The Home User's Guide to Commodore Computing

RUN

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CANADA $3.50
A CWC/I Publication
April 1985

UNIQUE CREATIONS FOR YOUR COMMODORE

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Biorhythms
Celestial Swami

The Pros and Cons Of SIMONS' BASIC

LET IT SCROLL On Your C-64 and VIC-20

A Beginner's Guide to Assembly Language

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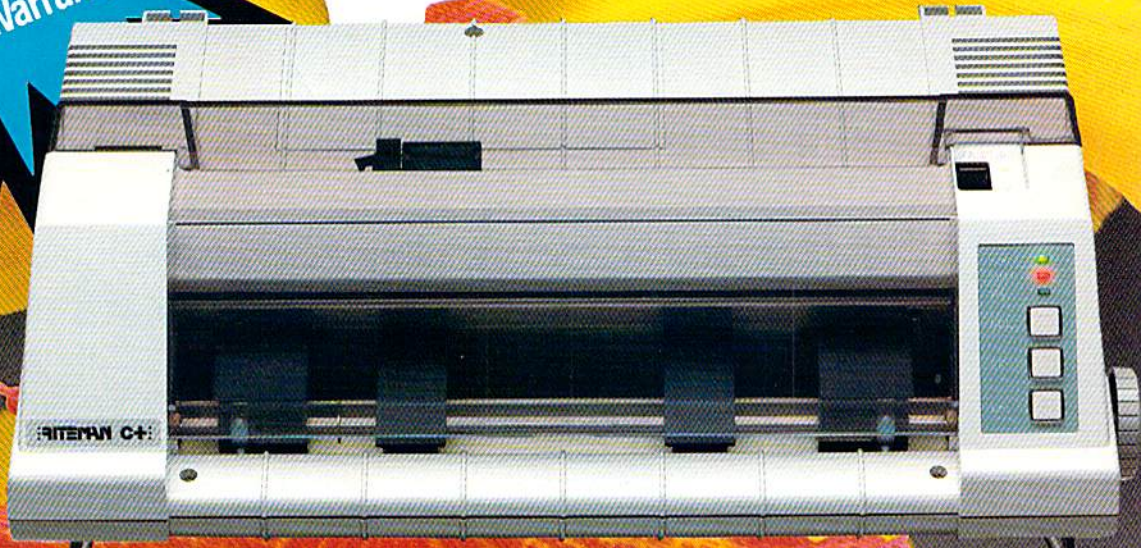

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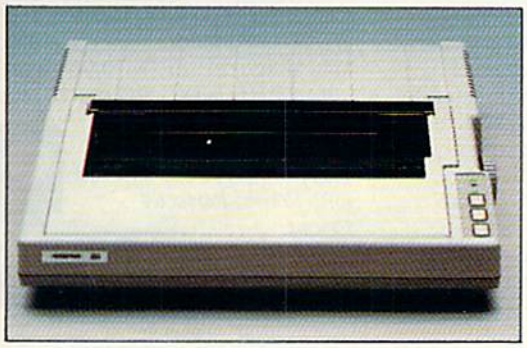
FEATURES	RITEMAN C+	ACTUAL PRINT	COMMODORE PRINTERS				
			MPS 801	MPS 802	MPS 803	VIC1525	VIC1526
PRINT SPEED (CPS)	105		50	60	60	50	60
BIDIRECTIONAL PRINT	YES		NO	YES	YES	NO	YES
(COLUMN WIDTH)							
40 CHARACTERS PER LINE	YES	40 CPL	YES	YES	YES	YES	YES
80 CHARACTERS PER LINE	YES	80 CPL	YES	YES	YES	YES	YES
66 CHARACTERS PER LINE	YES	66 CPL					
132 CHARACTERS PER LINE	YES	132 CPL					
(PAPER HANDLING)							
FRONT LOADING FOR EASY PAPER SETTINGS	YES						
BUILT-IN PRINTER STAND	YES						
PRINT ON POST CARDS	YES						
(WARRANTY)							
ONE-YEAR WARRANTY	YES						
(SOFTWARE COMMANDS)							
DOUBLE STRIKE	YES	DOUBLE STRIKE					
EMPHASIZED	YES	EMPHASIZED					
COMPRESSED	YES	COMPRESSED					
UNDERLINE	YES	UNDERLINE					
SUPER/SUBSCRIPTS	YES	SUPERSUBSCRIPTS					
ITALICS	YES	ITALICS					
DOUBLE DENSITY BIT IMAGE	YES	C=R					
(CHARACTERS)							
9X9 FONT	YES						
TRUE DISCENDERS	YES	abcgjpqyabc					
ITALICS	YES	ITALICS					
COMMODORE GRAPHICS	YES	♠♥♦♣					
(OTHER FEATURES)							
SINGLE DENSITY BIT IMAGE	YES	C=R					
EXPANDED	YES	EXPANDED	YES	NO	YES	YES	NO
REVERSE	YES	REVERSED	YES	YES	YES	YES	YES
			YES	YES	YES	YES	YES

NO

RITEMAN R64



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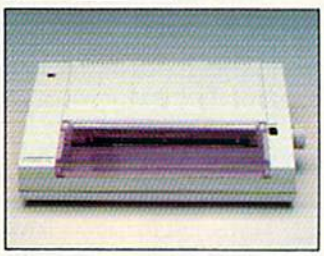

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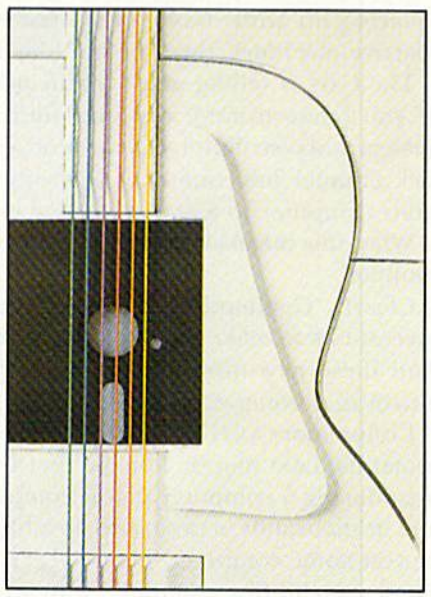

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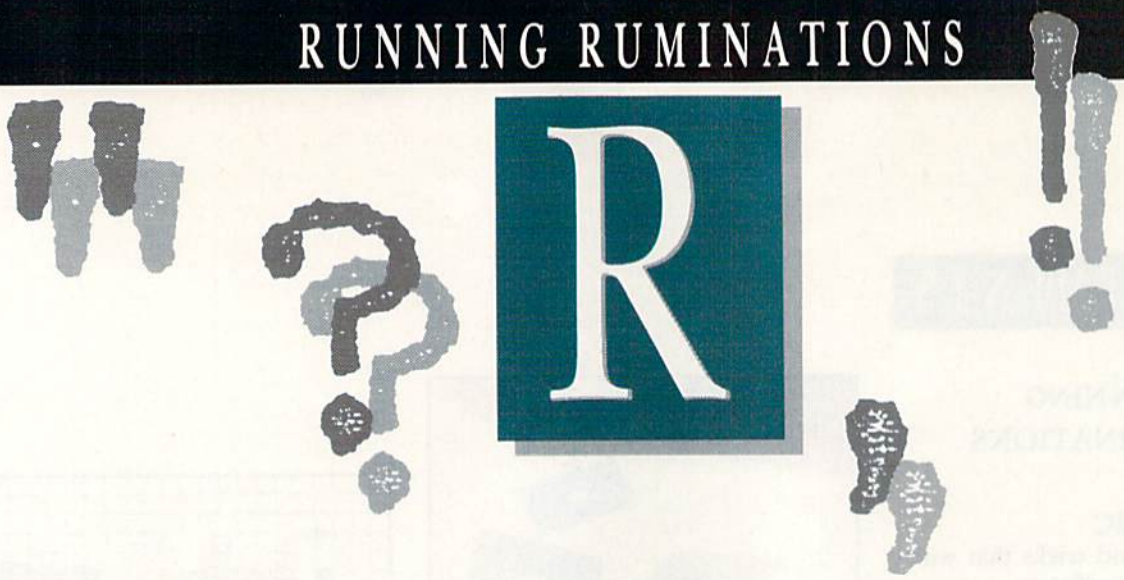

Byting and Fighting

Don't you just love price wars?

If you've been around the computing scene for more than two years, you've probably witnessed more than your share of skirmishes in the low-end home computer arena.

For example, Texas Instruments was soundly defeated when it pitted its contender, the TI 99/4A, against the spunky Commodore VIC-20 in late 1982. And Atari emerged bloodied and battered when it went against the same Commodore foe with its Atari 400 computer.

Now Commodore and Atari are at it again. They're squaring off with drastic price reductions for their respective machines, the C-64 and the 800XL.

The C-64 is selling at a bargain price of around $150 (if you scout around, you may find it for less at some dealers and distributors). Atari head, ex-Commodore boss Jack Tramiel, has countered by dropping the price of the Atari computer to $99.

What this means is good news for the home computer shopper.

Clearly, Commodore and Atari are selling off their inventories to make way for new entries into the market. And these new offerings are more powerful, more sophisticated home computers.

Commodore's C-128 is expected to make its appearance sometime next month. For the first time, Commodore is introducing a computer that is compatible with the C-64 and its thousands of programs. In addition, Commodore's newest home computer features 128K and a CP/M mode. These capabilities, combined with a low price of around $300, make the C-128 a purchase difficult to pass up.

This poses a dilemma for Commodore enthusiasts: Should you wait for the release of the C-128 or take advantage of the bargain-priced C-64? Whatever, don't wait too long. You'll soon be faced with another buying decision.

Commodore is scheduled to introduce an even more powerful home computer later this summer. Tentatively called the Amiga, this latest of the new machines will sell for a little over $1000 and feature graphics capability not found in computers costing two to three times as much.

You'll be reading more about the Amiga in upcoming issues.

RUN's GAMEPAK

RUN has planned something very special for all Commodore owners, particularly for those who enjoy playing quality games on the C-64.

It's called RUN's GAMEPAK and is our first ReRUN issue devoted entirely to one theme—games. This GAMEPAK is packed with 19 super games to run on your C-64. It features the best of *RUN*'s published games, as well as games that we have not yet published and may never have the chance to publish due to space limitations.

Newcomers to *RUN* will be pleased at this opportunity to share in some of our games from previous issues and to get a feel for the quality of programs that we offer.

This ReRUN issue holds a wide appeal for game players of all ages. You can choose from an impressive array of action-packed arcade games.

If you want an intellectual challenge, we also have several brain teasers and educational games to exercise your brain muscles.

Furthermore, we have included some old-time favorites—Tag, Shuffleboard and the Shell game—that have been played by families and friends for years before the advent of the computer.

Finally, we are pleased to present a superb adventure game—the best ever submitted to *RUN*—that's guaranteed to keep you on the edge of your computer chair.

Of course, all ReRUN programs are fully tested and eliminate the tedious job of entering program listings. Just load ReRUN into your C-64 and enjoy the fun.

RUN's GAMEPAK will be available in May. To order, simply call toll-free 1-800-258-5473 or contact Debbie Bourgault, ReRUN, 80 Pine Street, Peterborough, NH 03458.

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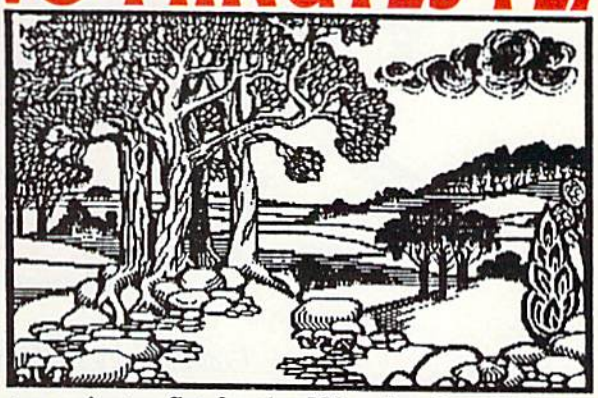

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Compiled by LOUIS F. SANDER

MAGIC is tricks, MAGIC is fun. MAGIC is doing what cannot be done.

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Every month, Magic brings you brief and useful computer tricks from around the world—tricks to make computing easier, more enjoyable or more exciting. We number our tricks in hex, the counting system of sorcerers and computerists.

Magic solicits your simple hardware ideas, short programs, useful programming techniques, little-known computer facts and similar items of interest. We look for new or recycled material that can be implemented with a minimum of time, effort or theoretical knowledge and that is of current value to Commodore computerists (Plus/4 and C-16 owners, too). We typically pay $10 for each trick accepted. Really super ones get $20 or more. Send your tricks to:

MAGIC
c/o Louis F. Sander
PO Box 101011
Pittsburgh, PA 15237

If you enclose a self-addressed stamped envelope, we'll send you a Trick Writer's Guide.

This month's Magic will be especially useful for typing in programs and working with disk drives. But no matter what your interest, our *juju* bag surely has something you can use.

$1C1 April Fool's program—When he's not looking, run this on a friend's VIC or C-64. Then get him to type a line or two, and watch the fun as he scrambles for his warranty.

```
10 POKE207,0:POKE204,0:WAIT198,1:GETA$:PRINT
   "{CTRL RVS OFF}"CHR$(ASC(A$)+1.1*RND(0));:GOTO 10
```

Don't forget the semicolon after the Print statement. Add to the fun by entering POKE808,225 (for the VIC, POKE808,100) before you run the program. (It disables the Stop, Restore and List commands.)

People have become famous by running this program at school or on machines displayed in stores.

Larson E. Rapp
Newington, CT

$1C2 Linefeed fix—Commodore computers are subject to an occasional but maddening malady, where the cursor refuses to linefeed when the return key is pressed. It will jump to the end of the current line, but will refuse to go any further. The problem usually arises when hardcopy printing is aborted by the stop key or some other non-standard means.

Pressing the shift key along with the return key will move the cursor to the start of the next screen line. Then, typing a letter or two and pressing the return key will cause a Syntax error, which will end the linefeed problem.

At this point, there is probably some garbage in your printer's buffer. Give it something unimportant to print, and the buffer will clear itself.

Beldare Lecone
Remulac, France

$1C3 SX-64 printer interface—As most owners know, the SX-64 has no cassette port from which to pick up +5 volts for the popular Cardco +G printer interface. Not so many people know that on most printers with a Centronics interface, pin 18 of the printer connector is a source of +5 volts. That is the case on my Panasonic KX-P1091 printer, and I took advantage of it by making an easy modification to my Cardco.

I opened up the Cardco +G, cut the white 5-volt power wire that went to the cassette connector and resoldered it to pin 18 of the printer connector. This arrangement has worked for over six months without any sort of problem. My Cardco warranty is probably void, but at least I'm able to use my printer.

T.V. Dinsmore
Knoxville, TN

$1C4 Magazine hacking—Whenever my magazines arrive, I go through each with a colored marker in hand, usually a translucent yellow one. I circle small

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items of special interest to me, such as interesting Magic tricks. I scan each article briefly, and if it appears to be of interest, I circle its listing in the Table of Contents. For advertising, I circle items I'm interested in, then put a line through their listings on the advertiser's page in the back. I also circle the number on the page of the ad itself so it stands out when I flip through. Later, I make up a card file on articles and so on. When my disk drive operates properly, I will set up disk files to replace the cards.

D.G. Munoz
Dania, FL

$1C5 Bookwork—After working with my system for several months, I found myself returning again and again to the same few pages and tables in my computer's reference guide. To make things easier, I copied my most frequently used pages and glued them to different-colored sheets of construction paper. Now I have a series of easy-to-find color-coded reference cards with all the sprite information, ASCII codes and other functional charts as needed. What a time saver it has been for me!

Mrs. Ruth A. Hicks
Oak Run, CA

$1C6 Magazine work—Every computer magazine has its own system of listing programs, and there's little standardization in the symbols they use for cursor and other special characters. You can make your life easier by copying the "how to type in listings" sections from each of your favorite magazines, then pasting them all onto an 8½- × 11-inch card. If you keep the card close by, you can use it as a handy reference when typing in programs.

Deb Sullivan
Pittsfield, MA

$1C7 Musical stitchery typing tip—As an aid in typing programs, my husband and I have combined equipment from two other hobbies, music and cross-stitch. A music stand allows us to easily adjust the height of our material. To keep our place while typing, we use the metal sheet and magnetized strips that are sold as place holders for cross-stitch patterns. With the metal sheet behind the page we're working on, we slide the magnetized strip under the lines being typed. One word of warning: The magnetized strips can be disastrous to disks and tapes, so keep them away from your magnetic media.

Barbara Eberly
Cullowhee, NC

$1C8 Program placekeeping—When typing in long programs, use a hi-liter marker to record your progress. These markers are available in transparent pastel colors in any stationery department. Every five lines or so, cross off the completed material with your marker. This is also a good method to use when checking for typing mistakes.

Ellen Pekar
Florence, MA

$1C9 Magazine magnifier—I went to a store where needlepoint and embroidery notions are sold, and I bought a line magnifier, made for use with sewing instructions. It works quite nicely in magnifying the program lines as I type in goodies from *RUN*.

Mildred Carroll
Rosedale, NY

$1CA Keyboard overlays—When using complex programs like Easy Script and Simons' Basic, the function keys, and usually others, have many hard-to-remember purposes. Cardboard overlays for your keyboard can make it easier to use these programs.

Get pieces of thin cardboard from a stationery store or shirt laundry, then measure the dimensions of your computer and its keyboard area. Cut the cardboard to fit your computer, then cut out places for the keyboard areas. When you put the overlay in place, your keys will be surrounded by cardboard on which you can write the instructions appropriate to your program. If you own several complex programs, it's easy to make an overlay for each.

Mary D. Brigito
Old Forge, NY

**$1CB Escape literature**—Many printers require the ASCII escape character, CHR$(27), to be sent as part of various control sequences. Commodore computers don't have an escape key, and there's nothing in the documentation to show how one can be rigged. Fortunately, the matter is easily resolved, since pressing {CTRL : } generates an escape character.

If the computer is in Quote mode, a reverse-field left bracket will come up on the screen, and when that character is printed, the escape code will be sent. If your printer is open to file #4, an escape can be sent to it by entering:

```
PRINT #4,"{CTRL : }"
```

Of course, {CTRL :} means to hold down the control key, then hit the colon.

Mrs. Deane Maddocks
Glenwood, IA

$1CC Easy GO testing—When testing a program that uses On...Go commands, or perhaps computed Goto's, it's useful to establish dummy lines as the targets for those commands, so you can get easy proof that the program is going where you want it to. Once you have that proof, you can replace the dummies with more interesting sections of code.

Continued on p. 106.

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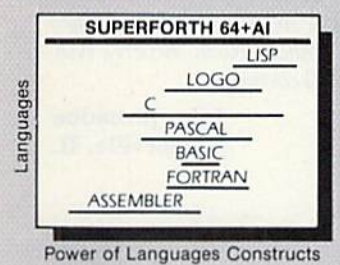

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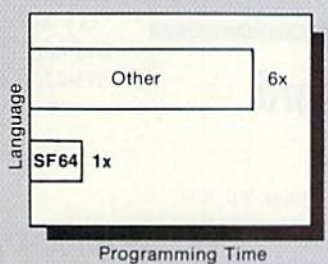

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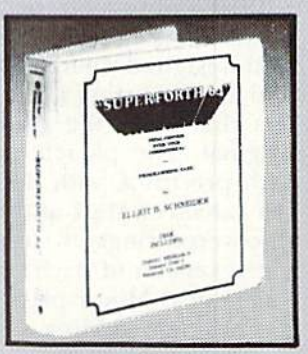

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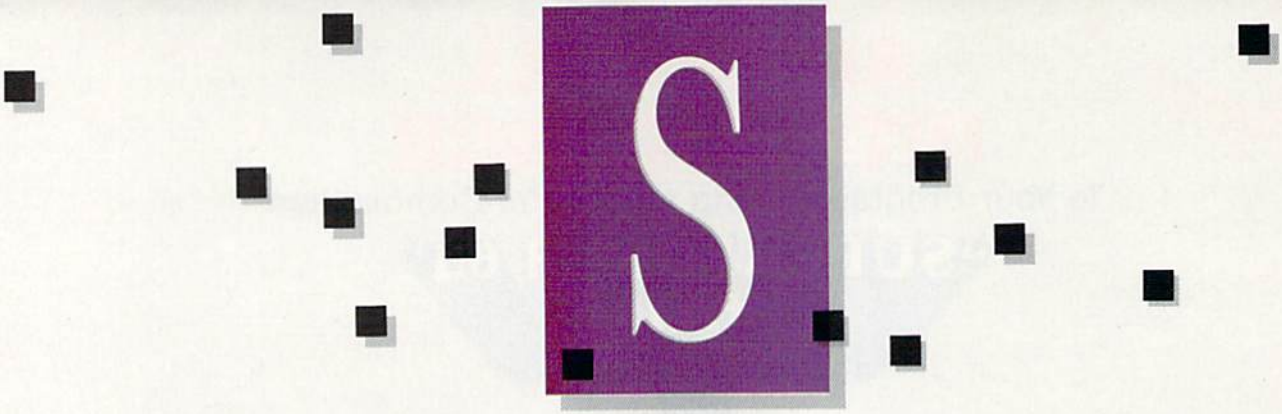

Compiled by SHAWN LAFLAMME

Gyruss

A

This C-64 Conversion From Parker Brothers Rivals the Arcade Original

You're 30 billion miles from Earth and two warps away from the planet Neptune. Your mission is to stop at each of the five worlds that separate you from Earth and destroy any enemy aircraft that you encounter. You must also beware of deadly meteors, run-away satellites and the hostile alien spacecraft that pursue you all the way to Earth.

Gyruss is an exceptionally well-written conversion of the arcade game. The graphics of Gyruss include well-designed spacecraft, meteors and an interesting space warping effect that rivals the graphics of the original. The planets are depicted with precision, with details such as the canals of Mars and the recently discovered rings of Uranus. An updated version of Bach's Toccata and Fugue in D Minor plays throughout the program, adding an interesting element to the game.

Gameplay consists of a series of warps and chance stages. During each warp, forty alien spacecraft dive and loop onto the screen in four squadrons. You must destroy as many airships as possible and avoid being hit by their return fire.

When you succeed in reaching a planet, chance stages begin. These are bonus screens that award 100 extra points for each ship that you destroy and a super 10,000-point bonus if you destroy all 40 of the aliens. These screens offer alien ships that don't fire back, but you have only seconds to destroy them before they disappear into the vastness of space.

There are two types of satellites in Gyruss. One resembles two blue molecules linked together by a connector. You must shoot the blue segments of the satellite for bonus points and destroy the connecting piece for double fire-power.

The second type of satellite consists of two white spheres connected by a long electromagnetic wave. You must shoot the white spheres of the satellite for extra points, without being destroyed by the deadly electromagnetic wave.

Meteors offer a very special challenge to the space pilot in Gyruss. These huge chunks of space rock cannot be destroyed, so you should avoid them as much as possible. The game is over when all of your spacecraft have been destroyed. If you do manage to complete your journey to Earth, your spaceship will reappear two warps from Neptune and the game will resume.

Gyruss combines excellent graphics with numerous sound effects and fantastic background music. The actual area that you control is quite small—only a one-inch circular band beginning an inch from the outside edge of the screen. Although it seems that you would have little control over your fate under these circumstances, this game actually plays quite well. I recommend Gyruss to anyone who appreciates an excellent version of a very successful arcade game. *(Parker Brothers, 50 Dunham Road, Beverly, MA 01915. C-64/$40 cartridge.)*

John Jermaine
Taylorville, IL

Report Card

A ***Superb!*** An exceptional program that outshines all others.

B ***Very Good.*** One of the better programs available in its category. A worthy addition to your software library.

C ***Good.*** Lives up to its billing. No hassles, headaches or disappointments here.

D ***Mediocre.*** There are some problems with this program. There are better on the market.

E ***Poor.*** Substandard, with many problems. Should be deepsixed!

NATO Commander

B

Command NATO Forces In a Confrontation With The Warsaw Pact

You have recently been sworn in as commander of the NATO forces deployed in West Germany. These troops consist of U.S., West

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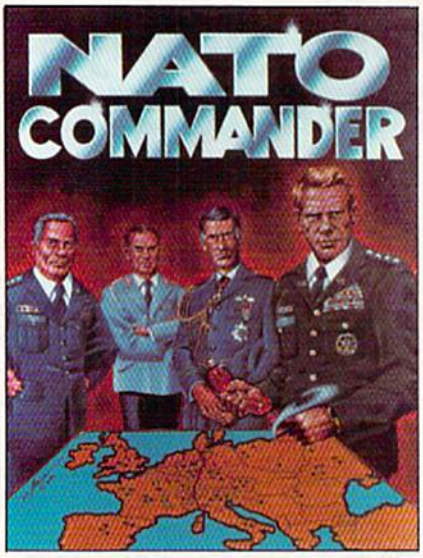

German, Dutch, British and Belgian infantry, armor and air forces. If war breaks out, you must block Warsaw Pact armies from overrunning Germany and western Europe. As the days pass, you receive news reports of growing tension between the east and west; everyone is preparing for a new war.

So begins NATO Commander, a strategy game played in simulated real time. You have a choice of four scenarios, which are minor variations of the main theme, and three difficulty levels. You always assume the role of NATO Commander and the computer plays the part of Warsaw Pact Commander.

The game is played on a vertically scrolling map of Germany, with symbols for towns, roads, rivers, mountains and forests. Eastern and Western units are displayed in different colors and each type of military unit is represented by a different symbol.

As night falls, the screen turns dark and the units are highlighted in color. At midnight on each day of combat, you receive a coded commander report in text if you correctly enter a supposedly secret code. (After the first day, the reports are automatic.)

Throughout the battle, radio messages flash across the screen to tell you which of your units have encountered the enemy or surrendered.

NATO Commander uses colorful map displays, but almost no sound. Map and unit symbols take some getting used to, and while the manual does explain unit symbols, it does not offer a table of map symbols.

Unfortunately, the program always distributes forces in the same way, no matter which game or level of difficulty you choose. The game is fairly easy to win at the lowest difficulty level and the added difficulty at the more advanced levels is rather unrealistic. Your casualty rates simply go up and you are forced to use your air force to suppress the enemy's air force rather than to support your ground forces.

Perhaps the most outstanding feature of NATO Commander is that it really gives you the feeling of being a senior military commander in a rapidly changing and frequently deteriorating military situation. Have you ever wondered why a general would consent to unleashing chemical or nuclear war? NATO Commander might give you a few answers. It is one of a new breed of games that combines the challenge of a thinker's strategy game with the excitement of an arcade game. *(MicroProse Software, 10616 Beaver Dam Road, Hunt Valley, MD 21030. C-64/$35 disk, tape.)*

Jerome Beck
Glendora, CA

Financial Cookbook

B

A Collection of Recipes for Better Financial Management

Money, and how to manage it effectively, is what Financial Cookbook is all about. Do you have a clear idea of what you're actually paying in interest on a loan, or the financial impact of inflation? If you're interested in where your money goes or how it is being utilized, then Financial Cookbook should fill your needs.

Many people are intimidated by the idea of high finance, principal vs. interest, variable-rate mortgages, IRAs, leasing vs. buying and so on. You would be surprised to learn what you're actually paying to rent someone else's money. The challenge in producing this program was to make it highly flexible, yet simple to use. It succeeds gloriously on both counts.

Here are a few examples of what's on the menu (or recipe) index: Understanding Your Marginal Tax Rate, Single Savings Deposits, Long Term Investments, Saving Money with IRAs, Mortgage Schedule (Yearly) and Buying or Renting a Home. It's quite an impressive recipe collection!

For example, if you are considering a home mortgage, select the Yearly Mortgage Schedule recipe. You input the amount of the loan, the interest rate percentage and the term of the loan. That's all there is to it. The results will come up on the screen, and if you scroll down the table, you can see how much of your payment will go toward interest and principal each year. All the menu options are equally simple. It's like having your own private accountant or investment planner right there giving you custom-tailored projections (but without the high fees).

Before you make that major investment or financial commitment, your money will be well spent to first get a copy of Financial Cookbook so that you can explore all of your options. I highly recommend it! *(Electronic Arts, 2755 Campus Drive, San Mateo, CA 94401. C-64/$40 disk.)*

Tom Benford
Bricktown, NJ

Exodus: Ultima III

A

Battle the Evil Exodus In Your Quest to Save the Land of Sosaria

First came the evil wizard Mondain, then his cunning apprentice Minax. After tremendous struggles and heroic sacrifices, both were duly defeated and overthrown. But the omens indicate that a far greater evil, known only as Exodus, has arisen to vent his fury upon the land of Sosaria.

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550CD from Seikosha, a division of Seiko (manufacturers of everything from wrist watches to space hardware). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550CD has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550CD outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking ***quality*** printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your Commodore!

Features That Won't Quit

With the GP-550CD your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy software commands right from your keyboard. All fonts have true descenders.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word making reading easier and faster. This is only one example of the careful planning put into the GP-550CD.

Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) to make the words stand out. Or, if you wish to be even more emphatic, underline the words. Or do both. You may also wish to "headline" a title. Each basic font has a corresponding elongated (double-wide) version. You can combine any of these modes to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line.

You can now do virtually any line spacing you want. You may select 6, 8, 7½ or 12 lines per inch. PLUS you have variable line spacing of 1.2 lines per inch to infinity (no space at all) and ***97*** other software selectable settings in between. You control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and . . . VOILA! The letter now fits on one page.

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4½ to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, anything you choose. Any size under 10" in width. Multiple copies? **Absolutely!** Put forms or individual sheets with carbons (up to 3 deep), and the last copy will be as readable as the first. Spread sheets with many columns? **Of course!** Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" page.

Consistent Print Quality

Most printers have a continuous loop ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade after a while. To keep the printers' output looking consistently dark, the ribbons must be changed more often than is healthy for the pocketbook. The GP-550CD solves this problem completely by using a replaceable, inexpensive ink cassette which is separately replaceable from the actual ribbon. It keeps the ribbon loaded with ink at all times. You only replace the ribbon when it truly wears out, not when it starts to run low on ink. Just another example of the superb engineering applied to the GP-550CD. (When you finally do wear out your ribbon, replacement cost is only $10.95. Ink cassette replacement cost is only $5.95, both postpaid.)

The Best Part

When shopping for a quality printer with all these features, you could expect to pay around $500 or more. *Not any more!* We have done our homework. You don't have to worry about interfaces or cables. Everything is included. We are now able to sell this fantastic printer for **only $259.95!** The GP-550CD is built especially for the Commodore 64, VIC-20, Plus 4 and C-16. All Commodore graphics are included. This printer does everything the Commodore printers do but has more features. **You need absolutely nothing else to start printing–just add paper.** We also have specific models for other computers. Call for details.

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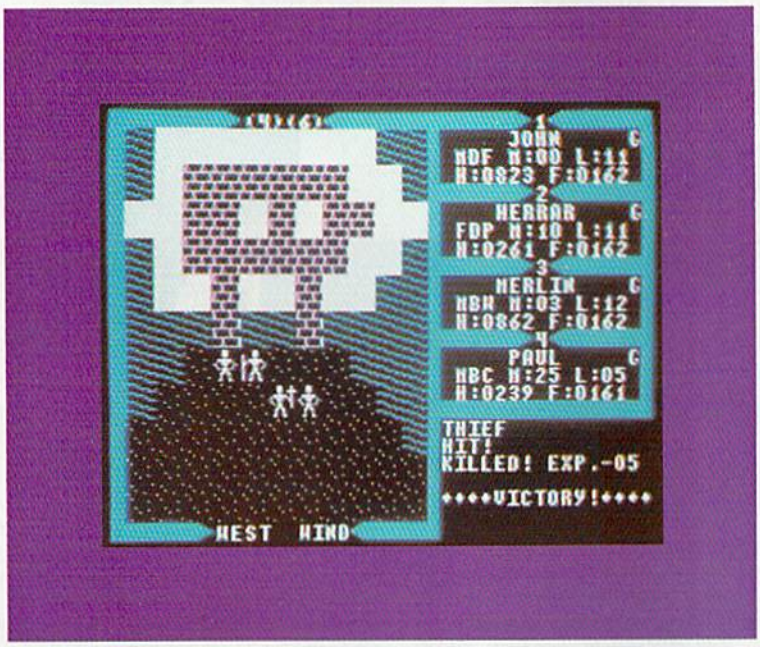

This is the setting for Ultima III, the third in the extremely popular Ultima series. The game includes a two-sided disk, a cloth map of Sosaria, two books of spells, a rule book and a reference card. No joystick is needed.

The basic premise is straightforward: You have been enlisted by Lord British to free his realm from the influence of Exodus. Accomplishing this task will take you across the breadth of Sosaria and its neighboring seas, through forests, towns and dungeons. You will have to overcome the attacks of roving monsters, garner treasure and important magical items, solve puzzles and interpret clues.

You create your own characters, with a choice of five races and eleven professions that offer a wide variety of characteristics and abilities. You may then form your adventuring party, which may include up to four characters.

The true magic of Ultima III lies in the graphics. Every game sequence is animated and in superb color. In towns, the characters stroll along cobblestone streets past dancing jesters and other assorted townspeople going about their business. The screen limits your vision to what your characters can actually see; thus, mountains and buildings block your sight so that you do not know what awaits you on the other side until your characters actually venture there. The game even contains a musical score that changes according to location.

The dungeons are displayed three-dimensionally, and this is one drawback to the game. The monsters in the dungeons do not appear on screen until you actually encounter them, so you have no opportunity to flee or somehow avoid the creatures.

Combat takes place on a special battle screen in real time, and each character can act individually. To survive and prosper in the world of Ultima III, you must quickly learn how to use your own particular strengths to your advantage in battle.

Combat is always to the death, which is another drawback of Ultima III. Characters are often forced to fight—an option to withdraw from combat after a certain amount of time would be a good alternative and would help extend the lifespan of many inexperienced or weakened characters.

In Ultima III, you will quickly learn that the game gives very little away and you must really work for your rewards. A word of caution may be helpful: Things are often not quite as they appear to be. Even the benign Lord British has his dark side.

Ultima III combines the mystery and problem-solving challenges of text adventures with arcade action. Until Ultima IV or something comparable comes along, Ultima III will remain the best on the market. *(Origin Systems, Inc., PO Box 99, 1545 Osgood St. #7, North Andover, MA 01845. C-64/$34.95 disk.)*

Jeff Seiken
Potomac, MD

Blue Moon

C

Five Screens of Arcade Action Highlight This British Import

Merlin Software's Blue Moon is a fast action British import for the C-64, available in the U.S. from 3R Import and Export Corp.

Blue Moon combines many challenges that should look familiar if you've spent any time in an arcade. There are five distinctly different screens, all of which require joystick mastery to survive.

As the pilot of an intergalactic spacecraft, your mission is to rescue a sister ship and her crew who are being held captive on a hostile planet and return with them to the Blue Moon.

You must begin your journey back to the Blue Moon by connecting the two modules of your spacecraft. This maneuver requires absolute precision; the slightest slip of the stick will destroy your ship.

The next three screens will give your trigger finger an exhausting workout. A comet storm is the first hazard you'll encounter. The comets streak across the top of your screen and occasionally plummet toward your spacecraft at the bottom. If you can survive the storm, the Blue Bouncers will harass you next. These nasty little aliens bounce across the screen in dizzying patterns, making the comet storm look serene in comparison.

The deadly Tecom Man is your final nemesis. Drifting slowly across the top of the screen, he releases droids and large yellow eggs, which

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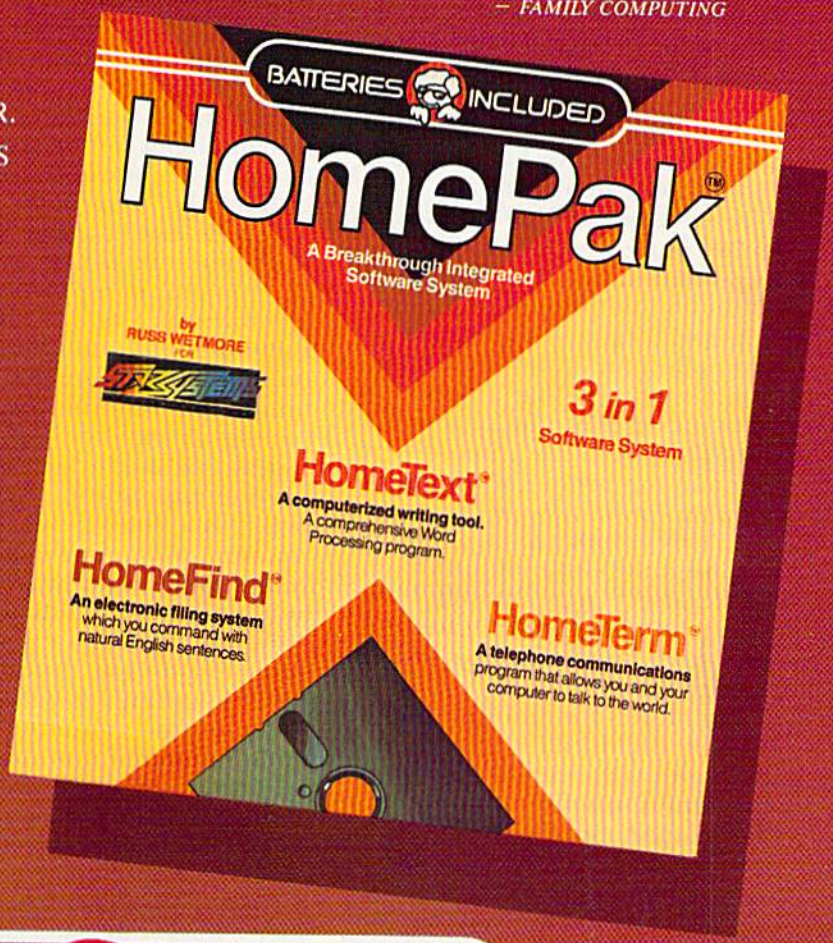
And it's easy to use the three programs together. For example, in the "Merge" mode, you can take data stored in HOMEFIND and print letters and labels using **HOMETEXT**. Or, use **HOMETEXT** to write reports based on information you've called up via **HOMETERM**.



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fall toward your ship. Bell birds hatch from the eggs and attack you with plasma bombs. There's little room to breathe in this cluttered screen, and you'll have to clear it completely before you can move on toward home.

Your final task is to land safely on the Blue Moon. As in the first screen, there's no margin for error as you maneuver to one of three possible landing sites. When you've landed safely, the Union Jack is raised triumphantly over the Blue Moon.

The pace is fast and furious on the easiest level; on the higher levels, it's an absolute frenzy. In fact, Blue Moon could probably be used as a quality control test for joysticks.

The game is simple and straightforward. There's no manual—everything you need to know is on the back of the package. However, Blue Moon lacks some of the features found in other C-64 games of this type: There's no two-player option and no way to save high scores or pause a game in progress.

The scenario of Blue Moon as described in the game's introduction is rather misleading. There's no hostile planet and no sister ship to rescue. The game begins with your journey back to the Blue Moon; you're simply asked to imagine that a rescue has taken place. Also, in screens two through four, your spacecraft remains at the bottom of the screen, allowing for horizontal movement only. This technique, while effective in some game scenarios, fails to create the effect of traveling. Blue Moon is a good shoot-'em-up game, but it's a poor simulation of a journey through space.

Blue Moon's fast action and simple concept could make it a popular game with younger players. The arcade-quality graphics are appealing and colorful, and the action is complemented by entertaining sound effects and music.

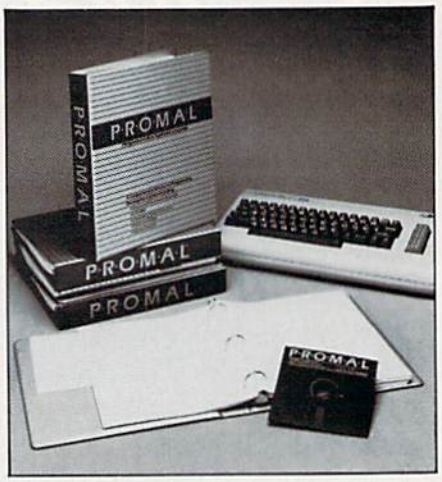
If you're an arcade enthusiast, you won't find anything new or unusual in this game. But if fast-paced action is what you crave, then Blue Moon won't disappoint you. *(3R Import and Export Corp., 731 James St., Suite 405, Syracuse, NY 13203. C-64/$19.95 disk or tape.)*

Shawn Laflamme
***RUN* staff**

Promal

B

A Fast and Efficient Programming Development System



Promal is a new programming development system for the C-64. Version 1.0 of Promal comes with an executive that replaces Commodore's Basic interpreter. The executive has 23 commands and facilities that allow you to load and execute programs, manage files and disks and display and modify memory.

One powerful feature of Promal is its ability to redirect input and output. A program that normally outputs data to the screen can have its output redirected to a file or device by using the > operator. In the same manner, input can be taken from a file or device instead of the keyboard by using the < operator.

The Promal language is a structured language similar in syntax to C or Pascal. It supports high-level constructs such as If...Then...Else and Repeat...Until. Procedures and functions are supported, and a library of 43 machine language subroutines is supplied. These library routines are used to handle I/O, manage files, and perform string operations, data conversions and other assorted tasks. Arguments can be passed to the main program as well as to procedures and functions.

Promal supplies a full-screen text editor to assist you in creating source files. I found the Promal editor to be very powerful, with many useful features. The meaning of each function key is conveniently displayed on the bottom of the screen, along with the current line number and editor mode.

The Promal compiler is a very fast, one-pass compiler. It takes a Promal source file as input and generates an object file as output. This object file consists of a very compact pseudo-code (p-code) that averages six bytes per source statement. You can compile to or from disk or memory.

If the compiler encounters a Syntax error, the process stops, the appropriate error message is displayed and you will have the option to edit the source file. After a successful compilation, a sign-off message appears, displaying the number of lines compiled and the number of bytes produced.

To execute your compiled program, you simply type in the name of the program and the required arguments. The executive will search for the program in memory and execute it. If not found in memory, the executive will check for the program on disk, load it and begin execution.

I have compared Promal with other languages and compilers and my results were consistent with the company's claim that Promal is 70% to 2000% faster than any other language available for the C-64.

On the whole, I'm very impressed with the Promal package. The programming environment is friendly and a welcome change from Basic. The programs are compiled and executed very quickly. The thorough documentation consists of a 200-page manual, which is divided into three parts: a tutorial, a user guide and a language manual.

Promal does have some limitations. The language does not support multi-dimensional arrays, nor does it allow you to define records or structures. Also, a library of math functions should have been included.

Taking all things into account, Promal would be a powerful enhancement to your programming capabilities. *(Systems Management Associates, 3700 Computer Drive, Dept. MP-1, Raleigh, NC 27609. C-64/$49.99 disk.)*

Edward Rowe
Randolph, NJ

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But if you're really serious about programming, the *1541 FLASH!* is a gold mine. The manual will show you how to write software allowing data transfer to and from the 1541 disk drive at speeds up to *10 times* the normal.

For programs that usually load with a " '*',8,1" command, just hit Shift/Run-Stop. A spreadsheet program like BUSICALC 3 then loads in about 25 seconds.

The *1541 FLASH!* even adds 21 extra commands for the Commodore 64 user. Some of these include editing, programming and loading commands, as well as "DOS Wedge" commands. You can ignore all these commands, though, and just enjoy the rapid disk operations.

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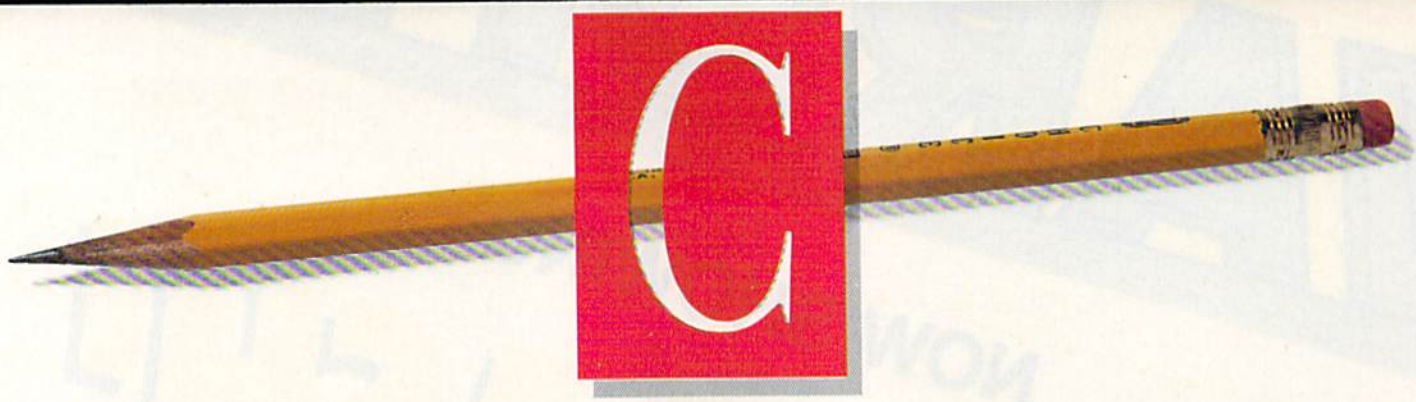


CHRISTINE ADAMEC

This month, RUN*'s bimonthly column on educational software focuses on some programs for the unexpanded VIC-20.*

Before I describe several good educational programs for the VIC-20, I'd like to share a concern expressed by a reader, Mason Caldwell, of Chesapeake, Virginia.

Caldwell wishes that he could see a program run before buying it for his child, and says of a recent experience, "I could not try the programs for my son, and the sales people were largely unfamiliar with the software that they had on their shelves." He wonders if CompuServe or another computer service could offer short demos of programs, and he compares such a service to music videos shown on TV. He adds, "The influence of music videos...on record sales would seem to indicate that a visual representation of a product would be a strong selling point."

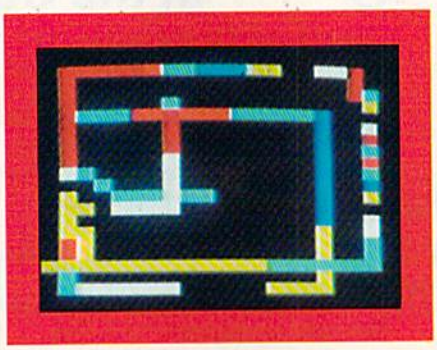
Your point is well taken, Caldwell. Apparently, several software manufacturers agree, because they are beginning to include short demo programs with their software. It may be a while before we see this done on a large scale, but when it does happen, computerists will have a chance to preview programs before buying them.

Now, about the VIC's educational programs. There aren't many such programs available, since most companies are concentrating heavily on the C-64, but here are a few enjoyable ones to consider. (All of them run on the unexpanded VIC.)

Think Twice

This program from Academy Software includes Memory Fun and Flashcard Quiz. Memory Fun is an entertaining game similar to the old television game, Concentration. Your child may play alone or with a friend. The computer directs your child to type in his or her name, and your child must choose either designs, pictures or words. (Words are three-letter ones, like cat and man.)

Memory tester from Academy Software.



Springboard's Draw program for preschoolers.

A gameboard appears on the screen, composed of every letter of the alphabet and numbers 1–4. Under each "tile" is a picture and a word, and the child must find as many pairs as possible.

Overall, Memory Fun is a game that encourages your child to concentrate and think, and my children enjoyed it. They were too young, however, to appreciate Flashcard Quiz. This is a program designed for drill and practice, and it includes a datafile of state capitals for all 50 states. Your child can drill himself on either states or capitals. The computer registers errors and you can work on those troublesome ones even we adults tend to forget. You can also input your own datafiles using the manual instructions. *(Academy Software, PO Box 9403, San Rafael, CA 94912; $16.95, cassette.)*

Early Games for Young Children

This program from Springboard Software is composed of nine games for preschoolers. Begin with Draw, a good motivator. Your child uses the keyboard to create colorful pictures (assuming you've got a color monitor). To change colors, the child presses the space bar.

Next is Numbers. A one-digit number appears on your screen, and the child locates it on the keyboard and types it in. Letters is a similar game, in which your child finds the letter on the keyboard matching the one displayed on the screen.

Count displays brightly colored blocks—Johnny finds the number on the keyboard corresponding to the number of shapes on the screen. The game Add reveals several blocks, the plus symbol and more blocks. How many? Count them up and type in the number. (The game Subtract is basically the same format.)

One popular game is Names. You'll type in your child's name, then the computer will ask the child to type it in. When the child does, each letter is displayed one at a time, in huge graphics that cover the entire screen. A real ego-booster.

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Computer Tutor

The last game is Compare Shapes. Four shapes are shown, three are the same and one is different. Each shape has a number underneath, and your child's job is to find the different shape and type in that number.

Early Games for Young Children may sound simplistic, but just remember: What entertains and teaches a four-year-old is vastly different from what amuses or educates a 30-year-old adult. (Usually.) *(Springboard Software, Inc., 7807 Creekridge Circle, Minneapolis, MN 55435, 800-328-1223, $29.95, cassette; unexpanded version with version for 16K memory expander on other side of tape.)*

Climb Time

Climb Time from Integrity Software helps children learn or sharpen their addition and subtraction skills. A problem is depicted, let's say it's 2+3. Two little blue men then run to stand next to the 2, and three little red men run to stand next to the 3 (with sound accompanying them as they run). As a result, your child receives both pictorial and numerical symbols of what 2 and 3 really mean.

To change to subtraction, press the f1 key. The men still run over to the problem, but subtracted ones disappear.

On the left-hand side of the screen is a ladder with a man at the bottom. If the child answers correctly, the man climbs up a rung. If the child answers incorrectly, he or she will get the same problem, complete with running men, until a correct answer is given. Once the man climbs to the top of his ladder, he'll jump up and down to display his joy, then move over to the top of the screen. The child then gets another little man and starts all over again. There's also a slow-moving turtle on the upper screen. You'll have until he reaches the right side to answer the problems that push your men up that ladder of success. *(Integrity Software, PO Box 29, Bristol, VT 05443; $17.95, cassette.)*

In the Chips

A far more complex program for your teenagers (and you, too!) is In the Chips by Creative Software. It's a challenging business game in which you try to make money by selling software.

You pick out five programs to sell,

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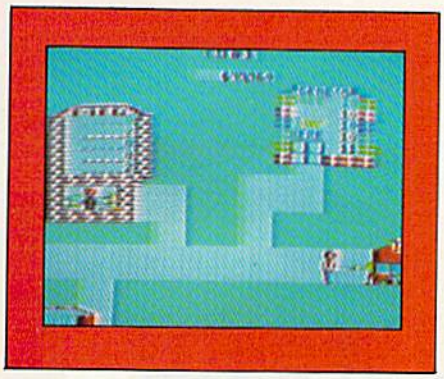

In the black with Creative Software's In the Chips.

how many units of each to make, how much money to spend on advertising and what price to charge for your product. Then you go home and find out how much money you've made! (Or, alas, lost!) This program stimulates that gray matter, which controls logical decision making.

You'll begin the game by deciding whether to play against the computer or a human opponent. (I recommend you learn on another person.) Each of you begins with $100,000, which you'll see on your company's financial statement. (No, you don't need an MBA to understand it.)

Next, you'll see your little man walking down a sidewalk, and you'll move him with your joystick to the appropriate buildings. You select which programs to sell, from Astro to Zork, by moving him to research and development. Manufacturing is next, so you'll scoot him on over to that building. (As you manufacture, you'll see a block display of each product in your warehouse.) How much should you charge for each product (with a minimum of $10 each)? What about advertising—how much should you spend? (I liked the hand that appeared as my man paid for his advertising.)

At the top of your screen is displayed your remaining cash, and after each expenditure, you can watch your working capital decrease. Your basic goal: Make a profit. (No easy task.)

After the second quarter, you can compare how you did at various prices—maybe when you dropped the price of Zork from $16 to $14, your sales skyrocketed. Watch out: Your competitor may suddenly build up his inventory and slash prices!

In the Chips is an engrossing game that teaches you about profits and losses and how a business basically operates. You must find that optimal balance between inventory, prices and advertising to succeed and, thus, win this game. *(Creative Software, 230 East Caribbean Drive, Sunnyvale, CA 94089; $29.95, cartridge.)* R

Christine Adamec (1921 Ohio St. NE, Palm Bay, FL 32907) is a professional writer, with articles in McCall's, Graduating Engineer, In Business *and* RUN *to her credit. As the mother of two children, ages five and six—who frequently serve as her guinea pigs for testing—she has become particularly intrigued with the subject of children's software. She eagerly invites readers to send in their comments on this column's content.*

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Commodore Sundial

By HOWARD WITT

Telling time by the sun is an unusual application, but one ideally suited for your Commodore. This article tells you how to make a sundial, and the accompanying program gives you the necessary data.

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One of my childhood memories is of a large sundial on my neighbor's lawn. The sundial, mounted on a pedestal, was made of brass, with a traditional, round clock-like face and a slender pointer. As the sun passed overhead, the shadow of the pointer moved across the face, indicating the time of day.

While beautifully decorated and of fine workmanship, the sundial had one flaw. It kept very poor time. It was not uncommon to find a difference of 30 minutes between sundial time and clock time. I remember being disturbed by this. How could such a finely crafted instrument be so wrong?

When I grew up, I eventually learned why the sundial performed the way it did. As the seasons change, the sun passes higher or lower in the sky, affecting the position of the pointer's shadow. Also, since the earth does not orbit the sun in a perfect circle, the length of a solar day varies throughout the year.

To indicate time correctly, a sundial must accommodate these phenomena. In addition, it must be specifically prepared for the exact location where it is to be used.

Would it be possible to design an improved sundial, one that would maintain the charm and simplicity of the traditional style and still keep good time? Theoretically, this was possible. The large number of calculations required, however, discouraged pursuit of the idea.

When I bought my VIC-20, my interest in the sundial rekindled. With its standard 5K memory and Basic interpreter, the VIC-20 proved equal to

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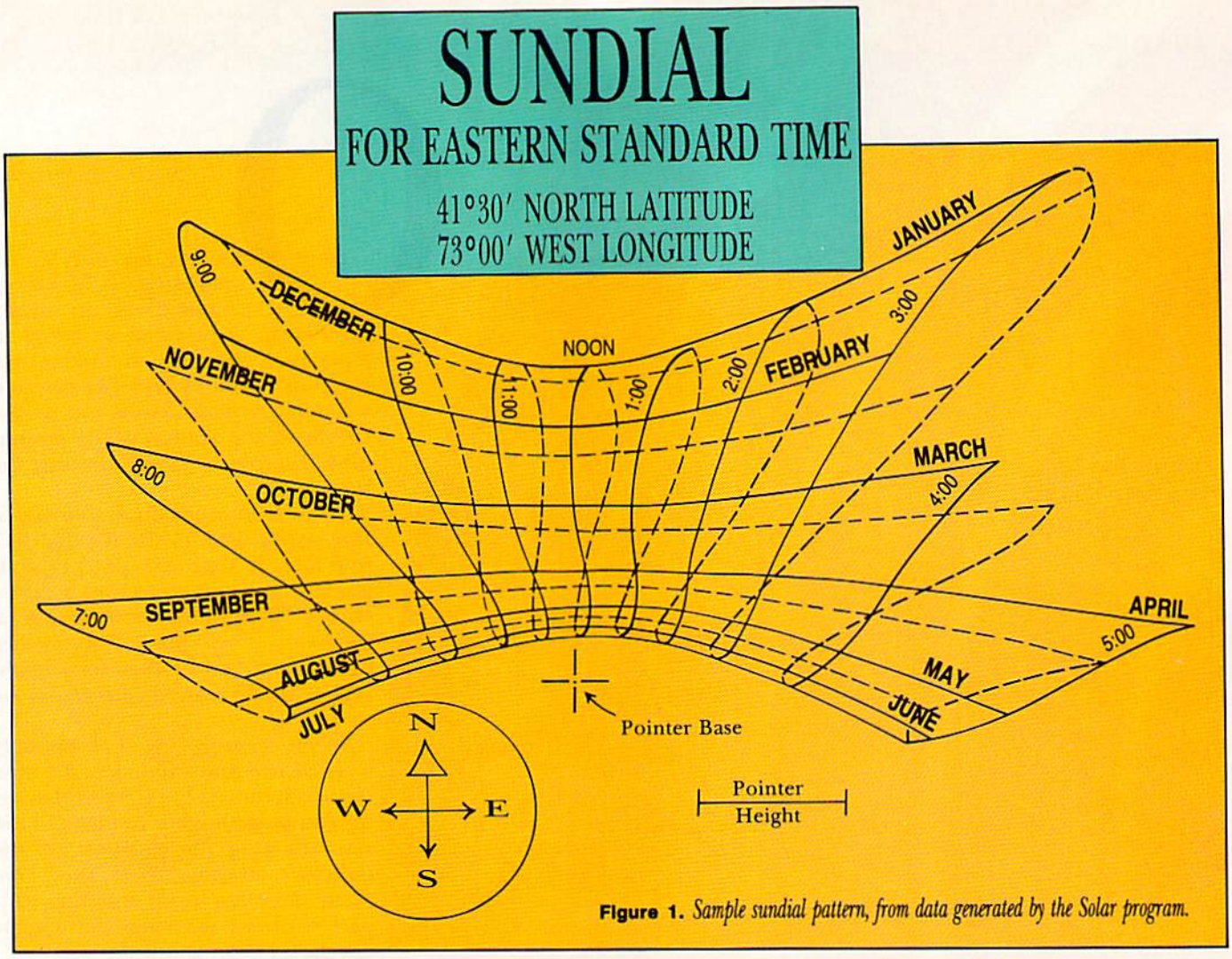

Figure 1. *Sample sundial pattern, from data generated by the Solar program.*

contending with the two fundamental problems of sundial design: keeping track of the sun's apparent position throughout the year and computing the length and direction of the pointer's shadow.

The Solar program was prepared to handle all the necessary calculations and to serve as an aid to designing an improved sundial, which is, after all, a solar clock. The Solar program uses straightforward, standard Basic and will run on the C-64, Plus/4 and C-16 as well as the VIC-20 with or without expansion.

How It Works

The program (see Listing 1) works in the following way. Your sundial is a flat surface placed horizontally on the ground, with a single pointer extending straight up. You specify a time of day, a month and the sundial's exact geographic location. (The Solar program assumes north latitudes and west longitudes.)

The computer then tells you whether the sun is above the horizon and, if so, where on the flat surface the tip of the pointer's shadow will appear. By running the program for various combinations of times and months, then plotting the computed shadow locations on the flat surface, you can prepare an accurate sundial pattern.

Following is a sample run of the Solar program. All input, which you must provide for the computer, is underlined.

```
RUN
LATITUDE (DEG,MIN)      ? 41,30
LONGITUDE (DEG,MIN)     ? 73,00
G.M.T. (HOUR,MIN)       ? 14,30
MONTH (1 TO 12)         ? 8

SHADOW APPEARS,
POSITION OF END IS:
WEST          .742973688
NORTH         .348427809
```

The latitude and longitude indicate the location of the sundial. The above coordinates are for my home in Connecticut. You can find the latitude and longitude of any location by referring to an atlas or road map.

"G.M.T." stands for Greenwich Mean Time, the international time standard. Twenty-four hour notation is used, hence 14:30 is 2:30 PM in Greenwich, England. Converting to local time, this is 9:30 AM Eastern Standard Time, or 10:30 AM Eastern Daylight Time.

When making a sundial, you must use the correct time zone and, for most parts of the country, select either Standard Time or Daylight Saving Time. Conversion from G.M.T. to local time is done as follows.

Eastern Daylight Time—subtract 4 hours
Eastern Standard Time—subtract 5 hours
Central Daylight Time—subtract 5 hours
Central Standard Time—subtract 6 hours
Mountain Daylight Time—subtract 6 hours
Mountain Standard Time—subtract 7 hours
Pacific Daylight Time—subtract 7 hours
Pacific Standard Time—subtract 8 hours

The Solar program assumes that a year comprises 12 months of equal duration, which is sufficiently true for the intended purpose. Specifying month number 8 means the program will use August 1, or thereabouts.

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Listing 1. *The Solar program.*

```
5 PRINT"{SHFT CLR}{3 CRSR DNs}"
1Ø INPUT "LATITUDE (DEG,MIN){2 SPACEs}";D,M
2Ø LET T=(D+M/6Ø)*.Ø174532
3Ø LET A=T
4Ø INPUT "LONGITUDE (DEG,MIN) ";D,M
5Ø LET P=(D+M/6Ø)*.Ø174532
6Ø LET B=P
7Ø GOSUB 42Ø
8Ø LET U=X
9Ø LET V=Y
1ØØ LET W=Z
11Ø INPUT "G.M.T. (HOUR,MIN){3 SPACEs}";H,M
12Ø LET G=H+M/6Ø
13Ø INPUT "MONTH (1 TO 12){5 SPACEs}";M
14Ø LET M=(M-1)*.5235987
15Ø GOSUB 46Ø
16Ø GOSUB 42Ø
17Ø LET U=U-X
18Ø LET V=V-Y
19Ø LET W=W-Z
2ØØ LET D=SQR(U*U+V*V+W*W)/2
21Ø IF D<1/SQR(2) THEN GOTO 25Ø
22Ø PRINT
23Ø PRINT "NO SHADOW APPEARS"
24Ø GOTO 4ØØ
25Ø LET L=1/TAN(1.57Ø8-2*ATN(D/SQR(1-D*D)))
26Ø GOSUB 53Ø
27Ø LET C=Z/SQR(Y*Y+Z*Z)
28Ø LET I=SGN(Y)
29Ø LET P=B
3ØØ GOSUB 42Ø
31Ø GOSUB 53Ø
32Ø LET C=Z*C/SQR(Y*Y+Z*Z)
33Ø LET S=I*SQR(1-C*C)
34Ø PRINT
35Ø PRINT "SHADOW APPEARS,":PRINT"POSITION
    OF END IS:"
36Ø IF S>Ø THEN PRINT " EAST{3 SPACEs}";L*S
37Ø IF S<Ø THEN PRINT " WEST{3 SPACEs}";-L*
    S
38Ø IF C>Ø THEN PRINT " NORTH{2 SPACEs}";L*
    C
39Ø IF C<Ø THEN PRINT " SOUTH{2 SPACEs}";-L
    *C
4ØØ PRINT
41Ø GOTO 1Ø
42Ø LET X=COS(T)*COS(P)
43Ø LET Y=COS(T)*SIN(P)
44Ø LET Z=SIN(T)
45Ø RETURN
46Ø LET T=.ØØ663
47Ø LET P=(G-12)*.2617993
48Ø LET T=T-.4ØØØ3*COS(M)+.Ø6929*SIN(M)
49Ø LET P=P+.ØØ2Ø9*COS(M)-.Ø3211*SIN(M)
5ØØ LET T=T-.ØØ663*COS(2*M)+.ØØØ7*SIN(2*M)
51Ø LET P=P-.Ø1431*COS(2*M)-.Ø4189*SIN(2*M)
52Ø RETURN
53Ø LET Z=Z*COS(A)-(X*COS(B)+Y*SIN(B))*SIN(
    A)
54Ø LET Y=Y*COS(B)-X*SIN(B)
55Ø RETURN
56Ø END
```

Specifying month number 1 implies January 1; month number 2, February 1; and so on.

The output provided by the Solar program in the example above shows that the sun is indeed visible at the specified time and location. It also shows that if the pointer is a slender post extending one foot, for example, straight up from the flat face of the sundial, the tip of the shadow cast by the pointer would appear .74 feet west and .35 feet north of its base.

Other Uses

The Solar program could be run for other times and for other months to produce a pattern of marks showing the position of the pointer's shadow throughout the year. The sample sundial (Figure 1) is such a pattern, with lines connecting the same months and hours.

Note the arrow showing the position of the pointer's base, and the scale indicating its height. Note also the four directions: north, south, east and west.

To test the pattern, I placed the sundial outside on a flat, horizontal surface, then turned it around until the north arrow pointed to true north. (Since I used a magnetic compass to align the pattern, the appropriate variation was applied.) I made a pointer of the correct height from a toothpick stuck in a button. I positioned it over the base, pointing straight up. Then I waited to see what would happen.

It was a very satisfying experience to watch the thin shadow of the pointer move slowly across the sundial during the day, showing the correct time in nearly perfect synchronization with my wristwatch.

Ultimately, you could enlarge the sundial pattern and transfer it to a surface of metal, wood or stone, then mount it permanently on your lawn. There are endless possibilities for creativity. Why not turn the lawn north of your house into a giant sundial, using the top of the TV antenna as a pointer?

The sample sundial, of course, works only in the vicinity of my hometown. For other locations, the Solar program must be run to prepare different patterns. It is especially interesting to consider locations north of the arctic circle or near the equator.

If your computer is equipped with an automatic plotting device or high-resolution graphics, you may want to expand the program to produce complete patterns automatically.

You can also use the sundial as a practical application—as an aid in the design of energy-efficient homes or to answer questions such as, "How should an overhanging roof be placed so it admits light in the winter, but provides shade in the summer?"

Use your imagination and enjoy the program. R

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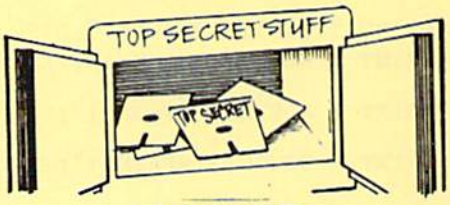

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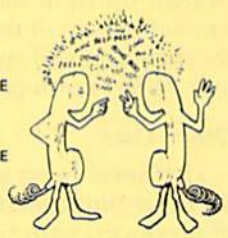

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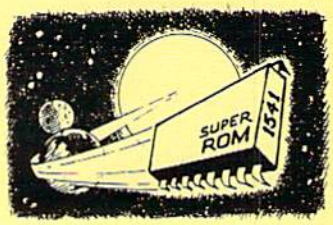

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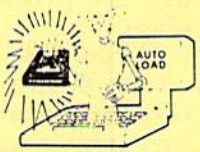

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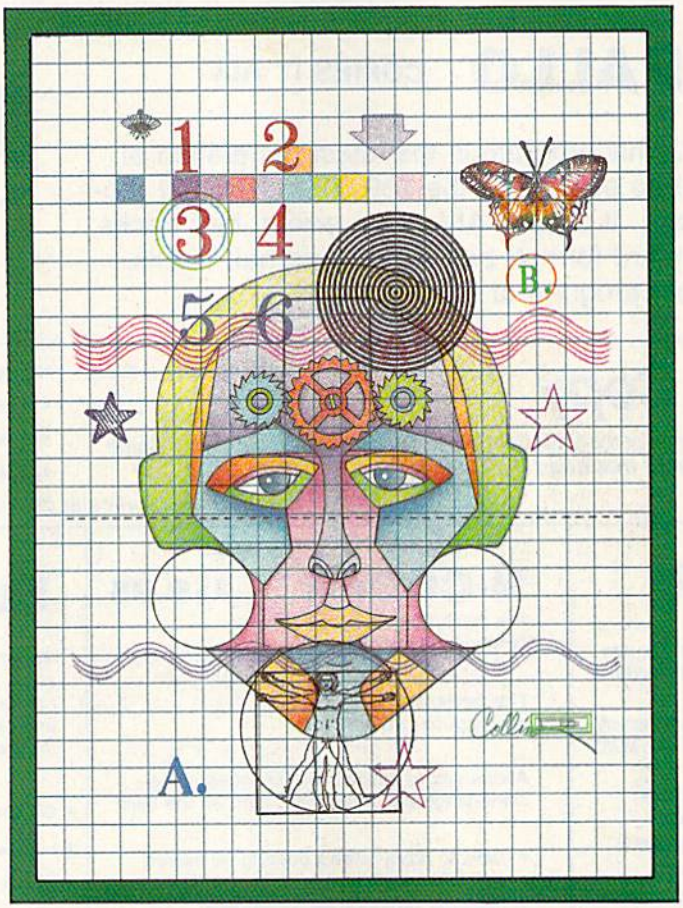
Charting Your Future

Biorhythms can tell you a lot about your state of being. This program lets you chart them.

By ALLAN E. WHEELER



DAN COLLINS

Biorhythms are rhythmic fluctuations in a physical organism that are related to and indicative of various biological processes.

Biorhythms are based on 23-, 28- and 33-day cycles that start with 0 at birth and initially proceed in a positive direction. This program calculates your daily position on each of the biorhythm curves for any desired month and year.

Vertical bar-graph representations of the physical, emotional and intellectual levels for each day are printed to the screen.

The lowest levels, considered to be the ebb-tide rest and recovery phase, are indicated by purple bars projecting to the left of the screen. The high levels are the full-tide active phases of the biorhythms and are indicated by blue bars projecting to the right. The high and low levels are also known as the recharge and discharge phases.

Days when the transition between these periods occur are considered to be significant as critical periods of instability and times of abnormal effects of the biorhythm. Those days are indicated by printing the day, or adjacent days if the event occurs close to the midpoint, in purple.

Periods where two or three biorhythms are at very high levels during the same day are considered by some to be days of good fortune and luck. Such days are flagged by a blue star for two high levels or a yellow star for three high levels occurring in the same day. The stars appear in the day-of-the-month column.

Interesting periods to look at are your month and year of birth, 58 years, two months and approximately one week (21,252 days) from your birth and, of course, biorhythms for the present and future.

No claim is made for the validity of biorhythms. There are those who claim that they are meaningless; others use them to direct their lives. I found them to be an interesting programming exercise.

Using the Program

The input screen will ask you to enter your birthdate, the year you are interested in and the starting month for that year.

Entries are user friendly. You may enter the year as 1983 or simply 83. Months may be entered numerically or spelled out with at least the first three letters. Illogical days of the month, such as February 29th of a non-leap year, won't be accepted by the Input routine.

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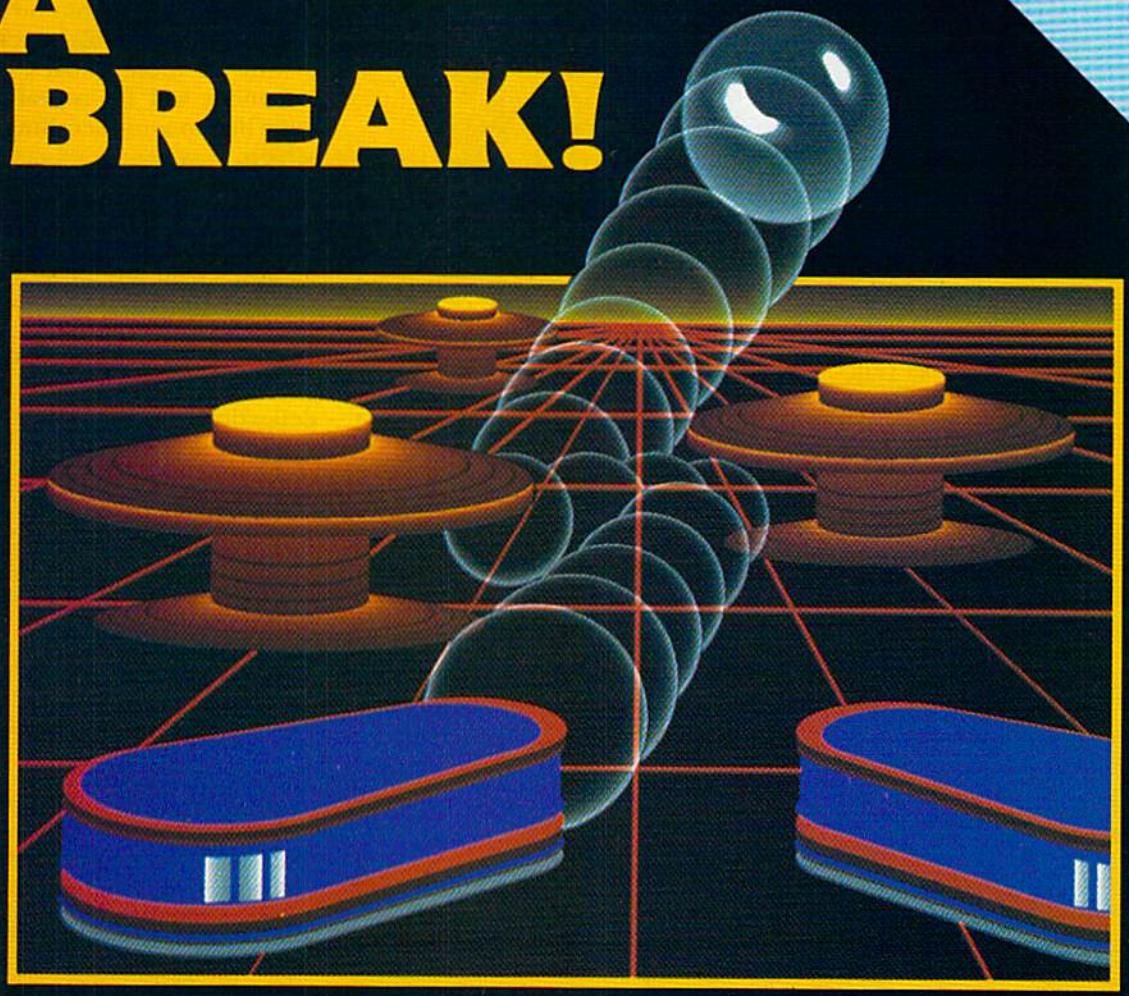

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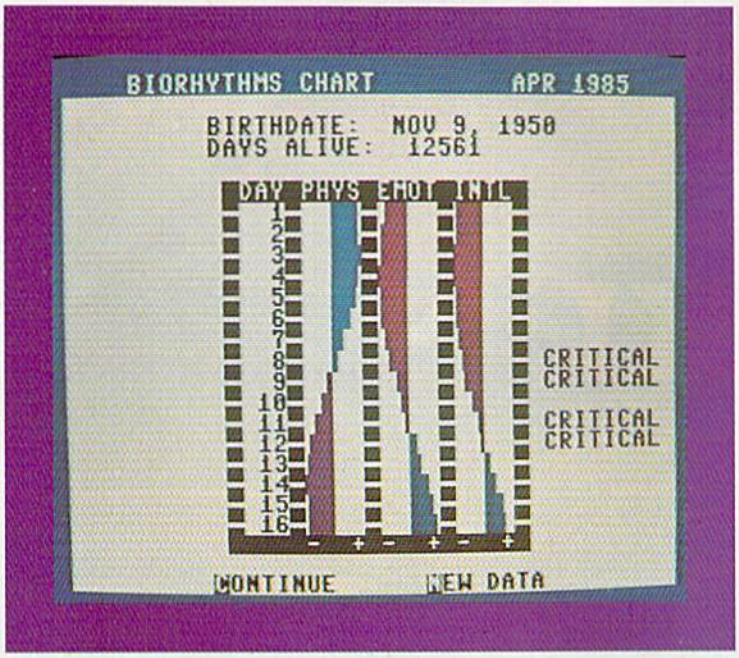

10–110.	Bar graph variable assignment	490–570.	Calculate biorhythms and analyze characteristics
120–140.	Initialization	580–660.	Print them without scrolling
150–320.	Input routines	670–710.	Proceed to the next month/year and do it again
330–390.	Count days back to January of birth year	720–740.	Heading subroutine
400–430.	Find the number of days to January of current year	750–790.	Footing and Prompt subroutine
440–470.	Find number of days from January current year to desired month	800–830.	Error-checking subroutine
480.	Go to Heading subroutine	840–860.	Data

Table 1. *Program line descriptions.*

I tried to make the input routines as crash-proof as possible. An error-checking subroutine will check month and day entries against Data statements for correctness. Year entries are accepted only if they are numerical and if the current year entry is the year of your birth or later.

If an unacceptable error is made in any of these entries, the Input statement will be repeated on the same line to avoid scrolling the input screen.

The vertical bar graph has a resolution of 16 levels to the left and 16 to the right. The method I used could be applied to any program suitable for this type of graph. Scale your data from 0 to 15 for full to minimum deflection to the left of the screen, and from 16 to 31 for right-hand deflection; then enter PRINT A$(N), where N is your scaled data. Include program lines 10–110 in your program initialization.

You can experiment with these bars by temporarily adding the following lines to the Biorhythm Chart program:

```
115 PRINT"(CLR)":FORN = 0TO15:
    PRINTSPC(7)A$(N):NEXT:
    PRINT"(HOME)"
116 FORN = 16TO31:PRINTSPC(14)A$(N):
    NEXT:STOP
```

To save memory and enable this program to run on an unexpanded VIC, REM statements were not included in the program. R

Address all author correspondence to Allan E. Wheeler, 1119 Niblick Road, Paso Robles, CA 93446.

Listing 1. *Biorhythm Chart program for the C-64.*

```
5 REM C64 BIORHYTHMS CHART BY A.E.WHEELER
10 DIMA$(32):RV$=CHR$(18):BK$=CHR$(157):RO$
   =CHR$(146)
20 A$(13)=CHR$(182):A$(14)=CHR$(170):A$(15)
   =CHR$(167):A$(16)=CHR$(165)
30 A$(17)=CHR$(180):A$(18)=CHR$(181):A$(19)
   =CHR$(161)
40 A$(8)=RV$+CHR$(160):A$(9)=RV$+A$(16):A$(
   10)=RV$+A$(17):A$(11)=RV$+A$(18)
50 A$(12)=RV$+A$(19):A$(0)=BK$+A$(8)+A$(8):
   A$(1)=BK$+A$(9)+A$(8)
60 A$(2)=BK$+A$(10)+A$(8):A$(3)=BK$+A$(11)+
   A$(8):A$(4)=BK$+A$(12)+A$(8)
70 A$(5)=BK$+A$(13)+A$(8):A$(6)=BK$+A$(14)+
   A$(8):A$(7)=BK$+A$(15)+A$(8)
80 A$(20)=RV$+A$(13):A$(21)=RV$+A$(14):A$(2
   2)=RV$+A$(15):A$(23)=A$(8)
90 A$(24)=A$(8)+RO$+A$(16):A$(25)=A$(8)+RO$
   +A$(17):A$(26)=A$(8)+RO$+A$(18)
100 A$(27)=A$(8)+RO$+A$(19):A$(28)=A$(8)+A$
   (13):A$(29)=A$(8)+A$(14)
110 A$(30)=A$(8)+A$(15):A$(31)=A$(8)+A$(8):
   GC$=RV$+CHR$(144)+CHR$(96)+CHR$(146)
120 DEFFNA(X)=INT(((SIN((X-INT(X))*6.2832)+
   1.05))*15.2)
130 TL$="{10 SPACEs}{CTRL 9}{CTRL 1} DAY PH
   YS EMOT INTL {CTRL 0}"
135 BM$="{10 SPACEs}{CTRL 9}{CTRL 1}{5 SPAC
   Es}-{2 SPACEs}+ -{2 SPACEs}+ -{2 SPACEs
   }+ {CTRL 0}"
137 TD$="{SHFT CLR}{CTRL 9}{CTRL 7}{4 SPACE
   s}BIORHYTHMS CHART{2 SPACEs}{CTRL 0}{CT
   RL 1}"
140 CB$="{2 SPACEs}{CTRL 7}":CP$=" {CTRL 3}
   ":POKE53281,1:POKE53280,6
145 PRINT"{SHFT CLR}{CTRL 9}{CTRL 7}{12 SPA
   CEs}BIORHYTHMS CHART{12 SPACEs}{CTRL 1}
   {CTRL 0}"
150 INPUT"{COMD 4}{9 SPACEs}YEAR OF BIRTH";
   YB$:YB=VAL(YB$)
155 IFYB=0THENPRINT"{2 CRSR UPs}";:GOTO150
160 IFYB<1000THENYB=YB+1900
170 YR=YB:YB$=RIGHT$(STR$(YB),4)
180 INPUT"{CRSR DN}{9 SPACEs}MONTH OF BIRTH
   ";MB$:B$=MB$:MO=VAL(MB$):GOSUB800:MB$=A
   $:MB=C
```


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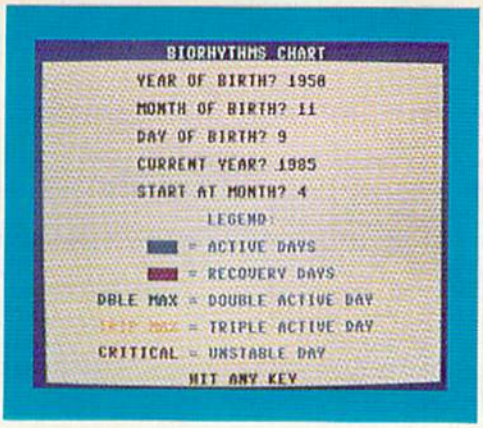
Listing 1 continued.




```
19Ø IFLB=1THEN18Ø
2ØØ INPUT"{CRSR DN}{9 SPACEs}DAY OF BIRTH";
    DB$:DB=VAL(DB$):B$=MB$:GOSUB81Ø:DB$=DB$
    +","
21Ø IFDB<1ØTHENSP$=" "
22Ø IFDB=29ANDMB=2ANDINT(YB/4)=YB/4THEN24Ø
23Ø IFDB>BORDB=ØTHENPRINT"{2 CRSR UPs}";:GO
    TO2ØØ
24Ø INPUT"{CRSR DN}{9 SPACEs}CURRENT YEAR";
    YC$:YC=VAL(YC$):IFYC>ØANDYC<1ØØTHENYC=Y
    C+19ØØ
25Ø IFYC=ØORYC<YBTHENPRINT"{2 CRSR UPs}";:G
    OTO24Ø
26Ø INPUT"{CRSR DN}{9 SPACEs}START AT MONTH
    ";MW$:B$=MW$:MO=VAL(MW$):GOSUB8ØØ:MW$=A
    $:MW=C
27Ø IFLB=1THEN26Ø
28Ø PRINTTAB(16)"{CRSR DN}{CTRL 5}LEGEND:":
    PRINTTAB(1Ø)"{CRSR DN}{CTRL 9}{CTRL 7}{
    3 SPACEs}{CTRL Ø}{CTRL 5} = ACTIVE DAYS
    "
29Ø PRINTTAB(1Ø)"{CRSR DN}{CTRL 9}{CTRL 3}{
    3 SPACEs}{CTRL Ø}{CTRL 5} = RECOVERY DA
    YS"
295 PRINTTAB(5)"{CRSR DN}{CTRL 7}DBLE MAX{C
    TRL 5} = DOUBLE ACTIVE DAY"
3ØØ PRINTTAB(5)"{CTRL 8}{CRSR DN}TRIP MAX{C
    TRL 5} = TRIPLE ACTIVE DAY"
3Ø5 PRINTTAB(5)"{CTRL 3}{CRSR DN}CRITICAL{C
    TRL 5} = UNSTABLE DAY":PRINTTAB(14)"{CR
    SR DN}{COMD 4}HIT ANY KEY";
31Ø GETA$:IFA$=""THEN31Ø
32Ø PRINT"{CTRL 3}{CRSR UP}{31 SPACEs}WORKI
    NG{CTRL 1}{2 SPACEs}";
33Ø DA=DA-DB
34Ø MB=MB-1:IFMB=ØTHEN4ØØ
35Ø ONMBGOTO39Ø,36Ø,39Ø,38Ø,39Ø,38Ø,39Ø,39Ø
    ,38Ø,39Ø,38Ø,39Ø
36Ø DA=DA-28:IFINT(YR/4)=YR/4THENDA=DA-1
37Ø GOTO34Ø
38Ø DA=DA-3Ø:GOTO34Ø
39Ø DA=DA-31:GOTO34Ø
4ØØ IFYR=YCTHEN44Ø
41Ø DA=DA+365:IFINT(YR/4)=YR/4THENDA=DA+1
42Ø YR=YR+1:IFYR=YCTHEN44Ø
43Ø GOTO41Ø
44Ø READMO$:READDC:READC
45Ø IFMO$="FEB"ANDINT(YR/4)=YR/4THENDC=DC+1
46Ø IFMO$=LEFT$(MW$,3)THEN48Ø
47Ø DA=DA+DC:GOTO44Ø
48Ø GOSUB72Ø
49Ø FORN=1TODC:DA=DA+1
5ØØ BP=FNA(DA/23):BE=FNA(DA/28):BI=FNA(DA/3
    3)
51Ø CD$=""
515 IFBP>12ANDBP<19ORBE>12ANDBE<19ORBI>13AN
    DBI<18THENCD$=" {CTRL 3}CRITICAL{CTRL 1
    }"
52Ø PF$=CP$:IFBP>15THENPF$=CB$
53Ø IFBP>29THENFL=1
54Ø PE$=CP$:IFBE>15THENPE$=CB$
55Ø IFBE>29THENFL=FL+1
56Ø PI$=CP$:IFBI>15THENPI$=CB$
57Ø IFBI>29THENFL=FL+1
58Ø FL$="{1Ø SPACEs}"
585 IFFL=2THENFL$="{CTRL 7} DBLE MAX {CTRL
    1}"
59Ø IFFL=3THENFL$="{CTRL 8} TRIP MAX {CTRL
    1}"
6ØØ FL=Ø:N$=MID$(STR$(N),2):L=2-LEN(N$)
61Ø PRINTFL$;GC$;" ";SPC(L)"{COMD 4}"N$;
62Ø PRINTTAB(14)GC$;PF$;A$(BP);TAB(19)GC$;
63Ø PRINTTAB(2Ø)PE$;A$(BE);TAB(24)GC$;
64Ø PRINTTAB(25)PI$;A$(BI);TAB(29)GC$;CD$
65Ø LC=LC+1:IFLC=16THENPRINTBM$:GOSUB75Ø:GO
    SUB72Ø
66Ø NEXT
67Ø PRINTBM$:GOSUB75Ø
68Ø READMO$
69Ø IFMO$="X"THENRESTORE:YR=YR+1:GOTO68Ø
7ØØ READDC:READC:MW$=MO$
71Ø GOTO45Ø
72Ø PRINTTD$"{CTRL 9}{CTRL 7}{7 SPACEs}"MO$
    ;YR"{CRSR LF}{3 SPACEs}{CTRL Ø}"
73Ø PRINTTAB(9)"{COMD 4}BIRTHDATE: "SP$;MB$
    " "DB$" ";YB$
74Ø PRINTTAB(9)"DAYS ALIVE: ";INT(DA+.5):PR
    INT"{CRSR DN}"TL$:RETURN
75Ø PRINT"{HOME}":FORAW=1TO22:PRINT:NEXT:PR
    INTTAB(9)"{COMD 4}{CTRL 9}C{CTRL Ø}ONTI
    NUE{6 SPACEs}{CTRL 9}N{CTRL Ø}EW DATA";
76Ø GETA$:IFA$=""THEN76Ø
77Ø IFA$="C"THENLC=Ø:RETURN
78Ø IFA$="N"THENRUN
79Ø GOTO76Ø
8ØØ LB=Ø:B$=LEFT$(B$,3)
```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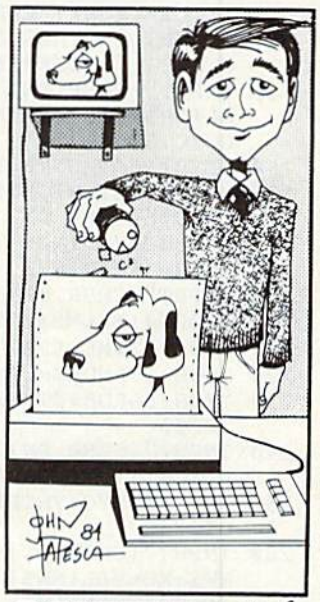

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Listing 1 continued.

```
81Ø READA$,B,C:IFA$=B$ORC=MOTHENRESTORE:RET
    URN
82Ø IFC=-1THENRESTORE:PRINT"{2 CRSR UPs}";:
    LB=1:RETURN
83Ø GOTO81Ø
84Ø DATA"JAN",31,1,"FEB",28,2,"MAR",31,3,"A
    PR",3Ø,4,"MAY",31,5
85Ø DATA"JUN",3Ø,6,"JUL",31,7,"AUG",31,8,"S
    EP",3Ø,9,"OCT",31,1Ø
86Ø DATA"NOV",3Ø,11,"DEC",31,12,"X",Ø,-1
```

Listing 2. *Biorhythm Chart program for the VIC-20.*

```
1Ø DIMA$(32):RV$=CHR$(18):BK$=CHR$(157):RO$
   =CHR$(146)
2Ø A$(13)=CHR$(182):A$(14)=CHR$(17Ø):A$(15)
   =CHR$(167):A$(16)=CHR$(165)
3Ø A$(17)=CHR$(18Ø):A$(18)=CHR$(181):A$(19)
   =CHR$(161)
4Ø A$(8)=RV$+CHR$(16Ø):A$(9)=RV$+A$(16):A$(
   1Ø)=RV$+A$(17):A$(11)=RV$+A$(18)
5Ø A$(12)=RV$+A$(19):A$(Ø)=BK$+A$(8)+A$(8):
   A$(1)=BK$+A$(9)+A$(8)
6Ø A$(2)=BK$+A$(1Ø)+A$(8):A$(3)=BK$+A$(11)+
   A$(8):A$(4)=BK$+A$(12)+A$(8)
7Ø A$(5)=BK$+A$(13)+A$(8):A$(6)=BK$+A$(14)+
   A$(8):A$(7)=BK$+A$(15)+A$(8)
8Ø A$(2Ø)=RV$+A$(13):A$(21)=RV$+A$(14):A$(2
   2)=RV$+A$(15):A$(23)=A$(8)
9Ø A$(24)=A$(8)+RO$+A$(16):A$(25)=A$(8)+RO$
   +A$(17):A$(26)=A$(8)+RO$+A$(18)
1ØØ A$(27)=A$(8)+RO$+A$(19):A$(28)=A$(8)+A$
    (13):A$(29)=A$(8)+A$(14)
11Ø A$(3Ø)=A$(8)+A$(15):A$(31)=A$(8)+A$(8):
    GC$=RV$+CHR$(144)+CHR$(96)+CHR$(146)
12Ø DEFFNA(X)=INT((SIN((X-INT(X))*6.2832)+
    1.Ø5))*15.2)
13Ø TL$=" {CTRL 9}{CTRL 1} DAY PHYS EMOT IN
    TL {CTRL Ø}":BM$=" {CTRL 9}{CTRL 1}{5 S
    PACEs}-{2 SPACEs}+ -{2 SPACEs}+ -{2 SPA
    CEs}+ {CTRL Ø}"
14Ø CB$="{2 SPACEs}{CTRL 7}":CP$=" {CTRL 5}
    ":TD$="{SHFT CLR}{CTRL 9}{CTRL 7}{3 SPA
    CEs}BIORHYTHMS CHART{3 SPACEs}{CTRL Ø}{
    CTRL 1}":POKE36879,3Ø:PRINTTD$
15Ø INPUT"{CRSR DN} YEAR OF BIRTH";YB$:YB=V
    AL(YB$):IFYB=ØTHENPRINT"{2 CRSR UPs}";:
    GOTO15Ø
16Ø IFYB<1ØØTHENYB=YB+19ØØ
17Ø YR=YB:YB$=RIGHT$(STR$(YB),4)
18Ø INPUT"{CRSR DN} MONTH OF BIRTH";MB$:B$=
    MB$:MO=VAL(MB$):GOSUB8ØØ:MB$=A$:MB=C
19Ø IFLB=1THEN18Ø
2ØØ INPUT"{CRSR DN} DAY OF BIRTH";DB$:DB=VA
    L(DB$):B$=MB$:GOSUB81Ø:DB$=DB$+","
21Ø IFDB<1ØTHENSP$=" "
22Ø IFDB=29ANDMB=2ANDINT(YB/4)=YB/4THEN24Ø
23Ø IFDB>BORDB=ØTHENPRINT"{2 CRSR UPs}";:GO
    TO2ØØ
24Ø INPUT"{CRSR DN} CURRENT YEAR";YC$:YC=VA
    L(YC$):IFYC>ØANDYC<1ØØTHENYC=YC+19ØØ
25Ø IFYC=ØORYC<YBTHENPRINT"{2 CRSR UPs}";:G
    OTO24Ø
26Ø INPUT"{CRSR DN} START AT MONTH";MW$:B$=
    MW$:MO=VAL(MW$):GOSUB8ØØ:MW$=A$:MW=C
27Ø IFLB=1THEN26Ø
28Ø PRINTTAB(3Ø)"{CTRL 1}LEGEND:":PRINT"{CR
    SR DN}{2 SPACEs}{CTRL 9}{CTRL 7} {CTRL
    Ø}{CTRL 1} ACTIVE DAYS"
29Ø PRINT"{2 SPACEs}{CTRL 9}{CTRL 5} {CTRL
    Ø}{CTRL 1} RECOVERY DAYS":PRINT"{2 SPAC
    Es}{CTRL 7}*{CTRL 1} DOUBLE ACTIVE DAY"
3ØØ PRINT"{2 SPACEs}{CTRL 8}*{CTRL 1} TRIPL
    E ACTIVE DAY":PRINTSPC(5)"{CRSR DN}HIT
    ANY KEY"
31Ø GETA$:IFA$=""THEN31Ø
32Ø PRINTTAB(29)"{CTRL 3}WORKING{CTRL 1}";
33Ø DA=DA-DB
34Ø MB=MB-1:IFMB=ØTHEN4ØØ
35Ø ONMBGOTO39Ø,36Ø,39Ø,38Ø,39Ø,38Ø,39Ø,39Ø
    ,38Ø,39Ø,38Ø,39Ø
36Ø DA=DA-28:IFINT(YR/4)=YR/4THENDA=DA-1
37Ø GOTO34Ø
38Ø DA=DA-3Ø:GOTO34Ø
39Ø DA=DA-31:GOTO34Ø
4ØØ IFYR=YCTHEN44Ø
41Ø DA=DA+365:IFINT(YR/4)=YR/4THENDA=DA+1
42Ø YR=YR+1:IFYR=YCTHEN44Ø
43Ø GOTO41Ø
44Ø READMO$:READDC:READC
45Ø IFMO$="FEB"ANDINT(YR/4)=YR/4THENDC=DC+1
46Ø IFMO$=LEFT$(MW$,3)THEN48Ø
47Ø DA=DA+DC:GOTO44Ø
48Ø GOSUB72Ø
49Ø FORN=1TODC:DA=DA+1
5ØØ BP=FNA(DA/23):BE=FNA(DA/28):BI=FNA(DA/3
    3)
51Ø CD$="{CTRL 1}":IFBP>12ANDBP<19ORBE>12AN
    DBE<19ORBI>13ANDBI<18THENCD$="{CTRL 5}"
52Ø PF$=CP$:IFBP>15THENPF$=CB$
53Ø IFBP>29THENFL=1
54Ø PE$=CP$:IFBE>15THENPE$=CB$
55Ø IFBE>29THENFL=FL+1
56Ø PI$=CP$:IFBI>15THENPI$=CB$
57Ø IFBI>29THENFL=FL+1
58Ø FL$=" ":IFFL=2THENFL$="{CTRL 7}*{CTRL 1
    }"
59Ø IFFL=3THENFL$="{CTRL 8}*{CTRL 1}"
6ØØ FL=Ø:N$=MID$(STR$(N),2):L=2-LEN(N$)
61Ø PRINT" ";GC$;FL$;CD$;SPC(L)N$;
62Ø PRINTTAB(5)GC$;PF$;A$(BP);TAB(1Ø)GC$;
63Ø PRINTTAB(11)PE$;A$(BE);TAB(15)GC$;
64Ø PRINTTAB(16)PI$;A$(BI);TAB(2Ø)GC$
65Ø LC=LC+1:IFLC=16THENPRINTBM$:GOSUB75Ø:GO
    SUB72Ø
66Ø NEXT
67Ø PRINTBM$:GOSUB75Ø
68Ø READMO$
69Ø IFMO$="X"THENRESTORE:YR=YR+1:GOTO68Ø
7ØØ READDC:READC:MW$=MO$
71Ø GOTO45Ø
72Ø PRINTTD$;:PRINT"{CTRL 9}{CTRL 7}{7 SPAC
    Es}"MO$;YR"{CRSR LF}{7 SPACEs}{CTRL Ø}"
    ;
73Ø PRINT"{CTRL 1}BIRTHDATE: "SP$;MB$" "DB$
    ;YB$;
74Ø PRINT"{2 SPACEs}DAYS ALIVE:";INT(DA+.5)
    :PRINTTL$:RETURN
75Ø PRINT"{HOME}":PRINTTAB(255)TAB(154)"{CT
    RL 1}{2 SPACEs}{CTRL 9}C{CTRL Ø}ONTINUE
    {2 SPACEs}{CTRL 9}N{CTRL Ø}EW DATA";
76Ø GETA$:IFA$=""THEN76Ø
77Ø IFA$="C"THENLC=Ø:RETURN
78Ø IFA$="N"THENRUN
79Ø GOTO76Ø
8ØØ LB=Ø:B$=LEFT$(B$,3)
81Ø READA$,B,C:IFA$=B$ORC=MOTHENRESTORE:RET
    URN
82Ø IFC=-1THENRESTORE:PRINT"{2 CRSR UPs}";:
    LB=1:RETURN
83Ø GOTO81Ø
84Ø DATA"JAN",31,1,"FEB",28,2,"MAR",31,3,"A
    PR",3Ø,4,"MAY",31,5
85Ø DATA"JUN",3Ø,6,"JUL",31,7,"AUG",31,8,"S
    EP",3Ø,9,"OCT",31,1Ø
86Ø DATA"NOV",3Ø,11,"DEC",31,12,"X",Ø,-1
```


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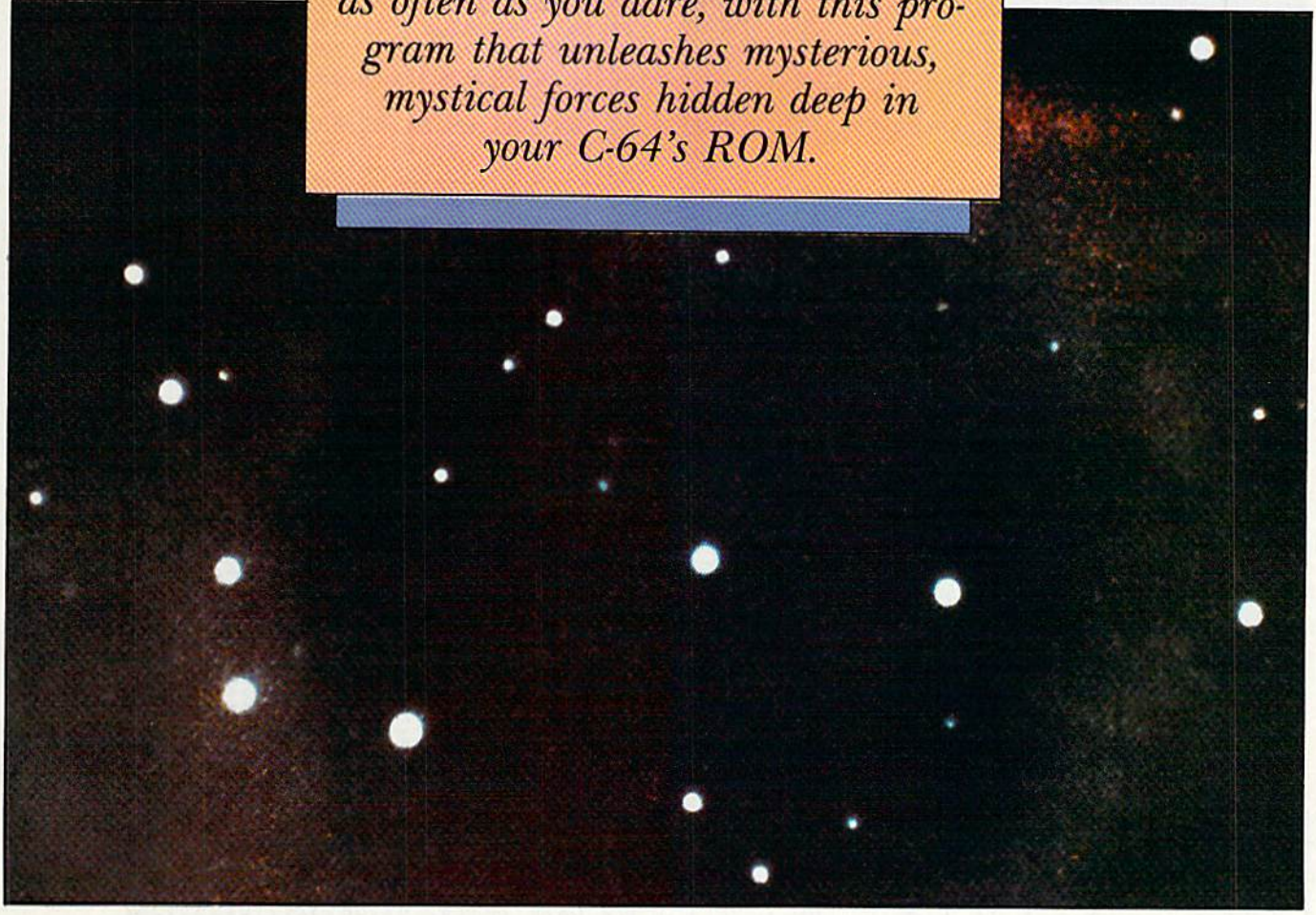
You can look into the future as often as you dare, with this program that unleashes mysterious, mystical forces hidden deep in your C-64's ROM.



Celestial Swami

By JIM BERNARD

If you are old enough to remember the penny fortune-telling machines, in which you placed a coin, pushed in a lever and pulled out a response that was worded vaguely enough to fit just about any question, then you have a fair idea of what Celestial Swami is all about.

After you have loaded and run Listing 1, load and run Listing 2. From then on, just type in your questions about the future, press the return key and know the future!

Naturally, if you are too young to type, Swami will accept questions from the mental concentration, or Oral, mode, as long as you finish with a tap of the return key. But Swami has one important rule—any one question may be asked only once!

The graphics in Celestial Swami are simple, yet elegant, with a nighttime moon and stars combination that never, ever repeats itself—you will have your own unique juxtaposition for each question. Not only do my kids like it a lot, but it is a great attraction with our guests. R

Address all author correspondence to Jim Bernard, 8018 Sunset Path Court, Springfield, VA 22153.

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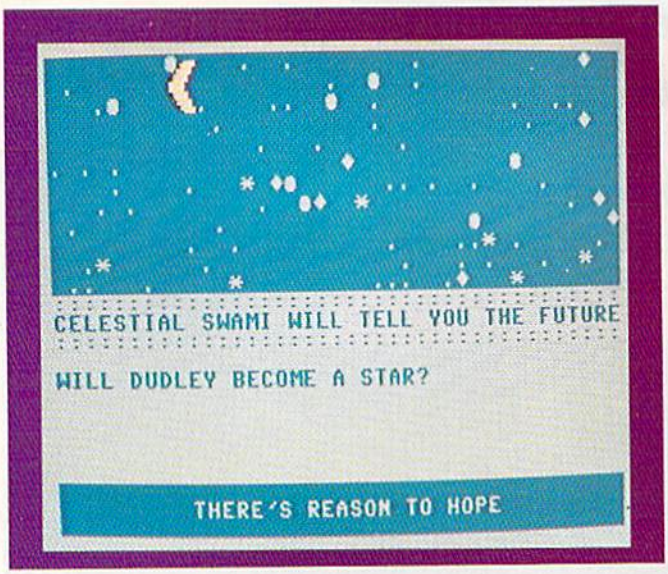

Listing 1. *Celestial Swami Loader program.*

```
1Ø REM CELESTIAL SWAMI (PART 1)
2Ø REM BY JIM BERNARD
3Ø REM LOAD, RUN & NEW THIS PART
4Ø REM THEN LOAD PART 2 AND RUN
5Ø FORX=49152TO49415:READA:POKEX,A:N=N+A:NE
   XT
6Ø FORY=51712TO51933:READA:POKEY,A:N=N+A:NE
   XT
7Ø IFN<>49Ø34THENPRINT"CHECK DATA FOR ERROR
   "
8Ø IFN=49Ø34THENPRINT"DATA O.K.! ---NOW NEW
   AND LOAD PART 2"
1ØØ DATA 24,162,23,16Ø,9,32,24Ø,255
11Ø DATA 162,72,189,24,192,32,21Ø,255
12Ø DATA 2Ø1,146,24Ø,3,232,2Ø8,243,96
13Ø DATA 18,32,84,72,69,32,83,84
14Ø DATA 65,82,83,32,83,65,89,32
15Ø DATA 39,78,79,39,32,32,32,146
16Ø DATA 18,32,32,39,89,69,83,39
17Ø DATA 32,83,65,89,32,84,72,69
18Ø DATA 32,83,84,65,82,83,32,146
19Ø DATA 18,73,84,39,83,32,84,79
2ØØ DATA 79,32,69,65,82,76,89,32
21Ø DATA 84,79,32,84,69,76,76,146
22Ø DATA 18,84,72,65,84,39,83,32
23Ø DATA 81,85,73,84,69,32,8Ø,79
24Ø DATA 83,83,73,66,76,69,33,146
25Ø DATA 18,73,7Ø,32,89,79,85,32
26Ø DATA 82,69,65,76,76,89,32,87
27Ø DATA 65,78,84,32,73,84,33,146
28Ø DATA 18,84,72,69,82,69,39,83
29Ø DATA 32,82,69,65,83,79,78,32
3ØØ DATA 84,79,32,72,79,8Ø,69,146
31Ø DATA 18,67,79,78,68,73,84,73
32Ø DATA 79,78,83,32,83,69,69,77
33Ø DATA 32,82,73,71,72,84,32,146
34Ø DATA 18,84,72,65,84,39,83,32
35Ø DATA 81,85,73,84,69,32,85,78
36Ø DATA 76,73,75,69,76,89,32,146
37Ø DATA 18,32,67,76,85,69,83,32
38Ø DATA 65,82,69,32,65,76,76,32
39Ø DATA 65,82,79,85,78,68,32,146
4ØØ DATA 18,32,89,79,85,39,68,32
41Ø DATA 82,65,84,72,69,82,32,78
42Ø DATA 79,84,32,75,78,79,87,146
5ØØ DATA 169,19,32,21Ø,255,169,18,32
51Ø DATA 21Ø,255,169,6,141,134,2,169
52Ø DATA 15,141,32,2Ø8,141,33,2Ø8,162
53Ø DATA Ø,169,32,32,21Ø,255,232,224
54Ø DATA 255,2Ø8,246,24Ø,Ø,162,Ø,169
55Ø DATA 32,32,21Ø,255,232,224,225,2Ø8
56Ø DATA 246,24Ø,Ø,169,146,32,21Ø,255
57Ø DATA 162,Ø,169,58,32,21Ø,255,232
58Ø DATA 224,4Ø,2Ø8,246,24Ø,Ø,162,Ø
59Ø DATA 189,176,2Ø2,32,21Ø,255,232,224
6ØØ DATA 4Ø,2Ø8,245,24Ø,Ø,162,Ø,169
61Ø DATA 58,32,21Ø,255,232,224,4Ø,2Ø8
62Ø DATA 246,24Ø,Ø,162,Ø,169,32,32
63Ø DATA 21Ø,255,232,224,24Ø,2Ø8,246,24Ø
64Ø DATA Ø,162,Ø,169,32,32,21Ø,255
65Ø DATA 232,224,4Ø,2Ø8,246,24Ø,Ø,169
66Ø DATA 18,32,21Ø,255,162,Ø,169,32
67Ø DATA 32,21Ø,255,232,224,119,2Ø8,246
68Ø DATA 24Ø,Ø,162,Ø,169,146,32,21Ø
69Ø DATA 255,162,16,16Ø,Ø,32,24Ø,255
7ØØ DATA 162,Ø,189,216,2Ø2,32,21Ø,255
71Ø DATA 232,224,6,2Ø8,245,24Ø,Ø,96
72Ø DATA 67,69,76,69,83,84,73,65
73Ø DATA 76,32,83,87,65,77,73,32
74Ø DATA 87,73,76,76,32,84,69,76
75Ø DATA 76,32,89,79,85,32,84,72
76Ø DATA 69,32,7Ø,85,84,85,82,69
77Ø DATA 87,73,76,76,32,Ø
```

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Listing 2. *Celestial Swami program.*

```
1Ø FORK=12288TO1235Ø:READA:POKEK,A:NEXT:FOR
   K=12352TO12414:READA:POKEK,A:NEXT
2Ø GOSUB1ØØ:REM TITLE SCREEN
3Ø POKEV+21,Ø:POKEV+16,Ø:SYS51712:POKE2Ø23,
   224:POKE56295,6:REM ML GAME SCREEN
```

→

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0128	Dust Cover - 801 Printer	7.99	5.75
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0546	Elementary Commodore	14.95	11.50
0092	Elephant Disks SS/DD (10)	37.00	17.65
1337	Elephant Disks SS/SD (10)	34.00	16.35
0107	Epson MX-80 Ribbon	14.00	6.30
1535	F-15 Strike Eagle (D)	34.95	24.20
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```
40 GOSUB300:REM SPRITE SET-UP
50 GOSUB200:REM RANDOM CELESTIAL DESIGN
55 OPEN1,0:INPUT#1,Q$:CLOSE1
57 FORK=1TO1000:NEXT
60 X=INT(RND(.)*10):X=X*24:POKE49161,X:REM
   HELP SWAMI CHOOSE REPLY
70 SYS49152:POKE214,15:REM ML REPLIES
75 GETY$:IFY$<>""THEN75
80 GETZ$:IFZ$=CHR$(13)THEN30
90 IFZ$=CHR$(133)THENPOKEV+21,0:END
99 GOTO80
100 REM TITLE PAGE SUBROUTINE
110 PRINTCHR$(147):POKE53280,15:POKE53281,1
    5:POKE646,6
120 PRINTSPC(12)"CELESTIAL SWAMI"
130 PRINT"{3 CRSR DNs}{SHFT Q}QUESTIONS MUS
    T ADDRESS FUTURE EVENTS!"
140 PRINT"{3 CRSR DNs}{SHFT Q}ASK ANY QUEST
    ION ONLY ONCE!"
150 PRINT"{3 CRSR DNs}{SHFT Q}PRESS 'RETURN
    ' AFTER TYPING A QUESTION."
160 PRINT"{2 CRSR DNs}{SHFT Q}PRESS 'RETURN
    ' TO ASK ANOTHER QUESTION";
170 PRINT"{2 SPACEs}OR PRESS 'F-1' TO END T
    HE GAME."
180 PRINT"{3 CRSR DNs}{SHFT Q}NOW PRESS 'RE
    TURN' TO CONTINUE."
190 GETC$:IFC$<>CHR$(13)THEN190
199 RETURN
200 REM CELESTIAL SUBROUTINE
210 SC=1024:CL=55296
220 FORD=1TO60:N1=INT(RND(TI)*480):POKESC+N
    1,174:POKECL+N1,6:NEXT
230 FORD=1TO8:N2=INT(RND(TI)*480):POKESC+N2
    ,170:POKECL+N2,6:NEXT
240 FORD=1TO8:N3=INT(RND(TI)*480):POKESC+N3
    ,209:POKECL+N3,6:NEXT
250 FORD=1TO8:N4=INT(RND(TI)*480):POKESC+N4
    ,218:POKECL+N4,6:NEXT
299 RETURN
300 REM SPRITES ON
310 POKE2040,192:POKE2041,193:V=53248
320 POKEV+28,3:POKEV+37,0:POKEV+38,7
330 AA=INT(RND(1)*275)+40:IFAA>255THENAA=AA
    -255:POKEV+16,1
340 BB=INT(RND(1)*75)+50
350 POKEV+0,AA:POKEV+1,BB:POKEV+2,AA:POKEV+
    3,BB
360 CC=INT(RND(TI)*2)+1
370 IFCC=1THENPOKEV+21,1
380 IFCC=2THENPOKEV+21,2
390 RETURN
500 REM SPRITE #1 DATA
510 DATA 0,252,0,3,255,0,7,255,128,15,{2 SP
    ACEs}255,192
520 DATA 31,255,224,63,255,240,127,255, 248
    ,127,255,248
530 DATA 255,255,252,255,255,252,255,255,25
    2,255,255,252
540 DATA 127,255,248,127,255,248,63,255,240
    ,31,255,224
550 DATA 15,255,192,7,255,128,3,255,0,0,252
    ,0,0,0,0
600 REM SPRITE #2 DATA
610 DATA 0,252,0,3,252,0,7,248,0,15,240,0
620 DATA 31,240,0,63,224,0,127,224,0,127,19
    2,0
630 DATA 255,128,0,255,128,0,255,128,0, 255
    ,128,0
640 DATA 127,192,0,127,224,0,63,224,0,31,24
    0,0
650 DATA 15,240,0,7,248,0,3,252,0,0,252,0,0
    ,0,0
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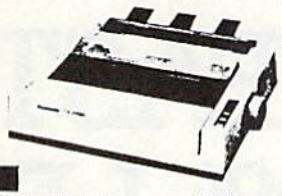
(does not have near-letter quality)

SG 10, NLQ Dot Matrix from Star ..... Call



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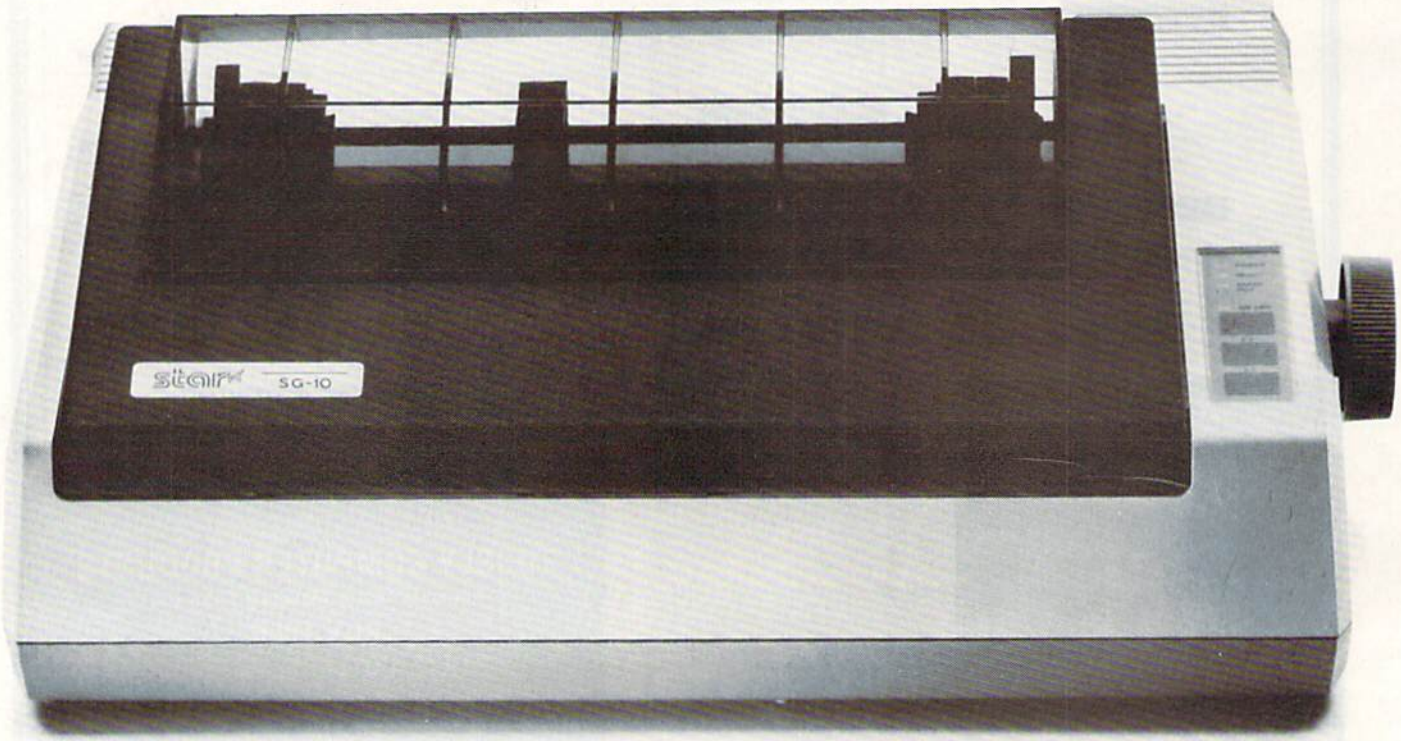

This new dual-mode SG-10 is only $299.

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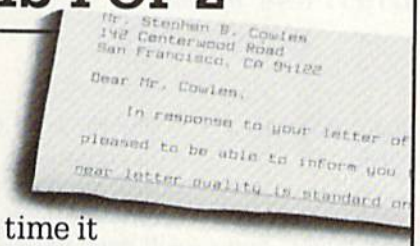
NLQ IS 1 OF 2



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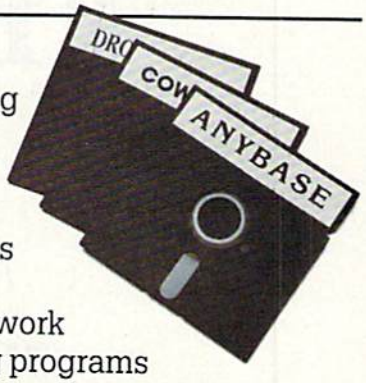

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The Plus/4's File Manager

By MARGARET MORABITO

This article reviews the Plus/4's built-in File Manager. This command-driven database program can accommodate an impressive 999 records per file and can be integrated with the built-in Word Processor to create customized mailing labels, form letters and more.

This article, covering the File Manager, is the third in a series of reviews on the Plus/4's built-in programs. (See *RUN*'s December 1984 issue for a review of the Plus/4 Word Processor and the February 1985 issue for a review of its Spreadsheet and Graph programs.)

The File Manager allows you to create individualized file formats for storing, updating and retrieving information. Your data files can be integrated with the Word Processor, so you can display and print your records within letters or reports. This integration capability also lets you merge your Plus/4 Spreadsheet files and accompanying graphs so that your printed documents are truly a cooperative blend of all four of the Plus/4's programs.

Like its companion programs, the File Manager requires a monitor or television, a disk drive and a printer for full usage. *The Plus/4 Integrated Software Manual* devotes a 40-page section to instruction on the File Manager.

This database program offers random access to its files with a maximum of 999 records per file. Each file can have 17 fields, with 38 characters per field. Because of the great number of records that can be managed and the variety of data-handling features, the File Manager imposes a limit of one file to a disk.

Starting Up

To access the File Manager, you must be in the Word Processor. Once there, simultaneously press the CMD with the C key (always used to initiate Command mode), then type tf and press the return key. You are now in the File Manager.

You will first see a prompt to insert a separate disk, which will serve as your datafile disk. It is important not to insert a disk that has your word processing or spreadsheet files on it, as these files will all be erased when the disk is formatted to accept File Manager records.

Once the data file disk is in place, you may either type newtf, to format the disk to accept a new file, or tf, if you have already formatted the disk and just want to update its information. If you are simply accessing a previous file, tf will display your filename, the number of records used and the cursor prompt for Command mode.

When starting a new file, you will be prompted for filename, number of fields, field names and field lengths. After entering your file parameters, you can modify them before your disk undergoes formatting.

For those of you who are familiar with database setup, these procedures are not difficult. Those who are newcomers to database creation will need to practice creating file formats. The Plus/4 documentation provides ample opportunity for this practice.

Entering and Editing

Unlike some database programs, the File Manager lets you enter records in either nonsequential or sequential order. This is accomplished with the rc# (record number) or nr (next record) command. Entering data is easily accomplished by following the screen prompts.

At the bottom of the screen, you will see two status lines showing the filename and the current field name. At the upper left corner, you will see a cursor where you will type your information for each field; press the return key after each line. After a record has been completed, you will always save it on disk by entering the ud (update) or nr command.

Changing information is a simple matter because of this computer's full screen-editing capability, which lets you move your cursor to the desired location and retype. With your record displayed, as a result of the rc#

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or nr command, you will use the insert, delete and cursor movement keys to make any changes. After editing a record, you will use the ud or nr command to save to disk. The ud command can also be used to save duplicate records, thus eliminating the need for retyping material.

As with most command-driven programs, it seems difficult at first to try to remember which commands do what. However, by the time you get into the File Manager, you will have used the commands necessary for the other three built-in programs, thereby making the learning of these few new commands quite easy.

Review, Search and Sort

Databases offer you the opportunity to review records, search specific fields and sort records. The review feature on the File Manager lets you sequentially view your file, starting at any record number. This feature is useful for browsing for specific information, as it automatically advances through each record. You can also temporarily or permanently halt the display by pressing the S or Q keys, and you can return to any record for rereading or editing.

The ability to locate information quickly is of the utmost importance, and this is where a database earns its keep. The File Manager has an extremely powerful search feature that allows you to request all or any part of a field's data. You are not limited by left-to-right character matching. In addition, when you do ask for a search, all fields of each record in your file will be analyzed, resulting in a display of each record that contains your request.

Furthermore, the highrc and the pick commands let you limit the number of records in a search. This is a useful feature when you have a very large file and need to scrutinize a specific section.

One of the benefits of a database

C-64 Versions of Plus/4 Software

C-64 owners will be pleased to hear that David Johnson (from Tri Micro, 1010 N. Batavia St., Suite G, Orange, CA 92667), the creator of the Plus/4 built-in software, has written versions of these integrated programs to run on the C-64.

The Write File combines the Word Processor and the File Manager onto one disk, while Your Home Office offers the Word Processor and the Spreadsheet on another disk. Each disk will be selling for $29.

The Word Processor offers double spacing. Also, this File Manager sorts records much faster than the Plus/4's. (It does not need the accompanying fix.) Plus/4 owners can get a utility disk with these enhancements from Tri Micro ($14).

I have tested these new C-64 programs and have successfully transferred files to and from the Plus/4. Be aware that to load a Plus/4 Word Processor file into your C-64, you will need to use the Merge command, rather than the Load command that you use to load Spreadsheet and File Manager files. Use the Load command, however, to load all C-64 files into your Plus/4.

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Plus/4 File Manager Fix

Tri-Micro's David Johnson, the creator of the built-in Plus/4 software, has informed me of two slight problems that aren't often seen, but do exist in the Plus/4 File Manager program. Here is a brief description of them and a fix that has been developed to alleviate any difficulties they may cause.

When, through the Word Processor, you are trying to merge over 255 records for printing, your printer might stop, early in your file, on one particular record, and repeatedly print this record. Less often encountered is a second problem of one record overwriting another when entering records, again when you have over 255 records in a file.

To offset the possibility of these bugs creeping into your File Manager handling, type in Listing 1 and save it to a disk on which you won't be storing your File Manager records. Before using the File Manager with over 255 records, load and run this short program right after powering up and before accessing the Word Processor through which you enter the File Manager.

MM

Listing 1. *File Manager Fix program.*

```
10 REM FILE MANAGER FIX 10/30/84
20 REM LOAD AND RUN
30 FOR I=32571 TO 32765
40 READ A:POKE(I),A:NEXT I
50 SYS32571
100 DATA 169, 75,133,218,169,129,133
110 DATA 219,169, 51,141,171,127,169
120 DATA 218,141,172,127,120,174,255
130 DATA 127,138,134,251,157,208,253
140 DATA{2 SPACEs}88,173,{2 SPACEs}6,255, 4
    1,239,141
150 DATA{3 SPACEs}6,255,169,{2 SPACEs}0,133
    ,216,169
160 DATA{2 SPACEs}16,133,217,160,{2 SPACEs}
    0,177,218
170 DATA 145,216,230,218,208,{2 SPACEs}2,23
    0
180 DATA 219,230,216,208,{2 SPACEs}2,230,21
    7
190 DATA 165,219,205,172,127,144,233
200 DATA 165,218,205,171,127,144,226
210 DATA 240,224,120,162,{2 SPACEs}0,134,25
    1
220 DATA 142,208,253, 88,173,{2 SPACEs}6,25
    5
230 DATA{3 SPACEs}9, 16,141,{2 SPACEs}6,255
    ,160,{2 SPACEs}0
240 DATA 185,173,127,153, 49, 49,200
250 DATA 192,{2 SPACEs}3,144,245, 76,192, 1
    7
260 DATA 247,{2 SPACEs}0, 76,199,127,162,{2
     SPACEs}1
270 DATA 165, 43, 24,105,{2 SPACEs}2,133, 4
    3
280 DATA 144,{2 SPACEs}1,232,138, 24,101, 4
    5
290 DATA 133, 45,144,{2 SPACEs}2,230, 46, 9
    6
300 DATA 141,{2 SPACEs}6,125, 32, 52, 49,16
    0
310 DATA{3 SPACEs}0,185,231,127,153,157, 82
320 DATA 185,246,127,153,227, 86,185
330 DATA 250,127,153,162, 88,200,192
340 DATA{3 SPACEs}4,144,233, 96,208, 10,234
350 DATA 234,144,{2 SPACEs}6,230, 45,208,{2
     SPACEs}2
360 DATA 230, 46, 76,179, 86, 76,235
370 DATA 127,165, 76,176,127,123
```

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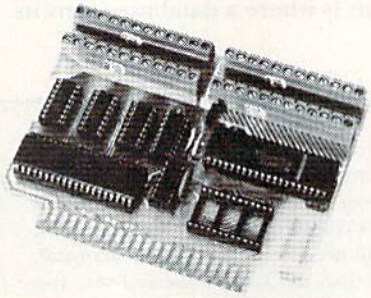

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is its ease of manipulating information. You will want to call up categories of information in a particular order. This is the job of a sort routine. The Disk Sort command lets you sort three fields at once and save your sorted file for future use. In addition, you can negate a sort—any time after it has been saved to disk—and return to your original entry order. You will use this when you need to print out your data in more than one order.

Integration with Word Processor

The integration of the File Manager with its three companion programs is what makes the Plus/4 such a good value. You can create a document that merges data from all four programs by using special instructions entered in reverse video inside the Word Processor. All word-processing instructions can be used as well.

You can achieve a wide variety of print formats when coordinating the File Manager with the Word Processor. This variety ranges from the ability to create printed lists of all your records in any field order to a selective report feature that lets you access a certain group of records from your file for printing.

Furthermore, the Plus/4 enables you to print form letters with accompanying mailing labels, using your file. The Plus/4 documentation will provide clear explanations with plenty of pictures and directed exercises for you to perform. These will lead you into advanced datafile handling within a very short time. The form that your data can take is only limited by your needs and creativity.

The four software programs inside the Plus/4 make this computer immediately valuable to someone who knows nothing about actual computer programming. These programs will more than pay for the cost of your Plus/4 as they aid you in home, small business and even educational applications.

Over the next few months, those of you who are interested in computer programming can look forward to in-depth reviews of the outstanding programming capabilities of the Plus/4: enhanced Basic 3.5, high-resolution and multicolor graphics, sound and the machine language monitor. R

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By JOE W. ROCKE

Video Jukebox

A rhapsody of color accompanied by a rinky-tinky tune can help drive your cares away when you play the C-64 Jukebox.

When you run the C-64 Jukebox, be prepared to relax. Colorful graphics characters begin filling each corner of the black display area. The first note of an easily recognizable theme song sounds. The background color changes, again and again, while the display continues to fill toward center screen, providing an ever-changing kaleidoscope of color and pattern.

In the screen's center, a message flashes, one word at a time—your C-64 is making like a jukebox of the near past.

The display continues changing even after it has filled the screen. New color patterns dance across the screen in perfect symmetry. No pattern will be repeated, no matter how long you let the program run! And the music continues playing in the background until you tire of it and turn the volume down.

Jukebox Program

The Jukebox program consists of an initializing subroutine, a routine that Pokes the color pattern to the display and a sound routine. In present form, the program provides hundreds of pattern changes without repetition. With minor changes, it would be possible to modify the program to provide a near-infinite number of patterns and color changes.

Upon execution, the program branches to the initialization subroutine. Following this, program flow jumps to the main program beginning at line 80. The subroutine for reading sound data has been placed near the beginning of the program to speed up program flow.

Regardless of where a subroutine is called from within a program, the flow jumps to the first line to begin the count to the subroutine. Although the time delay may be very small, it can cause a noticeable effect in programs of this type.

The initialization subroutine (lines 420–540) sets the variables used to produce the display and sound. Subscripted variables CL(0) through CL(7) provide the basis for the pattern display. All but two ASC subscript characters must be typed in as shifted characters.

Note that all but one ASC subscript variable has an attendant numerical value added to or subtracted from it. The numerical value provides a true lowercase character during program execution. This convention is necessary due to the manner in which the C-64 handles upper- and lowercase characters—just the reverse of most computers.

The SID (Sound Interface Device) registers are cleared in line 490. Values used to produce the musical tones are Poked to the primary sound registers in lines 500–530. The sound-producing routine is included in the main program.

Pattern Routine

Three loops are used to draw the kaleidoscope-like patterns on the display (lines 100–120). The loop values contribute to the constant changes in the pattern displayed.

The formula in line 130 is the heart of the program. This formula establishes the basis for all display-pattern character and color Pokes. Variable C becomes the character Poked to screen memory and is based on subscripted variables CL(n) plus current value of the loop variables.

Negative values for variable C can result if you make an error in typing in the ASC character values in lines 450–480. As a negative value will result in an error message, line 140 has been included to change a negative to a positive value, and thus avoid an error during program operation.

The four screen Poke locations are in lines 150–180. The color (variable X) to be Poked to color memory is established by the formula at the end of line 180. This formula uses character variable C and color variable T. As the value of variable C is constantly changing, so will the value of color variable X, which is Poked to color memory.

Pattern characters and their related color are Poked to screen and color memory in lines 190–260. You will notice that eight locations are Poked in sequence. The Pokes occur so rapidly that a character appears at the top, bottom, right and left side of the display almost simultaneously. The pattern begins at the four outer margins and fills toward the center of the display.

Line 360 accounts for the change in display background color during the startup cycle. If you are partial

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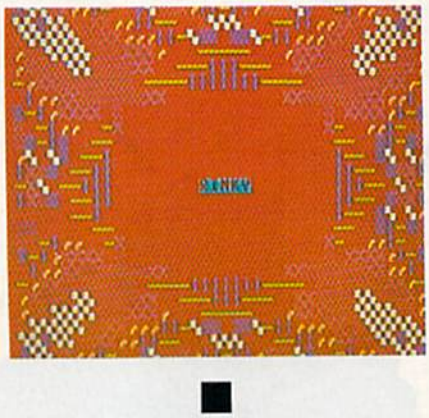
to a particular background color, lines 350 and 360 may be deleted. Be sure to include the background color of your choice in the initializing Poke of line 430.

Music Routine

The music routine used in the program is based on an example given in the *Commodore Programmer's Reference Guide*. The routine uses two voices and produces a "rinky-tinky" tune.

Sound Voice 1 provides the basis for the tune, with Voice 3 used for the tonal frequency. Filtering is used to cut off audio output of Voice 3 by Poking 143 to volume register 24.

The working portion of the sound routine (lines 270–330) follows the screen Pokes. A musical note is played after each series of screen Pokes. The musical note and its duration is based on the data beginning at line 550. Audio output is muted (line 330) after each note is played. The effect is musical accompaniment to each change in the display.



Data for the musical notes is read via the subroutine in lines 30–60 during each iteration of the loops in lines 100–120. While the display can continue until you hit the stop key, it would be impractical to include music data for a like period. Therefore, line 70 has been added to the subroutine to restore the data and replay it.

The Flashing Message

The flashing commercial-like message displayed center screen is purely optional. It does, however, demonstrate another facet of the program's potential for enhancement.

Words for the message are included with the music data and are read in at the same time via the sound subroutine. I am the first to admit that the words are pretty corny. But they demonstrate interesting possi-

Listing 1. *C-64 Jukebox program.*

```
1 REM ********************************
2 REM{1Ø SPACEs}C64 JUKEBOX
3 REM{15 SPACEs}BY
4 REM{11 SPACEs}JOE ROCKE
5 REM{9 SPACEs}RIDGECREST, CA
6 REM ********************************
1Ø GOSUB 42Ø
2Ø GOTO 8Ø
29 REM ****** SUBRINE ******
3Ø READ FR,DR,Z$
4Ø IF FR=-1THEN 7Ø
5Ø PRINT"{HOME}":POKE214,11:PRINT:PRINTTAB(
   18)"{CTRL 9}"Z$
6Ø RETURN
7Ø POKES+4,64:FOR Q=ØTO2ØØ:NEXT:RESTORE:GOT
   O 3Ø
79 REM ***** MAIN PROGRAM *****
8Ø PRINT"{SHFT CLR}":N1=1Ø24:N2=4Ø:N3=.625
9Ø N4=39.9999:T=Ø
1ØØ FOR W=3 TO 5Ø:GOSUB 3Ø
11Ø FOR I=1 TO 19:GOSUB 3Ø
12Ø FOR J=Ø TO 19:GOSUB 3Ø
13Ø K=I+J:C=CL((J*3/(I+3)+I*W/12)AND7)
14Ø IFC<ØTHENC=C*-1
15Ø Y1=N1+N2*INT(N3*I)
16Ø Y2=N1+N2*INT(N3*K)
17Ø Y3=N1+N2*INT(N3*(N4-I))
18Ø Y4=N1+N2*INT(N3*(N4-K)):X=C-(3Ø-T)
19Ø POKE I+Y2,C{3 SPACEs}:POKE (I+Y2)+CS,X
2ØØ POKE K+Y1,C{3 SPACEs}:POKE (K+Y1)+CS,X
21Ø POKE N2-I+Y4,C:POKE (N2-I+Y4)+CS,X
22Ø POKE N2-K+Y3,C:POKE (N2-K+Y3)+CS,X
23Ø POKE K+Y3,C{3 SPACEs}:POKE (K+Y3)+CS,X
24Ø POKE N2-I+Y2,C:POKE (N2-I+Y2)+CS,X
25Ø POKE I+Y4,C{3 SPACEs}:POKE (I+Y4)+CS,X
26Ø POKE N2-K+Y1,C:POKE (N2-K+Y1)+CS,X
269 REM ***** SOUND RINE *****
27Ø POKES+24,143:{2 SPACEs}REM- VOLUME
28Ø POKES+4,65:{4 SPACEs}REM- PULSE WF,VOIC
   E 1
29Ø FOR Q=1TODR*2: REM- DURATION LOOP
3ØØ FQ=FR+PEEK(S+27)/2
31Ø HF=INT(FQ/256):LF=FQ AND 255
32Ø POKES,LF:POKES+1,HF:NEXT
33Ø POKES+4,64:{4 SPACEs}REM- MUTE TONE
34Ø NEXT J
35Ø IF Z=Ø THEN 37Ø
36Ø POKE53281,Z:Z=Z+1:IF Z>15 THEN Z=Ø:POKE
    53281,Z
37Ø NEXT I
38Ø FOR Q=ØTO1ØØØ:NEXT:PRINT"{SHFT CLR}"
39Ø T=T+1:IF T=8 THEN T=Ø
4ØØ NEXT W
41Ø END
419 REM ***** INITIALIZATION *****
42Ø PRINT"{SHFT CLR}{2 CRSR DNs}"TAB(255)"C
   64 JUKEBOX":FORQ=ØTO15ØØ:NEXT
43Ø POKE5328Ø,Ø:POKE53281,Ø:DIM CL(7)
44Ø CS=54272:S=CS:Z=1
45Ø CL(Ø)=ASC(" ")+128:CL(1)=ASC("{COMD B}"
   )-64
46Ø CL(2)=ASC("{COMD +}")-64 :CL(3)=ASC("{S
   HFT V}")-128
47Ø CL(4)=ASC("+")-128:CL(5)=ASC("{SHFT B}"
   )-128
48Ø CL(6)=ASC("{SHFT C}")-128:CL(7)=ASC(" "
   )
49Ø FOR Q=S TO S+24:POKES,Ø:NEXT
5ØØ POKES+3,8 :{4 SPACEs}REM - HI PULSE VOI
   CE 1
51Ø POKES+5,41:POKES+6,89:{3 SPACEs}REM- AT
   K/SUS
52Ø POKES+14,117:{2 SPACEs}REM- LF VOICE 3
53Ø POKES+18,16 :{2 SPACEs}REM- WF VOICE 3
54Ø RETURN
549 REM ****** SOUND DATA ******
55Ø DATA 4817, 2,"{COMD +} {COMD +} {COMD +
   }",51Ø3, 2,"PLAY "
56Ø DATA 54Ø7, 2,"{2 SPACEs}A{2 SPACEs}",85
   83, 4,"RINKY"
57Ø DATA 54Ø7, 4,"D", 8583,12,"B",9634,2,"T
   "
58Ø DATA 1Ø2Ø7,2,"TUNE ",1Ø814,2,"{SHFT V}
   {SHFT V} {SHFT V}",8583,2,"{5 SPACEs}"
59Ø DATA 9634, 4," AND ",1Ø814,2,"PLACE",85
   83,2,"YOUR "
6ØØ DATA 9634, 4,"NOTES",8583,12,"HERE ",85
   83,Ø,"HERE{SHFT SPACE}"
61Ø DATA -1,-1,-1,"{SHFT A}{SHFT S}{SHFT W}
   {SHFT S}{SHFT A}"
```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bilities in coining words by just changing one letter.

I used quote marks to identify each word or graphics display group simply because I wanted to maintain the same print location for each combination.

Customizing Encouraged

You can easily personalize your version of the C-64 Jukebox. But first, type in the program and save it to tape or disk. From that point on, you can customize the program to provide a variety of effects in the display and attendant music. You can create a new flashing message or leave out that feature altogether.

For example, you can change the display effects by using different graphics symbols (or even letters) in variable CL ASC subscripts. A word of caution in doing so: Be sure to include the proper lowercase numerical value if you use an unshifted character.

For a tune of your choice, substitute your own data for the data included in the program listing. Refer to the *Commodore Programmer's Reference Guide* for details on converting a musical score to numerical data for the notes. If you can read music, simply translate the notes to data using the decimal data in Appendix M of the *User's Guide*.

To eliminate the flashing message, delete variable Z$ in line 40 and delete line 50. And, of course, leave the words out of the music data group. Should you elect to include a personalized commercial, just make sure there is a word, or equivalent string data, for each musical note.

To get started on customizing ideas, how about a Happy Birthday theme? Background screen color can be of your choice. The musical score could be the tried and true "Happy Birthday," with a personalized flashing birthday message.

The ideas for customizing the C-64 Jukebox are limited only by your imagination. While I am the first to admit this is a do-nothing program, it is also one of the most peaceful I have ever run. It makes no demands on you and provides a thoroughly enjoyable visual experience. Type it in and let it become your programming break! R

Address all author correspondence to Joe W. Rocke, 224 W. Benson Road, Ridgecrest, CA 93555.

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This program helps you keep your guitar in tune. But it's up to you to strum the right strings.

Picking the Right Sounds

By MICHAEL and JEFFREY GOLLER

Many different ways have been developed to tune the guitar, but most involve expensive tone generators or inaccurate pitch pipes.

This program, Guitar Tuner-64, turns your Commodore 64 computer into a sophisticated guitar tuner. The program uses the SID (sound interface device) chip, found deep in the heart of the C-64, to produce a perfect pitch every time. This is one guitar tuner that will never go out of tune.

The guitar's strings (in order from thickest to thinnest string) are named E, A, D, G, B and E (octave). These strings must be tuned to the following frequencies (in cycles per second) to be considered in tune: 82.407(E), 110.00 (A), 146.83(D), 196.00(G), 246.94(B), 329.63(E octave). Because of the way that the Commodore 64 produces music, you can get these tones perfect every time without ever having to readjust the computer.

To use the program, carefully type in the program and, before running it, save it. When you are finished, type RUN and press the return key.

The screen on your monitor will clear and you will see the title "Guitar Tuner" and the message "Please Stand By." In a few moments, you will see the neck of a guitar being drawn on the screen. At the top of the neck is the head of the guitar with the tuning pegs. Above each string is displayed the string's name. At the bottom of the string is a set of instructions for using the tuner.

Before you tune the guitar, tighten all six strings to a medium tightness. Do not change any of your strings once you've begun the tuning process or you'll throw off the pitch of those already tuned.

To tune your guitar, first make sure that the volume on your monitor or television set is turned up. Now press the E key on the keyboard. If you typed in the program correctly, you will now hear the pitch to which you should tune your thickest string. Simply tighten or loosen the string so that the tones match. There will be an arrow under the string that you are tuning, to remind you which string you are working on. Also, the letter at the top of the string will be highlighted.

After the first string is tuned, simply hit the A key, and the pitch will now change so that you can tune the second string. If at any time you wish the program to be silent, hit the space bar. The sound will stop until you hit another key. Also, by pressing the space bar, you can go to any string in any order, even if you have already silenced the program.

To produce the tone for the sixth (and thinnest) string, you must hold down the shift key and then press the E key. This tone will be exactly one octave above the low E (first) string.

To exit and end the program at any time, simply hold down the CTRL key and press the X key.

If you would rather not type in the program by hand, mail us $3, a blank cassette or disk and an appropriate self-addressed stamped mailer, and we'll send you a copy of the program. We'd also like to hear your comments and suggestions about the program. R

Address all author correspondence to Jeffrey Goller, 3431 Telford #2, Cincinnati, OH 45220.

RUN It Right

Commodore 64
Datassette

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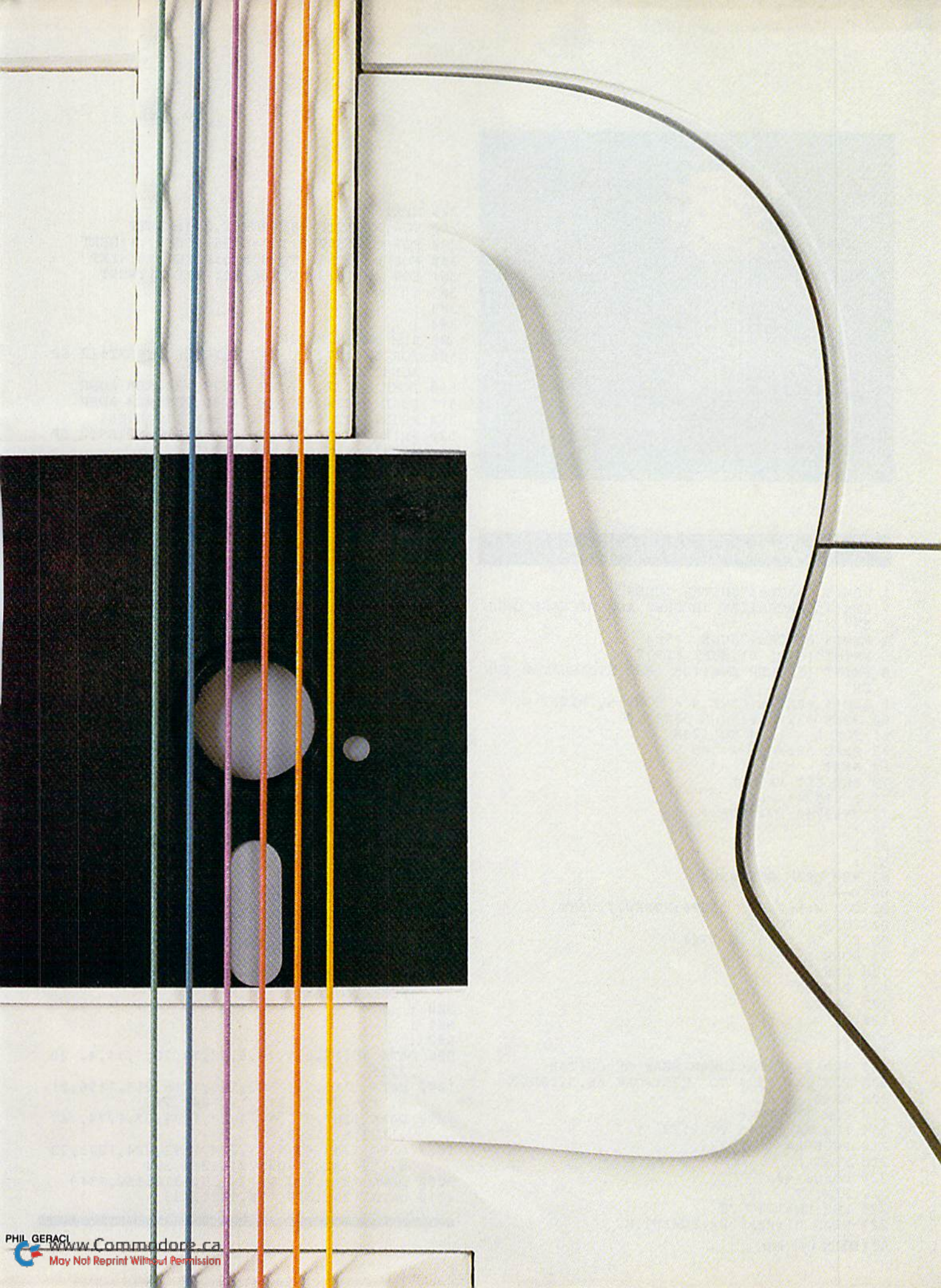

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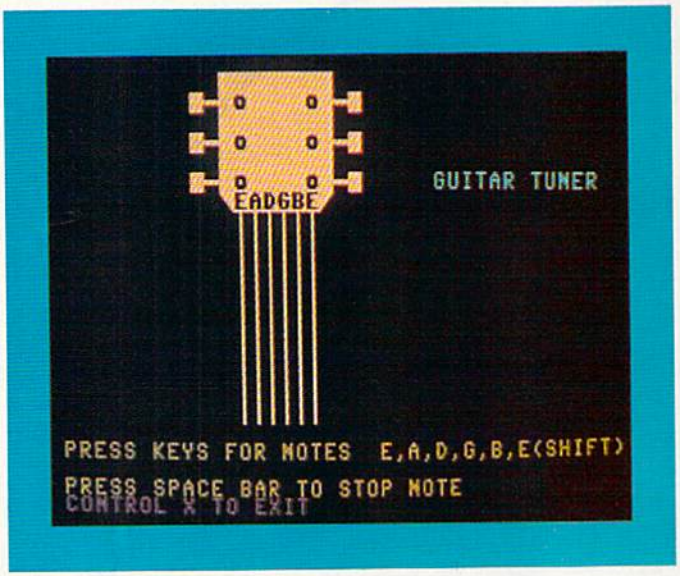

Listing 1. *Guitar Tuner-64 program.*

```
1 REM{5 SPACEs}"GUITAR TUNER"
2 REM{4 SPACEs}"BY JEFFREY AND MICHAEL GOLL
  ER"
3 REM{3 SPACEs}"JUNE, 1984 "
5 PRINT"{CTRL 8}{SHFT CLR}"
8 PRINT"{5 CRSR DNs}{26 CRSR RTs}GUITAR TUN
  ER"
9 REM{4 SPACEs}LINE 8 = DOWN 5, RIGHT 26
6Ø POKE 5328Ø,Ø:POKE 53281,Ø
61 FOR A = 1224 TO 1238
62 READ A8:POKE A ,A8
63 NEXT
7Ø REM SET VALUES
71 B =1Ø24:I=66
72 V=53248:PV=1964
78 :
81 :
82 :
83 REM DRAW STRINGS
84 E=Ø
85 FOR W=55296TO 56Ø96:POKEW,7:NEXT
9Ø FORJ=1 TO 11
95 FOR L= 1356 TO 1361
97 POKE L+E ,I
1ØØ NEXT L
1Ø1 E=E+4Ø
1Ø2 NEXTJ
12Ø :
14Ø :
15Ø :
151 REM{3 SPACEs}DRAW HEAD OF GUITAR
2ØØ FOR A5= 1224 TO 1238:POKE A5,32:NEXT
2Ø8 BB=Ø
21Ø FOR T=1 TO 6
214 FOR AA= 1115 TO 1122
216 POKE AA + BB,224
218 NEXT AA
22Ø BB=BB+4Ø
222 NEXT T
225 FOR HH=1 TO 2Ø
227 READ H1:READ H2:POKEH1,H2
229 NEXT HH
26Ø FORT=1Ø75TO1Ø82:POKET,224:NEXTT
29Ø FOR C2= 56Ø56 TO 56Ø96:POKEC2,1:NEXT
3ØØ FOR W= 55558 TO 55575:POKEW,14:NEXT
3Ø1 FOR X= 56236 TO 56255:POKEX,1:NEXT
3Ø2 :
3Ø3 :
3Ø4 :
4Ø3 REM BEGIN MUSIC
5ØØ FOR L=54272 TO 54296:POKEL,Ø:NEXT:{2 SP
    ACEs}POKE 54296,15
51Ø POKE 54277,Ø:POKE 54278,128:REM ADSR
511 POKE 54284,Ø:POKE 54285,128:REM ADSR
514 PRINT"{12 CRSR DNs}":REM (12 DOWN)
52Ø PRINT"{CTRL 6}PRESS KEYS FOR NOTES{2 SP
    ACEs}E,A,D,G,B,E(SHIFT)"
53Ø PRINT"PRESS SPACE BAR TO STOP NOTE"
531 PRINT"{CTRL 3}CONTROL X TO EXIT"
545 FOR X= 1 TO 6:READ X2:READX3:POKEX2,X3:
    NEXT
55Ø :
56Ø :
57Ø :
571 C=55599
6ØØ GET A$:IF A$=""THEN 6ØØ
6Ø1 POKE PV,96:POKEC,7
61Ø IF A$="E"THEN LF=5:HF=71 :PV=1796:C= 55
    588
62Ø IF A$="A"THEN LF=7:HF=12 :PV=1797:C= 55
    589
63Ø IF A$="D"THEN LF=9:HF=1Ø4:PV=1798:C= 55
    59Ø
64Ø IF A$="G"THEN LF=12:HF=143:PV=1799:C= 5
    5591
65Ø IF A$="B"THEN LF=15:HF=21Ø:PV=18ØØ:C= 5
    5592
66Ø IF A$="{SHFT E}"THEN LF=21:HF=31 :PV= 1
    8Ø1:C= 55593:REM SHIFT E
67Ø IF A$=" "THEN LF=Ø:HF=Ø:PV=1964:{4 SPAC
    Es}C=55599
671 IFA$="{CTRL X}"THEN8ØØ:REM "CONTROL X"
68Ø POKEPV,3Ø
681 POKEC,14
7ØØ POKE 54272,HF:POKE 54273,LF
7Ø1 POKE 54279,HF:POKE5428Ø,LF
7Ø9 POKE 54282,15:POKE 54281,1
71Ø POKE 54276,33 :POKE 54283,65
75Ø GOTO 6ØØ
8ØØ PRINT"{SHFT CLR}":FORL = 54272 TO 54296
    :POKEL,O:NEXT
9ØØ :
9Ø1 :
9Ø2 :
99Ø DATA 16,12,5,1,19,5,32,19,2Ø,1,14,4, 32
    ,2,25
1ØØØ DATA 1315,95,1322,1Ø5,1116,215,1196,21
    5,1276,215,1121,215,12Ø1,215
1Ø1Ø DATA 1281,215,1114,67,1194,67,1274, 67
    ,1123,67,12Ø3,67
1Ø2Ø DATA 1283,67,1113,224,1193,224,1273,22
    4,1124,224,12Ø4,224,1284,224
2ØØØ DATA 1316,133,1317,129,1318,132,1319
2Ø1Ø DATA 135,132Ø,13Ø,1321,133
```


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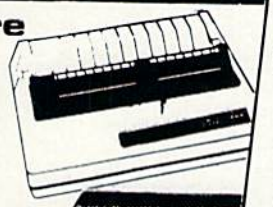

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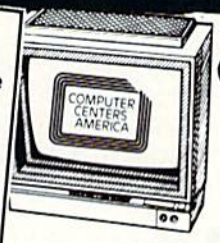

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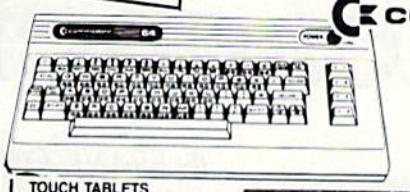

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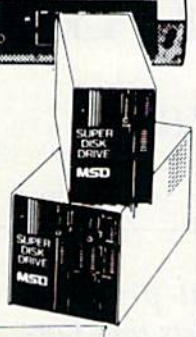

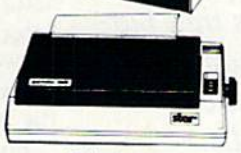

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Teacher's Pet

By FRANK COLOSIMO

This educational program generates worksheets that parents and teachers can use to help students practice their basic arithmetic skills.

This program produces math worksheets with one- to three-digit addition or subtraction problems or one- or two-digit multiplication problems. Six rows of seven problems each are placed on a standard 8½- × 11-inch sheet of paper. The answers are printed near the bottom of the sheet in six closely spaced rows.

For addition and subtraction, you must specify whether you want carrying or borrowing in the problems. Numbers are generated randomly, but for single-digit problems, you may specify the maximum number to appear in the problems. These options have been selected to allow worksheets to be produced with varying levels of difficulty for kindergarten through grade three.

Equipment Requirements

The program works with the Commodore 64, the VIC-20 (any memory), the Plus/4 and the C-16. I developed the program using a Star Gemini 10X printer with Tymax's The Connection interface in the Commodore 1525 Emulation mode. It also works with the Commodore 1525, 1526, the Smith-Corona TP-1 (daisywheel) and the Epson MX-80. Although double-width printing is not supported on a daisywheel printer, acceptable worksheets are produced.

Since it is impossible to test a program like this on all printers, I used features that would ensure compatibility with a variety of equipment. For instance, to locate the numbers on the paper, I used only the SPC function, since the Tab function differs from one printer to another.

If you do not have a Commodore printer (or another printer that simulates one), try the program anyway. If it does not work, the suggestions given below should provide the information you need to get it working properly.

For Non-Commodore Printers

If the program is not producing nicely formatted worksheets on your printer, you may need to make changes in lines 30, 50 and 60.

Line 30 contains the Open statement. Modify this if your interface requires a non-zero secondary address to simulate a Commodore printer (for example: OPEN 1,4,2).

Lines 50 and 60 contain the commands to turn double-width characters on and off. This produces characters of ideal size for young people to work with. Use the appropriate values for your printer, as found in the printer manual.

For the Gemini 10X, with a standard serial-to-parallel interface where there is no emulation of the Commodore printer, use CHR$(14) for UN$ (double-width on) and CHR$(20) for OFF$ (double-width off). If your machine does not support double-width characters, you may need to use null values (UN$ = "" and OFF$ = "").

With these null values, the worksheet will not be spaced as nicely across the paper, but will be completely usable. The rest of the program shouldn't require any modification if your printer is working properly with your computer.

How to Use It

There are five screen prompts you must answer before producing a worksheet:

1. *Operation*—Select addition, subtraction or multiplication.
2. *Number of digits*—Select 1–3 for addition or subtraction or 1 or 2 for multiplication.
3. *Carrying/borrowing*—For addition

RUN It Right

C-64, VIC-20, Plus/4, C-16; printer

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NAME: _____

MATH WORKSHEET

87	59	88	36	52	64	73
+11	+10	+11	+62	+25	+33	+16
37	63	46	48	29	97	66
+11	+24	+31	+11	+10	+ 1	+13

or subtraction, you must specify whether you desire carrying or borrowing in the problems.

4. *Highest digit*—For single-digit problems, this prompt will appear. Select the largest number that you want in the problem digits.

5. *Answers*—If you want answers printed on the bottom of the worksheet, enter Y in response to this question. The answers are positioned so that they can be easily torn off (or folded over, if you trust your student).

Program Description

Several program features are worth mentioning.

I used the random-number function (RND) to generate the digits for the problems. It is employed in such a way as to avoid the selection of the numbers 1 and 0 where possible. This results in fewer overly simple problems appearing on the worksheet.

I adjusted the vertical spacing to provide exactly 11 inches of paper travel per worksheet. If your printer uses the standard $^1/_6$ of an inch linefeeds, you will be able to produce a continuous series of worksheets on fanfold paper, with the horizontal perforations properly spaced between the worksheets.

I tried to document the program with plenty of REM statements and to make use of subroutines for most functions. This should allow easy customization of the program, if desired. You may omit the REM statements if you want to save a little typing time.

If you would like a copy of the program and do not want to do the typing, send me $5 with your name and address and specify whether you want VIC, 64, Plus/4 or C-16, and whether you want disk (1541 format) or tape (VIC/64 format). R

Address all author correspondence to Frank Colosimo, 112 Shoreway Drive, Rochester, NY 14612.

Listing 1. *Commodore Math Worksheet program.*

```
10 REM MATH WORKSHEET BY F. COLOSIMO
30 OPEN1,4{3 SPACEs}:REM USE APPROP. CMD FO
   R YOUR PRINTER/INTERFACE
50 UN$=CHR$(14):REM THIS CMD TURNS ON DBL W
   IDTH
60 OFF$=CHR$(15): REM THIS TURNS OFF DBL WI
   D.
70 DI$="(1-3)":X=0:POKE53280,0:POKE53281,12
80 DIMA%(28),B%(28),A$(7),B$(7),N1%(28),N2%
   (28),AN%(42)
90 PRINT"{CTRL 1}{SHFT CLR}{CRSR DN}{4 SPAC
   Es}******* MATH WORKSHEET *******":PRINT
   "{2 CRSR DNs}{2 SPACEs}POSITION PAPER NO
   W "
100 PRINT"{4 SPACEs}WITH PERF AT PRINTHEAD.
    ..{CRSR DN}"
120 PRINT"{CRSR DN}{3 SPACEs}DO YOU WANT AD
```

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Listing 1 continued.

```
    DITION,SUBTRACTION{8 SPACES}OR MULTIPLI
    CATION?(+,-,X)
130 GETO$:IFO$=""THEN130
140 PRINTSPC(6)"{CTRL 3} OPERATION = {CTRL
    1}"O$
150 IFO$="X"THEND1$="(1-2)":GOTO170
160 IFO$<>"+"ANDO$<>"-"THEN120
170 PRINT"{CRSR DN}{2 SPACEs}HOW MANY DIGIT
    S DO YOU WANT?"D1$
180 GETD$:IFD$=""THEN180
190 D=VAL(D$):IFD<1ORD>3THEN170
200 IFD>2ANDO$="X"THEN170
210 PRINTSPC(6)"{CTRL 3} PROBLEMS WILL HAVE
     "D"DIGITS{CTRL 1}"
220 IFD=1ORO$="X"THENCA$="Y":GOTO270
230 PRINT"{CRSR DN}{2 SPACEs}DO YOU WANT CA
    RRYING/BORROWING? (Y/N)"
240 GETCA$:IFCA$=""THEN240
250 IFCA$<>"Y"ANDCA$<>"N"THEN230
260 PRINTSPC(7)"{CTRL 2} CARRY/BORROW = {CT
    RL 1}"CA$
270 IFD>1THENAA=9:GOTO310
280 PRINT"{CRSR DN} WHAT IS THE HIGHEST NUM
    BER YOU WANT IN{2 SPACEs}THE PROBLEMS?
    (1-9)"
290 GETAA$:IFAA$=""THEN290
300 AA=VAL(AA$):IFAA<1THEN280
310 PRINTSPC(4)"{CTRL 3} HIGHEST NUMBER IN
    PROBLEMS ={CTRL 1}"AA
320 PRINT"{CRSR DN} DO YOU WANT ANSWERS ON
    WKSHT? (Y/N)"
330 GETAN$:IFAN$=""THEN330
340 GOSUB960:REM{2 SPACEs}PRINT TITLE
360 FORM=1TO6
370 GOSUB490:GOSUB810:NEXTM:AS=D
380 IFAN$<>"N"THEN410
390 FORN=1TO3:PRINT#1,CHR$(13):NEXT:GOTO430
410 FORN=1TO6:PRINT#1,OFF$SPC(1+AS);:FORM=1
    TO7:DU=AN%((N-1)*7+M):D=10:GOSUB920
420 PRINT#1,DU$;:NEXT:PRINT#1:NEXT
430 PRINT#1,CHR$(13)CHR$(13):CLOSE1
440 PRINT"{SHFT CLR}{CRSR DN}WOULD YOU LIKE
     TO MAKE ANOTHER WORKSHEET?(Y/N)"
450 GETC$:IFC$=""THEN450
460 IFC$="Y"THENRUN
470 END
490 FORN=1TOD*7:A%(N)=(AA-1)*RND(0)+2:NEXT
500 IFCA$="N"ANDO$="+"THEN570
510 FORN=1TOD*7:B%(N)=AA*RND(0)+1:NEXT
520 IFO$<>"-"THEN630
540 FORN=1TOD*7:IFA%(N)<B%(N)THENC%=A%(N):A
    %(N)=B%(N):B%(N)=C%
550 NEXT:GOTO580
570 FORN=1TOD*7:B%(N)=RND(0)*(9-A%(N))+1+(A
    %(N)=9):NEXT
580 IFCA$="N"THEN630
600 FORN=1TOD*7STEPD:C%=A%(N):A%(N)=B%(N):B
    %(N)=C%
610 NEXT
630 FORN=1TO7:PL=0:N1%(N)=0:N2%(N)=0
640 FORNN=D*(N-1)+1TO(N-1)*D+D
650 N1%(N)=N1%(N)+A%(NN)*10{UP ARROW}PL
660 N2%(N)=N2%(N)+B%(NN)*10{UP ARROW}PL:PL=
    PL+1:NEXT
670 IFO$<>"-"THEN710
690 IFN1%(N)<N2%(N)THENC%=N1%(N):N1%(N)=N2%
    (N):N2%(N)=C%
710 X=X+1
720 IFO$="+"THENAN%(X)=N1%(N)+N2%(N)
730 IFO$="-"THENAN%(X)=N1%(N)-N2%(N)
740 IFO$="X"THENAN%(X)=N1%(N)*N2%(N)
750 NEXT
770 FORN=1TO7:DU=N1%(N):GOSUB920:A$(N)=DU$
780 DU=N2%(N):GOSUB920:B$(N)=DU$:NEXT:RETUR
    N
810 L=LEN(A$(1)):PRINT#1,UN$SPC(4);:FORN=1T
    O7
820 PRINT#1,UN$" "A$(N)SPC(4-L);:NEXT
840 PRINT#1,CHR$(10):PRINT#1,UN$SPC(4);
850 FORN=1TO7:PRINT#1,UN$O$B$(N)SPC(4-L);:N
    EXT
870 PRINT#1:PRINT#1,UN$SPC(4);:FORN=1TO7
880 FORNN=0TOL:PRINT#1,"-";:NEXT:PRINT#1,UN
    $SPC(4-L);:NEXT
890 PRINT#1,CHR$(10)CHR$(10)CHR$(10)CHR$(10
    )
900 RETURN
920 DU$=STR$(DU)
930 IFLEN(DU$)<D+1THENDU$=" "+DU$:GOTO930
940 DU$=RIGHT$(DU$,D):RETURN
960 PRINT#1,CHR$(13)CHR$(13)
970 PRINT#1,UN$SPC(18)"NAME:":PRINT#1,UN$SP
    C(23)"----------"
980 PRINT#1,CHR$(10)UN$SPC(12)"MATH WORKSHE
    ET"CHR$(13)CHR$(13):RETURN
```


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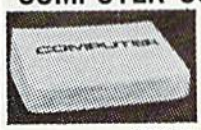

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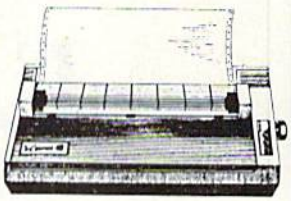

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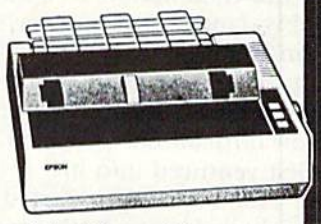

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Easy Assembly

By WILLIAM B. SANDERS

Finally, here's an easy-to-understand tutorial on assembly language. By the end of this series, you'll be programming with consummate skill.

One of the most intimidating, yet fascinating, challenges in programming your Commodore 64 is tackling assembly language. However, once you understand it, you'll not only find it to be fun, you'll find it a lot simpler than you imagined. (Remember how difficult Basic seemed when you first ventured into it?)

The best way to get started is to jump right in. Using a Basic program, we'll write an assembly language program. It will be simple and direct, and it will do something you can see immediately.

```
10 FOR X = 49152 TO 49157
20 READ OP : POKE X, OP
30 NEXT X
40 DATA 169,2,141,33,208,96
```

Leaving your Basic program in memory, enter SYS 49152. Your background color should have turned red, but you should have no idea why.

Now, let's see what happened. You know you Poked the values in line 40 into the consecutive addresses of 49152–49157. Here's what those addresses would look like if you Peeked into them:

49152	169
49153	2
49154	141
49155	33
49156	208
49157	96

That's a lot clearer, right? Wrong! Unless you already know machine language, that list looks like a random collection of numbers. Let's see what they mean.

First of all, the values from 49152–49157 are consecutive addresses in memory. For the moment, think of them as line numbers in Basic. The values next to the "line numbers" are either commands, values or addresses.

Secondly, let's translate the encoded command values into something clearer.

49152	LDA
49153	2
49154	STA
49155	33
49156	208
49157	RTS

The fundamental ingredients in assembly language are opcodes and operands. The alphabetic codes (opcodes) in the above example are mnemonics, designed to make it easier to remember their meanings. The three in the example have the following meanings:

```
LDA means LoaD the Accumulator
STA means STore the Accumulator
RTS means ReTurn from Subroutine
```

In Basic, the same thing might look like this:

```
10 A=2
20 POKE 53281,A: REM BACKGROUND
   COLOR
30 END
```

Specifically, the Basic equivalents of the assembly code mnemonics are as follows:

	Assembly code	Basic
49152	LDA	A=
49153	2	2
49154	STA	POKE
49155	33	???
49156	208	???
49157	RTS	END or RETURN

Everything in the example has a Basic equivalent except for the command values at addresses 49155 and 49156. The explanation lies in the way the C-64 stores numbers.

The largest number that can be stored in one byte is 255 (decimal). Its binary form (11111111) requires all eight bits of the byte. The next larger number, 256, requires *nine* binary digits (100000000), so one byte will not suffice. The two-byte method of storing numbers larger than 255 is called low-byte/high-byte sequence. Furthermore, the values are stored, not as decimal, but as hexadecimal numbers, indicated by the $ symbol. Using hexadecimal values, the two addresses would look like this:

49155	$21
49156	$D0

To read the full hex number, you reverse the order, getting $D021, which equals the decimal number 53281. You achieve the same thing in Basic by: PRINT 33+(208*256).

If you rearrange the listing (using decimal values) to look like the following, you can see the relationship between the commands (the opcodes) and the numbers (the operands).

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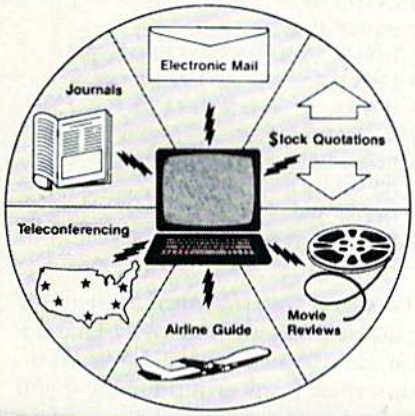

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```
49152    LDA   #2
49154    STA   53281
49157    RTS
```

Assembly language is a simpler way of putting machine language into your computer. When you enter the assembly language opcode LDA, your assembler puts the machine language opcode (with the correct addressing mode) into a given memory location. Looking at the original listing and comparing it with the assembly listing, you can see the assembly listing makes a lot more sense.

Machine Code		Assembly Code
49152	169	LDA #2
49153	2	
49154	141	STA 53281
49155	33	
49156	208	
49157	96	RTS

Simple Monitor

To begin exploring what's in your computer's memory, let's take a look at a simple "monitor" that will allow you to look at and enter machine code.

From Basic, you know that Peek lets you look at something in memory and Poke lets you put something into memory. To keep it clear, I'll make an idiot-proof monitor; one that you can write *and* understand using Peek to see things and Poke to enter things.

```
10 REM **************
20 REM SIMPLE MONITOR
30 REM **************
40 PRINT CHR$(147)
50 INPUT "ADDRESS";A$
60 IF A$="A" THEN GOSUB 140
70 IF A$="A" THEN GOTO 50
80 IF A$="Q" THEN END
90 A=VAL(A$)
100 FOR X=A TO A+20
110 PRINT X;" = ";PEEK(X)
120 NEXT X
130 GOTO 50
140 PRINT CHR$(147)
150 INPUT "ADDRESS TO BEGIN";BA
160 PRINT BA;: INPUT"VALUE";V$
170 IF V$="Q" THEN RETURN
180 V=VAL(V$)
190 POKE BA,V
200 BA=BA+1
210 GOTO 160
220 REM <--WATCH THIS LINE
    NUMBER
```

To work your monitor, just enter the address you wish to view. That address and the next 20 will be listed on your screen. Look around to see if you can find some zeroes. This is "free RAM," where you can put your machine code. Try looking at addresses 828 and 49152, a couple of good areas with some free space. When you're finished looking around, press Q to quit.

To enter code, press A (for add) and the starting address. Don't try any number larger than 255 and be careful where you add your code. Put it up in 49152 or down in 828. Try entering the little program that turned the background color red.

If you want to do something weird, have the program look at itself. Basic programs begin in address 2048. Look around there and see if you can find the line numbers. In your monitor program, they are all followed by zeroes; so look for a zero and then back up to see the line number. If you put the spaces in just right, when you look up around 2392 you will see something that looks like this:

```
2392=220
2393=  0
2394=143
```

The 220 is line 220, the 0 is the high byte of the line number and the 143 is the Basic token for REM. Press A for add and enter the value 255 in 2392 and 2393 (or whatever addresses are the two just before the 143). Use Q to get out of the program and then list your monitor program.

Your last line number is now 65535. Try removing that line number from Basic. You can't do it. If you run your monitor again, you can re-Poke those addresses where you added those 255s.

An Easier Language

Playing with the monitor is a lot of fun, but it is not going to help you really start programming in assembly language. It will help you understand something about the way in which code is stored, and how your Basic program is tokenized, but the main purpose is to show you how much more difficult it is to program in machine language than assembly language.

With the mnemonic opcodes used in assembly language instead of the numeric opcodes in machine language, you can better understand the logic of what you're doing.

In future columns, we'll start working on an assembler for you to use if you don't already have one. For the time being, start looking at how your computer stores numbers; especially look for those empty places where you can store your own code. R

William B. Sanders (8982 Stimson Court, San Diego, CA 92129) is the author of Assembly Language for Kids: Commodore 64 and *Elementary Commodore 64.*

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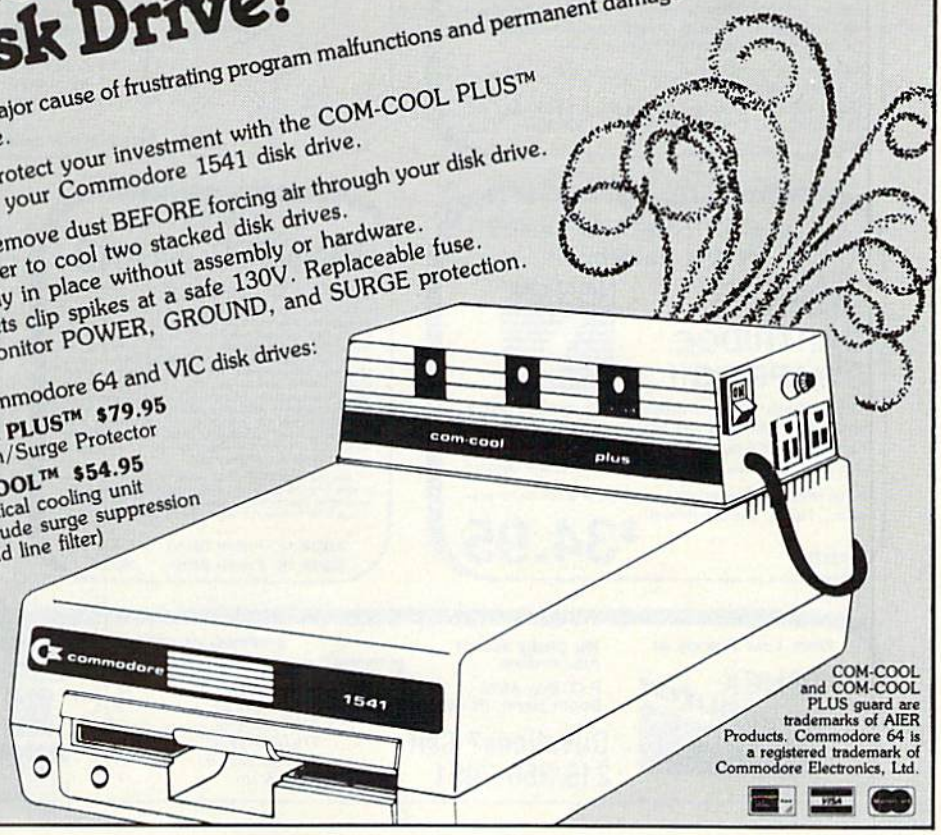

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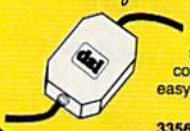

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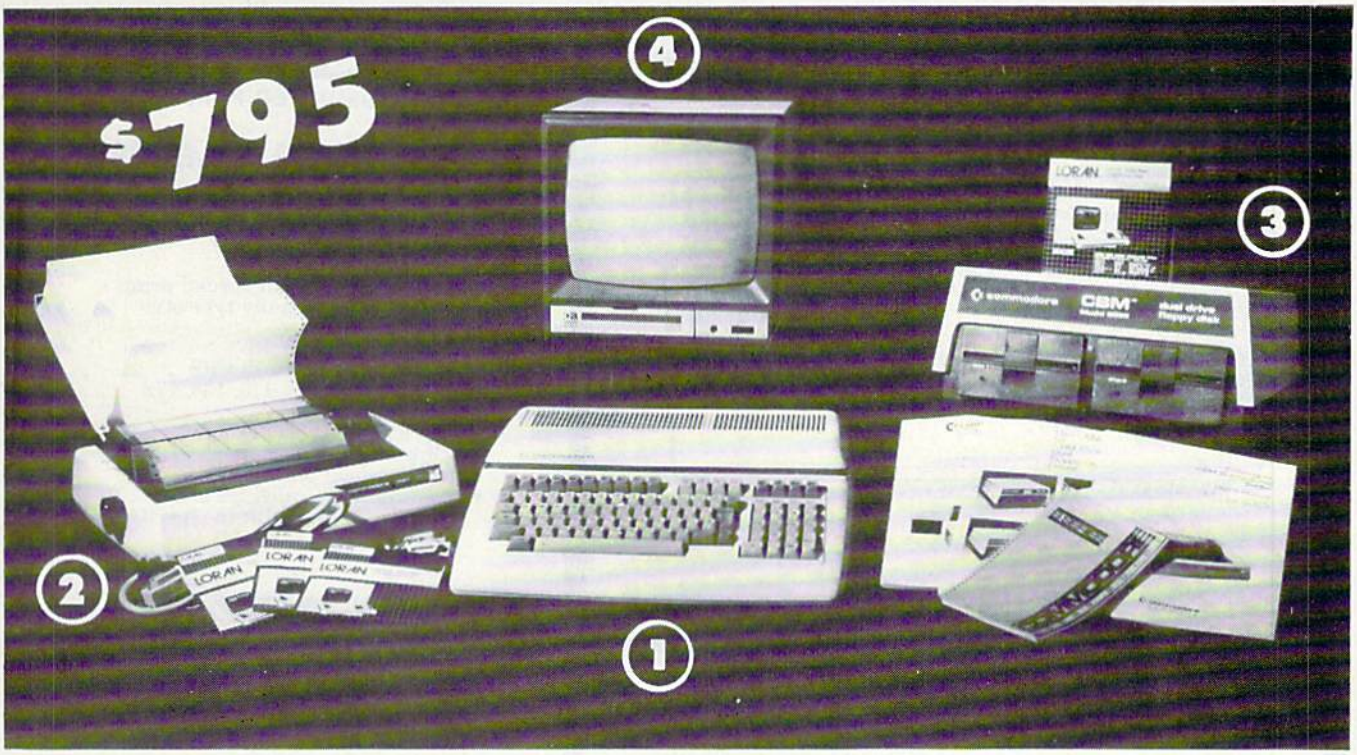

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Order Entry	$149.95	**$99.00**	

* When Bought with B128 Computer System.

☆ **PRINTER REPLACEMENT OPTIONS**
(replace the 4023 with the following printers at these sale prices. Interface Included)

	LIST	SALE
☆ Olympia Executive Letter Quality Printer	$699.00	**$369.00**
☆ Comstar Hi-Speed 160 CPS 15½" Business Printer	$779.00	**$459.00**
Telecommunications Deluxe Modem Package	$199.00	**$139.00**
IEEE to Centronics Parallel Printer Interface	$179.00	**$139.00**

15 DAY FREE TRIAL. We give you 15 days to try out this SUPER SYSTEM PACKAGE!! If it doesn't meet your expectations, just send it back to us prepaid and we will refund your purchase price!!
90 DAY IMMEDIATE REPLACEMENT WARRANTY. If any of the SUPER SYSTEM PACKAGE equipment or programs fail due to faulty workmanship or material we will replace it IMMEDIATELY with no service charge!!

Add $50.00 for shipping and handling!!
WE DO NOT SHIP THIS SYSTEM TO FOREIGN COUNTRIES, CANADA, PUERTO RICA, ALASKA, OR HAWAII.
Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. 1 day express mail! We accept Visa and MasterCard. We ship C.O.D. to continental U.S. addresses only.

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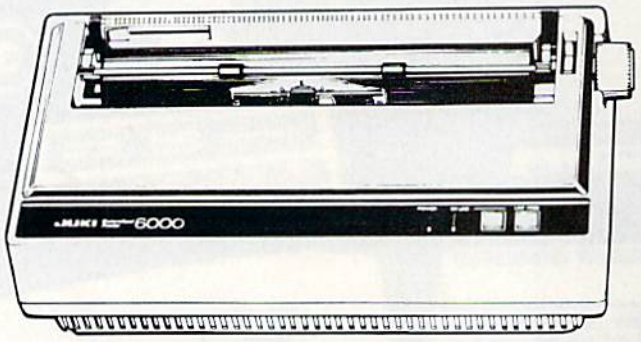
DAISY WHEEL PRINTER SALE!

JUKI®

(Japanese Highest Quality Award Winner)



Letter Quality Printer

Letter Quality Printer/Typewriter

DELUXE LETTER QUALITY "DAISY WHEEL PRINTERS"

JUKI®

DELUXE COMPUTER PRINTER

List Price $399 **SALE $249**

- Superb "Daisy Wheel" Computer Printer
- 100 Characters
- Bi-directional with special print enhancements-many type styl· $18.95
- Pitch 10, 12, 15 CPI
- Print Speed up to 12 CPS
- Print line width: 115, 138, 172 characters
- 12" Extra large carriage
- Drop in cassette ribbon (replacement $8.95)
- Centronics parallel RS 232 Serial interface built in (specify)

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DELUXE "COMBINATION" PRINTER/TYPEWRITER

List Price $499 **SALE $299**

- Superb Computer Business Printer combined with the deluxe electronic typewriter!
- Two machines in one—just a flick of the switch!
- Superb letter quality correspondence—home, office, word processing!
- 12" Extra large carriage
- Drop in cassette ribbon—replacement $8.95
- Precision daisy wheel printing—many type styles! $18.95
- Pitch selector-10, 12, 15 CPS, Automatic relocate key!
- Automatic margin control and setting! Key in buffer!
- Centronics parallel or RS 232 Serial interface built-in (specify)

15 Day Free Trial - 90 Day Immediate Replacement Warranty

- COMMODORE 64 COMPUTER INTERFACE ONLY $49.00 - ATARI INTERFACE $79.00

ADD $10.00 for shipping and handling!!

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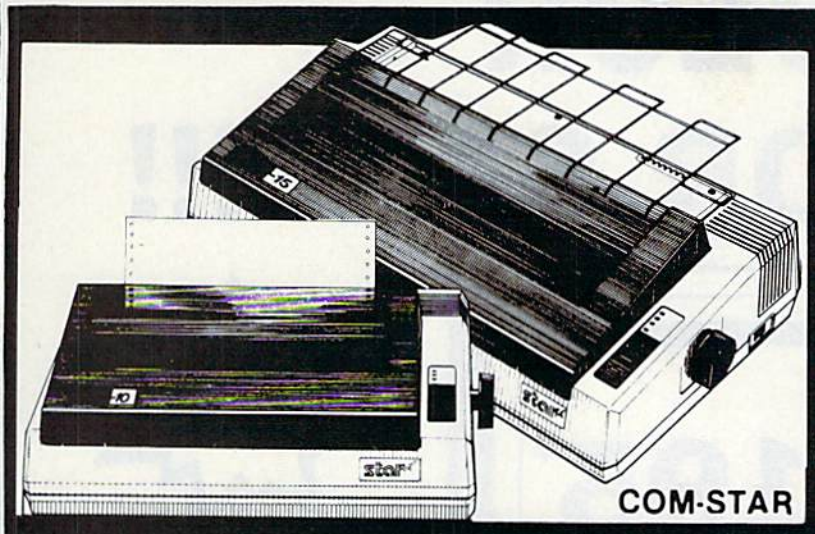

COM-STAR T/F

Tractor
Friction
Printer

only $ 169**

- Lowest Priced, Best Quality, Tractor-Friction Printers in the U.S.A.
- Fast 80-120-160 Characters Per Second • 40, 46, 66, 80, 96, 132 Characters Per Line Spacing
- Word Processing • Print Labels, Letters, Graphs and Tables • List Your Programs
- Print Out Data from Modem Services • "The Most Important Accessory for Your Computer"

** DELUXE COMSTAR T/F 80 CPS Printer $169.00

This COMSTAR T/F (Tractor Friction) PRINTER is exceptionally versatile. It prints 8½" x 11" standard size single sheet stationary or continuous feed computer paper. Bi-directional, impact dot matrix, 80 CPS, 224 characters. (Centronics Parallel Interface).

Premium Quality 120-140 CPS 10X COM-STAR PLUS+ Printer $199

The COM-STAR PLUS+ gives you all the features of the COMSTAR T/F PRINTER plus a 10" carriage, 120-140 CPS, 9 x 9 dot matrix with double strike capability for 18 x 18 dot matrix (near letter quality), high resolution bit image (120 x 144 dot matrix), underlining, back spacing, true lower decenders with super & subscripts, prints standard, italic, block graphics & special characters. It gives you print quality and features found on printers costing twice as much!! (Centronics Parallel Interface) (Better than Epson FX80). RATED "BEST BUY" BY CONSUMERS DIGEST BUYERS GUIDE, JANUARY 1985! List $499.00. **Sale $199.00.**

Premium Quality 120-140 CPS 15½X COM-STAR PLUS+ Business Printer $319.00

Has all the features of the 10" COM-STAR PLUS+ PRINTER plus 15½" carriage and more powerful electronics components to handle large ledger business forms! (Better than Epson FX 100). List $599. **Sale $319.00.**

Superior Quality 15½" COM-STAR PLUS+ H.S. High Speed 160-180 CPS Business Printer $449.00

15½" Carriage and more powerful electronic components to handle larger ledger business forms! (Serial Centronics Parallel Interface). List $799. **Sale $449.**

12" DAISY WHEEL PRINTER $249.00

"JUKI" Superb letter quality daisy wheel printer, 12" extra large carriage, up to 12CPS bi-directional printing, drop-in cassette ribbon, (90 day warranty) centronics parallel or RS232 serial port built in! (Specify). List $399.00. **Sale $249.00.**

Superior Quality 10" COM-STAR+ H.S. HIGH SPEED 160-180 CPS Business Printer $349.00

This **Super High Speed Com-Star+ Business Printer** has all the features of the 10" COM-STAR+ PRINTER with HIGH SPEED BUSINESS PRINTING 160-180 CPS, 100% duty cycle, 8K Buffer, diverse character fonts, special symbols and true decenders, vertical and horizontal tabs. **A RED HOT BUSINESS PRINTER** at an unbelievable low price (Serial or Centronics Parallel Interface). List $699.00.
Sale $349.00.

Printer/Typewriter Combination $299.00

"JUKI" Superb letter quality, daisy wheel printer/typewriter combination. Two machines in one — just a flick of the switch. 12" extra large carriage, typewriter keyboard, automatic margin control and relocate key drop in cassette ribbon! (90 day warranty) centronics parallel or RS232 serial port built in (Specify). List $499.00. **Sale $299.00.**

• 15 Day Free Trial - 1 Year Immediate Replacement Warranty

PARALLEL INTERFACES

For VIC-20 and COM-64 — $49.00. Commodore B-128 — $139.00. Apple — $79.00. Atari — $79.00.

Add $14.50 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $29.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

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COM-STAR PLUS+ Print Example:
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ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890

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(Lowest price in USA)

- Built in speaker and audio
- Front Panel Controls
- For Video Recorders
- For Small Business/ Computers
- Apple-Commodore Atari-Franklin-etc.

13" Color Computer Monitor

16 COLORS

- Beautiful Color Contrast
- High Resolution
- Separated Video
- Sharp Clear Text
- Anti Glare Screen
- 40 Columns x 24 lines
- Supports 80 Columns
- List $399

SALE **$195**

15 Day Free Trial - 90 Day Immediate Replacement Warranty

12" XTRON SUPER HI-RESOLUTION "SWIVEL BASE" MONITOR

List $249 **SALE $119***

80 Columns x 24 lines, Super Hi-Resolution 1000 lines
Green or Amber super-clear Easy to Read text with special anti-glare screen!

12" ZENITH HI-RESOLUTION GREEN OR AMBER TEXT DISPLAY MONITOR

List $199 **SALE $99***

80 Columns x 24 lines, Hi-Resolution-crisp clear easy to read text with anti-glare screen! A MUST for word processing.

12" MONITOR GREEN OR AMBER TEXT

80 Columns x 24 lines, easy to read up front controls

List $159 **SALE $79.95***

***Plus $9.95 connecting cable!**

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

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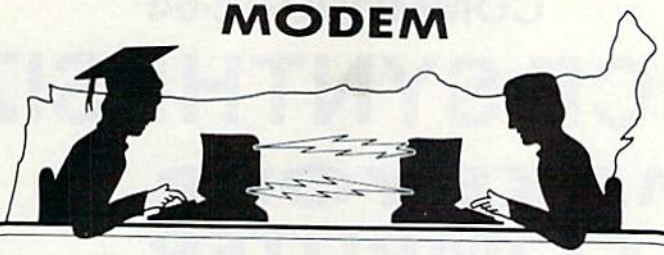
Sale

Commodore 64 MODEM



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$59 List $129.95

Telecommunications

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Complete Auto Dial Telecommunications Package

"The only telecommunications package you will ever need."

(Exclusive Easy To Use Features)

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Total Telecommunications

NEW

• 300 Baud Modem • Auto Dial • Auto Answer • Upload & Download

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- News Updates and Information
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- On-line Clock
- Capture and Display High Resolution Characters
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- Stores on Disk Downloaded Files
- Reads Files from Disk and Uploads Text or Program Files
- Select Any Protocol (access almost any computer or modem)
- Plus Much, Much More

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Special Low-Low Price $59.00

We are so sure this is the only telecommunications package you will need we will give you 15 days Free Trial.

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COMMODORE-64

VOICE SYNTHESIZER

NEW NEW

MAKE YOUR COMPUTER TALK

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SALE ONLY $59.00

You can program any words or sentences • Adjust volume and pitch • Receive Modem messages • Make adventure games that talk • Real sound action games • Make customized talkies • (Demo disk or tape included)

You can add TEXT TO SPEECH SOFTWARE that allows you to simply type what you want to hear!! Also allows you to add sound and voice to SCOTT ADAMS and "ZORK" ADVENTURE GAMES. List $29.95. SALE $19.95. (Disk or Tape).

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• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

COMMODORE 64

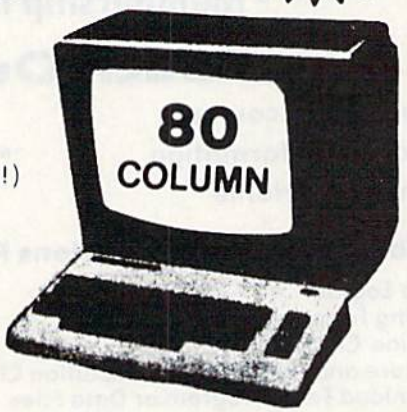
80 COLUMN BOARD

SALE

FOR ONLY $89.00

(Word Processor Disk Program included FREE!!)

Now you can program 80 columns on the screen at one time! Converts your Commodore 64 to 80 columns when you plug in the PROTECTO 80 Expansion Board. List $199.00. **Sale $89.00.**



Includes 4 Slot Expander and can be used with most existing software!!!

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Premium Quality Floppy Disks

Box of 10 *with hub rings, sleeves and labels*

Famous Brand FUJI Floppy Disks for those who care about keeping their data.

Single Sided — Double Density
for Commodore 64, Atari, Apple

List $39.95
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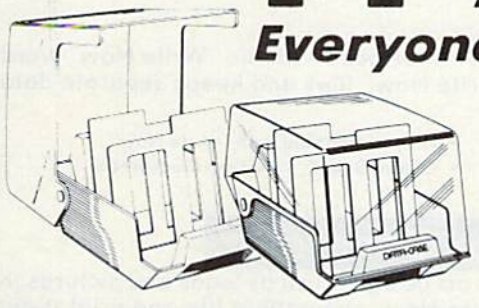
Data-Case

Floppy Disk Filer



Everyone Needs a Floppy Disk Secretary

Facts:

- Dust and Dirt particles can hurt your disks
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- Proper filing of your disk collection will reduce unnecessary handling of your disks

The Floppy Disk Filer is an inexpensive hard plastic Fliptop case that will allow for easy filing, and protect your disks from dust, smoke, and dirt. Plus, the Floppy Disk Filer will keep all your disks out of unwanted hands and in one place where you can easily find them. **(Holds Over 50 Disks)**

List $24.95 **Introductory Sale Price $14.95** **** Coupon $12.95***

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Commodore 64 **CARDCO** Commodore 64

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Write Now! — Word Processor

Easy To Use Cartridge Based Word Processor for the C-64, With Full 80 Column On-Screen View Mode

The WRITE NOW! word processor provides you with the easiest to use, fastest to learn format available for your Commodore 64 computer. It will give you all the fetures you would expect in a professional word processor and some features not found in any other Commodore 64 word processor.
(Cartridge) List $49.95. **Sale $34.95.** *Coupon $29.95.*

- Program is on cartridge and loads instantly so there is no waste of time loading from unreliable tapes or disks.
- Built in 80 column display allows you to see exactly what you will print including headers, footers, justification, page numbers and page breaks.
- Can send all special codes to any printer, even in the middle of a line without losing proper justification.
- Page numbering in standard numbers or upper or lower case Roman numerals.
- Full string search and search/replace functions.
- Direct unlimited use of previously stored text from tape or disk called from within text during the print out so it uses no memory space and allows creation of unlimited length documents.
- Full scrolling up and down through text.
- No complicated editing modes or commands.
- Multiple line headers and footers.
- Justification and text centering.
- Block copy and delete commands.
- Save text to tape or disk.
- Easy full screen editing.
- Works with any printer.
- Easy to understand instruction booklet.
- 4 help screens included.

Spell Now — Spell Checker

"Spell Now" is a disk based professional spelling checker that interfaces with the "Write Now" word processor for the C-64. Use "Spell Now" to check the spelling in your "Write Now" files. It includes all features of the most expensive spelling checkers on the market. (Disk) List $39.95. **Sale $19.95.**

- 34,000 word dictionary.
- 1,000 word mini-dictionary.
- Unlimited number of supplemental dictionaries (user-definable).
- You see status of spelling check.
- Menu-driven; user-friendly.
- Fully compatible with "Write Now".
- Allows for marking, immediate correction and viewing in context.
- CARDCO, INC.'s Lifetime Guarantee.

Mail Now — Mailing List Software

The "Mail Now" is a disk based full random access data base designed to be used with the "Write Now" word processor. "Mail Now" allows the user to merge an address file into the text of the word processor for form letters. (Disk) List $39.95. **Sale $19.95.**

- Machine language fast sort.
- User-friendly, totally menu-driven operation.
- 10 character comment line.
- User-defined, print format can print one, two or three labels across.
- 2 character category field.
- Supports 600 entries per disk.
- Quick (in memory) sorts by Zip, Category, Last name and State.
- Includes data back-up utility.
- CARDCO, INC.'s Lifetime Guarantee.

File Now — Database

"File Now" is the inexpensive data base you've been waiting for. "File Now" interfaces with the "Write Now" word processor for the C-64. Helps you with data base management of your "Write Now" files and keeps separate data bases for other important information. (Disk) List $39.95. **Sale $29.95.**

- Functions as a deck of 3 x 5 note cards.
- Fields are user-definable.
- Full edit features; add, edit, delete.
- Searching is bidirectional.
- Wild card searching and printing.
- Capacity up to 700 cards per file-disk.
- Fully compatible with "Write Now".
- CARDCO, INC.'s Lifetime Guarantee.

Graph Now / Paint Now — Graphic/Logo Generator

A full graphics package capable of generating line, bar graphs and graphic art designs such as logos and pictures to be used with "Write Now" for the C-64. Save your graph or logo in a "Write Now" compatible file and print it out along with your "Write Now" text file. (Disk) List $39.95. **Sale $19.95.**

- Allows plotting of x,y coordinates from software or keyboard.
- Compatible with "Write Now" files.
- Menu-driven; user-friendly.
- Draw lines, rectangles and circles.
- 3 fill shades; white, gray and black
- Character font editor
- Load or save graphics.
- Optional joystick control.
- CARDCO INC.'s Lifetime Guarantee.

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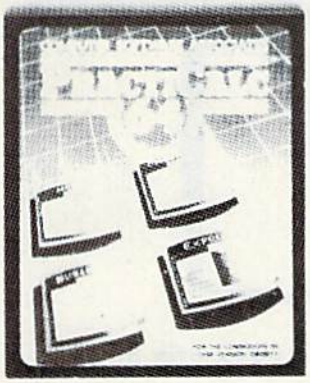
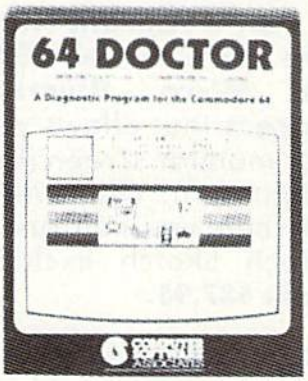
• Keep Mailing Lists • Change Records, numbers, methods of filing • Information Retrieval

• Test RAM Memory • RS-232 Port • Keyboard • Video • Audio • Joystick • Printer • Disk Drive • And More!





Practicalc 64: A consistent best seller, Practicalc 64 has become a reference standard among Commodore 64 spreadsheets. With features like alphabetic and numeric sorting and searching, variable comumn widths, graphing and over 30 math functions, this program is an exceptional value. Practicalc 64 also interacts with Practifile, forming the perfect small business bundle.
List $59.95. **Sale $24.95**. (Disk or Tape)

Practifile: Flexibility and large capacity make Practifile the ideal data-base manager for the Commodore 64. (3800 records per file, sorts 5 fields at once.) Files written with the program are compatible with Practicalc 64 and popular word processing programs such as EasyScript, Word Pro, PageMate and PaperClip. Finally, a full-featured data-base at an affordable price!
List $59.95. **Sale $24.95**. (Disk.)

64 Doctor: A special diagnostic program for the Commodore 64, 64 Doctor takes the guesswork out of isolating troublesome hardware problems. The program tests each piece of hardware to pinpoint defects and help prevent costly and time-consuming service calls. An essential program for all Commodore 64 users!
List $34.95. **Sale $19.95**. (Disk.)

PractiCalc II *Better than Lotus 1-2-3* *Coupon $44.95*

PractiCalc II, a fast, versatile spreadsheet with database and word processing features, does away with erasers, broken pencils and a wastebasket filled with scrap paper. PractiCalc II, with its functions and features, has the ability to complete simple and complex tasks. PractiCalc II is flexible enough to be used for checkbooks, alphabetized lists, home budgets and business financial statements. PractiCalc II is the tool of the eighties. List $69.95. **Sale $49.95.** Coupon $44.95. (Disk)

With PractiCalc II you can:

- Use 250 rows by 100 columns
- Use 36 math functions from simple addition to square roots and trig functions.
- Sort alphabetically and numerically.
- Use upper and lower case letters.
- "Hide" columns of numbers for special reports without losing data.
- Create fixed titles of several rows and/or columns.
- Replicate any data in any area.
- Adjust individual column widths.
- Use graphic display option.
- Set global and individual cell formatting.
- Use IF ... THEN statements.
- Edit labels and formulas.
- Format disks from within the program.
- View disk catalog from within the program.
- Write expanded labels up to 88 characters long.
- Insert, delete and move information with ease.
- Start using PractiCalc II within ten minutes of opening the package.
- Consolidate separate spreadsheets for totalling.
- Search for known and variable entries.

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Computer Learning Pad

- **Makes graphic tablets Obsolete**
- **Includes Special Printer Feature**

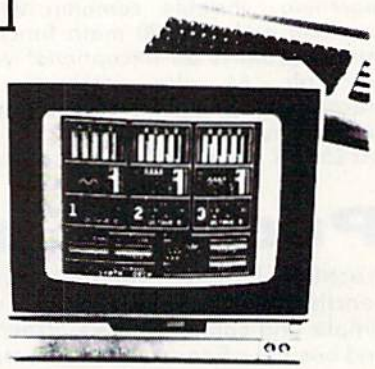
Hi-Resolution!

Sale! $37.95

Now you get this **Fantastic Tech Sketch Computer Light Pen Program** with a **Professional Light Pen Free!** ($39.95 value) plus the **Micro Illustrated Graphics Pen Program** that allows you to draw on your T.V. or monitor screen (better than Gibsons $99 light pen). Whatever you can draw on the screen you can print on your printer (A Tech Sketch Exclusive.) (Disk) List $59.95 **Sale $37.95.**

Also available is **Lite Sprite**, a light pen driven sprite builder (List $39.95 **Sale $29.95**).

MUSIC PORT



The ultimate music synthesizer and multi-track recording system for the Commodore 64. A **Full-sized REAL Keyboard** and all software including printing to the printer and preprogrammed songs are included. (Disk) List $149.95 **Sale $99.00.**

Fully Responsive "MUSICIANS" Keyboard

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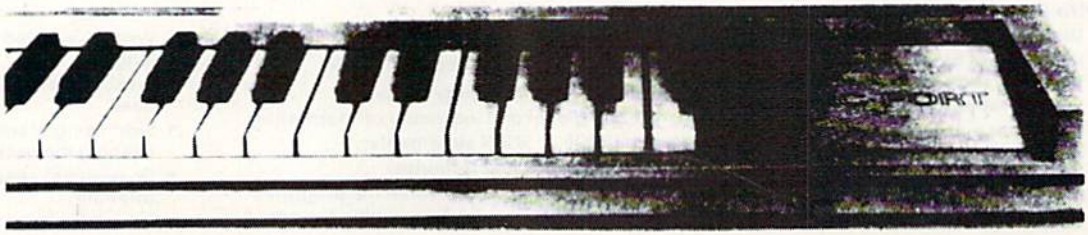

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All programs were written by teachers and have been classroom validated. These programs teach in a standard classroom format with rewards as the user gets through the various lessons.

(Disk)

US Geography Facts — Has 35 pre-programmed lessons plus an authoring system that lets you create your own lessons. Excellent for teaching and reinforcing factual knowledge of the U.S. After completing two lessons the user earns the right to play a unique and challenging maze game. Fantastic educational value.
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US Government Facts — 35 lessons plus authoring system included. This program was designed for the following: • Eighth grade American History • Ninth grade Civics • High School electives in government • College refresher courses in government and American History. Fantastic aid to learning about American government.
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(Disk)

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(Disk)

AEC Spelling — A series of seven educational software programs for grades 2 through 8. It teaches the spelling of 4,000 words most commonly used in writing (98% of most people's writing vocabulary). The word lists used are the result of over 25 years of research into the writing/spelling needs of children and adults. Each grade level consists of one two-sided disk with word lists on one side and study activities on the other. The activities are designed to develop mastery in spelling utilizing a Test/Teach/Test approach. A pre-test is used to find out which words a user cannot spell correctly. These are recorded on a "Words To Study" list. The activities for learning these words are provided. Finally, a post-test is taken by the learner to measure progress. The approach is simple and rewards are built in. List $99.95. **Special Sale — 7 programs $34.95**. *Individual programs $19.95. (Specify grades 2-8).*

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Level 1 (grades 1-3)	$29.95	**$16.95**
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	List	Sale
Level 1 (grades 1-3)	$29.95	**$16.95**
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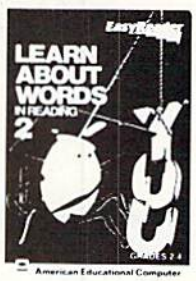

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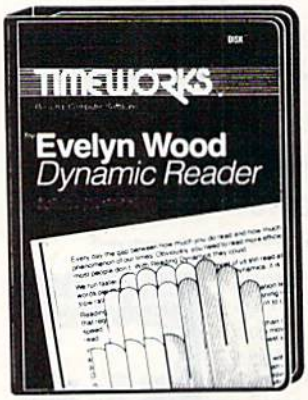

The EVELYN WOOD DYNAMIC READER provides you with the exercises and tools you need to help you increase your reading comprehension and speed. You can use your own personal computer and develop your skills at your own pace. You can learn the essential techniques of Dynamic Reading in your own home — at any time that is convenient for you. You can repeat exercises as often as you wish to assure that you maintain optimal reading efficiency.

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Evelyn Wood *Dynamic Reader*

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An effective and enjoyable way to improve your reading comprehension, retention and speed.

(See Page 29, 30, 54)

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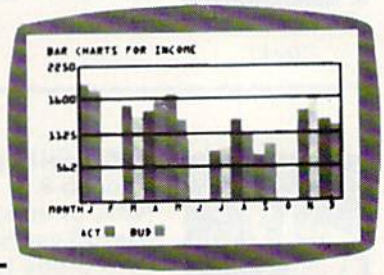

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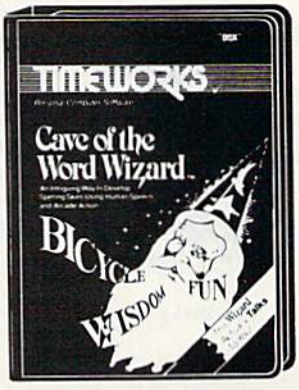

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Race the magician to spell over 400 prepared words (or enter your own). If you succeed you release the animals, otherwise you seal their fate. (Ages 7 and up) (Disk.) List $34.95. **Sale $19.95.**

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Learn about U.S. geography and the famous facts of each state. You must piece states in with only mountains and river. Traits include problems like bordering states and rivers, historical facts, current trivia and capitols. (Ages 9 and up.) (Disk.) List $44.95. **Sale $27.95.**

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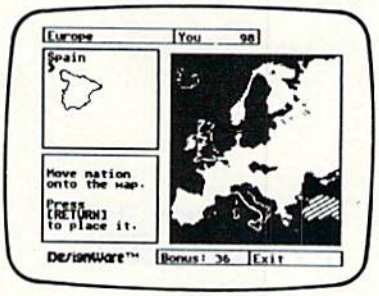
Learn country names, capitals, bordering nations, geographic landmarks, major mountain ranges, rivers and lakes, historical and cultural facts, and where they belong on a map in achallenging and fun game for the whole family. Fantastic way to learn about the countries of Europe. (Disk) List $44.95 Sale **$29.95.**



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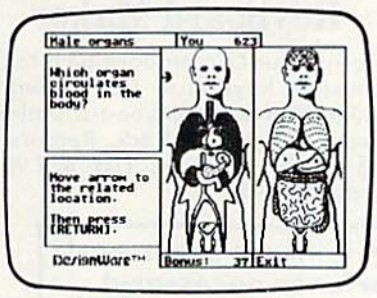

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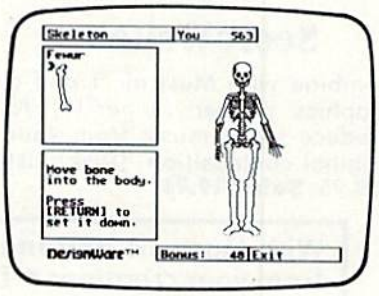

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- Learn notes on a music keyboard
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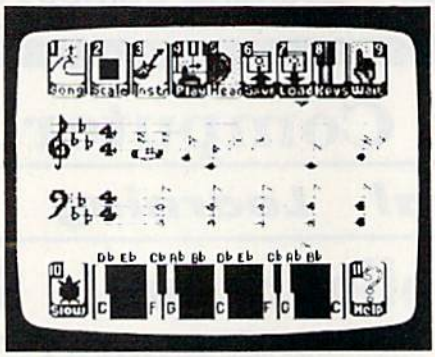
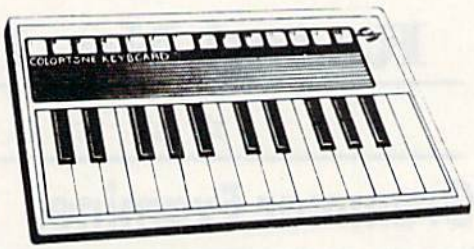
- Begin learning music theory





ColorTone Keyboard — Now you can play and learn just like on an organ. Just point to one of the colortone's preset songs, change the musical scale you are playing in or make your Commodore 64 sound like one of eight different instruments. As you play, you'll see the notes you're hearing displayed on a musical staff then record your musical creations to listen to them again and again. List $59.95. **Sale $29.95.**

Turn Your Commodore-64 Into A Sophisticated Musical Instrument

"The Program That Gives You A Reason To Buy A Commodore-64."
New York Times.

MusiCalc

MusiCalc 1 — Synthesizer & Sequencer

MusiCalc 2 — ScoreWriter

MusiCalc 3 — Keyboard Maker

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This 1st step turn your Commodore-64 into a sophisticated musical instrument — a three voice synthesizer and fully interactive step sequencer play along with pre-recorded songs or develop your own and record the music you create. (Disk)

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ScoreWriter

Combine with Musicalc 1 and a graphics printer (Super-10) to produce sheet music from your original composition. (Disk) List $39.95. **Sale $19.95.**

Keyboard Maker

Turns your Commodore-64 into a musical keyboard. Comes with over 30 pre-set keyboard scales from Classical to Rock. Requires Musicalc 1. (Disk) List $39.95. **Sale $19.95.**

With Musicalc **anyone** can • Make and record sophisticated music • Print out sheet music from your creations • Turn your computer into a keyboard • **No experience necessary!**

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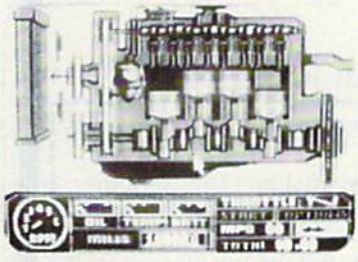
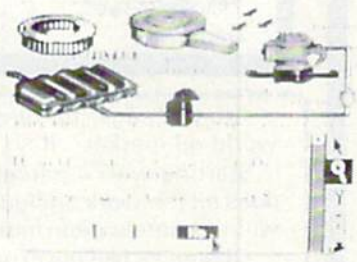
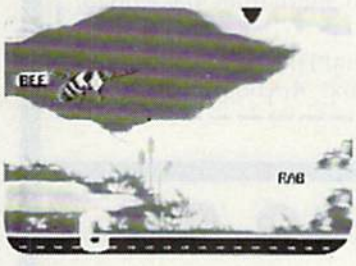


Injured Engine

Work with an accurate cutaway representation of a functioning automobile engine. Brilliant graphics detail various engine systems and parts. Learn the names of each part and how it relates to the other parts of the engine, then, use your knowledge to diagnose computer-generated engine problems. Inspect and test at will but remember everything costs! Work against the clock to tune and repair the motor to perfect running condition. (Disk) List $39.95. **Sale $27.95.**





Speak and Seek

It talks!! Speak and Seek teaches the alphabet to children, ages 2-5. It shows children how to print letters in capital and lower cases, pronounces the letter as it is drawn and asks them to find and press the letter on the keyboard. Incorrect answers prompt a variety of helping phrases, such as "Try a little to the right" or "Try higher," and other encouraging and amusing feedback. The make a creature appear that starts with the collect letter. (Disk) List $39.95. **Sale $27.95.**

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Shakespeare's enthralling play of murder, greed and intrigue comes to life in this startlingly textured and vivid treatment. Armed with your wits, an impeccably detailed edition of the Scottish play and a learned mentor who questions and guides your insights and judgements, the play's the thing for you to solve! An engrossing and educational interactive adventure!. (Disk) List $39.95. **Sale $29.95.**

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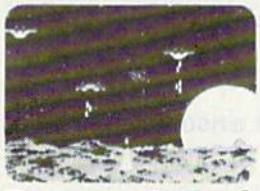

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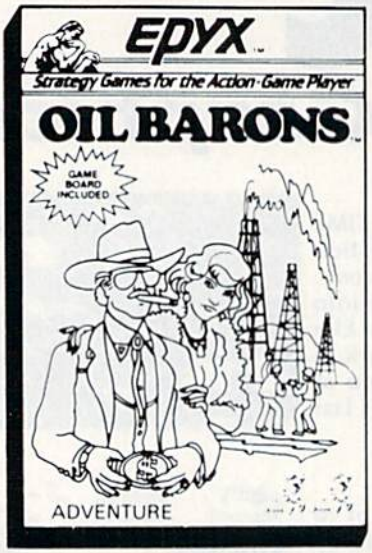

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Are you eager for new challenges...ready to pit your skill and luck against others in an attempt to corner the world oil market? If so, Oil Barons is your game.

Starting with 4 parcels of land and over $1 million, you search for that ever-elusive gusher. The computer does all the work, including banking and scorekeeping, freeing you to plan your strategy and make decisions that will ultimately determine your success.

Obstacles like government regulations, well fires, and hurricanes complicate matters, but the fun of increased land holdings, striking it rich, and even unloading worthless parcels on the uninitiated, more than make up for the setbacks.

FOR ALL AGES — Family, schools; businessmen, stockbrokers, oilmen etc. One to eight players, large 4 color game board, over 200 playing pieces, two sided disk and manual in a large colorful box! Keyboard controlled.

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- 60% of all drive downtime is directly related to poorly maintained drives.
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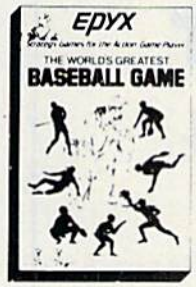

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Ballblazer — Unique split-screen, 3-D graphics give you and your opponent a first person view of the field of play. You race across the playfield in your Rotofoil trying to capture the ball and fire it through the goal before your opponent. The winner is the player with the most points at the end of the timed competition. Hold onto your joystick and keep that finger on the fire button, this is the type of two player head-to-head action you've been waiting for. Two Players. (Disk) List $29.95. **Sale $21.95.**

Fast Load Cartridge — Load, save and copy disks five times faster than normal. It plugs into the cartridge port of the Commodore 64 and goes to work automatically, loading disks with ease. And that's only the beginning. It can copy a single file, copy the whole disk, send disk commands, and even list directories without erasing programs stored in memory. (Cartridge) List $39.95. **Sale $24.95.**

Barbie — The biggest name in dolls. Browse through Barbie's closet full of beautiful clothing and dress her for the party. You can cut her hair or make it longer and color it or change the style. Buy new clothing at the boutique or any of the six other specialty shops, or even go to the dress shop and create Barbie's designer clothes with the help of the computer. The combinations are endless and so is the fun. One or two players. (Disk) List $39.95. **Sale $24.95.**

G.I. Joe — The best selling toy soldier is now available as an activity toy on the home computer. Select the battle situation then choose the equipment you think you will need to get the job done. Choose from a number of uniforms and weapons in your well stocked arsenal and get ready for the action. Play alone or with a friend, if you plan the right strategy you will complete the mission if not you will have to try again. One or two players. (Disk) List $39.95. **Sale $24.95.**

Hot Wheels — Now all the action and fun from playing with Hot Wheels cars is taken one step further on the home computer. Hot Wheels lets you choose your play activity from repairing cars to the destruction derby. You can actually play the activities along with a partner on the computer screen, even build and customize your own cars. A whole new way to play Hot Wheels. One or two players. (Disk) List $39.95. **Sale $24.95.**

Break Dance — Break Dance is an action game in which your dancer tries to break through a gang of break dancers descending on him. "A simon-like game" where your dancer has to keep the steps of the computer controlled dancer, and even a free dance segment where you develop your own dance routines and the computer plays them back for you to watch. Now anyone can break dance!! (Disk) List $39.95 **Sale $24.95.**

Rescue On Fractalus! — Your mission is to fly your Valkyrie Fighter through the Jaggi defenses and rescue the downed Ethercorps pilots. Sounds easy, but don't let it fool you. It's tough enough jut to navigate the mountains and canyons of Fractalus, but try doing it while destroying enemy gun emplacements or dodging suicide saucers. We supply the Long Range Scanner, Dirac Mirror Shield and Anti-Matter Bubble Torpedoes... YOU supply the skill and guts! One Player. (Disk) List $29.95. **Sale $21.95.**

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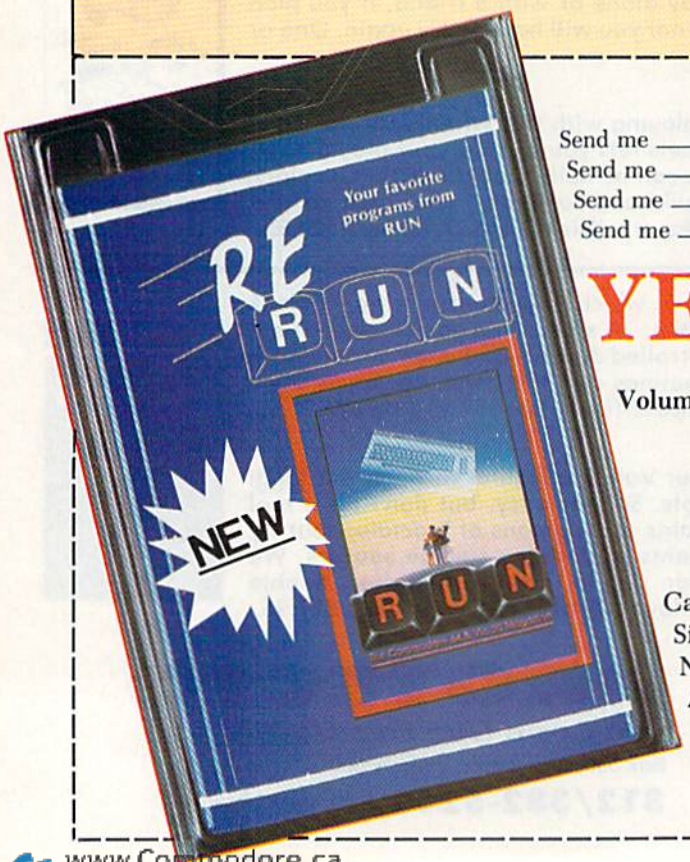

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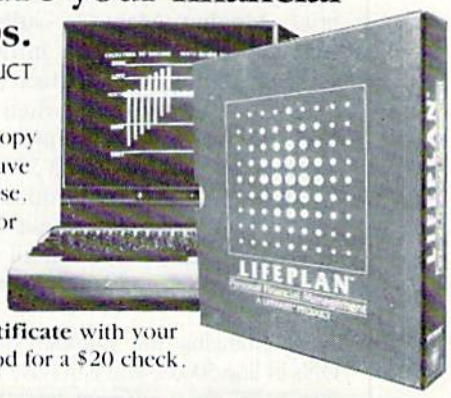

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LET IT SCROLL

By BRUCE JAEGER

Make your own marquee with this easy-to-use subroutine that lets you scroll those important (or just plain fun) messages across your screen.

Did you ever find yourself with a whole screen filled with graphics but still needing more room on the screen for more information? One way out is to clear the screen, print the information and then redraw the graphics. Not too efficient!

An easier and neater way is to use this brief Moving Marquee subroutine, which will scroll your information across the bottom of the screen (just like the electronic signs you often see on banks). Just set ME$ equal to your message and enter GOSUB 50000.

There are a couple of options you can use. Setting variable RE equal to 1 will make the message repeat until a key is pressed. (Set RE equal to 0 to cancel this option.)

By changing the number of CRSR DNs in line 50060, you can have the message scroll on a different line. You can change the speed of the message's scrolling by changing the variable DELAY in line 50080. A higher number will slow down the message; set it to zero, and watch the message scream by! R

Address all author correspondence to Bruce Jaeger, 1253 Ashland Ave., St. Paul, MN 55104.

Listing 1. *Moving Marquee program for the VIC-20.*

```
1 REM ********************************
2 REM **{27 SPACEs}**
3 REM **{6 SPACEs}MOVING MARQUEE{7 SPACEs}*
  *
4 REM **{27 SPACEs}**
5 REM **{7 SPACEs}BRUCE JAEGER{8 SPACEs}**
6 REM **{7 SPACEs}ST. PAUL, MN{8 SPACEs}**
7 REM **{27 SPACEs}**
8 REM ********************************
9 REM
10 REM
100 REM DEMO PROGRAM, MARQUEE
110 REM
120 REM
130 ME$="THIS IS A TEST MESSAGE.{2 SPACEs}I
    T CAN BE "
131 ME$=ME$+"ANY LENGTH, UP TO ABOUT 210 CH
    ARACTERS. "
132 ME$=ME$+"JUST DON'T USE 'CONTROL' CHARA
    CTERS LIKE "
133 ME$=ME$+"'REVERSE' OR COLOR CHANGES."
140 REM ***************************
150 RE=0: REM DON'T REPEAT MESSAGE
160 GOSUB50000
170 REM ***************************
180 RE=1: REM REPEAT MESSAGE UNTIL KEY PRES
    SED
190 ME$="THIS MESSAGE WILL REPEAT UNTIL A K
    EY IS PRESSED."
200 GOSUB50000
210 REM ***************************
220 END
230 REM
```


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Listing 1 continued.

```
24Ø REM
25Ø REM
26Ø REM
5ØØØØ REM *** MARQUEE SUBROUTINE, VIC ***
5ØØ1Ø REM
5ØØ2Ø REM{5 SPACEs}PRINTS MESSAGE ME$
5ØØ3Ø REM
5ØØ4Ø SP$="{2Ø SPACEs}":REM 2Ø SPACES
5ØØ5Ø ME$=SP$+ME$+" ":X9=1
5ØØ6Ø CP$="{HOME}{22 CRSR DNs}{CRSR RT}"
5ØØ7Ø REM CP$ = "HOME, 22 CURSOR DOWNS, 1 C
     URSOR RIGHT"
5ØØ8Ø DELAY = 5Ø
5ØØ9Ø FOR XX = 1 TO DELAY : NEXT
5Ø1ØØ PRINT CP$;MID$(ME$,X9,2Ø);CHR$(19)
5Ø11Ø X9=X9+1:IFX9>LEN(ME$)THENX9=1
5Ø12Ø IF X9=1 AND RE=Ø THEN 5Ø15Ø
5Ø13Ø IF PEEK(2Ø3)=64 THEN 5ØØ9Ø
5Ø14Ø PRINTCP$;LEFT$(SP$+SP$,2Ø);CHR$(19)
5Ø15Ø RETURN
```

Listing 2. *Changes in Moving Marquee program for the C-64.*

```
5ØØØØ REM *** MARQUEE SUBROUTINE, 64 ***
5ØØ1Ø REM
5ØØ2Ø REM{5 SPACEs}PRINTS MESSAGE ME$
5ØØ3Ø REM
5ØØ4Ø SP$="{2Ø SPACEs}":REM 2Ø SPACES
5ØØ5Ø ME$=SP$+SP$+ME$+" ":X9=1
5ØØ6Ø CP$="{HOME}{24 CRSR DNs}{CRSR RT}"
5ØØ7Ø REM CP$ = "HOME, 24 CURSOR DOWNS, 1 C
     URSOR RIGHT"
5ØØ8Ø DELAY = 5Ø
5ØØ9Ø FOR XX = 1 TO DELAY : NEXT
5Ø1ØØ PRINT CP$;MID$(ME$,X9,38);CHR$(19)
5Ø11Ø X9=X9+1:IFX9>LEN(ME$)THENX9=1
5Ø12Ø IF X9=1 AND RE=Ø THEN 5Ø15Ø
5Ø13Ø IF PEEK(2Ø3)=64 THEN 5ØØ9Ø
5Ø14Ø PRINTCP$;LEFT$(SP$+SP$,38);CHR$(19)
5Ø15Ø RETURN
```

Programming Briefs

Handy Reference Listing

By MARY D. BRIGITO

New Disk (format)	OPEN15,8,15,"NO:name,ID# CLOSE15
Save and Replace	SAVE"@0:name",8
Verify	VERIFY"name",8 or "*"
Load	LOAD"name",8
List Directory	LOAD"$",8 then LIST
Initialize	OPEN15,8,15 PRINT#15,"I" CLOSE15
Scratch	OPEN15,8,15,"s0:name" CLOSE15
Validate	OPEN15,8,15 PRINT#15,"V" CLOSE15
RENAME	OPEN15,8,15 PRINT#15,"R0:newname = 0: oldfile" CLOSE15

Table. *Basic disk commands.*

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	SAMSON AND DELILAH	24.95	18.75	
	ISRAEL GEOGRAPHY	24.95	18.75	
	JEWISH I.Q. BASEBALL	24.95	18.75	
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The Number Puzzle

By ZOLTAN SZEPESI

This puzzle might appear simple, but it offers you a real challenge.

The Fifteen Puzzle evoked as much excitement during the last quarter of the nineteenth century as the Rubik's Cube (or Magic Cube) does now.

The Fifteen Puzzle and the Rubik's Cube are very similar in principle. The Fifteen Puzzle consists of 15 scrambled numbers on a 4 × 4 square (one position is empty), and you must put the numbers into numerical order. Both games are extremely addictive; however, it is much easier to solve the Fifteen Puzzle than the Rubik's Cube.

The Fifteen Puzzle was invented in 1878 by an Englishman named Sam Lloyd. The idea of the game is very simple. The numbers from 1 to 15 are randomly placed in 16 squares, with one square empty. The object of the game is to arrange the numbers in numerical order, as in Figure 1. A number that is adjacent to the empty square can be moved into that square, thus leaving its own place empty for another number to move in.

There are almost 21 trillion, or precisely $16! = 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ possible starting positions for the Fifteen Puzzle. Mathematicians showed that half of these positions cannot be solved. According to D.D. Spencer's *Game Playing with Computers*, mathematicians derived a simple rule for checking whether or not a given setup can be solved.

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Statements	Steps
30–40	The computer sets the border and screen color and prints the title.
50–80	You are asked if you want to read the instructions, which are in statements 1300–1580.
100–210	The computer draws the 4 × 4 square.
230–270	This subroutine creates the random order of numbers 1 to 16 (notice the way it doesn't allow the same number to appear more than once in the series).
510–580	Subroutine to check if solution is possible. If not, it goes back and creates another set of random numbers.
600–680	If solution is possible, the program goes to subroutine 600, which displays the numbers on the game board. Play starts. Timer is set to 0. You press the number you want to move.
400–430	Subroutine 400 tells the board location of this number.
700–830	Subroutine 700 checks whether or not it was a legal move. If it was not, the computer informs you of this and asks you to choose another number. If the move was legal, the program goes to the next step, to subroutine 900.
900–930	Subroutine 900 checks to see if the game is completed, i.e., if the numbers are in proper order. If they are not, you are asked to move another number.
940	If the game is completed, your last move is shown on the board, the time is read, and
1110–1260	the computer plays the first five measures of Beethoven's Fifth Symphony (in three voices).
950–990	You are congratulated and told how many moves and how much time it took you to finish the game.
1000–1030	You are asked if you want to play again.

Table 1. *Fifteen Puzzle program line descriptions.*

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Variables	Description
A$,B$,C$,D$	Building lines of the game board.
X	Position on the game board.
A(X)	Number at position X.
N,N$	Number in subroutine 600 for displaying game board.
M	Number of moves.
F	Flag in subroutine 500. F = 1, game solvable; F = 0, game not solvable.
F	Flag in subroutine 700. F = 0, legal move and its value is the change in position; F = 1, not legal move.
SU	Sum in subroutine 500.
S	Start of sound chip.
H1,H2,H3 and L1,L2,L3	High- and low-frequency codes in subroutine 1100.

Table 2. *Variables used in Fifteen Puzzle program.*

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

Figure 1. *Gameboard of Fifteen Puzzle.*

sition, count how many numbers are of lower value than the number in the starting position (count the empty space as 16), then add them together. Also, add 1 to the sum if the empty square is in one of the following positions: 2, 4, 5, 7, 10, 12, 13, 15. If the sum is even, then the puzzle can be solved; if it is odd, then it cannot be solved.

The difficulty in solving the Fifteen Puzzle depends on the particular order of the numbers. With some practice, you will learn how to succeed faster and in fewer steps.

However, be careful. This game is addictive. Once you start, it's difficult to stop.

When my wife and I began playing this game, our average number of moves for our first 13 games was 145, with a minimum of 75 and a maximum of 208. Our solving time ranged from 5½ to 19 minutes, with an average of 10. Our scores have improved with practice. R

Address all author correspondence to Zoltan Szepesi, 2611 Saybrook Drive, Pittsburgh, PA 15235.

Listing 1. *Fifteen Puzzle program.*

```
1 REM FIFTEEN PUZZLE V 4.4 FOR C-64,WRITTEN
  FOR TRS-8Ø BY W.L.COLSHER
1Ø REM KB/MICROCOMP.,V.5,P.114,FEB.1981.MOD
  IFIED AND CONVERTED FOR C-64 BY
2Ø REM Z.SZEPESI 2611 SAYBROOK DRIVE,PITTSB
  URGH,PA 15235
3Ø POKE53281,13:POKE5328Ø,2:PRINT"{SHFT CLR
  }{CTRL 1}{2 CRSR DNs}{12 SPACEs}FIFTEEN
  PUZZLE."
4Ø PRINT"{12 SPACEs}{15 COMD Us}"
5Ø PRINT"{2 CRSR DNs}{2 SPACEs}**DO YOU NEE
  D INSTRUCTIONS?"
6Ø PRINT"{CRSR DN}{4 SPACEs}PRESS 'Y', OR A
  NY OTHER KEY FOR NO."
7Ø GETA$:IFA$=""THEN7Ø
8Ø IFA$="Y"THENGOSUB131Ø
9Ø REM ***INITIALISATION*****************
  *****
```


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Listing 1 continued.

```
100 DIM A(20):M=0:S=54272:PRINT"{SHFT CLR}"
110 A$=" {SHFT U}{4 SHFT Cs}{COMD R}{4 SHFT
     Cs}{COMD R}{4 SHFT Cs}{COMD R}{4 SHFT
    Cs}{SHFT I}":REM SH=SHIFT;CM=COMMODORE
    KEY IN FOLLOWING
120 REM SPACE;SH U;4 SH C;CM R;4 SH C;CM R;
    4 SH C;CM R;4 SH C;SH I
130 B$=" {COMD Q}{4 SHFT *s}{SHFT +}{4 SHFT
     *s}{SHFT +}{4 SHFT *s}{SHFT +}{4 SHFT
    *s}{COMD W}"
140 REM SPACE;CM Q;4 SH C;SH +;4 SH C;SH +;
    4 SH C;SH +;4 SH C;CM W
150 C$=" {SHFT B} {3 SHFT SPACEs}{SHFT -}{4
     SHFT SPACEs}{SHFT -}{4 SHFT SPACEs}{SH
    FT -}{4 SHFT SPACEs}{SHFT B}"
160 REM SPACE;SH B;4 SPACE;SH B;4 SPACE;SH
    B;4 SPACE;SH B;4 SPACE;SH B
170 D$=" {SHFT J}{4 SHFT Cs}{COMD E}{4 SHFT
     Cs}{COMD E}{4 SHFT Cs}{COMD E}{4 SHFT
    Cs}{SHFT K}"
180 REM SPACE;SH J;4 SH C;CM E;4 SH C;CM E;
    4 SH C;CM E;4 SH C;SH K
190 PRINTA$:FORI=1TO3
200 PRINTC$:PRINTC$:PRINTB$:NEXTI
210 PRINTC$:PRINTC$:PRINTD$:IFQ=1THEN RETUR
    N
220 PRINT"{2 CRSR DNs}{2 SPACEs}{CTRL 9}**W
    AIT PLEASE"
230 FORX=1TO16:A(X)=0:NEXT:REM **CREATING A
     SET OF RANDOM NUMBERS**
240 FORI=1TO16
250 X=INT(16*RND(RND(0)))+1:IFA(X)THEN250
260 A(X)=I:NEXT
270 GOSUB510:TI$="000000":IFF=0THEN230
280 PRINT:GOSUB610:PRINT:PRINT"{16 SPACEs}"
    :REM 17 SPACES
290 PRINT"{CRSR UP}{2 SPACEs}*YOUR MOVE";:X
    $="":X1$="":REM **PLAY STARTS*****
300 GETX$:IFX$=""THEN300
310 IFX$="{LEFT ARROW}"THENX=1:GOTO350
320 IFX$<>"1"GOTO340
330 GETX1$:IFX1$=""GOTO330
340 X$=X$+X1$:X=VAL(X$)
350 PRINTX:GOSUB410:GOSUB710:IFF THEN370
360 PRINT"{CRSR DN}{2 SPACEs}*ILLEGAL MOVE,
    RE-ENTER":GOTO280
370 A(X+F)=A(X):A(X)=16:GOTO910
380 M=M+1:GOTO280
400 REM ***CONVERT NUMBER TO LOCATION IN AR
    RAY***
410 FORI=1TO16:IFA(I)=XTHEN430
420 NEXT
430 X=I:RETURN
500 REM ***VERIFY IF SOLUTION IS POSSIBLE**
    ******
510 F=0:SU=0:FORI=1TO15:FORJ=I+1TO16
520 IFA(I)>A(J)THENSU=SU+1
530 NEXTJ:NEXTI:RESTORE
540 FORI=1TO8:READX:IFA(X)=16THENSU=SU+1
550 NEXTI
560 A=INT(SU/2):IFA*2=SUTHENF=1
570 RETURN
580 DATA2,4,5,7,10,12,13,15
600 REM ***DISPLAY GAME BOARD**********
    ******
610 PRINT"{HOME}":PRINT:FORI=1TO4:PRINT
620 PRINTSPC(1):FORJ=1TO4:N=A((I-1)*4+J):PR
    INTSPC(1);:N$=STR$(N)
630 IFN<10THENPRINT" ";
640 IFN=16THEN N$="{3 SPACEs}"
650 PRINTN$;SPC(1);
660 NEXTJ:PRINT:PRINT
670 NEXTI
680 PRINT:RETURN
```


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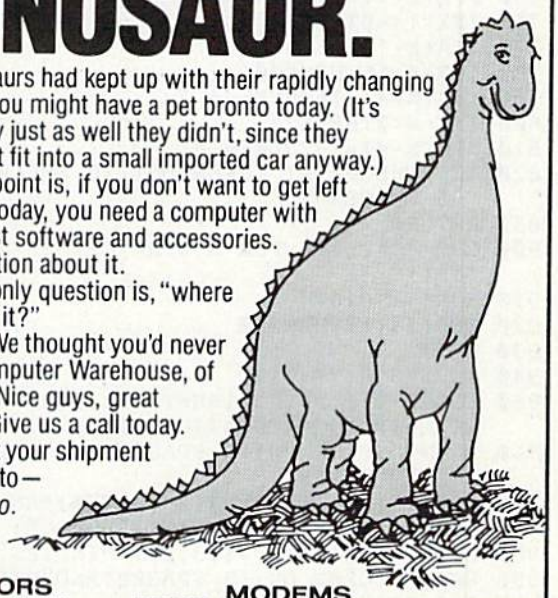
HOW TO AVOID BECOMING A DINOSAUR.



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Listing 1 continued.

```
7ØØ REM ***CHECK FOR LEGAL MOVE*********
    ******
71Ø F=Ø:IFX>16THEN RETURN
72Ø IF(X=4ORX=8ORX=12)ANDA(X+1)=16THENRETUR
    N
73Ø IF(X=5ORX=9ORX=13)ANDA(X-1)=16THENRETUR
    N
74Ø IFX+1>16THEN76Ø
75Ø IFA(X+1)=16THENF=1
76Ø IFX-1<=ØTHEN78Ø
77Ø IFA(X-1)=16THENF=-1
78Ø IFX+4>16THEN8ØØ
79Ø IFA(X+4)=16THENF=4
8ØØ IFX-4<ØTHEN82Ø
81Ø IFA(X-4)=16THENF=-4
82Ø IFF THENPRINT"{CRSR DN}{26 SPACEs}":REM
     26 SPACES
83Ø RETURN
9ØØ REM ***CHECK FOR A WIN**************
    ******
91Ø FORI=1TO16
92Ø IFA(I)<>ITHEN38Ø
93Ø NEXT
94Ø GOSUB61Ø:T$=TI$
95Ø GOSUB111Ø:PRINT"{SHFT CLR}{CRSR DN}{2 S
    PACEs}*CONGRATULATIONS!!!"
96Ø PRINT"{CRSR DN}{3 SPACEs}YOU DID IT IN
    ONLY"M"MOVES!!"
97Ø PRINT"{2 CRSR DNs}{2 SPACEs}*AND YOU NE
    EDED "VAL(MID$(T$,1,2))"HOUR,";
98Ø PRINT VAL(MID$(T$,3,2))"MINUTES"
99Ø PRINT"{CRSR DN}{3 SPACEs}AND"VAL(MID$(T
    $,5,2))"SECONDS."
1ØØØ PRINT"{2 CRSR DNs}{2 SPACEs}**PRESS 'Y
     ' TO PLAY AGAIN OR{14 SPACEs}{CRSR DN}
     ANY OTHER KEY TO END.
1Ø1Ø GETA$:IFA$=""THEN1Ø1Ø
1Ø2Ø IFA$="Y"THENCLR:GOTO1ØØ
1Ø3Ø END
11ØØ REM ***SOUND SUBROUTINES**********
    *******
111Ø FORL=STOS+24:POKEL,Ø:NEXT:POKES+24,15
112Ø POKES+5,Ø:POKES+12,Ø:POKES+19,Ø:POKES+
    6,24Ø:POKES+13,24Ø:POKES+2Ø,24Ø
113Ø RESTORE
114Ø FORI=1TO8:READZ:NEXT
115Ø READH1,H2,H3:IFH1=-1THENFORL=STOS+24:P
    OKEL,Ø:NEXT:RETURN
116Ø READL1,L2,L3,D:POKES+1,H1:POKES+8,H2:P
    OKES+15,H3
117Ø POKES,L1:POKES+7,L2:POKES+14,L3:POKES+
    4,17:POKES+11,17:POKES+18,17
118Ø FORT=1TOD:NEXT:POKES+4,16:POKES+11,16:
    POKES+18,16:FORT=1TO5Ø:NEXT:GOTO115Ø
119Ø DATA25,12,6,3Ø,143,71,1ØØ
12ØØ DATA25,12,6,3Ø,143,71,1ØØ
121Ø DATA25,12,6,3Ø,143,71,1ØØ
122Ø DATA19,9,4,239,247,251,4ØØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø
    ,1ØØ
123Ø DATA22,11,5,96,48,152,1ØØ
124Ø DATA22,11,5,96,48,152,1ØØ
125Ø DATA22,11,5,96,48,152,1ØØ
126Ø DATA18,9,4,2Ø9,1Ø4,18Ø,8ØØ,-1,1,1
13ØØ REM ***INSTRUCTIONS*****************
    *******
131Ø PRINT"{SHFT CLR}{CRSR DN}{5 SPACEs}FIF
    TEEN PUZZLE"
132Ø PRINT"{5 SPACEs}{14 COMD Ys}"
133Ø PRINT" *THE OBJECT OF THE FIFTEEN PUZZ
    LE IS"
134Ø PRINT" TO MOVE THE NUMBERS AROUND, SO
    THAT"
135Ø PRINT" THEY ARE IN ORDER FROM 1 TO 15.
    "
136Ø PRINT" A MOVE IS MADE BY TYPING IN THE
     NUMBER"
137Ø PRINT" YOU WISH TO MOVE. HOWEVER, IF Y
    OU"
138Ø PRINT" WANT TO MOVE THE NUMBER '1', PR
    ESS"
139Ø PRINT" INSTEAD THE LEFT ARROW ('{LEFT
    ARROW}')."
14ØØ PRINT" *THE NUMBER TO BE MOVED MUST BE
    "
141Ø PRINT" ADJACENT TO THE EMPTY SQUARE."
142Ø PRINT" THE TYPED NUMBER THEN MOVES INT
    O THE"
143Ø PRINT" EMPTY SQUARE."
144Ø PRINT"{CRSR DN} *DO NOT PRESS RETURN A
    FTER TYPING THE"
145Ø PRINT" NUMBER."
146Ø PRINT"{CRSR DN} *YOU WIN, WHEN THE BOA
    RD LOOKS LIKE THE"
147Ø PRINT"{CRSR UP}{2 SPACEs}FIGURE WHICH
    FOLLOWS:"
148Ø PRINT"{CRSR DN} **PRESS ANY KEY TO CON
    TINUE"
149Ø GETA$:IFA$=""THEN149Ø
15ØØ Q=1:GOSUB1ØØ
151Ø FORI=1TO16:A(I)=I:NEXTI
152Ø GOSUB61Ø
153Ø PRINT"{CRSR DN} **PRESS ANY KEY TO STA
    RT"
154Ø GETA$:IFA$=""THEN154Ø
155Ø Q=Ø:CLR:GOTO1ØØ
156Ø PRINT"{CRSR DN} **PRESS ANZ KEY TO CON
    TINUE"
157Ø GETA$:IFA$=""THEN157Ø
158Ø PRINT"{SHFT CLR}":RETURN
```


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May

COMING ATTRACTIONS

- **Home Applications**—There's no place like home for the C-64, and this is nowhere more evident than in the upcoming May issue, which features articles that will help you integrate your computer into the home with time-saving, useful applications. For example:
  Home Inventory—Keep an up-to-date list of all your valuables and home furnishings. Hopefully, you'll never need to use this program, but, for your own protection, you'll have a detailed inventory of your belongings.
  Shopper's Companion—Good news for the harried shopper! Now you can become more efficient and organized. Simply use this program to generate a printed shopping list at home. No more return trips to the supermarket to pick up items you may have forgotten.
  Energy Watchdog—This "Kilowatt Kontroller" program stores readings from your electric meter, calculates usage and computes your daily electricity cost.
- **On-Line with Telecommunications**—Home telecommunications promises to be a major application for computerists in 1985. Next month, *RUN* begins a series on telecommunications that will focus on the services available for on-line users. First to take the spotlight will be the popular CompuServe.
- **In Therapy**—Now there's C-64 software that claims to help you lose weight, quit drinking or smoking and even improve your sex life! *RUN*'s resident psychiatrist takes an analytical look at these commercially available self-help programs. Do they really work?
- **Guide to Troubleshooting**—Have you ever decided against typing in a program listing for fear of making errors? Well, fear no more. This article provides you with hints on how to prevent errors and helps you understand and deal with those errors that do occur.
- **Plus/4's High-Resolution Graphics**—With the Plus/4 you needn't fuss with Peek and Poke commands to achieve those high-resolution graphics displays. Instead, you can use simple one-word commands such as DRAW, CIRCLE and BOX.
- **VIC Patrol**—Don't think that the VIC-20 has outlived its usefulness. There are plenty of applications for the VIC-20 that will save you money and make your life easier and safer. For example, you can control lights, alarms, robots, sprinkler systems, thermostats, appliances—anything that can be turned on and off with a switch—with your VIC-20.
- **Snakes**—In this strategic game for the C-64, you must maneuver your snake to gain the territorial advantage on the screen and thus defeat your opponents.

A First Lesson in Programming for Kids

By AMY and JAMES BLODGETT

The Basic Print and Goto statements can make a child's introduction to programming both easy and enjoyable.

Kids like to program. They like to be able to make the computer do things, and a few simple Basic language statements will help them get started.

The most useful is the Print statement, which is both easy and interesting. It lets kids make the computer draw pictures. For example:

```
100 PRINT "  XXX  "
110 PRINT "XO  OX"
120 PRINT "X  L  X"
130 PRINT "X  -  X"
140 PRINT "  XXX  "
150 PRINT "  !   !  "
160 PRINT "/      \"
```

Another Basic command kids sometimes enjoy is the GOTO statement. They find they can use it to make their pictures print repeatedly:

```
100 PRINT "  XXX  "
110 PRINT "XO  OX"
120 PRINT "X  L  X"
130 PRINT "X  -  X"
140 PRINT "  XXX  "
150 PRINT "  !   !  "
160 PRINT "/      \"
170 GOTO 100
```

By learning these two statements, kids can write their own programs and take the first steps toward learning programming. R

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A Review of

Simons' Basic

By ROBERT W. BAKER

Noted Commodore author Bob Baker takes a hard look at Simons' Basic, which adds over 100 commands to your C-64 system.

Simons' Basic for the Commodore 64 originated in England over a year ago. It was written by a sixteen-year-old student named David Simons.

The cartridge adds 114 commands to the normal Basic that's built into the C-64. Available memory is reduced to only 30K, and the standard screen colors are changed to black characters on a gray screen with a dark-blue border.

The Basic extensions provide many powerful and useful commands, which were, unfortunately, implemented very poorly for a commercial package. There is very little command parameter checking, and many things have been overlooked or ignored.

Reviews appearing in England back in 1983 pointed out some of the deficiencies, but nothing was done to correct these items prior to bringing the package into the United States.

One review of Simons' Basic commented that the package presents "plenty of quantity but little quality," and I couldn't agree more.

The commands are generally easy to use. On the other hand, be careful in using Simons' Basic during initial program development—small, hard-to-find mistakes can cause unpredictable results. Also, keep in mind that any program written using these commands will not run without the Simons' Basic cartridge installed.

Criticisms

Simons' Basic is very sloppy in changing Basic program text into tokens. Its keywords in Data statements are changed into tokens and will normally read as garbage.

Any keywords that appear in hex numbers are also tokenized. For example, attempting to enter PRINT $CDEF will result in an error message, since DEF is tokenized and hence is no longer a valid hex character.

When entering program lines, you cannot abbreviate Simons' keywords. Since some commands are quite long, the process of entering lines can become a little tedious.

Another drawback of Simons' Basic is its spacing—spaces between keywords and their parameters are sometimes required and sometimes not allowed. The manual further confuses the issue by insisting that all commands (except Find) must be separated by a space.

Many command parameters are not checked to see if they are within range, and many strange effects can thus occur. Some commands allow values up to 255, while others allow up to 65535 before displaying an Illegal Quantity error. Plotting commands are the biggest offenders and can cause bizarre results when parameters exceed the normal screen boundaries.

You are also unable to flip back and forth from text to graphics character sets using the CBM and shift keys or the CHR$(8) and CHR$(9) commands, because that function of those keys and commands is disabled by Simons' Basic.

Further, the restore key usually sets everything back to normal, but, in Simons' Basic, flashing borders and characters remain. Some options in Simons' Basic are selected by numeric values instead of words, like ON or OFF. The Trace option, for example, is enabled by TRACE 10 and disabled by TRACE 0.

The accompanying manual is approximately 150 pages long and is broken into 13 sections. It provides a brief introduction, plus detailed information on the various commands and features. The material is generally well presented with helpful examples. However, several errors are scattered throughout the book. At least one of the examples will not work as presented.

By the way, I found two reserved variables, defined by Simons' Basic, that are not mentioned in the manual. The word GRAPHICS is defined as the base address of the VIC video chip, 53248, and can be referenced just like any other variable within your program. Likewise, the word SOUND is defined as the base address of the SID sound chip, 54272.

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Simons' Basic Commands

Note: Some of the commands and their definitions are followed by qualifying explanations, denoted by bullets (●).

AUTO Provides automatic line numbering and allows an increment of up to 255.

BCKGNDS Allows displaying messages with three different character background colors.

● With the BCKGNDS command, only the characters shown on the top of each key can be used (graphics characters cannot be used). You'll have to actually issue a BCKGNDS command in order to see the correct text within the program listing. Otherwise, graphics characters will appear instead. Printed listings present a problem, since they'll no longer match displayed listings.

BLOCK Allows you to plot a rectangle and fill it with a specified color.

CGOTO Allows an expression in place of the normal GOTO target line number.

CHAR/TEXT Allow individual characters or entire lines of text to be superimposed on a graphics screen.

● The CTRL-A and CTRL-B characters used to select upper- or lowercase letters in the TEXT command are not really needed (the default is uppercase). Cursor controls and other special control codes (like colors) cannot be used within the character string for the TEXT command. The reverse on and off can be used, but only the text will be reversed on the screen (spaces are not reversed).

All high-resolution plotting uses X,Y coordinates, starting at 0,0 in the top left corner of the screen and ending at 319,199 in the bottom right. In Multicolor mode, the bottom right corner becomes 159,199, due to the double-width plotting of each point. There is very little checking for valid coordinates by each plotting command; only values greater than 65535 or 255 cause errors. There are no error messages if you're only slightly out of bounds, and results are unpredictable.

CMOB Used to set up colors for a multicolor MOB.

MOB SET Used to initialize a MOB.

MMOB Used to display MOBs.

MOB OFF Used to clear MOBs.

RLOCMOB Moves a specific MOB across the screen at a specified rate, but only one MOB can be moved at a time.

● A speed of 0 is valid for both the MMOB and RLOCMOB commands and produces the fastest motion.

COLD Resets the C-64 under software control, but will not reset attached peripherals.

COLOUR/HIRES/MULTI Allow selecting colors, plotting types and initializing the high resolution or multicolor graphics modes.

LOW COL/HI COL Allow you to change plotting colors.

NRM Allows you to return to a low-resolution screen from a graphics screen.

● The difference in coordinates between normal High-resolution and Multicolor Graphics modes makes it difficult to set up a screen in High-resolution and then see what it would look like in Multicolor mode. The difference in plot type codes for both graphics modes makes switching from one mode to the other even more complex. Incidentally, none of the graphics commands are compatible with the VIC's Super Expander, making the transfer of programs difficult.

COPY/HRDCPY Allow you to print a copy of a graphics or low-resolution screen on a serial printer.

SCRSV Saves low-resolution screen data in a datafile on cassette or disk.

SCRLD This same low-resolution screen data can be restored to the screen using this command.

● Be careful when loading a screen from disk—strange things happen if the file is not found. Also, don't try to load a screen from tape on an Executive-64, since Simons' Basic uses tape routines in ROM that do not exist in the SX-64.

CSET Allows selecting either of the C-64 character sets or recalling and displaying the last graphics screen.

DEFINE/@ Used to define specific characters in the same manner as defining MOBs.

DELAY Controls the scrolling rate.

DESIGN Used to specify the location in memory where the data for each movable object block (sprite, or MOB) is to be stored.

● The sample sprite program on page 8-4 of the manual will not work properly as written. When the program runs, the sprite data will overwrite and destroy the Basic program so it cannot be run again. If you change the following lines in the example, the sprite data will be stored in an unused area of high RAM without harming the program:

```
85 MEM
90 DESIGN 0,$F000
320 DESIGN 1,$F000+64
700 MOB SET 0,192,0,1,0
710 MOB SET 1,193,2,0,1
```

To use the DESIGN command and sprites as designed, you'll have to move the start of Basic program space higher in memory. Otherwise, you'll have to use the MEM command and then put sprite data in the high area of RAM, starting at location 61440 ($F000), as hinted in the manual.

A BAD CHAR FOR A MOB error will occur if the DESIGN command is not immediately followed by exactly 21 @... format lines, each with exactly 12 or 24 valid color codes. If more than 21 format lines exist, a Syntax error will occur. If there are too many color codes in a format line, no error will be reported.

DETECT/CHECK Used to initialize and control MOB-collision detection.

● The CHECK command must have two parameters or you'll get a

Just don't try to redefine these variables within your program.

Besides the mistakes in the documentation and the operation of the program, there are basic flaws in the overall design of the package.

The inconsistencies, plus poor attention to detail and lack of error checking, seem to indicate the package was written in a piecemeal fashion without any clear concept of the end result. In preparing such a utility package, it is vital to spend a great deal of time planning the final product.

Simons' Basic, however, does have many useful features. Its graphics and sound commands will save a lot of Peeking and Poking, while the structured programming commands may help newcomers getting started with programming. R

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Syntax error. The single zero parameter for CHECK, shown in the manual, is not allowed.

DIR Allows displaying the disk directory with selectable character matching and without loading into memory.

DISK Allows you to send command strings over the disk-command channel.

- There is no provision for reading the error status returned by the disk following any disk command.

DISABLE/RESUME Allow disabling and reinstating the previous ON KEY command, which, once initiated, stays in effect throughout the program.

DISAPA/SECURE Program security aids that can be used to hide portions of a program when it's being listed.

- Despite the manual's claims, the DISAPA command works anywhere in a Basic program line. When secured, the remainder of the line disappears, leaving the colon prior to DISAPA.

Make sure DISAPA always appears within quotes in Data statements. It will still function by adding colons and securing the remainder of the line even if no colon is entered. The DISAPA command actually places five colons, not three, as the manual claims, before following code. If you look at the examples, they do show five colons being added.

DRAW Allows you to draw an arbitrary shape that you define as a string of command letters, much like turtle graphics.

- There is no check for valid command letters in the string used by the DRAW command. The first invalid character encountered terminates the command at that point.

DUMP Displays the current values of all non-array variables, but has a problem handling string variables.

- If you use a string variable in a Get command to read the keyboard or a disk file, you may get garbage listed for that variable in the dump.

FCHR/FILL Allow filling an area of the screen with a specified character.

FCOL Allows changing a character color in a specified screen area.

INV Used to invert a specified screen area.

- For the FCHR, FILL, FCOL and INV commands, be careful that the row plus depth does not exceed 25 and that the column plus width does not exceed 40. If the screen limits are exceeded, you'll get a BAD MODE error. You'll get the same error if either the width or depth, the third or fourth parameter, is 0.

FETCH Allows you to limit the number and type of characters that will be accepted as user input.

- When using FETCH, watch your screen handling, as this command does not position the cursor past the input line, like the INPUT command. Any following PRINT will overwrite the inputted data. Also, you cannot enter a null string when a FETCH has been executed; you must enter valid data.

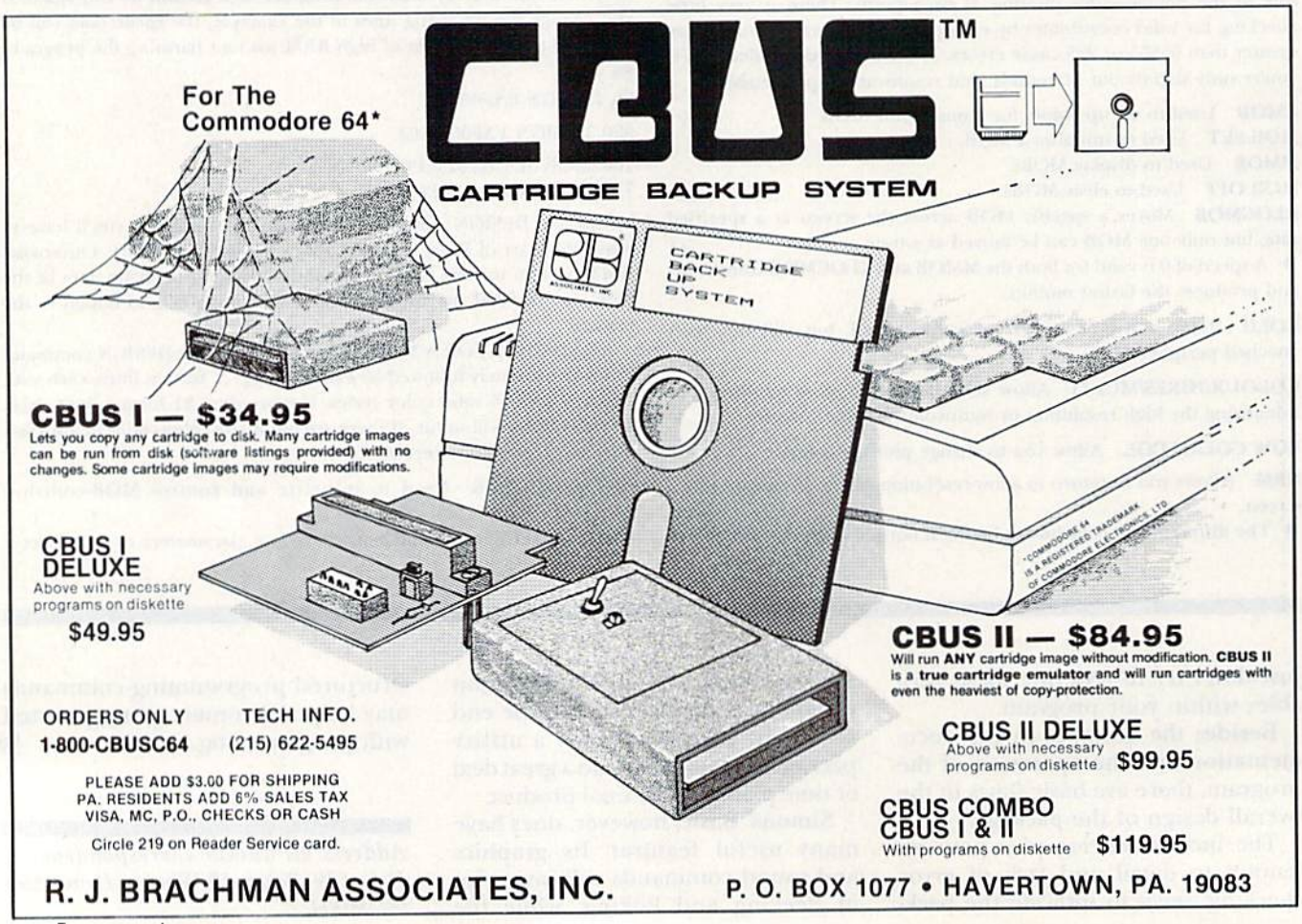
When looking for numeric data, FETCH also allows the entry of characters such as commas, colons, semicolons, equals signs, plus signs, minus signs, greater-than and less-than signs, asterisks and at (@) signs. The cursor-right control is listed as accepting alphanumeric and shifted characters, but it only accepts normal and shifted letters A–Z.

FLASH/BFLASH/OFF Control flashing the entire screen or just the border.

- When flashing the border at fast speeds (under 7 or 8), you'll actually see a mixing of the colors, which can be used to create interesting effects. Since BFLASH and FLASH both affect the internal interrupt routines, the TI variable is slowed down significantly, and input and output characters may be lost by the system.

IF...THEN...ELSE/REPEAT...UNTIL/LOOP...EXIT IF...END LOOP Allow you to write structured code.

- The manual is a little fuzzy on these commands, but the IF...THEN...ELSE command can have null, true and/or false arguments.



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The REPEAT...UNTIL command must have colons after the repeat and before the UNTIL, but can contain multiple conditions separated by colons. The correct format for a LOOP statement includes colons after LOOP, before and after EXIT IF and before the END LOOP.

Note, there must be a space in the EXIT IF and END LOOP keywords, and loops may span over multiple program lines. The RCOMP statement will always take the true (IF) path if a prior IF...THEN was not executed.

INKEY Provides a quick and easy test for a function-key input.

- When using the INKEY, the value returned may not always be between 1 and 8. Much higher numbers will be returned when you hold the control key (166–173), shift-control (205–212) or the Commodore key, shifted or unshifted (9–16), while pressing a function key.

INSERT Allows one character string to be inserted within another at a specific point.

INST Does the same thing as INSERT, except the substring will overwrite the original string contents.

DUP Allows creating a repetitive string.

PLACE Provides an easy way to find a given substring within a string and to return its position.

- INSERT does not work in Direct mode with immediate values for both strings. INST does not work in Direct mode when the substring equals the string. PLACE doesn't work in Direct mode if the substring is an immediate string.

Also, despite what the manual claims, PLACE cannot be used to compare numeric variables, but only strings. The DUP command accepts a rep count value up to 65535, but produces incorrect results if the created string exceeds 255 characters in length. For instance, DUP("A",259) creates a string of three A's; DUP("ABC",100) produces a string of 44 Cs.

KEY Assigns a character string to a function key, allowing one-keystroke access to often-used commands.

DISPLAY Lets you review the current assignments for each function key.

- Clearing a key definition by assigning a null string doesn't work; it assigns to the key a garbage string with unpredictable contents. To clear a key definition, use a space.

LIN Returns the current line number of the cursor. The manual does not describe this command.

LINE/REC/CIRCLE/ARC/ANGL Draw full two-dimensional figures of the corresponding shape.

- The CIRCLE command actually draws an ellipse with selectable X and Y radii. Equal values for the X and Y radii do not yield a perfect circle, due to the rectangular shape of the screen and the differences in the X and Y sizes of each dot. You'll have to adjust the values yourself to compensate for the screen.

LOCAL Defines variables to operate locally.

GLOBAL Restores a variable's global values.

- Variable arrays are not handled correctly. If any array element is listed in a LOCAL command, the entire array is cleared and set as local. When the corresponding GLOBAL command is executed, it doesn't restore the original values to the array. Also, the DUMP command may display multiple values for variables after using a LOCAL command. In this case, the first value listed should be the current value.

MEM Before you create user-defined characters, use this command to copy the standard character set from ROM to RAM.

- Once the MEM command is issued, sprite data can only be stored starting at location 61440 ($F000). The only problem with the MEM command is that screen memory moves to location 52224 ($CC00), and some commands that write directly into screen RAM (like TRACE) continue to write into the original screen area. By the way, the last line in the example on page 8-13 should be line 100, not 30 as shown.

MERGE Appends a program on disk to the end of any program currently in memory.

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• Note that the MERGE command *appends* a program; it is not a true merge, since line numbers are ignored. The program from disk immediately follows the program in memory (lines are not interspersed as expected).

MOD Returns the remainder when one integer is divided by another.
DIV Returns the integer portion of the same operation.
EXOR Performs a logical exclusive OR between two numbers.
FRAC Extracts the fractional part of a floating-point number.

• The numeric functions (MOD, DIV and EXOR) only work with values in the range of 0 to 65535, where normal Basic integers range from −32768 to 32767 (negative numbers are invalid).

Non-decimal numbers can be used in all expressions by preceding binary numbers with a percent sign and hexadecimal numbers with a dollar sign. There's a slight problem with hex numbers, though, since certain combinations of hex digits can include Basic keywords that are still tokenized by Basic. Also, there is no provision of converting numbers to binary or hexadecimal.

All binary numbers must be eight digits long, and all hex numbers must be four digits, but the manual fails to tell you this. If a number contains an incorrect number of digits, you'll get an Invalid Character error, even though the number contains valid binary or hex digits. If the number of digits is a multiple of 8 (binary) or 4 (hex), only the first set is used, and the extras are ignored without an error message.

MOVE Used to duplicate a section of the screen in a new location.

OLD Allows reversing the effects of a NEW command and regaining access to the program still in memory.

ON ERROR With reserved variables ERRN and ERRLN, provides a mechanism to trap selected errors and pass control to a specified line in the program. The value of ERRN indicates the type of error that occurred, while ERRLN indicates what line in the program caused the problem.

OUT/NO ERROR Used to disable the last error condition or restore normal error processing.

• If you have trouble listing a program and keep getting repeated error messages, use the NO ERROR command and try listing the program again. Remember that ON ERROR and NO ERROR both must have the separating space.

ON KEY Provides a filter that only accepts specified input characters and ignores all others. On receipt of a valid character, program control is passed to a specified line in the program.

• Character codes must be used with caution in ON KEY commands, since numbers above 127 are treated as negative in ST. A comparison like A = ST will not give expected results for shifted keys.

OPTION Highlights any Simons' Basic commands within a listing, making them easier for you to find.

FIND Helps you search for other character strings or codes in a program.

• The FIND command only lists the line numbers of where a particular item is found. Also, when you're searching for specific character strings within quotes, the entire string must be an exact match. FIND will not find sections of strings within quotes, like "CD" within "ABCDEFG."

PAGE Divides a listing into screen pages of a specified length.

• The paging function displays one more line than requested and does not always work as described.

PAINT Lets you fill in any enclosed area with color.

• The PAINT command can be very slow when filling large areas. Also, when painting an area with a different color than that used to draw the object, some sides will be replaced with the new color while others will stay unchanged. If the X and Y coordinates used in the PAINT command fall directly on the border of an object, the object will not be filled in. Invalid plot types in a PAINT command are not detected and can cause rather strange results.

PAUSE Provides timed delays in program execution that can be aborted by pressing the return key.

PENX/PENY Used to determine the location of a light pen on the screen.

PLOT Handles individual point plotting.

POS Returns the horizontal cursor position.

POT/JOY Used for interfacing paddles and joysticks.

• In the POT command, the parameter that indicates which paddle to read can be a variable. Unfortunately, the JOY command only supports joystick #2, so you'll still have to resort to PEEKs to read the other joystick.

PRINT AT Allows printing strings at specific positions on the screen.
CENTRE Centers a character string on a screen line.

• Using row or column numbers that exceed screen limits in a PRINT AT command will produce unpredictable results. Placing embedded cursor controls in a character string to be centered on the screen will defeat the function of the CENTRE command.

PROC/END PROC Used to create named procedures. Once defined, you can call them as subroutines with the EXEC command or branch to them by using the CALL command.

• The only thing missing in the commands used to create named procedures is the ability to pass parameters to the procedure. As implemented, procedures are nothing more than labeled line numbers, and EXEC acts like GOSUB, CALL like GOTO and END PROC like RETURN.

RCOMP...ELSE Repeats the last IF...THEN condition test without having to repeat the same code again.

• The RCOMP...ELSE command simply uses the result of the previous condition test, so, if conditions are changed, they must be retested.

RENUMBER Renumbers all program lines and allows an increment of up to 65535.

• RENUMBER does not change the line numbers following GOTOs, GOSUBs and so on, so its usefulness is questionable. (Also, both AUTO and RENUMBER can generate illegal line numbers above 63999, causing all kinds of problems.)

RESET Allows moving the data pointers so that subsequent READ commands start reading data at a specified line number.

ROT Allows you to display the selected shape scaled up and/or rotated through multiples of 45 degrees.

SCROLLING Allows easy control of scrolling within a given area of the screen.

• When using the SCROLLING command, you can scroll the data in one of four directions and control whether or not the data continues when it reaches the end of the screen. The maximum height and width of the scroll area is incorrect in the manual; it's really the entire screen of 25 lines down by 40 characters across. It appears the manual was never updated from the original VIC-20 version.

TEST Allows a check to see if something has been drawn at a specific location.

TRACE/RETRACE For tracing program execution as an aid to debugging.

• As program lines are executed, the line numbers are displayed in a window in the upper right corner of the screen. TRACE uses white characters on a gray background and can be very difficult to read. Also, it doesn't show the line currently being executed, but, rather, displays it only *after* the next line is started.

USE Formats the screen.

• A "print using" function combines the USE command and the normal PRINT statement to format numbers stored as strings. It will only accept one field or variable per command, but multiple commands can be used to format an entire line. The usual zero-filling, left and right justification and other features normally found in a print-using function, do not exist.

The USE command does not work in Direct mode and cannot be used to format printed output. It only works for the screen.

VOL/WAVE/ENVELOPE/MUSIC/PLAY These commands make sound effects extremely easy to program without the usual barrage of Pokes.

• Be careful of the binary number in the WAVE command. Bits that must be 0 and invalid combinations of bits are not flagged as errors.

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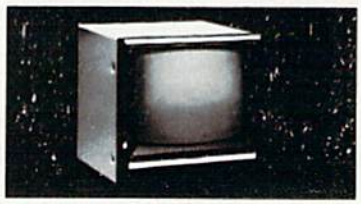

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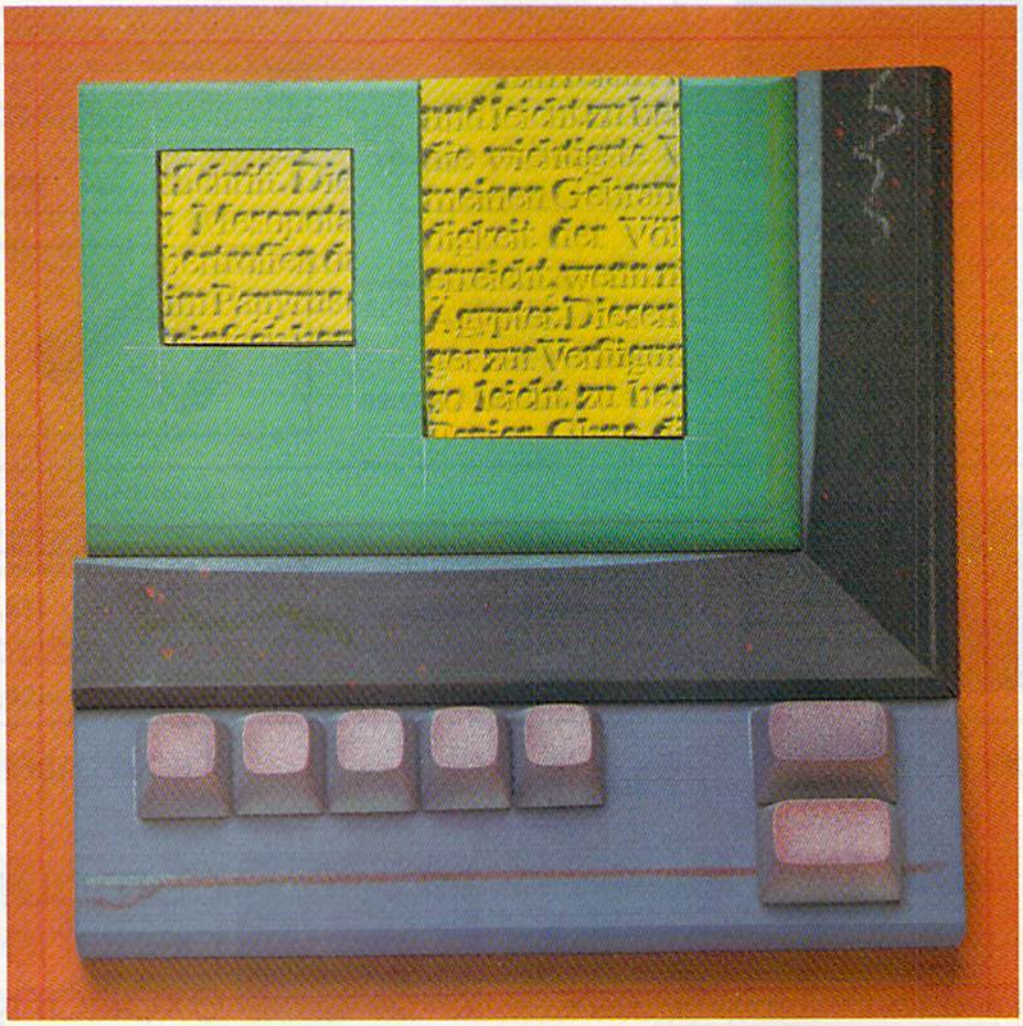
Add a little punch to your programs with this short subroutine that lets you box in your screen messages and menus with ease.

Making Boxes

By RICHARD LOVETT

Some of the more attractive computer programs dress up their screen menus or other important text by printing boxes around them. However, determining which graphics characters to use, how to space and print them and how to put a box where you want it can take lots of trial and error. And with each new box, much of the guessing starts all over again.

Here's a little subroutine to help



PHIL GERACI

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you get boxed in quickly. Simply include it in your programs, define a few variables and then enter GOSUB 10000. With one or more passes of this subroutine, you can easily make as many boxes as you want, of any shape and size. The same subroutine works on both the VIC and the 64.

The variables that need to be defined before each call of the subroutine are: WID, the width of the box in spaces; DEP, the depth of the box in lines; DOWN, the number of lines from the top of the screen for the box to begin; and LEF, the number of spaces from the left screen margin for the side of the box to begin.

Here's the subroutine:

```
10000 REM ** BOX MAKER SUBROUTINE
10010 POKE211,LEF:POKE214,DOWN:
  PRINT"{CRSR UP}"
10020 FOR I=1 TO WID:PRINT
  "{COMD P}";:NEXT:PRINT
10030 FORI=1 TO DEP:PRINTTAB(LEF);
  "{COMD H}";TAB(LEF+WID-1)
  "{COMD N}":PRINT"{CRSR UP}":NEXT
10040 POKE211,LEF:POKE214,
  DOWN+DEP+1:PRINT"{CRSR UP}";
10050 FORI=1TOWID:PRINT"{COMD Y}";:
  NEXT:RETURN
```

Of course, there are limits to the parameters you can set. WID must be at least 2, and it can't exceed 21 on the VIC-20 or 39 on the Commodore 64 without producing a jumble. DEP can't exceed 21 on the VIC or 23 on the Commodore 64 without the same result. DOWN must be at least 1, and both DOWN and LEF must stay within reasonable bounds or you will push the box off the screen.

To see how the subroutine works, type it in and run it along with the demonstration program (see Listing 1 for the VIC-20 version, Listing 2 for the C-64 version).

When you use the subroutine in your own programs, you should first print the text or graphics to be boxed, then create the box. If you draw the box first, the cursor is likely to erase part of it when putting the text or graphics inside.

The subroutine has lots of possibilities. By changing the variables each time you use GOSUB 10000, you can print boxes within boxes, or put boxes at several points on the screen simultaneously. If you'd like, each box can be a different color.

With a little experimenting, you will soon be a professional boxer, and your screen messages and menus will take on an added authenticity. R

Address all author correspondence to Richard Lovett, 6649 Oak St., Kansas City, MO 64113.

Listing 1. *VIC-20 demonstration program. Run with subroutine.*

```
5 REM VIC VERSION
1Ø PRINT"{SHFT CLR}{8 CRSR DNs}"
2Ø PRINTTAB(3)"TA-DAH!{2 SPACEs}HERE'S
3Ø PRINTTAB(4)"OUR TEXT WITH
4Ø PRINTTAB(3)"A BOX AROUND IT.
5Ø WID=18:DEP=7:DOWN=7:LEF=INT((22-WID)/2)
7Ø GOSUB1ØØØØ:PRINT:PRINT:PRINTTAB(4)"PRESS
   ANY KEY"
8Ø GETJ$:IFJ$=""THEN8Ø
9Ø PRINT"{SHFT CLR}{CRSR DN}DRAW A BOX TO Y
   OUR OWN SPECIFICATIONS
1ØØ INPUT"BOX WIDTH (2-21)";WID
11Ø INPUT"BOX DEPTH (1-21)";DEP
12Ø PRINT"DISTANCE DOWN":PRINT"FROM TOP";:I
   NPUT DOWN
13Ø IFDEP+DOWN>22THENPRINT"YOU CAN'T DO THA
   T":GOTO11Ø
14Ø PRINT"CENTER THE BOX":PRINT"LEFT/RIGHT"
   ;:INPUTAN$
15Ø IFLEFT$(AN$,1)="Y"THENLEF=INT((22-WID)/
   2):GOTO18Ø
16Ø INPUT"DISTANCE FROM LEFT";LEF
17Ø IFLEF+WID>21THENPRINT"YOU CAN'T DO THAT
   ":GOTO16Ø
18Ø PRINT"{SHFT CLR}":GOSUB1ØØØØ:FORI=1TO5Ø
   ØØ:NEXT:INPUT"{SHFT CLR}{CRSR DN}ANOTHE
   R BOX (Y/N)";AN$
19Ø IFAN$="Y"THEN1ØØ
2ØØ END
1ØØØØ REM *** BOX MAKER SUBROUTINE ***
1ØØ1Ø POKE211,LEF:POKE214,DOWN:PRINT"{CRSR
     UP}";
1ØØ2Ø FORI=1TOWID:PRINT"{COMD P}";:NEXT:PRI
     NT
1ØØ3Ø FORI=1TODEP:PRINTTAB(LEF);"{COMD H}";
     TAB(LEF+WID-1)"{COMD N}":PRINT"{CRSR
     UP}":NEXT
1ØØ4Ø POKE211,LEF:POKE214,DOWN+DEP+1:PRINT"
     {CRSR UP}";
1ØØ5Ø FORI=1TOWID:PRINT"{COMD Y}";:NEXT:RET
     URN
```

Listing 2. *C-64 demonstration program. Run with subroutine.*

```
5 REM C-64 VERSION
1Ø PRINT"{SHFT CLR}{8 CRSR DNs}"
2Ø PRINTTAB(12)"TA-DAH!{2 SPACEs}HERE'S
3Ø PRINTTAB(13)"OUR TEXT WITH
4Ø PRINTTAB(12)"A BOX AROUND IT.
5Ø WID=21:DEP=7:DOWN=7:LEF=INT((4Ø-WID)/2)
7Ø GOSUB1ØØØØ:PRINT:PRINT:PRINTTAB(8)"PRESS
   ANY KEY TO GO ON
8Ø GETJ$:IFJ$=""THEN8Ø
9Ø PRINT"{SHFT CLR}{CRSR DN}DRAW A BOX TO Y
   OUR OWN SPECIFICATIONS
1ØØ INPUT"WIDTH OF BOX (2-39)";WID
11Ø INPUT"DEPTH OF BOX (1-23)";DEP
12Ø INPUT"DISTANCE DOWN FROM TOP";DOWN
13Ø IFDEP+DOWN>24THENPRINT"YOU CAN'T DO THA
   T":GOTO11Ø
14Ø INPUT"CENTER THE BOX LEFT/RIGHT";AN$
15Ø IFLEFT$(AN$,1)="Y"THENLEF=INT((4Ø-WID)/
   2):GOTO18Ø
16Ø INPUT"DISTANCE FROM LEFT";LEF
17Ø IFLEF+WID>39THENPRINT"YOU CAN'T DO THAT
   ":GOTO16Ø
18Ø PRINT"{SHFT CLR}":GOSUB1ØØØØ:FORI=1TO5Ø
   ØØ:NEXT:INPUT"{SHFT CLR}{CRSR DN}ANOTHE
   R BOX (Y/N)";AN$
19Ø IFAN$="Y"THEN1ØØ
2ØØ END
1ØØØØ REM *** BOX MAKER SUBROUTINE ***
1ØØ1Ø POKE211,LEF:POKE214,DOWN:PRINT"{CRSR
     UP}";
1ØØ2Ø FORI=1TOWID:PRINT"{COMD P}";:NEXT:PRI
     NT
1ØØ3Ø FORI=1TODEP:PRINTTAB(LEF);"{COMD H}";
     TAB(LEF+WID-1)"{COMD N}":PRINT"{CRSR
     UP}":NEXT
1ØØ4Ø POKE211,LEF:POKE214,DOWN+DEP+1:PRINT"
     {CRSR UP}";
1ØØ5Ø FORI=1TOWID:PRINT"{COMD Y}";:NEXT:RET
     URN
```

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Sound Sampler

This program gives you 17 amusing, captivating or out-of-this-world sounds that you can add to your own programs.

By BRUCE BARTLETT

Sound Effects Sampler is a menu-driven program that demonstrates the amazing sound capabilities of the Commodore 64. The menu provides a list of sound effects with a letter beside each one. To hear the desired sound effect, press the appropriate key.

The letter of your choice lights up to indicate which effect is playing; otherwise the letter is light blue.

You can add these sound effects to your own programs by typing in the appropriate subroutines and initializing statements. There are 17 subroutines with titles at lines 100, 200, 300 and so on. Lines 10 and 20 should also be included; they clear the sound chip and define the sound parameters.

How It Works

In the sound subroutines, up to three kinds of For...Next loops are used. FOR F =...NEXT F increments or decrements frequency. That is, it sweeps the pitch from low to high, or vice versa. FOR D =... NEXT D increments or decrements duration. It varies the duration, or length, of silences in between tones. FOR N =...NEXT N increments the number of repetitions, to repeat an effect several times.

For definitions of the program variables, see Table 1.

Here are the functions of the program lines:

Line 10 clears the sound chip.

Line 20 defines the sound parameters.

Lines 25–49 make up the screen display (the menu).

Line 50 restores a yellow letter to light blue after a sound effect has been played.

Line 55 resets the attack/decay and sustain/release to nominal values for most of the sound effects.

Line 60 gets keyboard input.

Line 70 converts the typed-in letter to a number for use with the On... Goto statement in line 80.

Line 72 colors the typed-in letter yellow, to indicate which sound effect is playing.

Lines 75–77 branch to the appropriate subroutine for sound effects 16 and 17 (letters P and Q).

Line 80 branches to the appropriate subroutine for sound effects 1 through 15 (letters A through O).

Lines 100–1790 make up the sound-effect subroutines.

Inside the Subroutines

I will now briefly describe what's happening in each sound subroutine. I won't mention the ADSR settings, since they are self-explanatory. In the last program line of each sound effect, the voice is turned off. If the Filter mode, or resonance, has been used, it is also turned off. Then the program goes back to line 50 to reset the selected letter to blue and get a new keystroke.

Echoing UFO Takeoff enables ring modulation, sets the Voice-2 frequency for ring modulation and sweeps FU and FL up in frequency.

Pulsing UFO Takeoff alternates rapidly between a triangle waveform and a noise waveform as it sweeps upward in frequency.

Crystal Goblet enables the Voice-2 triangle wave, enables synchronization and sweeps up and down in frequency four times.

Alien Planet sets the Voice-2 frequencies, enables ring modulation and sweeps up and down in frequency four times.

S = 54272, the start of sound chip memory
FL = S = lower frequency
FU = S+1 = upper frequency
W = S+4 = waveform
AD = S+5 = attack/decay
SR = S+6 = sustain/release
SL = S+14 = Voice 2 lower frequency, used in Ring Modulation and Synchronization modes
SU = S+15 = Voice 2 upper frequency, used in Ring Modulation and Synchronization modes
S+21 = filter lower cutoff frequency
S+22 = filter upper cutoff frequency
S+23 = Filter and Resonance modes
V = S+24 = volume and bandpass
F = frequency (when used in a For...Next loop)
D = duration (when used in a For...Next loop)
N = number of repetitions (when used in a For...Next loop)
PU = pulse tone = memory location 54275
PL = pulse width = memory location 54274
POKEW,19 enables ring modulation
POKEW,21 enables synchronization

Table 1. *Definitions of the program variables, which refer to Voice 1, except as noted.*

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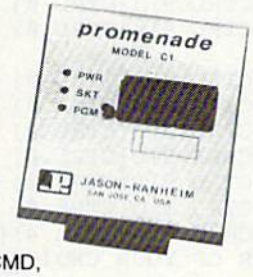

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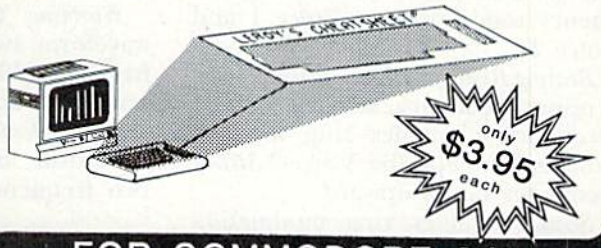

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Beating Rising Buzzer sets the Voice-2 upper frequency, sets the Voice-1 frequencies, enables ring modulation and sweeps the Voice-2 lower frequency slowly upward.

Seasick enables ring modulation and sweeps the Voice-2 lower frequency up and down four times.

Rubber Band sets the Voice-1 lower and upper frequencies, sets the Voice-2 upper frequency, enables synchronization and sweeps the Voice-2 lower frequency upward in frequency.

Chime sets the Voice-2 frequencies, sets the Voice-1 upper frequency and turns on a ring-modulated tone with ADSR set to sound like a chime.

Spinning Falling Wheel enables the bandpass filter, sets resonance to maximum, turns on the sawtooth waveform and sweeps Voice 1 and the filter-cutoff upper frequency *down* in frequency at an accelerating rate (by increasing the step size). Whew!

Bwee turns on the triangle waveform and sweeps a gentle tone upward between two random frequencies, 30 times.

Cosmic Rays turns on the sawtooth waveform and sweeps Voice 1 down in frequency between two random frequencies, 15 times.

Pulse Sweep sets the Voice-1 frequency, turns on the pulse waveform, sets the pulse width and tone and sweeps the pulse width from long to short to long, three times.

Ow sets Voice 1 to a random frequency, sets resonance to maximum, enables the bandpass filter and sweeps down the bandpass-filter upper frequency. All this is repeated ten times.

Warbling turns on the triangle waveform, sweeps upward rapidly in frequency 30 times, then sweeps upward less rapidly, 20 times.

Deedle Deedle turns on the sawtooth waveform and alternates between two frequencies; first slowly (duration D is long), then rapidly (D is short), then slowly (D is long).

If you'd rather not type in the program, I'll be glad to send you a copy if you send me $3, a self-addressed stamped envelope and a blank cassette with "Sound Effects Sampler" printed on the label. R

Address all author correspondence to Bruce Bartlett, 26921 Dumbarton Court, Elkhart, IN 46514.

Listing 1. *Sound Effects Sampler program.*

```
5 PRINT"{SHFT CLR}"
1Ø S=54272:FORL=ØTO24:POKES+L,:NEXT
2Ø V=S+24:W=S+4:FU=S+1:FL=S:AD=S+5:SR=S+6:S
   L=S+14:SU=S+15:POKEV,15:POKEAD,15
25 PRINT"{CRSR DN}{5 SPACEs}{CTRL 8}*** {CT
   RL 9}SOUND EFFECTS SAMPLER{CTRL Ø} ***"
3Ø PRINT"{CRSR DN}{11 SPACEs}{CTRL 6}BY BRU
   CE BARTLETT{COMD 7}"
31 PRINT"{CRSR DN}{CTRL 9}A{CTRL Ø} ECHOING
    UFO TAKEOFF"
32 PRINT"{CTRL 9}B{CTRL Ø} PULSING UFO TAKE
   OFF"
33 PRINT"{CTRL 9}C{CTRL Ø} CRYSTAL GOBLET"
34 PRINT"{CTRL 9}D{CTRL Ø} ALIEN PLANET"
35 PRINT"{CTRL 9}E{CTRL Ø} COMPUTER COMPUTI
   NG"
36 PRINT"{CTRL 9}F{CTRL Ø} CHIPMUNK FIGHT"
37 PRINT"{CTRL 9}G{CTRL Ø} BEATING RISING B
   UZZER"
38 PRINT"{CTRL 9}H{CTRL Ø} SEASICK"
39 PRINT"{CTRL 9}I{CTRL Ø} RUBBER BAND"
4Ø PRINT"{CTRL 9}J{CTRL Ø} CHIME"
41 PRINT"{CTRL 9}K{CTRL Ø} SPINNING FALLING
    WHEEL"
42 PRINT"{CTRL 9}L{CTRL Ø} BWEE"
43 PRINT"{CTRL 9}M{CTRL Ø} COSMIC RAYS"
44 PRINT"{CTRL 9}N{CTRL Ø} PULSE SWEEP"
45 PRINT"{CTRL 9}O{CTRL Ø} OW"
46 PRINT"{CTRL 9}P{CTRL Ø} WARBLING"
47 PRINT"{CTRL 9}Q{CTRL Ø} DEEDLE DEEDLE"
49 PRINT"{CRSR DN}{CTRL 4}{5 SPACEs}TYPE TH
   E LETTER OF YOUR CHOICE{COMD 7}"
```

→

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Listing 1 continued.

```
5Ø IFA>ØANDA<18THENPRINT"{HOME}":FORN=1TOA+
   3:PRINT:NEXT:PRINT"{CTRL 9}{COMD 7}"CHR$
   (A+64)"{CTRL Ø}"
55 POKEAD,15:POKESR,Ø
6Ø GETA$:IFA$=""THEN5Ø
7Ø A=ASC(A$)-64:IFA<1ORA>17THEN5Ø
72 PRINT"{HOME}":FORN=1TOA+3:PRINT:NEXT:PRI
   NT"{CTRL 9}{CTRL 8}"CHR$(A+64)"{CTRL Ø}"
75 IFA=16THEN16ØØ
77 IFA=17THEN17ØØ
8Ø ONAGOTO1ØØ,2ØØ,3ØØ,4ØØ,5ØØ,6ØØ,7ØØ,8ØØ,9
   ØØ,1ØØØ,11ØØ,12ØØ,13ØØ,14ØØ,15ØØ
1ØØ REM ***ECHOING UFO TAKEOFF***
11Ø POKESR,8
12Ø POKEW,21
13Ø POKESL,67:POKESU,12
14Ø FORF=ØTO255:POKEFU,F:POKEFL,F:NEXT
15Ø POKEW,2Ø:FORT=1TO1ØØ:NEXTT
16Ø GOTO5Ø
2ØØ REM ***PULSING UFO TAKEOFF***
21Ø FORF=ØTO155:POKEW,17:POKEFU,F:FORT=1TO6
   :NEXTT
22Ø POKEW,129:FORT=1TO5Ø:NEXTT
23Ø NEXTF
24Ø POKEW,128
25Ø GOTO5Ø
3ØØ REM CRYSTAL GOBLET
31Ø POKES+18,17:POKEW,19
32Ø POKESU,64
33Ø FORN=1TO4
34Ø FORF=1TO255:POKEFU,F:NEXTF
35Ø FORF=255TO1STEP-1:POKEFU,F:NEXTF
36Ø NEXTN
37Ø POKEW,18:GOTO5Ø
4ØØ REM ***ALIEN PLANET***
41Ø POKESL,67:POKESU,12
42Ø POKEW,21
43Ø FORN=1TO4
44Ø FORF=ØTO255:POKEFU,F:NEXTF
45Ø FORF=255TOØSTEP-1:POKEFU,F:NEXTF
46Ø NEXTN
47Ø POKEW,2Ø:GOTO5Ø
5ØØ REM ***COMPUTER COMPUTING***
51Ø POKESL,24Ø:POKESU,12
52Ø POKEW,19
53Ø FORN=1TO5Ø:F=INT(RND(1)*255)+1:POKEFU,F
54Ø FORT=1TO6Ø:NEXT
55Ø NEXTN
56Ø POKEW,18:GOTO5Ø
6ØØ REM ***CHIPMUNK FIGHT***
61Ø POKEW,21
62Ø FORN=1TO15Ø:F=INT(RND(1)*255)+1
63Ø POKEFU,F:POKESU,F
64Ø FORT=1TO12:NEXTT
65Ø NEXTN
66Ø POKEW,2Ø:GOTO5Ø
7ØØ REM ***BEATING RISING BUZZER***
71Ø POKEAD,9:POKESU,3
72Ø POKESR,64+12
73Ø POKEFU,4:POKEFL,1Ø
74Ø POKEW,21
75Ø FORF=ØTO255STEP.3:POKESL,F:NEXT
76Ø POKEW,2Ø:FORT=1TO1ØØØ:NEXT:GOTO5Ø
8ØØ REM ***SEASICK***
81Ø POKEAD,63:POKEFU,4:POKEFL,1Ø:POKESU,1Ø
82Ø POKEW,21
83Ø FORN=1TO4
84Ø FORF=ØTO255:POKESL,F:NEXTF
85Ø FORF=255TOØSTEP-1:POKESL,F:NEXTF
86Ø NEXTN
87Ø POKEW,2Ø:GOTO5Ø
9ØØ REM ***RUBBER BAND***
91Ø POKEAD,1Ø:POKESR,64+9
92Ø POKEFU,67:POKEFL,12:POKESU,5
93Ø POKEW,19
94Ø FORF=ØTO255STEP1.3:POKESL,F:NEXT
95Ø POKEW,18:FORT=1TO5ØØ:NEXT:GOTO5Ø
1ØØØ REM ***CHIME***
1Ø1Ø POKEAD,1Ø:POKESR,64+11
1Ø2Ø POKESU,1Ø:POKESL,1Ø
1Ø3Ø POKEFU,4:POKEW,21:FORT=1TO5Ø:NEXT
1Ø4Ø POKEW,2Ø:FORT=1TO18ØØ:NEXT
1Ø5Ø GOTO5Ø
11ØØ REM ***SPINNING FALLING WHEEL***
111Ø POKEV,15+32:POKES+23,239
112Ø POKEW,33
113Ø FORSP=1ØTO255
114Ø FORF=255TOØSTEP-SP:POKEFU,F:POKES+22,F
   :NEXT
115Ø NEXTSP
116Ø POKEW,32:POKES+23,Ø:GOTO5Ø
12ØØ REM ***BWEE***
121Ø POKEAD,119
122Ø FORN=1TO3Ø
123Ø POKEW,17
124Ø FORF=INT(RND(.)*5Ø)+5ØTOINT(RND(.)*15Ø
   )+5ØSTEP2:POKEFU,F:NEXT:POKEW,16
125Ø NEXTN
126Ø GOTO5Ø
13ØØ REM ***COSMIC RAYS***
131Ø POKEAD,119
132Ø FORN=1TO15
133Ø POKEW,33
134Ø FORF=INT(RND(.)*15Ø)+5ØTOINT(RND(.)*5Ø
   )STEP-1
135Ø POKEFU,F:NEXTF
136Ø POKEW,32
137Ø NEXTN
138Ø GOTO5Ø
14ØØ REM ***PULSE SWEEP***
141Ø POKEFU,2:POKEFL,12:POKEW,65:PL=54274:P
   U=54275
142Ø FORN=1TO3
143Ø FORL=ØTO255STEP2:POKEPL,L:POKEPU,Ø:NEX
   T
144Ø FORL=255TOØSTEP-2:POKEPL,L:POKEPU,Ø:NE
   XT
145Ø NEXTN
146Ø POKEW,64:GOTO5Ø
15ØØ REM ***OW***
151Ø POKEAD,47:POKES+23,239:POKEV,15+32
152Ø FORN=1TO1Ø
153Ø POKEFU,INT(RND(.)*5)+2
154Ø POKEW,33
155Ø FORSW=1ØØTOØSTEP-3
156Ø POKES+22,SW:NEXTSW
157Ø POKEW,32:FORT=1TO1ØØ:NEXT
158Ø NEXTN
159Ø POKES+23,Ø:POKEV,15:GOTO5Ø
16ØØ REM ***WARBLING***
161Ø POKEW,17:FORN=1TO3Ø
162Ø FORF=5ØTO2ØØSTEP2Ø:POKEFU,F:NEXTF
163Ø NEXTN
164Ø FORN=1TO2Ø
165Ø FORF=5ØTO2ØØSTEP1Ø:POKEFU,F:NEXTF
166Ø NEXTN
167Ø POKEW,16:GOTO5Ø
17ØØ REM ***DEEDLE DEEDLE***
171Ø POKEW,33:FORD=1ØØTOØSTEP-5
172Ø POKEFU,64:FORT=1TOD:NEXT
173Ø POKEFU,54:FORT=1TOD:NEXT
174Ø NEXTD
175Ø FORD=ØTO1ØØSTEP5
176Ø POKEFU,64:FORT=1TOD:NEXT
177Ø POKEFU,54:FORT=1TOD:NEXT
178Ø NEXTD
179Ø POKEW,32:GOTO5Ø
```

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From p. 10.

The ideal dummy line would be easy to type in, easy to replicate with various line numbers and would be self-documenting when executed. After years of looking, I finally found it:

```
1200 STOP:RETURN
```

When executed, this line will cause a Break In XXX message, where XXX is whatever line number you've given it. When you then enter CONT, the program will return from the subroutine. Of course, if you've used a Goto rather than a Gosub command, you don't need the Return command in your dummy line.

Louis F. Sander
Pittsburgh, PA

$1CD Calculated Goto command—On the C-64, you can use this one-liner to jump to any calculated line number within your program. Simply set the variable GL to the desired line number, then enter GOTO 1000.

```
1000 POKE 785,188 : POKE 786,168 : POKE GL,PEEK(GL) :
     GL = USR(0)
```

It may not look like it, but believe me, it works! [Yes, it does! Ed.]

Randy Thompson
Eugene, OR

$1CE Shifted REMs—If you put a shifted letter inside a REM statement, the computer will interpret it as a Basic keyword when it is listed. (The same is true of the graphics characters created by the Commodore key.)

A shifted L in any REM statement will cause a Syntax error if the computer tries to list it. REM followed by an alternating series of shifted V's and unshifted spaces will commemorate nylon stockings, the Olympics and an equally famous fountain of knowledge. Replacing the shifted V's with shifted S's will show what you do with the latter.

When shifted or Commodore key characters follow a quotation mark, they list as themselves rather than as Basic keywords. So, if you *must* use shifted characters in your REM statements, precede them by a quotation mark.

Ellen Pekar
Florence, MA

$1CF Word trick contest—Last month, we announced a contest based on the principle described above. This month's grand prize entry is:

```
10 LIST
20 REM  Q: HOW FAR IS IT FROM THE TOP
21 REM     OF THE EMPIRE STATE
22 REM     BUILDING TO THE BOTTOM?
```

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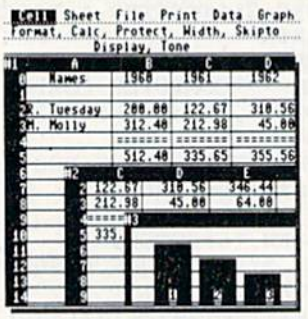

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```
30 REM " A: {2 SPACES}{SHIFT -}{E}{SPACE}{SHIFT
   LB.}{SHIFT 1}
40 REM  Q: WHAT TAKES TWO (10 BINARY)?
50 REM " A: {2 SPACES}{COMD @}{SPACE}{SHIFT *}{SHIFT K}
60 REM  Q: WHAT DID THE BROKEN GUITAR
61 REM       SAY TO ITS DISTRAUGHT OWNER?
70 REM " A: {2 SPACES}{COMD LB.}{SPACE}{COMD @}
   {SPACE}{COMD U}{T}
```

Type the answers very carefully, with no extra spaces, and save the program. Then delete the quotes and run it to see the answers.

Gary Forney
Oelwein, IA

$1D0 Last prize

—This is the absolute worst entry we received. It is printed here as a tribute to programming ingenuity, no matter how misdirected.

```
10 LIST
20 REM  Q: WHAT'S AN APPLECOSTA?
30 REM " A: {2 SPACES}{COMD V}
   {T}{SPACE}{A}{SPACE}{SHIFT R}{E}
```

Mike Leherr
Startzen University
Puget Sound, WV

$1D1 Automatic line numbering

—This Direct mode line puts ten line numbers on the screen. By moving your cursor to the proper position on the screen line, then typing a program line, you can use them as line numbers.

```
FOR A = 10 TO 100 STEP 10 : PRINT A : NEXT
```

The number values, of course, can be changed to anything you'd like. If you're typing in Data statements, change the line to read:

```
FOR A = 10 TO 100 STEP 10 : PRINT A;"DATA" : NEXT
```

You then only have to enter the data items themselves.

Lum Kin Leon
Kuala Lumpur, Malaysia

$1D2 Fade in, fade out

—Have you ever thought of having the title of your program fade in, then out, on a black screen? It's a nice effect, and it's actually quite simple. The C-64 has 16 colors, three of which are different shades of gray, with black and white at either end, and you can use them in your fading process. The following program summarizes it. Have fun!

```
10 POKE 53280,0 : POKE 53281,0
20 A$(1) = "{CTRL 2}" : A$(2) = "{COMD 8}" : A$(3) = "{COMD 5}" :
   A$(4) = "{COMD 4}" : A$(5) = "{CTRL 1}"
```


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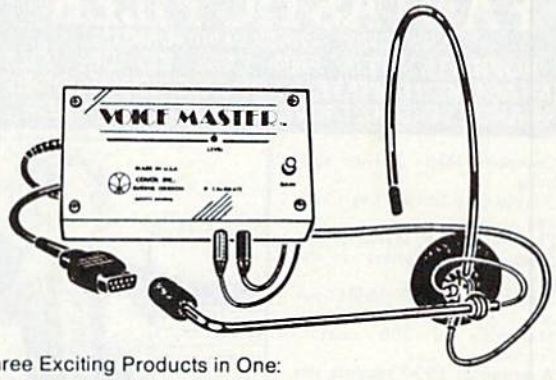

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```
30 INPUT "{SHIFT CLR} MESSAGE";ME$
40 PRINT "{SHIFT CLR}" : FOR J = 5 TO 1 STEP -1 : PRINT
   "{HOME}";A$(J);ME$ : FOR K = 1 TO 95 : NEXT : NEXT
50 FOR J = 1 TO 5 : PRINT "{HOME}";A$(J);ME$ : FOR K = 1 TO 95
   : NEXT : NEXT : PRINT A$(1)
```

Greg Burns
Address unknown

$1D3 Disk wedge tip—Wedge commands can be used from within Basic programs, as long as the proper syntax is used. The @, >, /, % or up-arrow symbol must be the first character in the statement, with no quotes around it. The rest of the command must be enclosed in quotes. The following routine, for example, will put a directory on the screen, read the error channel, print a message, then load a program.

```
200 @ "$"
210 @
220 PRINT "WIZARDRY, INDEED!"
230 / "THE LAND OF OZ"
```

With normal Program mode loads, you must be concerned about program length; with this one, you don't. The technique has worked with every wedge command we've tried it on.

Arnie Lee
Abacus Software

Circle 172 on Reader Service card.

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$1D4 Shifted spaces in filenames—Things would be easier if all disk files had short names—like M1 instead of MONITOR.49152, for example. But how do you remember the meaning of M1? If you save or rename a file using a shifted space inside the name, you can use its left portion (before that shifted space) as a normal name, while the rest of it may be treated as a comment. If you save a program as

"M1{shift space}MONITOR.49152"

the directory will list it as

"M1"MONITOR.49152

From then on, you will be able to treat it as just "M1." If you forget, just list the directory and see the whole name. Incidentally, the DOS still considers the entire name, so these two files can coexist with no problems:

"M1"MONITOR.49152
"M1"MONITOR.51111

This is not any convenience, however, since any command aimed at "M1" will affect only the one that appears first in the directory.

Carlos A.G. de Figueiredo
Sao Paulo, Brazil

$1D5 Easy load filenames—If you load programs by typing on top of a directory listed to the screen, the easy part is typing the word LOAD on top of the number of blocks to the left of the filename. It's somewhat harder to move the cursor past the filename in order to type ,8,1 or ,8: (either the ,1 or the colon removes the need to erase the PRG).

It is generally known that messages may be embedded to the right of the filename, just past the second question mark, by renaming the file and using a shifted space to separate the filename from the message. If we could put a ,8,1 message in the filename like that, we'd make it a lot easier to load the program from its directory listing. Unfortunately, the drive will not accept a comma when it renames a file.

But there is a way to put a comma there. Instead of using a comma, use a Commodore-D, the little block character that the D key makes when pressed with the Commodore key. The disk drive will accept this character, and the new directory will print it out as a comma!

For example, to embed the phrase ,8,1 after the filename MERLIN, just type the following.

```
OPEN 15,8,15 , "R:MERLIN{shift space}{COMD D}8{COMD D}
1 = MERLIN" : CLOSE 15
```

To put a colon in the filename, use the shifted @.

Doug Ferguson
Elida, OH

$1D6 Disk de-banger—When using copy-protected programs, the copy-protection scheme can create a lot of disk-head bumping, as evidenced by the 1541's machine-gun sound effects. The banging tends to knock

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drives out of alignment or to kill them before their time.

If you run the following program before loading any DOS-protected software, most of the banging will stop.

```
10 OPEN 15,8,15
20 PRINT#15,"M-W";CHR$(106)CHR$(0)CHR$(1)CHR$(133)
30 CLOSE 15
```

The de-banger will stay in effect until the drive is powered down.

Gilbert D. Helland
Scott AFB, IL

$1D7 Directory trouble—I forgot to enter NEW after loading a disk directory, and after spending an hour typing in a program, I found I was in trouble. When the program was listed, the directory lines were interspersed with the program lines. Since the directory line "numbers," really the numbers of sectors, etc., were not in numerical sequence, they wouldn't erase in the usual way.

I solved the problem by renumbering the few program lines that were mixed in with the directory numbers and erasing the original program lines. When I relisted the program, all the directory lines appeared at the beginning, where they could easily be deleted by typing their numbers.

Richard L. Mitchell
Lafayette, LA

$1D8 Loading machine language—The common way to load a machine language program from disk is:

```
LOAD "filename",8,1
```

It isn't widely known that *any* odd number can be used instead of the 1. I find it easier to use:

```
LOAD "filename",8,9
```

since the 9 is right next to the 8 on the keyboard.

Eric the Juggler
Squirrel Hill, PA

$1D9 Loading "*"—When you enter LOAD"*",8 with your Commodore disk drive, you don't always get the first program on the disk. Usually, in fact, you get the last program you've accessed. To fix this, just insert a colon in front of the asterisk:

```
LOAD":*",8
```

This gives you the first program every time.

Brian Kennedy
Colorado Springs, CO

$1DA Disk copying tip—When making a copy of disks, using the programs that require switching source and destination disks, it is a good idea to put a write-protect tab over the window of the source disk. It provides extra protection against accidental erasing of the source material.

Larry Thomas
Hooks, TX

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Graph Maker 64

This program allows you to create, save and print colorful vertical bar graphs on your C-64. It also includes two routines that let you load your graphs into other programs.

By DOUG SMOAK

Graph Maker draws vertical bar graphs on your screen, then allows you to add titles and text, and edit the screen. You can then save your graph to disk and print out a hard copy. Once saved, you can reload the screens to edit or print out again.

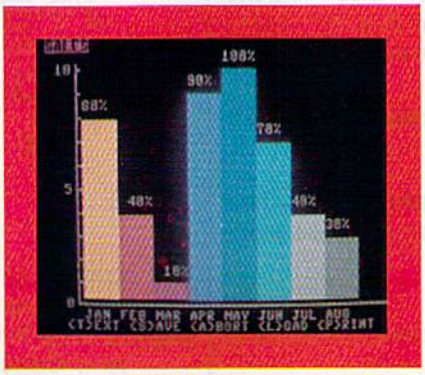
Also, I have included two routines you can add to your own programs to load previously prepared graphs for presentations.

Setting Up the Graph

After you type in Graph Maker (Listing 1), save it. When you run the program, you'll be prompted for bar parameters of the graph. You must first give the maximum vertical scale. This should be at least the size of the highest value to be graphed.

Occasionally, you might have one value that greatly exceeds the rest of the bars. To avoid a disproportionate graph, you should enter a value closer to the second highest bar. In this case, the largest bar will still appear, reaching to the top of the screen. You can then use the Text mode to enter that highest bar's actual value.

You will find that using whole numbers for the maximum graph value will yield a more attractive display. If your values are more than three digits, then only the left-most three digits will be displayed. This is



Screen shot of Graph Maker program.

necessary to maintain as much space for the bars as possible. If you have very high values, it is probably better to break them into percentages and then use 100 as your maximum value; or you can divide them by 100, 1000 and so on, and, in Text mode, add a note like "in hundreds." The best way to learn is just to experiment with the program for a while.

The second prompt will request the number of vertical bars you want on the screen. You may have from two to 36. I chose 36 as the maximum because it is more evenly divisible by the most likely charted items, such as 12 months (up to three years' worth). Here again, you'll receive the best results by experimenting to get a feel for how it works.

Next, you will be prompted to label each of the bars and told how many characters each title can possess. If you want only numbers beneath each bar, just hit the return key, and Graph Maker will automatically enter the number for that bar as its title.

After having set the maximum bar height, the number of bars and their labels, the final step will be to enter the values for each bar. You will be prompted for the value to be graphed, with the title after the number, such as:

BAR #1, JAN

These values must be entered carefully to avoid having to redo all of the input.

After all the data has been entered, the graphing begins, taking only a few seconds for even a 36-bar chart. Then, at the bottom of the screen, you will see a flashing prompt showing the options available: Text, Save, Abort, Load and Print.

If you hit A for Abort, the program will rerun from the beginning and wipe out what has been done up to that point.

The Program's Options

Text mode will give you a flashing cursor that you can move about the screen to add titles or notes or to edit bar titles. Just use the cursor controls

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to move about and then type in your desired characters. If you want a reversed character, you must first type it in normally; then go back and press the return key over each character you want highlighted.

To change colors in Text mode, just do it as you normally would, by simultaneously pressing the CTRL and color keys or the Commodore and color keys. When you have finished with Text mode, you escape to Command mode by pushing the pound key (£). Then you will again get the flashing prompt.

If you hit S for Save, the flashing prompt will be replaced with a prompt for a filename. To abort this option, hit the return key without entering a name. After entering the filename, the drive should come on and *two* saves will be made. Why two?

The first file is the screen memory, saved right off the screen as a program file. The second (saved as filename.C) is the screen-color memory, saved right out of memory as a second program file. This means that for every graph, there are two files of four blocks each on the disk. The color file has the same name as the screen file, except ".C" is added to it.

When you hit L for Load, you will again be prompted for your filename. You enter only the filename for the screen file; the program itself will then look for the color file with the same name. You could use this option to make rough drafts, saving them and then later reloading to add text before resaving final versions. To abort the Load option, just hit the return key without entering a name.

Don't save graphs under the same name, or you'll get a disk error. In the case of any Load or Save errors, you will get a flashing message on the bottom line of the screen and an opportunity to redo the procedure.

If you choose P for a printout of the screen, you must have a printer/interface combination that will support the 64's keyboard graphics; otherwise the printout will not be usable. Note that the printout uses double-width characters to make a chart that is 80 columns wide. If you want smaller charts (40 columns), then change CHR$(14) in line 1470 (in the printout routine) to CHR$(15).

The two short loader programs will allow you to load your screens into your own programs. The first one is

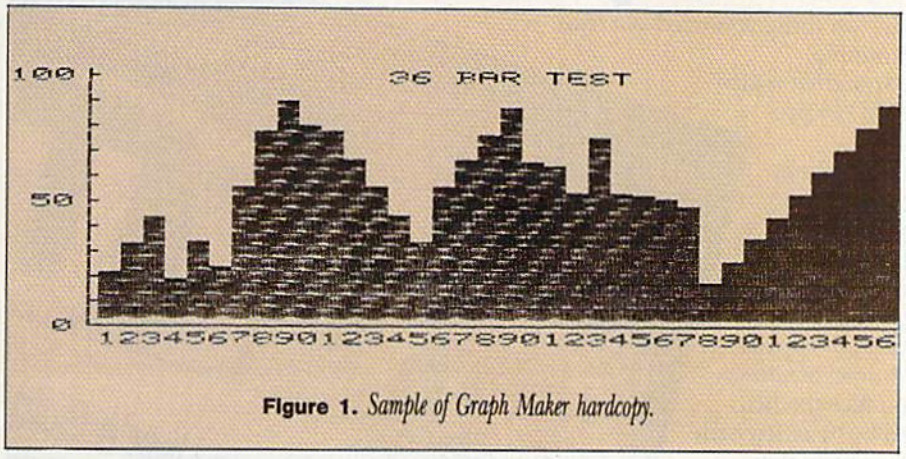

Figure 1. *Sample of Graph Maker hardcopy.*

Listing 1. *Graph Maker program.*

```
1 REM ******************************
2 REM *{29 SPACEs}*
3 REM *{6 SPACEs}GRAPHMAKER 64 (C) 1984 *
4 REM *{9 SPACEs}DOUG SMOAK{1Ø SPACEs}*
5 REM *{9 SPACEs}3Ø3 HEYWARD ST.{5 SPACEs}*
6 REM *{9 SPACEs}COLUMBIA SC 292Ø1{3 SPACEs
  }*
7 REM *{9 SPACEs}(8Ø3)-765-1189{6 SPACEs}*
8 REM *{29 SPACEs}*
9 REM ******************************
1Ø BO=5328Ø:BG=BO+1:POKEBG,Ø:POKEBO,Ø:POKE5
  6296,Ø
2Ø OV$="{41 CRSR RTs}"
3Ø DN$="{HOME}{21 CRSR DNs}"
4Ø BL$=DN$+"{3 CRSR DNs}"+"{38 SPACEs}{HOME
  }"
5Ø CC=4:DIMFR$(7),T$(36),V(36),CL$(7),F$(2)
  ,S(2),E(2)
6Ø S(1)=1Ø24:E(1)=2Ø24:S(2)=55296:E(2)=5629
  7
7Ø CL$(Ø)="{COMD 5}":CL$(1)="{CTRL 8}":CL$(
  2)="{COMD 1}":CL$(3)="{CTRL 3}":CL$(4)="
  {CTRL 5}":CL$(5)="{CTRL 7}"
8Ø CL$(6)="{COMD 7}":CL$(7)="{COMD 8}"
9Ø PRINT"{SHFT CLR}{COMD 5}{14 SPACEs}GRAPH
  MAKER 64"
1ØØ PRINT"{2 CRSR DNs}{CRSR RT}C{LEFT ARROW
  }CREATE A GRAPH":PRINT"{CRSR DN}{CRSR R
  T}L{LEFT ARROW}LOAD A GRAPH"
11Ø GETG$:ON-(G$="")GOTO11Ø:IFG$<>"L"ANDG$<
  >"C"THEN11Ø
12Ø IFG$="L"THEN117Ø
13Ø INPUT"{SHFT CLR}{CRSR DN}{CRSR RT}MAXIM
  UM VERTICAL SCALE VALUE";MX:BI=MX/2Ø:LI
  =BI/7:IFMX=<ØTHEN13Ø
14Ø GOSUB28Ø:GOSUB57Ø
15Ø FORI=1TOVB
16Ø PRINT"{SHFT CLR}{CRSR DN}{CRSR RT}VALUE
   TO BE GRAPHED":PRINT"{CRSR DN}{CRSR RT
  }FOR BAR #"I"{CRSR LF}, "T$(I);
17Ø INPUTV(I):IFV(I)>MXTHENV(I)=MX
18Ø GOSUB39Ø
19Ø NEXT:PRINTGR$MX$
2ØØ :
21Ø REM ** LOOP FOR BARS **
22Ø :
23Ø FORC=1TOVB:V=V(C):V=V-3*(BI/7):GOSUB46Ø
  :NEXT
24Ø GOTO81Ø
25Ø :
26Ø REM ** SET UP PARAMETERS **
27Ø :
28Ø PRINT"{SHFT CLR}{CRSR DN}{CRSR RT}HOW M
  ANY VERTICAL BARS":PRINT"{CRSR DN}{CRSR
   RT}(2-36) ";:INPUTVB
29Ø IFVB>36ORVB<2THEN28Ø
3ØØ BW=INT(36/VB)
31Ø FORI=1TOVB
32Ø PRINT"{SHFT CLR}{CRSR DN}{CRSR RT}TITLE
   FOR BAR #"I:PRINT"{CRSR DN}{CRSR RT}UP
   TO"BW"CHARACTERS";
33Ø INPUTT$(I):IFT$(I)=""THENT$(I)=STR$(I)
34Ø IFLEN(T$(I))>BWAND(BW>2)THEN32Ø
35Ø NEXT:RETURN
36Ø :
37Ø REM ** CENTER ROUTINE **
38Ø :
39Ø IFBW<3THENT$(I)=RIGHT$(T$(I),1):RETURN
4ØØ IFLEN(T$(I))=BWTHENRETURN
41Ø MR=BW-LEN(T$(I)):MR=MR/2:IFMR<1THENRETU
  RN
```

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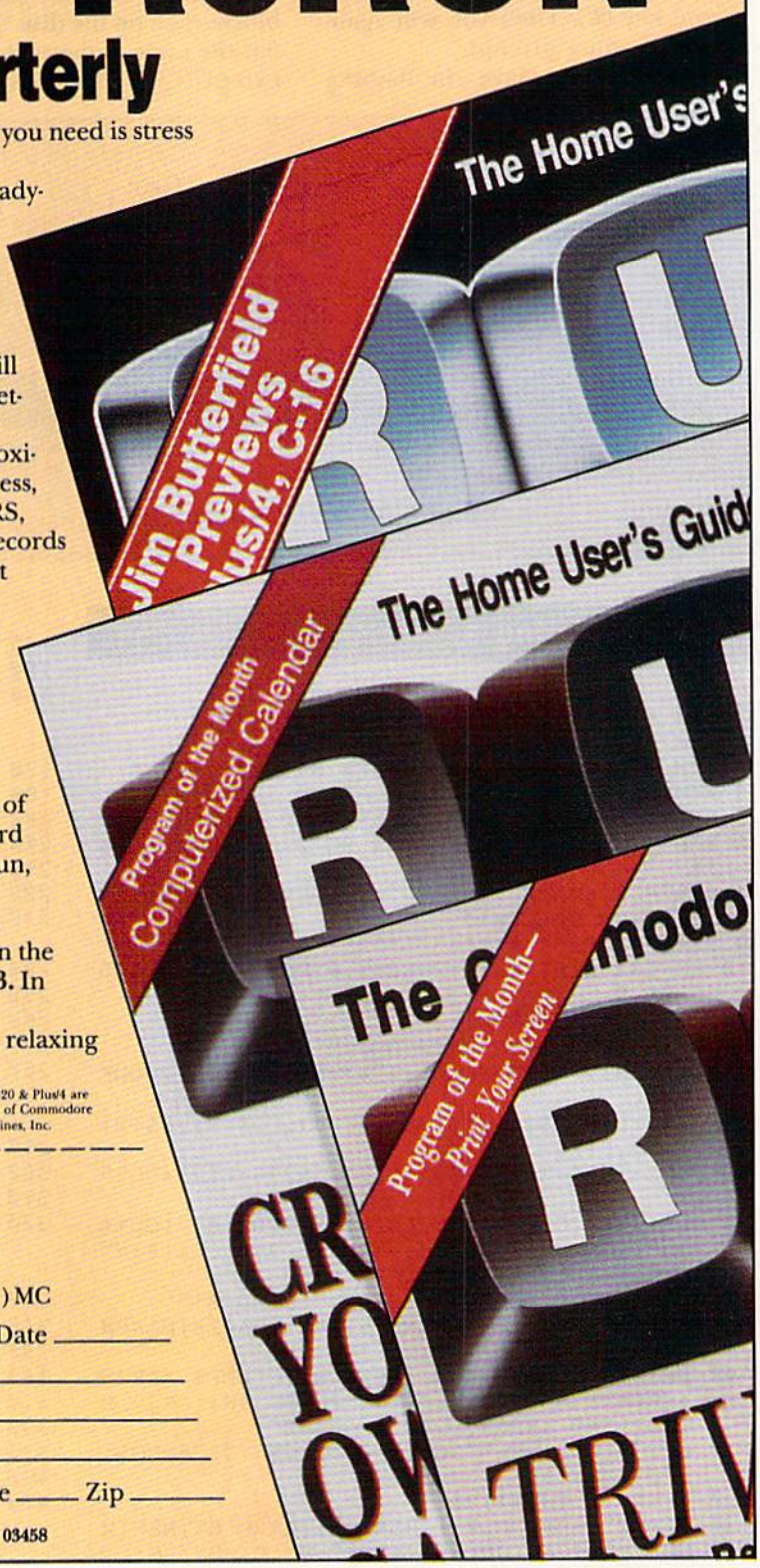

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the simplest, but I prefer to use the second.

The first one (Listing 2) uses the Basic Load command, but when a load is executed from a program, it is a load/run. After the loading procedure, a run is executed.

This means that your program has to set some kind of flag to check to see whether or not the Run command is the first one you typed in or the one from the Load routine. If it is from the Load routine, is it from the screen file or the color file? This gets complicated.

The second loader (Listing 3) uses the Kernal Load routine, doing all the necessary preparation for it in Basic. This routine does not execute a run, so no flags are necessary, and program flow is easier to keep up with.

The Pokes in both of them are to set the border and background colors to the value that was used when the graph was created. You may change this value in line 10 of the program. The Graph Maker program uses the second routine for Loading and Saving.

Line Explanations

Lines 10–120. Initialize some variables and prompt for the choice to create or load a graph.

Lines 130–200. Begin the defining of parameters for the graph.

Lines 210–250. Set up the loop to draw the bars after input is complete.

Lines 260–360. Subroutine called from line 140 to further define parameters and input the data.

Lines 370–430. Subroutine that centers the titles for each bar.

Lines 460–550. Do the actual drawing of the bars from previously defined strings and such.

Lines 560–780. Subroutine called from line 140 to set up the strings for this particular graph.

Lines 790–890. Loop that presents the flashing prompt and processes the choice of options.

Lines 900–1020. Assemble the filenames for the two files under which a particular screen will be saved.

Lines 1030–1080. Called by the Save and Load routines to prepare for calling the Kernal Save and Load routines.

Lines 1090–1140. Finish the preparation for Saving the two files.

Lines 1150–1220. Input the filename of a graph to be loaded and finish the setup to load both files.

Lines 1230–1430. Form the Text routine that allows you to add text to a screen that has been created.

Lines 1440–1570. Form the Printer Dump routine to allow a hardcopy to be made of a screen.

Lines 1580–1650. Read the disk error channel when an attempt to load or save has been made. If an error has occurred, the error will be flashed at the bottom of the screen along with a "press any key to continue" prompt.

Some Fine Distinctions

I think you will be happy with the high-quality graphs that this program generates. It has the ability to make very fine distinctions, since it can resolve about 160 gradations in the vertical direction, which is one pixel of the 64's screen. Also, the Text mode gives you the freedom to customize the final result to suit your needs and wishes.

While Graph Maker is an excellent program for business needs, you can also use it for comparative analysis of nonbusiness applications, such as utility bills, grades at school, commodities pricing and even ages of family members.

I have included REM statements to title each subroutine and give you a brief description of the program.

Finally, if you don't have the time or inclination to type in the program, I can supply all three programs on tape for $5, or on disk for $8, to cover costs; or, if you just want to ask a question, feel free to write me (include a self-addressed stamped envelope for a reply). R

Address all author correspondence to Doug Smoak, 303 Heyward St., Columbia, SC 29201.

Listing 1 continued.

```
42Ø MR$="":FORJ=1TOMR:C$="{CRSR RT}"+C$:NEX
    T:T$(I)=C$+T$(I):C$="":RETURN
43Ø :
44Ø REM ** CHART ROUTINE**
45Ø :
46Ø IFV<LIANDV(C)>ØTHENFR=1:GOTO48Ø
47Ø IFV>ØTHENBL=INT(V/BI):F=V-BL*BI:FR=INT(
    F/LI)
48Ø CC$=LEFT$(OV$,CC)
49Ø PRINTDN$"{COMD 5}{2 CRSR DNs}"CC$T$(C);
5ØØ PRINT"{HOME}"CL$(CAND7)
51Ø PRINTDN$CC$;:IFBL=ØTHEN53Ø
52Ø FORI=1TOBL:PRINTCL$;:NEXT
53Ø IFFR>ØTHENPRINTFR$(FR)
54Ø CC=CC+BW:BL=Ø:FR=Ø:RETURN
55Ø :
56Ø REM ** SET UP STRINGS **
57Ø :
58Ø MX$=STR$(MX):MX$=RIGHT$(MX$,LEN(MX$)-1)
59Ø MX$=LEFT$(MX$,3):J=3-LEN(MX$):IFJ=ØTHEN
    61Ø
6ØØ FORI=1TOJ:M$=" "+M$:NEXT:MX$=M$+MX$:M$=
    ""
61Ø HF=1ØØ*MX:HF=INT(HF/2):HF=HF/1ØØ:HF$=ST
    R$(HF)
62Ø HF$=RIGHT$(HF$,LEN(HF$)-1):HF$=LEFT$(HF
    $,3)
63Ø J=3-LEN(HF$):IFJ=ØTHEN65Ø
64Ø FORI=1TOJ:M$=M$+" ":NEXT:HF$=M$+HF$:M$=
    ""
65Ø IFVAL(HF$)>VAL(MX$)THENHF$=LEFT$(" "+HF
    $,3)
66Ø MX$="{HOME}{2 CRSR DNs}"+MX$+"{1Ø CRSR
    DNs}{3 CRSR LFs}"+HF$
67Ø GR$="{SHFT -}{CRSR DN}{CRSR LF}{COMD Q}
    {CRSR DN}{CRSR LF}":FORI=1TO4:C$=C$+GR$
    :NEXT:C$=C$
68Ø C$="{COMD 5}{SHFT CLR}{2 CRSR DNs}{3 CR
    SR RTs}{COMD Q}{CRSR DN}{CRSR LF}"+C$
69Ø FORI=1TO5:C$=C$+GR$:NEXT:GR$=C$+"{SHFT
    -}{CRSR LF}{CRSR DN}":C$=""
7ØØ GR$=GR$+"{CRSR LF}Ø{COMD Z}{36 SHFT *s}
    {HOME}"
71Ø FORI=1TOBW:C$=C$+" ":NEXT:CL$=C$:C$=""
72Ø FORI=1TOBW:C$=C$+"{CRSR LF}":NEXT:CL$="
    {CTRL 9}"+CL$+C$+"{CRSR UP}{CTRL Ø}":C$
    =""
73Ø FR$="{COMD @}{COMD P}{COMD O}{COMD I}{C
    OMD U}{COMD Y}{COMD T}":FORI=1TO7:FR$(I
    )=MID$(FR$,I,1)
74Ø IFI>4THENFR$(I)="{CTRL 9}"+FR$(I)+"{CTR
    L Ø}"
75Ø NEXT
76Ø FORI=1TO7:FORJ=1TOBW:F$=F$+FR$(I):NEXTJ
    :FR$(I)=F$:F$="":NEXTI
77Ø RETURN
78Ø :
79Ø REM** INPUT FOR S/L,TITLE ,ETC.**
8ØØ :
81Ø PRINTDN$"{COMD 5}{3 CRSR DNs}{2 CRSR RT
    s}<T>EXT <S>AVE <A>BORT <L>OAD <P>RINT{
```

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Listing 1 continued.

```
    HOME}":FORT=1TO8ØØ:NEXT
82Ø GETG$:IFG$<>""THENPRINTBL$:GOTO84Ø
83Ø PRINTBL$:FORT=1TO125:NEXT:GOTO81Ø
84Ø IFG$="A"THENRUN
85Ø IFG$="L"THEN117Ø
86Ø IFG$="T"THEN125Ø
87Ø IFG$="P"THEN146Ø
88Ø IFG$<>"S"THEN81Ø
89Ø :
9ØØ REM ** GET SAVE FILENAME **
91Ø :
92Ø F$="":PRINTDN$"{3 CRSR DNs}FILENAME? {C
    OMD +}{CRSR LF}";
93Ø GETG$:ON-(G$="")GOTO93Ø
94Ø IFASC(G$)>31ANDASC(G$)<96THENF$=F$+G$
95Ø IFG$<>CHR$(13)THENPRINT" {CRSR LF}"G$"{
    COMD +}{CRSR LF}";:GOTO93Ø
96Ø PRINTBL$:IFF$=""THEN81Ø
97Ø IFLEN(F$)>14THEN92Ø
98Ø F$(1)=F$:F$(2)=F$+".C"
99Ø OP$="S":FORJ=1TO2:F$=F$(J)
1ØØØ S=S(J):E=E(J)
1Ø1Ø GOSUB1Ø5Ø:NEXT:GOSUB16ØØ:GOTO81Ø
1Ø2Ø :
1Ø3Ø REM ** SAVE AND LOAD**
1Ø4Ø :
1Ø5Ø FORI=1TOLEN(F$):POKE819+I,ASC(MID$(F$,
    I,1)):NEXT
1Ø6Ø POKE183,LEN(F$):POKE187,52:POKE188,3:P
    OKE186,8:POKE185,1
1Ø7Ø IFOP$="L"THEN121Ø
1Ø8Ø :
1Ø9Ø REM ** SAVE **
11ØØ :
111Ø SH=INT(S/256):SL=S-SH*256:EH=INT(E/256
    ):EL=E-EH*256
112Ø POKE251,SL:POKE252,SH:POKE78Ø,251:POKE
    781,EL:POKE782,EH
113Ø SYS65496:RETURN
114Ø :
115Ø REM ** LOAD **
116Ø :
117Ø INPUT"{SHFT CLR}{CRSR DN}{CRSR RT}EXAC
    T FILENAME";F$:IFF$=""ORLEN(F$)>14THEN
    117Ø
118Ø F$(1)=F$:F$(2)=F$+".C"
119Ø FORJ=1TO2:F$=F$(J):OP$="L":GOSUB1Ø5Ø
12ØØ NEXT:GOSUB16ØØ:GOTO81Ø
121Ø POKE78Ø,Ø:SYS65493:RETURN
122Ø :
123Ø REM ** CURSOR ROUTINE **
124Ø :
125Ø SC=1Ø24:CR=55296
126Ø IFIN<ØTHENIN=Ø
127Ø IFIN>959THENIN=959
128Ø OM=PEEK(SC+IN):OC=PEEK(CR+IN)
129Ø POKESC+IN,(PEEK(SC+IN)+128)AND255:POKE
    CR+IN,PEEK(646)
13ØØ GETG$:ON-(G$="")GOTO129Ø
131Ø IFG$="{LB.}"THENGOSUB141Ø:GOTO81Ø
132Ø IFG$="{SHFT INST}"ORG$="THENG$="{SHFT
    -}"
133Ø IFG$=CHR$(13)THENOM=(OM+128)AND255:GOS
    UB141Ø:IN=IN+1:GOTO126Ø
134Ø IFG$="{CRSR RT}"THENGOSUB141Ø:IN=(IN+1
    ):GOTO126Ø
135Ø IFG$="{CRSR LF}"THENGOSUB141Ø:IN=(IN-1
    ):GOTO126Ø
136Ø IFG$="{CRSR UP}"THENGOSUB141Ø:IN=(IN-4
    Ø):GOTO126Ø
137Ø IFG$="{CRSR DN}"THENGOSUB141Ø:IN=(IN+4
    Ø):GOTO126Ø
138Ø SP=IN:GOSUB142Ø:PRINTG$
139Ø IFASC(G$)>31ANDASC(G$)<128THENIN=IN+1
14ØØ GOTO126Ø
141Ø POKESC+IN,OM:POKECR+IN,OC:RETURN
142Ø Y=INT(SP/4Ø):X=SP-4Ø*Y:POKE781,Y:POKE7
    82,X:SYS6552Ø:RETURN
143Ø :
144Ø REM ** PRINTER DUMP **
145Ø :
146Ø R$=CHR$(145):V$=CHR$(146):OPEN4,4:CMD4
    :G=PEEK(648)*256
147Ø PRINTR$+CHR$(14);
148Ø FORP=GTOG+999
149Ø C=PEEK(P):C$=""
15ØØ IF(P-G)/4Ø=INT((P-G)/4Ø)THENPRINTCHR$(
    8)+CHR$(13)+CHR$(14);
151Ø IFC>128THENC=C-128:C$=CHR$(18)
152Ø IFC<32ORC>95THENC=C+64:GOTO154Ø
153Ø IFC>63ANDC<96THENC=C+128
154Ø C$=C$+CHR$(C):IFLEN(C$)>1THENC$=C$+V$+
    R$
155Ø PRINTC$;:NEXT:PRINT#4:CLOSE4
156Ø GOTO81Ø
157Ø :
158Ø REM ** READ DISK ERROR CH **
159Ø :
16ØØ OPEN15,8,15:INPUT#15,A,B$,C,D
161Ø CLOSE15
162Ø IFA=ØTHENRETURN
163Ø PRINTBL$DN$"{3 CRSR DNs}{2 CRSR RTs}"A
    "{CRSR LF} "B$" ERROR{HOME}":FORT=1TO8
    5Ø:NEXT
164Ø GETG$:IFG$<>""THENRETURN
165Ø PRINTDN$"{3 CRSR DNs}{2 CRSR RTs}PRESS
     ANY KEY TO CONTINUE{HOME}":FORT=1TO85
    Ø:NEXT:GOTO163Ø
```

Listing 2. *Graph Maker loader #1.*

```
5 REM LOADER #1 GRAPHMAKER-SMOAK
1Ø IF A=1THEN6Ø
2Ø IF A=2THEN4Ø
3Ø PRINT"{SHFT CLR}FIRST TIME THRU"
4Ø INPUT"{HOME}{CRSR DN}{CRSR RT}FILENAME";
   F$:F$(1)=F$:F$(2)=F$+".C"
5Ø A=1:LOADF$(2),8,1
6Ø POKE5328Ø,PEEK(56296)
7Ø POKE53281,PEEK(56296)
8Ø A=2:LOADF$(1),8,1
```

Listing 3. *Graph Maker loader #2.*

```
5ØØØØ REM ** LOAD SUBROUTINE{4 SPACEs}**
5ØØ1Ø :
5ØØ2Ø REM ** (C) 1984 BY D. SMOAK **
5ØØ3Ø :
5ØØ4Ø INPUT"{SHFT CLR}{CRSR DN}{CRSR RT}EXA
    CT FILENAME";F$:IFF$=""ORLEN(F$)>14TH
    EN5ØØ4Ø
5ØØ5Ø F$(2)=F$:F$(1)=F$+".C"
5ØØ6Ø FORJ=1TO2:F$=F$(J)
5ØØ7Ø IFJ=2THENCL=PEEK(56296):POKE5328Ø,CL:
    POKE53281,CL
5ØØ8Ø FORI=1TO LEN(F$):POKE819+I,ASC(MID$(F
    $,I,1)):NEXT
5ØØ9Ø POKE183,LEN(F$):POKE187,52:POKE188,3:
    POKE186,8:POKE185,1
5Ø1ØØ POKE78Ø,Ø:SYS65493:NEXTJ
5Ø11Ø REM** RETURN (IF CALLED BY GOSUB){2 S
    PACEs}**
```

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A User's Castle

Blueprint for a Computer Sanctuary

By JIM STEPHENS

A room of one's own—quiet, spacious and light—is what every Commodore user really needs, and this article describes how to build one.

Now that you've finally acquired all your computer components and have decided that you're serious about programming, you need a suitable place to work. A well-designed computer area is as important as the keyboard console, yet it's a component rarely mentioned in the list of needed peripherals.

I designed and built my own computer room, but not without a great deal of trial and error (lots of error). I could have avoided these errors had I known then what I know now.

If I'd known that my little Commodore 64 keyboard and portable TV were only the small beginning of a long list of components that would eventually be necessary, I never would have tried to work on the dining room table.

I couldn't blame my wife for hating computers, especially since she had to fight for table space to serve dinner. I fought bravely, but finally surrendered and moved to the den. What she didn't know was that my new disk drive needed another outlet and my books needed more space. The den seemed like a great idea at the time, but was I ever wrong!

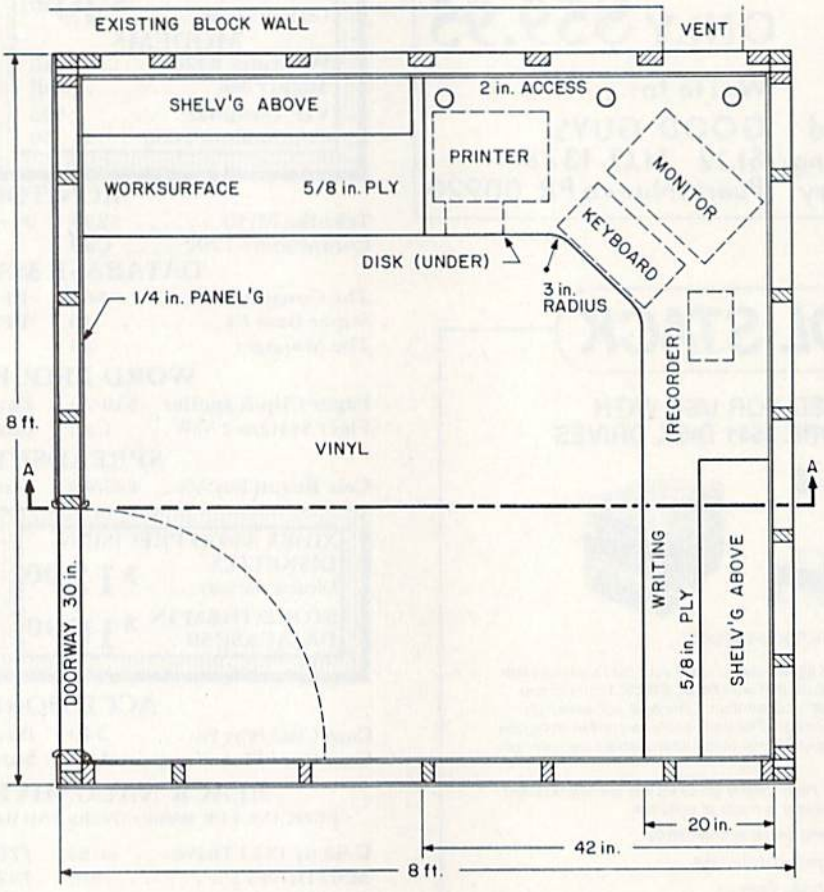

Figure 1. *Plan view of computer room design.*

My reference library grew amazingly fast, and with the addition of a printer, I needed still more space and another outlet.

When "hacking," a true programmer has a tendency to spread out. That is, things have a habit of migrating outward. Open magazines, note sheets and printouts seem to explode into every available space, including the floor.

A bigger desk and furniture rearranging were necessary, so I thought. I mean, you can't have your system just anywhere, right? However, more serious problems developed.

Shhh...Be Quiet

Our den has the family television, the kids, the dog, others' kids, the telephone and a noise level like downtown at rush hour. My constant screams of "pipe down, daddy's working" only seemed to add to the confusion. The kids couldn't laugh at the Saturday morning cartoons (at least not aloud) and the telephone had to be dragged into the next room for all use.

The noise level appeared to double when I tried to find out why a program wouldn't run. This is one phenomenon that I've never fully understood, but there's probably a scientific law—for every mistake in a program, there is an equal and proportional increase in bedlam.

I found that I was constantly waiting for a television commercial, so I could hit the print key. I'd then pray that the printer would finish the listing before

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the TV program returned. I got rather good at terminating the listing before everyone started yelling. Eventually, something had to go, and, of course, I lost.

My Own Space

The basement was the last unused space in the house but I just *couldn't* put my beautiful system in that cold, dark, damp "dungeon." I once left an old pair of boots down there, only to find they'd turned green and withered away.

I agonized for days, until my brother, a master carpenter, suggested we build a custom environment for my unloved and unwanted "child." He saw right away from my existing work space that it would cost very little to finish out the area I would need. He noted that my scrap material alone would be enough to frame a small room. We listed each environmental item that's necessary for proper programming and found that there was a way to control these to any standard.

My greatest fear was mildew, which is caused by moisture, a lack of ventilation and a difference in temperature between the air and the surfaces. This could be easily handled by a small thermostatically controlled heater and a vent fan.

Lighting would be done with two small ceiling-hung fluorescent tubes, and the space could be framed and insulated well to maintain the heating (or cooling). This insulation would also act somewhat as a buffer against sound.

I would only need about sixty-four square feet of floor space, and by using a corner of the basement, we would only have to frame two walls.

A week and three mashed fingers later, my brother and I completed a small, well-designed computer room. The following description highlights some of the more important factors involved in designing a room—whether you build in an attic, an unused bedroom or a garage.

Design and Build Upward

Building materials cost a fortune. I could not work in a hardware store and sleep at night. Just one 2 × 4 eight-foot piece of wood costs more than most people make an hour. Therefore, we held the floor space to a minimum.

I learned there were places that sell "seconds." A second is a piece of wood that is not exactly straight, smooth or whatever. It costs about half as much as one that is. We used only seconds and saved a bundle.

Since floor space was minimal, we built upward. Figure 1 shows that most of the space is countertop ($^5/_8$-inch plywood. Shelving is used for storing all computer-related materials, and the countertop is reserved entirely for the hardware and writing surface. Even the disk drive is placed under the counter to conserve space. The printer is elevated so you may place its paper supply under it. Access holes were drilled into the counter to eliminate the tangle of wires that take up valuable space on the counter.

> I couldn't blame my wife for hating computers, since she had to fight for table space to serve dinner.

The space was divided into three areas: work, keyboard and printing. Since I do a lot of hardware interfacing work, a small area of the counter was reserved for tinkering. This area is higher, with an ample supply of shelving above and below.

Electrical power is supplied by three separate circuits; one line powers all the computer equipment; one is used entirely for the lights, general outlets and the ventilating fan; a separate circuit (210 volts, in my case) powers the heater. I hope someday to connect a small air conditioner to this circuit, too.

Make sure that the circuit you use for your computer's power supply is not one that already has large motor-type appliances, such as the refrigerator or washer, on it. The sudden drop in voltage that occurs when these motors start up causes terrible things to happen to your system. The motors also have a tendency to cause your display to show hash lines. You turn on your computer's power by flicking a wall switch, but you must turn each component on and off individually, since the disk drive and printer should be on before the computer.

The layout of your room will largely be determined by the space in which you build. The general layout should remain basically the same, however. If you are one of the few who has a quiet study, an extra bedroom or a finished basement, you'll only need a well-designed desk or work surface.

The Work Surface

Don't buy a ready-made desk until you know how much material (and peripherals) you will ultimately have. Above all, don't buy one of those desks that places the monitor some 14 inches above the keyboard. The strain on your neck will half kill you. Keep the monitor at or slightly below eye level. If you want to save some money, build your own work counter.

Figures 1 and 2 provide you with all the necessary dimensions. The heights are selected to provide the greatest comfort for both typing and writing. Before I built my new work surface, I did most of my writing by holding the paper in my lap.

My work surface was laminated with Formica and edged with $^5/_8$-inch plastic edge strips. You can use any smooth material. I think linoleum would make a great surface—it worked just fine when I did my homework on the floor as a child.

Wiring and Lighting

Lighting becomes an important factor when you work with your eyes for any extended amount of time. My space uses two separate fluorescent ceiling fixtures, both mounted slightly behind me. If the lights are placed in front of you, they tend to glare and reflect off surfaces, especially the keys on the keyboard. You can also mount an incandescent lamp, with a soft glow, on your wall for reading. I don't recommend using many incandescent lights, however, because of the heat build-up.

Notice that the light switch is by the door; this saves poking around in a dark room, looking for the wall switch. This switch should control only the fluorescent lights; the wall outlets should not be switched. The six-outlet bank for the computer's power is an exception.

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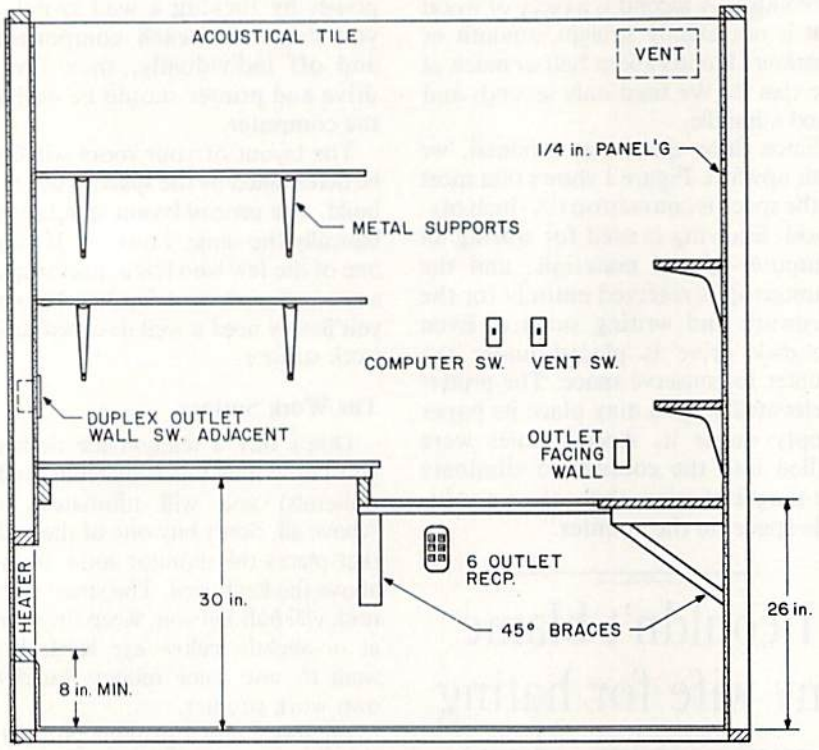

Figure 2. *Elevation view of desk and shelf arrangement.*

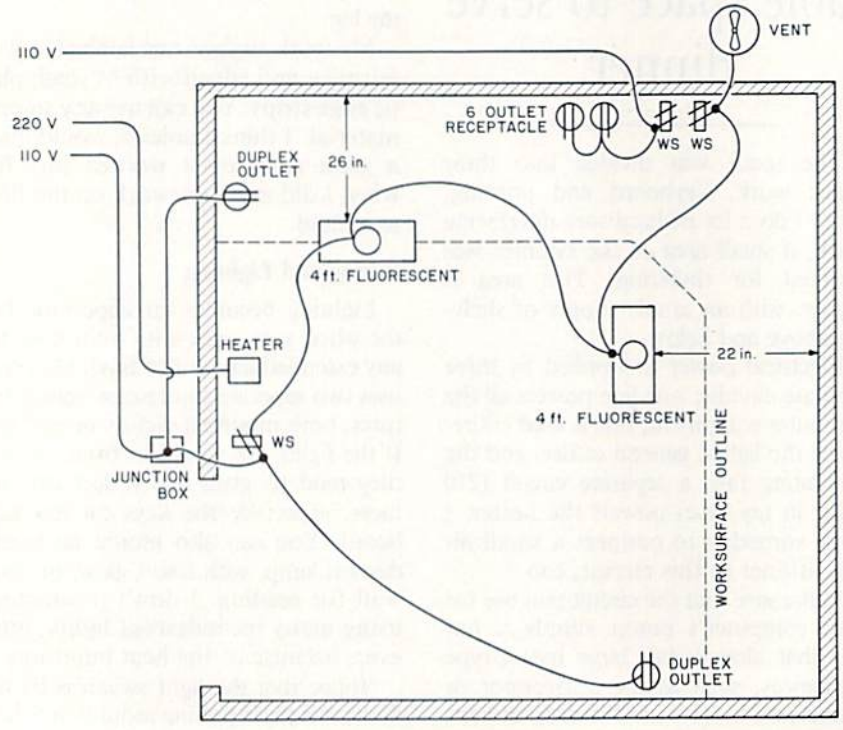

Figure 3. *Electrical circuits plan.*

Figure 3 shows how these circuits are connected. Since 110 volts can be deadly, the wiring should only be done by one skilled in home wiring.

General Construction Techniques

We used standard interior wall construction techniques. However, if you're going to build in an unheated area, you must use insulation. You can heat the area with a very small wall heater or a plug-in space heater, which I don't recommend. A lack of heat makes an area dreary and lets moisture accumulate, and moisture is a deadly enemy of computer equipment. Besides insulating the room, we even added polyethylene sheets to all four walls, as a moisture barrier.

We found that the insulation boards worked beautifully for the insulation of the raised floor and the wall adjacent to the concrete block, It has an even greater insulating value than roll fiberglass, which is twice as thick.

We paneled the room with Masonite paneling, since it is made with no formaldehyde-containing glue. In a small space, you can easily be bothered by fumes emitted by certain materials. Avoid breathing sawdust from the Masonite, since it's sometimes made from redwood or red cedar, which can cause allergic reactions. We painted the paneling off-white to increase light reflection. The ceiling was simply painted insulation board, "scored" in squares to resemble ceiling tile.

The area of the basement in which we built the room had several runs of water pipe. This was a serious detraction, which almost led to their rerouting. I felt, however, that this replumbing would certainly turn to disaster, and chose to paint each pipe with its own bright enamel color. The colors add something to the area, and I've thanked myself a hundred times for this decision.

Because I was constantly running upstairs to answer the phone, I added a small wall phone for convenience. It has a small "chirper" for a bell and works great. The kids have figured out how to buzz me on it to settle their arguments. It seems I'll never escape. R

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Gateway to the World

By JIM GRUBBS

Before you connect your Commodore computer to the outside world, you should be aware of its capabilities and limitations. This article examines these and gives you a small project to start you on your way to controlling the user port.

Before beginning an exercise program, you are advised to get a physical checkup. Through an examination, you gain advice on just how much exercise you should attempt. Some of us don't listen to the doctor or, worse yet, never even ask for the doctor's advice. What often results are sprained ankles, bad backs, and sometimes broken arms and legs or even more serious maladies.

Before you progress any further in connecting your Commodore computer to the outside world, let's go to the doctor and find out just how fit Messrs. VIC and 64 are, and what medical problems could occur if you try to overtax their abilities. Finally, you will put this information to work to control something of your own choosing. I'll show you how!

The VIC and 64 are amazingly versatile machines. The more that I have learned about other computers, the more I come to appreciate the connections that Commodore has made available to us as a part of the base price of the computer. In making these connections available, however, a minimal amount of protection has been included, making connection to the different gateways on your machine a bit on the delicate side. Abuse of these connections can result in anything from a blown internal fuse to damage to all of the integrated circuits that make your computer tick.

Power Supplies

A computer's fuel, or energy, comes from the power supply. There are several different versions of VIC and C-64 power supplies.

Early VICs used a small black transformer that powered the computer through a two-pin plug. C-64s use a DIN plug that is connected to a much larger external power supply unit. Newer VICs have adopted the larger transformer but still use a two-pin plug. A larger power supply box was needed in order to fit the electronics of the C-64 into the same case used for the VIC.

The external power boxes tend to get quite warm. If you are particularly safety conscious, you might want to *unplug* the power unit when the computer is not being used. (Just turning off the computer does not turn off the power supply!) My own experience, however, is that leaving the units plugged in and operating continuously does not cause problems.

Your computer's power circuitry supplies several different voltages. One of the voltages made available on both the user port and the joystick port is +5 V dc. When dealing with power sources, not only is it necessary to have the proper voltage, but the voltage source (in this case your power supply) must be able to supply the total amount of power that is going to be consumed by the circuit. This means that you must consider the current being drawn by your device.

Ohm's law says that power is equal to voltage multiplied by current. To return to the human analogy, you may be able to lift a 100-pound weight, but you must also consider how long you can hold it. Equate the weight to the voltage level and the endurance element to the current. If you try to hold up the weight for too long, you'll either drop it or collapse under the pressure.

Your computer's user manual warns you that although the 5-volt dc voltage is available, the amount of current is limited to 100 milliamperes (mA). That is *not* very much! Many of today's low-power integrated circuits use as little as 5 mA each, so it is still possible to power peripherals such as the VICModem directly from this connection. You must, however, keep the limit in mind when using your computer to drive an external device.

Now that you have a bit of background on your machine's life source, it's time to head for the doctor's office.

The Examination

In phase 1 of the Commodore doctor's examination, you are warned not to overexert the 5-volt dc power source. This cannot be stressed enough. On to the next test.

The signals available from the user port are called TTL-level signals. TTL (transistor-transistor logic) refers to a certain type of integrated circuit technology. In theory, a +5 V signal represents a logic 1, while zero volts represents a logic 0.

In actual practice, most logic 1 signals will measure between about 3.5 and 4.5 volts. The logic 0 signals will be near, but not actually at, 0 volts.

If you plan to use any of the signals from your computer, be careful not to connect anything that will require too much current.

As the doctor examines VIC and 64, he tells us that the output signals from them are real weaklings! In technical terms, these signals are capable of connection to only one TTL connection. That isn't very much—certainly not enough to drive a mechanical relay, for example.

The reason for this is fairly simple. Each of your computer's integrated cir-

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cuits consists of hundreds of transistors. Each transistor is microscopically small. Because the physical size of the junction in the transistor is so minute, it cannot dissipate much heat. This has a direct correlation to the amount of power (or current) that can be handled.

Some computers isolate their internal signals with a buffer, to protect the computer from damage by an external device. Such a buffer can also be used to increase the current capabilities. The signals on your Commodore are *not* buffered.

So, the doctor's final word on phase 2 is *be careful*. VIC and 64 signals are very weak and will tolerate no abuse. Doing so will probably result in a dead computer! The example circuit you will build (see Figure 1) shows how to properly buffer the output of your computer so such nasty things won't happen.

The next step in the examination involves signals coming into your computer from the outside world. An example is the positioning information transmitted from the switches in your joystick to the computer. In most cases, you will use the TTL signal levels again, a 1 being represented by +5 V dc and a 0 being zero volts, or ground. You must be careful not to exceed the 5-volt mark, or accidentally input an alternating current signal. Once again, buffering is a good idea.

The doctor takes a final look just to make sure everything is there . . . all the input and output lines; voltages up to specification. It's time to go sit in the reception area for a minute and wait for the doctor to come out with the results. In the meantime, he suggests we read the user's manual and pay particular attention to the drawings and charts that show the different gateways to your computer.

The Doctor's Orders

The prognosis is good! You should be able to use your computer to connect to the world for many different applications. However, the doctor does utter a few emphatic warnings:

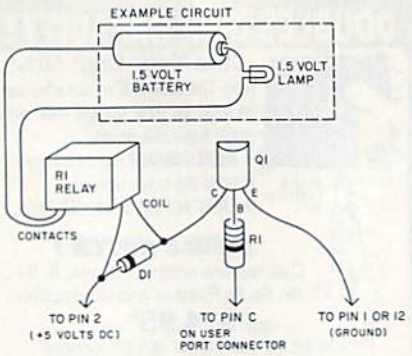

Figure 1. *Example circuit.*

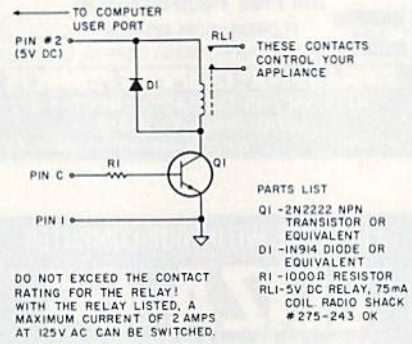

Figure 2. *Diagram of the interface.*

- *Never* connect or disconnect *anything* to or from your computer with the power *on*!
- Always double-check to make sure you are really connecting to what you think you are connecting to. The pins on the connectors are small, and it's easy to be one pin off.
- Always heed the limitations of your equipment. Don't try to draw too much power from your computer. Some projects you may want to build will require more power than your machine can supply. In such a case, it is possible to use an external power source. So there it is. The Commodore doctor has been encouraging about your machine's capabilities, provided you know its limitations. It's time to build something!

A Step Toward Control

This month's program and interface are intended to get you started on your way to connecting your computer for control.

The program itself is pretty straightforward. It uses your computer's internal clock to turn a signal on the user port on and off at the times you have predetermined.

The signal will be present on pin C of the user port. If you have trouble understanding how the program selects the proper connection on which to output (pin C), I suggest you review this magazine's first installment of "Gateway to the World" (May 1984).

The interface shown (see Figure 2) is a very simple one. All of the parts should be readily available. The transistor is noncritical; I suggest the 2N2222, which is a very popular general-purpose kind of transistor.

The signal from pin C of the user port is first fed through resistor R1, which is used to limit the amount of current you draw from the computer, thus offering a certain measure of protection for your machine. As Figure 2 shows, R1 feeds into the base connection of the transistor. You might think of this as the valve that turns the electron flow on and off.

The transistor's emitter is grounded. You place a small 5-volt relay in the collector lead. The other side of the relay is connected to +5 V, which can be obtained from pin 2 on the user port. Diode D1 serves as some additional protection. When relays operate and release, a pulse can be induced into the circuit much like the one produced by the ignition coil in your car. It can destroy transistors! The diode doesn't allow this pulse to get there.

You are using the transistor as a buffer. The transistor can be turned on

Listing 1. *Commodore Controller program.*

```
10 DR=56579:W=56577:R=1:REM FOR C-64
20 REM IF VIC-20 DR=37138:W=37136
30 POKE DR,R
40 PRINT "{SHFT CLR}COMMODORE CONTROLLER"
50 PRINT "{2 CRSR DNs}ENTER CURRENT TIME":P
   RINT "(HHMMSS-24 HOUR CLOCK): ":INPUT TI
   $
60 PRINT "{2 CRSR DNs}ENTER ON TIME:":PRINT
    "(HHMMSS)":INPUT OT$
70 PRINT "{2 CRSR DNs}ENTER OFF TIME:":PRIN
   T "(HHMMSS)":INPUT OF$
80 IF OT$=TI$ THEN POKE W,R:PRINT "{2 CRSR
   DNs}RELAY ON":GOTO 100
90 GOTO 80
100 IF OF$=TI$ THEN POKE W,0:PRINT "{2 CRSR
    DNs}RELAY OFF":FOR X=1TO2000:NEXT X:GO
    TO 40
110 GOTO 100
200 REM ************
201 REM *
202 REM * (C) 1984
203 REM * JIM GRUBBS
204 REM * PO BOX 3042
205 REM * SPRINGFIELD
206 REM * ILL 62708
207 REM *
208 REM ************
```


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Pin	
1	Ground
2	+5 volts
3	Reset
*4	Joy 0
*5	Joy 1
*6	Joy 2
*7	Light Pen/Firebutton
*8	Cassette Switch
9	Serial ATN In
10	+9 volts
11	+9 volts
12	Ground
A	Ground
*B	CB1
C	PB0 (bit 0)
D	PB1
E	PB2
F	PB3
H	PB4
J	PB5
K	PB6
L	PB7
*M	CB2
N	Ground

*These pins have a different nomenclature on the C-64. For this month's project, the difference is of no concern. Readers are advised to check the Programmers Reference Guide before using these pins.

Figure 3. *Pin nomenclature for user I/O.*

and off with only a very small amount of current. The transistor itself, rather than the computer, then bears the load. When the input signal is high (+5 V or so), the transistor turns on just like a switch, providing a ground path for the relay. With ground on one side of the relay and +5 on the other, the relay operates. When the signal from the computer drops to 0, the transistor turns off. There is no ground path for the relay, so it opens up.

You can use the relay's contacts for anything you desire, within the ratings limitations of the relay contacts. You could certainly, for example, turn a small cassette recorder on and off with the contacts. If you use the proper relay, you can turn any appliance on and off. The possibilities are endless. Such an arrangement can be used with the proper program to create a dial-pulse-type telephone dialer.

Next month, we will begin a visit to the joystick port. R

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Here's a four-star menu that will add a little spice to your selection routines.

Menu, please

By PAUL J. MOTISE

The menu is one of the most common and useful devices in a program. Typically, a list of items is displayed on the screen and you are asked (prompted) to enter a number or letter that corresponds to one of the items. Once you enter your choice, the program branches to another routine. Usually, you must compare the number or letter you type with the number or letter that appears next to the menu line item.

Like Magic

A more user-friendly menu, however, lets you select and enter your menu choice by pressing only the space bar and the return key. This kind of menu initially displays a cursor next to the first line item on the menu.

If that item is your choice, you press the return key. If the cursor is not on the line of your choice, you simply press the space bar, and the cursor magically drops down to the next line of the menu. Every time you press the space bar, the cursor moves down the list one line. If you scroll through to the last item in the menu and wish to go through the list again, just continue pressing the space bar.

This kind of menu is fast and easy to use, and is featured on some expensive word processors. You can have this same feature on your Commodore 64 or VIC-20 by adapting the routines in Magic Menu to your own Basic programs.

Magic Menu not only gives you the jumping-cursor method of item selection, it also gives you the check-mark (✓) character to use as a cursor. The check-mark character is not found on the VIC-20 or C-64 keyboards, nor is it listed in the *Programmer's Reference Guide*'s Commodore Table of ASCII and CHR$ codes.

I discovered the check-mark character by accident. To see the check mark, switch the computer to the uppercase/lowercase Text mode by simultaneously pressing the Commodore and shift keys. Then hold down the shift key and press the @ key. You should now see the check mark on the screen.

If you then type in (still in Text mode) print asc("✓") and press the return key, you will see that the check mark has an ASCII value of 186 in the Text mode. (Try typing print chr$(186), and then press the return key, again in the Text mode.)

You can easily adapt Magic Menu to your own Basic programs. However, there are two important points to remember. First, be sure to use the Text mode when you type and list the program, so that uppercase letters in your Print statements don't appear as graphics characters in your listing. Second, you must set the screen display to the Text mode whenever you use the menu. Although Magic Menu was written for the C-64, it should work on the VIC-20 as well, with only a few shortened Print statements to account for the VIC's narrower screen width.

The Program

Here's how the program works and how to change it to fit your needs. Basically, the menu is printed and the check-mark cursor is printed next to the first menu item. A counter keeps track of the check-mark cursor's location on the screen.

The keyboard buffer is read for the presence of either a space or a return character. If a space character is detected, the check-mark cursor is overwritten with spaces and reprinted on the next line unless the value of the counter is greater than the number of menu items.

If the value is greater, then the check-mark cursor is printed at the first menu item and the counter is reset. If a return character is detected, then the program branches out of the check-mark cursor Printing routine. To make the cursor move smoothly, it is necessary to keep track of the location of the screen cursor (which is normally invisible while the program is running).

Line 90 switches the display to the Text mode.

Line 95 sets n (see Table 1) equal to the number of menu items.

Line 100 defines the check-mark cursor as a reversed check mark, padded with reversed spaces and three cursor lefts in order to place the screen cursor at the position of the first reversed space. (Here and elsewhere in the program, I place reversed spaces at the start and end of reversed characters to improve text clarity.) The cursor lefts are important because the check-mark cursor will be made to disappear by being overwritten with spaces, and, to do this completely, the overwrite must begin at the first character.

Line 105 defines the "eraser" as

RUN It Right

C-64 or VIC-20

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three spaces followed by three cursor lefts so as to properly reposition the screen cursor for Print commands that follow.

Lines 120–180 clear the screen, print the menu and print the prompt below the last menu item. The tabs before each menu item leave room for the check-mark cursor. Your own tabbed menu items must be short enough to fit on one screen line. VIC-20 owners will want to shorten the prompts on lines 175 and 180.

Line 200 positions the screen cursor to the start of the first menu item and initializes the counter l, which indicates the menu item where the check-mark cursor is displayed.

Line 210 prints the cursor.

Lines 410–430 handle the response to the prompt, using the Get statement. The program ignores keys other than return (CHR$(13)) and space (CHR$(32)). If you press the return key, you have then made a menu choice, and the program branches to line 800. If you press the space bar, the check-mark cursor moves to the next menu item.

Lines 710 and 720 move the check-mark cursor. First, the eraser is printed and the screen cursor drops to the start of the next line on the screen. The counter l increases by one. The value of l is now compared with the total number of menu items, n, to determine where the screen cursor is located.

If l is greater than n, the screen cursor falls below the last menu item, and must be reset to the first menu item, where the check-mark cursor can be reprinted. The reset is done by a branch to line 200. However, if l is not greater than n, then the screen cursor is still on one of the menu line items, and the check mark can be printed at that line (this is done by a branch to line 210).

Lines 800–5000 display the menu item chosen and branch to other parts of the program according to the item you have selected. Line 810 repositions the screen cursor to the upper-left corner of the screen and then drops it down to a line below the prompt. Line 870 uses the value of l to branch to other parts of the program.

Remember that your display will still be in the Text mode after branching occurs. If you prefer the Uppercase/Graphics mode for displays in other parts of your program, clear the screen and switch to the Uppercase/Graphics mode with this program statement:

```
PRINT "{CLEAR}"CHR$(142);
```

Happy menu-making! R

n	=	total number of items on the menu
cr$	=	check-mark cursor
e$	=	eraser, which blanks out check-mark cursor
a$	=	string to hold answer to prompt
l	=	current menu line item at which check-mark cursor appears
i	=	index counter used by For... Next loop

Table 1. *Magic Menu program variables.*

Address all author correspondence to Paul J. Motise, 6 Whetstone Drive, Gaithersburg, MD 20877.

Listing 1. *Magic Menu program for the C-64 or VIC-20.*

```
1 REM *** MAGIC MENU ***
2 REM *** COPYRIGHT 1983 BY PAUL J. MOTISE
  ***
3 REM **** VARIABLES ****
4 REM
5 REM{5 SPACEs}N=NUMBER OF LINE ITEMS IN ME
  NU
6 REM{3 SPACEs}CR$=CHECK MARK CURSOR
7 REM{4 SPACEs}E$=ERASER
8 REM{4 SPACEs}A$=ANSWER TO PROMPT
9 REM{5 SPACEs}L=LINE ITEM WHERE CHECK MARK
  APPEARS
1Ø REM{4 SPACEs}I=INDEX COUNTER USED BY FOR
  /NEXT LOOP
12 REM
2Ø REM ******************
9Ø PRINT CHR$(14): REM UPPER/LOWER CASE
95 N=5: REM SET NUMBER OF LINES IN MENU
1ØØ CR$="{CTRL 9} "+CHR$(186)+" {CTRL Ø}"+"
  {3 CRSR LFs}"
1Ø5 E$="{3 SPACEs}{3 CRSR LFs}": REM 3 SPAC
  ES 3 LEFT
11Ø REM PRINT MENU
12Ø PRINT"{SHFT CLR}";
13Ø PRINT "{CTRL 9} {SHFT M}{SHFT A}{SHFT I
  }{SHFT N} {SHFT M}{SHFT E}{SHFT N}{SHFT
   U} ":PRINT
14Ø PRINT TAB(5)"1) {SHFT F}{SHFT I}{SHFT R
  }{SHFT S}{SHFT T} {SHFT C}{SHFT H}{SHFT
   O}{SHFT I}{SHFT C}{SHFT E}"
145 PRINT TAB(5)"2) {SHFT S}{SHFT E}{SHFT C
  }{SHFT O}{SHFT N}{SHFT D} {SHFT C}{SHFT
   H}{SHFT O}{SHFT I}{SHFT C}{SHFT E}"
15Ø PRINT TAB(5)"3) {SHFT T}{SHFT H}{SHFT I
  }{SHFT R}{SHFT D} {SHFT C}{SHFT H}{SHFT
   O}{SHFT I}{SHFT C}{SHFT E}"
155 PRINT TAB(5)"4) {SHFT F}{SHFT O}{SHFT U
  }{SHFT R}{SHFT T}{SHFT H} {SHFT C}{SHFT
   H}{SHFT O}{SHFT I}{SHFT C}{SHFT E}"
16Ø PRINT TAB(5)"5) {SHFT F}{SHFT I}{SHFT F
  }{SHFT T}{SHFT H} {SHFT C}{SHFT H}{SHFT
   O}{SHFT I}{SHFT C}{SHFT E}"
165 PRINT:PRINT
17Ø REM DISPLAY PROMPT
175 PRINT"{CTRL 9} {SHFT P}RESS {SHFT R}ETU
  RN {SHFT T}O {SHFT E}NTER {SHFT C}HOICE
  {3 SPACEs}"
18Ø PRINT"{CTRL 9} {SHFT P}RESS {SHFT S}PAC
  E {SHFT B}AR {SHFT T}O {SHFT M}OVE {SHF
  T C}URSOR "
2ØØ PRINT"{HOME}{2 CRSR DNs}";: L=1 : REM P
  OSITION CURSOR ON FIRST LINE ITEM
21Ø PRINT CR$;
4ØØ REM GET ANSWER TO PROMPT
41Ø GET A$:IF A$="" THEN 41Ø
42Ø IF A$<>CHR$(13) AND A$<>CHR$(32) THEN 4
  1Ø : REM IGNOR INVALID KEYS
43Ø IF A$=CHR$(13) THEN 8ØØ: REM CHOICE MAD
  E, SO BRANCH.
5ØØ REM MOVE CHECK MARK CURSOR
71Ø PRINT E$: L=L+1 : IF L>N THEN 2ØØ
72Ø GOTO 21Ø
8ØØ REM PRINT MENU CHOICE
81Ø PRINT "{HOME}";: FOR I=1 TO N+8 :PRINT:
  NEXT: REM DROP CURSOR BELOW PROMPT
82Ø REM LINE CHOICE IS L
83Ø PRINT"{SHFT Y}OUR CHOICE IS ITEM ";L"."
  :PRINT:PRINT
85Ø REM BRANCH HERE FOR REMAINDER OF PROGRA
  M
87Ø ON L GOTO 1ØØØ,2ØØØ,3ØØØ,4ØØØ,5ØØØ
1ØØØ PRINT"BRANCH FOR CHOICE 1":END
2ØØØ PRINT"BRANCH FOR CHOICE 2":END
3ØØØ PRINT"BRANCH FOR CHOICE 3":END
4ØØØ PRINT"BRANCH FOR CHOICE 4":END
5ØØØ PRINT"BRANCH FOR CHOICE 5":END
```

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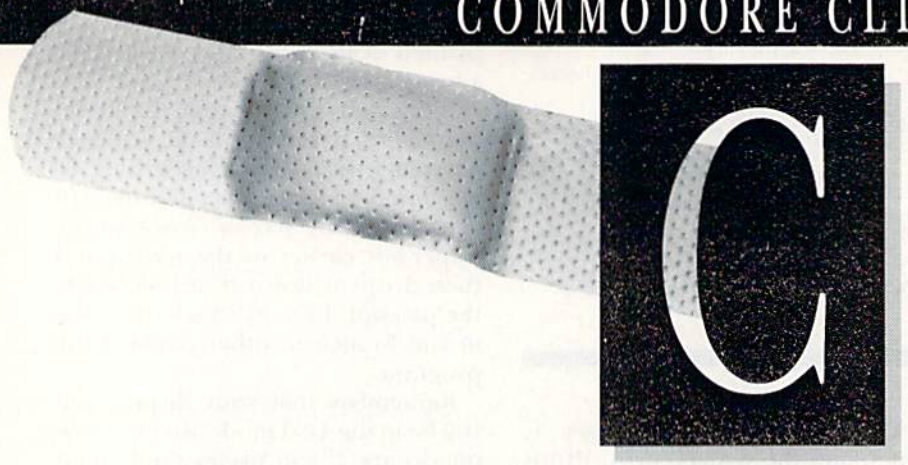

C

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HARDWARE

Q: Upon hooking up my 64 (serial #45447) to my Zenith 19-inch color TV, I noticed the display was not as sharp as the one in the store. Despite repeated attempts to tune the TV, the waviness of the images continued.

I have read that early 64s suffer from serious video problems. Could my machine be suffering from video defects? The letters on the screen are legible in blue on blue, but unreadable in many other colors—they seem smudged. Also, the screen shows diagonal waves that travel vertically up or down, distorting the image.

A letter to Commodore brought a suggestion that the cause was an asynchronous scan being put out by the TV's automatic fine tuner, but turning off the automatic fine tuner did not help. I would appreciate any help you could give me on this matter.

Bill Reed
Palmdale, CA

A: Your 64 is old enough that it might have some video problems, including the smudging together of a few combinations of colors. In part, this is not Commodore's fault; it is due to the method used to make U.S. TV signals and will continue even on the newest 64s and most non-Commodore video monitors. However, the VIC II chip has been revised since your 64 was made, and a newer VIC chip might give better results.

The bulk of your problem, however, is due to your TV, not the 64. According to information Commodore sent its dealers in December 1982, the problem is unstable vertical synchronization, and there is a simple fix—defeat the integrated vertical mode circuit on the TV.

On the Triple Plus chassis, it is located on the 9-152 series module. On 9-152-01, remove the 2K jumper to the right of R2129. On 9-152-02, unplug the yellow wire from 2H. On the Z chassis, it is on the 9-181 module and is defeated by turning jumper 5M 90 degrees.

Although it sounds simple enough to remove a wire or jumper, nothing is simple about the interior of a modern TV. Unless you are skilled at working in areas of very high voltage, leave the fix to your Zenith dealer.

Q: When using my 1541 with a Zork I disk, I received an internal error message. Since then, I have not been able to use the disk drive. It will not accept commands and states "Error #21." Is it out of alignment?

Peter Hansen
Mexico City, Mexico

A: Error 21 is probably DOS Error 21, a serious disk error. If it only happens when you try to use the Zork disk, the disk has probably become damaged, most likely by your having left the disk in the drive when the power was turned off or on. In such cases, Commodore suggests you return the disk to them with $5 U.S., and they will replace it.

On the other hand, if none of your disks work anymore, misalignment is a real possibility. Try to format a new disk. If that works, then try to use your other disks again. If only the new disk works, your drive is most likely out of alignment.

If all the disks now work, then the problem was most likely that your drive head was in an unusual position from which it could not work properly until the formatting process moved it back into proper position.

Q: About 3 months ago, I sent away for Letco's 64K Expander. As soon as it arrived, I realized I was in way over my head. I know nothing about "paging." Here I am with a dandy expander and not the least notion how to use it. Can you help?

John Desmond
Valyermo, CA

A: From the instructions you sent, it appears the Letco expander works by mapping one of eight 8K blocks of added memory into the 8K of memory used by most cartridges on the 64. It works much like the added memory on the SuperPET.

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In both cases, you have access only to a small part of your added memory at any one time, but can quickly and easily choose which parts are in use, thereby gaining effective use of all parts. It is similar in principle to a spreadsheet, which can be very large but allows you to see only a small fraction of its information at a time.

This arrangement allows you to use the 64 as usual, but also means the added memory can be used only by machine language programs or via Peeks and Pokes from Basic.

Worse yet, only programs that are specially designed to work with your particular memory expander can use more than one 8K bank of it. To use multiple banks in a single program, each piece must call the next one as it is needed, much as the Basic Load command can be used to make one program load another.

Unless you have a specific use for the added memory and are skilled enough to use it, bank-switched add-on memory probably isn't a good idea for you.

Q: We purchased a Commodore 1702 video monitor, which came with an 8-pin DIN plug. Our 64 has a 5-pin DIN jack. What can we do?

I.A. Smith
Boston, MA

A: You can buy a suitable 5-pin DIN cable from many Commodore dealers. If none in your area has it, try a stereo store.

The cable you need has a 5-pin DIN plug at one end and four RCA phono plugs at the other. It is normally used to plug European stereos into speakers and tape decks. Also, the 5-pin cable is intended to use the jacks on the front of the monitor, not those on the rear. If you want to use the rear jacks, you'll need to modify 64s with 5-pin DIN jacks.

According to an article in *Baron's Microcomputing Reports*, if you disconnect resistor R10, the chrominance signal required by the 1702's rear connector will be available on pin 4 of the 5-pin DIN jack, which formerly carried composite video. Since this will make the computer incompatible with ordinary TVs, you may want to add a switch to reconnect the resistor when using a TV. (I haven't tested this modification, so proceed at your own risk.)

PROGRAMMING

Q: Some programs appear to use lengthy variables (for example, DELTA = 1). I thought variables could only be two characters. Does the computer disregard all after the first two?

Paul Arneth
Sandy Hook, CT

A: That's correct. PET Basic variables may be any practical length, but only the first two characters are significant. One other limitation is that no part of a variable name may read

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as a Basic keyword. The value of using long names is that they can be more descriptive. In the example you cite, Delta is very descriptive of the function of that variable in a flight simulator, whereas the equivalent DE = 1 would require a Remark statement for clarity each time it is used.

Q: There is a beast beneath the keyboard of my 64, and its number is −1.49011612E-08. To awaken the beast, run this:

```
10 A=40
20 B=.18
30 C=A+B
40 D=40.18
50 PRINT D-C
```

The zero you would expect to see has been eaten by the beast. Is there a glitch in Commodore's engineering?

Gaylen Moore
Bovey, MN

A: No, you've simply discovered that the computer uses binary (base 2) for its calculations, while you use decimal (base 10). Your beast comes from errors in converting from one to the other. Precision in all Microsoft Basics except the one in Commodore's B-128 model is limited by the space set aside to do these conversions. A fix for your line 50 is shown below.

```
50 PRINT INT(100*(D-C)+.5)/100
```

This change rounds the result to the nearest two digits, well within the limits of precision on all Microsoft Basics. To select more or fewer digits of precision, add or subtract zeroes from the numbers used for both multiplication and division in my version of line 50.

Let me also remind you that in scientific work, if you want two valid known decimal places in your answer, line 10 should also be changed to

```
10 A=40.00
```

The computer doesn't care about the extra zeroes, but without them, anyone checking your program must assume A was calculated only to the nearest whole number.

Q: Why do I get a Syntax error when I try to type in more than two lines of a program that has five or six lines between line numbers?

Gilbert Neldner
Haines City, FL

A: Programs that have lines longer than two lines have done one of two things: either they have been typed in using the abbreviated forms of the Basic keywords, or they have been run through a compactor program after they were finished. If the Basic line you see is five or six screen lines in length, it almost certainly has been compacted. To type it in, you will have to split its parts down into several smaller Basic lines, no one of which is longer than two screen lines. An uncompactor program to automate this chore was featured in the November 1984 issue of *RUN*.

If it is important to restore the line to its original oversize length later on, you'll have to run it through a compactor program afterwards, such as the one also included in the November *RUN*. As the name suggests, compactor programs combine Basic lines as much as possible, up to the theoretical maximum line length (255 characters), without affecting the logic of the program, and also delete Remark statements and spaces that are not within quote marks. Most require a disk drive.

Q: I would like to sell, as a plug-in cartridge, a program that I have written. How can I get it mass-produced? Should I have the program copyrighted? If so, how?

Curtis Finke
Evansville, IN

A: Several companies will gladly sell you EPROM burners to convert your program into ROM form. Two with which I am familiar are the Prom Queen from Gloucester Computers (1 Blackburn Center, Gloucester, MA), and the Promenade from Jason Ranheim (580 Parrott, San Jose, CA). To complete the process, you will then need cartridge shells. These are available from at least two companies: Eastern House Software (3239 Linda, Winston-Salem, NC) and Richvale Telecommunications (10610 Bayview, Richmond Hill, Ontario, Canada). These companies or others like them may also be willing to burn the needed ROMs for you, saving you the need to have an EPROM burner.

Recent court decisions suggest ROM-based programs can now be copyrighted, so long as they claim to be so. Therefore, be sure to include a copyright notice, such as "Copyright 1985 Curtis Finke, all rights reserved" both in the code stored in the ROM and on the outside of the ROM and cartridge. That should be enough to copyright your program. However, you can gain some advantages in a lawsuit to enforce your copyright if the copyright has been registered at the U.S. Copyright Office in Washington, D.C. The cost is small, but contact the copyright office for current details.

Q: When I first ran the color adjustment check in the *Commodore 64 User's Guide* (holding CTRL and a number), it worked excellently. But when I went back to do it again, it would only display letters in color and wouldn't display color bars when I held down the space bar. Is this a defect?

Ronnie Barcak
Fort Stewart, GA

A: I expect your 64 is working just fine. You merely need to press one more pair of keys when you do the color-bar test—the CTRL key plus the 9 key. This turns on reverse field (labeled RVS ON on the front of the 9 key), which makes the space character show up as a bright bar on your screen. The bar will be the same color as any characters you type and will change in color when you change the character colors.

To turn *off* the color bars, merely press the return key, alone or together with a shift key. You can also turn it off without moving the cursor

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by simultaneously pressing the CTRL key with 0 (the RVS OFF key).

Q: After typing in a program, I saved it to my 1541 disk, then loaded and ran it. Later, I wrote another one. It, too, loaded and ran all right.

Now here's the funny part. When I went back to load the first program, I got the second instead. I can't figure it out; I hope you can.

Joe Nakles
Blairsville, PA

A: The problem often arises when a disk has been used for a while, contains some programs, and at least one program has been scratched. Then another program is saved, but something happens and the save doesn't work. The red error light flashes and you know you have a problem.

Your files have become cross-linked. The only sure cure is to copy the entire disk to a freshly formatted disk, copying one file at a time, rather than using a disk backup program.

The most probable cause is that at some previous time you scratched (erased) an improperly saved program or file (one whose name appeared in the directory with an asterisk next to its filetype, but could not be loaded). For future reference, the proper way to get rid of such improperly saved files is with the disk Validate command (known as the Collect command on the Plus/4 and C-16).

Q: In typing a program, there are occasions when one must press the CLR key (between quotation marks, of course). What has happened is that, for some reason, my leading quote mark wasn't there, with the consequence that the program was wiped out. Is there any way to recover the typed program after hitting CLR?

L.P. Thomason
Jacksonville, FL

A: Pressing the CLR key should have no effect on your program. If you accidentally erase the screen by pressing the CLR key, you can view your program listing again by simply typing the word LIST and pressing the return key. Then, retype the line where you initially erred.

Q: I recently purchased a 64, but already had a VIC and 1540 disk. Is there a way to get the 64 to work with the 1540? I have been told there is a command to slow the disk's transfer speed, but I have also been told that the only way to get the 1540 to work is to have a chip changed to make it a 1541. I don't believe this because I have seen many pictures of the 64 with the 1540.

Rob Gregg
Topeka, KS

A: The disk command that slows its transfer speed won't help you—it's designed to return a 1541 disk to 64 speed after using a similar command to change it to VIC speed. Apart from added speed when used with a VIC, there's no need to use either command. For future reference, the two commands are:

@UI– (speeds a 1541 by 25% for VIC only)
@UI+ (restores normal speed)

Both examples assume you're using the DOS wedge program on your test/demo disk.

A command that *will* help you is POKE 53265,11. It turns off the 64's video screen, preventing the interrupts from the VIC-II chip that normally keep the 64 from working with the 1540. Since it's difficult to work with the screen off, the easiest way to use this command is as follows:

```
POKE 53265,11:LOAD "NAME",8
```

or

```
POKE 53265,11:SAVE "0:NAME",8
```

where "NAME" is the name of the program you want to load or save. After the command has been obeyed and the drive activity light turns off,

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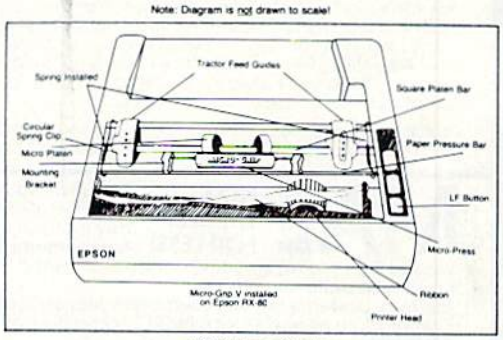

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turn the screen back on by simultaneously holding down the restore and stop keys.

Since this is a painful method at best, and not included in most programs for the 64, I'm sure you'll soon order Commodore's 1541 upgrade chip for your 1540.

Q: Could you tell me how to write a program to generate random non-repeating numbers?

Bob Hendershot
Carrollton, TX

A: The first step is to decide how many random numbers you need and what range (top and bottom values) and increment (distance between possible values) you require. Then you can dimension a suitable array, fill it with appropriate numbers and finish by shuffling the values within the array. After all this, you generate your random, non-repeating sequence by printing the contents of the array in order.

Here is a program to generate and shuffle a suit of cards:

```
100 REM RND DEMO
110 X=RND(-TI):REM RANDOMIZE
120 DIM A(13)
130 REM MAKE 13 CARDS
140 FOR I=1 TO 13
150 : A(I)=I
160 NEXT
170 REM NOW SHUFFLE
180 FOR I=1 TO 99
190 : C1%=RND(1)*13+1
200 : C2%=RND(1)*13+1
210 : T=A(C1%)
220 : A(C1%)=A(C2%)
230 : A(C2%)=T
240 NEXT
250 REM PRINT SEQUENCE
260 FOR I=1 TO 13
270 : PRINT A(I)
280 NEXT
290 END
```

The key lines are 110, which makes the sequence of random numbers more truly random; 190–200, which select a random integer between 1 and 13; and 210–230, which do the actual shuffling.

Q: The VIC-20 has 22 columns across its screen. How do you display a word like "William" (7 characters) in the center of the screen—in other words, how do you move over half a space?

H.L. Jackson
Minneapolis, MN

A: Given any string of fewer than 22 characters, its contents may be centered on the VIC's screen by printing it this way:

```
PRINT TAB(22-LEN(A$)/2);A$
```

(64 owners should change the 22 to 40.) If there is a leftover character, it will appear on the left, just as it

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should when you type the same phrase on a typewriter. To move over half a space, you'd have to switch to the high-resolution screen and draw your own letters dot by dot.

SOFTWARE

Q: I have the CP/M cartridge for the 64. I also bought Fortran and Cobol. I've tried to write programs in Fortran, but the CP/M editor was not easy to use. Could you recommend some other editor?

Yeong-Guk Kwon
Lubbock, TX

A: Reader John McGlothlin, of San Bruno, CA, writes, "The best source for software I've found has been CompuServe (currently database XR4 in the CBM Programmers' SIG). An example is VDO.BIN, a text editor that works more easily than the one included in CP/M."

To take advantage of such programs, you will need to get a modem, such as Commodore's new model 1660, which comes with a free membership in CompuServe. Using the terminal program disk included with the 1660, you can call CompuServe. Once you get past the hassle of signing on, you will see a menu of things CompuServe can do. At this point, type "GO CBM", and you will be in Commodore's Information Network. From there, you can print out several screens of helpful information about getting to the programs you want.

You will also need a better-than-standard terminal program in order to download programs from CompuServe. The one sold by CompuServe and Commodore for this purpose is VIDTEX, but there are others. The dealer who sold you a modem probably has a suitable program.

Q: Being in Thailand, it is not practical to dial up the Commodore Information Network. Can you give me an address where I can get CP/M programs for the Commodore 64?

Curtis Hamilton
American Consulate
Chiang Mai, Thailand

A: One company that supports CP/M on the 64 is Cardinal Software (13646 Jefferson Davis Hwy., Woodbridge, VA 22191; 800-762-5645). The company offers disks of CP/M programs and utilities, including a CP/M terminal program and a modification to let CP/M use two 1541 disk units as drives A: and B:.

Q: In a computer store, I noticed a joystick port for the VIC. It said, "Now you can play two-player games on your VIC." Is that possible?

David Rainbolt
Marshall, AR

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A: Yes, with proper wiring and programming, a second or even a third joystick can be plugged into the user port. In the old days, before the VIC, all PET joysticks were connected there. However, a joystick or joysticks so connected will only work with programs either you or someone else writes specifically for them, because they use different memory addresses and codes than the standard joystick(s) on the VIC and 64.

Q: **Why is it that Commodore never answers letters sent to them about problems one is having with their products? I have written repeatedly to their West Chester, PA, address about several things, but three months later, I have not even received an acknowledgement of my letters.**

Roy Babin
Sterling, IL

A: Actually, Commodore *does* answer many such letters, but apparently not all of them. To assure proper delivery to their Customer Support department, Commodore suggests you include the code "C-2655" in the lower left corner of your envelope. Be sure you also address the letter to 1200 Wilson Drive, West Chester, PA 19380.

Another way to get an answer to a question, usually overnight, is to ask it via the Commodore Information Network on CompuServe. To do this, you'll need to buy a modem. If it's a Commodore modem, it will come with a free CompuServe membership and instructions on using the Commodore Information Network.

UPDATES

Update: Although we are way behind in some things "down under," there is one thing we have before the States! In your September 1984 column, Jeff Rosenblad asked about descenders on the MPS 801. A replacement character ROM chip is now available from Paul Blair (35 Calder Crescent, Holder Act 2611, Australia; (062) 88 3584). The cost in Australia is $32, postpaid. It provides a much more acceptable print.

Mrs. Maureen Williams
Boulder, Western Australia

A: Thanks for writing and for the good-looking sample printout from the new ROM. It apparently gains descenders by stealing a bit from the ascenders (for example, the "H" doesn't go as high above the line, so the "y" can go below it). Paul is a good source of Commodore information "down under," and I'm always glad to hear from or about him. (Anyone wanting the ROM shipped outside of Australia should add extra postage for overseas airmail.) R

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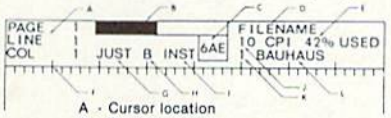

A - Cursor location
B - Scroll Indicator
C - Print features currently being used
D - Filename of text
E - Percentage of RAM (memory) used
F - Ruler (also message line)
G - Word wrap/justification flag
H - 'Block marked' flag
I - Insert mode flag
J - Characters per inch
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I Speak Basic to My Commodore 64

Aubrey B. Jones, Jr.
Hayden Book Co., Inc.
50 Essex St.
Rochelle Park, NJ 07662
Softcover, 232 pp., $9.95

As C-64s are used in more and more classrooms, the need for good lesson books will be strong. *I Speak Basic to My Commodore 64* is primarily intended to fill this need.

The book is a computer literacy course designed to introduce students to Basic language programming. It's written in outline form, with very few normal text paragraphs. When more information is required, extensive notes are provided at the end of the section.

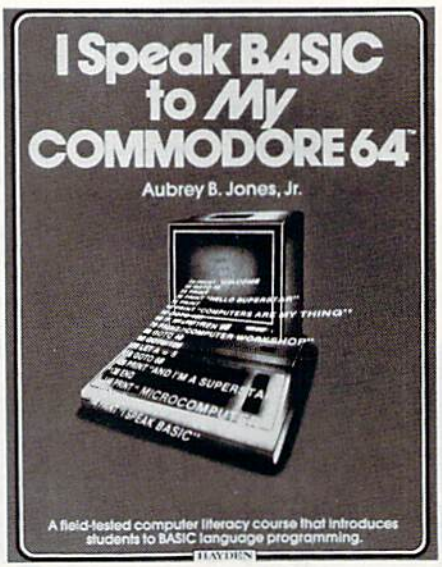
This outline style will be somewhat awkward if the book is used alone as a self-teaching tool. It is best suited to a classroom setting.

To help the student, many examples, charts and helpful hints are included. Program listings are very easy to read. The entire layout and text size is very well suited to classroom use.

As for limitations, there are several to be aware of. First, you should remember that this book is just an introduction to Basic programming. Only the very elementary Basic commands and statements are covered.

Certain topics that are important to the operation of the C-64 are omitted. For example, while there is a brief section on cassette usage, there is no discussion of the 1541 disk drive.

Also missing is any mention of



printers and making hardcopies of program listings. Whenever areas beyond the scope of this book are noted, the reader is told to see the *Commodore 64 Programmer's Reference Guide.*

These limitations might make the book inappropriate for some courses of study. But if all you need is a lesson manual to introduce students to Basic programming, *I Speak Basic* should fit your needs.

Larry Bihlmeyer
Pontiac, MI

Commodore 64 Subroutine Cookbook

David D. Busch
Robert J. Brady Co.
Bowie, MD 20715
Softcover, 194 pp., $12.95

Have you ever found yourself in need of a quick sound effect to add a finishing touch to your Basic program? Or maybe you need a simple timer for a game program.

Searching through stacks of old magazines and programming books for simple, effective subroutines and programming tricks can be frustrating. Even when you find what you're looking for, you still have to work out a way to incorporate it into your existing program, and this often involves extensive editing, renumbering of lines and renaming of variables.

The Commodore 64 Subroutine Cookbook solves many of these problems by bringing together over 60 of the most useful Basic subroutines into one well-organized volume.

Each subroutine is accompanied by a line-by-line description that explains how it works, as well as a few paragraphs that detail how the subroutine might be used in your own programs.

In addition to sections dealing with sound, joysticks and the computer's internal clock, there are chapters devoted to game routines, business and financial subroutines, communications, datafiles and an advanced section on bit-level operations. There is even a chapter containing nine subroutines that allow you to add a number of new functions to Commodore Basic.

Because most of the subroutines are short, they are easily appended onto existing programs by using the simple merge methods described in the first chapter. Since each subroutine is complete and does not build upon previous routines in the book, you can begin with those chapters

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and subroutines that interest you the most.

While the *Commodore 64 Subroutine Cookbook* may not be suited to the programming neophyte, as long as you know a Peek from a Poke, you should have no trouble using the subroutines, as well as understanding the organization and logic behind them.

Whether you're cooking up a program to figure the compound interest on your money market certificates, or simply looking for a way to manipulate on-screen objects with a joystick, the *Commodore 64 Subroutine Cookbook* will provide the right ingredients.

Bob Guerra
Charlestown, MA

The Anatomy of the 1541 Disk Drive

Abacus Software
PO Box 7211
Grand Rapids, MI 49510
Softcover, 320 pp., $19.95

After you've learned everything you can about your Commodore 64, you may want to learn more about the 1541 disk drive and its internal workings. *The Anatomy of the 1541 Disk Drive* progresses from basic operations and commands to simple file structures, data storage techniques and technical details of the hardware and internal software of the 1541. Various utility programs are included with full listings and complete operational descriptions. There are plenty of examples throughout the book, plus a brief discussion of the programs found on Commodore's Test/Demo disk.

The major item of interest in this book is a detailed disassembly listing of the DOS ROMs. The extensive comments provided here make it a very handy reference for advanced users who might want to write routines to be executed within the disk controller. There are unlimited possibilities in this area for those willing to spend the time to learn and experiment.

The book is very well written, and it presents the material in a clear, logical fashion. Some details are missing, such as how to clear an entire disk without having to reformat. On the other hand, this book presents information on how to scratch-protect a file, which is not covered in most other books of this type.

Basic 4.0 disk commands are referenced at times, even though they do not apply to the Commodore 64. However, this does present a handy translation reference between Basic 4.0 and DOS commands, if needed.

I would highly recommend *The Anatomy of the 1541 Disk Drive* as a starting point for the serious 1541 user. For those less-advanced users, the sections on datafile techniques will be of great interest and value. There's something here for everyone who wants to expand his knowledge of the 1541 disk drive.

Robert Baker
Atco, NJ

New Releases

Assembly Language Programming with the Commodore 64

Marvin L. DeJong (Brady Communications Co., Inc., Bowie, MD 20715. Softcover, 296 pp., $14.95.) This introductory guide shows how to write, debug and execute assembly language programs. Exercises and problems familiarize you with the instruction set of the 6510 microprocessor.

Commodore 64 Tutor for Home and School: How to Program in Logo, Pilot and Basic

Julie Knott and Dave Prochnow (Scott, Foresman and Co., 1900 East Lake Ave., Glenview, IL 60025. Softcover, 300 pp., $15.95.) Designed for beginners, this book provides a concise introduction to the C-64. Each language is introduced, followed by analysis of sample programs.

The Second Book of Machine Language

Richard Mansfield (Compute! Publications, Inc., 324 West Wendover Ave., Suite 200, Greensboro, NC 27408. Softcover, 446 pp., $14.95.) This book uses the rules and fundamentals covered in Mansfield's *Machine Language for Beginners* to construct a large, sophisticated machine language program for the C-64 or VIC-20.

How to Sell Your Commodore Computer Software

(Associated Technology, Rt. 2, PO Box 448, Estill Springs, TN 37330.) This manual gives information on obtaining national directory listings, pricing new software, writing user's manuals and operating a mail order service.

Cookbook of Creative Programs for the Commodore 64: Projects for Music, Animation and Telecommunications

Robert Rinder (New American Library, 1633 Broadway, New York, NY 10019. Softcover, 206 pp., $12.95.) Explores the graphics and sound capabilities of the C-64 by showing you how to create light shows and music. Nine ready-to-run programs are included.

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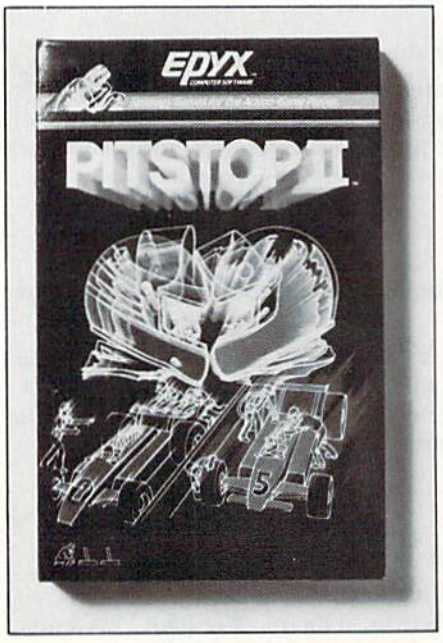
Compiled by SHAWN LAFLAMME



Pitstop II

Epyx, Inc. (1043 Kiel Court, Sunnyvale, CA 94089) has introduced Pitstop II for the C-64.

Pitstop II features two-player competitive racing on the tracks and in the pits, as you combine strategy and driving skill to beat your opponent. Available on disk, Pitstop II retails for approximately $35.

Check Reader Service number 400.

Battle of the Bulge

Strategic Simulations, Inc. (883 Stierlin Road, Bldg. A–200, Mountain View, CA 94043) has introduced Breakthrough in the Ardennes for the C-64.

Simulating the Battle of the Bulge, the game attempts to incorporate all the factors that played a part in the actual battle. Available on disk, Breakthrough in the Ardennes retails for $59.95.

Check Reader Service number 402.

Weather Tamers

Weather Tamers, an educational program for ages 12 and up, allows you to create the weather for North America using various meteorological elements.

The program aims to encourage cooperation and scientific thinking. It is available on disk for the C-64 and retails for $39.95. CBS Software, One Fawcett Place, Greenwich, CT 06836.

Check Reader Service number 403.

Be Your Own Coach

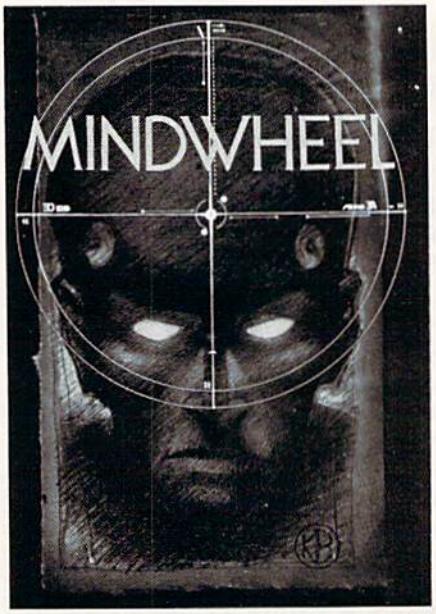
Be Your Own Coach is the second release in the series called To Your Health, from Avant-Garde Publishing Corp. (PO Box 30160, 1907 Garden Ave., Eugene, OR 97403).

The program is a runner's training tool that aims to minimize injury and maximize each runner's own abilities. It is available on disk for the C-64. Retail price is $79.95.

Check Reader Service number 407.

Electronic Novel

Mindwheel is one of the first titles to be released in the Electronic Novel series from Synapse Software (5221 Central Ave., Richmond, CA 94804).



Mindwheel involves a journey into the minds of four deceased people. The Mindwheel package, including disk and hardcover book, retails for $39.95.

Check Reader Service number 405.

High-Rise Adventure

Rock 'n Bolt is a game of strategy and action for the C-64, from Activision, Inc. (2350 Bayshore Frontage Road, Mountain View, CA 94043).

You must guide Louie, who dances across high-rise construction beams and girders, as you try to complete construction of a 100-story building in record time. Rock 'n Bolt is available on disk for $29.95.

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Spelunker

Broderbund Software (17 Paul Drive, San Rafael, CA 94903) has introduced Spelunker for the C-64.

Spelunker combines the arcade action of a maze-style game with the strategy of an adventure game. It is available on disk for $29.95.

Check Reader Service number 404.

Bounty Bob Is Back

Miner 2049er II, the sequel to the popular Miner 2049er, offers ten all-new action screens and even more jumping and climbing challenges.

You must dodge ricocheting ore lumps and make your way through a radioactive mine. Miner 2049er II is available for the C-64 and retails for $35. MicroLab, 2699 Skokie Valley Road, Highland Park, IL 60035.

Check Reader Service number 408.

Computerized Music Videos

Computer Hitware is a series of software packages that combine today's popular music with color graphics, creating a kind of music video.

You can arrange your own graphics displays to accompany the program's pre-recorded music. The first release features Duran Duran. The programs are available on disk for the C-64, retailing for $19.95 each. Passport Music Software, 625 Miramontes St., Suite 103, Half Moon Bay, CA 94019.

Check Reader Service number 411.

Basic Compiler

Nanosec Corp. (Lincoln Plaza, 3544 Lincoln Ave., Ogden, UT 84401) has released Pro-Compiler for the Commodore 64.

The program compiles Basic programs to straight machine code. Your compiled program can have up to 48K. During compilation, other Basic programs or subroutines can be included. Available on disk for $99.95.

Check Reader Service number 409.

3-D Graphics

Pioneer Software (1112 Fort St., Victoria, British Columbia, Canada V8V 4V2) has released Perspectives, a three-dimensional graphics animation program for the C-64.

The program offers six on-screen help menus that allow you to design your own graphics. Perspectives is available on disk and retails for $39.95.

Check Reader Service number 410.

Full-Sized Musical Keyboard

Music Port is a new musical keyboard and software system for the Commodore 64.

The system features a 37-key electronic keyboard with digital synthesizer capability. It allows you to create your own accompaniment and edit multi-track arrangements. Ten-minute songs can be stored on disk.

Music Port retails for $149. Tech Sketch, Inc., 26 Just Road, Fairfield, NJ 07006.

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Dot-Matrix Printer

Inforunner Corp. (Airport Business Center, 431 N. Oak St., Inglewood, CA 90302) has released the Riteman C+, a dot-matrix printer that connects directly to the C-64 through the serial port.

The Riteman C+ prints in a 9×9 dot-matrix at 105 cps and has seven printing modes. Retail price is $299.

Check Reader Service number 424.

Calc Now!

Calc Now!/64 is a spreadsheet package for the C-64. It has a capacity of up to 64 columns by 254 rows and 39K of free memory for data.

Designed for home or business use, Calc Now! is available on disk for $39.95. Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.

Check Reader Service number 416.

The Gold Disk

Gold Disk, Inc. (2179 Dunwin Drive #6, Mississauga, Ontario L5L 1X3 Canada) has introduced The Gold Disk Subscription Series for C-64 users.

Every month, subscribers receive a disk containing a feature program. Also included are tutorials, games, a programming puzzle, music, sound effects and a "programmer's corner."

A six-month subscription to The Gold Disk costs $54.95; a one-year subscription costs $99.95.

Check Reader Service number 428.

C-64 Graphics Package

Graph-Tech Software (1315 Third Ave. #4C, New York, NY 10021) has released 3-D World 64, a graphics package for the C-64.

With 3-D World 64, you can create three-dimensional drawings to be viewed on-screen or printed out on the Commodore 1520 Printer/Plotter. 3-D World 64 is available on disk for $39.95.

Check Reader Service number 414.

Stellar Conflict

Handic Software (520 Fellowship Road, Suite B206, Mount Laurel, NJ 08054) has released Stellar Conflict, a C-64 action game.

Stellar Conflict offers sound effects, animation and the option to create your own scenarios. The game is available on disk for $49.95.

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Medical Diagnostics Program

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poisoning or the effects of drug abuse.

The program analyzes data accumulated from yes-or-no questions and displays the most probable medical condition. Related disorders with similar symptoms are also identified. It is available on disk for $38. Navic Software, PO Box 14727, North Palm Beach, FL 33408.

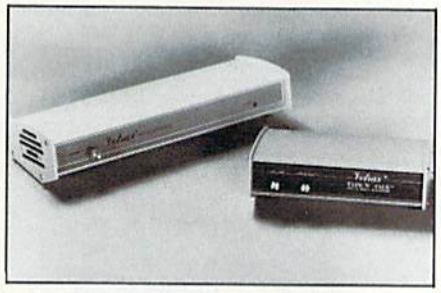
Check Reader Service number 427.

Voice Synthesizers

Votrax, Inc. (1394 Rankin Road, Troy, MI 48083) has released Personal Speech System and Type-'N-Talk.

These two devices convert computer data into spoken English. Each operates from a CMOS synthesis chip and general microprocessor. Both units are compatible with the C-64 and the VIC-20.

The Personal Speech System is



priced at $395, while Type-'N-Talk retails for $249.

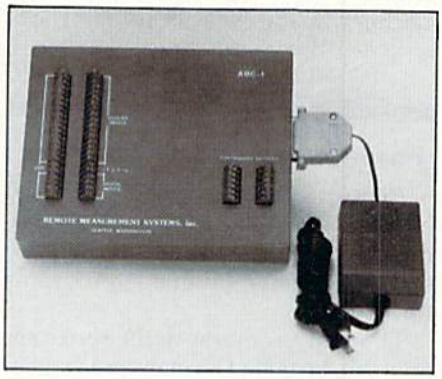
Check Reader Service number 420.

Roll Call USA

Roll Call USA, a trivia game for the C-64, was recently released by Creative Software (230 East Caribbean Drive, Sunnyvale, CA 94089).

This game will challenge your knowledge of the history and geography of the United States, with questions on the fifty states, the capitals and major industries. Roll Call USA is available on disk and retails for $14.95.

Check Reader Service number 401.



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system (which includes a Basic module and a BSR controller) has a retail price of $395. Remote Measurement Systems, PO Box 15544, Seattle, WA 98115.

Check Reader Service number 406.

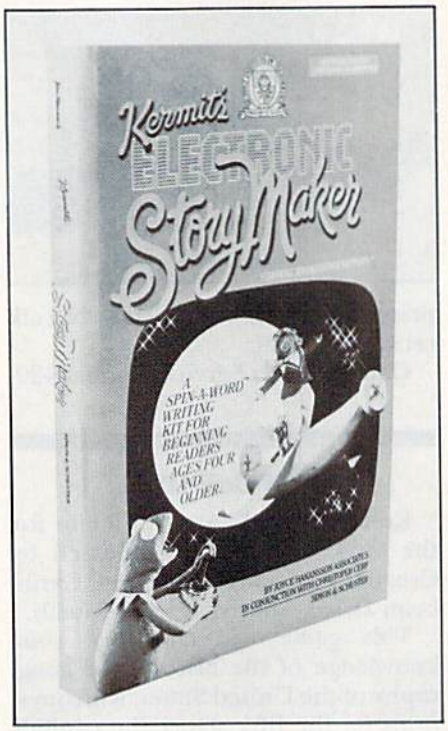
Foreign Language Programs

Artworx Software Co., Inc. (150 North Main St., Fairport, NY 14450) has released the Linkword Language series of foreign language programs for the C-64.

The four programs in the series are Spanish, French, German and Italian. Linkword uses a system based upon imagery, linking foreign words to acoustically similar English words.

Each package contains both disk and cassette versions of the program, along with an audio tape to assist in pronunciation. The programs retail for $24.95 each.

Check Reader Service number 422.

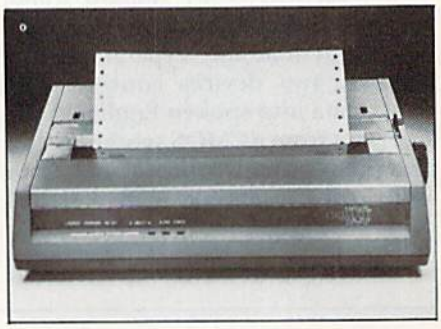


Enroll at MIT

Kermit's Electronic Storymaker is the first release in the Muppet Institute of Technology series, from Simon & Schuster (1230 Avenue of the Americas, New York, NY 10020).

The program is designed to help children ages four and up develop their reading, writing, vocabulary and grammar skills. It is available on disk for the C-64. Retail price is $39.95.

Check Reader Service number 417.



Commodore-Compatible Printer

Okidata (532 Fellowship Road, Mt. Laurel, NJ 08054) has released the Okimate 120 dot-matrix printer.

The Okimate 120 prints bidirectionally in Draft mode with short line-seeking logic at 120 cps. Features include a Commodore character set, true descenders and double-width characters.

The printer comes with an interface cable, making it compatible with the C-64, Plus/4, C-16 and VIC-20. Retail price is $269.

Check Reader Service number 421.

Word Processing Package

Word Runner is a word processing package designed for ease of use.

The program requires the use of very few commands and allows all editing to be done in one mode. Word Runner is available on disk for the C-64. Retail price is $44.95. N-Systems, PO Box 160, Steger, IL 60475.

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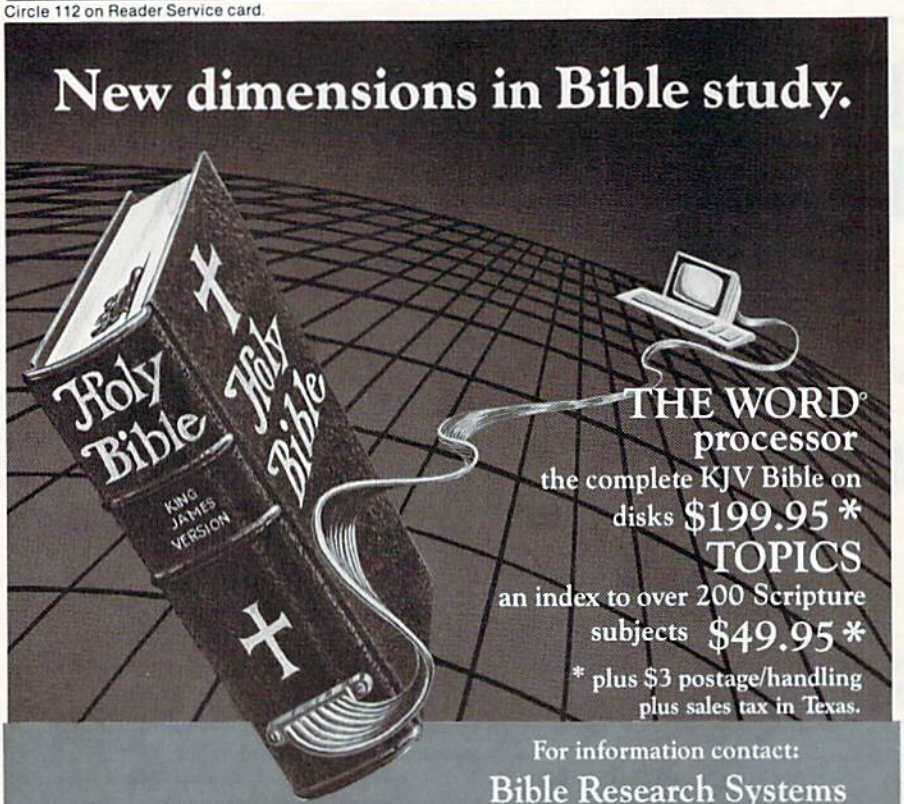

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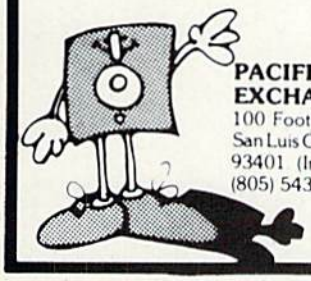

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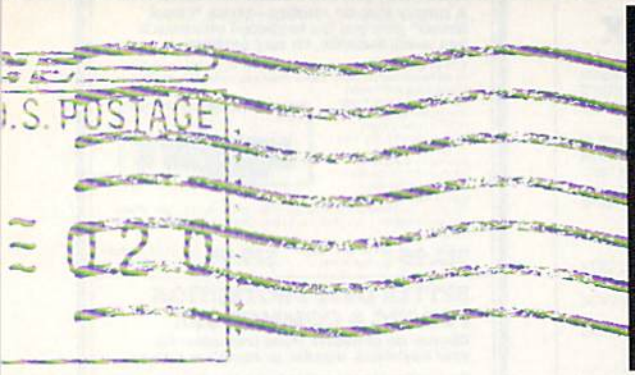

Two Good Interfaces

Everyone knows about the Cardco/ ?+G interface, but I just bought a GPI graphics printer interface by Xectec. The interface is 100% compatible with software written for the VIC-1525 printer and gives you complete emulation of the special Commodore graphics set. This is real handy, especially when you are using Commodore software such as the Easy Script word processor.

I have an Epson RX 80 F/T printer hooked up to it, and my interface gives me the conveniences of an Epson printer and the compatibility of a Commodore printer. The nice thing is that it comes with a standard 2K buffer and costs about $89.

Donovan Palmer
Montrose, CO

Your article on printers and interfaces ("Selecting the Right Printer" by Jim Strasma, January 1985) was just what I needed. When this issue arrived, I had already decided on a Gemini-10X printer, but wasn't sure what interface to use. After reading this article and making phone calls to some of the mail-order houses that advertise in *RUN*, I finally ordered the Micrografix MW-350.

The system is great. My only complaint is that none of the people who mentioned the advantage of the MW-350 having a 4K buffer told me that the 4K is optional. The unit comes standard without any buffer.

Gerry Scerra
Sutton, MA

Alien Voice Module

In March of 1984 I purchased an Alien Voice Module for my VIC-20, and recently I purchased a C-64. When I tried to get the C-64 software for the module, I discovered that Alien and Mathews Research is no longer in existence.

Do you or any of your readers possibly know where I could acquire some software?

Michael Gibney
Box 925
Salem, MA 01970

Our attempts at contacting Alien and Mathews Research were futile. Readers?

Editors

The Ideal Computer?

I've only had a glimpse of the Commodore 128PC, but it looks very close to my description of the ideal computer, down to the numerical keypad on the right-hand side.

I hope the new model also contains the wedge in residence and a couple of programs like Easy Script and The Manager.

The expansion to 128K is great, and the compatibility with my 1000 C-64 programs is absolutely wonderful!

Now I am ready to peel those greenbacks and get myself a 128PC! Congratulations to those at Commodore.

Alfred Coya
Miami, FL

The C-64's Basic 2.0 needed the wedge. The new C-128 has Basic 7.0, which will offer as much if not more than the wedge. As for built-in software, there isn't any. However, this new machine offers 6000 existing software programs that will run on it, in addition to new software that's being developed.

Editors

Commodore in Italy

In Italy, the VIC-20 is still by far the best-selling micro. Close seconds seem to be the C-64 and Timex-Sinclair's Spectrum.

As to applications here, I guess we've followed the typical trend of starting off with games (arcade, not adventure), learning Basic and writing limited programs before moving on to machine language.

Most street-corner newsagents are crammed with computer magazines, and at least 15 or so are either American or British. We have about five Commodore-only Italian magazines and five or six more cassette-based ones, plus plenty of Basic courses. The English involved isn't too much of a problem, as English is just about the most popular second language here. Also, there are plenty of computer-based translating companies.

Certainly one of the biggest areas of applications (apart from games) is in education. Although not really fully started in schools yet, there is plenty of educational software available, ranging from English teaching games and translating dictionaries to statistical analysis. Good-quality Italian software is available, but not in the States or Britain. A large portion of Italian software is made up of translations.

D. Purvis
Brescia, Italy

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How to type listings from RUN

Typing in listings can be difficult enough without having to worry about strange graphics characters, charts or tables. That's why we decided to make it easy to enter listings from *RUN* by translating everything we thought might be confusing in any program.

When you see something between the curly brackets, all you have to do is press the keys indicated. For example:

{SHIFT L}—means hold down the shift key and press the L key at the same time.

{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key at the same time.

{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.

CLR/HOME key.

{HOME}—press the CLR/HOME key without shifting.

{CTRL 6}—hold down the control key and press the 6 key.

{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).

{CRSR UP}{CRSR DN}{CRSR LF}{CRSR RT}—these are the four cursor directions.

{UP ARROW}—means the arrow key (the one with the pi sign under it).

{LB.}—the British pound sign (£).

{PI}—the pi sign key (π); (shift and press the up arrow key).

Our translating program does not designate single spaces between characters. Within quotations, these spaces are often critical to the screen display. Be sure to read the listings closely and include these single spaces as you type in your program.

In some instances, when a large number of characters or spaces are repeated in a listing, we will represent them this way: {22 spaces} or {17 CRSR LFs}.

Print vs Print#

RUN readers should be aware of difficulties that may arise when entering listings that contain the PRINT and PRINT# commands.

These two commands may look very similar, but they are different. If, for example, you use a question mark (?) to abbreviate PRINT in a line such as 10 PRINT#4,A$, then you are signaling to the Commodore computer that you are trying to print the variable #4, which is not a legal variable name.

The command PRINT#4 actually means "print to file number 4." You can abbreviate PRINT# by hitting the P key and the shift and R keys at the same time and then entering the file number. But *do not* abbreviate PRINT# with a question mark.

If you think of PRINT as one command and PRINT# as an entirely different command, then you should have no problems.

■ ■ ■

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RUN AMOK

Item: In the Special Issue, there were two errors in the C-64 Basic Music Lesson program listing on p. 24 (in the article Sound & Music, by Peggy Herrington). In line 10, insert REM after the line number; in line 200, line 210 was inadvertently tacked on after Data item 30.

Item: Also in the Special Issue, in the Magic item Double-spaced Listing (p. 120), the Open statement should read: OPEN 128,4:CMD 128:LIST

Item: On the wall chart in the Special Issue, the ASCII codes for the function keys were incorrectly listed. They should have been:

Funct 1	133	Funct 2	137
Funct 3	134	Funct 4	138
Funct 5	135	Funct 6	139
Funct 7	136	Funct 8	140

Item: In the listing of the Trace Utility program in Magic item $169 of January 1985 (p. 12), line 125 was inadvertently omitted from the relocation routine. Insert the following:
125 A = INT(S/256):B = S – (A*256): POKE S + 38,A: POKE S + 33,B

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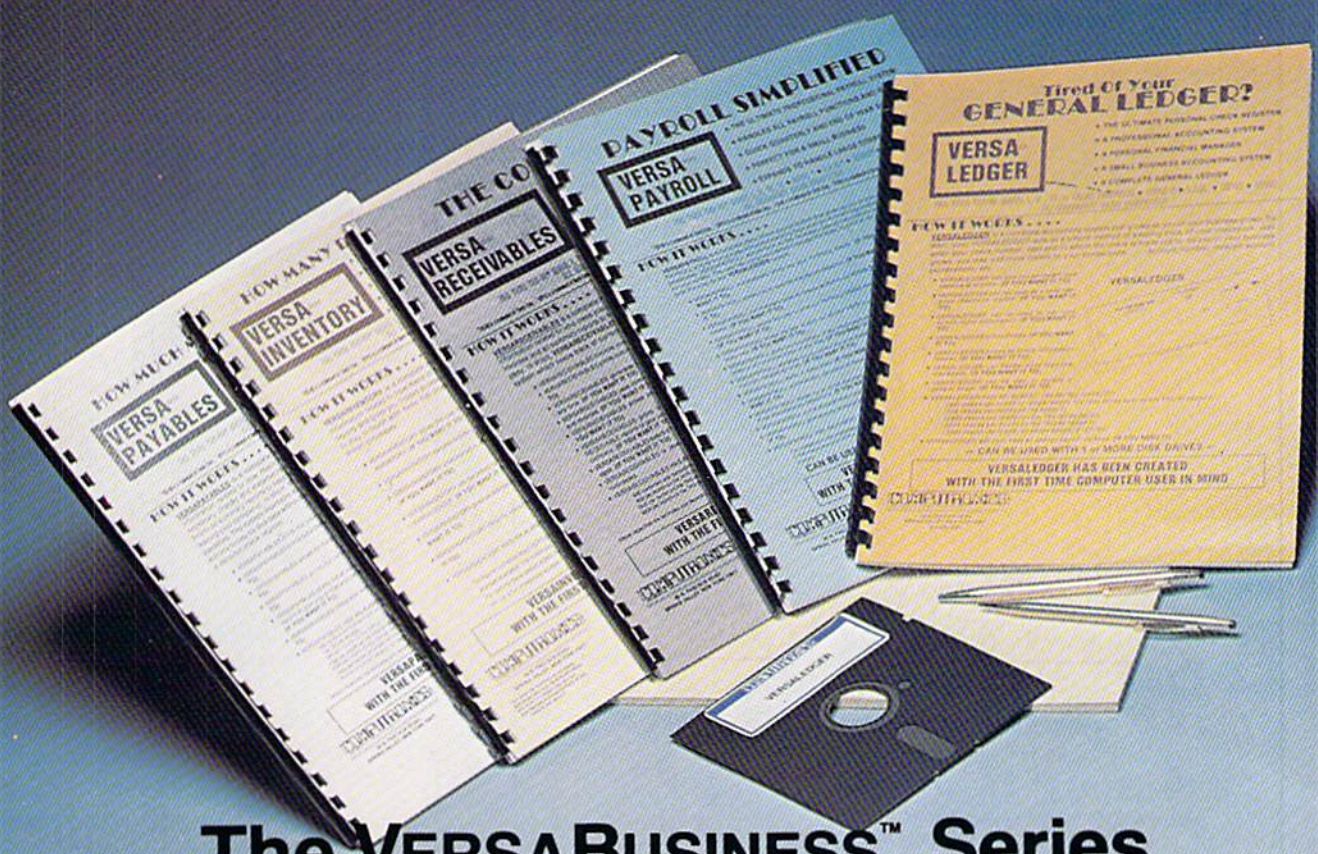

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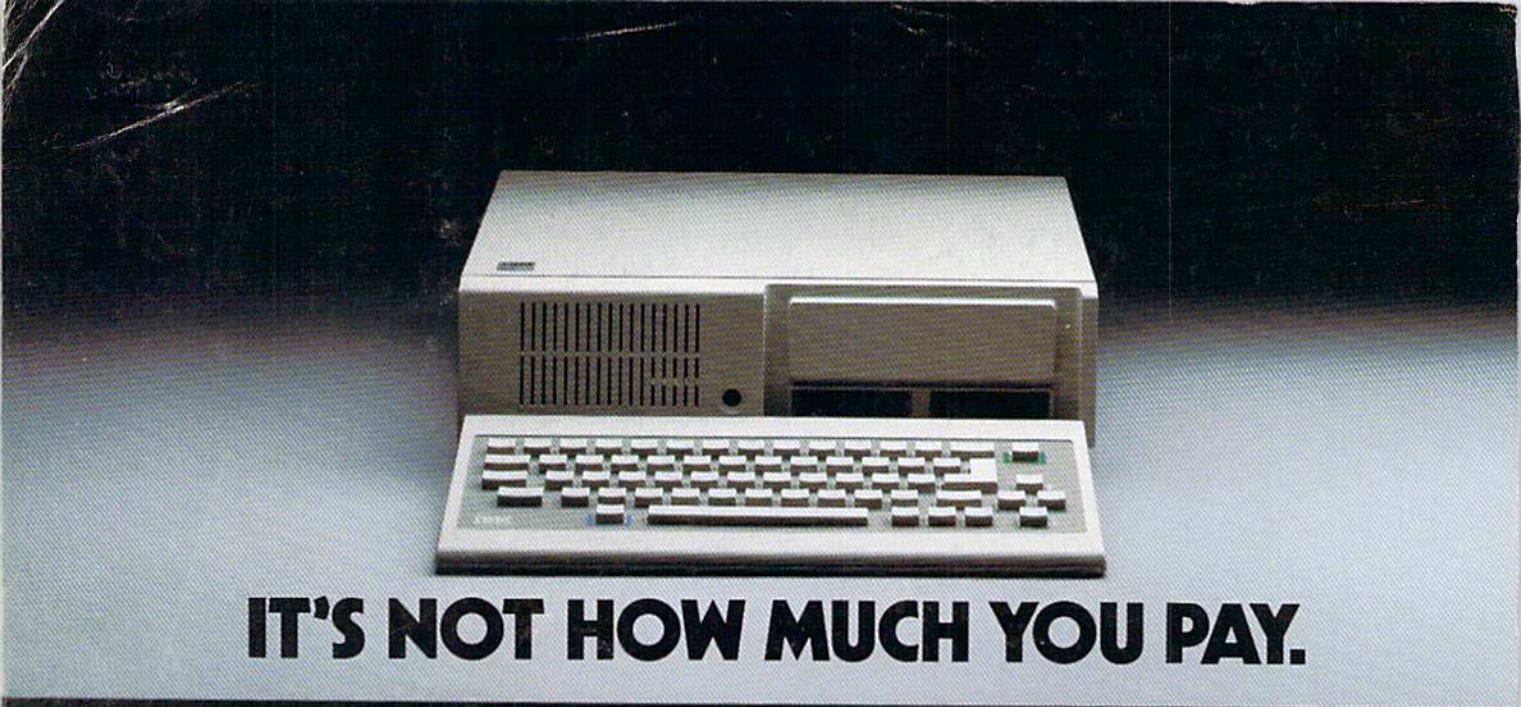

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