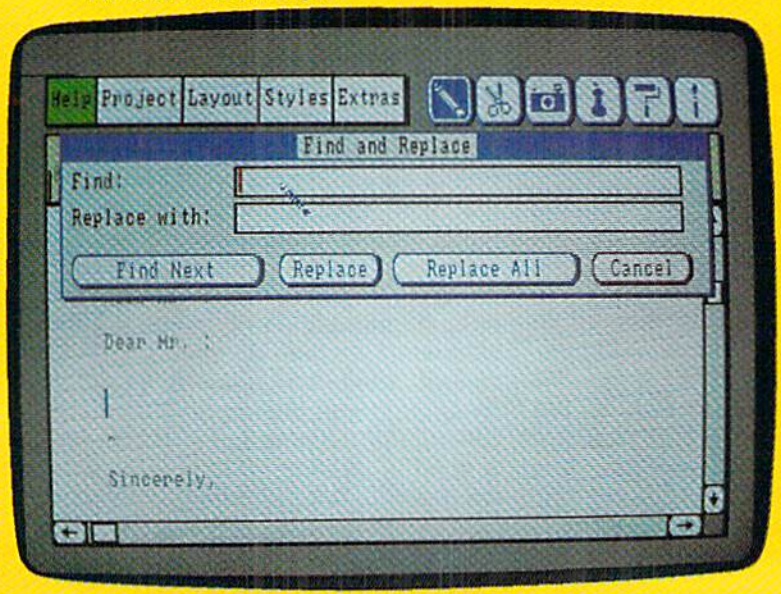
In addition, a voice-recognition program is included that will work alone or with the speech system. This adds even more commands, all dedicated to voice recognition. They are TRAIN, RECOG, BLANK, TPUT, TFIND, MAX and MIN. By using TRAIN, you can create voice-pattern files for up to 64 different words. These can be stored to disk with TPUT, recalled later with TFIND, and compared to a word inputted with RECOG.

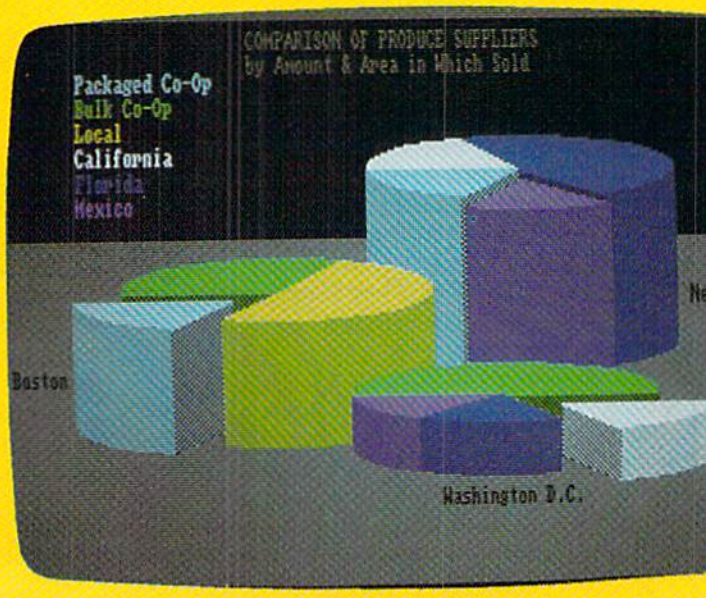
While the VoiceMaster often did not recognize words as well as the VCM, it still gave satisfactory results. And, because of its speech recording/playback capabilities, it has considerable potential as a program-development tool.

There are other programs on the VoiceMaster disk that demonstrate speech recording, playback and recognition. One of these is really unique. It is called the Voice Harp. Part one of the program is called "Hum-Along." Here if you hum, sing or whistle into the microphone, you will hear the computer trying to reproduce those sounds as music. In effect, the 64 is accompanying you while you sing. Part two is the "Composer." It allows you to hum, sing, whistle or whatever you do to make musical sounds into the microphone, and translates them into written musical notes. You can enter a song this way, save it to disk, recall it and modify it with an editor, replay it (as music), and save it again. And part three is the "Score Printer," which will print the score created by part two on a dot matrix printer. While these programs are not terribly sophisticated, I believe they represent an application that will soon be commonplace. I found them very impressive.

Included with the VoiceMaster hardware is perhaps the most complete documentation of all the voice products I looked at. The 50-page manual, while it was not an expensively produced document, did contain a lot of information. And Covox is good at sending updates to registered users. With all things considered, I think the VoiceMaster is a good buy at $89.95. C

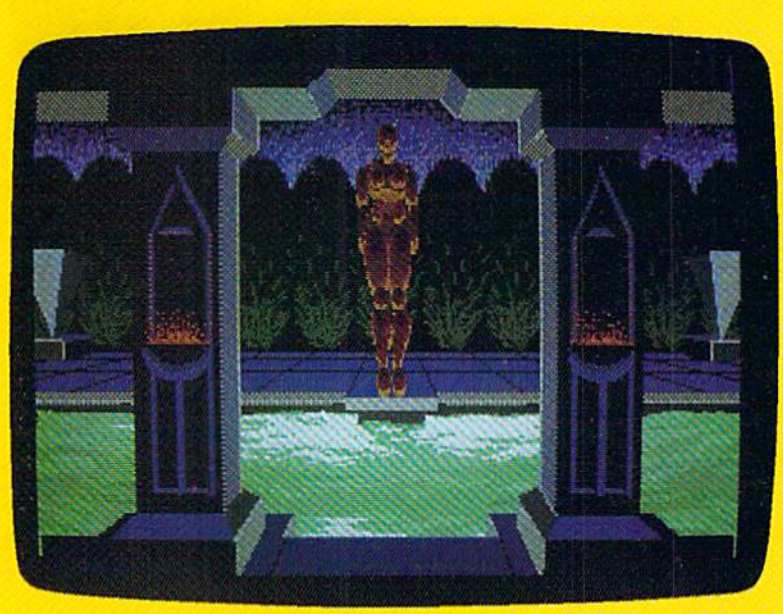
The Amiga Personal Computer is an advanced graphics machine capable of producing very high resolution screens in two separate graphic modes. Normal resolution provides a 320 × 400 (interlaced) or 320 × 200 (non-interlaced) pixel screen with a color palette of 32 colors selected from a possible 4096. High resolution provides a 640 × 400 or 640 × 200 pixel screen with a palette of 16 colors out of the possible 4096. The following screens show the scope of graphic possibilities on the Amiga.





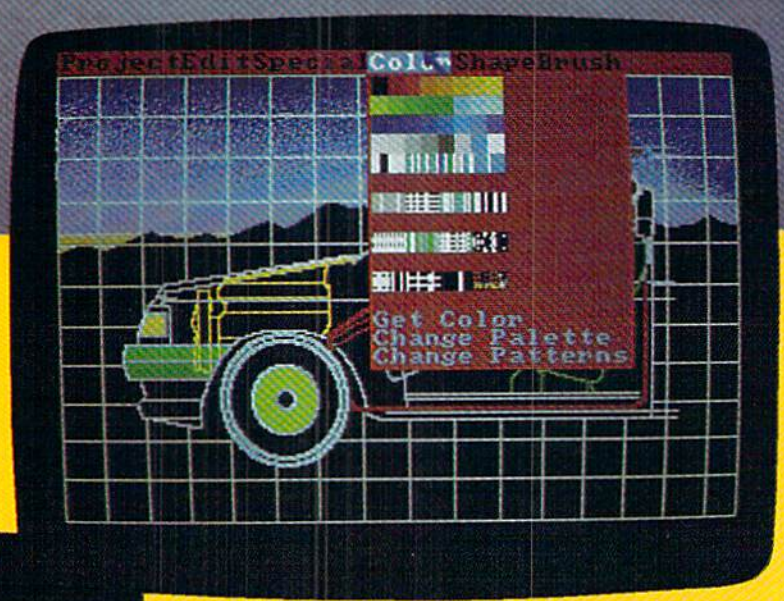
Amiga Preview

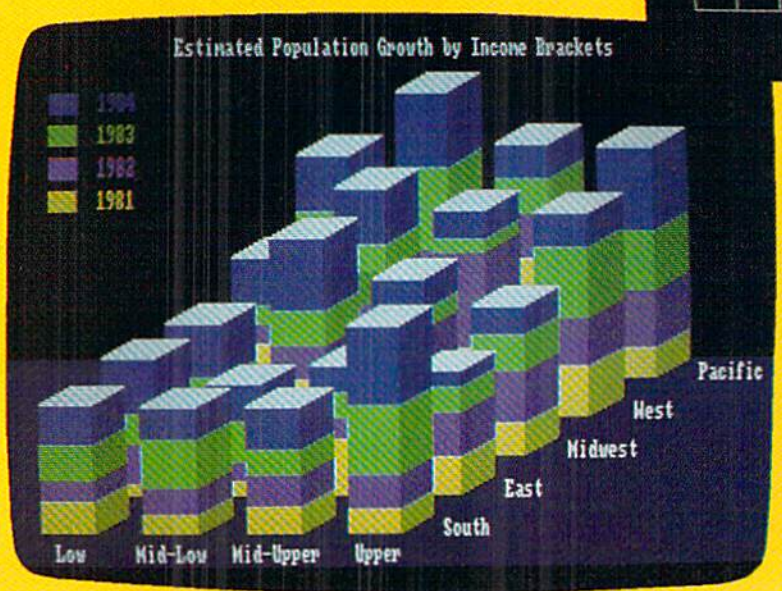
Commodore's new Amiga computer is a 256K RAM personal computer based on the 68000 microprocessor. It has 192K of ROM and a built-in 3.5-inch disk drive. A complete Amiga system consists of the main computer unit with drive, the keyboard, an RGB analog monitor and a mouse. The monitor in this picture is the Commodore 1080.

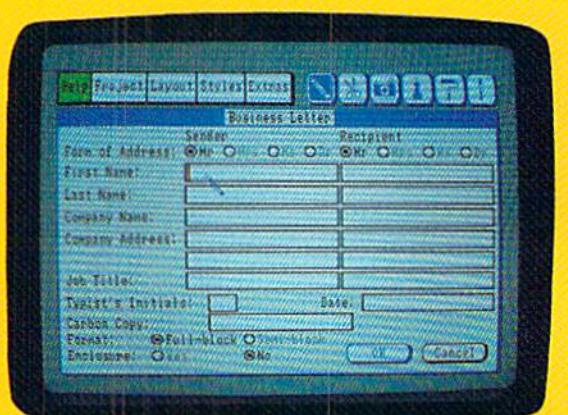


Amiga Preview

The keyboard includes a four-cursor pad, a numeric keypad, ten function keys, a CAPS LOCK key with LED, an ESC key and special Amiga logo keys on either side of the space bar. The keyboard has lift-out legs on the top to tilt the keyboard ergonomically.

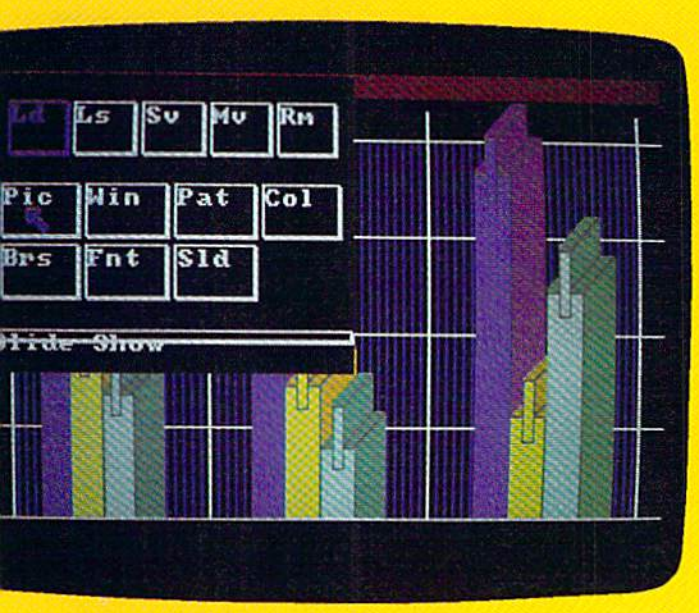


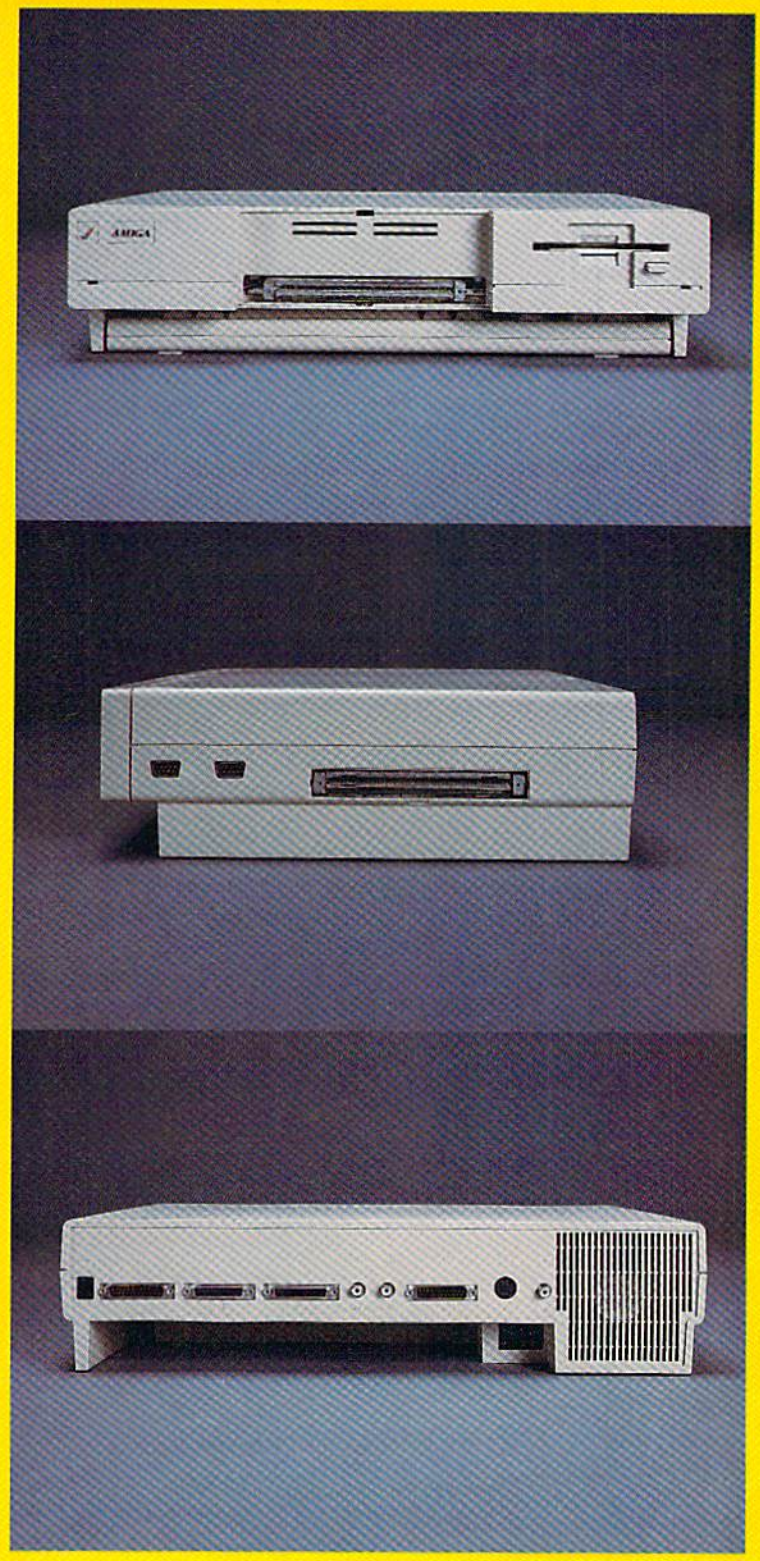




This is the front of the main computer unit with the memory expansion slot cover removed. To expand the Amiga to 512K you insert a 256K expansion board onto this edge connector and replace the cover. To the right of the expansion port is the 3.5-inch disk drive. This is a double-sided double-density disk drive with a formatted disk capacity of 880K. The small LED square below and to the right of the drive slot is the drive busy indicator and the LED square on the left middle is the power indicator.

This the right side of the main computer unit showing the two mouse/joystick connectors and the system expansion bus. This expansion bus provides access to virtually every signal line in the Amiga and allows third party developers to create peripherals using as much (or as little) of the Amiga operating system as required. This is the bus through which the external 8Mb of external RAM will be connected.





This the rear of the main computer unit showing the ports and connectors for accessing a wide variety of peripherals. Starting from the left, they are:

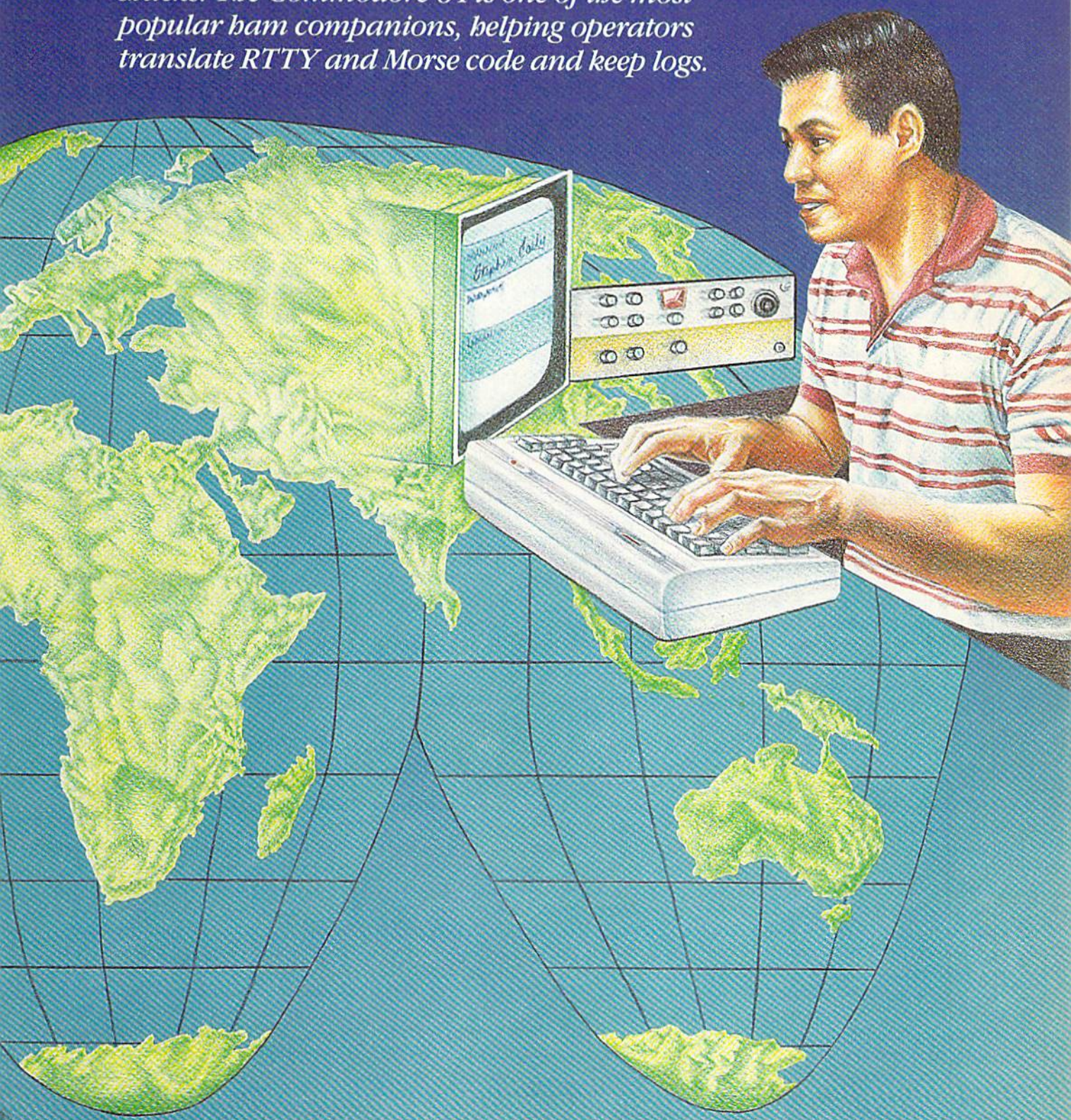
Keyboard connector
Centronics parallel printer port
External disk drive port
RS-232 modem port
Right- and Left-channel RCA stereo output jacks
RGB monitor connector (RGB monitor)
Composite video output port (composite monitor)
RF modulated video output port (television)
Below these ports and to the right is the main power port

BECOME RADIO-ACTIVE WITH YOUR 64

BY MEL GRANICK, KS2G

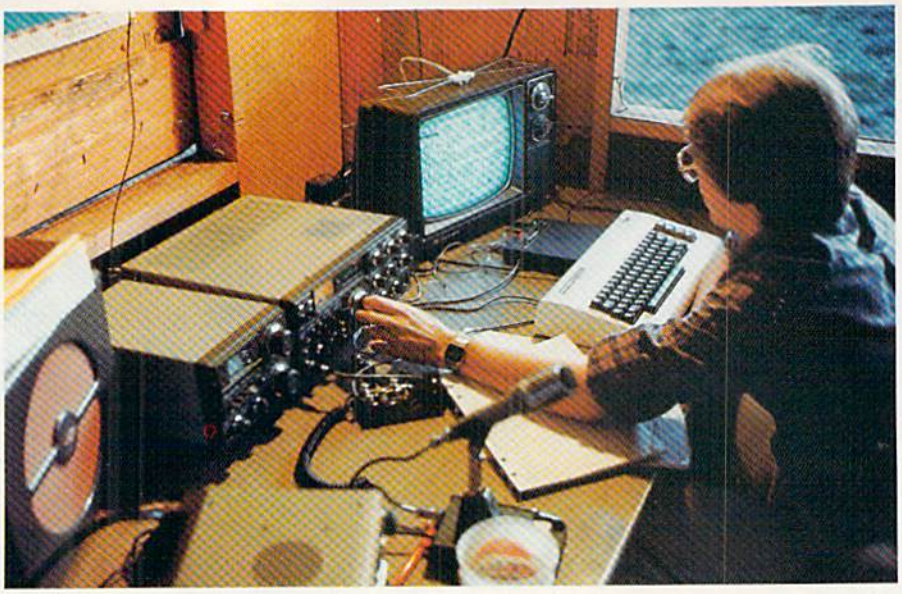
The Commodore 64 helps advance the art of amateur radio.

According to the American Radio Relay League, there are about 438,000 ham radio operators in the United States, and at least 40% of them are using microcomputers in their ham shacks. The Commodore 64 is one of the most popular ham companions, helping operators translate RTTY and Morse code and keep logs.



If ever a marriage was made in heaven, it's the joining of personal computers and amateur radio. An infatuation dating back to the original Commodore PET 2001 has blossomed into a love affair that's made computers one of the topics of conversation heard most often on the nation's ham bands. And the power, versatility, and low cost of the Commodore 64 have made it one of the computers found most often in the nation's ham shacks.

For radio amateurs, computers are more than just a means of taking the tedium out of record keeping and the complexity out of math. They're a tool for advancement of the radio art, and a way to increase the enjoyment of a fascinating hobby. A sampling of the most popular ham radio uses of the Commodore 64 shows how.



Logging

There was a time when Federal Communications Commission regulations required ham operators to maintain detailed logs of their radio transmissions. Those requirements are long gone, but most hams continue to keep records of their on-air activities either for the pleasure of recalling particularly enjoyable contacts, or to qualify for some of the many amateur radio awards. Typically, hams log the date and time of a contact, frequency band on which it's made, mode of operation (Morse code, voice, radio-teletype, etc.), callsign, location and signal strength of the station contacted, the name of its operator, and whether a "QSL card" providing written confirmation of the contact has been received.

Although conventional database software can be used to computerize such records, it's far easier with specialized programs typified by the Ham Data Company's *Super Log* series. Contact information is entered in a screen format that's similar to a page from a log book kept by hand. Data on hundreds of contacts can be stored on disk or tape cassette for later retrieval on screen or as a printout, either in tabular form or as a QSL ready for mailing. Contact information also can be retrieved through a search for any desired date, call sign, location, or name. The programs also keep track of QSL cards received, and progress toward operating achievements such as confirmed contacts with particular states or foreign countries.

Contesting is a special amateur radio activity requiring still further refinement of computerized logging. Contest operation involves contacting as many different stations in as many different locations as possible within a limited period of time. Logging for such competitions, therefore, involves not only the recording of contact information, but also assuring that no station is contacted more than once. Programs like Ham Data's *Contest Log* guard against such duplicate contacts (a process known as "dupe checking") while keeping track of how many different locations have been logged to automatically calculate a running contest score, and provide a printed summary at the end of the competition.

Calculation, Destination, Propagation

The days of scratch paper covered edge to edge with scribbled electronic equations are but a memory in today's computerized ham shacks. Not since the pocket calculator replaced the slide rule has there been a device as useful as the Commodore 64 for speeding the computations involved in so much of ham radio.

Software like the *Formulas* series by RAK Electronics makes short work of the mathematics of Ohm's Law, coaxial cable losses, and series and parallel circuits. RAK's *Ham Antennas* program is typical of software which performs the sometimes complex arithmetic for determining the dimensions of the many types of ham antennas.

Pointing a transmitting antenna in the proper direction at the proper time of day is the key to getting a short-wave radio signal to its intended destination. Doing it is easy with the help of software like Ham Data's *Propagation Chart*. This software provides compass headings and distances to locations around the globe, and, using readily available information on the sunspot activity which governs radio propagation, calculates the frequencies most likely to reach those locations at any particulaar time of day. Xantec Inc.'s *The DX Edge* takes advantage of the Commodore 64's graphics capabilities to present similar propagation data in the form of a world map, and includes a real-time clock and time zone conversion display to boot!

Antenna orientation is crucially important in amateur radio space communications. The first Orbiting Satellite Carrying Amateur Radio (OSCAR) was launched in 1961 and nearly a score of others have followed from both the United States and the Soviet Union. VHF and UHF frequency bands once limited to local contacts are now open to trans-global communications, thanks to these orbiting relay stations. To use them, however, it's necessary to determine when they're in range and which way to point your antenna to reach them. Thanks to tracking programs like the ones available from the AMSAT Software Exchange of the nonprofit amateur Satellite Corporation, that once tedious and time-consuming process is now quick and easy.

Morse and RTTY

Radio amateurs are as diverse as their hobby, but they all have one thing in common. Whether engineer or homemaker, schoolboy or univer-

sity professor, every ham has at least some proficiency in Morse code. FCC regulations require the ability to send and receive CW, as hams call it, at five words per minute for Novice and Technician class amateur licenses, thirteen words per minute for General and Advanced classes, and twenty words per minute for the Amateur Extra ticket.

Although printed charts of the code show the letters of the alphabet as dots and dashes, learning Morse really involves associating the characters with the "dit" and "dah" sounds which those dots and dashes represent. Code practice and instruction software like the Microlog Corporation's *Morse Coach* cartridge speeds the process by using the Commodore 64's audio capabilities.

Probably the most popular use for the 64 among hams is for the actual transmission and reception of Morse code and radioteletype (RTTY). In much the way that telephone modems and terminal programs allow the use of computers for communication via what hams call the "landline," special interface devices and software can link computers to ham radio transmitting and receiving equipment. Such arrangements have opened a new world of ultra-high-speed CW operation, as computers both generate the Morse to be sent, and interpret the code being received. Likewise, as the clatter of mechanical teleprinters has given way to the glow of the computer display, thousands of hams have discovered the joys of radioteletype.

The Kantronics *Interface II* and CP-1 *Computer Patch* terminal unit from Advanced Electronic Applications (AEA) are typical of the sophistication to be found in the CW/RTTY equipment available for the 64. With appropriate software, they permit transmission and reception of conventional Morse, baudot (RTTY), and ASCII signals, along with a newer radioteletype system known as AMTOR which automatically checks for garbling of text due to interference or fading of the radio signals. Microlog offers similar features in the combination of hardware and software found in its *AIR-1* interface cartridge. For a still newer type of radioteletype operation known as packet radio, AEA offers its PKT-1 *Packet Controller,* which equips the 64 for a combination of error checking, higher speed transmission, multiplexing of several signals on the same radio frequency, and electronic mailbox capabilities.

Simulation and Control

Perhaps the most fascinating application of computerized Morse is AEA's *Doctor DX* simulator-trainer. In much the way popular flight simulation programs turn your 64 into an airplane control panel, the *Dr. DX* cartridge makes your computer behave like a ham transceiver that's on the air in the thick of an international CW contest. As you "tune" each band at a specified hour, you'll hear "stations" operating from the parts of the world which would actually be heard as a result of the propagation characteristics typical of that band at that time of day. Stations you "call," by sending Morse as you would on the air, will answer or fail to answer based on what the signal from your location would be like as compared to the other signals on the band at the same time. The effect is described as so realistic that *Dr. DX* is rumored to have successfully "impersonated" an operating station at a major amateur radio convention!

One of the newest developments in the ham shack is computer control of on-the-air operations. Some of the latest ham equipment provides for control of such functions as frequency and mode selection via an RS-232 port, and Electronic Equipment Bank offers a computer control interface designed to mate such gear to the Commodore 64. Such an arrangement could potentially allow remote control via telephone through an auto-answer modem, or even fully automatic station operation under control of the computer.

Finding What You Need

The one difficulty you're likely to encounter in computerizing your hamming, is obtaining the hardware and software you need. Most of the programs and devices I've described won't be found amid the games, joysticks, word processors and printers in the typical computer store. However, both manufacturers and mail order retailers of ham-oriented computer items advertise extensively in amateur radio publications. There's also a considerable amount of public domain software available at little or no cost through local amateur radio clubs, and the American Radio Relay League maintains a library of public domain program listings. A catalogue of what's available from the League can be obtained by sending a stamped, self-addressed envelope to the ARRL's "PX" program exchange department.

From logging contacts to designing antennas, tracking satellites to sending and receiving Morse code and radioteletype, ham shack uses for the Commodore 64 are as diverse as amateur radio itself. So it's easy to see why the question for hams who own a 64 isn't, "What can I do with it?" but, "What should I do first?" C

Mel Granick is a radio and electronics hobbyist who holds an Extra Class Amateur radio license.

Ham/Computer Resource Guide

Advanced Electronic Applications, Inc.
P.O. Box C-2160
Lynwood, WA 98036

American Radio Relay League
225 Main Street
Newington, CT 06111

AMSAT Software Exchange
Box 27
Washington, D.C. 20044

The DX Edge
P.O. Box 834
Madison Square Station
New York, NY 10159

Electronic Equipment Bank
516 Mill Street
Vienna, VA 22180

Ham Data Company
3331 Bybrook Lane
Woodbridge, VA 22192

Kantronics
1202 East 23rd Street
Lawrence, KS 66044

Microlog Corporation
18713 Mooney Drive
Gaithersburg, MD 20879

RAK Electronics
P.O. Box 1585
Orange Park, FL 32067

The Electronic Cottage Controversy

Computer Work at Home May Be Illegal

The AFL-CIO wants to protect cottagers from labor abuse. But electronic cottagers think their constitutional rights are threatened. Journalist—and electronic cottager—Tom Benford offers his opinion on the controversy.

BY TOM BENFORD

Thousands of folks live and work in electronic cottages, and thousands more will join them over the next year. An electronic cottage is a home and workplace that is wired to the world through a computer keyboard and screen. Whether the keyboard and screen is attached to a dumb terminal linked to a mainframe through a modem, or a Commodore 64 used for writing magazine articles, doesn't matter. The main criterion that defines an electronic cottage is that some form of income-generating computer work be done in the home.

Those who work in such environments are called cottagers, and this work/lifestyle is known as the "electronic cottage industry." Cottagers may be self-employed or employees of others; as long as they're using a terminal or computer for work at home, they're cottagers.

Working at home is not at all a new idea; folks have been doing it for years. The computer, however, has made working at home an accessible reality to some members of the workforce. In his best-selling book *The Third Wave,* author Alvin Toffler prophetically describes the next "wave" of work trends and accepted norms for the business world—spawned by the emergence of the electronic cottage.

By nature, electronic cottaging will not work for a great number of jobs where physical presence at the workplace is necessary. However, certain jobs requiring little or no interaction among people are ideally suited to this cottage industry.

Should Computer Work at Home Be Banned?

For instance, cottage workers can be employed to process claim forms by Blue Cross/Blue Shield. In such an arrangement, these workers make their own hours and are paid a fixed amount for each form they process. The data is entered from a terminal in their home, sent through a modem to a mainframe at the company, and their wages are tallied from the number of completed transmissions received by the mainframe.

Occupations such as this, involving information entry, handling, manipulation or transmission, do particularly well in cottage environments. Professions like consulting, writing, researching, brokering and others fall into this category as well, and cottagers in these fields are often self-employed entrepreneurs.

Recently, however, the AFL-CIO, the largest labor organization in the United States, has resolved to seek a ban by the federal government on all computer work done at home. It's important to understand the implications of such a ban. If it were made law, you would be breaking that law by doing anything for profit with a computer in your home. This means, for example, that if you sent a program or software review to a magazine, and they bought it from you, you'd become a criminal.

This example is not taking things to the extreme. In fact, cottaging may even be illegal in your locality already. For instance, about a year ago, two writers working out of their apartment in a Chicago suburb were served with a cease-and-desist order. A municipal ordinance prohibiting any kind of income-generating work at home was cited. This incident attracted some attention from the media, and efforts were undertaken to amend the ordinance; the success or failure of these efforts is unknown as of this writing.

The AEC vs. the AFL-CIO

With the increasing popularity of cottage-industry work, small local "cottage" groups have sprung up. On a nationwide scale, however, the Association of Electronic Cottagers (AEC) was founded to provide a central organization for the cottage industry at large. It provides marketing assistance, business consultation, assistance in setting up a computer-based home business, and other services to members.

The AEC was formed in January, 1985, by Paul and Sarah Edwards, co-

Dennis Chamot Assoc. Director Dept. for Professional Employees AFL/CIO

"Home-work in the past did *lead to widespread, well documented cases of abuse . . . low wages, long hours, poor health conditions . . ."*

—*Chamot, AFL-CIO*

authors of several books on home-based computer business opportunities. As of this writing, the organization already has over 100 members, with Commodore users comprising about 10% of the total membership.

The AEC's most significant contribution to the cottage industry thus far involves writing an "Electronic Cottage Bill of Rights" in opposition to the AFL-CIO ban efforts. This "bill" reaffirms the right of an individual to choose cottaging as a legitimate means of earning a living. The AEC also functions effectively as an information source on any legislative and regulatory activities threatening the rights of cottagers.

According to Paul Edwards, the AFL-CIO is predominantly concerned with the labor abuses that electronic cottaging may promote: child labor, long hours, no benefits, and the like. These points are valid and no one would argue their merit. The proposed ban, however, is a blanket condemnation of all home computer work, with no provision or suggestion for regulating it.

The AFL/CIO Side of the Issue

Dr. Dennis Chamot, the Associate Director of the Department for Professional Employees at the AFL-CIO Professional Employee offices in Washington, D.C., detailed what the proposed ban encompasses and who it affects. My phone interview with Dr. Chamot went like this:

Benford: What is the official stand of the AFL-CIO regarding computer work done at home?

Chamot: The AFL-CIO Convention passed a resolution about two years ago calling for a ban on computer home-work. Since it is a convention resolution, that is the official stand of the AFL-CIO.

Benford: But what about the rights of people to work on computers at home?

Chamot: There's a long history of home-work and problems with home-work in this country, which led to such a level of abuse that several forms of industrial home-work were banned by the federal government decades ago. The most recent wrinkle is the lifting of the ban for home knitting; the others still remain in effect.

I think it's important for people to understand why the original bans were put into effect, since that will go a long way toward explaining why

Paul and Sarah Edwards. Authors of *Working from Home: Everything You Need to Know About Living and Working Under the Same Roof.*

"Where you work and whom you work for is your own business--and it should stay that way."

—Electronic Cottager

many of us [personally]—not just the AFL-CIO—are opposed to the lifting of the other bans and why we have our concerns about the development of computer home-work. Home-work in the past did lead to widespread, well documented cases of abuse. The abuses we're talking about here are low wages, piece-work systems, long hours, poor health conditions, the use of child labor, and so forth.

Benford: Wasn't there an alternative to banning home-work that would prevent such abuses?

Chamot: The initial approach was not to ban the work, but to regulate it. Here were people trying to make a living and they were being exploited—they needed some protection. After a long period of trial-and-error and many problems, enforcing standards for home-workers was found to be virtually impossible. Therefore, in the industries where the worst abuses were prevalent, a total ban was put into place. Those bans have remained for decades until the advent of the Reagan administration in seeking to overturn them. The overturning of the knitting ban was not a smooth process—there was opposition to that. There is no attempt being made right now to eliminate the other bans.

I think there is a fairly widespread recognition of the fact that home-workers can be and have been abused.

Benford: I understand this ban on computer home-work makes no exception to persons who are self-employed. Is that correct?

Chamot: If someone is truly independent or self-employed, they take care of themselves. You start to come into an area, though, when the work becomes very widespread, that the definition of a "self-employed" or an "independently self-employed" individual becomes a little fuzzy.

Benford: For the purposes of clarity as to what "self-employed" means, let's use me as an example.

Chamot: We can't—you see, that's the problem. The people from the cottage industry association and the like immediately jump to the case of those people who are least abused and who have the most ability to take care of themselves. Those are not the people we're worried about. There's a very big difference between somebody like yourself and, say, a clerical worker. That is, a worker who is given work by a major company, who has no ability whatever to negotiate over pay rates, who is not given any benefits,

Continued on page 120

Ergonomic Accessories for Comfortable Computing

BY TOM BENFORD

e-r-go-nom-ics—The study of the relationship between man and his working environment, with special reference to anatomical, physiological and psychological factors: human engineering.

—*Funk & Wagnalls International Dictionary*

Have you ever had a long session at your computer and felt achy or stiff at the end of it? Perhaps the reason for your discomfort is that your equipment isn't *ergonomically* arranged. Regardless of whether you use your Commodore for gaming, word processing, programming or other applications, paying some attention to the ergonomics of your equipment set-up will make your computing more enjoyable—and more comfortable!

Virtually everything in your computing environment affects the ergonomics to some degree. Lighting, keyboard height, seating, disk and accessory storage are some of the considerations that come under the heading of ergonomics. Several manufacturers have come out with ergonomically designed products, and we'll cover several of them here. But there are many things you can do yourself to make your computing more comfortable. In fact, you'll find that having a good basic work area to begin with will help you derive the maximum benefit from any accessories you do add.

Your Work Area

Your computer work area doesn't have to take up much room. Most any place will do as long as it has sufficient lighting, enough electrical outlets for your equipment, and is in a low-traffic area. If you plan to use your modem for telecomputing, then proximity to a phone jack is also important, although extension cords may solve this problem.

Your Work Surface

Once you've picked a spot to set up shop, you'll have to choose a work surface for your equipment and accessories. The work surface can be anything from a sturdy card table to a desk to a custom-built wall unit or a commercially available computer work station. The three main requirements for a work surface are that it is large enough to comfortably hold your equipment, sturdy enough so it won't collapse from the weight, and at a comfortable height for typing on the computer keyboard. Most typing tables are between 25 and 28 inches—a range that is comfortable for most.

To find the height that's right for you, try keeping your elbows at your side while assuming a typing posture with your arms and hands. Your forearms should be slightly elevated, with your wrists about two inches higher than the crook of your elbow. Whatever this height is, subtract three inches from it and that's where your work surface should be (the Commodore 64 is

Virtually everything in your environment affects the ergonomics to some degree, including lighting, keyboard height, seating, and disk and accessory storage.

about three inches thick at the keytops).

The work surface should be deep enough to hold your monitor or TV set with the Commodore 64 in front of it. Allow six inches or more between the computer and monitor/TV for accessing the ports. A work surface depth of 30 inches works well for the 64 and a 1702 monitor; other monitors or TV's may require more or less depth.

Sufficient width is another factor to consider. I recommend a minimum width of 30 inches to hold a 64 and disk drive or datassette with enough "breathing" room between the units. A 48-inch width will afford you plenty of room to keep the computer, disk drive, disk storage file, notepad and pen, joystick, and other small items with room to spare. I use a 48-inch work surface, and I like the extra elbow room it provides me (I have a separate printer stand). To accommodate your printer on the same surface, plan on making it 54 or even 60 inches, depending on the printer.

Storage Space

Ergonomics come into play when you are storing your disks, cartridges and other items. Depending on what you've chosen for the work surface, you may already have drawers or shelves. If not, there are still plenty of options for your storage needs.

Shelving brackets and composition board shelves are an inexpensive way to clear up some of the clutter and yet keep everything within arm's reach. You can create shelves easily with metal "standards" which are screwed into the studs of the wall. Metal shelf brackets snap into the holes in the standards, and the shelf rests on these brackets. Since the standards have holes placed at half-inch intervals, you can adjust the height of your shelves—very ergonomically sound! The standards, shelf brackets and shelves are available in the hardware or lumber departments of most large chain or department stores.

You can also install fixed shelves if you're interested in doing a little carpentry. Most home repair/modification books have plans for building simple, strong wall shelving inexpensively, and many lumber/building-materials dealers have free brochures on shelving for the do-it-yourselfer. "Organizers" also provide storage. They can be virtually anything from a sturdy cardboard box for holding your small accessories to a specially designed unit for storing disks. Stackable plastic bins available in the housewares sections of department stores make dandy containers for holding cables, joysticks, cartridges and the like. Clear plastic shoe storage boxes also come in handy for organizing your gear, as do shallow plastic trays, also available in housewares.

Bookends are another item you might want to include for holding your user manuals and other documentation neatly. Just about any heavy, free-standing objects can be used for bookends, even a couple of large rocks—don't be afraid to be creative or innovative.

Psychological factors are also part of your work station's ergonomics. The whole idea is to create a place where you will feel comfortable. To this end, include any items that make you feel at home, such as favorite pictures, knick-knacks and the like. This is supposed to be your place, so make it homey.

I'm one of those people who constantly jots down cryptic notes and reminders to myself. Some inexpensive corkboard on the facing wall holds these shards of paper in what almost approaches an organized manner. If you're an incorrigible note-poster, then the corkboard will allow you to indulge yourself without poking holes in the wall.

Seating Arrangements

You'll be sitting down for 99% of the time you spend at your computer, so a comfortable seat is an important consideration. Choosing a comfortable chair is largely a matter of personal taste, as long as it provides good back support. Typing or secretarial chairs are good choices and are often adjustable for back support and height. The height adjustment helps you compensate for a less-than-ideal-height work surface. These chairs frequently have casters that allow you to roll about, another ergonomic point to consider if your work surface is on the long side.

Comfortable cushioning and a design that fosters good posture will also make for comfortable computing. The kitchen chairs were meant to be used while eating, not for long stretches at the 64. Their intended purpose becomes achingly clear after a couple of hours of computing while perched on one. Comfort and support are the rules of the day when choosing the right seat for your work area.

The latest item in the ergonomic seating department is the "kneeler" or "back" chair available from several manufacturers. These odd-looking chairs distribute the body's weight evenly over the center of gravity and are extremely comfortable. The angle of the seat distributes support between the lumbar region of the back and the knees. The thigh bones support the bulk of the load. The result is an ergonomic support that promotes good posture.

Several discount chain stores are selling inexpensive versions of this basic design, but they may not have sufficient padding on the "kneeler" portion,

The latest item in ergonomic seating is the "kneeler" or "back" chair, which distributes the body's weight evenly over the center of gravity.

which makes them not so good for long stints. Good chairs I am familiar with in this genre include the Back Chair from British Design (U.S.A.) Corporation. Constructed of oak wood veneer, it is available in either fawn or brown and has comfortable padding. It assembles in about five minutes and has a suggested retail price of $49.95.

Starshine of Santa Barbara also offers a kneeler chair in a choice of two models. The standard model is made of oak veneer with comfortable padding for the seat and knee surfaces, priced at $29.95. A deluxe three-position adjustable kneeler chair on wheels is also available for $49.95, which allows you to select the best angle and height for your particular needs.

Cable Jungle

Cables are the veins and arteries of the computers. But if you have a Commodore 64, 1541 disk drive, monitor or TV and a printer connected together, then you have four power cables, the monitor/RF cable, the disk drive cable, the printer cable and possibly even a printer interface cable—more than that if you have dual drives, a modem, joystick or other goodies. In addition to being unsightly, all these cables cause a very non-ergonomic clutter.

While you can't eliminate them, you can eliminate some of the clutter. If possible, try to route your power cables down the back of your work station, perferably in a neat bundle. You can purchase "cable ties" from electronics supply houses, or you can make your own from garbage-bag ties. Another good idea is to label each cable where it plugs into the electrical outlet to identify which device it is for. Masking tape is good for making cable labels.

If your work station is flush with the wall, you might want to drill a hole through it near the wall to route your power cables through. Just make sure that there are no rough or sharp edges on the hole to fray or pierce the insulation on the cables, causing a shock/fire hazard.

You can also relieve cable clutter by using a multiple-outlet power box. Better multi-outlet boxes have built-in surge suppressors to clean up the power coming from the wall outlet, and often feature a master power switch, which lets you turn the power on or off to all your equipment at the same time. Built-in surge suppressors protect the equipment from a sudden jolt of power when it is first turned on. Some multi-outlet boxes can be screw-mounted to the work station or wall.

Discwasher offers three such multi-outlet surge suppressors in its SpikeMaster line, all offering protection from sudden voltage surges while providing interference filtering. Two of the models are designed for tabletop use, and since they both offer four inputs and a master on/off switch, they're ideal for ergonomic power-handling chores.

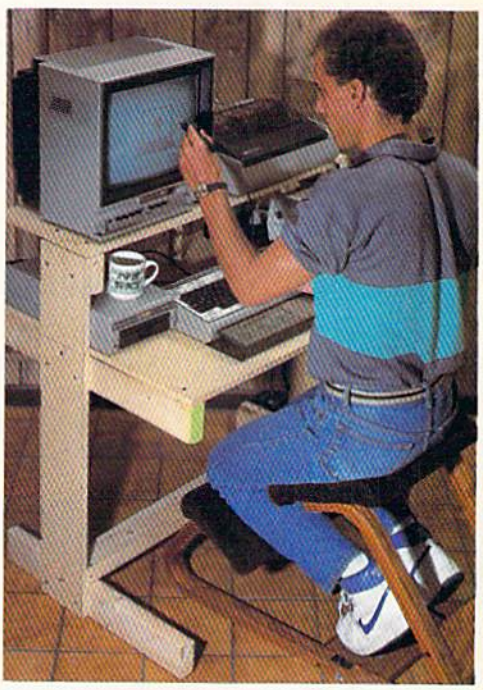
Shedding Some Light

Lighting is another ergonomic consideration, since too much can be as bad as too little. Insufficient light will cause eye strain and discomfort, but an overabundance of light will cause screen glare, which also contributes to eye strain and discomfort. Most folks feel comfortable with sufficient lamp light to read by, but not enough to disrupt the readability of the video display.

Incandescent (light bulb) light is easier on the eyes than fluorescent light, especially since fluorescent light also causes some people to experience a "strobing" effect on the video display. Diffused light is preferable to direct light, because it is less harsh on the eyes. A small table lamp with a translucent shade is often all you'll need to shed some light on your work station without overdoing it.

While we're on the subject of lighting and eye strain, it's also a good ergonomic practice to give your eyes a break. This is merely a short period away from the monitor or TV to give your eyes a change of pace. Since your eyes remain in a fixed focus when you work on your computer, they need a rest and a chance to focus on some distant objects now and then. This goes a long way to combat eye strain. Many offices give their terminal operators, word processors and other CRT users an "eye break" every hour or two. Eye breaks for employees are required by law in many states as well, which gives you an idea of how important they are.

Incandescent light is easier on the eyes than fluorescent light, especially since fluorescent light also causes some people to experience a "strobing" effect on the video display.



The Falcon Fire Extinguisher is a compact unit containing Halon 1211, a residue-free extinguishent that's safe for use on high-tech equipment.

Leroy's Cheatsheets

There are several small items you may want to include in your computer work area that will enhance both your productivity and comfort. Among these are Leroy's Cheatsheets. These are handy keyboard overlays that give you all the pertinent information and commands to run your favorite word processor, terminal program or other applications software. Cheatsheets are available for *EasyScript, VIP Terminal, The Smart 64 Terminal,* BASIC programming commands, and other popular programs and applications, and are available from Cheatsheet Products at $3.95 each.

Monitor and Printer Stands

Because monitors and printers are bulky and hard to place conveniently on a desk, you may want to invest in specially made stands that get them up off your work surface and into a more comfortable position for use. Suncom is one company that makes stands for both monitors and printers. Their monitor stand is a nice unit that holds most video monitors or TV sets with up to 14-inch screens. The stand allows you to swivel the monitor or TV 360 degrees and tilt it up to 12.5 degrees. It's great for reducing glare and getting the best viewing angle—prevents stiff shoulders and neck from craning to see the video display. It's available for $26.95.

The Suncom printer stands are available in five sizes to fit most popular printers. They are sturdily constructed of plastic-covered metal and have rubber-tipped "feet." They're ergonomically designed to tilt the printer slightly toward the user at a comfortable angle, and their wide-open construction won't inhibit the printer's ventilation. They also help to lessen both vibration and noise while the printer is in operation. Suncom's printer stands are available in the following sizes and prices:

12″ × 12″ × 2″, $17.95
12″ × 12″ × 4″, $19.95
15″ × 12″ × 2″, $21.95
18″ × 14″ × 2″, $24.95
21″ × 17″ × 4″, $29.95

A multi-purpose stand that can serve as a work station, printer stand or desk, among other things, is available from Abstract Enterprise for $40.00 plus $2.50 handling. The sturdy unit assembles easily and looks good. Abstract also offers a computer table with hutch for $160 that has enough room to hold all your equipment comfortably. An illustrated catalog with price sheet is available directly from the company showing their entire line of ergonomic accessories.

Another ergonomic computer work station and its matching printer stand are available from The Furniture Byte. Both units are well made, assemble with only a screwdriver and are available in either natural oak or walnut woodgrain finishes. The work station features a desk shelf that swings up to close the unit when it's not in use, an adjustable upper shelf for holding the disk drive or other accessories, and plenty of room, at proper viewing height, for the monitor on top. The matching printer stand has a shelf underneath for holding the paper supply. Casters provide mobility for the printer stand and complement the ergonomic design of the unit. The work station and printer stand are available directly from The Furniture Byte.

The DeskTopper ($49.95 from Madison Computer) is a beautiful solid oak stand that holds your monitor at an elevated height for easy viewing. A shelf provides ample room for holding two disk drives or a single drive and other accessories. The lower compartment houses the 64 itself, when it's not in use. The unit provides an ergonomic means of organizing your components while hiding unsightly cables. Madison also carries other useful computer accessories and has a free catalog.

Info-64 Ergboard

If you've ever gotten a case of wrist fatigue from a long computing session, then you'll welcome this nifty device from Info-64. It is essentially a sloped platform that provides support for your wrists. Made from smoked bronze acrylic, it has slots cut into it to accept the front "feet" of the computer and prevent if from moving around the work surface.

Three handy "Ergcards" are supplied with the unit. The cards provide

command and control references for Gemini 10X printers, a BASIC programming reminder and syntax checker, and a code summary for *Wordpro 3 Plus/64*. The Ergboard is available from Info-64 for $19.95 including the postage and handling.

Computer Hardcover

Diversified Manufacturing offers the Computer Hardcover for the VIC or 64. This lighweight plastic lid combines ergonomic styling with functional protection for your keyboard when you're not using it. It's molded of beige plastic to match the Commodore 64, slips on and off the keyboard in an instant, and sells for $9.95.

Rolltop Disk Files

The Rolltop Disk File is available from MicroComputer Accessories, Inc. in two versions. The standard version sells for $36.00, while a locking version is also available for $46.00. Either version of the Rolltop will hold 100 disks between 11 dividers and provide you with high-capacity, space-efficient storage for your floppies. The company also carries other ergonomic accessories such as anti-glare screens, monitor swivel stands, and dust covers, all illustrated in their free catalog.

Stationary Carriers

Plastic check and stationary carriers provide an ergonomic means of printing checks or letters on your tractor-feed printer. The vinyl carriers have tractor-sprocket holes in the edges, and slits in the carriers hold either checks or letterhead sheets firmly in place for printing. They're available for $11.95 including postage and handling from CHF.

Fire Extinguishers, Coffee Mugs

Falcon Safety Products offers the Falcon Fire Extinguisher, a compact one-pound unit containing Halon 1211, a residue-free extinguishent that's safe for use on high-tech equipment. The extinguisher has a suggested retail price of $39.95, and an optional wall-mount bracket is also available. Falcon also carries an extensive line of computer-care products, all illustrated in their free catalog.

Computer coffee mugs, note paper, jigsaw puzzles, pencils, banks—even computer gift wrap paper are all available from Computer Personals. These items are great for lending an "ergonomic ambiance" to your computer nook, and they're all functional as well as cute. Some of the inscriptions include "Software Scribble" and "Computer Comments" for the note paper, "Data Bank" for the coin bank, and "Input Device" and "User Friendly" for the drink mugs. The mugs retail for $5 each plus shipping and handling. A free catalog is available from the company showing the entire product line and prices.

Where to Get It

The products mentioned in this article or more information on these products may be obtained directly from the companies at these addresses:

Cheatsheet Products
P.O. Box 8299
Pittsburgh, PA 15218
Leroy's Cheatsheets

Suncom, Incorporated
260 Holbrook Drive
Wheeling, Il 60090
Monitor station, printer stands

Info-64
Route 2, Box 198-E
Iowa City, IA 52240
Ergboard and Ergcards

Computer Personals
P.O. Box 376
Southampton, PA 18966
Coffee mugs, banks, pencils, gift wrap paper, etc.

Diversified Mfg., Inc.
P.O. Box 2240
Wichita, KS 67201
Computer hardcover

Microcomputer Accessories, Inc.
5721 Buckingham Parkway
P.O. Box 3725
Culver City, CA 90231
Rolltop disk files, other accessories

Discwasher
1407 North Providence Road
P.O. Box 6021
Columbia, MO 65205
SpikeMaster Surge Suppressors

British Design (U.S.A.) Corp.
4601 Oakport Street
Oakland, CA 94601
Kneeler-type "back" chairs

Starshine of Santa Barbara
816B State Street
Santa Barbara, CA 93101
Regular and adjustable "back" chairs

Abstract Enterprise, Inc.
7210 Jordan Avenue, Suite B24
Canoga Park, CA 91303
Multi-purpose rollabout stand, computer hutch, other accessories

The CHF Company
P. O. Box 185
Oberlin, OH 44074
Vinyl check and letterhead carriers for line printers

The Furniture Byte
P.O. Box 1757
9 Judith Place
Longview, WA 98632
Computer work station and printer cart

Madison Computer
1825 Monroe
Madison, WI 53711
Desktopper component stand, other products

Falcon Safety Products, Inc.
1065 Bristol Road
Mountainside, NJ 07092
Fire extinguisher, other products

Build This Economical Ergonomic Work Station for $10

PLANS & TEXT BY TOM BENFORD

GENE SMITH

Some folks don't mind putting in some extra work to save some bucks. If you're budget-conscious and can handle a screwdriver, drill and saw, you can make this computer work station in several hours for about $10. It's easy, economical and ergonomic!

The work station pictured here used these materials at these prices:

1—3′ × 4′ sheet 3/4″ particle board	— $5.99
2—8′ lengths blemished 2 × 4 @ .97	— $1.94
28—1-1/2″ woodscrews @ .06 each	— $1.68
4—2-1/2″ woodscrews @ .09 each	— $ .36
	$9.97

With tax, it came out to less than $11, so even if you purchase a quart of paint and a cheap brush, we're still talking under $15.

I purchased the sheet of 3/4″ particle board and the 2 × 4's from Rickels, although similar prices will be found at most home/lumber centers. I purposely chose blemished 2 × 4's because of their low price ($.97 for an 8′ length). You can get really nice 8′ lengths of 2 × 4 for about $2.25 each without any blemishes if appearance is important to you.

I had the woodscrews in my workshop, but a quick check with the neighborhood hardware store yielded the prices I've listed here.

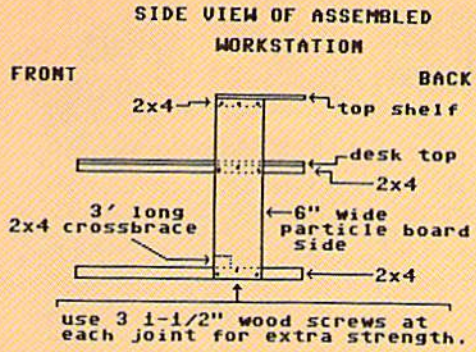
As far as tools go, you'll need a screwdriver, power drill with bit, countersink bit, saw, pencil, yardstick or ruler, and a square. You can get by with a hand saw and a hand drill, but the power tools make the going considerably faster and easier. A power screwdriver is also an asset.

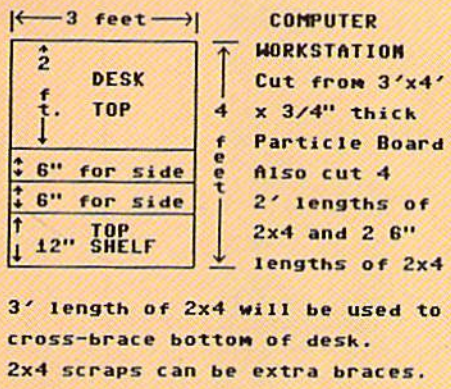
Depending on the screws you're using, you may want to countersink the screw holes so the screw heads fit flush with the surface. In the accompanying photos, a countersink purposely wasn't used so the screw locations would show up better. You may notice that our prototype model uses two screws on each side to secure the top shelf; three would be better. In the accompanying plans, I suggest using three screws to secure each joint.

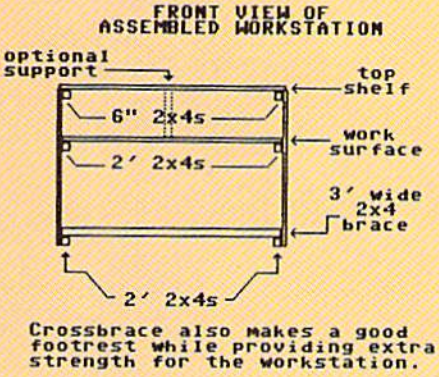
Also note that I recommend sanding all rough edges with medium grit sandpaper to remove any splinters produced by sawing, even though our "model" work station hasn't had this treatment (yet). A coat of paint or stain will do wonders to cover up slight imperfections and add the finishing touch.

Construction

Measure the particle board halfway down and score a line with your pencil, so it will yield two 2′ × 3′ halves,







and cut the sheet in half. Set one half aside. This will be the work surface of the work station.

Measure and cut the remaining two-foot section into two 6" × 3' panels and one 1' × 3' panel. The six-inch panels will be the sides of the work station, while the one-foot piece will be the top shelf.

Cut one of the 2 × 4's into four equal two-foot lengths. These will make up the floor and worksurface platforms.

Cut the other 2 × 4 in half. Then cut one half into one three-foot section and two six-inch sections. The three-foot piece will provide a crossbrace for the bottom of the unit, while the six-inch sections will act as mounting cleats for the top shelf. Save the remaining piece of 2 × 4 for additional (optional) support bracing. That takes care of all the cutting involved.

Next, determine what height you would like the work surface to be by using the method I've detailed in the main article. On our prototype here, I decided that a 27" worksurface height would be about right, so I measured 26-1/4" (allowing 3/4" for the thickness of the particle board) and made a pencil line on both of the six-inch-wide particle board panels.

Notice from the side-view diagram that the work surface and top shelf overhang the side panels by six inches to the rear of the unit. Measure six inches and make pencil lines on each of the four two-foot sections of 2 × 4. Line up the 2 × 4's and panels according to your pencil marks, drill three holes for each joint, and install the woodscrews, countersinking their heads for a flush fit.

Next are the bottom 2 × 4's with the same six-inch overhang. Make sure that the 2 × 4's are flush with the bottoms of the side panels, drill three holes and screw them together.

The next operation involves attaching the six-inch 2 × 4 sections to the tops of the side panels. Make sure these are positioned flush with the tops and sides of the side panels, drill three holes and affix with woodscrews (front-view diagram).

At this point, you should have two side panels, each consisting of a six-inch particle board panel with a two-foot 2 × 4 base support, a two-foot 2 × 4 worksurface support, and a six-inch 2 × 4 top shelf support. You should also have your 2' × 3' work surface (desk top), 1' × 3' top shelf, three-foot 2 × 4 crossbrace, and some scrap 2 × 4. Take inventory now, and make sure this is what you have. If not, you've done something wrong, so backtrack to find where you erred.

Having someone assist you at this point will make life easier. Place the 2' × 3' particle board work surface between the two side panels, resting it on the 2 × 4 worksurface supports. The work surface should be flush with both the 2 × 4 ends and the side panel itself. Drill these holes in the left and right sides of the work surface and mount it to the 2 × 4's with woodscrews.

Mount the three-foot 2 × 4 crossbrace next. Place it between the two side panels on top of the base support 2 × 4's. Drill two holes in the left and right sides. Once again, make sure everything is sitting flush. Use two 2-1/2" woodscrews in each side to secure the crossbrace to the base supports. This crossbrace gives the work station extra stability and strength, while providing a convenient footrest at the same time.

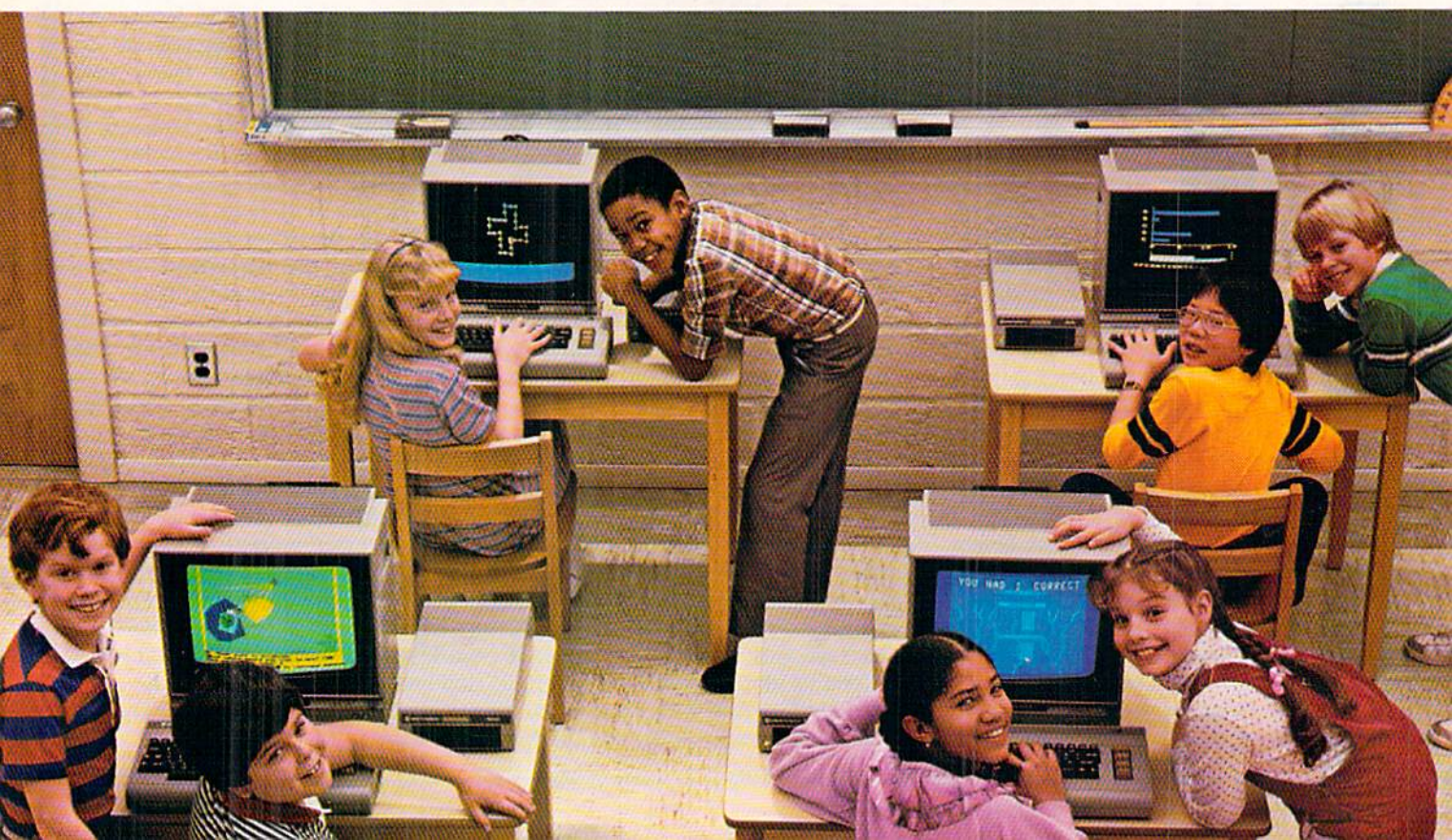
Now it's time to mount the top shelf. The top shelf should sit flush with the fronts of the 2 × 4 mounting cleats and overhang the rear of the cleats by six inches, as does the work surface (refer to side-view diagram). Drill three holes in each side an fix the top shelf to the mounting cleats with woodscrews. That's it!

From the scrap piece of 2 × 4 left over, you can make additional braces or supports if you desire. An additional support may be important if you intend to keep both a monitor and a printer on the top shelf. While the particle board is strong enough to support the weight of these two devices, it has a tendency to bow slightly in the center when stressed. A 2 × 4 support brace in the center of the top shelf extending down to the work surface will help prevent this bowing. In the front-view diagram, I've indicated the placement of this optional support by dotted lines.

Sanding any rough edges and painting or staining will finish the job and make the work station look like a commercial unit costing $100 or more. Not bad for ten bucks, huh?

On a closing note, a Flexidraw Light Pen and software facilitated the creation of the three construction diagrams. Special thanks are also in order to Liz Benford for assisting in the carpentry department, to Tom Benford, Jr. who immediately confiscated the work station for his own use, and our dog Freelance, who claimed the 2 × 4 scraps as his property and absconded with them.

WHY THE COMMODORE 64 ISN'T IN A CLASS BY ITSELF.



At Commodore, we think it's easier for school children to learn about a computer by using it rather than by waiting to use it.

So, we sell the Commodore 64™ at about half the cost of comparable computers.

With the money you save on the Commodore 64, you can afford the things you'll really need: more Commodore 64's.

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For further information on the Commodore 64 and our 250 Educational Resource Centers, contact your nearest Commodore Education Dealer.

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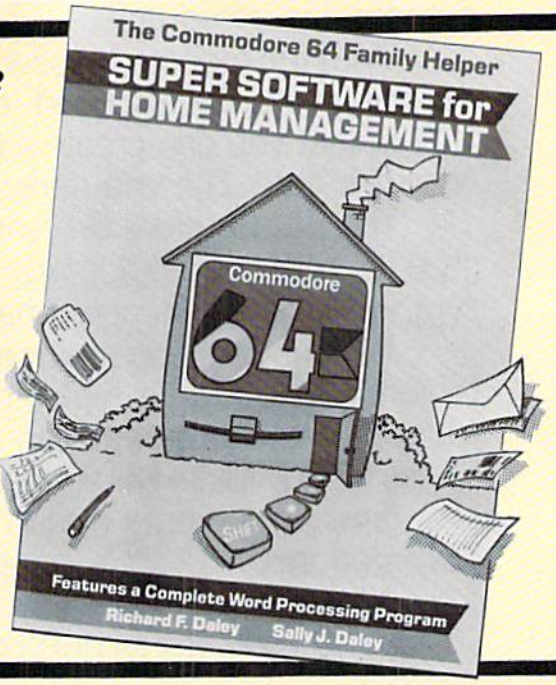
REVIEWED BY TED SALAMONE

The Commodore 64 Family Helper:

Super Software for Home Management

Computer: Commodore 64
Authors: Richard F. Daley and Sally J. Daley
Publisher: Scott, Foresman & Co. 1900 East Lake Avenue Glenview, IL 60025
Medium: Book and disk
Retail Price: $19.95

The MiniScribe word processor alone is worth more than the purchase price of the entire package.



The Commodore 64 Family Helper is a 178-page paperback and a disk with five home applications: Memo Calendar, Checkbook Manager, MiniScribe, Data Manager, and for those less serious moments, Backgammon.

Before you rush out to replace *PaperClip, EasyScript* or *The Manager,* you should know that *Family Helper's* routines are entry-level at best. This doesn't mean they are worthless or poorly done. It simply means they don't have the power and capabilities of most single-purpose programs.

First, you must copy each program onto a working disk. Preferably only one routine per disk, since the data files reside on the same floppy as the programs themselves. The copy process doesn't take long. Program execution is rather good too, considering the routines are written entirely in listable BASIC. Mr. Daley evidently knows how to make a program accomplish a good deal without a lot of code.

In the first routine, Memo Calendar, you customize your appointment schedule, review it on-screen, or dump it to a printer. Permanent holidays (Easter and Christmas) are included. You add the important birthdays, anniversaries and medical appointments.

Memo Calendar can quickly compute any day of the week of any year. (What day of the week was March 31, 1955? Thursday, in case you're the least bit interested.) Another extra is the ability to calculate the number of days between two dates. These minimarvels work as far back as 1582.

Memo Calendar works fine for the most part, though editing obsolete multiple entries (cancelled appointments) is somewhat involved. (It's easier to just print the calendar in question and cross out the unwanted entries.)

A printer isn't absolutely necessary because the daily review option eliminates any output needs. A printer is nice, however, because the calendar format and content are aesthetically pleasing.

A sectional summary recaps the highlights of the Memo Calendar, as it does for every other application. This is an important feature, because it reinforces the material just introduced and provides a handy reference for later.

The Checkbook Manager is an unassuming program that handles up to 22 categories, each composed of a maximum of 20 characters. However, only 14 of the 20 characters per category are displayed on-screen.

This program runs similarly to Memo Calendar. You can enter a new month's checks and/or deposits, alter a previous month's entries, or perform edits to weed out misapplied funds and other financial fumbles. Transactions or monthly summaries can be sent to a printer, categories can be summed individually, or the current balance can be calculated.

This program works fine for the most part, though it is a tad slow when you insert or delete a check entry. This "turtle stroll" doesn't come as a surprise, if you read the book. Like the other programs, this one also has a menu option that returns you to BASIC. This is an unexpected refinement which makes it easy for you to load another application without having to perform yet another system-wide cold start.

Now we come to the *tour de force,* the one program on the disk that's worth more than the offering's list price: the MiniScribe word processor. Another name for it could be "Son of *EasyScript 64,*" the word processor marketed by Commodore. Not only does MiniScribe work like *EasyScript,* it looks like it too.

You can set border, background and character colors, toggle justification on or off, alter spacing parameters, or set text, page or margin sizes. As in *EasyScript,* the status line displays the cursor's whereabouts by column and row. Output to a printer is less complicated since there are fewer options available (continuous paper and multiple copies just about wrap it up).

In a similar vein, there is no tab fea-

ture. Automatic centering, line insertion/deletion and block erasure/moves can be performed quickly and effortlessly. There's a handy search-and-replace option, an all-caps mode, and a built-in disk-access mode for directory listings, blank disk formatting, and unwanted file eradication.

You can also force page breaks, imbed commands, place non-printing comments within the body of the text, or set the vertical "start print" position. Most of these commands can be daisy-chained on a single line, provided each command is separated from the others by a colon. (There are 21 editing commands in all.) MiniScribe is very easy to learn and the manual's a real breeze to use.

The Data Manager, is really a file manager, not a true database manager. Your options include creating and editing data bases, performing primitive sorts (alphabetic or numeric sequencing), and printing rudimentary reports. You can also produce labels, though that's something that can be done with MiniScribe as well.

For the sake of a clear printout from the Data Manager, the Daleys recommend a maximum (total) horizontal field length of no more than 80 characters. Another restriction concerns the number of allowable files, though the limitation is a more generous 130. Up to 20 different report formats can be saved to disk for later recall.

Last but not least, we come to the entertainment section—video backgammon. The computer is not an unmerciful foe. Sometimes it even makes mistakes, giving the less-than-adept player (like me) a fighting chance. Though mostly a game of strategy and cunning (once the dice are rolled), the pixel portrait of the board is surprisingly clear and well defined.

Overall, the programs are certainly worth the minimal investment. Again, I must say that MiniScribe alone is worth more than the purchase price of the entire package.

The book also goes beyond being simply a manual. It provides several dozen software critiques in education, entertainment, utilities, and record keeping. Most of the reviews are good, making this one mighty useful dual-purpose publication. C

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BOOK REVIEWS

REVIEWED BY HOWARD MILLMAN

How to Get the Most Out of CompuServe

Authors: Charles Bowen and David Peyton
Publisher: Bantam Books
666 Fifth Avenue
New York, NY 10103
Retail Price: $14.95

If you're a novice, this how-to handbook is your guide through the remarkable world of CompuServe telecommunications. For those of you already familiar with CompuServe, here's a ready reference detailing shortcuts and express routes.

Through a series of on-line guided tours, the authors introduce numerous facets of CompuServe, including bulletin boards, special interest groups, electronic mail, games, and more. Following their footsteps during your first forays into CompuServe minimizes your meanderings, while saving you time and money. These tours introduce you to many of the services of CompuServe while encouraging you to become comfortable with CompuServe's numerous menus and commands.

CompuServe is introduced buffet style: a bite at a time. Although encyclopedic in content, the book is still easy to read. As the authors deftly lead you through the menus, you are always a participant, not merely an onlooker.

The book begins by explaining how to become a member of CompuServe. From there, you learn how to log on via a direct line, Tymnet or Telenet. While too many variables prevent detailed advice on using a specific micro/modem system (Commodore or any others), directions are nevertheless clear and concise. Each chapter is recapped and the important details reemphasized.

Many of CompuServe's services, from the simple to the complex, are detailed. The authors' honesty extends to even illustrating the flaws and pitfalls in the CompuServe system. Like any good reference, the book contains a detailed appendix summarizing instructions, commands, and hard-won hints. The index recaps major and minor topics and is an excellent time saver.

For game players, there are detailed summaries of three dozen games. Once again, it's easier (and certainly less expensive) to read about them before you're on-line.

You might be able to learn the material covered in this book by yourself, but remember: you're paying for every minute you're on-line. Not only will the on-line savings pay for the book several times over, but you'll be enjoying the fascinating features of CompuServe sooner.

How to Get the Most Out of CompuServe delivers what it promises. C

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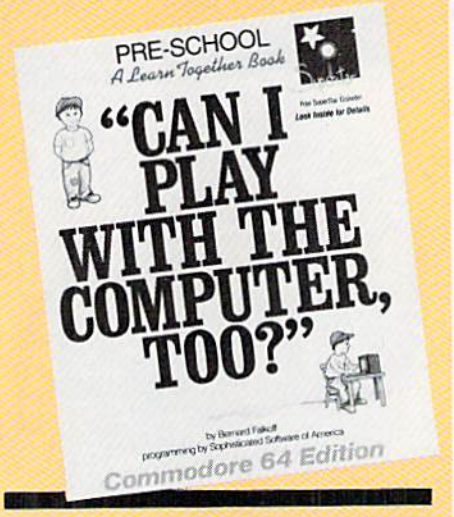
REVIEWED BY JACK EMBERLY

Can I Play with the Computer, Too?

Computer: Commodore 64
Author: Bernard Falkoff
Publisher: Banbury Books
353 West Lancaster
Wayne, PA 19087
Medium: Book and disk
Retail Price: $19.95

A package that focuses on both the development of school "readiness" skills and the beginning use of the computer.



Recently, a new book/disk program forged a bond between my four year-old student Earl and the Commodore 64. As the letters of the alphabet appeared on the monitor screen, Earl heard the unmistakable notes of the ABC tune. Earl's first question was, "Is that the ABC's I hear?" His second was, "Can I play, too?"

The answer to both questions was an enthusiastic yes. The ABC tune was part of a package called *Can I Play with the Computer, Too?,* written specifically for children between three and six by Bernard Falkoff for Banbury Books in conjunction with Sophisticated Software.

Book/disk packages have been around for a few years now, but a package that focuses on both the development of school "readiness" skills and the beginning use of the computer is long overdue. Earl and I both agree that *Can I Play with the Computer, Too?* gets high marks for both entertainment and instructional content. And as a reading teacher, I am especially intrigued by the innovative manner in which print and computer technology combine. So effective is this partnership that one part would not be impressive without the other.

As a book, *Can I Play with the Computer, Too?* is a set of games about the ABC's, time, and numbers. A parent or teacher reads one side of the page while the child follows along on his or her side. In addition, a "parents' guide" is provided with every chapter, to help the adult participant make the best use of the material. Since this is essentially an introduction to first grade, in a sense, *Can I Play with the Computer, Too?* is "readiness" training for school. But when you load the accompanying disk, it also becomes an introduction to the computer keyboard and to the commands of shift, cursor and function keys. This program is a preschooler's first course in computer literacy.

Both the double-sided disk and the 53-page book contain four distinct chapters: "Playing with the Keyboard," "Clocks and Time," "Learning about Stars," and "Numbers and Pictures." Each chapter contains from one to six subsections that approach the same topics through different games. Each game is presented to the child through nursery style rhymes read by the adult. For example, in chapter one's "Press a Key," the following appears on the screen:

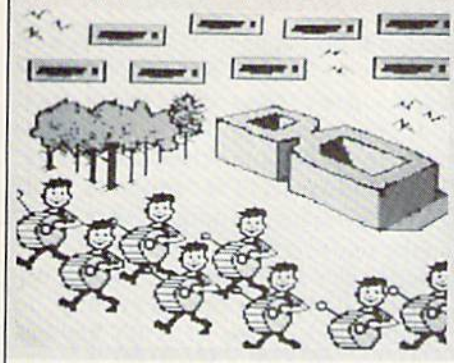
"Press a key
and you will see
loads of fun
for you and me.
Touch numbers here
or letters there
now watch TV
What do you see?"

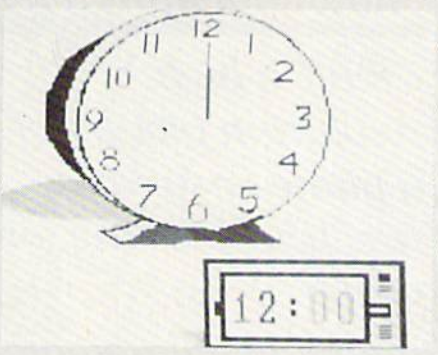
As the child responds, the chosen characters appear boldly before him. But of course the images don't just present themselves one-dimensionally as in print. They're orchestrated with sound and movement. In this game, the "pinging" sound of old typewriters accompanies the pressing of each key. In chapter two, the moving hands of the clock really tick. Flip the disk for chapters three and four, and a six-sided star separates magically, only to be reassembled as the child uses the cursor keys.

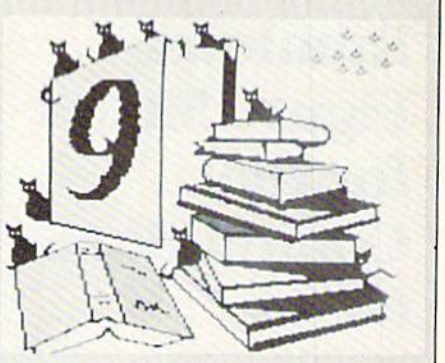
For its entertainment lure, *Can I Play with the Computer, Too?* could easily compete with the average video game. Instructionally, it provides much more than a game. When Earl heard the ABC tune, he was actually learning the alphabet through a valuable auditory association. Let's look at the other instructional benefits chapter by chapter.

Chapter one, "Playing with the Keyboard," takes the child through exercises and games to learn the alphabet and the keyboard at the same time. Earl's favorite game in this chapter was the Alphabet Game, but he also enjoyed the Name Game. In the Name Game, he was required to type any letter or word that appeared on the top half of the divided monitor screen. Next, he had to repeat what he had just typed onto the bottom half of the screen. To do this correctly, he had to memorize images of the letters and carry them across space. No easy task for a four year-old, but excellent preparation to visual perception skills that later translate into spelling skills.

The shapes, sizes, and thicknesses of the letters varied from the keyboard to the screen. Sometimes Earl saw "M's" or "A's" that were small and sharp-edged. Other times, he saw the same letters with large and jagged forms. As an educator, I especially approved of this. Noting these differences can develop the visual discrimination skills that later become so important in reading. Specifically, it develops the perception of form constancy. Form constancy is the realization that letters may have small differences in shape but still maintain their identity.







The importance of visual perception skills led American educator, Marrianne Frostig (1968) to develop a program of shape-matching activities to prepare youngsters for letter identification. In time, however, the program fell into disregard because it assumed identification of non-alphabetic shapes had to precede discrimination of differences in the actual letters. Luckily, *Can I Play with the Computer, Too?* successfully makes the leap straight into letter discrimination.

Chapter two, "Clocks and Time," takes an innovative approach to the telling of time. As a logical prerequisite to talking about clocks, section one of this chapter uses pictures to demonstrate the passage of day and night. The screen shows a house sitting on the Earth's horizon. The sun is in the east. A caption at the bottom of the screen announces that it is breakfast time. When the child presses the space bar, the sun moves to a position above the house, the sky brightens, and the caption announces lunch time. Further pressing the space bar results in similar changes: the moon and stars appear and the program announces bed time. In this way, the child experiences a graphic representation before being introduced to the more abstract notion of clocks.

The author of *Can I Play with the Computer, Too?* recognizes that most pre-schoolers will have difficulty understanding the connection between clocks and the notion of "lunch time" or "dinner time." Nevertheless, section two of this chapter presents a large image of a mantel clock whose hands move to the sounds of "tick-tock." Beneath this clock, a digital reading also gives a time. Although few children at this age can truly comprehend the relationship of minutes to hours, for Earl, this didn't really matter. He was happy just to identify the numbers on the face of the pretty clock, and was absolutely delighted by the "tick-tocking" sound that correlated to the movement of both the mantel and digital clocks. By grade two Earl should be ready for this. Second-grade teachers should consider this program for this section alone.

My favorite part of the time chapter was the first section. As the sun and moon moved across the sky, Earl and I talked about words such as "above," "beside," "behind," "left," and "right." His understanding of these concepts will be especially beneficial for spatially confusing letters such as "b" and "d" and "m" and "w".

The first section of chapter three, "Constellations in the Sky," is purely for fun. The child finds pictures in a night sky through a connect-the-dots game. Earl tired of this activity quickly, but not before finding an outline of a horse and a snake. Earl first thought, however, that the snake was the Easter Bunny. Don't ask me how; it looked like a snake to me.

In the second section of chapter three, "The Star Puzzle," a large star appears briefly on the screen and then falls apart. The child must then reassemble the original six-pointed star while mastering the cursor keys.

Chapter four, "Numbers and Pictures," helps the child understand the numbers from one to nine. By pressing a number key, the child calls to the screen a variety of objects. From here it is possible to count and compare the number of objects.

If all this praise is beginning to sound redundant, it's nevertheless well deserved. My only criticism of *Can I Play with the Computer, Too?* is the time it takes to load chapters and subsections. Expect to wait a full 40 seconds as this program moves from chapter to chapter.

Apart from that, it's difficult not to be in favor of *Can I Play with the Computer, Too?*. It is certainly refreshing, from an educator's point of view, to see books and computers work together. As a teacher who uses computers for instruction at all elementary grade levels, I often lament the way most computer-assisted instruction (C.A.I.) has separated itself from good print instruction. Useful C.A.I. should send the student back to the text for reinforcement. *Can I Play with the Computer, Too?* does not ignore the power of print. Conversely, it adds another dimension for extra impact. In doing so, *Can I Play with the Computer, Too?* is more than innovative: it is truly instructional.

Nothing prepares pre-school children for the academic demands of grade one better than a storybook. Read "Goldilocks and the Three Bears," for example, and suddenly your three or four year-old begins to arrange events in proper sequence and to think about cause and effect relationships. Letters of the alphabet take on their first meaning. Talk expands into a command of complex sentences essential to reading comprehension. Counting bears paves the way for adding and subtracting.

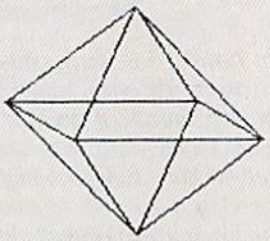
By using the computer to enhance a child's pre-school learning, products such as *Can I Play with the Computer, Too?* are breaking new ground. Finally, here is intelligently designed software that doesn't *replace* reading, but adds to its appeal through the computer.

In closing, I should mention that if your local bookstore does not carry this book/disk package, you can ask them to order it from Banbury. C

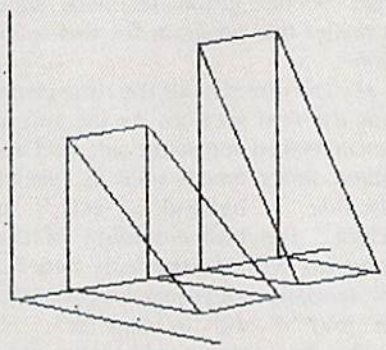
BY NANCY AND TOM SIMMONDS

Fabulous Figure Maker for the Commodore 64

Create a high-resolution picture of a plane or solid figure, line drawing, or graph.



Built-in Octahedron



Built-in Demo Bar Graph

Fabulous Figure Maker is a learning tool with useful output. It will allow you to create a high-resolution picture of any plane or solid figure, line drawing, or graph that can be drawn with less than 150 points and edges. For example, you can generate large block letters, numbers, or figures for teaching a pre-schooler, or perhaps complex three-dimensional solid figures or graphs for the high school or college student.

The program is much more than the normal high-resolution drawing program, because once the coordinates of the corners and edges of the figure have been entered, they may be manipulated mathematically to present a variety of views. It is this ability to express your figure as an array of mathematical equations that will allow the computer, through your menu choices, to project the figure onto the screen as a 3D figure with the proper perspective. It may then be rotated about any of the three axes, changed in size and moved to anywhere on the screen. The program will even allow you to generate two offset views of the figure to give a stereoscopic effect.

As an added feature, you may change your effective viewing position to move into any figure you have created and watch the perspective view change. Text may also be added to the figure or graph. After you enter a figure, you may save it to disk or tape to be loaded back in at some later time, or you can send it to a printer for a hard copy to use as a teaching aid or for inclusion in a school paper or home report. The figures provide samples of printer output.

Since the program is long, it is advisable to save portions of it as you enter it. You should definitely save it before you run it. The plot (lines 1900-2030), and ML data (lines 4000-4530) subroutines should be checked carefully, since the special initializing and draw commands move the high-resolution bit screen to the middle of BASIC memory, where it will not interfere with your program or your program with it. Should one of these portions of the program be improperly entered, it could crash the whole program.

When the program is running, the first menu will ask for a figure in the form of (1) a plane or solid object/graph, (2,3) a figure or graph demonstration, or (4) a saved figure. The solid figures will take a little time to calculate but will draw quickly. With the program's ability to accept 150 corners and 150 edges, very complex figures may be entered—for example, a house, stick figure, 3D graph, or airplane.

To enter your own complex figure, sketch it on paper first, assigning x, y and z coordinates and a number to each corner. Now develop an edge list, i.e., the two corner numbers you want the program to draw each of the lines between. The program will prompt you for the number of corners in the figure and then for each of their coordinates in the form x,y,z (for example 19,-60,0). Corrections may be made as long as the RETURN key has not been pressed. After all the corners have been entered, the number of edges or lines is entered, followed by the two corner numbers between which each straight line is to be drawn.

After the figure data has been entered, the second menu is displayed. Ten choices are presented, ranging from P'lot to Q'uit. When you first try the program, request the demo figure (2), and P'lot it. The program will inquire if text is to be entered or edited. If it is, enter up to 35 characters with no commas or colons. The text will be printed along the bottom row of the figure.

Now you should see a figure that looks like two pyramids bottom to bottom. To return to the menu from viewing the figure, press the space bar. If you have a printer and want a hard copy, press the P' key. Try R'otating it about each axis 20 or 30 degrees. The figure will be recalculated and will then bring you back to the menu, where you may P'lot it or S'ize it along any of the axes or change the size of the entire figure with the global command. Again, you will be back to the menu. The M'ove choice will move the figure anywhere on the screen.

Remember, the screen is plus and minus 160 and plus and minus 100 units along the x and y axes, respectively, from the middle of the screen. You should keep the figure on the screen so that the border clipper does not introduce any distortion.

Excellent three-dimensional graphs may be created with the program. Enter the coordinates (x,y,z) of the origin, and one set at the limits of each axis, then enter the data points or bar graph corners. As in figure generation, number each point and/or corner. Now develop an edge list by giving the corner or points between

which each line is to be drawn. If only the point is to be plotted, then enter the edge by having the point terminate on itself. For example, corner (20) to corner (20) will produce a dot at the coordinates of corner (20).

After the corners and edges have been entered, P'lot the graph. When it is first displayed, you will see only the x and y projection of the three-dimensional graph, and it may be the wrong size and position. The power of the program will now let you S'ize change and M'ove the graph to fit your needs. But it is still not 3D, so R'otate it y,45 and x,8-10 degrees to achieve the effect desired.

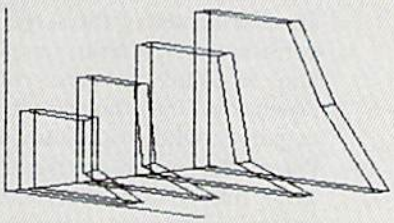
Now that you have mastered these commands, try the V'iew stereoscopic command. The demonstration figure is a good place to start. Depending on the size of your screen, on the prompt for offset you should move the object over far enough so that when its twin is created on the left, the centers of the figures are about four inches apart. Try an angle of three to four degrees. When the two figures are drawn, try staring at your finger about half way to the screen. You should be able to see three figures; the middle one will seem to stand out just like the old stereoscopic pictures in the holder. Some very interesting figures may be drawn with this mode. It is only limited by your patience in entering the coordinates and waiting for the figure to be drawn.

The remaining five commands are for convenience and housekeeping. Option (4) of the first menu will load previously saved figures. T'ape or disk figure-save will output to disk or tape the figure that was entered. O'riginal figure will cancel all the rotations, moves or size changes that were entered. N'ew figure returns you to menu one for your choice of figures. Q'uit ends the program. This is a flexible program that will allow you to generate useful and unusual figures or graphs that may be drawn on the screen or sent to a printer that is able to print a high-resolution screen.

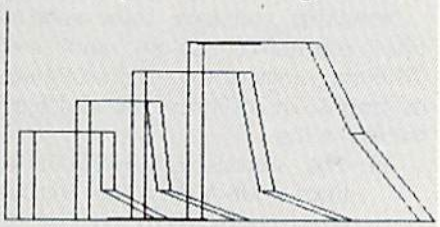
Program Details

The program creates and solves a number of simultaneous algebraic equations by manipulation of four-by-four matrices using the horizontal (x), vertical (y), and in-and-out (z) coordinates of the corners/points and edges of the figure, object or graph you want projected on the screen. The examples demonstrate how the figure is projected onto the two-dimensional TV or monitor screen. The DIM statements have been set for a maximum of 150 corners and 150 edges; however, this may be increased somewhat. The high-resolution 8K bit and color maps with ML draw program are located in the middle of the 64's BASIC program area from 23500 to 33400. Since the program uses only 11000 bytes of memory, there should be no interference with the high-resolution bit map. Once the projected corners and edges have been calculated, it is easy to generate a rotated, moved or sized version and then to plot it to the screen again.

Through menu choices, project the figure onto the screen as a 3D figure, rotate it, change its size, or move it anywhere on the screen.



Bar Graph Tilted 8 Degrees



Bar Graph Rotated 45 Degrees

The program is menu-driven and modular in layout. The use of these features allows ease of operation and flexibility. After you have become familiar with the program, you may think of other features or modifications you want. It is then easy to add to the menu and use the subroutines in a different way. Since the program is long, it is possible to make use of this modularity to enter the program in easy steps and "run as you go."

Six essential modules should be entered to start:

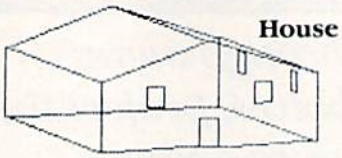
1. The skeleton, lines 50-590. This is the part of the program that sets up the initial conditions and menus.
2. The user input and demonstration subroutines, lines 600-930. These enter the corners, edges and text for objects or graphs by using prompts. The demonstration programs give you a built-in figure, an octahedron, and a 3D graph that can test your program or any new features you may have added.
3. The matrix initialization subroutine, lines 1300-1320. This routine creates the four-by-four matrices required to manipulate the x,y and z coordinates.
4. The draw subroutine, lines 1500-1540 and 4000-4530. This puts the computer into the high-resolution graphic mode, allowing the 64's screen to have 64000 pixels. It may be done in BASIC or a machine language subroutine, or with a graphics drawing program. Commodore's cartridge *Simons' BASIC* works well and leads to a simpler program. Listing 1. gives the small modifications that are needed to the subroutines. We have included a machine language draw routine entered as data statements; it is a modified version of the graphics routine by Frank Covitz published in *Commodore: The Microcomputer Magazine,* June/July 1983. BASIC routines may also be used, but they are very slow, even on simple figures.
5. The projection subroutine, lines 1600-1690. The screen x's and y's based on the chosen, or default position of your

eye are calculated. This subroutine is subsequently used by the plot routine.

6. The plot, print and text subroutine, lines 1900-2260. These routines form, from the results of the input initialization and projection subroutines, the x's and y's that are used by the ML drawing subroutine to plot in high-resolution graphics the object to the screen and printer. It also requests and enters any text that is to be displayed as a part of the figure.

With these six parts, the program may be run, and it will plot any object that is entered with the x, y and z coordinates and edge list. To get the full features of the program, the other subroutines may be added.

7. The matrices multiplication, lines 2700-2710. This is the utility that is required to rotate, size and move the figures.
8. The rotating subroutine, lines 2900-2990. The routine prompts for the axis you want to rotate around and the number of degrees, then it uses the multiplication subroutine to generate the new x, y and z's, returning you to the menu for the next command.



House

9. The size-changing subroutine, lines 3200-3240. It prompts for the axes and amount of size change or allows a global change. Numbers greater than one increase the size of the figure.
10. The move subroutine, lines 3400-3530. This routine prompts for which axes you want to move along and how far. The center of the screen is considered the origin, i.e., x, y and z equal to zero. Left, down, and into the screen are negative, while right, up and out of the screen are positive. After this routine, you return to the menu for your next choice.

Now that you have these subroutines, you may create any number of different views of the original figures or graphs. In addition, you also have the following:

11. The stereoscopic subroutine, lines 3600-3650. This routine consists of calls to most of the other routines. The routine will prompt for offset (move) to the right along the x axis and angle. Then instead of going to the menu, it goes directly to the plot subroutine and draws first a right and then a left figure for stereoscopic viewing.
12. The "locate eye" subroutine, line 1000. This routine may be used to give the sense of what happens when the perspective changes on a figure as you move toward it or away from it along the z axis. If the figure's x, y and z coordinates put it in front of the screen, then as you move toward the screen, the figure will increase in size and then run off the screen. Since the screen is finite in size, the program limits the corners to within the screen's boundaries: this causes great distortions to appear in the figure. It would be nice to have a better clipper, but for the time being we will have to do with what is called the "poor man's clipper." If you move all the way through the screen into "minus z," it will be as if you were looking over your shoulder at the figure. C

Listing 1. Modifications for Simons' BASIC

```
      OMIT THE FOLLOWING LINES

LINES 30,40,70,1350-1370,2100-2260
AND LINES 4000-4530.

    SUBSTITUTE THE FOLLOWING LINES

1640 XP=F*PT(1):YP=-F*PT(2)*.75
1960 HIRES 1,0:IX=0
1970 IFVV=1ORV$<>""THEN TEXT 20,190,
"CTRL A"+V$,1,1,8:VV=0:B$="N"
1980 FORI=1TONE:II=E1(I):JJ=E2(I):
LINE X(II),Y(II),X(JJ),Y(JJ),1:NEXTI
2010 IFA$="P"THEN COPY
2020 NRM:PRINT"CLEAR SCRN":IX=1:RETURN
```

Fabulous Figure Maker

Before typing this program, read "How to Enter Programs."

```
30 POKE 55,0:POKE 56,92
   :REM LOWER MEMORY TO 256*92'DFWI
40 BA=8*16^3:IN=BA:RS=BA+3:CL=BA+6
   :DR=BA+9:MV=BA+15:CR=BA+632'OTLU
50 POKE 53280,14:POKE 53281,0
   :DIM C(150,3),SH(4),MB(4,4),MC(4,
   4)'DWWM
60 DIM MA(4,4),P(44),PT(4),X(150),
   Y(150),E1(150),E2(150):IX=1
   :UX=1'DHTP
70 PRINT"[CLEAR,DOWN6,WHITE,SPACE3]
   LOADING HIGH RESOLUTION ML DRAW
   PGM":GOSUB 1350'CFJQ
100 PRINT"[CLEAR,DOWN3,SPACE3]
    ENTER TYPE OF FIGURE:[DOWN]"
    :REM FIRST MENU'CKAG
110 PRINT"[SPACE5,RVS,WHITE]1[RVOFF,
    L. BLUE] FIGURE OR GRAPH[DOWN]
    "'BADD
120 PRINT"[SPACE5,RVS,WHITE]2[RVOFF,
    L. BLUE] DEMO OF A FIGURE[DOWN]
    "'BAME
130 PRINT"[SPACE5,RVS,WHITE]3[RVOFF,
    L. BLUE] DEMO OF A GRAPH[DOWN]
    "'BAME
140 PRINT"[SPACE5,RVS,WHITE]4[RVOFF,
    L. BLUE] INPUT FIG/GRAPH FROM
    FILE[DOWN]"'BAFI
170 INPUT"[DOWN2,SPACE13]CHOICE (
    [WHITE,RVS]1-4[RVOFF,L. BLUE])";
    F'BCWI
180 IF F<1 OR F>4 THEN 100'FHYH
190 ON F GOSUB 600,800,800,1200'CRMI
280 GOSUB 1300:EZ=10000
    :REM INITIALIZE MATRICES AND SET
```

```
    EYE DIST.'DUCR
290 PRINT"[CLEAR,DOWN2,SPACE5]
    CHOOSE ONE OPTION:"'BATL
300 PRINT"[DOWN,SPACE6,WHITE,RVS]P
    [L. BLUE,RVOFF]LOT FIGURE OR
    GRAPH"'BABF
310 PRINT"[SPACE6,WHITE,RVS]V[L. BLUE,
    RVOFF]IEW STEREOSCOPIC
    FIGURE"'BAGH
320 PRINT"[SPACE6,WHITE,RVS]R[L. BLUE,
    RVOFF]OTATE FIGURE"'BAPF
330 PRINT"[SPACE6,WHITE,RVS]S[L. BLUE,
    RVOFF]IZE CHANGE"'BASF
340 PRINT"[SPACE6,WHITE,RVS]M[L. BLUE,
    RVOFF]OVE FIGURE"'BARG
350 PRINT"[SPACE6,WHITE,RVS]L[L. BLUE,
    RVOFF]OCATE EYE"'BAWH
360 PRINT"[SPACE6,WHITE,RVS]T[L. BLUE,
    RVOFF]APE OR DISK FIGURE
    SAVE"'BAZM
370 PRINT"[SPACE6,WHITE,RVS]O[L. BLUE,
    RVOFF]RIGINAL FIGURE"'BABK
380 PRINT"[SPACE6,WHITE,RVS]N[L. BLUE,
    RVOFF]EW TYPE OF FIGURE"'BASM
390 PRINT"[SPACE6,WHITE,RVS]Q[L. BLUE,
    RVOFF]UIT"'BADJ
440 INPUT"[DOWN,SPACE5]CHOICE";D$
    :D=ASC(D$)-75:IF D<1 OR D>11 THEN
    290'JUIO
450 ON D GOSUB 1000,3400,1380,1300,
    1900,3660,2900,3200,1400,1380,
    3600'CFFO
460 IF D=9 OR D=3 THEN 100'FHCI
470 GOTO 290'BDKG
600 PRINT"[CLEAR,DOWN3,SPACE13]
    CORNER LIST"'BAVG
610 INPUT"[DOWN,SPACE2,RVS,WHITE]
    NUMBER[RVOFF,L. BLUE] OF CORNERS";
    NC'BDAI
620 PRINT"[DOWN,SPACE2]
    ENTER COORDINATES OF CORNER
    : [RVS,WHITE]X,Y,Z[RVOFF,L. BLUE]
    "'BADN
630 FOR I=1 TO NC:PRINT"[RVOFF,SPACE3]
    CORNER NUMBER [RVS]";I;"[RVOFF]";
    'EJLN
640 INPUT"[RVS]";C(I,1),C(I,2),C(I,3)
    :NEXT I'CXXJ
650 PRINT"[RVOFF,DOWN2,SPACE14]
    EDGE LIST"'BAJK
660 INPUT"[DOWN,SPACE2,RVS,WHITE]
    NUMBER[RVOFF,L. BLUE] OF EDGES";
    NE'BDBM
670 PRINT"[DOWN] ENTER CORNERS OF EDGE
    : [RVS,WHITE]CORNER#,CORNER#
    [RVOFF,L. BLUE]"'BAAT
680 FOR I=1 TO NE:PRINT"[RVOFF,SPACE3]
    EDGE NUMBER [RVS]";I;"[RVOFF]";
    'EJMR
690 INPUT"[RVS]";E1(I),E2(I):NEXT I
    :PRINT"[RVOFF]":RESTORE'EQEP
700 PRINT"[CLEAR,DOWN2,SPACE5]
    DO YOU WANT TO INCLUDE TEXT?"'BAEK
710 INPUT"[SPACE10,RVS]Y[RVOFF]ES OR
    [RVS]N[RVOFF]O";C$:IF C$<>"Y"THEN
    RETURN'GGTM
720 INPUT" FIGURE TITLE UP TO 35
    CHAR.";V$:RETURN'CEYM
800 REM CRNRS & EDGES FOR
    OCTAHEDRON'BYOJ
810 DATA 6,32,10,40,-68,10,40,-32,-10,
    -40,68,-10,-40,0,60,-10,0,-60,
    10'BLYO
820 DATA 12,1,2,2,3,3,4,4,1,5,1,5,2,5,
    3,5,4,6,1,6,2,6,3,6,4,-999'BFVO
825 V$="OCTAHEDRON"'BCDN
830 REM CRNRS & EDGES FOR 3D BAR
    GRAPH'BYXM
840 DATA 21,-100,100,0,-100,-100,0,10,
    -130,108,70,-70,-170,-70,6,
    -28'BJDR
850 DATA-70,-94,-28,0,-110,42,42,-100,
    0,-28,-87,-70,-28,14,-70,0,68'BJPS
860 DATA-100,0,-82,-100,53,-92,-47,95,
    -85,-88,42,-74,-140,42,76,
    -140'BKKT
870 DATA-65,-105,40,-32,-114,72,-103,
    -50,0,-103,0,0,-103,50,0
    :REM CORNERS'CLUW
880 DATA 24,1,2,2,4,2,3,5,6,6,7,7,5,8,
    9,9,10,10,8,10,5,8,7,11,12,12,13,
    13,11'BRMX
890 DATA 13,14,11,16,14,15,15,16,16,
    14,17,17,18,18,19,19,20,20,21,
    21'BJNW
900 IF F<>3 THEN 930'EFUG
910 I=1:V$="3D BAR GRAPH"'CFDJ
920 READ H:IF H<>-999 THEN I=I+1
    :GOTO 920'JNKN
930 READ NC:FOR I=1 TO NC:FOR J=1 TO 3
    :READ C(I,J):NEXT J:NEXT I
    :REM READ IN CORNERS'LLTV
940 READ NE:FOR I=1 TO NE
    :READ E1(I),E2(I):NEXT I:SR=0
    :RESTORE:RETURN'JCDS
1000 INPUT"[DOWN] EYE DISTANCE TO
     ORGIN";EZ:RETURN:REM NEW EYE
     DISTANCE'DTAF
1200 INPUT"[DOWN] [WHITE,RVS]D[RVOFF,
     L. BLUE]ISK OR [WHITE,RVS]T
     [RVOFF,L. BLUE]APE";T$'BDAC
1210 IF T$<>"D"AND T$<>"T"THEN
     1200'HIUC
1220 DT=1:INPUT"[DOWN] [WHITE,RVS]
     NAME OF FIGURE FILE[RVOFF,
     L. BLUE]";OF$'CIVG
1230 IF T$="D"THEN DT=8'EFJC
1240 OPEN 1,DT,0,OF$:INPUT#1,NC,NE,EZ,
     V$'CYBF
1250 FOR N=1 TO NC:INPUT#1,C(N,1),C(N,
     2),C(N,3):NEXT N'FEKJ
1260 FOR I=1 TO NE:INPUT#1,E1(I),E2(I)
     :NEXT I:CLOSE 1:SR=0:RETURN'ICDL
1300 FOR I=1 TO 4:FOR J=1 TO 4
     :MA(I,J)=0:REM INITALIZE TRANS
     MATRICES MA & MB'ITWM
```

```
1310 MB(I,J)=0:IF I=J THEN MA(I,J)=1
     :MB(I,J)=1'GDKH
1320 NEXT J:NEXT I:RETURN'DECA
1350 DATA"ML":READ ML$:IF
     ML$<>"ML"THEN 1350
     :REM READ ML PGM'HWNL
1360 IF PEEK(32768)=76 THEN RESTORE
     :RETURN'GKSH
1370 CK=0:FOR I=32768 TO 33618:READ ML
     :POKE I,ML:CK=CK+ML:NEXT I'JHWQ
1375 IF CK<>88004 THEN STOP'FHIM
1380 RESTORE:RETURN'CBIF
1400 INPUT"[DOWN] [WHITE,RVS]D[RVOFF,
     L. BLUE]ISK OR [WHITE,RVS]T
     [RVOFF,L. BLUE]APE";T$'BDAE
1410 IF T$<>"D"AND T$<>"T"THEN
     1400'HIWE
1420 DT=1:INPUT"[DOWN] [WHITE,RVS]
     NAME OF FIGURE FILE[RVOFF,
     L. BLUE]";OF$'CIVI
1430 IF T$="D"THEN DT=8'EFJE
1440 OPEN 1,DT,1,OF$:CR$=CHR$(13)
     :PRINT#1,NC;CR$;NE;CR$;EZ;CR$;
     V$'ETON
1450 FOR N=1 TO NC:PRINT#1,C(N,1);CR$;
     C(N,2);CR$;C(N,3):NEXT N'FMLN
1460 FOR I=1 TO NE:PRINT#1,E1(I);CR$;
     E2(I):NEXT I:CLOSE 1:RETURN'HCIN
1600 P(4)=1:REM PROJECT P(1-3) INTO
     XP,YP'CDDH
1610 FOR J=1 TO 4:EU=0:FOR K=1 TO 4
     :EU=EU+P(K)*MA(K,J):NEXT K
     :PT(J)=EU:NEXT J'NOIR
1620 W=1/PT(4):FOR K=1 TO 3
     :PT(K)=PT(K)*W:NEXT K
     :IF PT(3)=EZ THEN F=10000
     :GOTO 1640'NTLT
1630 F=EZ/(EZ-PT(3)):REM PERSP
     PROJECTION'EDLM
1640 XP=F*PT(1):YP=F*PT(2)*.75
     :REM FIXES X VS Y SCREEN
     DISTORTION'GVOT
1650 IF XP<-159 THEN XP=-159'GKWK
1660 IF XP>159 THEN XP=159'EKJK
1670 IF YP<-99 THEN YP=-99'GIJM
1680 IF YP>99 THEN YP=99'EICL
1690 XP=XP+160:YP=YP+100:RETURN'FQGP
1900 PRINT"[DOWN,SPACE2]
     DO YOU WANT TO CREATE OR EDIT
     TEXT?"'BAGM
1910 INPUT"[SPACE14,RVS]Y[RVOFF]
     ES OR [RVS]N[RVOFF]O";B$
     :IF B$<>"Y"THEN 1930'FKDO
1920 INPUT"FIGURE TITLE UP TO 35
     LETTERS";V$:VV=1'CHJO
1930 FOR N=1 TO NC:REM PERSP PROJ
     ONTO X,Y'EVUN
1940 P(1)=C(N,1):P(2)=C(N,2)
     :P(3)=C(N,3):GOSUB 1600:X(N)=XP
     :Y(N)=YP:NEXT N'HDOW
1950 IF IX=0 THEN 1980:REM DO
     PLOTING'ERAO
1960 POKE CR,1:SYS IN:IX=0:'DMNM
1970 IF V$<>""OR VV=1 THEN GOSUB 2200
     :VV=0:B$="N":REM TEXT'KVXV
1980 FOR I=1 TO NE:II=E1(I):JJ=E2(I)
     :SYS MV,X(II),Y(II)
     :SYS DR,X(JJ),Y(JJ):NEXT I'ICVC
1990 IF UX=0 THEN RETURN'EDDO
2000 GET A$:IF A$=""THEN 2000'EJYX
2010 IF A$="P"THEN GOSUB 2100'EGIX
2020 PRINT"[CLEAR]":IX=1:SYS RS:RETURN
     :REM CLEAR SCREEN ON RESTORE'FEYH
2100 OPEN 4,4:DIM Z%(199)
     :REM BASIC BIT SCREEN DUMP FOR
     1525 PRINTER'DTLI
2110 Y=0:R=0:S=24576:REM START OF BIT
     SCRN $6000'EHSG
2120 FOR I=39 TO 0 STEP-1
     :FOR J=0 TO 24:FOR K=0 TO 7
     :Q=J*8+K'OTJK
2130 Z%(Q)=Z%(Q)+(PEEK(S+320*J+I*8+K))
     *2^Y:P$=P$+CHR$((Z%(Q)AND
     127)+128)'PTIR
2140 Z%(Q)=Z%(Q)/128:NEXT K
     :NEXT J'ERWF
2150 PRINT#4,CHR$(8)P$:P$="":Y=Y+1
     :IF Y=7 THEN Y=0:GOTO 2170'KYLM
2160 NEXT I:PP=1'CFKD
2170 FOR L=0 TO 199:P$=P$+CHR$((Z%(L)
     AND 127)+128)'IAJM
2180 Z%(L)=Z%(L)/128:NEXT L
     :PRINT#4,CHR$(8)P$:P$=""
     :IF PP=0 THEN 2160'JJUQ
2190 CLOSE 4:RETURN'CCFF
2200 POKE 56334,PEEK(56334)AND 254
     :POKE 1,PEEK(1)AND 251:BC=53248
     :BS=32280'IQRJ
2210 LN=LEN(V$):IF LN>35 THEN
     LN=35'GPWE
2220 FOR I=1 TO LN:AS=ASC(MID$(V$,I,
     1)):IF AS<64 AND AS>31 THEN
     2250'LFNM
2230 IF AS<96 AND AS=>64 THEN AS=AS-64
     :GOTO 2250'JTOJ
2240 AS=32:REM BLANK FOR ALL
     OTHERS'CWMH
2250 CM=AS*8+BC:FOR J=0 TO 7
     :POKE BS+(I-1)*8+J,PEEK(CM+J)
     :NEXT J:NEXT I'PFOR
2260 POKE 1,PEEK(1)OR 4
     :POKE 56334,PEEK(56334)OR 1:VV=0
     :B$="N":RETURN'JEVO
2700 FOR I=1 TO 4:FOR J=1 TO 4:EU=0
     :FOR K=1 TO 4'KPMK
2705 EU=EU+MA(I,K)*MB(K,J):NEXT K
     :MC(I,J)=EU'FFSQ
2710 NEXT J:NEXT I:FOR I=1 TO 4
     :FOR J=1 TO 4:MA(I,J)=MC(I,J)
     :NEXT J:NEXT I:RETURN'MGBQ
2900 PRINT"[DOWN] ROTATE ABOUT[DOWN,
     LEFT5,RVS,WHITE]X[RVOFF,L. BLUE]
      OR [RVS,WHITE]Y[RVOFF,L. BLUE]
      OR [RVS,WHITE]Z[RVOFF,L. BLUE]
      AND [RVS,WHITE]ANGLE[RVOFF,
     L. BLUE]";'BBLV
```

```
2905 INPUT AX$,MD'BGEJ
2910 RA=MD*[PI]/180:C=COS(RA)
     :S=SIN(RA):FOR I=1 TO 4
     :FOR J=1 TO 4:MB(I,J)=0'PLEW
2920 IF I=J THEN MB(I,J)=1'EKXJ
2930 NEXT J:NEXT I:IF AX$<>"X"THEN
     2950'GLJM
2940 MB(2,2)=C:MB(3,3)=C:MB(2,3)=S
     :MB(3,2)=-S:GOTO 2990
     :REM X AXIS'HVDV
2950 IF AX$<>"Y"THEN GOTO 2970'FHIN
2960 MB(1,1)=C:MB(3,3)=C:MB(1,3)=-S
     :MB(3,1)=S:GOTO 2990
     :REM Y AXIS'HVAX
2970 IF AX$<>"Z"THEN GOTO 2990'FHCP
2980 MB(1,1)=C:MB(2,2)=C:MB(1,2)=S
     :MB(2,1)=-S:REM Z AXIS'GQVY
2990 GOSUB 2700:RETURN'CFEO
3200 INPUT"[DOWN] SIZE: S[WHITE]X,
     [L. BLUE]S[WHITE]Y,[L. BLUE]S
     [WHITE]Z[L. BLUE] & S[WHITE]
     GLOBAL[L. BLUE]";SH(1),SH(2),
     SH(3),SH(4)'BYWL
3210 IF SH(1)=0 OR SH(2)=0 OR SH(3)=0
     OR SH(4)=0 THEN PRINT"[SPACE4]
     NO SIZE=0":GOTO 3200'LEGO
3220 FOR I=1 TO 4:FOR J=1 TO 4
     :MB(I,J)=0:IF I=J THEN MB(I,
     J)=SH(I):REM DIGNL=SIZE'MREQ
3230 IF I=J THEN MB(I,J)=SH(I)
     :REM SET MAIN DIAGONAL ELEMENT
     WITH SIZE FACTOR'FBKR
3240 IF I=4 AND J=4 THEN MB(I,
     J)=1/SH(I)'HRNJ
3250 NEXT J:NEXT I:GOSUB 2700
     :RETURN'EJPG
3400 INPUT"[DOWN] MOVES
     : GIVE M[WHITE]X,[L. BLUE]M
     [WHITE]Y,[L. BLUE]& M[WHITE]Z
     [L. BLUE]";SH(1),SH(2),SH(3)
     :REM MOVING'CAMN
3410 FOR I=1 TO 3:FOR J=1 TO 4
     :MB(I,J)=0:IF I=J THEN MB(I,J)=1
     :REM SET MB TO MATRIX'MQMR
3420 NEXT J:NEXT I:MB(4,4)=1
     :FOR J=1 TO 3:MB(4,J)=SH(J)
     :NEXT J:GOSUB 2700:RETURN'KMRP
3600 PRINT"[SPACE9]STEREOSCOPIC
     VIEW"'BAHH
3610 INPUT"[DOWN,SPACE3]ENTER [WHITE]
     OFFSET, ANGLE[L. BLUE]";SH(1),MD
     :SH(2)=0:SH(3)=0'DXWP
3620 AX$="Y":GOSUB 3410:GOSUB 2910
     :UX=0:GOSUB 1900:REM 1ST
     VIEW'GFHO
3630 SH(1)=-2*SH(1):MD=-2*MD
     :GOSUB 3410:GOSUB 2910:UX=1
     :GOSUB 1930:REM VIEW-2'LSNU
3640 SH(1)=SH(1)/-2:MD=MD/-2
     :PRINT"[CLEAR,DOWN2,SPACE11]
     RESTORING FIGURE"'HSOU
3650 GOSUB 3410:GOSUB 2910:RETURN'DKAJ
3660 END'BACH

4305 DATA 76,144,130,76,177,130,76,
     91'BCYJ
4310 DATA 130,76,137,128,76,236,130,
     32'BDNF
4315 DATA 226,130,140,60,3,140,62,
     3'BAQK
4320 DATA 141,61,3,141,63,3,32,
     226'BYYG
4325 DATA 130,140,64,3,140,66,3,
     141'BAUL
4330 DATA 67,3,32,198,129,169,0,
     133'BAVH
4335 DATA 254,56,169,199,237,64,3,
     72'BBLM
4340 DATA 41,248,10,38,254,10,38,
     254'BBKI
4345 DATA 10,38,254,72,141,80,3,
     165'BAIN
4350 DATA 254,141,81,3,104,10,38,
     254'BBCJ
4355 DATA 10,38,254,109,80,3,133,
     253'BBGO
4360 DATA 165,254,109,81,3,133,254,
     173'BDPK
4365 DATA 60,3,41,248,101,253,133,
     253'BCAP
4370 DATA 173,61,3,101,254,133,254,
     104'BDXL
4375 DATA 41,7,101,253,133,253,165,
     254'BDFQ
4380 DATA 105,96,133,254,173,60,3,
     41'BBJM
4385 DATA 7,170,189,41,131,141,68,
     3'BANR
4390 DATA 96,32,226,130,140,62,3,
     141'BBBN
4395 DATA 63,3,32,226,130,140,66,
     3'BYAS
4400 DATA 141,67,3,32,198,129,56,
     173'BBYF
4405 DATA 62,3,237,60,3,141,69,3'BWPJ
4410 DATA 173,63,3,237,61,3,141,
     70'BYHG
4415 DATA 3,56,173,66,3,237,64,3'BWYK
4420 DATA 141,71,3,173,67,3,237,
     65'BYQH
4425 DATA 3,141,72,3,173,62,3,141'BXGL
4430 DATA 60,3,173,63,3,141,61,3'BWHH
4435 DATA 173,66,3,141,64,3,173,
     67'BYSN
4440 DATA 3,141,65,3,169,0,141,79'BXSI
4445 DATA 3,44,70,3,16,23,173,69'BWSN
4450 DATA 3,32,231,129,141,69,3,
     173'BAIK
4455 DATA 70,3,32,232,129,141,70,
     3'BYZP
4460 DATA 169,2,141,79,3,44,72,3'BWWK
4465 DATA 16,27,173,71,3,32,231,
     129'BAIQ
4470 DATA 141,71,3,173,72,3,32,
     232'BYBM
4475 DATA 129,141,72,3,24,173,79,
     3'BYPR
```

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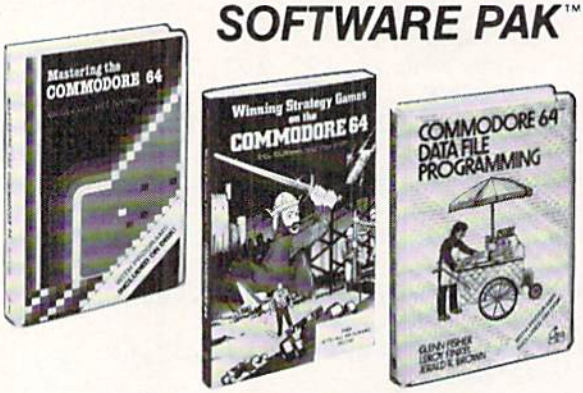

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4480 DATA 105,4,141,79,3,174,69,3'BXWM
4485 DATA 236,71,3,173,70,3,168,
     237'BARS
4490 DATA 72,3,16,27,173,71,3,141'BXNN
4495 DATA 69,3,173,72,3,141,70,3'BWQS
4500 DATA 142,71,3,140,72,3,24,
     173'BYBG
4505 DATA 79,3,105,8,141,79,3,173'BXBK
4510 DATA 69,3,32,231,129,141,73,
     3'BYJH
4515 DATA 173,70,3,32,232,129,141,
     74'BBHM
4520 DATA 3,56,48,1,24,110,74,3'BVKH
4525 DATA 110,73,3,160,0,140,77,3'BXBM
4530 DATA 140,78,3,240,55,174,79,
     3'BYTJ
4535 DATA 24,173,73,3,109,71,3,
     141'BYGO
4540 DATA 73,3,173,74,3,109,72,3'BWTJ
4545 DATA 141,74,3,48,20,56,173,
     73'BYPP
4550 DATA 3,237,69,3,141,73,3,173'BXUK
4555 DATA 74,3,237,70,3,141,74,3'BWPP
4560 DATA 232,32,186,129,238,77,3,
     208'BCWM
4565 DATA 3,238,78,3,177,253,13,
     68'BYBR
4570 DATA 3,145,253,173,77,3,205,
     69'BAUN
4575 DATA 3,173,78,3,237,70,3,144'BXUR
4580 DATA 180,96,138,10,170,189,10,
     131'BDKO
4585 DATA 72,189,9,131,72,96,173,
     62'BAGT
4590 DATA 3,201,64,173,63,3,233,1'BXFO
4595 DATA 176,12,173,66,3,201,200,
     173'BCCU
4600 DATA 67,3,233,0,144,8,32,177'BXSG
4605 DATA 130,162,14,108,0,3,96,
     56'BYFM
4610 DATA 73,255,105,0,96,32,50,
     130'BAEI
4615 DATA 165,253,41,7,73,7,240,8'BXWM
4620 DATA 230,253,208,17,230,254,208,
     13'BEWK
4625 DATA 24,165,253,105,57,133,253,
     165'BEIP
4630 DATA 254,105,1,133,254,96,32,
     72'BBKK
4635 DATA 130,165,253,41,7,208,15,
     56'BBKP
4640 DATA 165,253,233,57,133,253,165,
     254'BFNM
4645 DATA 233,1,133,254,208,8,165,
     253'BCKQ
4650 DATA 208,2,198,254,198,253,96,
     32'BCHM
4655 DATA 17,130,14,68,3,144,13,
     46'BYGR
4660 DATA 68,3,165,253,233,7,133,
     253'BBQN
4665 DATA 176,2,198,254,96,32,240,
     129'BCBS
```

64 USERS ONLY

```
4670 DATA 78,68,3,144,13,110,68,3'BXVN
4675 DATA 165,253,105,8,133,253,144,
     2'BCHT
4680 DATA 230,254,96,169,127,133,254,
     169'BFWQ
4685 DATA 0,133,253,168,145,253,234,
     234'BEDV
4690 DATA 160,63,162,32,145,253,136,
     208'BEDR
4695 DATA 251,198,254,202,208,246,96,
     169'BFAW
4700 DATA 176,162,0,157,0,92,157,
     0'BYJI
4705 DATA 93,157,0,94,202,208,244,
     162'BCON
4710 DATA 232,157,255,94,202,208,250,
     96'BEOK
4715 DATA 76,51,131,32,119,130,32,
     91'BBEO
4720 DATA 130,173,0,3,141,82,3,
     173'BYXK
4725 DATA 1,3,141,83,3,169,249,
     141'BYKP
4730 DATA 0,3,169,130,141,1,3,96'BWHK
4735 DATA 234,32,91,130,173,17,208,
     41'BCFQ
4740 DATA 223,141,17,208,173,0,221,
     9'BBBM
4745 DATA 3,141,0,221,173,24,208,
     41'BASR
4750 DATA 7,9,16,141,24,208,234,
     234'BAKN
4755 DATA 169,32,32,121,130,173,82,
     3'BBDS
4760 DATA 141,0,3,173,83,3,141,1'BWAN
4765 DATA 3,96,32,253,174,32,158,
     173'BBUT
4770 DATA 32,170,177,96,32,15,128,
     160'BCPP
4775 DATA 0,177,253,13,68,3,145,
     253'BANU
4780 DATA 96,72,138,72,152,72,32,
     177'BBCQ
4785 DATA 130,104,168,104,170,104,108,
     0'BEKW
4790 DATA 3,71,130,13,130,49,130,
     46'BAWR
4795 DATA 130,71,130,68,130,49,130,
     236'BDDW
4800 DATA 129,16,130,13,130,16,130,
     46'BCUJ
4805 DATA 130,239,129,68,130,239,129,
     236'BFQP
4810 DATA 129,128,64,32,16,8,4,2'BWSJ
4815 DATA 1,245,245,173,0,221,41,
     252'BBXP
4820 DATA 9,2,141,0,221,173,17,
     208'BYAL
4825 DATA 9,32,141,17,208,173,24,
     208'BBKQ
4830 DATA 41,7,9,120,141,24,208,
     76'BYIM
4835 DATA 147,130,0,-1'BMVO
```

END

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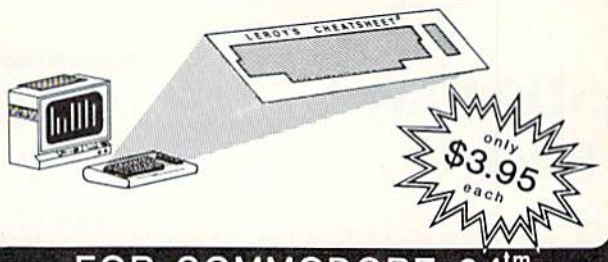

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SID Plays Bach

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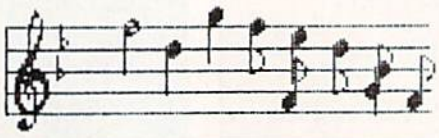

The Commodore 64's Sound Interface Device (SID) makes it the most sophisticated sound-producing computer ever made. The SID chip is so powerful that often many programmers don't make good use of it. Besides having to know about notes and their durations, anyone interested in programming music on the 64 must also understand the concepts of attack, decay, sustain, and release. You almost have to be both a hacker and an expert musician to take full advantage of the 64's abilities.

"SID Plays Bach" and its brother, "SID Plays Bach (Sad)" were created to demonstrate some of the musical power hidden inside your 64. They are straightforward assembly listings that, when assembled, produce a machine code program that plays part of a Bach tune. Since the assembly listings are self-documented, instead of explaining what each line does, I'll explain some of the general things that go on in the programs, and some of the musical concepts that must be understood to make sense of the assembly listings.

Volume on the 64 is set to the loudest possible level by either poking or storing (STA) a value of 15 in memory location 54296 ($D418). Since memory location 54296 is a special location that is used by the SID chip, it is called a register. To turn off the volume on the 64, you must store a zero in the same register. Any number between 0 and 15 is valid to produce slightly different volumes.

Attack and decay are a little more difficult to understand. They can be explained best in mathematical terms. Attack is the rate at which a sound reaches a certain volume (volume over time). A fast attack means that the sound will reach a pre-determined volume level very quickly and a slow attack means that the sound will take longer. If you were to graph these two, a fast attack would have a steeper slope than a slow attack. Decay is the opposite of attack. It occurs after the attack portion of the sound, and is also a function of volume over time. A fast decay makes the volume drop very quickly, while, a slow decay makes the volume drop much slower. This drop is not all the way to zero volume, but is instead to what is called a sustain level.

The sustain level is not a function of volume rising or falling over time. It is a volume level that is maintained for a period of time. The time period is determined by the delay loop used in the program. Release is the final stage of a sound. It is a function of volume over time and is the amount of time that it takes the volume to fall from the sustain level to zero. The release portion of the sound occurs when the bit zero is turned off in the voice control register.

"SID Plays Bach" uses only voice one and thus only the voice control register for voice one is affected. This register is location 54276 ($D404) in the 64. Lines 490 and 495 are used for turning off bit zero of the register. This bit is often referred to as the gate bit.

Attack, decay, sustain and release are all set in lines 215 through 235 of "SID Plays Bach." As you can see, there are only two registers to handle the four settings. This is because these two registers are treated by the SID chip as if they actually were four. Each four bits of each register is treated as if it were a separate register. Bits zero to three of register 54277 ($D405) are used for the decay setting and bits four to seven for the attack setting. The release setting is stored in bits zero to three of register 54278 ($D406) and the sustain volume level is stored in bits four to seven.

In "SID Plays Bach," the number placed in the attack and decay register is a nine. This creates an attack cycle of two milliseconds and a decay cycle of 750 milliseconds. The sound attains its peak volume in a very short amount of time and then decreases to the sustain level in a comparatively longer period of time. The value placed in the register is obtained by multiplying the desired attack by 16 and adding the decay. Thus, a value of nine means that attack is set to zero and decay to nine.

The value placed in the sustain and release register is 17 ($11). This means that the sustain volume is set to one and that the release level is also set to one. During the sustain part of the sound, the volume will be the lowest it can possibly be without being completely turned off, and the release will take about 24 milliseconds. The release will thus be quicker than the decay section of the sound.

Both assembly listings get note values that are stored in a table called "notes." This table contains the high and low value that must be used to produce a given note and the relative duration of that note. You can use these two assembly listings to produce other musical tunes by just changing the notes and durations. "SID Plays Bach" and "SID Plays Bach (Sad)" are essentially the same program with modified notes and a longer delay to increase the sustain period. You can see how the delay was increased by looking at line 455 of each listing.

If you are not musically inclined, you might be able to obtain notes from a friend and then convert them to the corresponding high and low values that your user's manual indicates. You may be able to also get the duration from your friend, or you can experiment until it sounds right. Just remember to adjust the value in line 380 to the quantity of values stored in your table at the end of the assembly listing. Line 380 currently holds a 96 for the 64 high and low values and the 32 durations.

The two assembly listings (Listings 1 and 2) were created using the 64's built-in BASIC editor and can be assembled with PAL 64. PAL is an assembler for the 64 that allows you to

create source code in BASIC lines and to assemble it by typing RUN. The SYS 700 in line 100 activates PAL when you type RUN. The source listing can also be transferred to the Commodore assembler without too many changes. If you prefer having the programs in BASIC loader format, then type in and run Listings 3 or 4 instead. After the READY prompt appears on the screen, type SYS 49152 to activate either of the two. C

Listing 1. SID Plays Bach Assembly

```
100 SYS 700:.OPT OO:*=$C000
105 ; ************************
110 ; *                      *
115 ; *  ML SOUND  GENERATOR  *
120 ; *  HAPPY SOUNDING BACH  *
125 ; *     ROBERT ALONSO     *
130 ; *                      *
135 ; ************************
140 ;
145 ; EQUATES
150 ;
155 SIGVOL = $D418
160 ATDCY1 = $D405
165 SUREL1 = $D406
170 VCREG1 = $D404
175 FRELO1 = $D400
180 FREHI1 = $D401
185 ;
190 ; INITIALIZATION
195 ;
200 LDA #$0F     ;SET THE VOLUME TO 15.
205 STA SIGVOL   ;LIKE POKE 54296,15.
210 ;
215 LDA #$09     ;SET ATTACK/DECAY TO 9.
220 STA ATDCY1   ;LIKE POKE 54277,9.
225 ;
230 LDA #$11     ;SUSTAIN/RELEASE TO 17.
235 STA SUREL1   ;LIKE POKE 54278,17.
240 ;
245 LDA #$11     ;SELECT TRIANGLE WAVE.
250 STA VCREG1   ;LIKE POKE 54276,17.
255 ;
260 LDX #$00     ;ZERO OUT THE OFFSET.
265 ;
270 ; MAIN LOOP, GETS AND PLAYS NOTES.
275 ;
280 LOOP = *
285 LDA NOTES,X ;GET THE HI VALUE AND
290 STA FREHI1   ;STORE IT IN REGISTER.
295 INX          ;INCREASE OFFSET.
300 ;
305 LDA NOTES,X ;GET LO VALUE AND STORE
310 STA FRELO1   ;IT IN REGISTER.
315 INX          ;INCREASE OFFSET AGAIN.
320 ;
325 LDA NOTES,X ;GET THE DURATION VALUE
330 STA ASAVE    ;AND STORE IT IN ASAVE.
335 INX          ;INCREASE THE OFFSET.
340 ;
345 STX XSAVE    ;SAVE THE OFFSET VALUE
350 JSR DELAY    ;AND GO TO THE DELAY.
355 ;
360 LDA #$11     ;RESET TRIANGLE WAVE.
365 STA VCREG1   ;DELAY TURNS IT OFF.
370 ;
375 LDX XSAVE    ;GET THE OFFSET VALUE.
380 CPX #$60     ;"IS IT 96?
385 BNE LOOP     ;NO, THEN LOOP AGAIN.
390 JMP END      ;YES, THEN GO TO END.
395 ;
400 ; DELAY LOOP USED FOR DURATION.
405 ;
410 DELAY = *
415 LDY #$00     ;ZERO THE .Y OFFSET
420 ;
425 SET LDX #$00;AND THE .X OFFSET.
430 PLAY INX     ;INCREASE THE .X
435 CPX #$FF     ;"DOES .X=255?
440 BNE PLAY     ;NO, THEN GO TO PLAY.
445 ;
450 INY          ;YES, INCREASE .Y
455 CPY #$4B     ;"DOES .Y=75?
460 BNE SET      ;NO, THEN GO TO SET.
465 ;
470 DEC ASAVE    ;YES,DECREASE DURATION.
475 LDA ASAVE    ;GET DURATION VALUE.
480 BNE DELAY    ;IF <>0 THEN DELAY.
485 ;
490 LDA #$10     ;SILENCE SOUND BY SET-
495 STA VCREG1   ;TING BIT 0 OFF.
500 RTS          ;RETURN TO CALLER.
505 ;
510 END LDA #$00;ZERO ALL REGISTERS.
515 STA VCREG1   ;POKE 54276,0
520 STA ATDCY1   ;POKE 54277,0
525 STA SUREL1   ;POKE 54278,0
530 STA FRELO1   ;POKE 54272,0
535 STA FREHI1   ;POKE 54273,0
540 STA SIGVOL   ;POKE 54296,0
545 RTS          ;RETURN TO CALLER.
550 ;
555 ; TEMPORARY STORAGE
560 ;
565 XSAVE .BYTE $00
570 ASAVE .BYTE $00
575 ;
580 ; HI, LO AND RELATIVE DURATION
585 ;
590 NOTES = *
595 .BYTE $33,$61,$02
600 .BYTE $22,$4B,$01
605 .BYTE $26,$7E,$01
610 .BYTE $2B,$34,$01
615 .BYTE $2D,$C6,$01
620 .BYTE $33,$61,$02
625 .BYTE $22,$4B,$02
630 .BYTE $22,$4B,$02
635 .BYTE $39,$AC,$02
640 .BYTE $2D,$C6,$01
645 .BYTE $33,$61,$01
650 .BYTE $39,$AC,$01
655 .BYTE $40,$BC,$01
660 .BYTE $44,$95,$02
665 .BYTE $22,$4B,$02
```

```
670 .BYTE $22,$4B,$02
675 .BYTE $2D,$C6,$02
680 .BYTE $33,$61,$01
685 .BYTE $2D,$C6,$01
690 .BYTE $2B,$34,$01
695 .BYTE $26,$7E,$01
700 .BYTE $2B,$34,$02
705 .BYTE $2D,$C6,$01
710 .BYTE $2B,$34,$01
715 .BYTE $26,$7E,$01
720 .BYTE $22,$4B,$01
725 .BYTE $26,$7E,$02
730 .BYTE $2B,$34,$01
735 .BYTE $26,$7E,$01
740 .BYTE $22,$4B,$01
745 .BYTE $1F,$FF,$01
750 .BYTE $22,$4B,$04
```

END

Listing 2. SID Plays Bach (Sad) Assembly

```
100 SYS 700:.OPT OO:*=$C000
105 ; ************************
110 ; *                      *
115 ; *  ML SOUND  GENERATOR  *
120 ; *   SAD SOUNDING BACH   *
125 ; *     ROBERT ALONSO     *
130 ; *                      *
135 ; ************************
140 ;
145 ; EQUATES
150 ;
155 SIGVOL = $D418
160 ATDCY1 = $D405
165 SUREL1 = $D406
170 VCREG1 = $D404
175 FRELO1 = $D400
180 FREHI1 = $D401
185 ;
190 ; INITIALIZATION
195 ;
200 LDA #$0F     ;SET THE VOLUME TO 15.
205 STA SIGVOL   ;LIKE POKE 54296,15.
210 ;
215 LDA #$09     ;SET ATTACK/DECAY TO 9.
220 STA ATDCY1   ;LIKE POKE 54277,9.
225 ;
230 LDA #$11     ;SUSTAIN/RELEASE TO 17.
235 STA SUREL1   ;LIKE POKE 54278,17.
240 ;
245 LDA #$11     ;SELECT TRIANGLE WAVE.
250 STA VCREG1   ;LIKE POKE 54276,17.
255 ;
260 LDX #$00     ;ZERO OUT THE OFFSET.
265 ;
270 ; MAIN LOOP, GETS AND PLAYS NOTES.
275 ;
280 LOOP = *
285 LDA NOTES,X ;GET THE HI VALUE AND
290 STA FREHI1  ;STORE IT IN REGISTER.
295 INX         ;INCREASE OFFSET.
300 ;
305 LDA NOTES,X ;GET LO VALUE AND STORE
310 STA FRELO1  ;IT IN REGISTER.
315 INX         ;INCREASE OFFSET AGAIN.
320 ;
325 LDA NOTES,X ;GET THE DURATION VALUE
330 STA ASAVE   ;AND STORE IT IN ASAVE.
335 INX         ;INCREASE THE OFFSET.
340 ;
345 STX XSAVE   ;SAVE THE OFFSET VALUE
350 JSR DELAY   ;AND GO TO THE DELAY.
355 ;
360 LDA #$11    ;RESET TRIANGLE WAVE.
365 STA VCREG1  ;DELAY TURNS IT OFF.
370 ;
375 LDX XSAVE   ;GET THE OFFSET VALUE.
380 CPX #$60    ;"IS IT 96?
385 BNE LOOP    ;NO, THEN LOOP AGAIN.
390 JMP END     ;YES, THEN GO TO END.
395 ;
400 ; DELAY LOOP USED FOR DURATION.
405 ;
410 DELAY = *
415 LDY #$00    ;ZERO THE .Y OFFSET
420 ;
425 SET LDX #$00;AND THE .X OFFSET.
430 PLAY INX    ;INCREASE THE .X
435 CPX #$FF    ;"DOES .X=255?
440 BNE PLAY    ;NO, THEN GO TO PLAY.
445 ;
450 INY         ;YES, INCREASE .Y
455 CPY #$78    ;"DOES .Y=120?
460 BNE SET     ;NO, THEN GO TO SET.
465 ;
470 DEC ASAVE   ;YES,DECREASE DURATION.
475 LDA ASAVE   ;GET DURATION VALUE.
480 BNE DELAY   ;IF <>0 THEN DELAY.
485 ;
490 LDA #$10    ;SILENCE SOUND BY SET-
495 STA VCREG1  ;TING BIT 0 OFF.
500 RTS         ;RETURN TO CALLER.
505 ;
510 END LDA #$00;ZERO ALL REGISTERS.
515 STA VCREG1  ;POKE 54276,0
520 STA ATDCY1  ;POKE 54277,0
525 STA SUREL1  ;POKE 54278,0
530 STA FRELO1  ;POKE 54272,0
535 STA FREHI1  ;POKE 54273,0
540 STA SIGVOL  ;POKE 54296,0
545 RTS         ;RETURN TO CALLER.
550 ;
555 ; TEMPORARY STORAGE
560 ;
565 XSAVE .BYTE $00
570 ASAVE .BYTE $00
575 ;
580 ; HI, LO AND RELATIVE DURATION
585 ;
590 NOTES = *
595 .BYTE $33,$61,$02
600 .BYTE $22,$4B,$01
605 .BYTE $26,$7E,$01
610 .BYTE $27,$DF,$01
615 .BYTE $2D,$C6,$01
620 .BYTE $33,$61,$02
625 .BYTE $22,$4B,$02
630 .BYTE $22,$4B,$02
```

```
635 .BYTE $35,$39,$02
640 .BYTE $2D,$C6,$01
645 .BYTE $33,$61,$01
650 .BYTE $35,$39,$01
655 .BYTE $3B,$BE,$01
660 .BYTE $44,$95,$02
665 .BYTE $22,$4B,$02
670 .BYTE $22,$4B,$02
675 .BYTE $2D,$C6,$02
680 .BYTE $33,$61,$01
685 .BYTE $2D,$C6,$01
690 .BYTE $27,$DF,$01
695 .BYTE $26,$7E,$01
700 .BYTE $27,$DF,$02
705 .BYTE $2D,$C6,$01
710 .BYTE $27,$DF,$01
715 .BYTE $26,$7E,$01
720 .BYTE $22,$4B,$01
725 .BYTE $26,$7E,$02
730 .BYTE $27,$DF,$01
735 .BYTE $26,$7E,$01
740 .BYTE $22,$4B,$01
745 .BYTE $1F,$FF,$01
750 .BYTE $22,$4B,$04    END
```

Listing 3. Bach BASIC Loader

```
100 REM ************************'BYBY
105 REM *                       *'BCBA
110 REM *   BASIC LOADER FOR    *'BQBA
115 REM * HAPPY SOUNDING  BACH *'BTRG
120 REM *                       *'BCBW
125 REM ************************'BYBG
145 :'ABHE
150 FOR X= 49152 TO 49362'DLJE
155 READ A: B= B+A'DFJI
160 POKE X, A: NEXT X'CFLD
165 IF B<>20685 THEN PRINT "DATA
    ERROR"'FGQN
170 END'BACC
175 :'ABHH
180 DATA 169,15,141,24,212,169'BVYH
185 DATA 9,141,5,212,169,17'BSAM
190 DATA 141,6,212,169,17,141'BUSI
195 DATA 4,212,162,0,189,115'BTQN
200 DATA 192,141,1,212,232,189'BVSA
205 DATA 115,192,141,0,212,232'BVGF
210 DATA 189,115,192,141,114,192'BXBB
215 DATA 232,142,113,192,32,64'BVPG
220 DATA 192,169,17,141,4,212'BUWC
225 DATA 174,113,192,224,96,208'BWEH
230 DATA 217,76,92,192,160,0'BTBD
235 DATA 162,0,232,224,255,208'BVPI
240 DATA 251,200,192,75,208,244'BWVE
245 DATA 206,114,192,173,114,192'BXUJ
250 DATA 208,234,169,16,141,4'BUXF
255 DATA 212,96,169,0,141,4'BSCJ
260 DATA 212,141,5,212,141,6'BTGG
265 DATA 212,141,0,212,141,1'BTWL
270 DATA 212,141,24,212,96,0'BTKH
275 DATA 0,51,97,2,34,75'BPFL
280 DATA 1,38,126,1,43,52'BQVH
285 DATA 1,45,198,1,51,97'BQLM
290 DATA 2,34,75,2,34,75'BPEI
295 DATA 2,57,172,2,45,198'BRLN
300 DATA 1,51,97,1,57,172'BQGA
305 DATA 1,64,188,1,68,149'BRPF
310 DATA 2,34,75,2,34,75'BPEB
315 DATA 2,45,198,2,51,97'BQNG
320 DATA 1,45,198,1,43,52'BQDC
325 DATA 1,38,126,1,43,52'BQVH
330 DATA 2,45,198,1,43,52'BQED
335 DATA 1,38,126,1,34,75'BQBI
340 DATA 1,38,126,2,43,52'BQWE
345 DATA 1,38,126,1,34,75'BQBJ
350 DATA 1,31,255,1,34,75,4'BSSF    END
```

Listing 4. Sad BASIC Loader

```
100 REM ************************'BYBY
105 REM *                       *'BCBA
110 REM *   BASIC LOADER FOR    *'BQBA
115 REM * SAD  SOUNDING  BACH  *'BRWG
120 REM *                       *'BCBW
125 REM ************************'BYBG
145 :'ABHE
150 FOR X= 49152 TO 49362'DLJE
155 READ A: B= B+A'DFJI
160 POKE X, A : NEXT X'CFLD
165 IF B<>21324 THEN PRINT "DATA
    ERROR"'FGHN
170 END'BACC
175 :'ABHH
180 DATA 169,15,141,24,212,169'BVYH
185 DATA 9,141,5,212,169,17'BSAM
190 DATA 141,6,212,169,17,141'BUSI
195 DATA 4,212,162,0,189,115'BTQN
200 DATA 192,141,1,212,232,189'BVSA
205 DATA 115,192,141,0,212,232'BVGF
210 DATA 189,115,192,141,114,192'BXBB
215 DATA 232,142,113,192,32,64'BVPG
220 DATA 192,169,17,141,4,212'BUWC
225 DATA 174,113,192,224,96,208'BWEH
230 DATA 217,76,92,192,160,0'BTBD
235 DATA 162,0,232,224,255,208'BVPI
240 DATA 251,200,192,120,208,244'BXKE
245 DATA 206,114,192,173,114,192'BXUJ
250 DATA 208,234,169,16,141,4'BUXF
255 DATA 212,96,169,0,141,4'BSCJ
260 DATA 212,141,5,212,141,6'BTGG
265 DATA 212,141,0,212,141,1'BTWL
270 DATA 212,141,24,212,96,0'BTKH
275 DATA 0,51,97,2,34,75'BPFL
280 DATA 1,38,126,1,39,223'BRYH
285 DATA 1,45,198,1,51,97'BQLM
290 DATA 2,34,75,2,34,75'BPEI
295 DATA 2,53,57,2,45,198'BQLN
300 DATA 1,51,97,1,53,57'BPGA
305 DATA 1,59,190,1,68,149'BRMF
310 DATA 2,34,75,2,34,75'BPEB
315 DATA 2,45,198,2,51,97'BQNG
320 DATA 1,45,198,1,39,223'BRGC
325 DATA 1,38,126,1,39,223'BRYH
330 DATA 2,45,198,1,39,223'BRHD
335 DATA 1,38,126,1,34,75'BQBI
340 DATA 1,38,126,2,39,223'BRAE
345 DATA 1,38,126,1,34,75'BQBJ
350 DATA 1,31,255,1,34,75,4'BSSF    END
```

BY MARK ZIMMERMANN

Random Thoughts:

Programming, Philosophy, and Crystals

"Random Crystallization" is a short BASIC program that simulates the motion of atoms in a two-dimensional world.

This month we'll look at a specific application of randomness to one physical problem—crystallization. The solution to that problem turns out to apply to lots of other important real-world tasks, and we'll discuss some of those, too.

Crystallization

A crystal has a regular arrangement of atoms or molecules, yet it forms from a chaotic melt or solution, where the atoms move around randomly relative to each other. Perfect crystals form slowly. If you try to grow a crystal too fast, defects or dislocations develop. But annealing—a process of slow heating and cooling—can get rid of some defects without having to melt the crystal and start over.

We can experiment with all of these phenomena on a small computer. The program listing accompanying this article is my first effort. I hope some of you will extend and improve it! Let me describe exactly what the program "Random Crystallization" does, and how to use it. We'll begin with a general broad-brush description, and then go on to details.

"Random Crystallization" is a short BASIC program that simulates the motion of atoms in a two-dimensional world. (In real life, thin films deposited on surfaces act a lot like two-dimensional systems.) The atoms move within a limited area, surrounded by a solid wall of "frozen" atoms to keep them confined. The area where the atoms move is divided into discrete cells and only one atom (at most) can be in a cell.

Atoms tend to "stick" to each other. They have a lower energy if they have neighbors. This "stickiness" accounts for the crystallization. The chance of an atom moving from one cell to an adjacent empty cell depends on the temperature and the difference in energy before and after the move. Specifically, atoms obey the "Boltzmann Law," which says that the chance of a transition is proportional to $e^{-(\text{change in energy})/\text{temperature}}$. (This is a very general relationship that holds for just about all real-world systems. From one viewpoint, it's the definition of "temperature" itself.) It means that things tend to move "downhill," toward lower energy, with random fluctuations about that general tendency. The fluctuations go away as the temperature goes to zero.

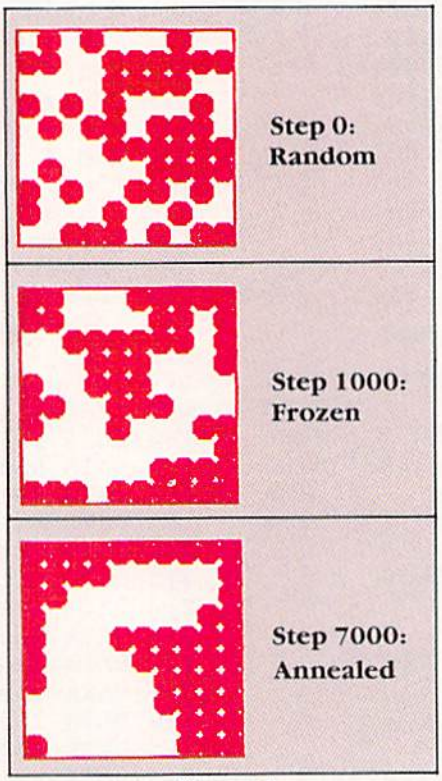

Figure 1.

In the implementation of the "Random Crystallization" program, I made some specific design choices. You may want to choose otherwise. I set the size of the atomic array to ten by ten. That gave room for a good number of atoms, and made the calculations run fairly fast. You can have a larger array, even a three-dimensional one if you like. (But let me know how you display the 3-D structure of that!) I defined the energy of an atom to be just −1 for each neighbor it has: above, below, left, and right. An atom with no neighbors has energy zero. One in the middle of a crystal with four neighbors has energy −4. You may want to take into account neighbors on the diagonals in your energy function.

The temperature and the number of atoms are entered by the user. A temperature of one or more gives a pretty "fluid" situation, with lots of fluctuations. A temperature of 0.1 or less is pretty solidly "frozen." I usually put in 50 atoms, so that the ten-by-ten array is half full.

When running the model, I simply watch the display and interrupt the program whenever I want to change the temperature, T. The program takes about one second to a single "step," so you can do thousands of steps in a reasonable length of time. You may want to automate the temperature variation, so that the value of T falls or rises in some regular fashion. This is especially useful for overnight experiments, which you may want to run unattended.

Crystal Simulation Results

Some friends and I have tried a number of experiments with the "Random Crystallization" model. We've found that lowering the temperature T in steps of 0.05 from 1.0 down to 0.1 can give a good crystal, provided the temperature is lowered very slowly. A "perfect" crystal would have all the atoms packed as closely together as possible, and the vacancies also grouped together to make a single big "void" of roughly circular shape. That way, the energy of the atoms is minimized—the surface area of the hole is as small as possible, and most of the atoms have as many neighbors as possible.

If you lower the temperature too rapidly, or start out at too low an initial temperature (a "supercooled" state), you'll get a crystal with many imperfections. You can anneal the imperfections out by warming the crys-

tal and then re-cooling more slowly. Try it!

Here's an experiment I tried. I began with temperature T = 1, and lowered the temperature by 0.05 every 50 steps, until at step number 1000, I was at T = 0.1. Figure 1 shows the initial state (random, 50 atoms) and the state at step 1000. The atoms are represented as black circles, and the voids between atoms are blank. As you can see, the crystal is very imperfect. (Running at T = 0.1 for another thousand steps didn't help much. The imperfections were "frozen in.")

So, I raised the temperature to T = 0.5 and then lowered it by 0.1 every thousand steps until, at step 7000, it was back to T = 0.1 and had been held there for 1000 steps. That gave a much better crystal, as the third part of the figure shows. There are still imperfections, but no badly separated voids or isolated clusters of atoms. Remember, there is a wall of atoms surrounding the area shown—so the atoms at the edge are really touching neighbors which aren't drawn on the figures.

Extensions and Implications

The "Random Crystallization" program can certainly be improved. Some possible extensions were mentioned above: changing the grid size, energy function, or temperature control. A more important change would be to increase the computational efficiency of the program. I kept the program logic very simple and, above all, worked to make it correct from a random-number viewpoint. If you try, you can probably increase the efficiency by a factor of two or more by varying the algorithms used in the subroutines.

You may also want to improve the display part of the program (subroutine 9000). It's very "plain vanilla" now, simply printing out the zeros and ones of the atom array to the screen. A better method would be to use screen pokes to update only the position of any atom that moves. I avoided that to allow people with different varieties of computers to run the program without modification.

Theoreticians may want to figure out how fast one should lower the temperature in order to get nice crystallization. I suspect that a good rate is proportional to (number of atoms)/(Temperature), but I don't know how to prove it, or what the constant of proportionality should be.

What are the implications of the "Random Crystallization" idea? Well, the fundamental idea applies to many areas. Suppose you want to find the shortest path to travel among a set of towns—the famous "Traveling Salesman" problem. This is a terribly hard problem to solve, if you demand the absolute best solution, but recently, investigators have found that they can get excellent working solutions by starting out with a random path at high "temperature," and then "cooling" it down. The "temperature" isn't a physical temperature. It's just part of a rule for the chance to change from one order of visiting the towns to another, just as our temperature was the chance for an atom to move from one location to another.

Other difficult optimization problems may be solved by analogous crystallization methods. It's a very new field of research—perhaps you can contribute to understanding it better!

Programming Philosophy

Since I've encouraged you to participate in the process of improving this program, I'd like to elaborate on that process, in general terms.

There are several central themes which underlie advanced work in all

Continued on page 125

Random Crystallization

```
10 REM RANDOM CRYSTALLIZATION
20 REM BY MARK ZIMMERMANN
30 REM
40 REM THIS PROGRAM ILLUSTRATES THE MOTION OF ATOMS IN A MINIATURE
50 REM 2-DIMENSINAL CRYSTAL (10X10 ARRAY) AT A CHOSEN TEMPERATURE
60 REM
70 REM THE CHANCE FOR AN ATOM TO MOVE TO A VACANCY IS
80 REM      P = EXP(-(ENERGYNEW-ENERGYOLD)/TEMPERATURE)
90 REM
100 REM THE ENERGY IS SIMPLY -1 * THE NUMBER OF ADJACENT ATOMS
110 REM (ABOVE, BELOW, LEFT, AND RIGHT)
120 REM
130 REM FOR SIMPLICITY, THE ACTION TAKES PLACE INSIDE A BOX OF
140 REM NON-MOVING ATOMS
150 REM
160 REM  --WORK BEGUN 1984 OCTOBER 21--
190 REM
200 DEF FNR(J)=1+INT(J*RND(1)): REM FUNCTION TO GENERATE A RANDOM
    NUMBER FROM 1 TO J
220 DIM XY(11,11): REM USE 10X10 AREA FOR ATOMS
240 INPUT "TEMPERATURE";T
260 INPUT "NUMBER OF ATOMS (1 TO 99)";A
270 REM
280 GOSUB 8000: REM INITIALIZE ARRAY WITH BORDER AND RANDOM
    CONFIGURATION OF ATOMS
300 GOSUB 9000: REM PRINT CONFIGURATION TO SCREEN
400 GOSUB 2000: REM PICK AN ATOM AT RANDOM WHICH HAS AN ADJACENT
    HOLE; RETURN LOCATION IN X,Y AND HOLE IN XN,YN
500 GOSUB 3000: REM CALCULATE ENERGY OF ATOM (E) AND ENERGY IF IT
    MOVES TO HOLE (EN)
600 P=EXP(-(EN-E)/T): REM CALCULATE CHANCE FOR ATOM TO MOVE TO HOLE
700 N=N+1: REM ADD ONE TO THE COUNTER THAT KEEPS TRACK OF STEPS
800 IF RND(1)>P GOTO 400: REM ATOM DID NOT MOVE; LOOP BACK TO TRY AGAIN
900 XY(X,Y)=0: XY(XN,YN)=1: GOTO 300: REM ATOM MOVED; LOOP BACK TO
    DISPLAY NEW CONFIGURATION
1999 REM
2000 REM ROUTINE TO PICK A RANDOM ATOM WITH AN ADJACENT HOLE
2020 X=FNR(10): Y=FNR(10): IF XY(X,Y)=0 GOTO 2020: REM LOOP UNTIL FIND AN
    ATOM
2040 IF XY(X+1,Y)=1 AND XY(X-1,Y)=1 AND XY(X,Y+1)=1 AND XY(X,Y-1)=1 GOTO
    2020: REM TRY AGAIN IF NO ADJACENT HOLE
2060 REM NOW PICK A RANDOM ADJACENT HOLE
2080 R=RND(1): IF R<.25 THEN XN=X-1: YN=Y: GOTO 2200
2100 IF R<.5 THEN XN=X+1: YN=Y: GOTO 2200
2120 IF R<.75 THEN XN=X: YN=Y-1: GOTO 2200
2140 XN=X: YN=Y+1
2200 IF XY(XN,YN)=1 GOTO 2080: REM KEEP TRYING UNTIL FIND A HOLE
2300 RETURN
2999 REM
3000 REM ROUTINE TO CALCULATE ENERGY OF ATOM IN CURRENT LOCATION (E)
    AND IN NEW LOCATION (EN)
3020 E=-XY(X-1,Y)-XY(X+1,Y)-XY(X,Y-1)-XY(X,Y+1)
3040 EN=-XY(XN-1,YN)-XY(XN+1,YN)-XY(XN,YN-1)-XY(XN,YN+1)+1: REM ADD ONE
    SINCE ATOM WILL HAVE MOVED OUT OF OLD SLOT AND INTO NEW ONE
3100 RETURN
7999 REM
8000 REM ROUTINE TO INITIALIZE CONFIGURATION OF ATOMS
8020 PRINT "INITIALIZING ATOMS IN BOX"
8040 FOR I=1 TO A
8060 X=FNR(10): Y=FNR(10): REM PICK A RANDOM POINT IN BOX
8080 IF XY(X,Y)=1 GOTO 8060: REM TRY AGAIN IF SOMETHING IS ALREADY THERE
8100 XY(X,Y)=1: NEXT I
8200 REM NOW FILL IN BOUNDARY CELLS OF BOX, TO AVOID ATOMS DRIFTING
    OUT
8220 FOR I=0 TO 11: XY(0,I)=1: XY(11,I)=1: XY(I,0)=1: XY(I,11)=1: NEXT I
8300 RETURN
8999 REM
9000 REM DISPLAY CONFIGURATION ON SCREEN
9020 PRINT: PRINT "N=";N
9040 FOR I=1 TO 10: FOR J=1 TO 10
9060 PRINT XY(I,J);
9080 NEXT J
9100 PRINT
9120 NEXT I
9200 RETURN
```

END

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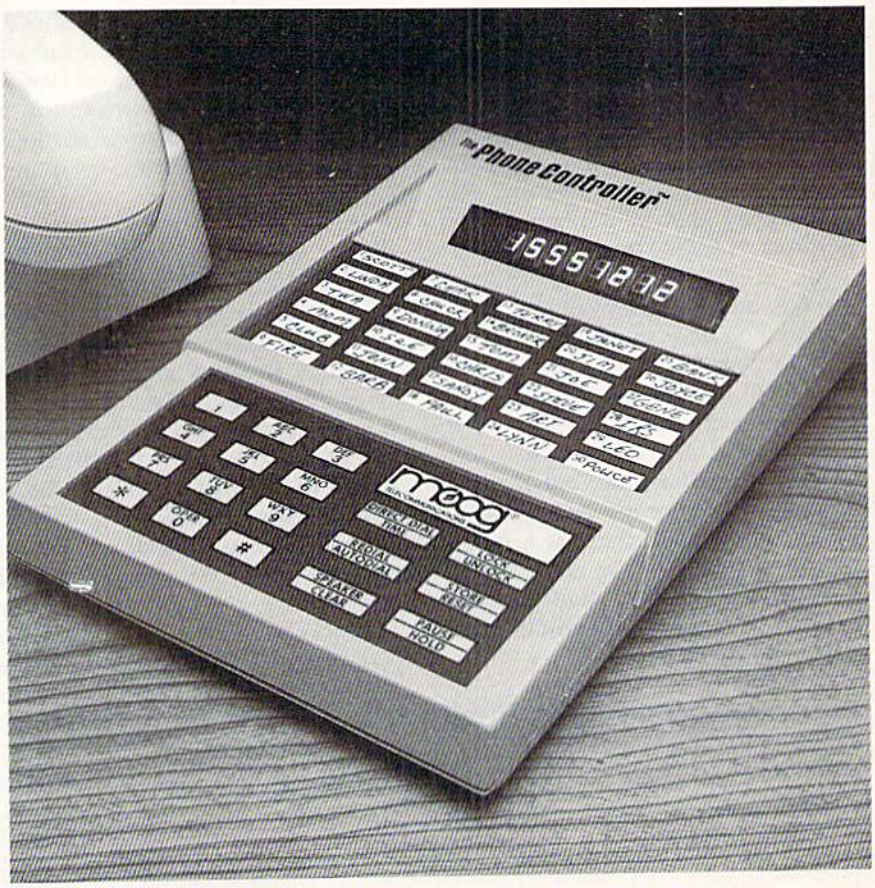

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BY ISAAC MALITZ, PH.D.

The Computer Scientist

What is Computer Science?

Only a few years ago, computer science (CS) was considered a rather narrow and difficult technical discipline. It was taught at only a few major universities and was studied mainly by advanced computer specialists. Now, however, CS is studied at thousands of schools nationwide by millions of people every year.

This is the first in a series of articles that will explore the field of computer science especially for you, the Commodore user. My aim is to give you a sense of what the field is about and to acquaint you with some of its major areas of knowledge. I believe that:

- Computer science provides a great deal of valuable information for anyone who uses computers frequently.
- You don't have to go to college to get involved in computer science. Indeed, one of the best ways to explore CS is by running "experiments" on your Commodore computer.
- You don't have to be a technical genius to learn about computer science. Although some parts of CS are technically difficult, many of the most important parts are amazingly straightforward and intuitive.

Definition of Computer Science

Computer science deals with the "timeless questions" and "timeless knowledge" about computers.

You probably know a lot about computers right now. For instance, you probably know about software packages, printers, disk drives, and monitors. Depending on your interests, you may be familiar with BASIC or other programming languages. You are familiar with many computer concepts and buzzwords ("spreadsheet," "word processing," "boot," "menu," "bug"). However: Much of your knowledge about computers will be obsolete in a few years.

A very strong case can be made that the computer is an emerging species of intelligent life.

Software and equipment will be different. Different programming languages will be used. Or perhaps eventually, software may be created without using a programming language. Many of the concepts and buzzwords that are important today will be obsolete or meaningless, and will be replaced with new concepts, new jargon.

However, some of your knowledge will still be valid and useful. Here are a few examples of current computer knowledge which will probably be relevant for many years into the future:

- New programs usually have bugs. With large programs, it sometimes takes years to shake out most of the bugs. With very complex programs, it is unreasonable to expect that all of the bugs could ever be eliminated.
- The performance of a computer system will usually deteriorate badly when its mass storage devices get close to full.
- Even the "friendliest" computer programs exhibit weird behavior under some circumstances.

This kind of knowledge remains valid and useful, despite the rapid changes in computer technology. And this is the kind of knowledge that CS deals with. CS is the body of knowledge (and questions) that do not go out of date, even when new generations of technology come to market. The goal of CS is to gather together fundamental information like this, and to organize it into an orderly body of scientific knowledge.

CS gathers its knowledge in different ways. Some of the knowledge is a distillation of practical experience with computers. Some of it is the result of laboratory experiments with computers. And some of the knowledge is theoretical, and depends on extensive investigations in advanced mathematics. So CS is a mixture of different kinds of information. Depending on your background, you will find some parts of CS interesting and easy, and others dull and difficult.

But all areas have in common their "timelessness"—what you learn today will not be obsolete next year. And that is one of the main reasons why so many people are becoming interested in computer science.

An Eagle's Eye View of Computer Science

You have already seen a few examples of the kind of knowledge CS is concerned with. Now, let's try to get a broad overview of the entire field. To do this, we will list some of the major "timeless questions" that CS is concerned with.

1. What is a computer, really?

A very strong case can be made that: The computer is an emerging species of intelligent life.

This startling thesis is based on a series of elementary, non-technical observations about computers, and we shall explore this thesis in a later article. If the thesis is true, it suggests that understanding the nature of computers is much like understanding the nature of other living things. To understand computers, we will need to understand the various "subspecies" of computers, their "anatomy," their "evolutionary progression," their "sociology," and so on.

Even if you do not accept this thesis, the biological analogy gives us some important clues about what we need to know in order to really understand what a computer is.

2. What are the simplest possible computers?

Computers are becoming more and more complex and powerful, to a degree which sometimes boggles even the experts. Why is this happening, and where are these developments headed? One way to get a handle on these issues is to ask, "What are the simplest computers like? What are their fundamental characteristics? What are their advantages and disadvantages, compared against more complex computers?"

In future articles, we will examine

a couple of "minimal computers." As you will see, they are almost startling in their simplicity, yet they have the capabilities of a true computer. They demonstrate beautifully some of the fundamental characteristics of all computers. They also help us to understand why there is a need for very complex computer systems to evolve.

3. What are the best ways to program a computer?

If you have tried any programming yourself, you know it's difficult to write a good computer program. The more complex the application, the more difficult it is to write a good program. Why is computer programming so difficult? Can programming be made easy? What are the best possible ways to program a computer? What kinds of programming language or programming techniques work best?

4. What are the best ways for a computer to organize information?

Computers typically deal with large amounts of information, expressed in electronic codes. Some of the codes and some of the information-handling techniques are highly complex, and are certainly alien to the ways human beings process information.

What are the best ways for a computer to organize information? Are intricate codes necessary? Are there simpler techniques that might be better? What are the advantages and disadvantages of various information-handling techniques in terms of speed, reliability, cost, flexibility, and so on?

5. How do you design computer systems that are reliable?

Even expensive, sophisticated computer systems are vulnerable to system crashes and information losses. And to my knowledge, there has never been a major commercial software package that is completely free of bugs. What can be done about these problems? How do you design a computer system that is crash-proof? Is there any hope of eventually having software packages that are totally free of bugs? If not, is there a way to design computer systems to function reliably, even if they contain software bugs?

6. What is the "anatomy" of a computer system?

All computer systems seem to have certain features in common. For instance, they all have codes, machine language, communications lines and communications protocol, an operating system which is built up in layers, capabilities for handling large blocks of information, error-handling capabilities, and "human interface" capabilities. Each of these features are entire subjects themselves, which can be explored in great depth.

Just as it is possible for a biologist to map out the anatomy of a living organism, so it should be possible for a computer scientist to map out the anatomy of various kinds of computer systems. When we attempt to do this, some tantalizing questions arise: What are the most important "organs" of a computer system? As computers continue to evolve, how will these organs evolve? Will some organs which are important in current generations become unimportant in later generations? Will completely new kinds of organs come into existence?

7. How fast can a computer system "think?"

The speed of a computer depends on two major factors. First, it depends on its "raw speed"—how many elementary operations per second it can perform. (A Commodore 64 can perform up to one million elementary operations per second. The fastest computers in the world are about 1,000 times faster than that.) Second, speed depends on how cleverly the computer is programmed. (Sometimes, a smart programmer can think of shortcuts which allow a huge task to be completed quickly, even on a "slow" computer.) Are there any upper limits to the potential "raw speed" of a computer? Are there any limits to what can be accomplished by a clever programmer?

8. Are there any tasks which a computer cannot perform at all?

Are there any tasks that are impossible to program? Are there any tasks that would require more computing power than is theoretically possible? Are there any tasks that require human intelligence, and which cannot possibly be realized on a computer?

9. What are the most important "recipes" for computer programmers to know?

A great deal of computer programming involves performing common tasks such as displaying text and graphic images on the screen, sorting information, printing reports, recording and updating information on disk, searching for data in memory or on disk, displaying error messages, and making appropriate responses when an operator does something wrong. Tens of thousands of brilliant programmers have worked on developing good techniques for programming tasks like these. What are the most common tasks that need to be programmed? What are the best recipes for programming each task?

More to Come

Computer science deals with the "timeless questions" and "timeless knowledge" about computers. CS seeks to gather this fundamental information and organize it into an orderly body of scientific knowledge. This information is a mixture of the theoretical and the practical, the technical and the intuitive, the abstract and the empirical. Depending on your background and interests, you will find some parts of CS interesting and easy, and other parts dull or difficult. What all areas have in common is the "timelessness"—what you learn today will not be obsolete next year.

Some areas of CS are of enormous commercial value (e.g., programming methods, database design, system reliability, computer "anatomy"). This helps to explain why so many people are learning about CS. Another reason is that unlike most of what you learn about computers, what you learn in CS does not go out of date rapidly.

The field of CS is really just beginning to take shape. Not only are a lot of fundamental questions unanswered, but also we are still discovering what are in fact the most fundamental questions and areas of knowledge. In this article, we have listed some of the major "timeless questions" of CS. In future articles, we will explore some of these questions.

Isaac Malitz is a computer consultant and system designer who specializes in accounting and database applications. He has written books on the internals of the Commodore 64. He holds a Ph.D. in Philosophy / Mathematical Logic from UCLA. C

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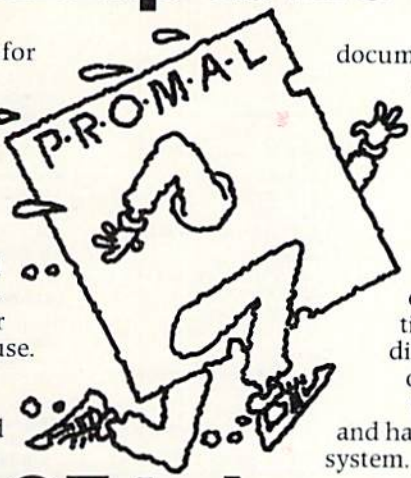

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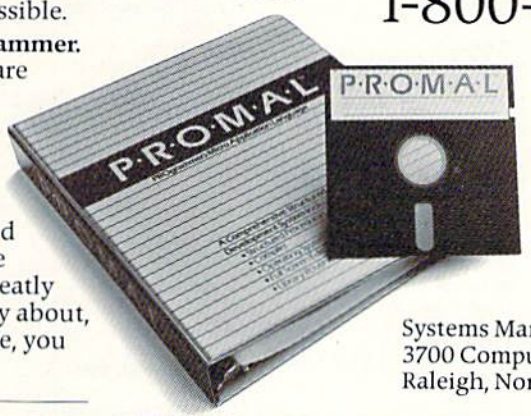

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This list is compiled from groups who responded to a survey conducted by Pete Baczor, Commodore's user group coordinator. If you would like your group to appear here, or if you need information about Commodore's user group support, contact Pete at Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380.

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User Group Support Program

Commodore is creating a program to support Commodore User Groups.

The two major components—approved user group status and a newsletter are now available.

Approved user group status is given to any user group meeting our basic criteria. These user groups receive meeting posters and membership cards and are automatically sent Input/Output each month. In addition they can request a speaker from Commodore to come and discuss (and demonstrate) new products at one of their meetings.

The newsletter, INPUT/OUTPUT, will include announcements, user group programs, calendar of events, letters, questions, product specifications, programs, and surveys. It will be a newsletter FOR user groups BY user groups supported by Commodore without advertisements.

For future issues of the newsletter Commodore is accepting announcements of user group activities, articles of interest, letters to the editor, and general questions. Please forward all correspondence with the name of your user group to:

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
Attention either New User Group or Input/Output

MAKE LIFE EASY

Syntax errors got you down? Need a cure for the computer language-barrier blues? A subscription to Commodore's official magazines will ease the pain with plenty of software reviews, programs to type and save, programming tips and behind-the-scenes industry news.

Get the inside story on Commodore computers with a subscription to both ***Commodore Microcomputers*** *and* ***Commodore Power/Play.*** *Send in the enclosed subscription card today.*

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 Continued from page 81

who may have to purchase or rent the equipment from the employer, etc. That's a very different situation.

Benford: So the official AFL-CIO stand is a blanket condemnation of all computer home-work with no exceptions?

Chamot: That's the way it reads now. Let me say that the AFL-CIO's calling for a ban is an expression of concern and an expression of opinion, as well as an indication of the directions in which the AFL-CIO will move. It does not, in fact, institute a ban; only the federal government has the power to do that. We have called for a ban because of our belief that historical precedent requires that kind of an action. The fact is that the ban is not—today—in effect. That's an important distinction.

The Cottager's Side

Thomas Martin of Houston, Texas, is an AEC member who uses a Commodore 64 to manage his electronics repair business. Thanks to the AEC and the *MicroMoonlighter* newsletter (which contains AEC news), Thomas was aware of the AFL-CIO's position on cottaging and the proposed ban.

He summed up his views this way: "I think where people want to work—whether it's an individual who wants to work for himself at home or if an individual wants to work for somebody else at home as an employee—it's their own business. Where you work and whom you work for is your own business—and it should stay that way."

Peggy Herrington's byline is a familiar sight to readers of Commodore-specific magazines, and she's also an electronic cottager who works from her home in Albuquerque, New Mexico. Peggy uses her 64 for writing her magazine articles as well as for writing songs.

Said she of the ban: "A college course I took on macroeconomics enlightened me to a point of view that I had never thought of before: unions and affiliations are really formed to keep people out of an industry. They do protect those who already belong, but they exclude the others. Based on that and a gut feeling, I have to say 'baloney' to the ban. It's counter-productive, in that it doesn't work for the people in general."

The consensus was that some form of regulation may be desirable, but that a total ban cannot be tolerated.

Other cottagers responded similarly. The concensus was that some form of regulation may be desirable in some select areas to prevent labor abuse. Agreement was unanimous, however, that a total ban on home computer work cannot be tolerated.

Possible Implications of a Ban

Such a blanket ban might be beneficial to some, but does not seem to consider the needs of those people who, for instance, can't work in a "traditional" setting because of a handicap, infirmity or extenuating personal situation. The institution of such a ban would close off work opportunities for these people—opportunities that have only recently begun to emerge.

As another example, take the young mother who is paid piece-work for entering data or processing claims via computer in her home. Such an arrangement allows her to have flexible hours and eliminates the worry of finding a babysitter or day-care center. A ban on computer home-work puts her out of business, as well. In addition, writers, consultants and other professionals who have offices at home would have to rent or otherwise secure commercial office space to ply their skills.

Food for Thought

The AFL-CIO's proposed ban on computer work at home raises a number of questions in my mind:

1. Whose purposes would this ban really serve? If home computer work is banned, all such labor would have to be conducted in a traditional workplace, where the AFL-CIO already has, or could in the future, organize the workers. You can't organize people if they're scattered in homes throughout the country.

Consider that many potential workers have extenuating circumstances which prevent them from working in a traditional job setting. Cottaging allows these people a means of bringing the work—and income—into their homes—an opportunity this ban would deprive them of.

2. Does such a ban undermine the free enterprise system? Whatever happened to the tenet of working hard to get ahead? If a cottager chooses to put in some extra hours to make some additional money or further his or her career, is there harm in that? It's common practice to work overtime, even "burn the midnight oil" in every other work environment, so should cottaging have its own set of rules?

3. Piece-work systems may be desirable in some situations. In the example I cited earlier involving the mother of young children, an hourly rate would be out of the question, since her work sessions would be subject to interruptions. With a piece-work system, the more she works, the more she gets paid. She determines how much or how little she produces.

4. Cottaging is a matter of choice. No individual is forced into cottaging; it's a life/workstyle that is chosen. This ban, if enacted, will remove cottaging as a choice.

5. The ban won't thwart child labor. If some unscrupulous employer or parent is going to employ children, they don't need a computer to do it. But it would seem that a computer terminal is far less dangerous than a meat-slicer, hot stove or hand saw.

6. The sanctity and privacy of the home may be at stake. If the proposed AFL-CIO ban is enacted, you will lose the right to decide what you do in your home with your computer.

In closing, I'd like to remind you that while only a small percentage of the overall population is immediately jeopardized by this proposed ban, it has the potential to affect the lives and livelihoods of many people in the future, as computers become increasingly absorbed into our lifestyle.

More information on the Association of Electronic Cottagers can be obtained from: AEC Headquarters, 677 Canyon Crest Drive, Sierra Madre, CA 91204; (818) 355-0800. C

HOW TO ENTER PROGRAMS

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN, RIGHT 2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The chart on this page tells you the keys to press for any word or words inside brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to each keystroke shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270", type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88)

CHART OF SPECIAL CHARACTER COMMANDS

"[HOME]" = UNSHIFTED CLR/ HOME
"[CLEAR]" = SHIFTED CLR/HOME
"[DOWN]" = CURSOR DOWN
"[UP]" = CURSOR UP
"[RIGHT]" = CURSOR RIGHT
"[LEFT]" = CURSOR LEFT
"[RVS]" = CONTROL 9
"[RVOFF]" = CONTROL 0
"[BLACK]" = CONTROL 1
"[WHITE]" = CONTROL 2
"[RED]" = CONTROL 3
"[CYAN]" = CONTROL 4
"[PURPLE]" = CONTROL 5
"[GREEN]" = CONTROL 6
"[BLUE]" = CONTROL 7
"[YELLOW]" = CONTROL 8
"[ORANGE]" = COMMODORE 1
"[BROWN]" = COMMODORE 2
"[L. RED]" = COMMODORE 3
"[GRAY1]" = COMMODORE 4
"[GRAY2]" = COMMODORE 5
"[L. GREEN]" = COMMODORE 6
"[L. BLUE]" = COMMODORE 7
"[GRAY3]" = COMMODORE 8
"[F1]" = F1
"[F2]" = F2
"[F3]" = F3
"[F4]" = F4
"[F5]" = F5
"[F6]" = F6
"[F7]" = F7
"[F8]" = F8
"[POUND]" = ENGLISH POUND
"[SHFT ↑]" = PI SYMBOL
"[↑]" = UP ARROW

GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,COMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

characters on one line. You can enter these lines by abbreviating the commands when you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Commodore Microcomputers
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem **C**

How to Use the Magazine Entry Program

The Magazine Entry Program on page 123 is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 50052, and just lets you know that the program is running. If everything is ok, the program will finish running and end. Then type NEW. If there is a problem with the data statements, the program will tell you where to look to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

 # OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word mispelled. Check the line in the magazine again and correct the mistake. **C**

Magazine Entry Program

The Magazine Entry Program is available on disk, along with the other programs in this magazine, for $9.95. To order, contact Loadstar at 1-800-831-2694.

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,8D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D,C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,BD,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

DREAM HOUSE

Continued from page 22

so place the cursor on the word COLOR and hit the fire button. Magically, the cursor transforms into a paintbrush and the rest of the menu area becomes a palette of 16 colors. Dip the tip of the brush into any one of the colors, press the joystick button, and your brush fills with an endless supply of color. Now move your brush up to any part of the house, hit the fire button, and a small block area fills in with your selected color.

You may find that the first time you press the button, only a part of the selected area is colored in. This is because there are two different "layers" to every part of your house. Basically, the first layer, the foreground, is the outline and/or detail of the area, and the second layer, the background, is the area contained by the outline. This means that, for example, you can paint one of the Victorian turnposts light blue and then embellish and outline the detail work. Or, create a window with bright yellow light coming from inside the house, while the rails and sashbars are black and the surrounding casing is rust.

To change your working color, all you have to do is dip your brush into another color on the palette and fill 'er up. In a matter of minutes, you can try out all 240 possible combinations of the 16 available colors. Try doing that with colored pens and graph paper!

When you're satisfied, albeit temporarily, with your house painting, there's still much more you can do here on the outside of your house. How about landscaping the front yard with trees and plants, and perhaps a picket fence? Dip your paintbrush into the water glass to the left of the color palette, hit the fire button, and you're back to the previous menu of words and icons. Now, with your cursor on the MOVING VAN, hit the fire button again and you'll be transported to the first of several storage areas.

Your house disappears (don't worry, it'll still be there when you get back), and all sorts of colorful objects, and parts and pieces of objects, fill the screen. There are bushes and flowers, and fountains and window shutters. There are tree trunks and branches and limbs with bright red apples. There are stars for the sky and bricks for the house. There is spurting water for the fountain, extra windows in all different shapes, and various pieces of picket fencing, posts and finials.

Now the menu along the bottom of the screen looks a little different as well. The HAMMER and MOVING VAN symbols are still there, but the icons for Color, Erase, Move and Copy have been replaced by a FLOORPLAN icon, EXTERIOR house icon, and INTERIOR house icon. Two new icon words, SAVE and LOAD, have also appeared. If you press either one of these, you follow the on-screen instructions to either save to your own formatted disk the house you are working on, or load in a previously saved house. Fortunately, the directory of your disk is automatically listed before any actual saving or loading takes place, which saves you from having to remember those weird names you might give your different house files. The last icon is labeled ZAP. This is what you do to your house if you have let your creativity get out of control.

Pick up a tree trunk, branches and leaves, the fountain and fountain water, some stars, and a few picket fence pieces by placing your cursor over the object or part and pressing the joystick button. A tone lets you know you've picked up each choice you've made. The VAN can hold only 12 items per load, but you can always come back for more.

When you're ready to return to the outside of your house, place the cursor on the EXTERIOR icon, hit the button, and you and all your stuff from storage are back in the front yard. Objects are dropped off in the reverse order that they were gathered, so as you move up from the menu area onto the screen, you will notice that the last object that you picked up from storage is clinging to the back of your cursor. Move it around for placement, drop it in place by hitting the fire button, and the next object from storage is now stuck to the end of your cursor awaiting its destiny.

Once your cursor is "empty," you can go back to storage and pick up additional objects, or you can play with and perfect the items you've already got. Rearrange their locations with the MOVE icon. Create duplicates with the COPY icon. Paint them all with COLOR. And, if you just don't like an object no matter where you put it or what color it is, delete it with the ERASE icon.

Besides record-breaking paint jobs, effortless moving about of heavy objects, and instantaneous "cloning," there are a few other tricks you might want to try your hand at. You can build an addition to your house by using the universal building blocks, shingles, windows, shutters and ornaments from storage. You can replace your next door neighbor's house with a big side yard by using COLOR to paint it a solid sky blue, and then piece together a lush green lawn in its place. Create a nighttime scene by painting the sky a dark blue or black, with white stars dotting the heavens. Or turn the season to winter simply by coloring the green grass snow white.

Now for something that will really knock your socks off: If you've placed a number of stars and the water fountain from storage into your picture then you're all set for the big crowd pleaser. Place your cursor on the ANIMATE ALL symbol and hit the fire button.

Ta-da! The stars start sparkling and twinkling, and the water fountain bursts into gushing, trickling life. Try *that* with paper and pens!

When you're finished marveling at the exterior of your house, wipe your feet and head for the interior. Place your cursor on the MOVING VAN to get to the storage screen menu. Then with your cursor on the INTERIOR house icon, hit the fire button to go inside your house. If you have not already used the SAVE icon to preserve your exterior design, a message will appear asking you if you want to do so. If you do, just follow the on-screen instructions.

The inside of the house is unpainted, undecorated, and unfurnished. The virgin walls beg for color, the bare wood screams for a good coat of stain, and the untread floors ache for wall-to-wall carpeting. This is a real enticement for those of us who have always had to scrape, steam, sand and fill before any surface was ready to accept a finishing touch.

You may want to paint, decorate and furnish each room as you go, or perhaps, like me, you prefer to tackle

DREAM HOUSE

a job step by step, painting every room first, then refurnishing, and finally adding all the finishing touches. Moving from room to room is easy, and you can take your paintbrush, palette, and any furniture or decorating items with you. Simply position your cursor on the black area (which looks like a natural shadow) in any doorway, press the letter "D" on your keyboard, and you will find yourself in the next room. You will find a similar black area at the foot and head of staircases which allow you to "floor-hop" in multi-level houses.

When you're ready to furnish, take the MOVING VAN to storage. Once inside the first storage area, press the MOVING VAN once again and you'll see an icon list of all the different storage areas available for pick up or perusal. There are areas for the living room, dining room, kitchen and bedrooms. There is another area for landscape and another called "weather and entertainment." There are two areas of "workshop shapes" for building your own objects, and there are even three other areas labeled "mom and pop," "kids" and "pets." Select the storage area you want to go to by placing the cursor over the appropriate icon and hitting the fire button.

You pick up and place the storage objects the same way you did for the outside of the house. And you are free to COLOR, COPY, MOVE and ERASE them any way you like. Some items, such as the grandfather clock, are broken down into parts within their storage area. This is because the computer allows only two colors for each individual shape or object. By breaking certain objects down into separate pieces, it is therefore possible to end up with, say, a clock of six colors rather than two colors. With this system, you can also take things like the black-and-white rotisserie into the kitchen, and then put the golden roasting chicken into it. You can assemble a candlestick, chandelier, a painting for the walls, or even a patchwork quilt, all in multi-colored splendor.

Once everything is in place, you can make your entire dream house come to life with movement and sound effects. Hit the ANIMATE ALL icon and watch the washing machine spin, the chicken slowly turn in the rotisserie, the goldfish swim around in its bowl, the candles flicker, and the bird hop and sing in its cage. Still, there are a few surprises left. Like what happens when you place your cursor over the mouse, the refrigerator, and the telephone and then hit the letter "A" on your keyboard. And like what goes on up in the Secret Attic in the cottage.

But I still have a thing for graph paper. My passion for rulers and templates and automatic pencils is unwavering. Colored pens still turn my head. And I still dream of Early Gothic Revivals, Eastlake Victorians, Norman Manors, French Colonials, and English Tudors. It's true. *Dream House* has not replaced nor diminished my old stand-by dream-weaving habitual hobby. It's just that, with *Dream House,* dreaming comes that much closer to coming true. C

TECHNICAL TIPS

Continued from pg. 111

areas of human endeavor. They are "obvious" in some ways—so obvious that they are generally overlooked. But, if we examine these key ideas and become conscious of them when they appear, we can apply them to solve our problems.

One of these concepts I'll call piggybacking. (It has many other names, of course.) Piggybacking means taking advantage of other people's work and of your own earlier labors. It means, "Don't re-invent the wheel!" Life is too short to spend re-doing the same things over and over again. The most extraordinary progress has always been made by people who took what was available and built upon it. Sir Isaac Newton, who developed calculus, the laws of gravitation, optics, and a large part of the rest of physics, once said, "If I have seen farther than other men, it is because I stood on the shoulders of giants."

In computing, we take advantage of piggybacking in several ways. We hardly ever build new hardware to solve a problem. Instead, we take advantage of clever engineers and mass production to solve our problems on standard machines. We hardly ever begin programming in machine language. Instead we take advantage of higher-level language interpreters or compilers to give us a head start. If possible, we run a "canned" program to do the job.

But, at a still higher level, we too often do "re-invent the wheel." We look at a complex problem and immediately begin writing BASIC code without asking whether some standard subroutines we've written earlier could be adapted to help. We ignore the possibility of putting together pieces of other programs to make a solution.

One development that may help is in the area of extensible languages. These are programming languages like FORTH or LISP, which make it easy to add new words and integrate those words with the rest of the language. BASIC has subroutines and functions, but they fall short of being true language extensions. It's just too hard to build up a big BASIC program out of modularized routines while worrying about variable names conflicting with each other, parameter passing, recursion, and so forth.

Though FORTH and LISP are steps in the right direction, programmers still have a long way to go before they really use the extensibility of those languages effectively. Most programs still begin with the old, standard central language core, and only then begin to build. It would be as though every writer were restricted to a first-grade vocabulary and had to define every word in terms of that before it was used!

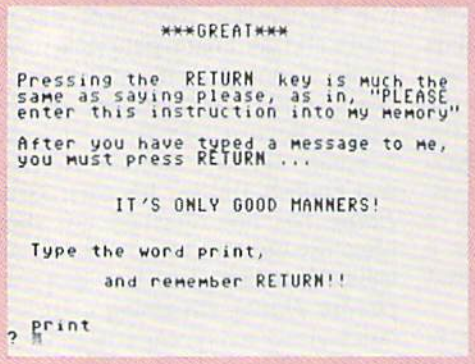
What does it all mean for you? Just this: Keep an eye on extensible languages, and maybe try learning one yourself. Make every effort to write your programs in modular form and re-use pieces of old programs whenever possible. Share your discoveries, and take advantage of other people's work. Above all, think before you program, "Do I really have to write this afresh?" C

NEWS

Electronic Typesetting Service

For Commodore computer users who need quality typesetting and high-resolution graphics prints without investing in expensive hardware, Compu-Print is the economical alternative. Compu-Print, accessed through a modem, allows writers, publishers, advertisers, and office managers to upload the material to be typeset directly to Compu-Print. The Compu-Print service is open 15 hours a day, seven days a week. Typeset copy is mailed the next day to the user or desired location. Yearly subscription fee is $65, and there is no charge for on-line time. Normal processing charge is 75 cents per page (300 or 1200 baud).

To date, 24 Compu-Print centers have been established around the country to allow quick turnaround. In most cases, Compu-Print will deliver camera-ready copy as quick as an in-house printing department at much less the cost. For more information or to locate the nearest Compu-Print Center, contact C-Band DBS/Encycloware, 715 Washington Street, Ayden, NC 28513. Call 919-746-3589 or call collect 919-746-2773.



Software for Beginning Computer Users

Grolier Electronic Publishing (95 Madison Avenue, New York, NY 10016) has released *Step One*, an entry-level program that teaches the fundamentals of the Commodore 64, BASIC, and word processing. Other features of the 64 are introduced with activities such as a simulated piano and several computer games. It retails for $39.95.

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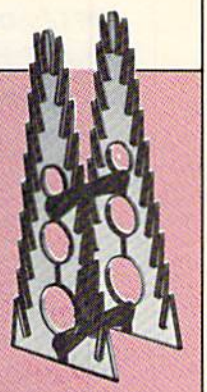
NEWS

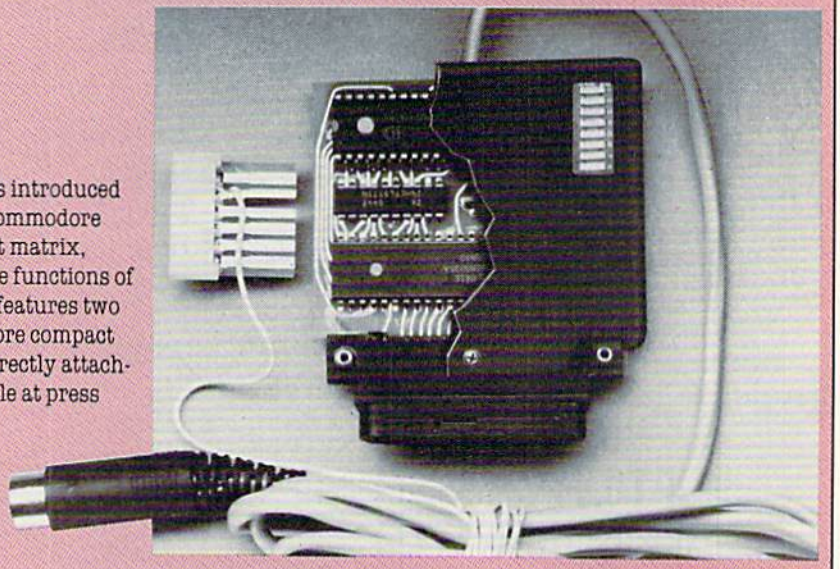
Disk Tree

The Disk Tree Company (404 Liberty Lane, Westerville, OH 43081) has released the Disk Tree, a plastic desk accessory that holds up to 20 floppy disks. Special tilt-out grooves hold each disk so dust is minimized. There are hand holes to lift and move or rotate the Disk Tree without touching the disks. The Tree is made of 14" x 6" x 4" transparent plastic and retails for $9.95.



Printer Interface

Cardco (300 S. Topeka, Wichita, KS 67202) has introduced G Wiz, a sophisticated interface which connects Commodore computers to virtually any Centronics printer (dot matrix, daisy wheel, or plotter). The G Wiz performs all the functions of Cardco's +G interface, but with greater speed. It features two character sets, open-access dip switches, and a more compact case, which eliminates the ribbon connector by directly attaching to the parallel port. Retail price was unavailable at press time.



Artificial Intelligence

TAB Books (Blue Ridge Summit, PA 17214) has released *Artificial Intelligence Projects for the Commodore 64* by Timothy O'Malley. Using programs designed to take advantage of the 64's unique memory and graphics capabilities, the author introduces such concepts as heuristics, language processing, pattern recognition, and robotics. Readers see how a computer decides what is the best move in a board game, what happens when the computer is programmed to carry on a conversation, and even how to train the computer to program itself. Most importantly, *Artificial Intelligence Projects for the Commodore 64* encourages users to write their own programming adventures. It is designed to sharpen problem-solving thought processes, increase BASIC programming knowledge, and provide ways to put the Commodore 64 to better use. The book retails for $17.95 hardbound and $12.45 paperback.

Software Protection Disks

Glenco Engineering (3920 Ridge Avenue, Arlington Heights, IL 60004) has introduced the *Safeguard 64* disk, a disk that provides highly sophisticated copy protection for the Commodore 64. *Safeguard 64* disks prevent unauthorized duplication of your software programs. The program to be protected is first encrypted using the Protect module provided. Each disk has a special magnetic fingerprint which must be found before the application program can be decrypted and allowed to run. The Safeguard series does not require a hardware add-on because the protection system is installed right on the disk. Backup copies of the program can be made, but they will run only on Safeguard disks. Prices are set by volume of disks desired.

Amateur Radio Contest Operator

Winner's Edge Software (2003 Sarazen Place, Reston, VA 22091) has announced *The Contester*, a fully integrated software package for the amateur radio contest operator. *The Contester* manages all of the "paperwork" functions involved in amateur radio contests. Designed by active contest operators, it logs and keeps track of up to 3000 contacts on up to six bands, alerting the operator to avoid duplicate contacts through a fast, sophisticated search algorithm. At a single keystroke command, *The Contester* also sends either preprogrammed messages or *ad hoc* texts in Morse code from 5 to over 50 words per minute. The computer connects to any amateur transceiver through a simple solid-state interface. The program retails for $39.95.

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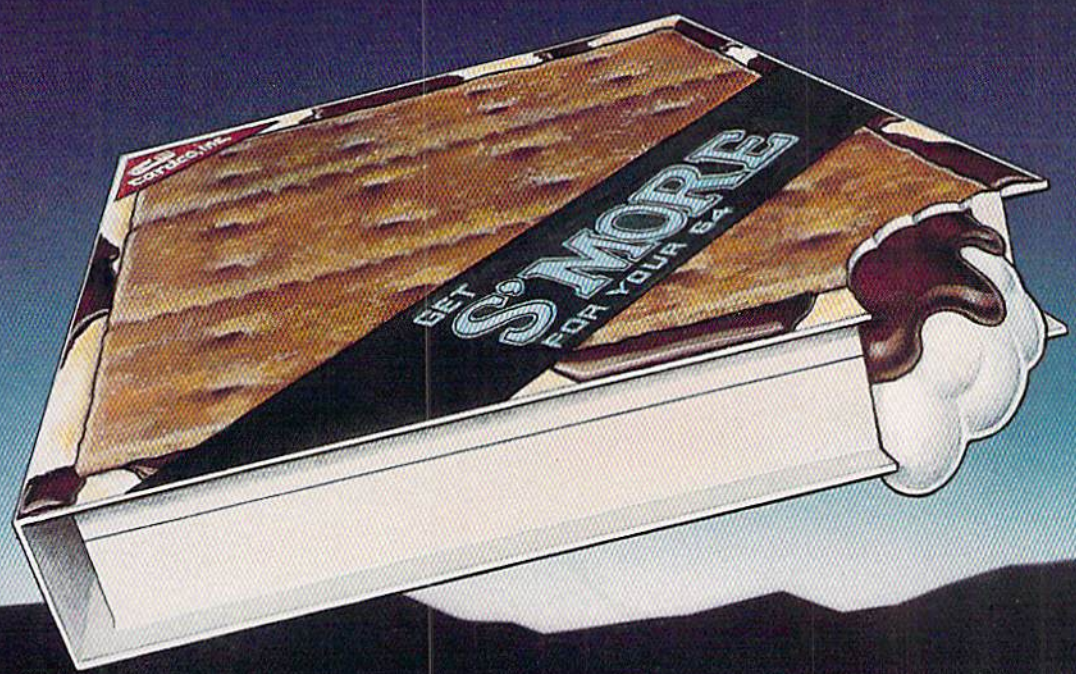

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cardco, inc.

The Wizards from the Land of Oz Have done it Again!

Circle Reader Service No. 5

CARDCO, Inc./300 S. Topeka/Wichita, KS 67202

AMAZING DAISY

NOW! FULL SIZE, FULL FEATURE, LETTER QUALITY AT ONLY $353

If you have been searching for a letter quality printer you probably found that the flood of claims and counterclaims were a real roadblock in your search. Not long ago we were in the same position. We tried to determine which daisy wheel printer had all the features anyone could want, but would also appeal to the cost conscious buyer. Recently several manufacturers introduced printers that had features we were seeking. After a thorough assessment we eliminated all but one which precisely met our qualifications.

THE RESULTS ARE IN

We found the printer which has all the features anyone could want. We've named it the Aprotek Daisy 1120, a real heavy-duty workhorse printing at 20 characters per second. The manufacturer is Olympic Co. Ltd., a highly respected Japanese firm.

FEATURES GALORE

This printer has it all. To start with, it has a front control panel with indicators for Pitch Selection which allows for 10, 12, or 15 characters per inch (CPI) or Proportional Spacing. There is a Select (Online) button (with indicator) and a Line Feed button. You can also set Top-of-Form or Form Feed with the touch of the TOF button. Other front panel indicators include Power and Alarm.

To load a sheet of paper, simply place it in the feed slot and pull the paper bail lever. The paper feeds automatically to a 1 inch top margin and the carriage aligns to the selected left margin. In this manner, each page can have identical margins.

You can continue to use your Commodore while the Daisy 1120 is printing.

The built in 2K buffer allows a page or two of concurrent printing and use of your computer for the next job. To really take advantage of your printer's optional features, the automatic Cut Sheet Feeder eliminates tiresome paper handling. Also available is the adjustable Tractor Feed option. *Compare our option prices!*

Best of all the Daisy 1120 is quiet: only 57 dB-A (compare with an average of 62-65 dB-A for others).

COMPLETE COMPATIBILITY

The Daisy 1120 uses industry standard Diablo® compatible printwheels. Scores of typeface styles are available at most computer or stationary stores. You can pop in a 10, 12, 15 pitch or proportional printwheel and use paper as wide as 14". At 15 CPI you can print 165 columns—a must for spreadsheet programs.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges. Again universally available.

Not only is the hardware completely compatible, the control codes recognized by the Daisy 1120 are Diablo 630® compatible (industry standard). You can take advantage of all the great features of word processing packages and automatically use superscripts, subscripts, automatic underlining, bold-face (shadow printing) and doublestrike.

The printer has a set of rear switches which allow the use of standard ASCII as well as foreign character printwheels. Page length can be set to 8, 11, 12, or 15". The Daisy 1120 can also be switched to add automatic line feed if required.

THE BEST PART

When pricing a daisy wheel printer with all these features (if you could find one), you would expect to pay $600 or $700 dollars. The options would add much more, but our exhaustive research has paid off for you the Commodore user. We can now offer this printer for only **$353.** Order yours today!

NO RISK OFFER

Try the Daisy 1120 for 2 weeks. If you are not satisfied for ANY reason we will refund the full price—promptly. A full 1-year parts and labor warranty is included. Another indication of quality and reliability.

THE BOTTOM LINE

Aprotek Daisy 1120 (Order#1120) $353 w/standard Centronics parallel interface and 2K buffer.

Options

Auto Cut Sheet Feeder (#1110) $188

Tractor Feed (#1112) $77

Interface with cable for all Commodore (except PET) (#1105) $44

Ask about cables and interfaces for other computers.

Shipping is $11—UPS continental USA. If you are in a hurry, UPS Blue or Air Parcel Post (second day air) is $25. Canada, Alaska, Mexico and Hawaii are $30 (air). Other foreign is $60 (air). California residents add 6% tax. Prices are cash prices—VISA and M/C add 3% to total. We ship promptly on money orders, cashier's checks, and charge cards. Allow 14-day clearing for checks. No C.O.D.'s. Payment in US dollars only.

TO ORDER ONLY CALL TOLL FREE

(800) 962-5800 USA

(800) 962-3800 CALIF. (8-8 PST)

Or send payment to address below:

Be sure to include order numbers with all items.

Technical Information & Customer Service: (805) 987-2454 (8-5 PST)

Dealer Inquiries Invited

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Circle Reader Service No. 4

APROTEK

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