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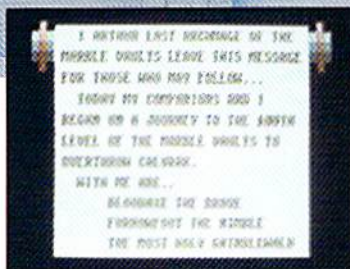
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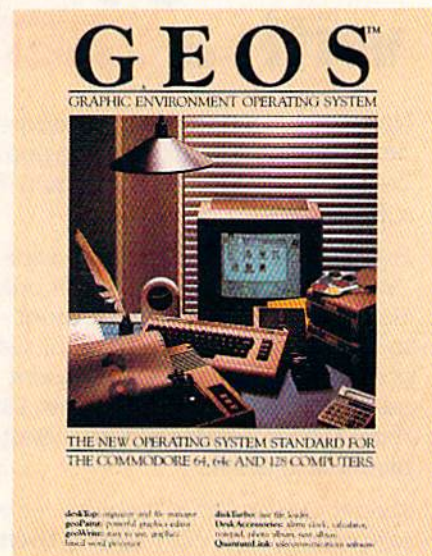
Time Warps Discovered

With GEOS, everything speeds up. Including you. Because the system is incredibly fast and ridiculously easy to learn: GEOS shows you options, you point at what you want and click your mouse.

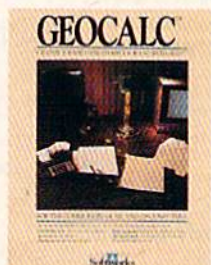
End of lesson.

Now, once you know that, you know how every other GEOS application works, too. Like geoWrite, which lets you punch up paragraphs with five different fonts. Or geoPaint, which dresses up diagrams with an arsenal of artistic appliances. Both are built

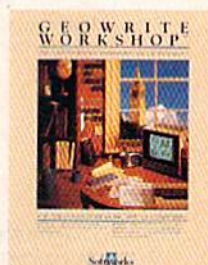
right into the GEOS disk. And when you put them together with geoWrite Workshop's LaserWriter compatibility, every new GEOS document comes out looking like an old master.



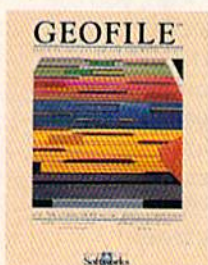
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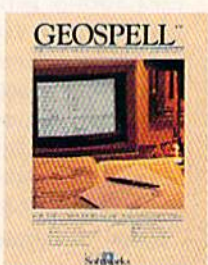
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NEW All the GEOS-compatible tools a writer needs, including new geoWrite 2.1 with headers, footers, margins to 8" and features to justify, center, search and replace text. Includes a Text Grabber (for converting text from programs like Paper Clip), geoMerge and LaserWriter printing capability.



GEOFILE
The GEOS-compatible database manager that sorts, edits and prioritizes whatever data you feed it. You fill out the "input form," specify your command, and geoFile takes it from there.



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You can finally get organized with geoFile, the database that searches, finds and lists almost anything that you want to search, find and list. You can manipulate mathematics or figure out financial formulas with geoCalc. If writing's your style, geoWrite Workshop can help you hammer out any kind of report. And geoPublish is the desktop publishing program that is still making headlines throughout the entire industry.

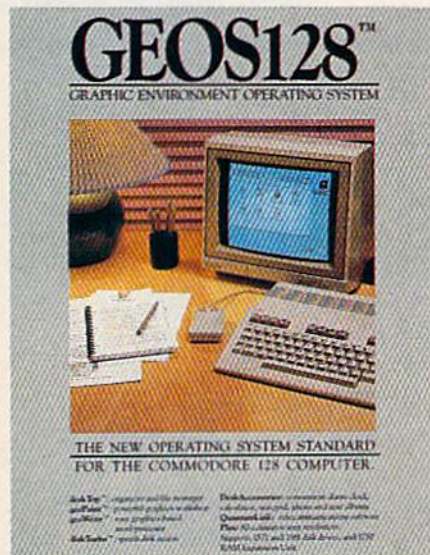
Of course, that's merely a sampling of what the GEOS environment has to offer. Because even as you read this, legions of our engineers are hard at work, developing even more GEOS applications for even more uses.

All of which means you get a whole lot more out of your Commodore than you ever bargained for. And while that may not actually keep your Commodore from getting older, that's certainly something it could live with for a long, long time.



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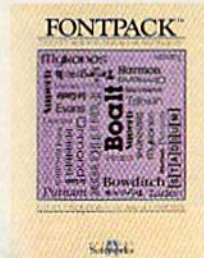


128 version features 128K memory, full 80 column screen, supports 1571/1581 disk drives. 1750 RAM expansion and runs at a full 2 MHz for lightning speed.



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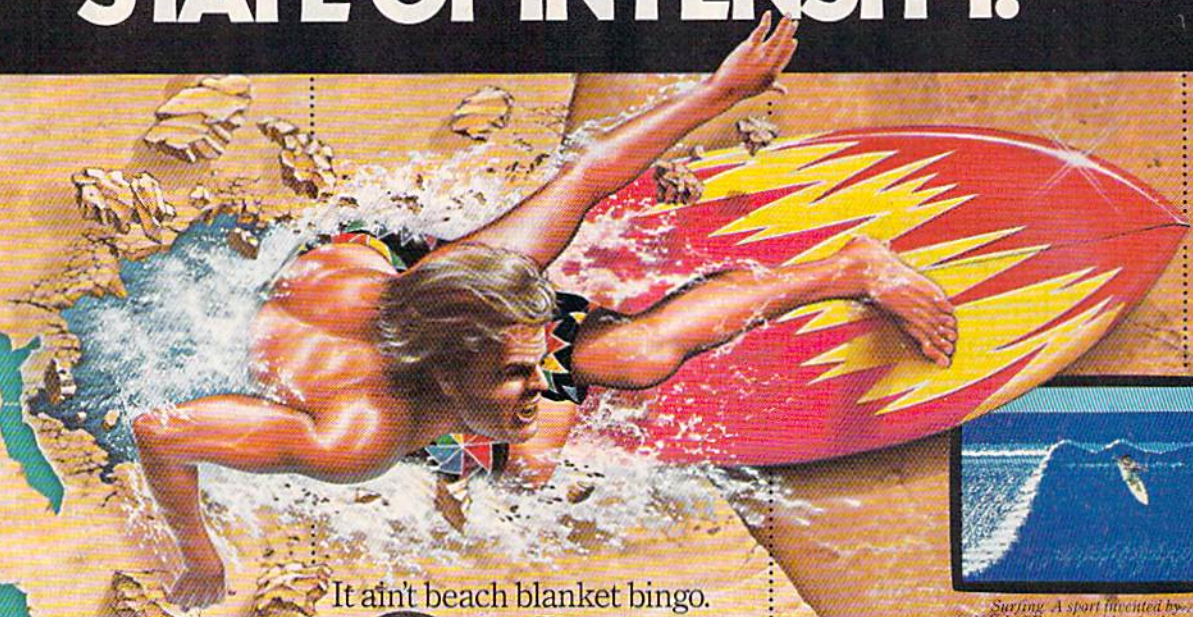
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March 1988 Vol. 6, No. 3

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*=General, 64=Commodore 64, +4=Plus/4, 16=Commodore 16, 128=Commodore 128

editor's notes

The news from Commodore is good: 1987 was a turnaround year. The startling losses incurred in 1986—\$127.9 million—were, to some, a portent of sure doom. But with all the numbers in for 1987, Commodore showed not only signs of recovery, but also of a return to health: a profit of \$28.6 million. And the first-quarter numbers for fiscal year 1988 (Commodore's fiscal year runs from July 1 to June 30) continue the trend. The quarter ending September 30 showed a profit of \$6.3 million.

Why? There are a number of reasons. While the Amiga 500 and 2000 had a moderately successful summer debut, and 128/64 sales have continued to remain strong, the most important factor in 1987's success was sales performance *outside* the U.S., where about 74 percent of the year's revenues were generated. (Of the non-U.S. markets, West Germany is the strongest.) The disappointing numbers in the American market were a major reason for the firing of Thomas Rattigan and the hiring last fall of new president Max Toy.

According to Irving Gould, Commodore's chairman of the board, "the normal standard for a truly international company is that the United States should represent 50 percent of the world in sales. We used to have 40 percent. In the last few years, that's gone down to somewhere between 20 and 25 percent. So, our concentration is going to be on recapturing the market share we lost in the U.S. That's why we appointed Max Toy to be president. His major task will be to lead the company toward our goal of recapturing our market share in the U.S."

Regaining the U.S. market share will be a stiff challenge for Toy in view of the inroads made into the PC market in recent years by Apple and IBM. However, Commodore watchers have been impressed by

Toy's market knowledge and business savvy in his tenure thus far. It's not surprising. Toy has more than 12 years of experience in the personal computer industry. He held top sales and marketing positions with ITT, Compaq, and IBM. Since his debut, Amiga U.S. sales have been brisk, and pre-Christmas reports put sales (worldwide) over the 500,000 mark. Commodore has been touting the Amiga in major news magazines and in TV spots, as well as running various promotions.

While the Commodore marketing crew has shown signs of an increasingly aggressive posture with the Amiga, they also realize that the venerable 64 has a potentially new market. In view of the surprising and resurgent interest in game machines—Nintendo, Sega, and the Atari 2600—they've been running TV ads on Saturday mornings to demonstrate that the 64 is a great game machine, and much more.

Irving Gould noted at the Toronto "World of Commodore" show held in December that if he had 50,000 Commodore 64s ready to ship, they'd be sold. He also commented that "we plan to continue the 64... it's selling very well. The 64 is such an old workhorse that we feel it has many years of good life left in it." Software developers seem to feel the same way: New titles are being released and planned on a regular basis.

As we move through 1988, we'll keep you up on new developments with Commodore, and we'll continue to provide you with the best coverage possible. Also, look for our Winter CES show report in next month's issue.

Lance Elko

Lance Elko
Editor

COMPUTE!'s GAZETTE

FOR COMMODORE PERSONAL COMPUTER USERS

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Editorial inquiries should be addressed to The Editor, COMPUTE!'s GAZETTE, Suite 200, 324 West Wendover Ave., Greensboro, NC 27408

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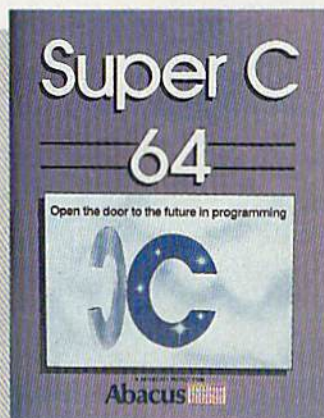
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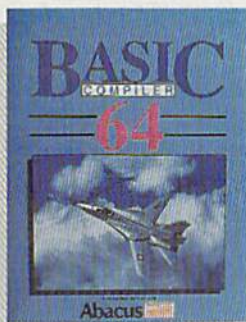
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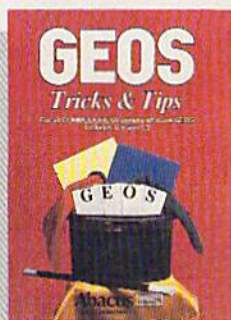


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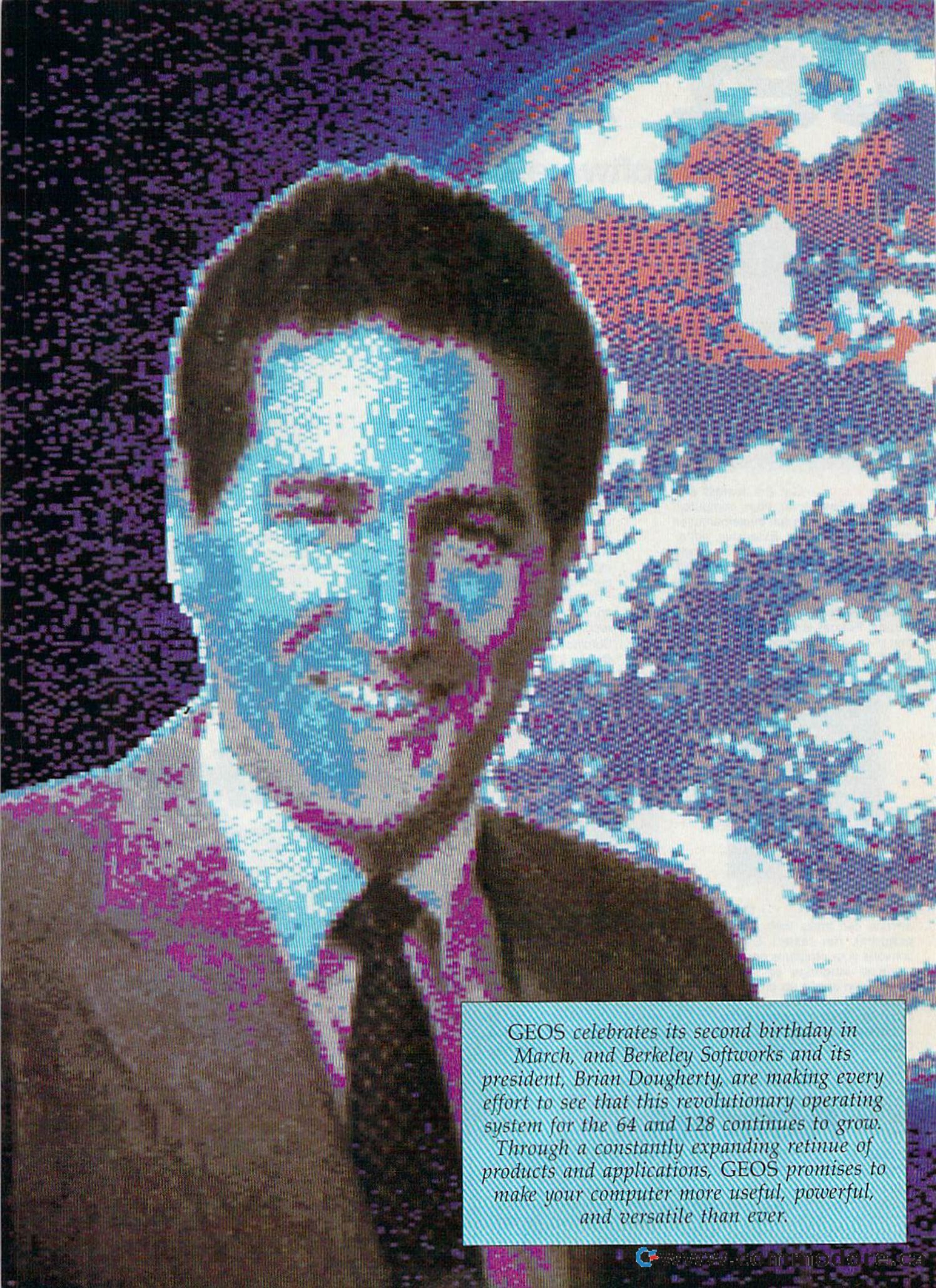
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GEOS celebrates its second birthday in March, and Berkeley Softworks and its president, Brian Dougherty, are making every effort to see that this revolutionary operating system for the 64 and 128 continues to grow. Through a constantly expanding retinue of products and applications, GEOS promises to make your computer more useful, powerful, and versatile than ever.

GEOS

Stretching The Boundaries

A Conversation With Brian Dougherty

Tom Netsel, Assistant Features Editor

In 1986, Berkeley Softworks introduced *GEOS (Graphic Environment Operating System)* for the 64. This powerful, graphics-based interface uses icons, windows, and pull-down menus to turn the 64—and now the 128—into a user-friendly system similar to the Apple Macintosh. *GEOS* attracted a lot of interest from the first, and its legitimacy was further enhanced by Commodore's decision to bundle *GEOS* with all 64C computers. As 700,000 *GEOS* users know, Berkeley didn't stop at the interface.

GEOS isn't static. It's a changing and expanding environment that was never meant to be a stand-alone system. Berkeley continues to add refinements and updates to *geoWrite* and *geoPaint*, its original word processing and drawing programs, and to develop new tools and programs that share data between system applications. In this interview, Brian Dougherty, president of Berkeley Softworks, discusses some of the changes seen in the past two years and what the future may have in store for the expanding universe of *GEOS*.

GAZETTE: In the first year of its release, *GEOS* sales were estimated at 450,000. What size is the base today?

Dougherty: We're at about 200,000 in sales from ourselves, and we expect Commodore's sales are well over half a million total 64s with *GEOS* installed.

GAZETTE: *GEOS* is now in version 1.3. Do you expect any more refinements or improvements?

Dougherty: There are improvements. We think we have all the bugs out, but we're adding additional capabilities. For example, a 1.4 version that will probably be released in early '88 will have additional support for things like the Commodore 1581 [3½-inch] drive. It has features that will take more advantage of the RAM expansion units and add just a couple of general improvements to the desktop.

We're constantly working on refining the operating system and the whole user interface to the operating system. We have to put enough improvements together

into a package to make it worthwhile to go through a whole upgrade. There's a fair amount involved in going through an upgrade phase. We need to change the inventory in the field as well as contact all of our registered owners to give them the upgrade software.

GAZETTE: When a new version comes out, do you contact all the registered *GEOS* owners?

Dougherty: We have a pretty substantial mailing list of *GEOS* owners who have sent in their registration cards, and we send out a flier to them letting them know they can upgrade. For example, when we came out with the 128 version, all the 64 owners who indicated they own a 128 were sent a brochure telling them about the 128 *GEOS* and that they could upgrade for . . . I think it was \$22, or something like that.

GAZETTE: How does *GEOS* for the 128 differ from the 64 version? Does it take advantage of the 80-column screen and the larger memory?

Dougherty: Exactly. There are a

We're constantly working on refining the operating system. . . .

couple of things it can do with more memory. For example, one of the problems we had with the 64 version was with people not understanding the concept of printer drivers. You had to have a printer driver on a disk that you wanted to print from. We got rid of that whole problem with the 128 version because there's enough memory to keep the selected printer driver memory-resident.

The big features that 128 owners benefited from were having 80-column support and taking advantage of the 1571 hardware protocol for transferring data from the disk—which made disk transfers even faster. I think those were the most notable improvements.

GAZETTE: What other after-sale support does Berkeley offer GEOS owners?

Dougherty: We do a substantial amount of customer service on QuantumLink [a Commodore-specific telecommunications service]. We run bulletin boards on Q-Link for every one of the products we have. We really prefer to handle customer service problems through Q-Link. At the price we sell our software—anywhere from \$29 and \$69—we really can't afford to have 20 or 50 people in customer service answering the phones. It's hard to handle all the customer service problems that are generated when you sell 200,000 units from a phone-call point of view.

If you look at companies that do have extensive customer service, they typically have more expensive packages. For example, *WordPerfect* has 113 people answering the phones, but when you charge more than \$450 for a product, you can afford to do that. We do have a phone line, and we're adding more people to the customer service phone support, but there's no way we can do a cost-effective job with the number of users we have just by phone support. So with Q-Link we have a

very efficient way of handling customer service.

GAZETTE: When people call Berkeley on the hotline, what question do they ask most frequently?

Dougherty: There are 10 or 20 questions that account for most of our customer service problems. They're usually printer problems or printer interface problems because there are so many different printers. We're now up to something like 30 different printer drivers, and each one will support several printers. So we have support for something like 75 to 100 different printers.

With that number of printers, people finding and selecting the correct printer driver to work with their printer is probably the most common problem. If somebody says he has a such-and-such printer, which may not be listed in our manual but does work with one of our printer drivers, that question might get asked over and over again on the phone line, but you only need to answer it once on QuantumLink. Somebody can look through the bulletin board and say, "Oh, yeah, here's somebody else that had the same problem I did, and here's the solution."

GAZETTE: In addition to having their questions answered, what are some of the GEOS programs people can download from QuantumLink?

Dougherty: We have upgrades and patches. For example, our *geoDex* and our *Graphics Grabber* program both had small bugs in them that we found out about after the products were released. They were very simple problems to fix, just something like an uninitialized variable. So via QuantumLink, we were able to download a patch program. You could download it and then run it, and it would fix the bug in your *geoDex* or *Graphics Grabber* program.

We also have LaserWriter screen equivalents for fonts you can download if you want to use the

Quantum Laser Writing service [a service offered by Berkeley for GEOS users who want to have material laser printed and sent back to them]. You can get screen equivalents for LaserWriter Times, Roman, and Helvetica fonts.

Even though the box says 1.2, since January 1987 we've been shipping the 1.3 version of the deskTop. But if you have the 1.2 software, you can get the 1.3 deskTop downloaded to you. There are a number of programs like that. There are also some little utility programs that have been done under GEOS that we've made available to the public domain.

GAZETTE: You released a number of applications during the past year, including *Deskpak 1*, *geoDex*, and *Fontpak 1*. Do you plan updates for any of these?

Dougherty: Actually, by the time this article is breaking, we'll be coming out with a combination pack that combines *geoDex* and the *Deskpak* software into one disk. It'll be a new *Deskpak*, and that version of *Deskpak* will work both with 64

We run bulletin boards on Q-Link for every one of the products we have.

and 128 software. So if you're running a 128 in 80-column mode, the desk accessory will automatically check for that and come up in 80-column. Or if you're running a 64, or a 128 in 64 mode or even 128 mode but in 40 columns, the desk accessory will sense which operating system you're running and come up in 40- or 80-column mode. We're also coming out with a *Fontpak 2* that will have just an enormous number of additional fonts. Both sides of a disk will be filled with interesting fonts for use with any application.

GAZETTE: What are you planning for *Writer's Workshop* or *geoPublish*? I know you took *geoWrite* and upgraded it to a 2.0 version for release with *Writer's Workshop*.

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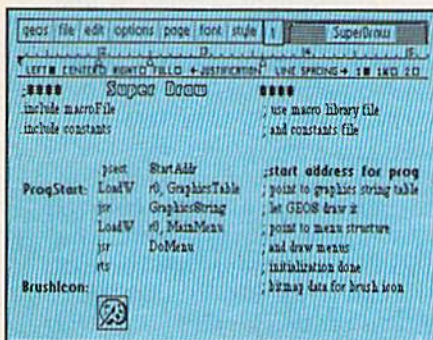
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The first three tools that any serious programmer needs are an assembler, a linker and a debugger. So we've installed all three, complete with sample GEOS applications that teach you the latest programming tricks in seconds.

geoAssembler not only reads directly from geoWrite files, but contains enough Pseudo Ops to



*Also available for 80 col. C128's.

allow all kinds of conditional assembles. It has all the state-of-the-art features you'd expect, including some you probably never thought possible. For example, integrating graphics is as simple as cutting and pasting the image from geoPaint directly into your program.

geoLinker ties your program modules together, supporting GEOS SEQ and VLIR applications and desk accessories. You can even use geoAssembler and geoLinker to create non-GEOS applications.

geoDebugger allows your program to be tested in memory with full symbolic disassembly, along with line assembly for patching code in memory. It also allows your code to be single-stepped or top-stepped, with sub-routines fully executed. It can stop a running program with one key, or use up to eight conditional breakpoints. When your program hits the breakpoint, it prominently displays the error in an overlay window, leaving the applications screen intact.

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Dougherty: We changed the name of *Writer's Workshop* to *geoWrite Workshop*, and that package should be well into distribution by the time this article appears. It has 2.1 *geoWrite* in it.

GAZETTE: What are some of its features?

Dougherty: The main addition to the 2.1 *geoWrite* is the ability to make a full screen-wide page. With *Writer's Workshop* up to this point and *geoWrite* 1.3 that came with *GEOS*, the maximum you could move the margins out were to within an inch of either edge of the page. But with the 2.1 version, you can actually go out to the edge of the page. You have a full eight inches viewable on the screen.

There have been a couple of other speed improvements, but that will be the most notable improvement to *Writer's Workshop*. And *geoPublish* will be coming out in a 128 version. Those are really the two major products for us right now. The 128 version should be out in the first quarter of '88.

GAZETTE: What's the status of *geoBASIC*? Is it still in the works?

Dougherty: Yes, in fact it should be released in February. From first talking about it, we've since gone back and asked, "What do we really want from this product?" We've really added a lot of extensive features to it, in addition to being a basic little support-all of the *GEOS* operating system calls.

There are all sorts of tools in it for constructing dialog boxes and menu structures for use in the *GEOS* environment, as well as a complete icon-based authoring tool. You could actually do an icon-based programming of BASIC programs. The idea is that people can develop modules that do very powerful things that they can provide to less-sophisticated programmers. And that whole module might be represented by a single icon.

It will allow people who don't have very much of a programming background to get into programming simply by stringing a few icons together that'll do some very global functions. It'll come out in a package whose working name right now is *geoPAT*, which stands for *Program Authoring Tool*. It will con-

***We think geoBASIC will be a terrific product
for the education market.***

tain both *geoBASIC* and this icon interface to *geoBASIC*. We think it will be a terrific product for the education market.

GAZETTE: Speaking of education, I've heard you're planning something called *geoNet* that can link a number of computers together.

Dougherty: Yes, last summer we demonstrated the first version of *geoNet*, networking IBM PCs and 64s together. It allowed another PC with a hard disk to be used as a file-server for up to thirty-two 64s that would be on this low-cost, local area network. Basically, it combined a ramdisk and the network hardware on a single card that could be plugged into the 64. But we've decided not to release that product until we come out with the Apple II version.

Since there's such a large installed base of Apple IIs in the school market, we figured that the right time to introduce the product was when we could go into schools that have Apple IIs, or a combination of Apples and Commodores, and allow everybody to communicate together. This is going to dovetail right around the end of January, because in February we'll introduce *GEOS* for the Apple II.

geoNet will come out shortly after that. It will allow Apple IIs and 64s to not only communicate over the *geoNet* network, but also actually share files, because the *GEOS* files will have the same file format on both the Apple and the Commodore. So if you take, for example, a *geoWrite* document on your Commodore and send it over the net to an Apple, a person using the Apple computer will be able to instantly read that file and add comments to it or do anything he or she wants with it. It's going to be a pretty exciting opportunity for us.

GAZETTE: Will *GEOS* for the Apple differ significantly from the 64 version?

Dougherty: There are a number of differences. *GEOS* for the Apple uses the basic ProDOS file structure, which is a hierarchical directory structure. So, while the deskTop looks very similar, there's the ability to make and change directories and a number of other features like that on the Apple version.

Then there are the applications. For example, on the 64, if you want to select a file from a different application, the dialog box comes up and lets you either switch disks or list all the files of that application. On the Apple version, since there's a hierarchical directory structure, it also gives you the option of changing to another directory to look for a file. There are a few subtle changes like that, but on the whole it'll look almost identical. People working on *GEOS* in the Apple environment or in the Commodore environment will have no problem switching between the two.

GAZETTE: A few companies have released applications for *GEOS*, but what's Berkeley doing to promote third-party support?

Dougherty: We have a technical special interest group on Quantum-Link, and there are a number of developers we've spoken with who are doing *GEOS* applications. We've just released a product—one that will be of enormous benefit to third-party developers working on *GEOS* applications—called *geoProgrammer*. This is a very sophisticated assembly language development environment for *GEOS*.

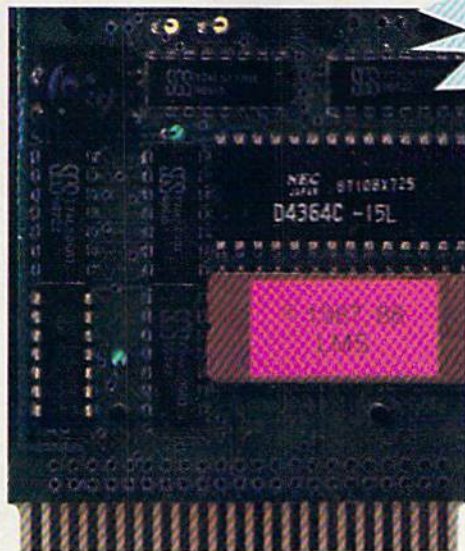
It consists of an assembler, a linker, and a complete symbolic debugger. If you're using RAM expansion, you're able to toggle between the symbolic debugger and your *GEOS* display screen. You can look at routines running in memory or you can set break points—all with symbolic labels exactly as they would appear in your listing. You can use any word processor you

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★★★★★ Read SUPER SNAPSHOT's 4 STAR review in INFO magazine (Jan. '88) "B+"... RUN, Dec. '87

To offer the most powerful utilities you must first have state of the art hardware. This is a fact that our competitor doesn't understand, which explains why they are offering their latest 'final' version based on the old style, ROM only, hardware. SUPER SNAPSHOT is the ONLY utility cartridge that incorporates a RAM chip AS WELL AS a large ROM. This is just one of the reasons why RUN magazine gave SUPER SNAPSHOT a "B+" rating (Dec. '87) while our competitor received only a "B" (Sept. '87). And INFO magazine gave SUPER SNAPSHOT a ★★★★★ rating while our competitor received only ★★★ (Jan. '88).

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The Expanding GEOS Environment

The GEOS world continues to grow. Commodore includes GEOS with every new 64C, and has dubbed the powerful software program the "official operating system for the 64." In just over two years, GEOS has grown into a complex network of products designed to enhance your computing experience. Here's a look at some of those products, most of which are in separate versions for the 128.

GEOS

The *Graphic Environment Operating System* comes on two double-sided disks and includes the GEOS Kernel and the *deskTop*, which convert the character-based operating system of the 64 and the 128 into one based on graphics. View files as icons and open, copy, delete, or sort them with a click of a mouse or joystick. Major applications include *geoWrite*, a word processor that offers 80-column text in a variety of fonts; and *geoPaint*, a full-featured drawing program and graphics editor. Other features include a built-in calculator, notepad, and alarm clock; enough printer drivers to support a multitude of printers; and a terminal program for QuantumLink, the Commodore-specific bulletin board service.

geoCalc

A spreadsheet for a variety of financial analysis needs—cost estimation, budget analysis, mortgage calculations, tax planning, or generating general financial statements. It provides basic arithmetic function to 12 places of accuracy in each of its 112 rows X 256 columns. It offers 9 places of accuracy for advanced functions, such as trigonometry, exponents, and logarithms.

geoFile

The GEOS-based data filing system in which information is organized and stored in "forms" that you design any way you want on the screen. After creating the form, simply fill in the blanks. Includes automatic sorting, keyword search command, and other powerful features.

geoWrite Workshop

A word processing package that features *geoWrite 2.1*. Features include full justification, line centering and spacing options, search and replace, header and footer options, plus LaserWriter support. It also includes *Text Grabber*, a program that converts files from other word processing programs into *geoWrite* format, and *geoMerge*, a mail merge program that generates form letters from *geoWrite* documents.

geoPublish

This desktop publishing program helps produce multiple-page, multiple-column documents, such as newsletters. It allows text and graphics to be mixed for creation of page layouts. Once a page is defined, text or graphics may be added or deleted without reformatting. Other features include automatic text adjustments, onscreen graphics tool box, and graphics placement.

geoProgrammer

This machine language programming tool provides the serious programmer with an assembler, a linker, and a debugger. The *geoAssembler* reads directly from *geoWrite* files and contains enough pseudo ops to allow a variety of conditional assemblies. Graphics can be cut and pasted directly from *geoPaint*; *geoLinker* ties program modules together and can be used with *geoAssembler* to create non-GEOS applications; and *geoDebugger* tests programs in memory with full symbolic disassembly, along with line assembly for patching code in memory.

Desk Pack

This revamped package contains four desk accessories and two applications to further enhance and refine your computing experience. *Graphics Grabber* transports clip art from other programs for use in the GEOS environment. An icon editor personalizes existing icons or creates originals. It also contains a calendar and appointment secretary to help organize schedules, and *Blackjack*, an authentic simulation of the card game. An electronic card filer, *geoDex*, stores names, addresses, phone numbers, and related information; *geoMerge* helps eliminate many repetitive tasks by merging data files created by *geoDex*.

geoNet

A low-cost local-area network designed for the educational market, *geoNet* allows 64, 128, Apple IIe, and IIc computers to be networked with an IBM PC, using the PC as a file and print server. Each student's workstation consists of a 64, 128, IIe, or IIc, and a *geoNet* interface card. Each interface card contains 512K ramdisk, network I/O card, and firmware to allow booting of the network. Files can be transferred to and from the PC, which is used as the teacher's workstation, with any student's workstation.

geoBASIC

A BASIC programming language that contains extensions for drawing and creating graphics. Contains a construction tool for creating menus, dialog boxes, and icon structures, which may be referenced by the *geoBASIC* program. Icons representing BASIC statements may be used, and a graph may be created showing program flow, with icons representing each step in the program.

Font Pack 2

This package contains 43 new fonts plus 10 of the most popular fonts from the discontinued *Font Pack 1*. It's designed for use with *geoPaint* and *geoWrite* to customize newsletters, reports, and fliers.

We've just released a product (geoProgrammer) that will be of enormous benefit to third-party developers working on GEOS applications.

want to create source files, but then you'd have to use *Text Grabber* to import them into *geoWrite*.

One of the powerful features of the development environment is that if you have graphics that you need to put in your program, like icon definitions, instead of having to develop the hex byte-pattern for the graphics, you can actually paste a picture into your source listing. The assembler will recognize that and generate the bytes in the object code. So it's a very powerful assembly language development environment for professional developers. We think that will make it a lot easier for third parties to develop GEOS applications.

We're also working on an improved programmer's reference manual. It will also have a section in it to cover porting programs between Commodore and Apple versions. We think that will be a big incentive for people to start supporting the GEOS environment.

A lot of people develop products for both Commodore and the Apple, and usually that means a complete rewrite to write a version for the other. But with GEOS support, since you're going through operating system calls for drawing graphics to the screen, a very minimum amount of programming is necessary. For example, here we're porting products developed for the

Commodore environment to the Apple environment in as little as two weeks.

GAZETTE: How about looking into your crystal ball and tell me what you see for GEOS in the future.

Dougherty: Well, the things we're willing to talk about now, we've pretty much covered. Things that are just coming onto the market now, like *Publish* and *Programmer*, and things that'll be on the market when this article appears, like *geoBASIC* and the Apple version of *GEOS*. And now there will be a tie between Commodore and Apple developers. That's a lot!

We do have other things that we're working on, but if something is more than three or four months away, we tend to keep it secret. I guess the one thing we're working on I can say is that we will have 128 versions for all of our major applications. So *geoCalc* and *geoFile* will have 128 versions probably around January, in addition to the 128 version of *geoPublish*.

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Report From Toronto:

The World Of Commodore

Neil Randall

While the Amiga drew its share of attention at this winter Commodore show, a host of significant new products for 64 and 128 owners was introduced. Here's a first-hand look at some new hardware and software.

December in Toronto.

The first covering of snow, the first collapse of the Maple Leafs, the start of the long wait for the return of the Blue Jays.

And for thousands of computer hobbyists, December in Toronto means the World of Commodore.

Since 1983, when the Commodore 64 was still the new kid in town, Commodore Canada has sponsored this all-Commodore exhibition. This year saw over 85 booths, including those sponsored by retailers and user groups, heavy hardware and software discounting, and—most importantly—demonstrations of new and recently introduced products.

For the first time, though, the 64 was not the star. In the past it has dominated the show, even after the introduction of the 128, even last year when the Amiga was on the rise. But this year the Amiga seemed to take over, with demonstrations of its new and glamorous software flashing from monitor after monitor. Even so, and despite grumbling from some quarters, 64/128 owners were anything but ignored, as seminars, stage shows, and new products kept their interest alive.

Productivity And Applications

Berkeley Softworks demonstrated its GEOS line, with *GeoFiler 128*, *GeoPublish 64*, and *GeoProgrammer 64* taking center stage. *GeoPublish* is a desktop publishing package for the 64 (to be released later for 128), featuring Berkeley's usual friendly interface and both simple and advanced features. Within the 64's limits, and the limits of the user's printer, the program produces very good copy and seems especially well-suited for classroom use.

GeoProgrammer (again for later 128 release) combines *geo-Assembler*, *geoLinker*, and *geo-Debugger* to provide a solid programming environment for serious GEOS users. According to Dana

Gale of Berkeley, *GeoProgrammer* will also appeal to regular GEOS users who are beginning to feel confident about producing their own software, tailored to their own needs.

The success of the GEOS system depends on not only Berkeley's support, but also on third-party support. To this end, CDA (Yreka, CA) has announced *Neofont*, a collection of 23 font styles in four different point sizes. The fonts are usable on all applicable GEOS packages.

Supporting GEOS as well was *BeckerBASIC*, a new programming package from Abacus (Grand Rapids, MI). Designed for users of BASIC, this program allows you to create GEOS applications. It includes over 270 commands, with 10

for cursor control, 20 for drawing, 35 for sprite animation, and nearly 20 for sound. The program also lets you construct pull-down menus and dialog boxes.

Also from CDA for the 64/128 comes *The Graphics Transformer*, an extremely handy device that lets you convert graphics pictures to the format of other graphics programs. This package allows you to create graphics with the drawing package of your choice and then move them to programs perhaps more useful for enhancement or printing.

Electronic Arts announced more new 64/128 packages than any other publisher. Among productivity programs, soon to be released are *Paperclip III* and *Outrageous Pages* (from their Batteries Included line). Already out is *Mavis Beacon Teaches Typing* (from the Software Toolworks line). *Outrageous Pages* promises to provide competition for *GeoPublish*, as well as Timeworks' new *Desktop Publisher*, with powerful graphics tools, the ability to flow text around graphics, and several templates and clip-art selections. *Paperclip III* takes the popular word processor a step farther with a telecommunication module, expanded spelling checker, and support for a ramdisk. *Mavis Beacon Teaches Typing* is a typing tutor with a difference: The fictional Mavis guides you through the lessons, in as friendly a manner

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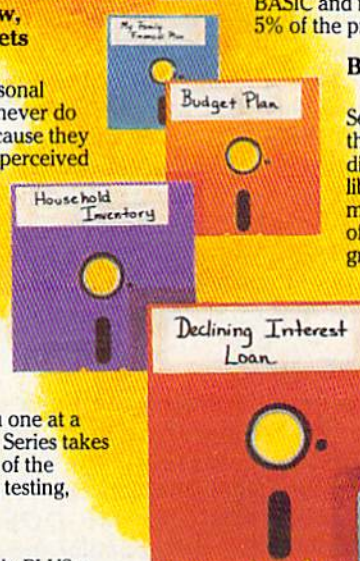
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"The World of Commodore," held annually in Toronto, is an important showcase for new products. This year's gathering did not disappoint.

as a computerized teacher has ever used. The idea is that she will customize lessons for you, depending on your progress, and you can even see how she does it. EA's Ken Tanenbaum was proudly distributing the *New York Times'* glowing review of the program, which says the package is the best typing program they've seen.

Peripherals

The show featured several displays of 64/128 hardware peripherals, but not much was actually new. One item was Xetec's *Super Graphix Gold*, a printer interface with a built-in 32K buffer, 16 dip switches, screen-dump capability, and many other features. It supports fast serial on the 128, with an accompanying disk that contains 40 usable fonts.

Bodylog's large booth drew constant attention from customers fascinated by its health and relaxation software. The company is constantly adding to its unique line, with such products as the *Step-In-Time Machine*, the *Enhanced Stress Reduction Package*, and the *Cardio Exercise Package*. The latest is *Heartlab*, which includes a pulse-rate sensor and applications that convert your heart signals into sounds, animations, and even games.

Multi-Link (Unionville, Ontario) demonstrated its classroom-oriented networking system for the 64/128. The Multi-Link central board connects your 64 or 128 through a 20-megabyte hard drive (included) to as many as 48 other 64s or 128s. Students can talk to one another or interact with the teacher (who operates the control device). Of course, all of this access is limited, to keep students from spending too much time talking to one another; and individual machines can be disengaged from the network and operated as stand-alone devices. Students can work on separate programs or the same programs, and the control device can operate a program without the teacher's actual presence. At over

\$3,000 for a ten-station system (not including the computers themselves), the system is far from inexpensive, but its educational potential is strong.

Games

The 64 is still regarded as the best game machine available, and the best games continue to be developed for it. While few new games made their debut at the show, a number were announced for release within a few weeks.

Most of them came from Electronic Arts. SSG's *Halls of Montezuma* (already released) expands the popular Battlefront system, while *Great Battles of the American Civil War* will soon follow. *Bard's Tale III* (fantasy role-playing) is due soon, as is *Skyfox II* (player-perspective air combat), *Strike Fleet* (naval strategy and combat), and the intriguing *Skate or Die* (professional skateboarding; reviewed in this issue)—all from Electronic Arts.

The PC 10-III

Commodore's major announcement was the introduction of the PC 10-III, its latest in the PC-compatibles line. The concept behind the 10-III is an MS-DOS system with the most popular features built-in, thereby preventing the buyer from having to spend extra money right off the bat.

The 10-III is XT-compatible and contains 640K RAM, two 5¼-inch drives, and graphics capabilities in the main board. With software-controlled running speeds of 4.77, 7.16, and 9.54 megahertz, a socket for an 8087 math coprocessor, and a built-in XT hard disk interface, the PC 10-III makes up for its inclusion of only three expansion slots. There is room internally for a half-height hard drive.

The Amiga

The star of the World of Commodore was unquestionably the Amiga, with 1000's, 500's, and 2000's everywhere. Software

ranged from arcade games (Discovery Software's *Arkanoid*) through new word processors (Abacus' *TextPro* and The Disc Company's *KindWords*) and other productivity tools, all the way to professional sound programs (SoundQuest's Editor/Librarian series), video programs (Byte By Byte's *Sculpt 3D* and Aegis Development's *VideoScape 3D*), desktop publishing programs (Gold Disk's *Professional Page*), and even a pairing generator system for commercial airlines (Airware's AWS-1000). Much of the software was clearly aimed for use by professionals, an emphasis that Commodore itself seemed to stress throughout.

And What Of The 64/128?

In an interview after the show, Stan Pagonis, director of marketing operations for Commodore Canada, explained the reasons for the show's Amiga orientation. "Because we believe the Amiga is our future," he said, "we're going to concentrate on it." Even so, he emphasized that the multidisplay Commodore area contained a balance among Amiga, 64/128, and PC exhibitions, and that the seminars and stage shows continued this balance.

Certainly the 64 and 128 were well-represented in the seminars, and on the stage were many software and hardware demonstrations for these machines. But on the floor itself, the Amiga was king.

What of Commodore's commitment to the 64? Despite the almost inevitable rumors circulating about Commodore pulling the plug on its most famous eight-bit machine, Pagonis stressed that the 64 was still here and that it won't die. He believes that people continue to buy the 64 because of the wealth of programs produced for it, the most, in all likelihood, for any single home computer.

More important, 64 software is getting better all the time.

The underlying message is quite clearly this: Commodore will push the Amiga with all its strength, but as long as the 64 continues to be bought, it will continue to hold a significant place in the world of Commodore. And as long as developers are willing to support it, that place will continue to be substantial. ■

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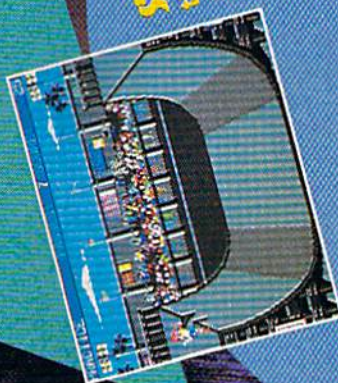
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On the heels of the 1990 state skate events, about 500 skaters from all over the state gathered at the skate park in the square off the north side of the park. The two skaters up



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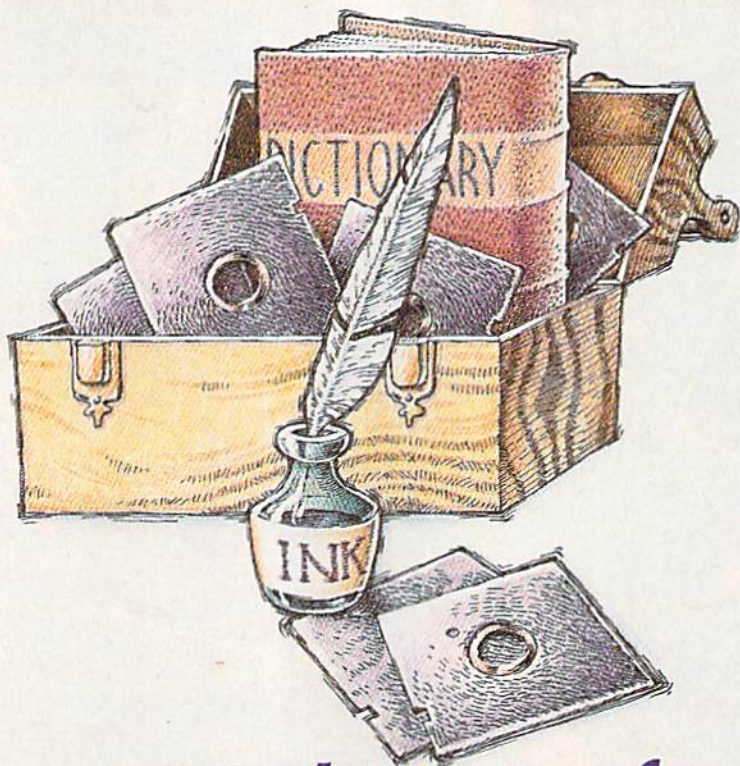
Spiegel: "Right out front, he [David Byrne] says, 'I don't want to be a poster boy for the dam and joint.' Every package I put together sticks in [Byrne's] mind."

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Super CP/M Software For The 128

Part 1: Writer's Toolbox

Clifton Karnes, Assistant Editor

If you're new to 128 CP/M or you're thinking about exploring it, then you'll find this article—the first in a two-part series—an excellent introduction to some of the best available software. If you're a 128 CP/M veteran, you may discover some exciting products you've overlooked.

The most amazing thing about the Commodore 128 is that it can run in four different modes, each under a different operating system: 64, 128, CP/M, and GEOS. Most 128 users are familiar with the 64 and 128 modes of their machines, and GEOS is becoming more popular each day, but what about CP/M? With all the impressive competition from the other modes, what does CP/M offer the 128 user?

CP/M allows a 128 owner to access a vast collection of well-tested public domain and commercial programs, especially in two key

areas—writer's tools and programmer's tools. Writer's tools include word processors, spelling checkers, grammar checkers, and so on. Programmer's tools are programming languages, text editors, assemblers, and the like.

In this first installment, we'll explore outstanding CP/M products for writers. Included are discussions of two word processors, two spelling checkers, and a grammar aid. Next month, we'll explore 128 CP/M programmer's tools. Let's get started by taking a look at CP/M word processors.

WRITE

It's a well-established fact that microcomputer owners use their computers more for word processing than anything else, and Commodore users are no exception. While 128 CP/M users have several word processors to choose from, two stand out from the rest. One is the classic *WordStar*. The other is a little-known but powerful package called *WRITE*, available from Workman & Associates.

WRITE (Writer's Really Incredible Text Editor) has an interesting history. It was originally developed for professional creative writers and has been used by many of these writers in both prerelease and commercial versions for years. *WRITE* users are often fanatical about its virtues. Arthur Naiman, to give just

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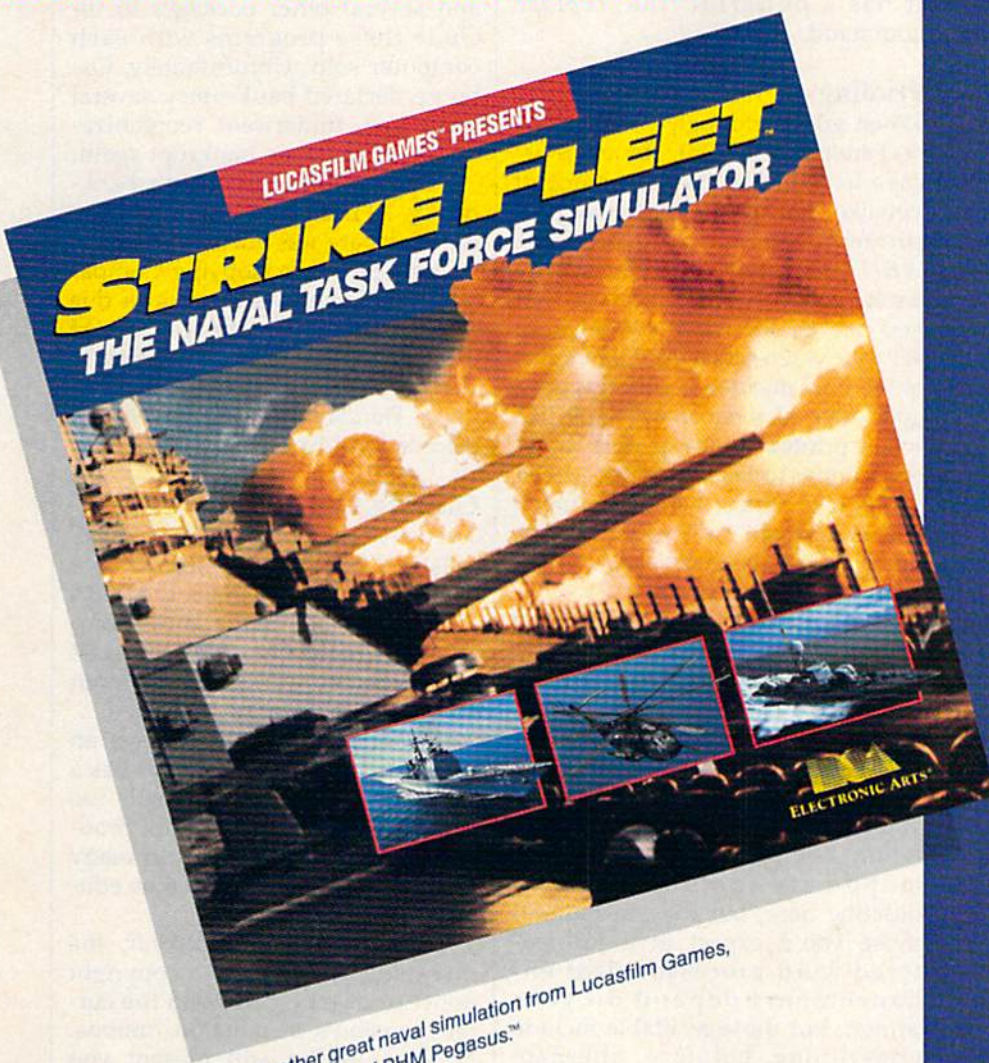
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one example, wrote his definitive book *Introduction to WordStar* with *WRITE*. Let's see what's behind the enthusiasm.

The first thing you'll notice about *WRITE* is its small size—under 22K. The entire program, along with your text, resides in the 128's memory. Since *WRITE* is memory-resident, it's fast. Because it's small, you can easily use it with a one-drive system: You load the program, remove the disk, insert your data disk—and you're ready to go. Because most 128 users have single-drive systems, this is an important feature.

In Action

You can invoke *WRITE* with or without specifying a filename. If the filename option is used, the program moves directly to the editor with your file in memory, ready to edit. If you invoke *WRITE* without a filename, you'll find yourself in what's called the *disk block*.

The disk block is *WRITE*'s outer sanctum. With its menu commands, you can do all the usual file operations: save, load, print, get help, and exit. In addition, there are several disk commands, including those to view a sorted directory, kill files, rename files, set the user number, and change drives.

The disk block also displays the number of bytes free and number of files unused on the logged-in disk, the workspace in memory available, and the number of words in the current text. You can also set tabs, change the width of the video display, and clear all or part of the workspace.

Hitting the Escape key will take you from the disk block to the edit block, where you enter text. You'll find the screen completely clear—no column numbers, line numbers, vendor's names, menus, or other distractions. The only thing *WRITE* places on your screen—except for your text—is a guide showing the tab settings, and even this is optional. *WRITE* leaves about 37K free for text. Files larger than this can be linked—a procedure with which most Commodore users are familiar.

WRITE's editing commands are single control-character sequences and are well thought out. All the normal cursor-movement commands are provided, and some

have nice features. The home command, for example, will move the cursor home if it's not there and to the bottom of the screen if it's in the home position. The move-to-the-beginning-of-the-line command works on the same principle.

Another handy editing feature is the overwrite-to-insert mode change. When you switch to insert mode, instead of seeing the usual translucent flashing block, the cursor becomes solid with an arrow in it. This is extremely useful: You always know which mode you're in without cluttering the screen with messages.

In addition to the usual cursor-movement and editing commands, *WRITE* can copy and delete marked blocks (to move text, you simply copy it and delete the original), and it has a powerful *find/replace* command.

Printing

When you're through entering text and are ready to print, you press Escape to return to the disk block. If you like, you can preview what your printed document will look like. *WRITE* is not a what-you-see-is-what-you-get word processor, but you can use the width command to set your video screen to the margins of the final document and thus get a good idea of what it will look like when printed. Many people, however, prefer to take the video screen on its own terms, getting as much text as they can on it without being distracted by page breaks, double-spaced lines, and so on.

To print, select the print option from the disk block. This takes you to the print block menu where you'll see a list of print and format options. You can change print options—like margins—on the command line just before printing, or you can embed them in your document. The printing format commands are too numerous to describe here, but they include all those you'd expect in a full-featured word processor. Text enhancements depend on your printer, but those available include underlining, boldface, alternate character sets, superscripts, subscripts, and additional fonts.

WRITE is consistently intelligent and considerate. As a word processor for the CP/M mode of the 128, it's a strong contender.

WordStar

WordStar is considered by many to be the most famous piece of software ever written. When the 128 first arrived, many owners looked forward to being able to use this classic in their 128's CP/M mode. Unfortunately, most found a CP/M version of *WordStar* either impossible to obtain or prohibitively expensive. But in a strange twist of fate, this venerable text cruncher is again readily available, and at a bargain price. Here's a little background.

Adam Osborne started the practice of bundling software with his company's microcomputers. The Osborne Computer Company made arrangements with the owners of *WordStar*, MBASIC, CBASIC, and several other packages to include these programs with each computer sold. Unfortunately, Osborne declared bankruptcy several years ago, underwent reorganization, and has gone bankrupt again.

As a result of Osborne's bankruptcy, all its in-house stock of bundled software was auctioned. Public Domain Software Copying Company (PDSC) purchased much of this software and is offering it to CP/M users at bargain-basement prices.

One of the titles PDSC is offering is *WordStar*, and, at \$39.95, its price is hard to argue with.

Gearing Up

The version of *WordStar* that PDSC sells is 2.26. It's preconfigured for the Osborne I, and since the 128's CP/M terminal emulation is compatible with the Osborne's, the supplied version works fine without any initial installation.

WordStar is in many ways an easy word processor to use. It has a large number of commands (as you'd expect with a powerful product), but the program has so many help screens and menus that editing is surprisingly easy.

When you run *WordStar*, the first thing you'll see is a copyright notice and some details on the current version's installation options. Pressing Return will present you with a menu of disk commands and a directory of files on the logged-in disk. You can create a document (using *WordStar*'s special format codes), create an ASCII text file, use MailMerge (included with *Word-*

T · H · E EVOLUTION OF THE PAPER CLIP



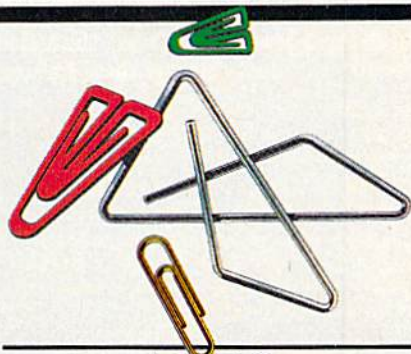
1900

Norwegian inventor, Johann Waaler, patents the paper clip in Germany. The metallic device allows one to attach sheets of paper together.



1950

By virtue of its sheer, simple power, Waaler's paper clip endures to become an indispensable item for both the home and office.



1970

While computers diminish paper flow, new-fangled variations of Waaler's paper clip emerge in an array of sizes, shapes and colors. Evolutionary note: When man can no longer invent, he must improve.



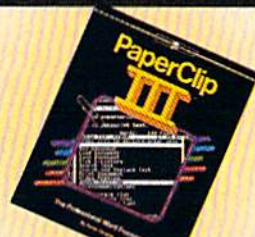
1982

Batteries Included invents a powerful word processing program for Commodore® users—PaperClip®. Compatible with virtually every popular printer, PaperClip provides users with fast, flexible editing and formatting freedom.



1986

PaperClip II becomes the #1 best selling C128® word processing program. Added editing and formatting features include word-wrap and an 80-column screen mode. Built-in telecommunications and a spelling checker make the second generation a supreme package. Omni Magazine calls PaperClip II "the Cadillac of word processors."



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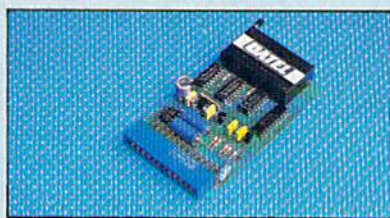
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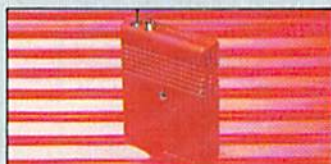
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Star), turn the file directory on or off, change the logged disk drive, run a program, set the help level, exit to CP/M, print a file, delete a file, copy a file, or rename a file.

If you choose to edit a document, you'll be guided through the initial steps, and finally find yourself in *WordStar's* editing screen. The top third of the screen will contain a menu of editing commands with all the one-control-character commands defined. To see the definitions of the two-control-character commands you simply type the first control character and wait. *WordStar* will place a help menu of this command at the top of the screen.

The *WordStar* command structure has become a standard in the microcomputer community, and most word processing and text editing packages either use it or support it. Learning *WordStar's* commands may take some time, but it certainly has its benefits.

Probably the most important command for a beginning *WordStar* user is Control-J, which displays the Help menu. One of the options you can select from the Help menu is to set one of *WordStar's* four help levels.

- 3 Displays all menus and explanations.
- 2 Suppresses main editing menu.
- 1 Also suppresses prefix menus.
- 0 Also suppresses command explanations.

The default Help level is 3, and it's a good idea to use this level until you're familiar with the commands. As you feel more at home with *WordStar*, you can gradually dispense with levels of help until you find a level with which you're comfortable.

WordStar comes with all the editing commands you'd expect in a high-quality word processor. If fact, if you've used another word processor, *WordStar* will probably seem familiar since it helped set the standards.

When you've finished editing your document you can return to the main editing menu and save the file, print it, or perform any of the tasks mentioned earlier.

WordStar comes with the original Osborne documentation, which is complete and easy to use. One notable section helps you patch *WordStar* to create a custom printer driver. (Patching a program involves changing certain bytes to

make it perform differently.) The documentation package even includes stick-on key tops with *WordStar* commands on them to make using the word processor easier.

On the negative side, *WordStar* is highly disk-intensive and for this reason is somewhat slow. And it really can't be used on a one-drive system, though one drive and a Commodore RAM expansion module (1700 or 1750) would give excellent performance.

WordStar has much to recommend it. It is a solid product—a standard with which you'll probably be glad you're familiar—and it's available at a price that's hard to resist.

Spelling Checkers

If word processing is the most-used microcomputer application, then spell checking can't be far behind. And next to word processing, having a computer check your spelling is one of the most exciting benefits of the microcomputer revolution. There are two excellent products to recommend in this category: One is the commercial CP/M version of *The WORD Plus* from Oasis, and the other is a public-domain program, *SPELL*.

The WORD Plus

First, *The WORD Plus* is much more than just a spelling checker. It's a collection of writing tools. The spelling checker itself is a combination of four programs working together—TW, *SPELL*, REVIEW, and MARKFIX. *SPELL* uses a 45,000-word dictionary to locate errors, REVIEW makes correcting them easy, MARKFIX actually makes the corrections, and TW orchestrates the whole ensemble.

If you're familiar with spelling checkers, you'll feel right at home with *The WORD Plus*. You simply tell the program the name of the file to spell check, and it displays, one by one, each word not found in its dictionary. When each word is displayed, you have several options. You can update the dictionary (that is, add the current word to it), mark the word (to decide about it later, for example), discard the word (pass over it with no action), correct the word, view the previous word, look at the next word, look up the word in the dictionary, view the word in

context, or resume your review.

In addition to these spelling tools, *The WORD Plus* contains several other writer's aids, including HYPHEN, FIND, ANAGRAM, LOOKUP, DICTSORT, and WORDFREQ.

HYPHEN reads a text and automatically inserts hyphens into long words. If you're preparing text to be used in columns—in a newsletter, for example—then this can be very handy.

FIND, ANAGRAM, and LOOKUP offer three ways to access *The WORD Plus's* massive dictionary. LOOKUP finds words for you in the dictionary, FIND is a tool for crossword-puzzle enthusiasts, and ANAGRAM finds anagrams in a text.

The last three tools in *The WORD Plus*—WC, DICTSORT, and WORDFREQ—all perform house-keeping duties. WC counts the words in a document, WORDFREQ generates a list of the words used in a document along with a count of how often each is used, and DICTSORT alphabetizes your own custom dictionaries.

There is little to complain about with *The WORD Plus*. It is an extremely powerful set of writer's aids that anyone serious about writing should consider.

SPELL

If you're interested only in a pure spelling checker and don't need an industrial-strength application like *The WORD Plus*, then the public domain *SPELL* may suit you well.

Using *SPELL* is easy: Just tell it the file you want to check and it compares each word in the text with its own dictionary and a user-defined dictionary—if one is on the disk. Words not found in either dictionary are marked with a CONTROL-@ (the marking character can be changed if you wish).

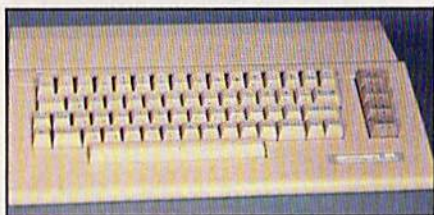
SPELL's dictionary is not quite as large as *The WORD Plus's*, but it gets high grades for performance. In fact, *The WORD Plus* notwithstanding, *SPELL* is better than many commercial products. (It also comes complete with Z80 assembly language source code.)

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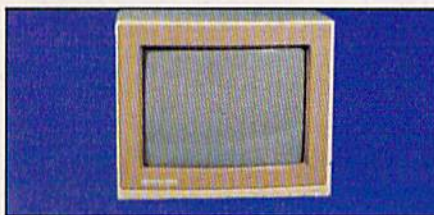


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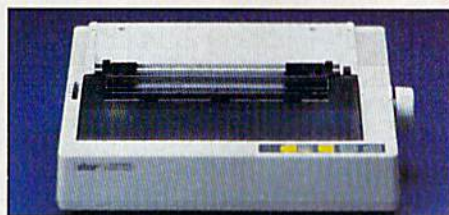
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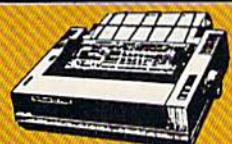
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spelling errors with spelling checkers, but it can also check your grammar and style. *Punctuation + Style* from Oasis (the makers of *The WORD Plus*) can save you from committing hundreds of stylistic inelegances and from just plain making mistakes.

P+S is really two programs, CLEANUP and PHRASE. CLEANUP finds a multitude of punctuation errors: missing punctuation, extra spaces, missing capitalization, incorrect capitalization, unbalanced quotation marks, double words, and a host of other errors.

PHRASE helps you with your writing style. The results are impressive, but the idea behind PHRASE is simple. PHRASE works just like a spelling checker, but instead of using a dictionary of *correctly* spelled words, it has a dictionary of commonly *misused* phrases. It attempts to match these phrases with those in your document, marks the ones it finds, and adds an explanation of each error.

What does PHRASE think constitutes poor style? First, it marks all use of the passive voice. Generally, writing that avoids the passive

voice is stronger and more energetic. PHRASE also marks phrases that are awkward, clichéd, erroneous, folksy, muddy, pompous, redundant, or wordy. And, just like a spelling checker, you can add your own problem phrases to the dictionary or delete those it already contains.

P+S doesn't change anything by itself—you still have complete control over your writing—and occasionally it makes a silly mistake, but it is guaranteed to improve your writing style.

An Investment

You may have noticed that CP/M software is more expensive than its 64 and 128 counterparts. There is, however, one factor worth considering when you're trying to decide whether or not to purchase CP/M products.

If you ever replace your 128 with an IBM PC, or if you use a PC in addition to your 128, there are emulators that will allow your PC to run most of your 128's CP/M products. One package, *Media Master Plus* lets a PC read MFM CP/M-formatted disks, and—with the

package's emulator, ZP/EM—run CP/M programs. No emulator will run everything, but emulators will run most CP/M software, which means your investment is not lost if you move to a PC.

WRITE

Workman & Associates
1925 East Mountain St.
Pasadena, California 91104
\$99.95

WordStar 2.26 (with MailMerge)
Public Domain Software Copying Company (PDSC)
33 Gold St.

New York, NY 10038
\$39.95

(Be sure to ask for double-density disks.)

The WORD Plus—\$150
Punctuation + Style—\$125
Oasis Systems
6160 Lusk Blvd., Suite C-206
San Diego, CA 92121

SPELL

public domain

Media Master Plus
(for the IBM PC and compatibles)
Intersecting Concepts
80 Long Ct., Suite 1A
Thousand Oaks, CA 91360
\$59

User Group Update

Mickey McLean

This list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1987 issues.

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Send typed additions, corrections, and deletions for this list to:

COMPUTE! Publications

P.O. Box 5406

Greensboro, NC 27403

Attn: Commodore User Groups

User Group Notes

The **Columbus Commodore 64/128 Club** of Mississippi has moved. Its new address is 504 N. 20th St. East, Columbus, MS 39702.

The Secretary and address have changed for the **Hedland Commodore Computer Group**. David Warren is the new contact person and the address is P.O. Box 2551, South Hedland 6722, Western Australia.

New Listings

NEW JERSEY

Toms River Commodore Users Group, 981 Cedar Grove Rd., Toms River, NJ 08753

NEW MEXICO

Los Alamos Commodore Users Group, 4125-D Sycamore Dr., Los Alamos, NM 87544

WASHINGTON

Covington Commodore 64/128 Club, 26232 173 SE, Kent, WA 98042

Outside the U.S.

CANADA

Chilliwack Commodore Computer Club, P.O. Box 413, Sardis, British Columbia, Canada V2R 1A7

COLUMBIA

ComSoft Commodore User Group, D.F. Cardenas, Apartado Aereo 9872, Cali, Columbia, South America

Skate Or Die

Rodney owns the Skate Shop in the middle of the town square, but don't expect to see this tattooed dude at Chamber of Commerce luncheons. He's too busy organizing skateboard competitions for Electronic Arts. Maybe competition is too polite a word for the action that goes on outside Rodney's shop. As his son Lester says, "You don't compete, man, you skate or die!"

Check out the title screen and let Rob Hubbard's opening theme put you in the mood while you slip on your knee and elbow pads. You're going to need them. Hit the fire button, and you're in Rodney's Skate Shop. Push the *Skate or Die* pointer around with your joystick, and Rodney will give you a few skating tips.

This is where you sign up to compete. You have the option of challenging a computer opponent or, if you have two joysticks, challenging up to seven other players. Move the pointer to the clipboard and press the fire button to sign up. Then type in your name. Click on the skateboard hanging on Rodney's wall, and select your favorite board color. Click on the trophy in his shop to see who has racked up the highest scores. While you're browsing around, check out Rodney's tattoo and hair style, but don't stare at his nose. He's a little sensitive about it.

If your skating's suspect, it's highly recommended that you Go Practice when you leave the Skate Shop. Nobody keeps score, and it gives you a chance to get the feel of the board before you meet Lester and the other locals. When you're ready to jam, skate down a street that's spray painted with the event's name. You have a choice of Freestyle, Highjump, Jam, Race, Joust, and Compete All.

Once you're on a board, push the joystick forward to move in the direction you're facing. Pull back to slow down or stop, and lean the stick left or right to turn. Sounds simple, but left and right lost all meaning as I shot out of the Skate Shop, smashed into a curb, and stumbled backward into my first event.

The Freestyle Ramp is wide, smooth, and U-shaped. There's also a big crowd of people watching your every move. You get ten passes to execute

exciting kickturns, aerals, handplants, and slams. (The last is what you do if you fail any of the first three.) Hit the fire button in a "pump zone" to build up speed, put a deft hand on the joystick, and you'll be executing crowd-pleasing stunts. A word of warning: Lean the joystick with a delicate touch. Push too hard and you'll fly off the ramp and splatter in front of the crowd. If you miss a 360, you'll slide to the bottom of the ramp on your knees. (Knee and elbow pads help, but nothing soothes the ego like a perfect 720.) A click of the fire button puts you back on your board, ready to drop in again.

Handling the stunts can be pretty tricky, but the documentation explains all you need to know as long as you're willing to practice. If you get rattled and the music gets on your nerves, the

Even if you wouldn't be caught dead in baggy shorts and red tennis shoes, Skate or Die is a fun, action-packed game that's injected with a large dose of zany humor.

Commodore key toggles it off and on. (I think the music adds a nice touch, though—it compliments the action.)

You won't need much skill at the High Jump. Just move the joystick rapidly in one direction to build up your speed as you go up and down the ramp. You have five passes to see how high you can go. Hit the fire button at the highest point of your jump to record your score. You can take a breather while you're in the air, but if you don't wiggle the joystick, you'll coast to a halt. The fire button won't get you back on top this time. You've got to wiggle that stick to get out.

Try the Downhill Race when you want to practice on your own. There's no crowd this time: just you, your board, and a paved path in a park. As you race the clock, you can save time



and pick up bonus points by skating under, over, and through various obstacles. Get radical! Nobody says you have to stay on the path, but watch out for gravel, grass, and—say, is that a shark fin in the water? While you can cut the music off and on, the programmers left in the grunts, groans, and splashes that accompany your missed tricks.

Skate or Die gives you the opportunity to try out a couple of skating styles: Regular or Goofy foot. You can control your speed and direction with the joystick. A click while you're turning gives you a "slide turn," a faster way to go around corners. You can duck and jump—just remember which control is which. More than once I jumped smack into a barrier.

When you feel comfortable skating, jumping, and ducking, leave the park and head into town for a Downhill Jam. Things aren't as nice there as they were in the park. Trash cans, soda cans, open manholes, and fences get in your way. And then there's Lester.

He (or your buddy, if you have one on the other joystick) is waiting to clobber you. Click and lean the joystick in the direction you're facing to fight back with high, low, or middle kicks. Don't get so involved trying to knock Lester off his board that you skate full-speed into a chain-link fence, or you might strain yourself. (Pun intended.)

If you get past the police at the end of the run, head out to an empty swimming pool for a little Pool Joust. It's like a game of tag as you skate from one side of the pool to the other, but the one who's "it" has a boffing stick. You know what a boffing stick is—Rodney has one hanging in his shop.

If you don't have your own opponent, you can choose from the comput-



er's locals. Poseur Pete likes to comb his hair a lot and look good for the betties (women). He's supposed to go easy on you, but I still kissed a lot of concrete trying to clobber him. Aggro Eddie is pretty good competition when you've learned a trick or two. And then there's Lester.

You get five passes at your opponent, and then the stick changes hands. The first one to get three hits on the other wins. One negative note here. When I'm lying nose down in the bottom of the pool, I hate the sound the stick makes when the winner swishes it over his head in a victory celebration.

After you've had a taste of each event, go back to the Skate Shop and sign up for competition. You can go back any time by pressing the RUN/STOP key. When you're ready to show your stuff, you can go to any event you like. Top scores and standings are recorded automatically. Head for the street marked Compete All to tackle the events in sequence. Both sides of the disk are used, but the computer guides you through each of the five events with prompts.

Even if you don't know an ollie from a handplant, and you wouldn't be caught dead in baggy shorts and red tennis shoes, *Skate or Die* is a fun, action-packed game that's injected with a large dose of zany humor. The animation is good, the music is hot, and even if you are a master at backside aerials, you're not going to slam Lester without a few hours of practice. So strap on your helmet, pull on your pads, get on that board, and do something radical!

—Tom Netsel

Skate or Die
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
\$29.95

The Maxx-Out Series

For software producers, a recent trend has been the establishment of an "oldies-but-goodies" line. Usually, it is combined with a new title, and the entire line sells for about half the price of the company's premiere products. This is rather like publishing paperback books after an entry has run its hard-cover course. A title can be brought back in a less expensive edition.

Besides the obvious advantage of price, this strategy serves the purpose of rescuing classic offerings and presenting them to a new generation of computer users. Previously, software was thought to have a finite shelf life. A hot title might be available for six months, but when sales slowed, no more copies were published. As a result, new computer owners never had the opportunity to purchase such early classics as *Gorf*, *Choplifter*, *Gridrunner* and others from the distant (three years ago) past.

For Epyx, it was not enough simply to buy rights to whatever was still available. The new line of games under the Maxx-Out label is unified by common themes. The first is price, with each entry carrying a suggested list price of \$24.95. Second, they are geared toward a younger audience, those in the 12- to 15-year-old bracket. Third, the releases

The Maxx-Out series is unified by common themes: price, each \$24.95; market, ages 12 to 15; and genre, arcade-style games—both classic and new releases.

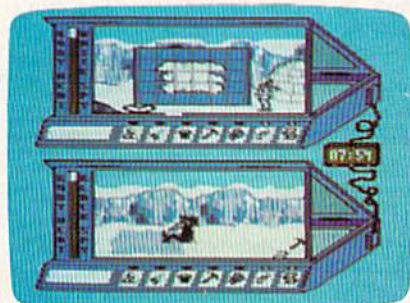
are a mixture of classics and new productions.

Launched with three titles, the Maxx-Out line is packaged in real boxes rather than plastic pegboard folders. This move allows Epyx to include real instruction books as well as literature on the rest of their line. Of the three titles, *Rad Warrior* is new, *Boulder Dash Construction Kit* is based on a classic, and *Arctic Antics* is the third release in the *Spy vs. Spy* series (the first two were originally published by First Star Software) that was inspired by characters from *Mad Magazine*.

In any event, *Arctic Antics* is a split-screen game that can be played against the computer or against a friend. The latter option requires two

joysticks. The upper screen controls the actions of the white spy, while the lower controls the actions of the black. If you've ever been a fan of *Spy vs. Spy* in any form, you'll know that each spy's primary mission is to foil the other by fair means or foul.

That goes a long way toward explaining why such a simple scenario results in a game that can be won only with difficulty and perseverance. This time, the spies are trapped on an arctic ice flow, and the only way to safety is by means of a one-man rocket under the ice. To take possession of it, you'll need to collect four critical items that are lying about, descend into the rocket's silo, and blast off.



Spy Vs. Spy III: Arctic Antics

Among the hazards are a polar bear who lives in the silo, the fast dropping of your body temperature (which can be raised by visiting an igloo), and, of course, the other spy—who is doing everything he can to stop you while implementing his own plans for being the sole survivor.

Boulder Dash was always one of the more popular incarnations of the computer maze game. *Boulder Dash Construction Kit* allows you to build your own tunnel systems if you tire of (or conquer) the 15 preexisting caves.

Played by one or two players, *Boulder Dash Construction Kit* has a scenario that seems simple: Make your way through a cave, collecting diamonds as you go, and score points.

But there are hazards, in the form of amoebas, fireflies, and boulders that are itching to kill you, and so on. Even though you have three lives, they may not be enough. Another hazard is the time clock at the top of your screen. It is counting down constantly, telling you how much time you have left to complete your journey through the cave.

Also displayed at the top of the screen are the number of diamonds to be found, the number you've collected, the value of each diamond, and your total point score. Should you do well, you'll receive an extra life for every 500

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You will also notice a few very cheap 1200s on the market at "too good to be true prices". They are. The reason is that they are either not truly Hayes and/or

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Boulder Dash Construction Kit

points, and you'll earn extra points for time remaining on the clock when you exit the cave.

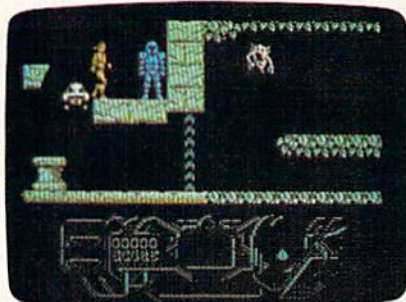
In a typical game, you'll find yourself in the upper-left corner of a brown screen, containing several chambers that are divided into two parts. You make a permanent path in the brown background as you dig your way through the cave. The object is to enter a chamber and grab the diamond. In the upper part of the chamber is a "crazed boulder" bounding off the walls. Since this is the only way in, you'll need good timing and reflexes to get past it and into the lower section that holds the diamond. Then, you'll use those same qualities to get out and go on to the next chamber.

Good luck. The action here is fast and deadly.

Rad Warrior represents the first "paperback original" in the Maxx-Out series, and it is, in essence, another maze game. As a warrior of the future, you must brave the hazards of a maze and mutant aliens who live there, as you try to get to a nuclear generator that provides the power to keep them alive.

Along the way, you'll want to pick up the flying antiradiation suit and its accessories, such as a particle negator, antigrav boots, laser, and so on. Without the suit and accessories, you won't last long against the mutants, the acid rain, the flame dragons, and all the other hazards.

With the best animation I've seen on the 64, *Rad Warrior* is full of challenge. As you begin, you are a half-clothed remnant of a resurgent race of mankind. You make your way through



Rad Warrior

a forest that is filled with a large variety of aliens and many levels which you must explore.

Send your character in the direction you wish, with the joystick, jump to new levels, crouch down to pick up an object, and throw rocks (your only weapon so far) at a host of enemies who stand in your way. When you're killed (you have three lives), your character kneels as if exhausted; a moment passes and he radiates with new life and then again stands tall and proud. With every move, the animation and the detail may surpass what you thought possible.

Nor is simply finding the antiradiation suit enough. Before you can do anything with it, you'll have to have the antigrav boots. Once you're into the suit, a strange device at the bottom of the screen comes to life. It's the suit's monitoring unit and it indicates your stamina, the energy level of the suit, and your score so far.

In choosing *Rad Warrior* to launch the Maxx-Out series, Epyx knew exactly what it was doing. In play action, animation, sound, and challenge, this is one of the best games of its type to ever appear.

Other common features of the Maxx-Out series include disks that will selfboot on the 128, and which take advantage of Epyx' FastLoad cartridge on the 64. Documentation for each begins with a comic strip introduction. In *Rad Warrior* this provides background to the story, while in *Boulder Dash Construction Kit* and *Arctic Antics*, it provides strategy hints. Following this are the usual written instructions.

As a new grouping, Maxx-Out is off to a good start with its initial selection. Further, with its consistency of packaging and its theme of providing arcade action for younger computer users, it will be a bit easier to pick up a new Maxx-Out game and have some idea of what to expect. That in itself seems a rather large benefit.

—Ervin Bobo

Maxx-Out Series

Rad Warrior

Spy vs. Spy III: Arctic Antics

Boulder Dash Construction Kit

Epyx

600 Galveston Dr.

Redwood City, CA 94063

\$24.95 each

Force 7

I've often heard it said, you can't save a man from himself. You can, however, save a man from millions of green, crab-like monsters on the planet Karis. In fact, you can save 370 humans who are kept in iron cages, for some unstated but presumably grisly purpose, by these chitinous creatures that leech soldiers' health like vampires.

And crabs aren't the only dangerous things you'll encounter in *Force 7*, the new action game for the 64 from Datasoft. On your rescue mission to the power station on the planet Karis, you'll find the floor there riddled with gaping acid holes—through which a soldier can take a fatal fall. Even passing near an acid hole will affect his or her strength. A towering green tyrannosaur (known as an alien leader) materializes out of the deck plates slaving for human flesh. Pulsating termite queens (called beating hearts) generate crab-like alien soldiers by the battalion.

Fireballs and puddles of lava follow you everywhere. Both are impossible to



destroy, but one of your soldiers can briefly neutralize them with a high-tech squirt gun called (in stereotypical military) an "automatic H₂O dispenser unit."

In the beginning of the game, you're prompted to enter your name, which is thereafter used by the game as the name of the captain and mission commander. You're in orbit over the forbidding planet of Karis. Your ship has been damaged by a planetesimal during your long interplanetary hibernation, leaving only one life-support unit for you and your crew of six.

Since there is only one life-support suit remaining, your crew members must take turns teleporting to the surface. Each member has a specialty; all but one have a weapon.

The specialties include blueprint reader, computer expert, welding expert, scientist, battle unit operator, and tactical weapons specialist. The weapons include flamethrowers, H₂O dispensers, grenade launchers, and sub-machine guns.

For some reason, weapons cannot

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From the designers of Super Sunday, NBA is the first and only fully-animated statistically-accurate basketball game on the market, coming in like a fast break with the following features:

- **A STAT-KEEPER PROGRAM** that allows you to keep track of how well your team is doing. This valuable accessory lets you save stats from the **NBA** game for later review. Individual players' performances and statistics are updated throughout the game. You can view them during and after the game on your screen or printer.
- **20 GREAT TEAMS** from the 1959-60 Boston Celtics to the four top teams from the 1985-86 season: Boston, Milwaukee, Houston and Los Angeles! In between are some of the greatest teams that ever played the game: the 1966-67 Philadelphia 76ers with Wilt Chamberlain and the classic match-up from the 1969-70 season between the Lakers and the New York Knicks!
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- **THREE MODES OF PLAY:** head-to-head, solitaire and autoplay. The autoplay function also allows you to play the same teams several games in a row . . . a needed option to replay a season.



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2	2	4	2	2
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P. WILKINS	F.C.	P. MCMALE	F.C.	
M. JORDAN	G.C.	M. J. PARRIS	G.C.	
K. A. JORDAN	G.C.	K. A. JORDAN	G.C.	
S. B. JORDAN	G.C.	S. B. JORDAN	G.C.	
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NO GOOD				
DEFENSIVE REBOUND BY LUCAS				
FAST BREAK SHOT GOOD				

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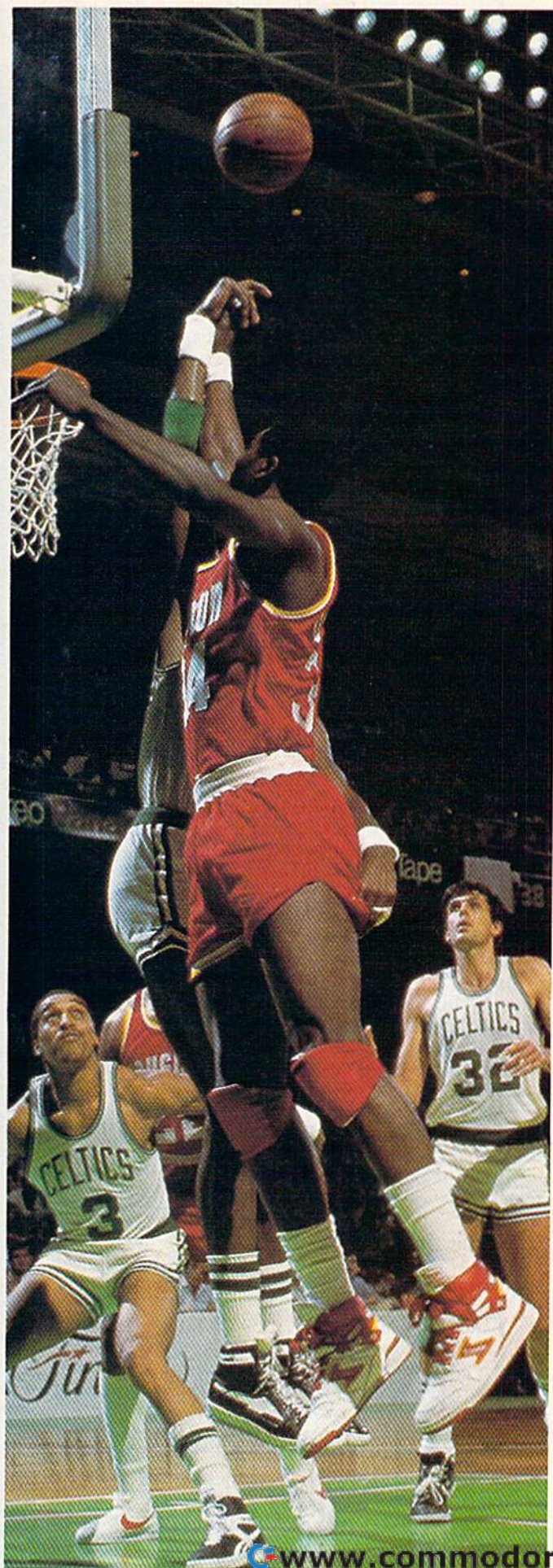
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be passed around among crew members. If I were in charge of a real rescue mission to Karis, and if my best machine gunner were taken out of action, I would pass the machine gun along to someone else, even if the person were not fully qualified. After all, how much training does it really take to kill crabs with a machine gun?

But that's not the way things happen on Karis. If your machine gunner is gone, and all you have left is the soldier with the super squirtgun, in she goes.

The roster of soldiers features a picture of each, along with his or her level of energy ("rested" or "dead"), weapon (if any), and area of expertise. If a soldier is destroyed by the aliens, the soldier's picture in the roster changes to a small pile of bones.

Although there is allegedly only one life support suit, it is somehow returned to service after the soldier wearing it bites the dust. How does the unit get back to the spacecraft? That part of the game was never made clear.

By pressing the f1 key, your soldiers can be teleported back to the ship when things get too hairy on Karis. The authors recommend sending an expendable soldier, a woman with no weapons, to scout the territory. Is it significant that the soldiers unambiguously identified as women (both privates) are the ones with the automatic H₂O dispenser and the ones with no weapons? There are aspects of this game that only an unregenerate sexist could love.

The challenge of high-speed action and unpredictability in Force 7 will keep the player coming back for more.

But if you can ignore that point, the game is truly first-rate. On Karis you must enter the power station (this is accomplished simply by teleporting to the planet). Choose your soldier and press the fire button. If you want to return to the ship, press f1 and you can change troopers or escape from a tricky situation. When you've chosen the right soldier for the job at hand, press the fire button to teleport back inside the power station.

A box at the bottom of the screen keeps you constantly informed of the health and energy level of the soldier, the number of humans rescued on the current level, the number remaining to be rescued, a score based on the number of aliens destroyed, and the number of rounds, grenades, and flames remaining in the soldier's private arsenal.

Pay particular attention to the soldier's health level. It's not possible to improve a soldier's health during the course of the game. Food and rest will only reduce fatigue: Health is a one-way street. Once it goes down, it stays down. The two things most likely to degrade your soldiers' health are physical contact with an alien and coming too close to an acid hole.

Within the power station, there are six different levels, each made up of rooms and hallways. Scattered throughout the various levels are battle units, food, ammunition, and black boxes.

Battle units are tiny steamrollers designed to turn the aliens into crabcakes, but they can only be driven by the two soldiers qualified to do so, and they last only a matter of seconds. Driving over a termite queen with the battle unit is one of the few ways to destroy her.

Food and rest are occasionally needed by soldiers when their fatigue level becomes dangerously high. To rest, simply find a convenient spot (such as in a magazine), and cease movement. Sleep comes almost instantly. For some reason the aliens cannot penetrate a stockpile of weapons. I suspect they're repelled by the smell of saltpeter and cordite.

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Upon entering a black box, a soldier is immediately taken to the teleportation computer. Only the three soldiers trained in blueprint reading are able to teleport within the power station, however. The others will simply have to deal with whatever dangers lurk in the vicinity of the teleportation computer.

The soldiers who can teleport may choose to move to another level or move elsewhere on the same level. This phase of the game has the interesting added effect of allowing the player to see an entire level from a bird's-eye view. Unfortunately, you can't see the aliens or their hostages from this view, so it's entirely possible, when teleporting to a seemingly advantageous position, to arrive at a crab convention.

The winning strategy of this game is flexibility. You must keep your soldiers—as many as you can—alive for as long as possible. Some of them are excellent in a given situation. For instance, on certain levels, you'll be unable to get around without welding some acid holes shut. Send Private Brown with her welder to clear the path. If she runs into an alien leader, press f1 and send in a soldier with a machine gun. When you're beset by lava monsters and fireballs, don't hesitate to send in the soldier with the squirtgun.

This adds an interesting and dynamic element to the game—you have only a few soldiers, but their specialties are so well mixed, it takes time to learn how to make an intelligent choice among them.

This element constitutes the game's strongest point—along with the six "mappable" levels of the station. It's a game that can be mastered, but only after long hours of play. Fortunately, during those hours, the challenge of high-speed action and unpredictability will keep the player coming back for more, each time armed with more knowledge.

—Robert Bixby

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Thunderchopper

Thunderchopper, for the Commodore 64, has been released. I can think of no other game or simulation with such a long wait between the first announcement and the time it appeared on dealers' shelves. By the same token, I can think of no program that spent so much time being fine-tuned. Over the past year, Colonel Jack Rosenow, president of ActionSoft and an ex-helicopter pilot, sent the programmers back to the drawing boards a number of times because he wasn't satisfied with what they had produced.

Now *Thunderchopper* is out, and I presume Colonel Rosenow is finally satisfied.

Not content to field another entry limited to search-and-destroy missions, ActionSoft chose to simulate the varied roles a helicopter performs in modern combat. As all good pilots do, you begin with *Flight Training*, in which you lift off, follow a twisting path on the

Thunderchopper simulates the various roles a helicopter performs in modern combat.

ground, and make landings on helipads and buildings. Although it isn't necessary to use this mode, you'll find the skills learned here will help you stay alive later on.

Next is *Rescue Alert*. Your mission is to find a group of downed pilots who may or may not (depending upon the skill level chosen) be broadcasting their location with an automatic direction finder. If they are, locating them is rather easy; if not, you'll have to quarter the area until you spot the men or their flares.

Finding them is only half the job: Now you'll have to lower the hoist and bring them up one at a time, being mindful of the increasing weight on your chopper; then, get them back to base safely, providing you haven't frittered away your fuel while looking for them.

Combat Alert sends you on a search-and-destroy mission, where your targets may be boats on a river, bridges, or enemy convoys. It's important to select the right weapon for the job, and your *Thunderchopper* is armed with both TOW and Stinger missiles, Zuni rockets, and a Hughes Chain Gun.

For a change of pace, try *Armed Escort*, in which you fly advance guard for a convoy of trucks as they weave



through mountain passes while trying to get back to friendly territory. Obviously, you must weave through those same passes, and you'll probably be happy you sharpened your skills in *Flight Training*.

There are snipers and other armed bodies in the hills, and to find them, you'll probably have to use the forward-looking infrared device. Toggled on or off by pressing the I key, the IR device will cause your screen to become red while all other colors of the landscape change accordingly. More than a gimmick, clusters of the enemy in the hills are revealed more clearly here than they would be otherwise.

Sea Rescue is like *Rescue Alert*—with a few exceptions. The map won't do you a great deal of good, since the sea is featureless. The men for whom you're searching are survivors of a ship sunk in a sea battle that's still winding down. Enemy ships may fire on you while you're attempting the rescue, and although you can fire back, the manual for *Thunderchopper* dryly points out that "it is not a good idea to needlessly engage battleships from a helicopter."

To get you into and out of these scrapes, *Thunderchopper* puts you in the pilot's seat of a modified Hughes 503MG Defender. Before you is a large windscreen split by a control panel that contains the usual readouts for fuel, altitude, speed, rate of climb, direction, and a clock. Because we're dealing with a helicopter, there are also gauges showing the position of cyclic, collective, and tail rotor.

Radar is of the conventional sweep type, with objects shown as little more than colored blocks. To aid in pursuit of the enemy, there's a zoom TV in the center of your console. Once your targeting devices are locked on, the zoom TV shows a magnified view of the target. It's up to you to decide whether or not the target is friendly. When not showing targets, the zoom TV constantly displays short messages reminding you of your mission.

From the function keys, you can switch screens to a map that will help you locate your target or objective; this, too, has a zoom feature. Put the cursor

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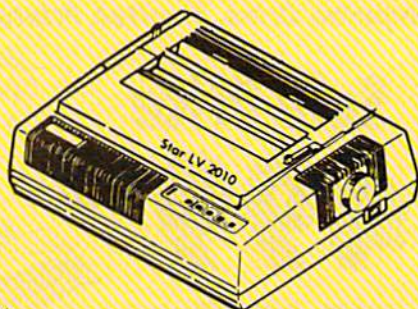
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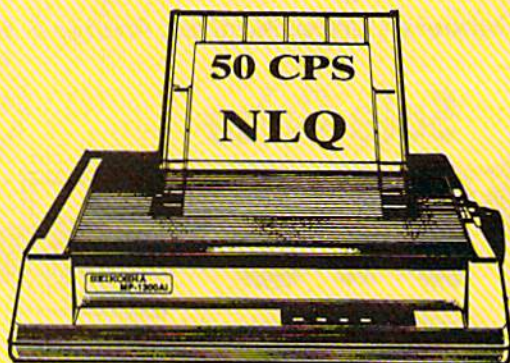
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over a suspected object and then use up to 16X magnification to help with identification. (A word of warning here: You must press RETURN to get back to your pilot's view after using the map. Since this is the same key that controls weapons selection, it will change your current selection while changing your mode.)

Further help is available by switching to a status screen. You're shown several views of your craft on a graph-paper background, with damage sustained indicated. You can also get a mission evaluation at any time by pressing the f7 key, but you probably won't want to. Unless you've completed your mission, the message will be less than encouraging.

Thunderchopper's graphics and sound are good. The graphics, licensed from subLogic, are of the 3-D type. Images are solid rather than wire-frame, which gives a greater illusion of reality. I also appreciate the fact that control is managed by either keyboard or joystick.

Everything you need to know to enjoy the simulation is contained in the manual and on the quick-reference card. While the manual is entertaining, it does sometimes slip into shop talk. Since it was written by Colonel Rosenow, this is probably forgivable.

In its action and in the variety of challenges it offers, *Thunderchopper* succeeds. Helicopter simulators are proliferating at a pace that will soon move them out of the general category of flight simulators and into their own specialized realm. I think *Thunderchopper* is a welcome addition to the field.

—Ervin Bobo

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ActionSoft
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Commodore 1581 Disk Drive

The new Commodore 1581 disk drive brings the world of 3½-inch disks to the users of Commodore 64 and 128 personal computers. The 3½-inch disk is already the standard medium for the Macintosh, Amiga, Atari ST, and the new IBM PS/2 computers. Additionally, the smaller floppy is quickly becoming the preferred medium for the IBM XT/AT computers and their clones. The 3½-inch disk's advantages over a 5¼-inch disk include a more convenient size (it will fit in a shirt pocket), much larger storage capacity, and a hard plastic case and shutter mechanism that keeps the disk clean and free from accidental damage.

Whether the advantages of the 3½-inch disk are of sufficient interest to Commodore 64 and 128 users depends upon the needs of each particular user. Clearly, the 1581 will not replace the 1541 or 1571 (5¼-inch) drives. Nearly all commercial software available for the 64 and 128 computers are on 5¼-inch disks, and the vast majority will continue to be sold on such media. However, the combination of a 1581 drive and 1541 or 1571 drive significantly increases the data storage capability and performance of a 64 or 128 user's computer system.

The 1581 drive is petite—2.6 inches high, 6 inches wide and 9.5 inches deep. Its small footprint is attributed to an external power supply that accompanies the drive and is approximately the same size and shape of the Commodore 64 power supply. Some users may be irritated by having a separate power unit for the drive, but I prefer having the external power source because of the space it saves on my cramped work area.

The drive, like both the 1541 and 1571 drives, connects to the serial port on the 64 or 128 and has twin serial ports for daisy-chaining with your other

drives and printer. A nice improvement that Commodore included on the 1581, as was included on the 1571 drive, is a DIP switch on the back of the unit that permits the user to change the device number. As most 64 owners are painfully aware of, a device change on the 1541 requires opening the case and doing a "cut and solder" job. The inclusion of a DIP switch, however, could have been more convenient had the switch been placed on the front of the drive.

The capabilities of the 1581 drive are impressive. The drive uses double-sided 3½-inch floppies and provides 800K of storage capacity. To 64 and 128 users, this means a whopping 3160 blocks of space. The data on almost five single-sided 5¼-inch disks can be stored on a single 3½-inch disk for the 1581.

A directory on a 1581 disk can hold a maximum of 296 files, as opposed to the 144-file maximum on the directory of a 1541 or 1571 disk. In order to handle the potential size of the directory for 800K of data, Commodore has expanded the DOS for the 1581 to support sub-directories. With the use of a new file type called CBM, a user can create partitions on a disk, with each partition having its own directory. Through the use of partitions, a user can create separate directories for his or her word processing files, basic programs, utilities, graphics, and so on.

The 1581 drive supports the "burst" mode available on a Commodore 128, thereby providing significant data transfer speed over the 1541 drive. In fact, the "burst" mode on the 1581 is

The data on almost five single-sided 5¼-inch disks can be stored on a single 3½-inch disk for the 1581.



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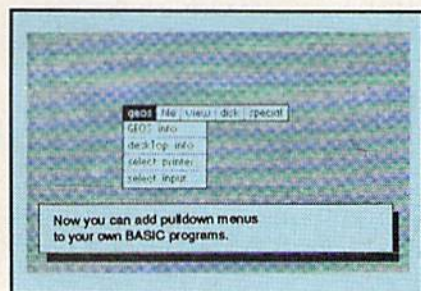
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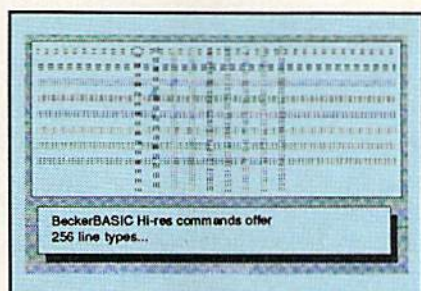
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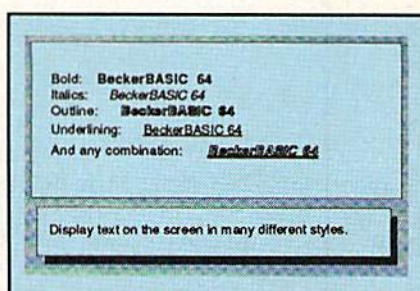
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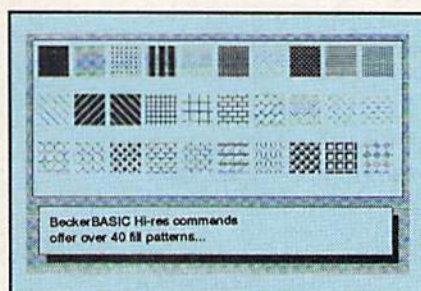
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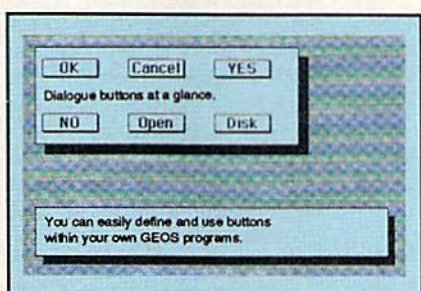
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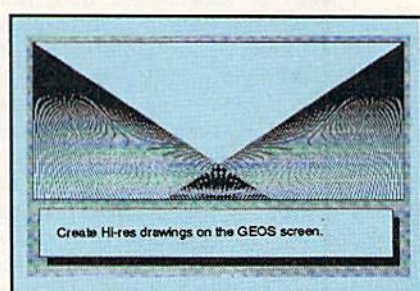
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Figure 1: Benchmark

Program	Size (blocks)	1541	Load Time (sec.)		
			1581 (64 Mode)	1571	1581 (128 Mode)
Yahtzee	47	33	24	8	5
Monopole-4	118	119	60	12	8

Figure 2: Benchmark

Program	Size (blocks)	1541	Load Time (sec.)	
			1581 (w/Zapload 64)	
Yahtzee	47	33	8	
Monopole-4	118	119	25	

about 50-percent faster than the first mode on the 1571. While the "burst" mode is not available on a 64, the 1581 still has some speed advantages over the 1541. The results in Figure 1 below demonstrate the loading capabilities of the 1581 with respect to a couple of basic programs.

The 1581 also possesses an 8K track cache buffer, which further improves drive access speed. With the track cache buffer, the drive stores the last 8K of information previously accessed on the drive. If that information is accessed again by the user, the drive retrieves the information from the buffer instead of looking for that information on the disk. An impressive demonstration of the advantages of the buffer is shown by requesting it again. The second request elicits a directory listing before you can get your finger off the RETURN key.

The 1581 drive uses the MFM format instead of the GCR format employed by the 1541 and 1571 drives. The format uses 80 tracks with 40 sectors per track. It is similar to those formats used by IBM PC and CP/M computers. It is flexible and provides a bridge for data transfer between 64 and 128 computers and IBM, CP/M, and other MFM format computers such as the Amiga. However, the employment of the MFM disk format affects the drives compatibility with software currently available for the 64 and 128. Many commercial software products take advantage of the GCR code and the ROM of the 1541 and 1571, to increase the program's loading speed or to provide disk copy protection. Those products, therefore, will not successfully load from a 1581 disk. To illustrate this problem, my attempts to load and run *BobsTerm Pro 128* and *Fleet System 4* after copying them to a 1581 disk were unsuccessful.

Formatting compatibility between the 1581 and the 1541 also hinders file copying between the two drives. The Test/Demo disk provided with the 1581 comes with several utility programs that will copy files between a

1541 or 1571 and the 1581 drive. A commercial program called *The 128 Cannon*, from Kracker Jax, also supports the 1581 drive. The file copier on *The 128 Cannon* is faster than the one provided on the Test/Demo disk. Currently, however, no whole disk copy programs are available that will copy the entire contents of a 1541 or 1571 disk to a 1581 disk, or vice versa.

A significant consideration for Commodore 64 users is the speed of the 1581. Without the "burst" mode, the 1581 drive transfers data at a much slower rate, although still faster than the 1541. Fast-load programs or cartridges, such as Access' *Mach 128* or Epyx's *Fastload* cartridges, do not work with the 1581, since those programs modify the GCR code used on the 1541 and 1571 drives. In anticipation of this problem, Commodore has included a utility program on the Test/Demo disk called *Zapload 64*. With *Zapload 64*, a user can significantly increase the loading time for many 64 programs, as shown by the test results set forth in Figure 2 below. However, *Zapload 64* is not very compatible with commercial software. After numerous attempts to load commercial 64 programs with *Zapload 64*, it appears that any program that is composed of more than one file does not work with *Zapload 64*. The utility's practical value, therefore, is limited to BASIC programs. A company called Chip Level Designs is reportedly developing new chips for the 64 and 128 (in 64 mode) that permit support of the "burst" mode of the 1571 and 1581 drives.

For 128 users, the 1581 drive supports CP/M mode, if you obtain an upgrade of the CP/M+ system file. By writing Commodore and sending them \$19.95, Commodore will send you a new CP/M+ system disk that will support the drive. Of possibly greater significance, however, the 1581 drive is fully supported by *GEOS 128* from Berkeley Softworks. The increased storage capacity and disk-access speed makes *GEOS 128* a much more satisfactory and viable operating system. Unfortunately, *GEOS 64* does not currently

support the 1581 drive.

The Test/Demo disk accompanying the drive contains many disk utilities that will be recognized by owners of a 1541 or 1571 drive. In addition, the Test/Demo disk contains *Zapload 64*, as well as a partition aid program to help you create sub-directories, and it contains a very impressive slide show. The graphics comprising the slide show is hidden in a subdirectory on the Test/Demo disk. The speed of transferring between graphics screens in the 128 mode is very impressive and provides a good showcase of the drive's capabilities.

In summary, the drive has outstanding storage and speed capabilities, which most 64 and 128 users will find useful and valuable. While the drive will be more attractive to the 128 user (because of the "burst" mode speed capabilities), it should still be seriously considered by 64 users. The drive lists for \$300, but can be found at a price less than the cost of a 1571. With 800K of storage space, using the 1581 drive as a data storage device alone should make it worth its price to 64 and 128 users; therefore, I highly recommend it to both.

—Scott Thomas

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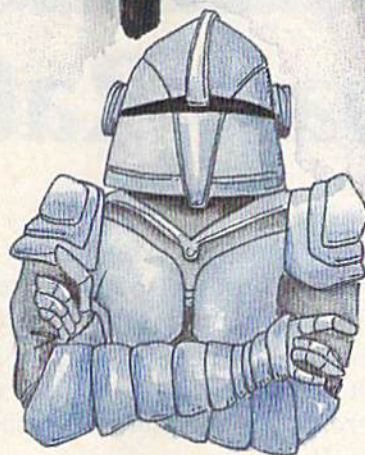
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Oil Defense

Mark H. Thomas



Whether it's in Texas or the Persian Gulf, oil is a treasured and well-defended commodity. In this arcade-action game for the 64, the oil craze has reached interplanetary proportions, forcing you to protect three tanks of "black gold" from the nightly raids of oil-thirsty aliens. A joystick is required.

After depleting their entire planet of its crude oil, the Martian population decided to look elsewhere for this precious energy source. Unfortunately, they found Earth. To rebuild their planet's oil reserves, Mars dispatches nightly raids on Earth's three largest oil tanks. You're armed with a mobile antialien gun, and your job is to defend these tanks—a difficult, but vital assignment.

Getting Started

"Oil Defense" is written entirely in machine language, so you need to enter the program using "MLX," the machine language entry program found elsewhere in this issue. Enter the following values when prompted:

Starting address: 0801
Ending address: 1720

After you have typed in Oil Defense, save a copy to tape or disk. Oil Defense is loaded and run just like a BASIC program. To play, you must plug a joystick into port 2.

Texas Tea Party

The Martian invaders begin with an attack force of ten flying saucers. These saucers do not have any

weapons or defense systems. They are designed for one purpose only: to swoop down and siphon the oil from storage tanks, immediately transporting the ill-gotten "Texas tea" to their mother ship in outer space. Your only defense is to shoot these saucers out of the sky before all of the oil is sucked away.



Before the peaceful backdrop of a city's night skyline, a fierce battle is fought over oil.

On a ramp built outside the oil tanks is a mobile anti-alien gun for blasting oil-thieving invaders. Using your joystick, you can move the gun left or right along the track and fire. Your gun is equipped with a special laser-tracking device, which allows you to steer your

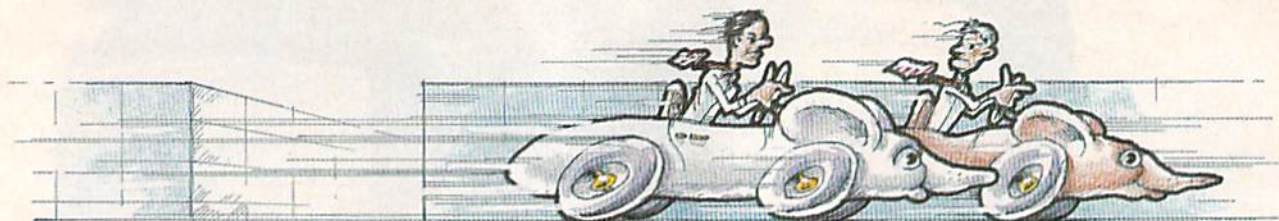
shots. After a shot is fired, moving your gun left and right also moves the shot.

The Martians are shrewd pilots: They avoid staying in one place too long and never keep their entire fleet on the screen at one time. Occasionally, a ship dives down towards your gun. If the Martian makes contact with your gun, it taxes your energy, making you move slower. Too many encounters completely drain your energy cells, stopping you dead in your tracks. After a while, your batteries recharge, but it's best to avoid any contact with the alien vessels.

Once you have shot down all of the invaders, another attack force is sent in. (The computer prompts you to press a key between invasions.) Each new wave has five more alien ships than before. The game ends when all of the oil is gone. All three oil tanks are visible, so you can watch as your supply slowly diminishes.

On the bottom right of the screen is the number of alien ships left alive. The bottom left displays your score. The more aliens you shoot and the longer you hold on to your oil, the higher your score. You may pause the game by pressing any key other than RUN/STOP. Resume by pressing a key again. To return to BASIC, press the RUN/STOP key; you may have to press it twice before the game ends.

See program listing on page 83.



Human Rat Race

Roger Hughes

This exciting two-player maze game is really two games in one. In the first variation, you race against an opponent and dangerous drones to reach the other side of a maze safely. In the second, you collect gold and try to get rich before time runs out—or else the drones will cash in your chips. And, as a special challenge to the arcade veterans, try the invisible maze variation. For the 64 with two joysticks.

You're racing through a maze with a sack of gold—running, twisting, turning. Oh no, another dead end. You retrace your steps and hear the clock ticking—six, five, four. . . . You see a deadly drone on your left. Can you get past it? Barely. Three, two. . . . You see the exit and your path is clear—or is it? You make a mad dash and escape with your gold just as time runs out. Is this a scene from *Raiders of the Lost Ark*? No, it's "Human Rat Race," an exciting maze game for two players.

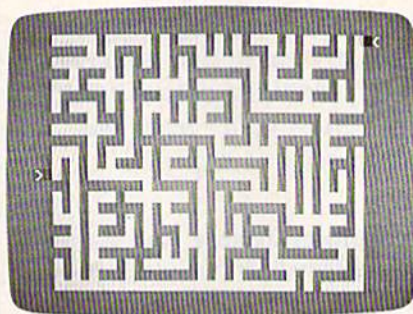
In Human Rat Race, you and a friend battle against each other and a group of drones—you decide how many—to either reach the other side of the maze or to collect gold, cash it in, and get rich before time runs out. If that's not tough enough for you, you can make the maze invisible.

Getting Started

Since Human Rat Race is written in machine language, you'll need to enter it with "MLX," the machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting address and ending address of the data you'll be entering. Here are the values to use for Human Rat Race.

Starting address: C000
Ending address: CBBF

Follow the MLX instructions carefully and be sure to save a copy of the Human Rat Race data when you finish typing. To load Human Rat Race, type LOAD "file-



Not just another maze game, "Human Rat Race" includes a number of variations that make it a challenge for players of all skill levels.

name", 8,1 for disk or LOAD "filename", 1,1 for tape, where filename is the name you used when you saved the program from MLX. Now type SYS 49152 to play the game.

Choice Of Games

When you first run Human Rat Race, you'll see the title screen and a game menu. You can use the function keys to create the specific variation of the game you want to play. With f1 you can choose to play either the "Race to the Other Side" or the "Grab the Gold" variation.

In "Race to the Other Side," you and a friend race through a maze with only one route across. The first player to reach the other's starting square—indicated on the screen by an arrow—is the winner. In "Grab the Gold," the maze is filled with gold, and you and a friend collect and cash in as much

as you can. To collect gold, you simply move through the maze, automatically collecting ounces of the precious metal as you travel along each new path.

The amount of gold you're carrying is displayed at the top of the screen on the same side of the maze as your home square. To sell your gold, you must return to your home square. The gold's price—indicated at the bottom center of the screen—begins at \$500 an ounce and decreases during the play of the game by five dollars each second. Each player's accumulated wealth is shown at the bottom of the screen on his or her side. At the end of one minute, the player who has cashed in the most gold wins.

If you're the adventurous type, you can use f3 to make the maze invisible. When this option is selected, both you and your opponent must navigate the maze by feeling your way around—quite a challenge.

Choosing f5 lets you specify the number of drones—from 0 to 15—you want to have patrolling the maze. These drones move erratically, making it difficult for you or your opponent to get through. If you hit a drone, you return to your home square. In "Grab the Gold," you also lose all the gold you're carrying.

To start the game, press f7. It takes about six seconds for the computer to generate the maze. The blue player uses the joystick plugged into port 1 and always starts on the left side of the maze; the red player uses port 2 and starts on the right. At any time during play, you can press f1 to end the game and show the maze if it was invisible. Pressing f1 again returns you to the title screen.

See program listing on page 88.

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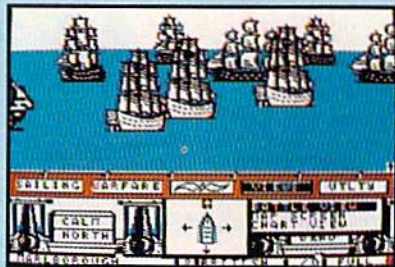
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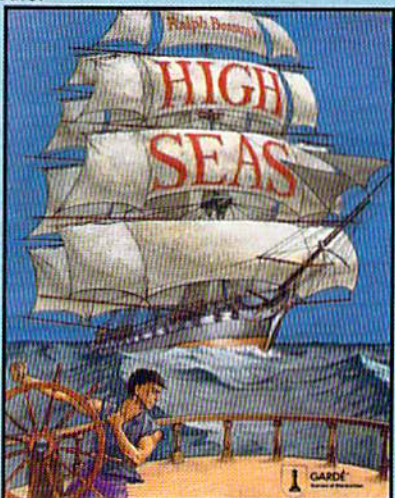
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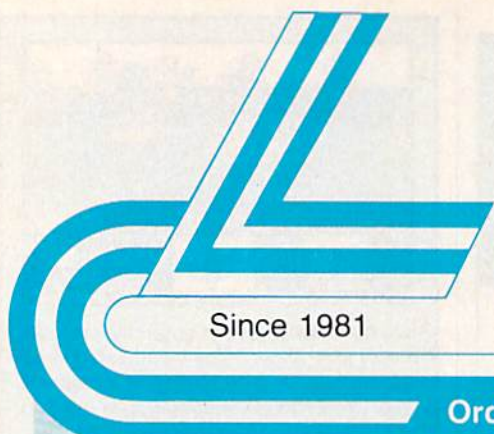
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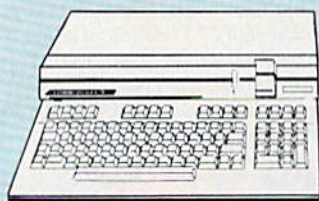


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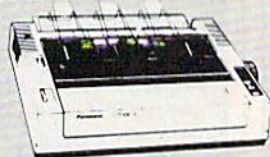
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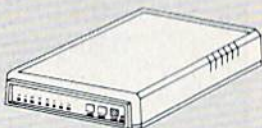


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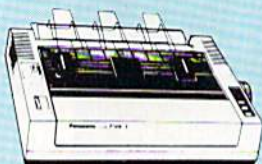
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Three Sizes Fit All

I'm thinking about getting a new disk drive and was wondering if you could tell me the difference between a 5¼-inch drive, a 3½-inch drive, and a hard disk drive.

Ron Willey

The 5¼-inch drive has been the standard disk drive for as long as the Commodore 64 has been around. Since virtually all Commodore software is sold on 5¼-inch disks, this should be your choice for a first drive. Commodore sells two different 5¼-inch drives—the 1541C and the 1571. Both drives work on the 64 and the 128. Also available are several good third-party drives for Commodore machines—many of these have been reviewed in past issues.

The 1571 is more expensive, but has several features the 1541 lacks. It has a high-speed burst mode for loading files roughly five times faster, but this only works with a 128 in 128 mode or CP/M mode. It can read a variety of other disk formats, including CP/M and IBM, which is especially good if you'll be running CP/M programs or transferring files from IBM disks. The 1571 uses both sides of a disk, so the disks hold twice as much data (340K against the 1541's 170K).

You may run across other Commodore-built drives, especially if you buy one second-hand. There are several older models of 5¼-inch drives developed for the Commodore PET series. These may or may not work with a 64 and 128; you often need a special IEEE interface. The 1540 model, precursor to the 1541, was designed for use with the VIC-20. It's slightly too fast to work reliably with the 64 and 128. The 1551 was designed for the Plus/4 and 16. The 1570 is a single-sided version of the 1571, but is apparently available only in Europe. The SFD-1001 was a one-megabyte disk drive that featured more storage capacity but used a nonstandard disk format.

The primary choices among Commodore drives are the 1541, 1541C, and 1571. (The 1541C is functionally identical to the 1541.) There are various workalike drives available from third-party manufacturers, as well.

After you've bought your first disk drive (which should be a 5¼-inch model), you could consider buying an additional 5¼-inch, 3½-inch, or hard disk drive.

The hard disk drive has long been seen as an important tool for software developers. A hard drive can store much more information than a floppy disk drive—at least 10 megabytes, where a megabyte is equal to 1024K—and is much faster. Prices have been falling, so bulletin board operators and serious programmers are turning increasingly to hard drives. Commodore doesn't sell any hard drives for the 64 or 128, but several third-party developers have recently filled the void (see November GAZETTE for a review of one of these, the Lt. Kernal).

Last year, Commodore displayed its newest drive at the Consumer Electronics Show. Dubbed the 1581, this 3½-inch drive uses smaller disks, which are housed in tough plastic cases. The new drive offers greater storage and speed than a 5¼-inch drive, but less than that of a hard drive. For an in-depth look at the 1581, see the review elsewhere in this issue.

The 64 Amiga?

With the help of the new 1764 RAM Expander, is it possible to run programs written for the Commodore 128 and the Amiga? If so, with what limitations?

M. A. Tabassum

Several people have written to ask this question. The answer: No, extra RAM is not enough to make the 64 run programs written for Commodore's newest computers.

First let's consider the Amiga. This computer uses the 68000 microprocessor, while the 64 contains a chip in the 6502 family—the 6510. Programs written for one chip will not directly run on another. The Amiga also includes sophisticated graphics and sound chips that simply do not exist in the 64. It would be very nearly impossible to contrive any means to run an Amiga program on the 64—even if the disk formats were compatible.

Although the Commodore 128 shares the same processor as the 64, it too has

hardware (the 80-column VDC chip) that is missing in the 64. Also, its operating system is different.

However, the 1764 Expander is an important peripheral. It can be used to make the GEOS operating system faster. It can also be used as a ramdisk—a simulated disk drive that, although volatile, has the advantage of running at many times the speed of a true disk drive.

128 Odds And Ends

I have several questions concerning the Commodore 128. I have found a way to print flashing and underlined characters on the 128 using CTRL-B to turn on underline and CTRL-O to turn on flashing. What are the control codes to turn off these features? Does anyone have a machine language routine that will allow the 128 to use double-precision numbers? Is there any way to get sprites in the 80-column mode? What is the shortest way to print out a hardcopy of a disk directory listing from within a program?

Mike Boone

The character code table (Appendix E) in the system guide that comes with the Commodore 128 lists only codes for 64 mode. Additional information for 128 mode control codes can be found in Appendix I. To summarize, here are the new codes for 128 mode:

Code	Key	Effect
2	CTRL-B	underline on
7	CTRL-G	bell tone
9	TAB or CTRL-I	tab
10	LINE FEED or CTRL-J	line feed
11	CTRL-K	disable case switching
12	CTRL-L	enable case switching
15	CTRL-O	flash on
24	SHIFT-TAB or CTRL-X	tab set/clear
130		underline off
143		flash off

All of these codes were undefined for the Commodore 64—except for 9, which was previously the code to enable case switching with the SHIFT-Commodore key combination. Code 8, used to disable case switching for the 64, is undefined in 128 mode. The underlined and flashing character attributes are for the 80-column

screen only; these codes have no effect on the 40-column screen. Note that there are no key combinations that produce codes 130 or 143, so you must use a CHR\$ to generate these codes in PRINT statements. For example:

```
PRINT "THIS IS "; CHR$(2); "UNDER
      LINED"; CHR$(143); " TEXT"
```

A higher-precision math package may be available for the 128, but we're not aware of such a product. All the arithmetic routines in Commodore BASIC are designed to handle only the standard precision. (It's not really fair to call it single precision when no double precision is available.) A complete high-precision math package would probably be very large and not particularly compatible with existing programs.

If it's any consolation, Commodore's arithmetic routines are more accurate than single-precision numbers on the IBM PC and many other computers. IBM single-precision values are held in only four bytes, while Commodore floating-point values use five bytes. As a result, the Commodore's arithmetic results are accurate to as many as 10 significant digits (although the printing routine rounds to 9 digits). By comparison, IBM single-precision numbers are accurate to only 6 or 7 digits. Consider the result of the operation $193 \div 71$. The actual value to 12 significant digits is 2.71830985916. IBM BASIC reports a result of 2.71831, while the Commodore returns 2.71830986. Try this short program:

```
10 X=0:Y=.0001
20 FOR I=1 TO 10000
30 X=X+Y
40 NEXT I:PRINT X
```

With perfect accuracy, the result should be 1. A Commodore returns 1.00000019, while an IBM returns 1.000054. In this case, the IBM's margin of error is 285 times larger than the Commodore's.

By the way, the math routines in BASIC ROM are nearly identical in all Commodore eight-bit computers from the PET to the 128. Thus, a given operation should produce the same result on almost any Commodore.

Sprites are a special hardware feature of the VIC-II chip that provides the 40-column video output. The VDC chip, which produces the 80-column display, doesn't include sprite circuitry, so there's no way to have true sprites on the 80-column screen. It would be possible to write a program that simulates sprites by storing the original contents of an area of the 80-column screen before drawing a new pattern in that area, and then restoring the original contents before moving the pattern to a new area. However, such simulated sprites would be much slower and more difficult to work with than the true sprites of 40-column mode.

Given elementary knowledge of

BASIC 7.0, you'd think that it would be simple to print a 128 disk directory with the statement OPEN 4,4:CMD 4:DIRECTORY:CLOSE 4. If you try this, however, you'll find that it doesn't work. DIRECTORY and the equivalent CATALOG both cancel the effect of CMD. Outside a program you could load the directory into memory with LOAD"\$0",8 and print it with OPEN 4,4:CMD 4:LIST:PRINT#4:CLOSE 4. Unfortunately, there is no equally simple way to print a directory listing within a program. Here's a short program segment that produces the desired results:

```
1000 OPEN 8,8,0,"$0":OPEN 9,4
1010 C=6:GOSUB 1100
1020 FOR I=1 TO 25:GET#8,A$:PR
      INT#9,A$;:NEXT I:PRINT#
      9
1030 C=3:GOSUB 1100:IF SS THEN
      CLOSE 9:CLOSE 8:END
1040 GET#8,A$,B$:PRINT#9,STR$(
      ASC(A$)+256*ASC(B$));"
      {2 SPACES}";
1050 FOR I=1 TO 27:GET#8,A$:PR
      INT#9,A$;:NEXT I:PRINT#
      9
1060 GOTO 1030
1100 FOR I=1 TO C
1110 GET#8,A$:SS=ST:IF SS THEN
      I=C
1120 NEXT I:RETURN
```

The key to getting a properly formatted directory is the secondary address of 0 in the first OPEN statement in line 1000. Any other secondary address value will yield only a garbled mess. This routine will also work on the Commodore 64 if the $ASC(A\$) + 256 * ASC(B\$)$ in line 1040 is replaced with $ASC(A\$ + CHR$(0)) + 256 * ASC(B\$ + CHR$(0))$. To use this as a subroutine within a larger program, simply renumber as appropriate and replace the END in line 1030 with a RETURN statement, then GOSUB to the first line of the subroutine.

More Speed Isn't The Answer

I frequently encounter the need to randomize a series of numbers, especially in card and alphabet games. I'm enclosing the subroutine I use. It repeatedly picks a number until it finds one that has not been selected. The difficulty I have is that it becomes drastically slower as it nears the end of the list. The more numbers picked, the smaller the odds of randomly picking a new number.

I'm aware that machine language is considerably faster than BASIC. Could my subroutine be improved to speed it up or would you write an ML program that will accomplish the same task at a much greater speed?

George Brady

Machine language (ML) isn't the answer to your problem; a better algorithm for creating a random list is.

The result you seek is a scrambled list

of unique numbers. If the array holds 1000 numbers, you want each of the numbers 1-1000 to appear only once. Your approach works, but it has a fundamental flaw. When you reach the thousandth slot in the list, there's only one number that has not been selected. The RND function has only one chance in a thousand to hit the right one. We ran ten tests, generating 1000 unique random numbers. In the best cases, the 64 only had to try 49 possibilities and 163 possibilities before finding the thousandth number. In the two worst cases, it had to look at 2420 and 3600 numbers before it came up with the right ones.

The BASIC program could be converted to ML, but when reaching the final numbers, it still might have to check several thousand possibilities.

Here's a better algorithm: Begin with a sorted list in which the first number is 1 and the last is 1000. You know in advance that each number is recorded only once. Then, scramble the list by randomly swapping two numbers. The routine would look like this:

```
10 DIM X(1000)
20 FOR I=1 TO 1000:X(I)=I:NEXT
      I
30 FOR I=1 TO 1000
40 A=INT(RND(1)*1000+1)
50 B=X(A):X(A)=X(I):X(I)=B
60 NEXT I
70 FOR I=1 TO 1000:PRINTI,X(I)
      :NEXT I
```

A Reset Key For The 64

I've owned my Commodore 64 for about a year. I'm very satisfied with it, but I can't understand why it was designed without a reset key. On my old TI-99/4A, pressing Control and Quit simultaneously accomplished this. Also, why don't commercial software developers incorporate, into their programs, ML routines that would allow you to reset with the press of a key?

Ron Hoffman

Holding down RUN/STOP and pressing RESTORE performs a warm start most of the time (however, if a program locks up your 64, you'll have to turn it off and then back on). For a nearly complete cold start, you can type SYS 64738. To regain a BASIC program that was in memory, enter POKE 2050,1:SYS 42291:POKE 45,PEEK(34):POKE 46,PEEK(35):CLR. These POKES also reverse the effects of the NEW command.

If you would like an inexpensive reset button, try this: POKE 792,226:POKE 793,252. Press RESTORE and your 64 will reset itself—but only once. The process of resetting changes the vector at 792 back to normal, so you'll have to retype the POKES after each reset.

Several hardware reset switches are available for the 64. The ones we have seen either plug into the user port or are wired directly inside the case. We also have seen the wiring diagram for a simple

reset switch that plugs into the user port. All that's required to build the switch is an edge connector, a resistor, and a diode.

The Third Dimension

I have a good understanding of how one- and two-dimensional arrays work, and how to set them up. But how in the world does a three-dimensional array look? For example, DIM CC%(4,4,4). My owner's manual doesn't explain it very well.

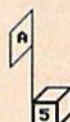
Steve Webber

The figure at the right may help you visualize a three-dimensional array. A simple variable has a name and a value: $A = 5$, for example. A one-dimensional array has one name and a subscript (or index) inside parentheses. You can imagine a row of variables, each of which is numbered. A two-dimensional array has two subscripts, which you can visualize as a grid. A three-dimensional array has three indices inside parentheses, which you can visualize as a block of variables. Four- and five-dimensional arrays are harder to visualize, but the principle is the same.

In the example you gave, DIM C%(4,4,4) would create an array of 125 integer variables. Each dimension has five open slots numbered 0-4, so the total size is $5 \times 5 \times 5$.

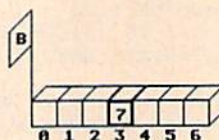
Simple variable

$A=5$



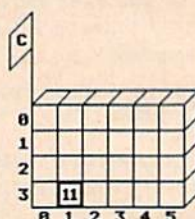
Arrays

One dimension
 $B(3)=7$



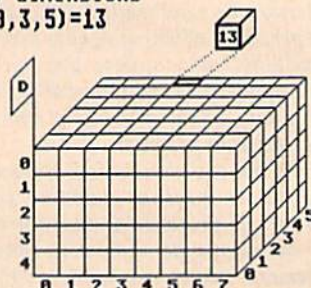
Two dimensions

$C(1,3)=11$



Three dimensions

$D(0,3,5)=13$



How would a three-dimensional array be used? Let's say you've invested money in four different stocks and you want to track them for 300 days, given a high price, low price, and close. The three indices would represent stock number, day number, and price, and you would create the array with DIM S(3,299,2). Remember that arrays start counting at 0, so this would build an array that has $4 \times 300 \times 3$, or 3600, entries. Numeric arrays take up 5 bytes per variable, so you would need 18,000 available bytes for S(3,299,2). Integer arrays, which are marked by a percent sign, use only 2 bytes. Thus, S%(3,299,2) would require 7200 bytes.

Stashing A Hi-Res Screen

I would like to know if you can PEEK the high-resolution screen and place the numbers in a number string (say A(I)) or in memory, and then with a SYS, POKE it back on the high-resolution screen. I have a Commodore 128. Can you write me a program?

Paul Hutchinson

There are three ways to save the Commodore 128's high-resolution screen. One way is to write a 32-element string array, with each element containing 254 bytes of high-resolution screen information. It would be very slow, but here is how it would be written:

```
10 DIMA$(32)
20 FORI=0TO32:FORJ=0TO254
30 A$(I)=A$(I)+CHR$(PEEK(8192+I*255+J))
40 NEXTJ:NEXTI
```

This method takes four minutes and 31 seconds to save the high-resolution screen.

The second method is simply to save the high-resolution screen to disk. The 1541 disk drive can save the high-resolution screen in just 13 seconds. The syntax for this statement is:

```
BSAVE"FILENAME",D0,U8,B0,P
8192 TO P16192
```

The fastest method to save the screen is to use the SSHAPE command. The following routine clears the high-resolution screen, draws a circle on it, and saves it to an array variable in just four seconds:

```
5 GRAPHIC1,1:CIRCLE1,160,100,1
00,100
10 DIMA$(39)
15 FORI=0TO39
20 SSHAPEA$(I),0,I*5,320,I*5+5
25 NEXTI
```

To return the screen from memory, use the following routine:

```
30 GRAPHIC1,1:FORI=0TO39
35 GSHAPEA$(I),0,I*5,0
40 NEXTI
```

There are many other ways to use the SSHAPE and GSHAPE commands. Consult your Commodore 128 System Guide.

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COMPUTE! Publications, Inc. 
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simple answers to common questions

Tom R. Halfhill, Contributing Editor

Each month, *COMPUTE!'s Gazette* tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o *COMPUTE!'s Gazette*, P.O. Box 5406, Greensboro, NC 27403.

Q. What happens when the flashing cursor on my Commodore 128 (in 64 mode) vanishes suddenly for no apparent reason while I'm working on something? I seem to be able to do nothing to get it back (except turning off the computer and turning it back on again). It doesn't happen often, but when it does, I have sometimes lost hours of work—very frustrating. Why does it disappear? Where does it go? If I wait long enough, will it come back? Most important, what can I do?

A. It sounds like you're suffering from an untoward event known to computer users as a *system crash* or *lockup*. Unfortunately, it's a normal part of computing.

It may be due to a bug in the program you're using, a bug in the computer's operating system, a bug in some peripheral (such as the disk drive or printer), or even a weird combination of things. Practically all programs and computer components harbor bugs of some kind. Usually what happens is that the bug makes the computer fall into a netherworld known to programmers as an *infinite loop*. That is, the computer gets trapped within a looping series of program instructions from which there is no escape.

It's sort of like an old joke that children play: "Pete and Repeat went to the store to buy some candy. Pete fell down, so who was left?" When you answer "Repeat," the response is, "Pete and Repeat went to the store . . ." and so on.

Even the dumbest kids on the block fall for this joke only two or

three times before they realize it's pointless and quit. But a computer isn't quite as clever, and it's not programmed to disobey instructions, no matter how inane those instructions may be. So when a computer stumbles into this kind of trap, it works with characteristic efficiency and keeps "repeating" forever.

While trapped in this loop, the computer ignores all input and produces no useful output. Industrious to a fault, it devotes full attention to what it's doing. To all outward appearances, it seems to be comatose or catatonic, even though its silicon mind is racing.

That's why the cursor seems to disappear. The cursor doesn't actually go anywhere, of course, because it never existed in the first place. A flashing cursor is just a small area of the screen which the computer blinks on and off at regular intervals. When the computer is trapped in a loop, it has no time to display the cursor, check the keyboard for input, or do anything else. You could wait for centuries and the cursor would never come back.

All you can do is turn the computer off and back on again to clear it, or press the reset button. Either way, the information in memory will most likely be wiped out. To avoid losing hours of labor to system crashes, acquire the practice of pausing now and then to save your work on disk.

Q. I correspond with several pen pals overseas. I have a small, pocket-sized electronic translator that translates words into various languages, but it works on only a word or two at a time, so it's cumbersome for translating an entire letter. What I'd like to see is a translation program for my Commodore which would let me enter English sentences and have them translated into German. Also, the program could reverse the process,

so I could enter German sentences and have them translated into English. It seems to me that this would be a fantastic aid, not just for hobbyists, but for business people as well. Does such software exist or is it forthcoming?

A. The kind of program you want would indeed be extremely useful, but it requires a computer much more powerful than a Commodore 64 or 128. Even the most powerful personal computers available today, such as the \$11,000-plus IBM PS/2 Model 80, would have trouble coping with this task.

A program that translates individual words or even short phrases is fairly simple to write, which is why your pocket-sized translator is possible. But a program that flawlessly translates whole documents is another story. In addition to having a vocabulary of hundreds of thousands of words, such a program would have to incorporate all of the grammatical rules (and exceptions to rules) for each language. It would also need a glossary of special terms and colloquial phrases, because often these can't be translated directly.

To store all of this information in memory would call for many megabytes of RAM. More likely, the information would be stored on a high-speed mass storage device, such as a large-capacity hard disk or CD-ROM (compact disc-read only memory).

Although we're not aware of any such programs on microcomputers, we'd be willing to bet that they exist on large mainframe systems. For one thing, programs like this would be invaluable to intelligence services, which invest thousands of hours in translating magazines, newspapers, and professional journals gathered from all over the world.

machine language programming

Managing Memory

Jim Butterfield
Contributing Editor

When you write a machine language program, it's important to plan your memory usage carefully. One of the most visible signs of a professionally written program is well organized use of memory.

Most programs can be divided into three sections. First, there's the area of memory that contains *code*—the actual instructions of your program. Second, there are the *constants*—data used by the program that don't change. Finally, there are the *variables*—the values that the program changes as it runs. As a rule, code and constants never change. Again, as a rule, variable space is not saved as part of the program. Instead, programs generate their own variables, making use of variable memory only when needed, "on the fly," so to speak.

There are exceptions to these rules, and it's possible to muddle the various categories together. For instance, a programmer may write a program that modifies itself as it runs; some of the actual machine language instructions are changed by the program itself. This kind of programming is tricky and should be avoided unless there's a good reason for it. The most serious problem caused by this type of programming is that the program may not run twice without being reloaded, since it's no longer in its original form.

Organizing Memory

It's often a good idea to organize your programs so that the main program comes first and is followed by subroutines; then put in the constants, with numeric values and strings separated; and, at the end, have an area allocated (but with nothing defined) for variables.

Keeping code up front makes it easier for you to disassemble and debug your program. It's difficult to

look through a program that has constants and variables mixed in with the code. Also, compact code helps keep your branches in range (a 6502 branch instruction has a range of a little over 120 bytes forward or backward).

If your code is kept close to your constants, you'll be able to bring it all into memory with a single load from disk or tape. What's more, if you fear that part of your program memory has been altered due to a bug, a quick VERIFY will tell you whether anything has actually been corrupted. If you have variables mixed in with the code or you use self-modifying code, you won't be able to use this VERIFY technique.

If you're a beginning programmer without a full symbolic assembler, it's hard to write compact code. It's good practice in this case to leave blanks—unused bytes of memory—between different sections of code, in case you've overlooked something. You can fill in these blank areas with NOPs (No Operation, a do-nothing command).

An Organized, But Friendly Program

Let's write a simple machine language program that asks you for your name and then replies with a friendly "HELLO, name." I've divided this program into the three different sections discussed above: code, constants, and variables. The actual program is the code, the input prompt and HELLO message make up the constants section, while the name input by the user is placed into variable storage that follows.

To make it easy to enter, I've written the program as a BASIC loader which POKES the machine language into memory. The machine language is POKED to a memory area suitable for all Commodore eight-bit computers except the Commodore 128 in 128

mode. Type in the program and save it to disk before running it.

The code part of this program goes from hexadecimal (hex) \$0340 to \$0393 (decimal 832 to 915). To view the program's instructions, you need to disassemble the code using a machine language monitor. The constants are close by at hex \$0394 to \$03AB (decimal 916 to 939). The variable area is not included in the DATA statements since it's generated by the program when the user enters his or her name. Variables are stored at hex \$03C1 (decimal 961) and up. Hopefully, the user won't input more than 64 characters. If more than 64 characters are entered, the name starts to run into screen memory—the program doesn't test for this.

```
CB 100 REM PROGRAM SECTION
GD 110 DATA 162,0,189,148,3,32,210,255
KB 120 DATA 232,224,17,144,245,162,0
QC 130 DATA 142,192,3,32,228,255,41,127
RE 140 DATA 201,13,240,16,201,65,144,243
CC 150 DATA 32,210,255,174,192,3,157,193,3
RH 160 DATA 232,208,228,32,210,255,162,0
AF 170 DATA 189,165,3,32,210,255,232,224,7
GP 180 DATA 144,245,162,0,189,193,3
JF 190 DATA 32,210,255,232,236,192,3
PP 200 DATA 144,244,169,46,32,210,255
AH 210 DATA 169,13,32,210,255,96
QP 220 REM PROMPT MESSAGE
PS 230 DATA 69,78,84,69,82,32,89,79,85,82
QQ 240 DATA 32,78,65,77,69,58,32
SG 250 REM HELLO STRING
XC 260 DATA 72,69,76,76,79,44,32
EM 300 FOR J=832 TO 939
BC 320 READ X
DR 330 T=T+X
PC 340 POKE J,X
DQ 350 NEXT J
XA 360 IF T<>13608 THEN PRINT
      {SPACE}"ERROR IN DATA":
      STOP
RK 400 SYS 832
```


computing for families

The Secret Life Of Fred D'Ignazio

Fred D'Ignazio
Associate Editor

I sat tilted back in the barber's chair, listening to the Monkees sing in tinny voices on the dusty little barber shop radio. The barber didn't seem to mind that I had my eyes closed and was dozing as he snipped away at the hair around my ears. He was too involved in imagining aloud how great it must be to be a writer.

"Oh, you writers have it made," he said. Snip. Snip. "You work at home." Snip. "You don't have to show up for work." Snip. "You don't even have to get dressed." Snip. "You can go anywhere, do anything you like. What a glamorous life."

Then he heaved a big sigh and began snipping furiously at my eyebrows.

My eyes popped open. The scissors swooped like giant birds just above my eyelids. "No!" I cried. "It's not like that at all!"

His snipping grew more sullen and capricious. "Sure," he said. Clumps of eyebrow hairs pelted my nose.

"I mean it," I said as I slid slowly down in my seat, retreating from those flashing blades. "What a writer writes may be exciting, but the writer's life is a bore."

"Right," said the barber, totally unconvinced. "You travel all over to get story ideas. You write a book, then you go on TV talk shows, get yourself snookered talking to pretty women at parties your editor throws for you, and you come home to find a fat check in your mailbox. Tell me about it."

"What parties?" I cried. "What pretty women?" I was starting to squirm, as much from his questioning as from his haircutting. "Look," I said. "You want to know what I do every day?"

"This morning, the first thing I did was feed the cat. Then I made

the kids' breakfast. I made my wife's breakfast. I said good-bye to my wife and ran my kids to school. Then I spent an hour straightening the house and making beds. I watched a little Donahue, had a cup of coffee, and went down in the cellar and changed the kitty litter. Then I turned on my computer. . . ."

"What's your computer got to do with it?" he asked, spinning me around by my shirt collar, and lathering the back of my neck.

"Oh, boy," I thought. "This guy really doesn't understand." But all I said was: "I use my computer for writing. The most exciting thing I do all day is writing. But even that's pretty boring. Just peck, peck, peck at the keys, all day long. Write something. Delete it. Struggle with it. Write it again."

"And then?" said the barber, his face lighting up. "And then?"

"And then the kids come home," I said, wiggling and itching from all the little hairs that had fallen down my back. "Then it's time to make the kids' snacks, stop them from fighting, run them to soccer practice, put in a load of laundry, and start dinner so that it's well along when my wife comes home."

"That's your whole day?" the barber said. He looked crestfallen, disappointed. His shears stopped buzzing; his arms fell to his sides. "You mean that's all?"

"That's all," I said. I tried to mirror his look of dejection. But inside I was grinning. I didn't dare tell him what really went on all day, in addition to the ordinary, humdrum events I had just described. He didn't know what I really did when I was alone by myself all day. No one did. It was my secret—the secret life of Fred D'Ignazio.

Conqueror, Avenger, Berserker

In the morning when the last child was safely dropped off at school I

raced home. Even before the ritual of washing the morning dishes or making the beds I headed straight for my Commodore computer and turned it on. In less than a minute I had shed all ties with my mundane, earthly existence. No longer was I Freddie the househusband or Freddie the daddy. Now I was Fred the Conqueror, Fred the Avenger, and Fred the Berserker. Depending on the game I loaded into the computer, I got to travel back in time, journey into the future, or sail off through clouds and mist and intergalactic supernovae and assume my true identity—Master of the Universe! Pretty soon, all thoughts of crumpled covers, dirty sinktops, and column deadlines vanished from my brain, and I was committed body and soul to battling a crew of aliens, or outwitting a malevolent magician, or climbing a cliff to a fabulous treasure.

My computer was my magic carpet, and I sailed away from the so-called glamorous life of a writer into new worlds, new experiences, and new friends.

I opened my eyes. I was still sitting in the barber chair, but now the barber was looking at me with a strange expression on his face. Could he tell what I'd been thinking? Was my secret revealed? Did he know what a writer really did?

"I was just saying," he said as he whipped the white sheet off my body and dusted my shoulders with his little broom, "that you might consider finding a new job. It's got to be more exciting than what you're doing now."

I slid out of the chair and nodded, and even gave him a big tip. Then I rushed out of the barber shop and headed home. If I hurried, I had time for a quick trip to another planet before my kids got home. And I was smiling. "Being a writer isn't so bad," I told myself. "Not if you can keep a secret." ■

Greg J. Badros

Here's a program that allows you to print out GEOS disk directories. Each directory listing includes information such as file size, author name, and even file comments. Directory printouts are output in an organized format, making it easy to locate and learn about your GEOS files. This program works with 64 GEOS (single-sided) disks only.

To list a normal 64 disk directory to your printer, all you have to do is load the directory and enter OPEN 4,4,7:CMD 4:LIST. You can do this with GEOS disks, but the results are far from complete. GEOS file directory entries contain much more information than standard 64 files. Each GEOS file has a file type, file size, file class, file date, and comments field.

"Directory Printer" creates complete printouts of GEOS disk directories. Having a hardcopy of a GEOS disk directory makes it easy to find files. Also, information once obtainable only through the deskTop's Info option is made readily available with a printout.

Typing It In

Type in Directory Printer using "MLX," the machine language entry program found elsewhere in this issue. Respond to MLX's prompts with the following values:

Starting address: 0801
Ending address: 12E0

After you've finished typing in the program, be sure to save a copy to disk.

Directory Printer is a standalone program. You do not have to run Directory Printer from the GEOS environment. In fact, Directory Printer loads and runs just like a BASIC program.

To print a GEOS directory, simply load and run Directory Printer,

insert a GEOS disk, and press RETURN. If the disk in the drive is not a GEOS disk, the computer tells you so and reruns the program. After printing a listing, the program asks whether you wish to print another directory. Answer no to exit the program and return to BASIC.

Due to GEOS's more involved file structure, more information is printed in a GEOS directory than in a regular 64 or 128 directory. This information varies among file types, but it is generally the same information produced by the deskTop's Info option. See the sample printout for an example directory listing.

Directory Format

Directory Printer prints the name of the disk and the current page number at the top of each page. The page number corresponds to the Disk Notepad page in which the files are located. The last page of the printout lists files that are found on the border (on the deskTop, below the Disk Notepad).

Filename, file type, and file

size are listed for each directory entry, whether or not they're GEOS files. GEOS has its own file types, such as Application, Desk Accessory, Printer Driver, and so on. The standard Commodore DOS file type—USR, PRG, or SEQ—follows in parentheses. GEOS files are almost always USR files. File size is shown in both kilobytes (K) and disk blocks.

For all GEOS files, Directory Printer lists the file class, modified date, and comments field. File class is simply the class of the file as it appears in the file's information window. The modified date is the time and date that the file was last modified. File comments appear last.

GEOS program files have two additional pieces of information: memory info and author name. Memory info consists of the starting address, ending address, and entry address for a program. This is vital information for GEOS programmers. The author name, of course, gives the name of the program's creator.

See program listing on page 91. ■

```

Name : GEOS KERNAL
File Type : System Program (USR)
Size : 22K (85 Blocks)
File Class : GEOS Kernel V1.2
Modified : On 04/07/86 At 12:00 pm
Mem. Info : $0000 to $FFFF --*-- Entry At : $C22C
Author : Berkeley Softworks
Comments : This is the core of the GEOS
operating system.

Name : DESK TOP
File Type : System Program (USR)
Size : 18K (72 Blocks)
File Class : deskTop V1.2
Modified : On 04/07/86 At 12:00 pm
Mem. Info : $0406 to $0405 --*-- Entry At : $0406
Author : Brian Dougherty
Comments : Use the deskTop to manage and
manipulate your files.

Name : GEOPAINT
File Type : Application (VLIR) (USR)
Size : 30K (119 Blocks)
File Class : geoPaint V1.1
Modified : On 04/07/86 At 12:00 pm
Mem. Info : $0400 to $03FF --*-- Entry At : $0400
Author : Jim DeFrisco
Comments : geoPaint is a full-featured color /
black & white graphics editor.
    
```

"Directory Printer" produces output as shown in this sample.

BASIC for beginners

More On The Random Function

Larry Cotton

Last month we learned how to generate a random number from 1 to 10 and used RND to determine the toss of a coin. To make life easier, we introduced two lines of code:

```
10 L = 1:U = 10
20 N = INT((U - L + 1)*RND(1)) + L
```

Here, the variables L and U represent the lower and upper limits of the random number to be generated. As you can see, these lines currently produce a random number between 1 and 10, inclusively.

One of the most popular uses for random numbers (at least in games) is to simulate the rolling of dice. Enter this short example, which illustrates the rolling of one die:

```
10 L = 1:U = 6
20 N = INT((U - L + 1)*RND(1)) + L
60 PRINT "PRESS ANY KEY TO SEE
   WHAT YOU ROLLED.":PRINT
70 GET A$:IF A$ = "" THEN 70
80 PRINT "YOU ROLLED"N
90 PRINT:GOTO 20
```

For both dice, add the following lines:

```
30 D1 = N
40 D2 = INT((U - L + 1)*RND(1)) + L
50 N = D1 + D2
```

You might have thought we could have simply set the variable L in line 10 equal to 2, for snake eyes, and U equal to 12, for two 6s. This would generate a random number between 2 and 12, but it would not accurately simulate two dice. You see, the odds of getting a number such as two (1 + 1) is much lower than getting a seven (1 + 6, 2 + 5, or 3 + 4). To account for this, we must produce two random numbers between 1 and 6, and then add them together.

Ordered Randomness

Randomness can be tempered with order. Here's a way to tilt the scales in a particular direction—in this case, causing after many loops, one person's name to be generated approxi-

mately twice as often as another.

```
10 PRINT "PRESS ANY KEY TO STOP."
20 FOR T = 1 TO 1000:NEXT
30 L = 1:U = 3
40 N = INT((U - L + 1)*RND(1)) + L
50 ON N GOTO 60,60,70
60 PRINT "DAVE":D = D + 1:GOTO 80
70 PRINT "MIKE":M = M + 1
80 GET A$:IF A$ = "" THEN 40
90 PRINT:PRINT "NO. OF DAVE'S IS"D
100 PRINT:PRINT "NO. OF MIKE'S
   IS"M
```

In this example, line 40 generates a random number between 1 and 3. The ON-GOTO in line 50 sends control of the program to the line number that corresponds to our random number. Thus, when a 1 or 2 is generated, control goes to line 60. Line 60 prints the name DAVE. When a 3 is generated, control jumps to line 70, which prints the name MIKE. Lines 60 and 70 also contain the two counters, D and M. Each time a particular name is chosen, the corresponding counter is incremented.

Line 80 uses GET to check the keyboard for keypresses. If no keys have been pressed, control is sent back to line 40 to generate another random number. If a key is pressed, lines 90 and 100 are executed, printing out the values of D and M. When run enough times, DAVE is printed twice as many times as MIKE. Try it and see.

Math Drills

Another popular use for random numbers is generating problems in math drill programs. How does one begin to write such a program? First we need to ask ourselves what sort of drill is needed. To keep our example relatively short, let's use multiplication only. Also, let's limit our math problems to numbers between 0 and 9. We'll begin by defining our number's lower and upper limits:

```
10 L = 0:U = 9
```

We'll need a problem counter as well. Let's use P and set it for the

first problem:

```
20 P = 1
```

To make sure a different random problem is presented every time the program is run for the first time, we must use a statement that we haven't seen before. For now, just type it in.

```
30 Q = RND(- TI)
```

Start with a nice blank screen.

```
40 PRINT "{CLR}"
```

Print the instructions and initialize our answer string.

```
50 PRINT:PRINT " TYPE THE ANSWER
   AND PRESS RETURN."
60 PRINT:PRINT " PRESS ONLY THE
   RETURN KEY FOR SCORE."
70 PRINT:PRINT "(THE LAST
   PROBLEM ISN'T COUNTED.)"
80 ANSWER$ = ""
```

Next, we need to generate two numbers (multiplicands) from 0 to 9. These numbers, M and N, are randomly generated.

```
90 M = INT((U - L + 1)*RND(1)) + L
100 N = INT((U - L + 1)*RND(1)) + L
```

Then we print the problem, preceded by a blank line for nice appearance.

```
110 PRINT:PRINT M"X"N" = ";
```

The easiest way to ask for a user's answer is to use INPUT.

```
120 INPUT ANSWER$
```

The INPUT statement outputs a question mark and a flashing cursor on the screen. Thanks to the semicolon in line 110, they immediately follow the problem.

We should prevent the computer from accepting anything but numeric input. We've seen comparisons of strings for equality (IF A\$ = B\$) and inequality (IF A\$ < B\$), but did you realize that strings can be compared with less-than (<) and greater-than (>) symbols?

```
130 IF ANSWER$ > "9" THEN PRINT "
   {3 UP}":GOTO 110
```

If letters or other illegal characters are entered, the three cursors-

up and GOTO 110 cause the program to reprint the question at the same location on the screen.

Our instructions state that the program announces the score if the RETURN key is pressed. The next line takes care of this:

```
140 IF ANSWER$ = "" GOTO 300
```

If ANSWER\$ is null, the user must have pressed RETURN without entering a number. In this case, control goes to line 300, where we print the score (we'll write this later on).

To convert ANSWER\$ into a number, we use BASIC's VAL() function.

```
150 A = VAL(ANSWER$)
```

Now that we have a numeric value, let's see if it's the right answer.

```
160 IF A = M*N THEN GOSUB  
200:GOTO 80
```

Later, we'll write a correct-answer subroutine beginning at line 200, which contains, as always, a RETURN. The RETURN command sends the program back to the GOTO 80, which begins generating a new problem.

Suppose the answer is wrong. The IF-THEN statement fails and the program falls through to line 170 (below). Line 170 increments the problem counter, prints an error message, and asks you to try the problem again.

```
170 P = P + 1: PRINT:PRINT " SORRY,  
THAT'S WRONG. TRY  
AGAIN.":GOTO 110
```

Now, let's write the correct-answer subroutine beginning at line 200. Again, we need to increment our problem counter, P. We also introduce a right-answer counter, R.

```
200 P = P + 1  
210 R = R + 1
```

Then, a nice congratulatory message should be printed.

```
220 PRINT:PRINT " RIGHT! TRY  
ANOTHER!"
```

And every subroutine needs a RETURN.

```
230 RETURN
```

Last, let's write the section that prints the score and ends the program.

```
300 PRINT:PRINT " SCORE: "R"RIGHT  
OUT OF"P - 1"TRIES"  
310 END
```

power BASIC

Color Lister

Bret M. Timmins

Use color to make your programs easier to debug. Versions of this handy utility are included for the Commodore 64, 128, and Plus/4 and 16.

When you write a long program, you probably break it up into small pieces—a sorting routine, a printing routine, an input routine. Your main program loop might even consist of distinct logical units. Perhaps the first section initializes variables, a second gets input, a third does a few calculations, and a fourth prints out the results.

Even though your program works in sections, when you type LIST, the entire program scrolls by in one monolithic chunk. Some programmers insert REM statements into their programs to help isolate the various sections. But when the program is scrolling by, it's all too easy to miss a REM command among the other text in the program.

Other programmers separate their routines by carefully choosing their line numbers. Perhaps the sort subroutine uses lines 6000-6099. But renumber your program, and all those carefully contrived distinctions disappear.

"Color Lister" makes it easy to identify the parts of your program. It lets you change the color of your program text at any point. You can use any of 16 colors as many times as you like. Color Lister is truly an unusual and useful debugging tool.

Typing It In

Color Lister is a small machine language program that is patched into BASIC's LIST routine. To make it easier to install, it's listed as a BASIC loader: You type it in, save it, and load it like a BASIC program. Be sure to use "The Automatic Proofreader," listed elsewhere in

this issue, when typing in Color Lister. The machine language itself is stored in DATA statements and one typo could crash the program. When you type RUN, the BASIC loader POKES the machine language program into memory. There are three versions of the program—one for the 64, one for the 128, and one for the Plus/4 and 16. Type in the program for your computer. Be sure to save a copy before running it.

Install Color Lister at the beginning of the programming session by loading the program and typing RUN. Then, type one of the following commands to turn Color Lister on:

Commodore 64	SYS 828
Commodore 128	SYS 2816
Plus/4 or 16	SYS 819

To see how Color Lister works, type NEW and then enter the following short program exactly as it is listed:

```
10 REMA  
20 PRINT"HELLO"  
30 REMB  
40 PRINT"GOODBYE"
```

Now type LIST. You'll see that the program is listed in two colors. To change colors, you must place the REM statement on a line of its own. The REM must be followed immediately by a number 1-8 or a letter A-H. The numbers represent colors 1-8, while the letters represent colors 9-16.

Color Lister survives RUN/STOP-RESTORE. To disable the program, type one of the following sets of commands:

Commodore 64	POKE 774,26:POKE 775,167
Commodore 128	POKE 774,81:POKE 775,81
Plus/4 or 16	POKE 774,110:POKE 775,139

See program listings on page 90. ■

Todd Heimarck
Assistant Editor

A few weeks ago, "Gazette Feedback" received the following letter: *I recently bought a 128D and I love it. I have a good many games, and every one of them was copied using a nibbler. In fact, I got my nibbler by using someone else's nibbler. They can save you a bundle of money. But I have a problem. My nibbler refuses to copy software copyrighted later than 1986. There are so many nibblers and file copiers available, it's so hard to tell which one's better. I'd hate to waste my money on something that isn't any better than what I already have, so could you please suggest a reliable nibbler? One tends to get confused after a while.*

To cut through the confusion, let's put it in very plain language: Duplicating and distributing copyrighted software that you did not buy is both illegal and immoral. It's the same as stealing. Copyright means the right to copy, and if you see a copyright message, you should not copy the software. Even just giving a copy to a friend is wrong. Furthermore, using one nibbler to copy another nibbler is like breaking into a locksmith's shop to steal a key so you can more easily steal a car.

People who illegally copy and distribute software are commonly called *pirates*. Most piracy occurs between individuals; one person copies a program and gives it to a friend.

Some time ago, we received a letter from a nun who taught programming in a parochial school. She said that in their curriculum, the students start programming in Logo in third grade, BASIC in fifth, and Pascal and assembly language in seventh grade. By the time students reached ninth grade, they were good enough (if good is the correct word) to crack commercial protection schemes and make

copies for the younger kids. She suggested that it's not enough to teach programming—that ethics should be part of a computer curriculum. Good point.

Enforcing The Law

Someone posed an interesting question on CompuServe: *If copying software is illegal, why don't the police enforce the law? But how? Even if there were such a thing as software police, they'd have to peek in windows to catch people making illegal copies. Or maybe they'd knock on doors, waving search warrants, demanding to inspect disks.*

The police don't usually get involved, except when the piracy occurs on a large scale, such as a software rental company or a bulletin board system (BBS). One software company recently put a bounty on pirate BBS's: \$200 cash or \$400 in software. Many pirates were uncovered. The company then filed a lawsuit against the parents of a minor child (the sysop of a pirate BBS) for failing to supervise the child's illegal activities.

The answer is not stronger law enforcement and lawsuits. To stop piracy, just say *no*. The next time someone asks if you want a copy of the hottest new game, say you don't believe in illegal copying.

When You Can Copy

Software falls into two broad categories: copyrighted and public domain. If you write a program and waive your copyright, saying anyone can have it free, then it's public domain. If you include a copyright message in the program, you control the right to make copies; the program is copyrighted. Shareware is a special case of copyrighted software: The author retains the copyright, but includes a message that it's OK to copy and distribute the software. He or she generally asks for a dona-

tion, too. Often, the people who pay will receive information about enhancements and upgrades.

There are thousands of Commodore programs in the public domain. They're available from user groups, computer stores, telecommunications services, bulletin boards, and other sources. Computer owners on a tight budget can satisfy their craving for new software without resorting to piracy.

Copying a program you own (for archival purposes) is generally considered legal, although some software agreements specifically prohibit this. For example, you buy a word processing program for \$100 and make a backup, in case you accidentally spill coffee on the disk or the dog decides to use it as a chew-toy. The backup is an archival copy. Copying *per se* is not piracy; giving away (or selling) copies is where piracy comes in.

Why Not Pirate?

Piracy is against the law; if you get caught, you may well end up in court.

But beyond the law, there's a moral question. If you work for a living, you expect to be paid for your time and expertise. Software authors have a job: They write programs. They're like composers, writers, or any other creative artist. Copyrights encourage artists to continue creating novels, songs, programs, and other works. Pirating software is like asking programmers to work for free.

But It Doesn't Hurt Anybody

Probably the most common justification for illicitly copying software goes like this: *Even if I had the money, I wouldn't have bought the program anyway. Thus, the software company didn't lose any money they might have made.* This argument ignores the fundamental rule of the market: The program is offered for sale and

you have the choice of buying or not buying. Imagine someone stealing an apple from a grocery store and then saying he wouldn't have bought it anyway.

The test-drive theory goes like this: *I copy software so I can test it out; if I like it, I'll buy it.* Too often, the test-drive turns into a cross-country trip—the tester never gets around to purchasing a legitimate copy (*I'll be done testing it by 1999*). In many cases, you can't test a program without the manual; you need the documentation to use the program to the fullest. If you really want to test out a program, you can use the original—at a friend's house or in a computer store. And you can read the reviews in magazines.

The most bizarre excuse is this one: *By copying software and giving it away, the pirate says he or she is providing free advertising for the author. It's a public service.* Someone might see the program and actually buy a copy. Proponents of this theory somehow don't realize that software companies advertise to reach people who *buy* software, not to reach people who give it away.

Many people think, "I'm just a drop in the bucket. It won't affect anyone if I make just one copy." Multiply that attitude by 50,000 and think of all those drops dripping into the bucket.

Any Answers?

The pirates who make excuses and try to justify their actions probably know what they're doing is wrong. Other people just don't know it's wrong, like our reader who was happy to discover he could save a bundle of money by copying programs.

Ironically, the more money you save by pirating software, the more you ultimately pay. Have you ever bought a program that's unsuitable for your purposes and then tried to return it for a refund? Most computer and software stores don't offer refunds. If they did, people would buy software, copy it, and get their money back.

Have you ever had a disk drive go out of alignment? You can probably blame copy-protection schemes that knock the drive's read/write head around—the woodpecker effect. If people didn't

pirate software, companies wouldn't feel it necessary to protect their disks.

Have you noticed how many software companies have gone out of business in the last five years? They just didn't sell enough software. Many of the survivors are known for their expertise at devising copy-protection techniques.

What do we do about piracy? If you have an opinion on this topic, send us a letter: Horizons/Piracy, COMPUTE!'s Gazette, PO Box 5406, Greensboro, NC 27403.

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IS YOUR PRINTING OUTPUT



FOR THE BIRDS?

ML Cloner

Joseph Charnetski

*Copy machine language files the easy way with "ML Cloner."
For the Commodore 64, 128, Plus/4, and 16.*

BASIC programs are easy to move from one disk to another. You just load them from one disk and save them to the other. Some machine language programs load and save just like BASIC programs, so this procedure works with them as well. But how do you copy a machine language program that doesn't load and save like a BASIC program?

One solution is to use a high-speed file copier like "Disk Rapid Transit," published in the December 1987 GAZETTE. If you don't have such a program, "ML Cloner" will make the job a breeze. It's very small, saving you typing time and

disk space, and it's versatile—it works equally well on the Commodore 64, 128, Plus/4, and 16.

Getting Started

ML Cloner is written in BASIC. Type it in and save a copy to disk. When you're ready to copy a machine language program, type RUN. ML Cloner will prompt you for a filename. Enter the name of the file you wish to duplicate, and the file will be read into memory.

After the file has been loaded, the starting and ending addresses of the file are displayed, and you are asked whether you would like

to continue copying the file. Answer Y for yes, or N if you want to exit the program.

ML Cloner next asks whether you'd like to change the name of the destination file. If you answer Y for yes, you are prompted for the new filename. Be sure to change the name if you plan on making a copy to the same disk.

Insert the destination disk into the drive and press RETURN. The file will be written to disk. You are now asked whether you'd like to make more copies of the file. If you answer Y, you can make more copies of the file in memory. Otherwise, you'll be given the option of running the program again to copy a new file.

See program listing on page 92. ■

bug-swatter

Modifications and Corrections

• Several users have had trouble with "Needleworks Graphics Editor" (January GAZETTE). The problem stems from a preliminary version of the new MLX lister we are now using. Apparently, some of the files from the January issue were listed using the faulty version. The result is programs that won't run because they're missing a few bytes here and there.

Below is a short program that will repair your copy of Needleworks Graphics Editor. Type in the program and save a copy to disk just to be safe. Next, place the disk containing your copy of Needleworks Graphics Editor into the disk drive and type RUN. You'll be prompted for the name of the INPUT FILE. Type the filename you used to save

Needleworks Graphics Editor and press RETURN. You'll then be asked for the name of the OUTPUT FILE. Type a new filename for Needleworks Graphics Editor. Be sure the new filename is different from the old one. You'll now have a working copy of Needleworks Graphics Editor. Be sure to scratch any bad copies of Needleworks.

```
SB 100 OPEN15,8,15
RF 110 INPUT "INPUT {2 SPACES} F
    LE";IN$
HX 120 OPEN1,8,3,IN$+"P,R":GO
    SUB260
FJ 130 INPUT "OUTPUT FILE";OT$
JM 140 OPEN2,8,4,OT$+"P,W":GO
    SUB260
RR 150 GET#1,$$:GOSUB240:GET#1
    ,$$:GOSUB240
HM 160 PRINT "WORKING":A=2049
AM 170 GET#1,$$:F=ST
AP 180 IF A=2210 THEN $$=CHR$(
    176):GOSUB240
```

```
QR 190 IF A=3035 THEN $$=CHR$(
    6):GOSUB240:$S=" ":GOSU
    B240
QM 200 IF A=3813 THEN $$=CHR$(
    211):GOSUB240
AS 210 $$=K$:GOSUB240:IF F=0 T
    HEN170
CE 220 CLOSE1:CLOSE2:CLOSE15:P
    RINT "DONE"
GE 230 END
CK 240 $$=CHR$(ASC($$+CHR$(0))
    ):A=A+1
CM 250 PRINT#2,$$:RETURN
BX 260 INPUT#15,E,E$:IF E=0 TH
    EN RETURN
XM 270 CLOSE1:CLOSE2:CLOSE15:P
    RINT E;E$
```

We suspect a similar problem with "Delta War" from the same issue, but as we go to press, we have not been able to confirm our suspicions. If we do find a problem, we'll publish a correction in this column next month. ■

Hi-Res Screen Dump For The Plus/4 and 16

James Host

This machine language hi-res screen dump is a handy memory-resident utility for the Plus/4 or 16 and almost any Commodore-compatible printer.

One of the nicest features any computer can have is the ability to print its high-resolution screen at the touch of a key. On some computers this feature is built-in, but on Commodore eight-bit computers a hi-res screen dump must be user-programmed and wedged into the operating system. This program, "Screen Dump," adds a high-resolution screen-dump feature to the Commodore Plus/4 or 16 computer with any Commodore-compatible printer.

Getting Started

Because Screen Dump is written entirely in machine language, you cannot enter it directly into your Plus/4 or 16. Instead, type in "Dumpmaker," the program accompanying this article. This program contains the whole of Screen Dump in DATA statements. Be careful when entering the DATA statements and be sure to save a copy of Dumpmaker to disk before running it.

If you're using a tape drive, you'll need to change line 50 of the program so D = 1 since that's the device number for tape. If you're using disk, the program will work fine without any changes.

When you run Dumpmaker, you'll be asked if your printer is 1525 compatible. Answer Y if your printer is a Commodore 1525, an MPS-801 or 803, a "Commodore ready" dot-matrix printer, or if your printer's interface has a good 1525 emulation mode.

Answer N if your dot-matrix printer uses the standard ESC K code to turn on its single-density graphics mode and is connected to your computer with an interface. After answering this question, Dumpmaker will write Screen Dump to your disk or tape with the filename +4SCREENDUMP.

How To Use It

To dump a screen, reset your computer and then load and run Screen Dump just like a BASIC program. You'll get the usual BASIC READY prompt almost immediately. Now load and run any program that creates a high-resolution screen you'd like to print.

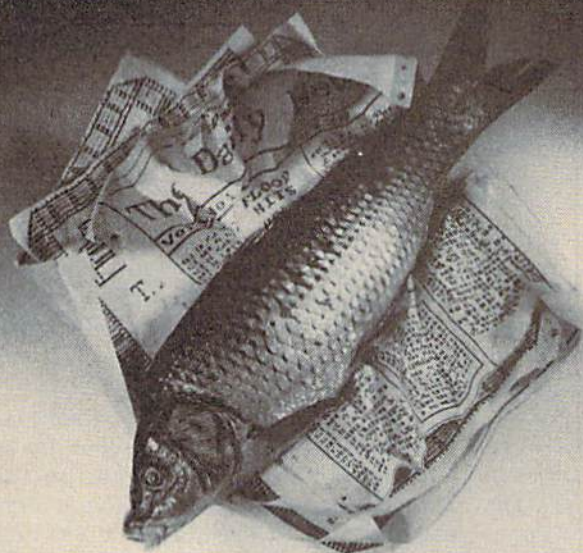
When the screen appears, press the Commodore and CTRL keys simultaneously and then release them. Your printer will come to life and print a hard-copy of the screen. After the printing is finished, control will return to your program where it left off.

Program Notes

Screen Dump occupies the bottom of BASIC storage and will work with many programs written in BASIC which create high-resolution screens. For the Commodore 16, however, some programs may run out of memory, which is already very limited when the 16's high-resolution screen is allocated.

See program listing on page 90.

DOES YOUR FONT SELECTION



STINK?

Big Screen

Robert Bixby

This amazing drawing program turns your 64 into a 640 × 400-pixel super graphics machine. You can create graphics, load and save them, edit portions of the screen by pixels, draw with a joystick or touch tablet, print, and much more. A disk drive and joystick are required. A touch tablet is suggested.



Very finely detailed graphics can be created with "Big Screen."

If you've ever felt constrained by the size of the 64's hires screen, "Big Screen" is for you. With it, your 64's drawing canvas is expanded to four times its usual size, encompassing an impressive 640 × 400 pixels. Graphics can be created and edited with Big Screen using either a joystick or touch tablet, then loaded and saved to disk, and they can be printed with either a Commodore 1525/MPS-801/803, a Star SG-10, or any printer compatible with either of these. If graphics is your game, Big Screen is guaranteed to spoil you.

Getting Started

Since Big Screen is written in machine language, you'll need to enter it with the "MLX" machine language entry program printed elsewhere in this issue. When you run MLX, you'll be asked for a starting and an ending address of the data you'll be entering. Here are the values to use for Big Screen:

Starting address: 0801
Ending address: 1DE0

Follow the MLX instructions carefully, and be sure to save a copy of the Big Screen data before you finish typing. After entering and saving a copy of Big Screen, it can be loaded and run just like a BASIC program.

Using Big Screen

Big Screen divides its 640 × 400 canvas into four quadrants of 320 × 200 pixels each. When you first run the program, you'll see the upper-left quadrant on your screen. This area will undoubtedly be filled with a random image produced by whatever happened to be in your 64's memory when you ran the program. No need to worry, though—it's easy to erase and edit the canvas.

Big Screen has four modes: *shell*, *zoom*, *joystick*, and *touch tablet*. When you first run the program, you're in shell mode. In this mode, you can load and save graphics, print graphics, clear the current quad-

rant, turn the screen into a negative image of itself, get a bird's-eye view of all four quadrants, get help, flip from quadrant to quadrant, scroll, and enter the other modes. Here's a summary of the shell mode commands:

L Loads a graphic from disk. While the graphic is loading, the screen turns red, then returns to its normal black-and-white image after the graphic is finished loading. If you change your mind after issuing either an S or L command, simply type RETURN when requested for a filename and you'll be returned to the shell.

S Saves a graphic to disk. Since each picture you create with Big Screen is 640 × 400 pixels—that's 256,000 bits or 32K—each drawing takes 130 disk blocks.

SHIFT-P Prints a graphic on a Commodore 1525/MPS-801/803 or compatible printer.

P Prints a graphic on a Star SG-10 or compatible printer.

SHIFT-CLEAR/HOME Erases the quadrant currently on the screen without changing the other three quadrants.

— The minus sign turns the entire 640 × 400 screen into a photographic-style negative of itself.

* This command gives a bird's-eye view of all four quadrants. You'll notice that the quarter currently on the screen will always occupy the upper-left corner of the picture when this command is invoked. Pressing any key will return to the shell.

CRSR ↑ ↓ ← → The cursor-control keys move from quadrant to quadrant.

Joystick You can use the joystick in shell mode to scroll the screen by 16 pixels horizontally and 8 pixels vertically.

M Provides a menu of commands for each mode.

K Enter touch tablet mode.

J Enter joystick mode.

Z Enter zoom mode.

RUN/STOP-RESTORE Exit Big Screen. If you exit by mistake, type RUN before doing anything in BASIC, and you'll reenter the program with your last drawing still in memory. If RUN doesn't work, you can reload and run Big Screen, and your last drawing should still be in memory.

Zoom Mode

Typing Z from the shell moves you to zoom mode where you can edit individual pixels. The 40 × 24-pixel area in the top-left corner of the visible hi-res screen is blown up to 64 times its apparent size and appears in the zoom window. Because you can smoothly scroll Big Screen with the joystick, any portion of the screen can be zoomed. This feature is also useful in designing brushes, discussed in the section on joystick mode, below.

In zoom mode, the cursor appears as a cross and is manipulated by the joystick. To place a pixel on the screen, type a period (.). You can erase with a comma (,) and return to the shell by pressing RETURN.

Joystick Mode

Plug your joystick into port 2 and press J to enter joystick mode. You'll see the border color change to remind you of the mode change. Typing a period (.) will cause your pen—an arrow-shaped cursor—to appear. To fill your pen with ink, press W. If you want to erase, press E. You can begin either drawing or erasing by pressing the plus (+) key. The minus (-) key stops the penpoint from drawing or erasing, making it safe to move the pen from place to place on the screen.

You can control the pen's speed with the equal-sign (=) key. Pressing (=) will give you extremely fast movement, SHIFT-(=) reduces the speed to half, CTRL-(=) reduces speed to one quarter, and Commodore-(=) reduces speed even further—slow enough for a meticulous artist. Be sure to release the equal-sign key first when using the SHIFT, CTRL, and Commodore combinations. If you don't, Big Screen will interpret the key combination as an unshifted (=). To exit joystick mode and return to the shell, press RETURN.

Defining A Brush

If you wish, you can change your pen to a brush by pressing D in joystick mode. Big Screen takes the 32-byte area in the upper-left corner of the screen (16 × 16 pixels) as the brush pattern. Before pressing D, you can create a brush pattern by drawing anything in this area with the joystick, or by using zoom mode to edit individual pixels. To return to the arrow-shaped pen, type a period (.). If you've defined a brush and want to return to it, press the slash (/) key.

In its default mode, the brush rolls across the canvas to allow you to fill a space with the defined pattern. If you prefer to smear the brush, press the joystick button while moving it. As with the penpoint, W provides the brush with ink, E with an eraser, (+) prepares to draw, and (-) stops drawing or erasing.

Touch Tablet Mode

Touch tablets provide one of the best input devices available for graphics on the 64. If you have a touch tablet (such as Koala Pad), plug it into port 1. To enter touch

tablet mode, press K from the shell. Notice that the border changes to black. In touch tablet mode, you can select brush or pen the same way you did in joystick mode, and you can use the joystick (still plugged into port 2) to scroll the screen. Press W to draw, E to erase. To begin drawing, press the left touch tablet button; to stop, release it.

Pressing the period (.) gives you a pen to draw with and (/), a brush. Pressing D selects the upper-left corner of the screen, as your brush, the same way it does in joystick mode. Unfortunately, the brush doesn't roll in touch tablet mode.

It is normal to see neither brush nor penpoint when you first enter the touch tablet mode. Select the drawing device with (/) or (.), and touch your finger to the tablet. The drawing device should appear.

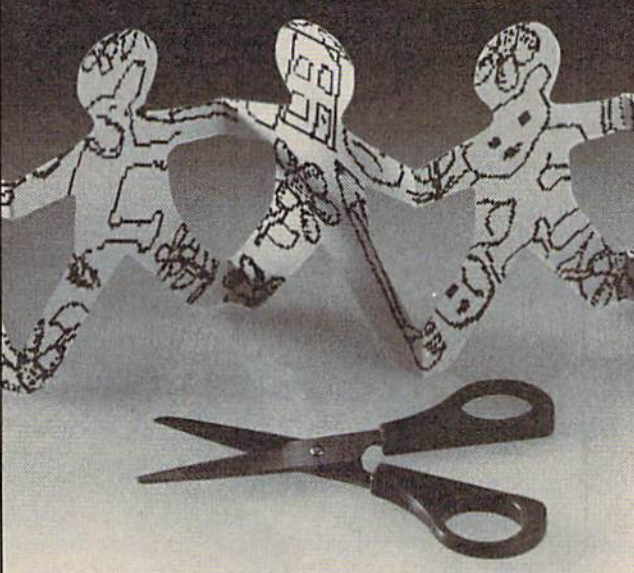
Be sure not to hold the left button down if your stylus is not on the touch tablet. After a second with no input, the pen or brush may leap to the upper-left corner and change your drawing. Release the left button and then remove your stylus from the touch tablet to avoid any unwanted surprises. To return to the shell, press RETURN.

Program Notes

Big Screen's 640 × 400-pixel canvas requires 256,000 bits—exactly half of the 64's available memory. To allocate this memory, Big Screen links together 8000-byte territories at 8192, 16384, 24576, and 32768. Big Screen itself is about 4K long and loads into the area of memory normally used by BASIC programs.

See program listing on page 81.

IS YOUR CLIP-ART



NAMBY-PAMBY?

Sketch Pad Plus

Forrest Bentley

Here's a companion program to "Sketch Pad," a full-featured drawing program for the 64 that was published in the November 1987 issue. Sketch Pad Plus adds seven new options to Sketch Pad's palette of drawing tools. A copy of Sketch Pad is required.

"Sketch Pad," a powerful graphics program published in the November 1987 issue of COMPUTE!'s Gazette, comes with a wide variety of drawing tools. Increasing this already impressive list, "Sketch Pad Plus" adds seven drawing functions to Sketch Pad's graphics repertoire: Ellipse, Diamond, Large Brush, Outlined Text, Screen Scrolling, Swap, and Zoom.

Upgrading Sketch Pad

To upgrade Sketch Pad, you need a disk that contains all of Sketch Pad's files: SKETCH-PAD MENU, SKETCH-PAD, SAVESKETCH, and PRINTSKETCH. To begin the update process, rename the BASIC file SKETCH-PAD MENU to SKETCH-PAD OLD. This can be done with the following command:

```
OPEN 15,8,15,"R0:SKETCH-PAD OLD=
SKETCH-PAD MENU":CLOSE 15
```

Next, load the program SKETCH-PAD OLD. We are going to modify this program so that it recognizes Sketch Pad Plus's new commands. Enter the following lines and save the resulting program as SKETCH-PAD MENU.

```
30 IFPEEK(52)<>32THENPOKE52,32
:POKE56,32:POKE252,86:CLR
90 POKE845,PR(1):POKE846,PR(2)
:POKE53287,PR(1):POKE646,PR
(1):PRINT"{CLR}":SYS32768
165 IFL=3THENL=4:LOAD"SKETCH-P
AD+",8,1
```

Now, it's time to type in Sketch

Pad Plus. Sketch Pad Plus is written in machine language, so you must enter it using "MLX," the machine language entry program listed elsewhere in this issue. When you run MLX, answer the prompts as follows:

Starting address: C2EC
Ending address: CF8B

After typing in the program, save a copy with the filename SKETCH-PAD+ on the disk containing Sketch Pad's files. When run, Sketch Pad Plus looks for the program with this filename.

Running Sketch Pad Plus is just the same as running Sketch Pad: Plug a joystick into port 2, turn on your 64, and load and run the file SKETCH-PAD MENU.

The "Plus"

The drawing tools added by Sketch Pad Plus are described below. These tools are available in Sketch mode only. Enter Sketch mode by pressing f1 from Sketch Pad Plus's menu.

Ellipse. To draw a circle or ellipse, press I. Four plus signs (+) appear, indicating the size of the ellipse. Move the joystick left or right to increase or decrease the horizontal size of the ellipse. Similarly, move the joystick up or down to increase or decrease the vertical size of the ellipse. Once you have the shape you want, press the fire button. Now, move the plus signs to where you want the ellipse drawn

and press the fire button again. An ellipse is placed onto the screen. To escape from this mode, press RETURN.

If you wish, you may rotate the ellipse before it is drawn. To rotate an ellipse, press a key, 1-9, prior to pressing the fire button for the last time. Pressing 1 rotates the ellipse 10 degrees, while pressing 9 rotates the ellipse 90 degrees. To fine-tune the rotation, use the + and - keys. These keys increase and decrease the rotation by one degree. To achieve a rotation of 45 degrees, for example, press 4 and then + five times. After selecting the rotation, press the fire button for that last time, and the rotated ellipse is placed onto the screen. Ellipses can be rotated a maximum of 90 degrees counterclockwise. You may not rotate objects clockwise.

Diamond. A diamond is a square that sits on its corner. To draw a diamond, press Q. Again, you are presented with four plus signs. Use the joystick to determine the shape of the diamond and press the fire button. Move to the desired location on the screen and press fire to draw the object. Diamonds can be rotated in the same fashion as ellipses (see above). To escape Diamond mode, press RETURN.

Large Brush. This option allows you to create a large square brush. To use this brush, press G. Four plus signs appear, allowing you to define the shape of the brush. After selecting the size of the brush with the joystick, press fire. Draw on the screen by holding down the fire button and moving the joystick. To return back to your

original brush, press RETURN. If you wish to erase using the large brush, enter Erase mode by pressing E before you press G.

The Large Brush makes erasing sections of the screen very easy. First, enter Erase mode by pressing E. Next, press G, expand the brush's size vertically or horizontally to create a large flat brush and press fire. Now, by moving along the screen with the fire button held down, you can quickly erase large sections of the screen.

Outlined Text. This tool gives Sketch Pad's Text mode the ability to generate outlined characters. To use it, simply press W before invoking Text mode with the T key. The W key acts as a toggle, so pressing W again returns characters to normal. You must exit Text mode with the f1 key before you can toggle Outlined Text on and off.

Outlined Text can come in handy for creating three-dimensional-looking characters. Simply type letters in normal mode, cursor back to the first letter, exit Text mode by pressing f1, move the pen up and left a few pixels, turn on Outline Text by pressing W, enter

Text mode, and retype your letters.

Screen Scroll. By using the cursor keys, you can move a drawing around on the screen. Any part of the drawing that moves off the edge of the screen is erased, so be careful. It is a good idea to create borders for your drawings last, just in case you accidentally hit a cursor key.

Swap. With Swap, you can have two sketches in memory at one time. When you press f5, the current screen is swapped with the one stashed in memory. When loading, saving, or printing a sketch, only the current screen—the one that's visible—is affected.


Using Sketch Pad's Transfer feature, you can copy objects from one screen to the other. Just press X for Transfer, select an area, press RETURN to exit Transfer mode, press f5 to Swap screens, and press N or M to transfer a normal or miniaturized copy to the alternate screen.

Zoom. To add detail to your pictures, Sketch Pad Plus offers a Zoom mode. You activate Zoom mode by pressing Z. A square area defined by four plus signs appears.

Move the square area over the section of the screen that you wish to edit and press fire. The selected area is enlarged to fill the entire screen (each pixel is enlarged eight times, creating a 40 X 25-pixel screen).

To edit this magnified view of your sketch, move the pen to a pixel that you want to change and press the fire button. If the pixel is on, it is turned off. If the pixel is off, it is turned on. To move the Zoom viewing area around the sketch, use the cursor keys. Press RETURN to restore your screen to normal. The Zoom selection square remains on the screen for you to use. If you wish to exit Zoom mode entirely, press RETURN again. Zoom mode is perfect for adding final touches to a detailed drawing.

Keep in mind that most of these drawing functions work in Erase mode as well as Draw mode; they simply erase instead of draw. For example, you may create an inverse ellipse by entering Erase mode and drawing—or in this case, erasing—an ellipse from a filled area of the screen.

See program listing on page 85. 

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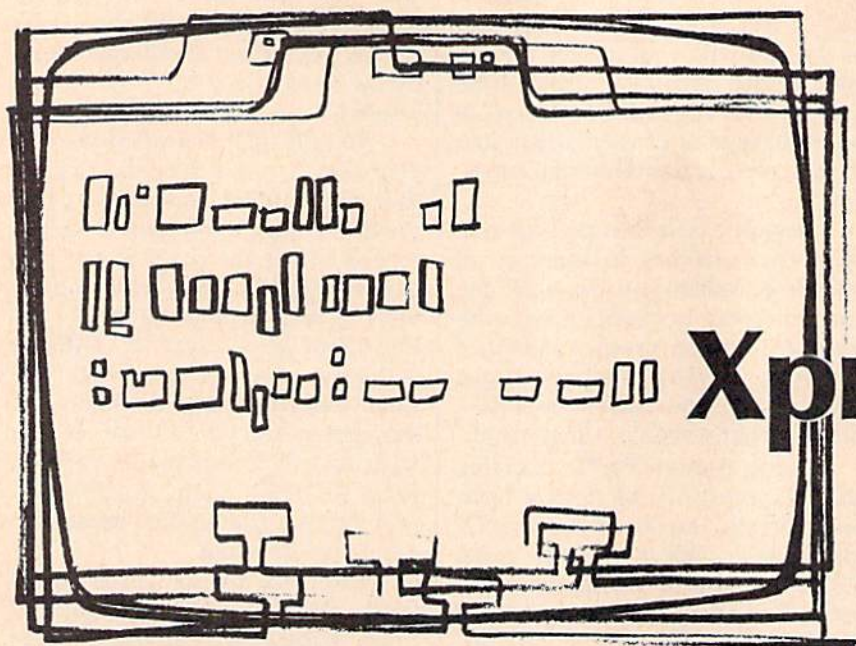
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XpressCard 128

Robert Bixby

This compact 2K filing program allows you to store an amazing 116K of information in the 128's memory. You can enter and retrieve data, search records, load and save files, and more. A disk drive is required.

How much software do you have that takes full advantage of the 128's hidden memory? Concealed under the Kernal and BASIC ROM in the hi-res 80-column screen, and even overlaid on top of BASIC RAM, are cavernous reserves that ordinary programs rarely tap.

"XpressCard 128" is the electronic equivalent of a conventional card file that uses all the 128's available memory—up to 116.75K. With a system of easy-to-remember commands, XpressCard 128 allows you to perform wildcard searches, insert and delete records, save and load card files, and make printouts. And XpressCard 128 itself is barely more than 2K of machine language.

Since XpressCard 128 is written in machine language, you'll need to enter it with the "MLX 128" machine language entry program printed elsewhere in this issue. When you run MLX, you'll be asked for the starting address and ending address of the data you'll be entering. Here are the values to use for XpressCard 128:

Starting address: 1C01
Ending address: 24A8

Follow the MLX instructions

carefully, and be sure to save a copy of the XpressCard 128 data before you finish typing. Once you've saved a copy, the program can be loaded and run just as if it were a BASIC program. If you save the program with the filename XPRESSCARD, for example, you can start it by entering the command DLOAD"XPRESSCARD" followed by RUN, or simply RUN"XPRESSCARD". To make new copies of XpressCard 128, simply load the program into memory, change disks, and save it as you would a BASIC program.

Moving Around The Card File

After entering XpressCard, load it, and type RUN. Please note that XpressCard 128 works only in 40-column mode, so be sure the 40/80 DISPLAY key is not depressed, and that your monitor is adjusted for 40 columns.

The first thing XpressCard 128 does is present you with a file card numbered 001, in the upper third of the screen. This is the top card in a deck of 467—the maximum number of cards XpressCard 128 allows. The top six and a half lines of the

screen constitute the 255 characters of text each card can hold. The bottom third of the screen is used for buffer cards, and the number 00 at the beginning of this area is the current buffer card's number.

To move through the file, you use the F7 and F8 keys. F7 moves forward through the file, one card at a time, and F8 moves backward, one card at a time. The F7 key has a special added function—it saves the current card before it moves to the next. F6 is like a home command—it will return to card 001 from any point in the file.

Editing A Card

You may be surprised when you first run XpressCard 128 to find random characters on the cards. In its default mode, XpressCard 128 does not initialize memory. This means that whatever occupied the 128's memory locations previously appeared in the card's editing window.

Not initializing memory saves time, but you can, if you prefer, configure XpressCard 128 so that it *does* initialize memory and clear all the cards. All you need to do is exit the program with RUN/STOP-RESTORE, type

POKE 9192,*n*

where *n* is any number other than 47, and save the program, just like a BASIC program, with a new filename. Initializing memory will take

about ten seconds. To clear a single card press SHIFT-CLR/HOME.

Your position in the current card is indicated by the flashing underline cursor. You can enter text just as you would with a word processor. The cursor keys will move you around the card, CLR/HOME moves to the home position, and the INST/DEL key will delete text. You can use the SHIFT-INST/DEL key to create spaces in the text. If the text you're moving with SHIFT-INST/DEL scrolls off the current card, it will move into the buffer card at the bottom of the screen, so it isn't lost.

When you're typing, text will wrap around the end of a line but, unlike most word processors, the program won't find a word on which to break your text. The RETURN key is not implemented in the editing window, so, to move to the beginning of the next line, you can use the cursor keys, press the space bar until the cursor wraps around, or use CLR/HOME followed by the appropriate number of Cursor Down keystrokes.

Commands

XpressCard uses function keys and easy-to-remember keystrokes for its commands. Here's a complete summary.

F1. Moves forward through the buffer. Cards and other information, like search strings, can be stored in one of XpressCard's 64 buffers. These buffers are not saved to disk when the card file is saved, so be sure to transfer any important information from the buffer to cards in the file before you use the save command.

F2. Saves the card in the bottom third of the screen to buffer memory. (Information can be moved into the buffer from the top of the screen with SHIFT-RETURN.)

F3. Moves backward through the cards in the buffer.

F4. Clears memory from the current card through card 467. Before clearing the memory, you'll be asked if you're sure you want to do this. Answer the prompt with y to clear memory.

F5. This is XpressCard's special function command. You press F5 followed by another key to tell XpressCard which special function you wish to use. To indicate that you've pressed F5 and the com-

puter is waiting for a second key, the border color changes.

Here's a list of the keys used with the F5 prefix, along with a short description of each command.

P. Prints the cards from 001 to the card currently on the screen. Nonalphanumeric characters will print as spaces. The default is to print the card exactly as it appears on the screen. You can, however, alter the way XpressCard 128 prints by using the following procedure. Exit to BASIC by pressing RUN/STOP-RESTORE. In direct mode, type

POKE 9192,47:POKE 8944,x:POKE 8954,y:POKE 8959,z

The first POKE statement prevents the program from initializing and thus clearing your cards from memory. The number of characters to print from each card is indicated by x; y is the number of columns to print; and z is the number of lines to print between cards. After entering this line, type RUN to reenter XpressCard 128, move through the file to the last card you wish to print, and type F5 followed by P to print your file.

S. Saves the card file to disk from card 001 to the card currently on the screen. Data beyond the card currently on the screen is ignored, so be sure to move to the last active card in your file before issuing the save command.

L. Loads a card file from disk, stopping either at the end of the disk file or at the card currently on the screen, whichever is first. Thus, if you only want the first ten cards of a 200-card file, use F7 to flip to card 10, and then issue the load command.

If you want to load an entire file and you're not sure how many cards it contains, the safest thing to do is move to card 467 before issuing the load command.

F. Performs a position-sensitive search. Before searching, move to an empty card (if the card isn't cleared, use SHIFT-CLR/HOME to clear any unwanted characters from it). Now, type in the string you want to search for in exactly the same location within the blank card where you expect it to appear in existing cards.

You can use spaces in the search string as wildcards. For example, the search string S N (S fol-

lowed by a space, followed by N, in positions 1-3 on the card) would match the strings SANE, SUN, SON, and SAND, as long as these strings started each card. It would not, however, match the string ARSON, because the letters S and N appear in positions 3 and 5 on any card in which ARSON is the first word.

When you've entered the search string, press SHIFT-RETURN to copy it into the buffer at the bottom of the screen. Next, move to the card where you want the search to begin. To search through all the cards, for example, move to card 001. Press F5 followed by F to begin the search.

If XpressCard 128 finds a match, that card becomes the current card and is displayed at the top of the screen. To continue searching, enter F5 followed by F, and the search will continue from the current card. If no matches are found, you're returned to card 001.

SHIFT-F. Performs a string search that is not position-sensitive, but doesn't allow you to use spaces as wild cards. In this search, the space is treated as a delimiter—it marks the end of the search string. Thus, if you type FOR RENT (two words), XpressCard will use FOR as its search string, ignoring RENT, and will match words like INFORMATION, AFFORDABLE, BALFOR, and FORTITUDE. In this case, RENT, by itself, would find more appropriate matches. Choose your search string with care.

D. Deletes the card in the editing window at the top of the screen, storing its contents in the buffer. All cards above the current card are copied down into the next lower card. So, after deletion, the current card will contain the information previously stored in the next higher card.

Since all the cards above the current card must be moved during a delete, deletions of lower-numbered cards take longer than higher-numbered ones.

I. Inserts a card exactly like the current card into the next card's place. All the cards after the inserted card are moved up to make room for the new one. You can clear the inserted card (with CLR/HOME) or fill it with the contents of the buffer. Be careful using insert when card 467 contains information you don't want to lose. Since insert moves all

the cards after the inserted card upward, card 467, being the last card in the file, has nowhere to go, and any information on this card will be lost.

R. Replaces the current card's contents with the contents of the buffer card displayed at the bottom of the screen. This command is handy for making multiple copies of a card, to use as a template, for example.

↑. This is the up-arrow key located to the left of the RESTORE key on the 128's keyboard. This command, and the three that follow, allow you to move quickly to certain points in the card file. With these commands, plus F6—which moves to card 001 from any point

in the file—you're never too far from any specific card. Up-arrow by itself (↑) moves to card 87 from anywhere in the file.

SHIFT-↑. Moves to card 210.

Commodore-↑. Moves to card 329.

Control-↑. This combination moves to card 166 if the current card is 217 or lower, and to card 416 if the current card is above 217.

RETURN. Returns to editing mode without executing any command. If you type F5 and then change your mind, pressing RETURN cancels F5 mode.

F6. Moves to card 001 from any point in the file.

F7. Moves through the card file in a

forward direction and saves the current card to memory before it moves to the next.

F8. Moves backward through the card file. Unlike F7 it does not save the current card to memory.

SHIFT-RETURN. Moves the contents of the current card—displayed in the editing window at the top of the screen—to the buffer located at the bottom of the screen.

SHIFT-CLR/HOME. Clears the contents of the current card.

RUN/STOP-RESTORE. Exits to BASIC. It's best to save your card file before you exit. However, if you've exited XpressCard 128 and want to reenter it without losing your data, you can type

POKE 9192,47

followed by RUN, and reenter the program with your data still in memory.

See program listing on page 87. ■

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Basically Music

A Complete Composition Tool For The 64

Greg Tarr

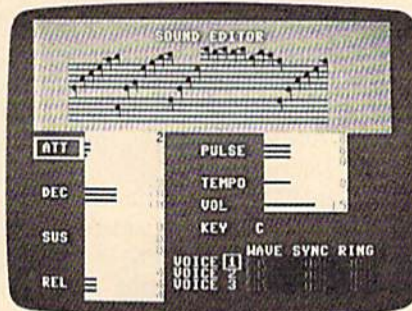
Never before have we published a music program so powerful and easy-to-use. "Basically Music" adds commands to BASIC, allowing for simple but complete control over the 64's sound chip. If you're interested in writing music for your programs—or just for your own enjoyment—"Basically Music" offers just what you need—and more.

With its synthesizer-like SID chip, the 64 is among the most powerful of all microcomputers in the category of music and sound effects. Unfortunately, this audio power is not easy to control. From BASIC, it takes several PEEKs and POKEs (and a little blind luck) to get just the effect you want. The very best sound effects require careful machine language programming.

"Basically Music" is designed to help programmers and nonprogrammers alike make music. Several music commands are added to BASIC, allowing you to avoid tedious, direct programming of the SID chip's registers. When you've finished composing your song, you can use the built-in sound editor to adjust each of the three voices (the SID chip can play three notes at a time—one through each voice). Best of all, you can compile your songs into small machine language files and have them play in the background, as other programs run.

Getting Started

Basically Music is written entirely in machine language so, use "MLX," the machine language en-



"Basically Music" offers a wide range of features, including a sound-editing screen.

try program located elsewhere in this issue to type it in. When you run MLX, you'll be asked for starting and ending addresses. Respond with the following values:

Starting address: 0801
Ending address: 2000

After you've entered all of the machine language data, be sure to save a copy of the program with the name BAS-MUS before exiting MLX.

To use Basically Music, type **LOAD "BAS-MUS",8** and then type **RUN**. The **RUN** command adds the new commands to BASIC, initializes the SID chip, performs a

few memory-management tasks, and then returns control to you. At this point, you have a version of BASIC with several new music-related commands.

Program 2, "Music Demo—Für Elise," is written in BASIC. Since it includes the Basically Music keywords, be sure that Basically Music is installed before you type in the program. Save the program before running it.

The Music Command

The first new command is **MUS**. It lets you play up to three notes in a single command. Its syntax is **MUS note1,note2,note3,duration**. Here's an example program line:

```
10 MUS C4,E4,G4,4
```

This line plays a chord consisting of three notes—a fourth-octave C, a fourth-octave E, and a fourth-octave G. The final number, 4, specifies the duration. In general, try using a duration of 1 for sixteenth notes, 2 for eighth notes, 4 for quarter notes, and so on.

There are two ways to indicate rests with the **MUS** command. The first is to use a statement of this form: **MUS,,,duration**. This command does nothing but wait for the number of counts specified by *duration*. **MUS X,X,X,duration** does nearly the same thing, but it shuts off all three voices.

All three forms of the **MUS** statement can be used together.

Here's an example:

MUS C4,X,4

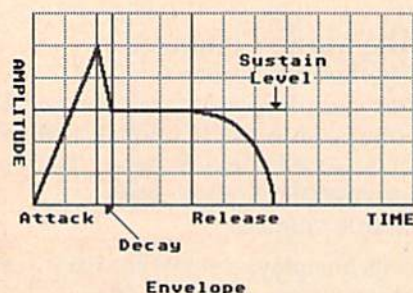
When this command is executed, voice 1 will play a fourth-octave C note, voice 2 will be shut off, and voice 3 will be left unaltered.

The MUS command also lets you specify sharps and flats. Use the # symbol to raise the note a half-step (a sharp) and use a £ symbol to lower the note a half-step (a flat). If you choose to use it, the sharp or flat sign follows the octave number. An example: MUS,,G3#,2.

Controlling The Sound

Several of Basically Music's commands are used to control the way the three voices sound. These commands do their work by manipulating certain SID registers.

The most basic of the commands are the ADSR commands—ATT, DEC, SUS, and REL (ATTack, DECay, SUStain, and RELease). The ADSR commands are used to shape the *envelope* (and thus the sound) of selected voices. The accompanying figure shows a typical sound envelope. The format for each of these commands is COMMAND *value for voice 1, value for voice 2, value for voice 3*. For each command, these values can range from 0 to 15.



The ATT command specifies the duration of the attack phase of the note. Using 0 will result in an attack of 2 milliseconds. Using 15 gives an attack of 8 seconds. The DEC command gives the duration of the decay phase. A 0 will make the decay 6 milliseconds. A 15 results in a decay of 24 seconds. The SUS command is used to change the volume at which the note will play after the attack and decay phases have passed. Volumes range from 0 (nearly inaudible) to 15 (maximum volume). Finally, the REL command is used to choose the length of the release phase of the

Basically Music Commands

Command	Parameters	Values
MUS <i>v1,v2,v3,d</i>	notes, duration	C0-B7, integer
ATT <i>v1,v2,v3</i>	voices	0-15
DEC <i>v1,v2,v3</i>	voices	0-15
SUS <i>v1,v2,v3</i>	voices	0-15
REL <i>v1,v2,v3</i>	voices	0-15
RING <i>v</i>	voice number	0-3
SYNC <i>v</i>	voice number	0-3
PULSE <i>v1,v2,v3</i>	voices	0-15
VOL <i>v</i>	volume	0-15
SPEED <i>n</i>	speed	0-255
KEY <i>k</i>	key	any note name
FOLLOW <i>v1,v2</i>	voices	1-3,1-3 (0 = off)
OCTAVE <i>v1,v2,v3</i>	voices	-8-6
SHIFT <i>n</i>	half-steps	0-11
WRITE <i>fn</i>	filename	any legal filename
KILL	none	
SCREEN	none	

envelope. A 0 gives a release of 6 milliseconds, while a 15 makes the release last 24 seconds.

The other control commands are VOICE, PULSE, RING, SYNC, VOL, and SPEED. Each of these commands modifies a different aspect of how a note will sound. For more detailed explanations of the SID chip's functions, see your *Programmer's Reference Manual* or *COMPUTE! Books' Mapping the 64*. For musicians who just want to know how to use the SID chip but don't need to know how it works, *All About the 64, Volume 2*, also from COMPUTE! Books, may be a better reference.

The VOICE command is used to select the waveforms for the SID's three voices. Here is a list of the different waveforms you can use in the VOICE command:

- 1 Triangle
- 2 Sawtooth
- 3 Pulse
- 4 Noise

You can choose a different waveform for each of the SID's three voices. For example, VOICE 1,2,2 sets voice 1 to a triangle wave and voices 2 and 3 to a sawtooth wave. Setting a voice's waveform to 0 turns the voice off.

The PULSE command is used to select the pulse width for a voice. The PULSE command is useful only if the pulse waveform is selected. Pulse width is normally a two-byte value, but PULSE affects only the high byte of the SID's pulse-width register. This is not really a limitation for music. If you need finer control, you can still set the

registers with the POKE statement.

With the SID, you can have one voice modify the other through synchronization or ring modulation. Basically Music has two commands to allow you to use these features: RING and SYNC. The RING and SYNC commands each take only one parameter, the voice number 1, 2, or 3. Selecting voice 1 will combine the output of voices 1 and 3, either through synchronization or ring modulation. Selecting voice 2 will combine the output of voices 2 and 1, and selecting voice 3 will combine the output of voices 3 and 2. A 0 value turns ring or sync off. Please note that the RING commands work only with the triangle waveform.

The VOL command sets the overall volume of all the voices. A volume of 0 is nearly silent, and 15 is maximum volume.

The SPEED command is used to set the tempo of the music. Unlike tempo markings in music, the higher the value, the slower the pace of the music. Basically Music defaults to SPEED 4 if you forget to set it.

Advanced Music Commands

Basically Music contains several powerful commands that make it even easier to write music. These are the KEY, FOLLOW, SHIFT, and OCTAVE commands.

Use the KEY command to declare a musical key. All following notes (until the next KEY command) will be adjusted up or down a half-step to fit into the key you specified. All 15 standard keys are

supported, and Basically Music automatically converts nonstandard keys like A-sharp to their standard equivalents—in this case, B-flat. The KEY command can be overridden by specifying the letter N (Natural) after the note name. Here's an example:

```
10 KEY G
20 MUSD3,F4,A4,4
30 MUSD3,F4N,A4,4
```

In line 20, the F4 becomes a F4# to fit into the key of G. The result is a D-major chord. In line 30, the KEY command is overridden and a D-minor is played (the F note is not sharpened; rather, an F natural is played).

Many pieces of music have sections that are repeats of another section, but with one or two subtle differences (a good example is the demo, Program 2). The FOLLOW, SHIFT, and OCTAVE commands were included to allow you to change the sound of the music within FOR-NEXT loops.

The FOLLOW command causes one voice to follow another. The format of this command is FOLLOW *leader,follower*. This is a convenient way to make two voices play in unison. Use this command after an IF statement to make the voice follow only once during the loop. Example:

```
10 FOR I=1 TO 2
20 IF I=2 THEN FOLLOW 1,2
30 REM MUSIC COMMANDS HERE
40 NEXT I
```

In this case, the music commands in line 30 are played twice. The first time through the loop, voice 1 and voice 2 play independently. The second time through, voice 2 follows the notes that voice 1 plays. Turn off FOLLOWing with the command FOLLOW 0.

The OCTAVE command is used to shift the voices up or down by the indicated number of octaves. The command OCTAVE 1,-1,0 shifts voice 1 up one octave, voice 2 down one octave, while voice 3 does not change.

If you need to transpose a song up or down, you'll appreciate the SHIFT command. It shifts all three voices up in half-step increments. To transpose a song up in pitch, just indicate how many half-steps to shift. If you need to shift a song down, you'll have to use the OCTAVE command to move to a lower

octave and then use SHIFT to raise the frequencies from there. For example, to move a song down two half-steps you would use the following commands:

```
OCTAVE -1,-1,-1:SHIFT 10
```

The Sound Editor

Basically Music features a sound-editing screen. Turn it on by placing the command SCREEN at the beginning of your program. With the editing screen enabled, you'll see your music appear on musical staves. As your tune scrolls by, you can adjust the sound with the following keys:

```
f1 move parameter pointer
f3 move voice pointer
f5 raise value of selected parameter
f7 lower value of selected parameter
V change voice
R toggle ring modulation
S— toggle synchronization
```

As you change the parameters, listen to the differences in the music. When you have just the sound you want, copy down the values shown on the screen and place them into your program with the appropriate Basically Music commands.

Compiling Your Song

After you've finished your song, you can include it as a subroutine in your own BASIC program. For even more flexibility, Basically Music includes a compiler to turn your song into a machine language program that can play in the background as you run other programs.

To create a compiled version of your song, place the command WRITE "filename" at the beginning of the program. *Filename* can be any legal filename that does not contain a space character. Place the command KILL at the end of the music. Type RUN. The music will be saved to disk as an object file.

While the music is compiling, printing to the screen is not allowed. If you have any PRINT statements in your program, be sure to remove them before compiling.

To hear your song, reset the computer by typing SYS 64738. Now type LOAD "filename",8,1. Enter POKE 56,125:CLR. This protects the memory used by the machine language file. To play the music, type SYS 32000. Your song will play in the background until the SYS is repeated to toggle the song off.

Memory Management

If you use the FRE(0) function to check the amount of available memory, you'll see that Basically Music occupies a sizable chunk. Much of this is due to the hi-res screen Basically Music uses for the sound editor.

Basically Music is tucked in neatly beneath screen memory. From the programmer's perspective, this is a useful place to have it. Basically Music is designed to facilitate mixing music with graphics.

Compiled music programs are placed right above screen memory. This leaves the small area below the screen for any of your own machine language subroutines. To use Basically Music with hi-res graphics, raise the bottom of BASIC text memory up to cover the music subroutine. This can be done with the following statement:

```
POKE 44,125+size:NEW
```

Size is the number of disk blocks shown in the directory.

See program listings on page 77.

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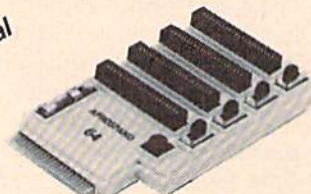
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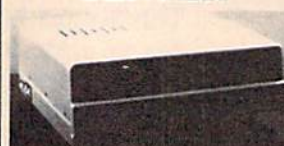
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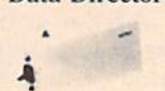
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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Basically Music

See instructions in article on page 73 before typing in.

Program 1: Basically Music

```
0801:0F 08 0A 00 9E 28 32 30 06
0809:39 30 29 3A A2 00 00 00 9F
0811:28 A9 80 20 90 FF 4C 90 5F
0819:09 00 AA B1 91 B3 22 00 BD
0821:00 00 4C 00 00 00 04 00 C2
0829:00 4C 80 09 08 19 16 00 BD
0831:0A 76 A3 00 00 00 00 00 58
0839:06 42 4D 55 53 49 43 2C 4E
0841:53 AA AA AA AA AA AA AA A5
0849:AA 08 00 03 01 D7 01 00 4A
0851:60 14 1D 8B 2B 03 FF 10 68
0859:06 00 00 00 00 00 AA 14 D5
0861:00 00 00 00 00 01 08 C3 49
0869:00 03 04 00 00 04 1B 00 01
0871:00 00 00 D8 00 0A 03 00 3D
0879:00 01 00 14 00 00 00 2E 3A
0881:45 4E 44 20 20 20 20 20 34
0889:20 52 54 53 20 4B 45 59 10
0891:54 41 42 2C 58 34 35 2C 51
0899:31 34 37 2C 31 37 39 2C FD
08A1:31 38 33 2C 32 34 37 2C 7E
08A9:32 35 35 2C 30 2C 30 3E 5A
08B1:41 54 54 31 36 46 49 4C BE
08B9:4C 45 53 4F 54 45 53 36 35
08C1:2C 32 35 35 2C 32 35 35 38
```

```
08C9:2D 08 20 C6 FF A9 0D 42 E5
08D1:4D 55 53 49 43 20 20 20 D7
08D9:20 20 20 20 20 20 20 E9
08E1:20 20 20 30 08 A9 04 AA AA
08E9:A0 FF 20 BA FF A9 00 20 C0
08F1:BD FF 20 C0 FF 20 7D 0D 79
08F9:A9 0D 20 D2 FF A9 07 A2 AA
0901:08 00 00 8C 1D 00 C3 45 95
0909:4E 44 20 20 20 54 2C 53 57
0911:53 57 A0 08 A9 02 20 60 2D
0919:F4 0E 54 45 20 23 23 20 FB
0921:5C 5C 5C 5C 5C 20 20 7E
0929:20 20 31 2E 30 08 C8 C0 50
0931:0E D0 F5 20 E4 0C 20 CC A3
0939:FF A9 08 AA A8 20 BA D8 75
0941:00 D8 00 D9 00 00 00 D8 FF
0949:4E A5 1C 90 03 9D F4 0E FE
0951:CA CA 18 4E A5 1C 90 03 25
0959:9D F4 0E 0E CA CA 18 88
0961:42 4D 55 53 49 43 2E 4F CA
0969:42 4A 2C 53 2C 57 A9 AA A6
0971:A0 15 0E 00 84 6B 88 00 BD
0979:9C 00 9C 6B 88 44 12 EA 88
0981:A9 48 85 2C A9 00 8D 00 56
0989:48 AD 08 03 8D A0 03 AD FE
0991:09 03 8D A1 03 A9 6A A0 E8
0999:0A 8D 08 03 8C 09 03 A9 7D
09A1:5A A0 1B 8D 04 03 8C 05 8F
09A9:03 A9 70 A0 1C 8D 06 03 E5
09B1:8C 07 03 20 BA 10 20 81 06
09B9:FF A2 00 BD E6 09 20 D2 BE
09C1:FF E8 E0 50 D0 F5 A2 00 D2
09C9:BD 36 0A 9D 00 D4 BD 3D 6F
09D1:0A 9D 07 D4 BD 44 0A 9D 2F
09D9:0E D4 E8 E0 07 D0 E9 A9 4C
09E1:0F 8D 18 D4 60 11 20 20 D6
09E9:20 20 2A 2A 2A 20 20 56
09F1:42 41 53 49 43 41 4C 4C 78
09F9:59 20 4D 55 53 49 43 20 26
0A01:56 31 2E 30 20 20 2A 2A 55
0A09:2A 2A 0D 11 20 43 4F 4D 69
0A11:50 55 54 45 21 20 31 39 A6
```

```
0A19:38 38 20 2D 20 32 32 35 91
0A21:32 38 20 42 41 53 49 43 B1
0A29:20 42 59 54 45 53 20 46 4C
0A31:52 45 45 0D 0D 60 08 00 33
0A39:FF 41 09 00 C3 0F FF 00 19
0A41:41 09 00 87 21 FF 00 41 FA
0A49:09 00 00 00 00 00 00 00 E1
0A51:00 00 00 00 00 00 00 00 65
0A59:00 00 00 00 00 00 00 00 6D
0A61:40 40 40 09 09 09 00 00 AA
0A69:00 A0 01 B1 7A C9 CC 90 06
0A71:0D 20 BA 10 20 73 00 C9 05
0A79:CC D0 14 4C 14 0B C9 99 69
0A81:00 0A AD F6 10 F0 05 A2 96
0A89:05 6C 00 03 4C 11 0B C9 F1
0A91:CD D0 03 4C 4E 0D C9 CE EE
0A99:D0 03 4C 7E 0D C9 CF D0 48
0AA1:03 4C 5F 0D C9 D0 D0 03 3D
0AA9:4C 72 D0 C9 D1 FF 00 4C E2
0AB1:D5 0D C9 D3 D0 03 4C EE 84
0AB9:0D C9 D2 D0 03 4C 07 0E 93
0AC1:C9 D4 D0 03 4C 20 0E C9 03
0AC9:D5 D0 03 4C A5 0E C9 D6 F1
0AD1:D0 03 4C 15 0F C9 D7 D0 0A
0AD9:03 4C D5 1C C9 D8 D0 03 55
0AE1:4C 05 0F C9 D9 D0 03 4C 40
0AE9:92 0F C9 DA D0 03 4C 18 35
0AF1:0F C9 DB D0 03 4C 52 0F 85
0AF9:C9 DC D0 03 4C BE 17 C9 C9
0B01:DD D0 03 4C FA 10 C9 DE E9
0B09:D0 03 4C 89 11 4C EB 0F 0B
0B11:6C A0 03 A2 13 A9 00 9D EC
0B19:4D 0A CA D0 FA AD 49 0E ED
0B21:8D 18 D4 20 7C 0B 20 41 32
0B29:0B A9 00 8D 5F 0A 20 59 C4
0B31:0B EE 5F 0A 20 59 0B EE 80
0B39:5F 0A 20 59 0B 4C C9 0C 44
0B41:AD 8F 0F 12 AE 90 0F 7E
0B49:AC 91 0F BD 56 0A 99 56 3C
0B51:0A BD 53 0A 99 53 0A 60 75
0B59:AE 5F 0A BD 56 0A F0 14 8C
0B61:C9 FF F0 10 8D 5D 0A BD 2F
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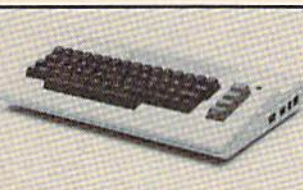
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0B69:53 0A 8D 5C 0A 20 2E 0C 5C
0B71:20 83 0C 60 9D 4D 0A 9D D3
0B79:50 0A 60 A9 00 8D 5D 0A DB
0B81:8D 5C 0A 8D 5E 0A 20 73 5E
0B89:00 C9 2C D0 0B EE 5F 0A 81
0B91:AD 5F 0A C9 03 D0 E4 60 B9
0B99:C9 58 D0 11 A9 FF AE 5F DF
0BA1:0A 9D 56 0A 9D 53 0A 9D 7B
0BA9:59 0A 4C 7C 0A 38 E9 41 8E
0BB1:C9 08 B0 20 AB BD C5 0B A9
0BB9:8D 5D 0A BD CE 0B 8D 5E 27
0BC1:0A 4C DA 0B 0B 0D 02 04 90
0BC9:06 07 09 00 00 05 06 00 E5
0BD1:01 02 03 04 A2 12 6C 00 BF
0BD9:03 20 73 00 B0 F6 38 E9 A3
0BE1:30 8D 5C 0A A0 01 B1 7A 86
0BE9:C9 2C F0 29 C9 23 D0 09 26
0BF1:20 73 00 EE 5D 0A 4C 16 A5
0BF9:0C C9 5C D0 09 20 73 00 D0
0C01:CE 5D 0A 4C 16 0C C9 4E A0
0C09:D0 CA AD 5D 0A 09 80 8D CA
0C11:5D 0A 20 73 00 AE 5F 0A 19
0C19:AD 5D 0A 9D 56 0A AD 5C 0D
0C21:0A 9D 53 0A AD 5E 0A 9D 49
0C29:59 0A 4C 7C 0B AD 5D 0A 95
0C31:18 0A 90 07 4A 8D 5D 0A A7
0C39:4C 51 0C AE 5D 0A D0 03 EF
0C41:4C 51 0C AE 5D 0A BD F4 C3
0C49:0E 18 6D 5D 0A 8D 5D 0A 3D
0C51:AD 02 0F F0 16 AD 5D 0A DD
0C59:18 6D 02 F0 C9 0D 90 08 B5
0C61:E9 0C AE 5F 0A FE 53 0A 3A
0C69:8D 5D 0A AE 5D 0A AC 5F 97
0C71:0A BD A9 0C 99 50 0A BD D3
0C79:B9 0C 99 4D 0A 8A 99 56 7D
0C81:0A 60 AE 5F 0A BD 53 0A 7A
0C89:18 7D 4B 0D 9D 53 0A A9 3F
0C91:07 38 FD 53 0A 90 0E A8 87
0C99:F0 0A 18 5E 50 0A 7E 4D 8A
0CA1:0A 88 D0 F6 60 4C DC 0F 67
0CA9:00 77 7E 86 8E 96 9F A8 8E
0CB1:B3 BD C8 D4 E1 EE FD FF 40
0CB9:00 7C 97 1E 18 8B 7E FA AC
0CC1:06 AC F3 E6 8F F8 2E FF B1
0CC9:AE 50 0A F0 1D AD 61 0A 0A
0CD1:F0 18 8D 04 D4 E8 F0 12 98
0CD9:CA 8E 01 D4 AD 4D 0A 8D AC
0CE1:00 D4 AD 61 0A 09 01 8D FE
0CE9:04 D4 AE 51 0A F0 1D AD 20
0CF1:62 0A F0 18 8D 0B D4 E8 88
0CF9:F0 12 CA 8E 08 D4 AD 4E 8E
0D01:0A 8D 07 D4 AD 62 0A 09 C5
0D09:01 8D 0B D4 EA AE 52 0A 76
0D11:F0 1D AD 63 0A F0 18 8D A8
0D19:12 D4 E8 F0 12 CA 8E 0F 85
0D21:D4 AD 4F 0A 8D 0E D4 AD 97
0D29:63 0A 09 01 8D 12 D4 EA F1
0D31:20 1F 10 8D 60 0A AD F6 7B
0D39:10 F0 03 20 A7 11 20 67 23
0D41:12 4C 11 0B A2 0E 6C 00 70
0D49:03 EA 00 00 00 A9 07 20 74
0D51:81 10 8D 4B 0D 8E 4C 0D DE
0D59:8C 4D 0D 4C 11 0B 20 1F 87
0D61:10 C9 10 80 09 8D 49 0E 22
0D69:20 EF 11 4C 11 0B 4C E1 A5
0D71:0F 20 1F 10 8D 48 0E 20 C9
0D79:EF 11 4C 11 0B A9 05 20 93
0D81:81 10 48 8A 48 98 48 AD F4
0D89:63 0A 29 07 8D 63 0A 68 E3
0D91:AA BD CD 0D 63 0A 8D 92
0D99:63 0A AD 62 0A 29 07 8D 54
0DA1:62 0A 68 AA BD CD 0D 73
0DA9:62 0A 8D 62 0A AD 61 0A 23
0DB1:29 07 8D 61 0A 68 AA BD EE
0DB9:CD 0D 61 0A 8D 61 0A 09
0DC1:20 EF 11 20 17 15 4C 11 C2
0DC9:0B 4C E1 0F 00 10 20 40 6A
0DD1:80 C0 60 30 A9 10 20 81 BA
0DD9:10 8D 39 0E 8E 3A 0E 8C 6D
0DE1:3B 0E 20 4B 0E A2 00 20 F0
0DE9:4E 1B 4C 11 0B A9 10 20 CB
0DF1:81 10 8D 3C 0E 8E 3D 0E 79
0DF9:8C 3E 0E 20 4B 0E A2 03 88
0E01:20 4E 1B 4C 11 0B A9 10 01
0E09:20 81 10 8D 3F 0E 8E 40 FF
0E11:0E 8C 41 0E 20 7C 0E A2 12
0E19:06 20 4E 1B 4C 11 0B A9 22
0E21:10 20 81 10 8D 42 0E 8E 9E
0E29:43 0E 8C 44 0E 20 7C 0E 38
0E31:A2 09 20 4E 1B 4C 11 0B 01
0E39:00 00 00 09 09 00 00 52
0E41:00 00 00 00 01 01 04 6F
0E49:0F 00 A2 00 20 6E 0E 8D A5
0E51:05 D4 8D 64 0A E8 20 6E BF
0E59:0E 8D 0C D4 8D 65 0A E8 AD
0E61:20 6E 0E 8D 13 D4 8D 66 31
0E69:0A 20 EF 11 60 20 48 14 C9
0E71:BD 39 0E 0A 0A 0A 1D C6
0E79:3C 0E 60 A2 06 20 6E 0E 09
0E81:8D 06 D4 8D 67 0A E8 20 AE
0E89:6E 0E 8D 0D D4 8D 68 0A 9A
0E91:8E 20 6E 0E 8D 14 D4 8D CC
0E99:69 0A 20 EF 11 60 00 01 FA
0EA1:00 01 00 01 A9 0F 20 81 59
0EA9:10 8D 45 0E 8D 03 D4 8E 6B
0EB1:46 0E 8E 0A D4 8C 47 0E 5C
0EB9:8C 11 D4 A9 80 8D 02 D4 A8
0EC1:8D 09 D4 8D 10 D4 20 3D AB
0EC9:12 A2 0C 20 56 14 A2 0D 70
0ED1:20 56 14 A2 0E 20 56 14 F1
0ED9:A2 0C 20 4E 1B 4C 11 0B 6A
0EE1:AD 45 0E 8D 03 D4 AD 46 CD
0EE9:0E 8D 0A D4 AD 48 0E 8D 37
0EF1:11 D4 60 00 00 00 00 00 D7
0EF9:00 00 00 00 00 00 00 16
0F01:00 00 00 00 20 1F 10 C9 86
0F09:0C 90 03 4C DC 0F 8D 02 B6
0F11:0F 4C 11 0B 4C 11 0B 20 79
0F19:1F 10 F0 14 C9 04 B0 2E 18
0F21:AA CA A9 02 1D 61 0A 9D BC
0F29:61 0A 20 17 15 4C 11 0B F6
0F31:AD 61 0A 29 FD 8D 61 0A 45
0F39:AD 62 0A 29 FD 8D 62 0A 8F
0F41:AD 63 0A 29 FD 8D 63 0A D9
0F49:20 17 15 4C 11 0B 4C EB DD
0F51:0F 20 1F 10 F0 14 C9 04 53
0F59:B0 2E AA CA A9 04 1D 61 56
0F61:0A 9D 61 0A 20 17 15 4C 8C
0F69:11 0B AD 61 0A 29 FB 8D 19
0F71:61 0A AD 62 0A 29 FB 8D 19
0F79:62 0A AD 63 0A 29 FB 8D B1
0F81:63 0A 20 17 15 4C 11 0B 50
0F89:4C E1 0F 4C EB 0F 00 00 88
0F91:00 20 1F 10 F0 25 C9 04 58
0F99:B0 1E 8D 90 0F CE 90 0F 36
0FA1:20 73 00 20 1F 10 C9 04 7F
0FA9:B0 0E 8D 91 0F CE 91 0F 54
0FB1:A9 0F 8D 8F 0F 4C 11 0B 26
0FB9:4C E6 0F A9 00 8D 8F 0F 98
0FC1:8D 90 0F 8D 91 0F 4C 11 F7
0FC9:0B 4C EB 0F 4C EB 0F 4C 6B
0FD1:EB 0F 4C EB 0F 4C EB 0F 82
0FD9:4C EB 0F A2 0B 6C 00 03 32
0FE1:A2 0E 6C 00 03 A2 1A 6C A5
0FE9:00 03 A2 11 6C 00 03 4C E3
0FF1:11 0B 00 A9 00 8D F3 0F 23
0FF9:20 73 00 90 0C C9 AB D0 BD
1001:E4 A9 80 8D F3 0F 20 73 76
1009:00 20 24 10 AE F3 0F D0 EA
1011:04 CD 80 10 60 49 FF 18 F7
1019:69 01 60 00 00 00 20 73 ED
1021:00 B0 56 29 0F 8D 1C 10 C1
1029:20 41 10 B0 24 8D 1D 10 58
1031:20 41 10 B0 21 8D 1E 10 4A
1039:20 41 10 B0 25 4C E1 0F F3
1041:A0 01 B1 7A 38 E9 30 C9 63
1049:09 B0 05 20 73 00 29 0F B9
1051:60 EA AD 1C 10 60 EA AD 59
1059:1D 10 AC 1C 10 18 79 AF E6
1061:10 60 EA AD 1E 10 AC 1D 81
1069:10 AE 1C 10 18 79 AF 10 D7
1071:7D AC 10 B0 04 CD 80 10 F0
1079:60 4C E1 0F 00 00 00 FF 0A
1081:8D 80 10 20 F4 0F B0 F1 C3
1089:8D 7D 10 20 73 00 20 F4 A4
1091:0F B0 E6 8D 7E 10 20 73 03
1099:00 20 F4 0F B0 8D 7F E0
10A1:10 AD 7D 10 AE 7E 10 AC 22
10A9:7F 10 60 00 64 C8 00 0A E9
10B1:14 1E 28 32 3C 46 50 5A 81
10B9:32 78 A9 CE A0 10 8D 14 A7
10C1:03 8C 15 03 AD 4C 0E 8D 91
10C9:B9 10 58 60 0A CE B9 10 EA
10D1:D0 0F AD 48 0E 8D B9 10 82
10D9:CE 60 0A EE 29 D0 EE 2A 3E
10E1:D0 4C 31 EA 00 00 00 00 52
10E9:00 00 00 00 00 00 00 0A
10F1:00 00 00 00 08 00 4C DC C7
10F9:0F A2 00 20 73 00 F0 18 E1
1101:C9 22 D0 14 20 73 00 F0 AB
1109:0F C9 22 F0 0B 9D E5 10 23
1111:E8 E0 10 F0 03 4C 05 11 55
1119:E0 00 F0 DA A9 2C 9D A5 96
1121:10 A9 50 E8 9D E5 10 A9 9C
1129:2C E8 9D E5 10 A9 57 E8 6C
1131:9D E5 10 E8 8E F5 10 A9 42
1139:01 E8 F6 10 A9 02 A2 08 C1
1141:A0 02 20 BA FF AD F5 10 96
1149:A2 E5 A0 10 20 BD FF 20 63
1151:C0 FF A2 02 20 C9 FF A9 1A
1159:00 20 D2 FF A9 7D 20 D2 34
1161:FF 20 6E 11 20 EF 11 20 6D
1169:3D 12 4C 11 0B A9 1E A0 25
1171:00 85 5B 84 5A A0 00 B1 AF
1179:5A 20 D2 FF C8 D0 F8 E6 8D
1181:5B A5 5B C9 20 D0 F0 60 49
1189:A9 01 20 D2 FF 20 D2 FF 18
1191:20 D2 FF 20 D2 FF A9 02 66
1199:20 C3 FF 20 CC FF A9 00 78
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11A9:53 0A 20 E4 11 0A 0A 0A 19
11B1:0A 0D 56 0A 0A 20 D2 FF FD
11B9:AD 54 0A 20 E4 11 0A 0A 94
11C1:0A 0A 0D 57 0A 0A 20 D2 0E
11C9:FF AD 55 0A 20 E4 11 0A 63
11D1:0A 0A 0A 0D 58 0A 0A 20 AC
11D9:D2 FF AD 60 0A 20 D2 FF 97
11E1:58 60 00 8D E3 11 38 A9 9E
11E9:07 ED E3 11 18 60 AD F6 2D
11F1:10 D0 01 60 A9 03 20 D2 E2
11F9:FF AD 48 0E 20 D2 FF AD 6B
1201:49 0E 20 D2 FF AD 64 0A 08
1209:20 D2 FF AD 65 0A 20 D2 33
1211:FF AD 66 0A 20 D2 FF AD 08
1219:67 0A 20 D2 FF AD 68 0A 36
1221:20 D2 FF AD 69 0A 20 D2 6B
1229:FF AD 61 0A 20 D2 FF AD 7F
1231:62 0A 20 D2 FF AD 63 0A C1
1239:20 D2 FF 60 AD F6 10 D0 62
1241:01 60 A9 05 20 D2 FF AD 7D
1249:45 0E 20 D2 FF AD 46 0E 16
1251:20 D2 FF AD 47 0E 20 D2 9A
1259:FF A9 80 20 D2 FF 20 D2 A3
1261:FF 20 D2 FF 60 60 20 0E BA
1269:16 20 82 12 AD 48 0E F0 AD
1271:05 AD 60 0A D0 F3 60 00 47
1279:00 03 06 09 0C 0F 10 11 7D
1281:00 20 E4 FF D0 01 60 A8 3E
1289:20 37 13 C0 87 D0 10 BD 57
1291:39 0E C9 0F F0 29 FE 39 63
1299:0E 20 FA 1A 4C B1 12 C0 DB
12A1:88 D0 1D A9 00 DD 39 0E 74
12A9:F0 15 DE 39 0E 20 FA 1A FB
12B1:20 56 14 20 E1 0E 20 7C 04
12B9:0E 20 4B 0E 20 95 1A 60 23
12C1:C0 85 D0 0E EE 78 12 AD CD
12C9:78 12 29 07 8D 78 12 4C 03
12D1:30 13 C0 86 D0 12 EE 81 81
12D9:12 A9 03 CD 81 12 D0 4F F3
12E1:A9 00 8D 81 12 4C 30 13 D9
12E9:AE 81 12 C0 56 D0 20 BD 08
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12F9:9D 61 0A 48 29 F8 0A 9D E9
1301:61 0A 68 29 06 1D 61 0A 6B
1309:9D 61 0A 20 96 15 60 C0 24
1311:53 D0 0C A9 02 5D 61 0A 83
1319:9D 61 0A 20 96 15 60 C0 34
1321:52 D0 0C A9 04 5D 61 0A 23
1329:9D 61 0A 20 96 15 60 20 A3
1331:5B 13 20 3E 1A 60 AE 78 D9
1339:12 BD 79 12 C9 0F B0 04 18
1341:18 6D 81 12 AE A0 60 83 A3 A1
1349:C3 E3 83 9B AB B8 17 17 06
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1359:E8 C4 AE 78 12 BD 4F 13 BB

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1361:8D 04 D0 BD 47 13 8D 05 EB	1609:8D 0D 16 60 08 AD 56 0A B5	18B1:03 E0 06 D0 03 AD B0 18 B1
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1379:60 A9 C0 8D 15 D0 A9 20 F3	1621:2E 17 AD 54 0A 8D 2F 17 21	18C9:4C 53 45 00 C8 32 44 45 7A
1381:8D FA 07 A9 21 8D FB 07 E6	1629:20 3B 17 AD 58 0A 8D 2E 26	18D1:43 00 18 32 54 45 40 50 6C
1389:A9 0C 8D 1D D0 A2 00 BD D9	1631:17 AD 55 0A 8D 2F 17 20 17	18D9:4F 00 C8 37 53 55 53 00 D4
1391:A1 13 9D 00 08 E8 E0 80 27	1639:3B 17 20 00 17 20 42 16 A0	18E1:98 34 56 4F 4C 00 C8 3C 5B
1399:D0 F5 20 02 15 60 64 64 21	1641:60 A2 08 A0 00 BD A0 22 AB	18E9:52 45 4C 00 18 37 4B 45 97
13A1:00 00 00 00 00 00 00 00 C7	1649:99 A0 22 BD E0 23 99 E0 32	18F1:59 00 C0 3A 56 4F 49 43 50
13A9:00 FF FF FF FF FF FF C0 90	1651:23 BD 20 25 99 20 25 BD 2A	18F9:45 20 31 00 00 3C 56 4F E7
13B1:00 03 C0 00 03 C0 00 03 CE	1659:60 26 99 60 26 BD A0 27 09	1901:49 43 45 20 32 00 40 3D A2
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13C9:00 03 C0 00 03 C0 00 03 E6	1671:60 2B 99 60 2B E8 C8 C0 21	1919:59 4E 43 20 52 49 4E 47 91
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13D9:FF 00 00 00 00 00 00 FF	1681:00 00 00 00 00 00 00 AD	1929:20 45 44 49 54 4F 52 00 5E
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1409:00 00 00 00 00 00 00 00 31	16B1:00 00 00 FF 00 00 00 FF DD	1959:19 A9 DB A0 18 85 FB 84 5B
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1429:32 32 34 37 37 39 3C 3C 44	16D1:00 00 00 FF 00 00 00 FF FD	1979:C5 19 A9 FD A0 18 85 FB 56
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1441:F4 30 90 94 D0 52 D2 8A 4B	16E9:00 00 00 FF 00 00 00 FF 16	1991:A9 11 A0 19 85 FB 84 FC A4
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1451:56 14 68 AA 60 A0 80 8C 73	16F9:00 00 00 00 00 00 00 A9 CF	19A1:FB 84 FC 20 C5 19 A9 E1 C0
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1461:8C 23 14 8C 24 14 8C 25 93	1709:00 A2 C0 BD C0 16 91 5A 97	19B1:19 A9 D3 A0 18 85 FB 84 B2
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1481:14 6E 22 14 6E 23 14 6E 6B	1729:03 4C 0C 17 60 00 00 A2 84	19D1:B1 FB F0 06 20 CD 19 4C 4D
1489:24 14 6E 25 14 38 6E 20 67	1731:3F BD 0C 16 9D C0 16 CA C6	19D9:D1 19 60 8C 31 19 A2 D0 14
1491:14 6E 21 14 6E 22 14 6E 57	1739:D0 F7 AE 2E 17 E8 BD A4 03	19E1:8E 12 1A C9 40 B0 05 A2 31
1499:23 14 6E 24 14 6E 25 14 21	1741:17 C9 10 B0 54 8D BD 17 E5	19E9:D1 8E 12 1A C9 26 D0 E0 23
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14B9:14 60 BD 26 14 85 5B BD 49	1761:8E 00 C0 E0 38 B0 32 A9 8F	1A09:02 0A 0A 0A AA A0 00 BD 38
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14C9:14 91 5A C8 91 5A A0 08 77	1771:E0 0C B0 11 8D CC 16 E0 E6	1A19:D0 F5 18 A9 08 65 5A 90 EB
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14D9:A0 10 AD 22 14 91 5A C8 92	1781:B0 03 8D CA 16 A0 00 B9 B3	1A29:C8 60 9D 05 3C 06 DD 06 A1
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14E9:5A C8 91 5A A0 20 AD 24 4E	1791:C0 08 F0 05 E8 C8 4C 88 1C	1A39:19 07 00 28 50 20 3A 18 CD
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14F9:AD 25 14 91 5A C8 91 5A 51	17A1:01 01 01 10 10 10 00 00 72	1A49:0A AA BD 2B 1A 85 5A BD F0
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1511:8D 78 12 20 5B 13 AD 81 68	17B9:38 40 40 40 00 A9 00 8D 54	1A61:B9 3B 1A A8 AD B1 18 91 05
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1529:EE 81 12 20 96 15 68 8D D6	17D1:11 D0 09 20 29 EF 8D 11 15	1A79:42 45 41 44 47 43 43 43 9D
1531:81 12 20 5B 13 60 66 76 B7	17D9:D0 A0 75 A2 00 A9 0C 9D CD	1A81:43 20 20 20 20 20 20 23 4A
1539:7E 7E 6E 66 66 0F FD FD A3	17E1:00 04 9D C8 04 A9 76 9D A2	1A89:23 20 5C 5C 5C 5C 5C 5C 12
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1549:0F 1B 33 63 C3 00 10 38 D4	17F1:E8 E0 C8 D0 E8 20 3A 18 47	1A99:07 F0 01 60 78 A5 01 29 39
1551:28 6C 44 C6 82 00 00 00 B3	17F9:A9 20 A0 00 85 5B 84 5A 16	1AA1:FB 85 01 AD 6E 1A 85 5A 71
1559:00 00 00 00 00 00 00 3C BF	1801:A9 00 A0 00 91 5A C8 D0 72	1AA9:AD 6F 1A 85 5B AE 4A 0E 64
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1571:00 00 00 00 00 00 00 3C D7	1819:13 20 32 19 A2 00 A0 00 09	1AC1:01 09 04 85 01 58 20 1C 57
1579:66 66 66 66 66 3C 00 7E 46	1821:18 20 F0 FF 20 EE 1A 20 94	1AC9:1D 60 00 E8 28 68 E8 28 10
1581:60 60 78 60 60 60 00 7E 0C	1829:3E 1A 20 9D 1A AD 11 D0 57	1AD1:68 E8 28 68 E8 28 68 88 41
1589:60 60 78 60 60 60 00 3B D0	1831:09 10 8D 11 D0 4C 11 0B 91	1AD9:C8 08 88 08 2C 2F 31 AF
1591:3C 3D 08 48 88 AE 81 12 C2	1839:00 A2 00 A9 03 A0 09 8C E5	1AE1:33 34 36 38 39 3E 3D 3E 76
1599:BD 90 15 85 5B BD 93 15 CF	1841:39 18 20 91 18 A2 14 A9 4E	1AE9:2D 2E 30 32 35 EA A2 00 04
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15A9:A2 28 29 02 D0 02 A2 40 88	1851:18 A2 00 A9 03 9D AE 06 C2	1AF9:60 E8 CB 1A BD CC 1A 85 F7
15B1:A9 18 8D 0D 16 20 FB 15 77	1859:9D D6 06 9D FE 06 9D 26 1A	1B01:5A BD DD 1A 85 5B 78 A5 61
15B9:A0 50 A2 28 68 48 29 04 D9	1861:07 9D 4E 07 9D 76 07 9D 29	1B09:01 29 FB 85 01 A9 D1 8D C1
15C1:D0 02 A2 40 A9 18 8D 0D 03	1869:9E 07 9D C6 07 20 B2 18 01	1B11:12 1A AE CB 1A BD 39 0E B1
15C9:16 20 FB 15 68 29 F0 C9 6B	1871:E8 E0 09 D0 E0 A2 0D A9 D1	1B19:C9 0A B0 13 A9 00 20 FF 8B
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15D9:C9 40 D0 05 A2 08 4C F9 2B	1881:88 07 CA 10 F4 A2 0C A9 06	1B29:30 20 FF 19 4C 43 1B A9 60
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15F1:4C F9 15 A2 20 4C F9 15 C8	1899:05 9D 0E 06 9D 36 06 9D 45	1B41:FF 19 A5 01 09 04 85 01 E6
15F9:A0 00 BD 37 15 91 5A E8 2C	18A1:5E 06 9D 86 06 20 B2 18 CC	1B49:58 AE CB 1A 60 20 FA 1A 06
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1B59:60 A6 7A A0 04 84 0F BD D0
1B61:00 02 10 07 C9 FF F0 3E F8
1B69:E8 D0 F4 C9 20 F0 37 85 3C
1B71:08 C9 22 F0 55 24 0F 70 3B
1B79:2D C9 3F D0 04 A9 99 D0 78
1B81:25 C9 30 90 04 C9 3C 90 1C
1B89:1D 84 71 A0 00 84 0B 88 58
1B91:86 7A CA C8 E8 BD 00 02 CF
1B99:38 F9 9E A0 F0 F5 C9 80 BB
1BA1:D0 2F 05 0B A4 71 E8 C8 E2
1BA9:99 FB 01 C9 00 F0 38 38 D4
1BB1:E9 3A F0 04 C9 49 D0 02 E0
1BB9:85 0F 38 E9 55 D0 A0 85 D0
1BC1:08 BD 00 02 F0 E0 C5 08 2A
1BC9:F0 DC C8 99 FB 01 E8 D0 E8
1BD1:F0 A6 7A E6 0B C8 B9 9D 74
1BD9:A0 10 FA B9 9E A0 D0 B5 2E
1BE1:F0 0F BD 00 02 10 BD 99 71
1BE9:FD 01 C6 7B A9 FF 85 7A C2
1BF1:60 A0 00 B9 1D 1C D0 02 19
1BF9:C8 E8 BD 00 02 38 F9 1D 88
1C01:1C F0 F5 C9 80 D0 04 05 33
1C09:0B D0 99 A6 7A E6 0B C8 E6
1C11:B9 1C 1C 10 FA B9 1D 1C C6
1C19:D0 E0 F0 C6 4D 55 D3 4F 33
1C21:43 54 41 56 C5 56 4F 49 0D
1C29:43 C5 56 4F CC 53 50 45 CD
1C31:45 C4 41 54 D4 53 55 D3 1D
1C39:44 45 C3 52 45 CC 50 55 D5
1C41:4C 53 C5 46 49 4C 54 45 FA
1C49:D2 4B 45 49 53 48 49 46 98
1C51:D4 46 4F 4C 4C 4F D7 53 D6
1C59:59 4E C3 52 49 4E C7 53 D5
1C61:43 52 45 45 CE 57 52 49 8E
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1C79:07 C9 CC B0 06 4C 2A 47 9D
1C81:4C F3 A6 38 E9 CB AA 84 8D
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1C91:1D 1C 10 FA 30 F5 C8 B9 B5
1C99:1D 1C 30 05 20 47 AB D0 04
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1CA9:05 00 02 04 08 01 00 0B 34
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1CB9:00 07 0A 08 06 0B 00 08 D9
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1CD9:41 90 F6 C9 48 B0 F2 29 66
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1CE9:C9 5C D0 0E AD 4A 0E 09 D4
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1CF9:0A 1D C9 23 D0 0B AD 4A 42
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1D11:4A 0E 20 1C 1D 20 9D 1A 78
1D19:4C 11 0B AE 4A 0E BD BF CF
1D21:1C 8D A6 1C 8D A5 1C A2 41
1D29:0D A9 00 9D F4 0E CA D0 74
1D31:FA A9 01 A2 0D 18 0E A5 28
1D39:1C 90 02 A9 FF 4E A5 1C 21
1D41:18 4E A5 1C 90 03 9D F4 52
1D49:0E CA CA 18 4E A5 1C 90 E9
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1DB1:20 1C 20 7E 27 EE 72 08 D0
1DB9:A2 56 20 5E 28 CE 72 08 2E
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1DC9:08 AD 71 AD 06 14 A9 04 50
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1DD9:29 20 F0 18 AD 74 08 10 AF
1DE1:13 60 AD 74 08 29 10 F0 B0
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1DF1:09 8D 1A 09 AD 04 09 85 FC
1DF9:06 AD 05 09 85 07 AD 78 EF

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1E39:18 0E 07 07 20 09 00 00 7B
1E41:00 00 0F 00 03 0F 20 20 14
1E49:20 A2 00 BD 2B 7D 9D 00 A4
1E51:D4 E8 E0 19 D0 F5 60 04 03
1E59:04 CE 59 7D D0 13 AD 45 C1
1E61:7D 8D 59 7D CE 58 7D D0 66
1E69:08 A9 04 8D 58 7D 20 75 DB
1E71:7D 4C 31 EA A0 00 B1 FB B8
1E79:29 01 F0 04 4C 5B 7E 60 16
1E81:20 2D 7E AD 07 7E F0 1E F5
1E89:AD 47 7D 8D 04 D4 AD 07 CC
1E91:7E C9 FF F0 11 8D 01 D4 24
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1F49:4A 4A AA F0 0A 18 4E 07 F7
1F51:7E 6E 08 7E CA D0 F6 60 3B
1F59:68 60 B1 FB C9 01 F0 0B 19
1F61:C9 03 F0 12 C9 05 D0 03 8B
1F69:4C C7 7E A9 7F A0 00 85 2E
1F71:FC 84 FB 4C 75 7D C8 B1 78
1F79:FB 8D 45 7D C8 B1 FB 8D 2C
1F81:46 7D C8 B1 FB 8D 05 D4 6B
1F89:C8 B1 FB 8D 0C D4 C8 B1 E7
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1FB1:48 7D C8 B1 FB 8D 49 7D CD
1FB9:A9 0C 18 65 FB 90 02 E6 36
1FC1:FC 85 FB 4C 75 7D C8 B1 09
1FC9:FB 8D 03 D4 C8 B1 FB 8D A9
1FD1:0A D4 C8 B1 FB 8D 11 D4 8B
1FD9:C8 B1 FB 8D 02 D4 C8 B1 E7
1FE1:FB 8D 09 D4 C8 B1 FB 8D 82
1FE9:10 D4 A9 07 18 65 FB 90 E9
1FF1:02 E6 FC 85 FB 4C 75 7D 5C
1FF9:48 4A 4A 4A 20 04 00 B7

```

Program 2: Music Demo—Für Elise

```

MJ 10 REM COPYRIGHT 1988 COMPU
TEI PUB., INC. - ALL RIG
HTS RESERVED
KJ 20 GOSUB 620:REM DELETE THE
[SPACE]NEXT 2 LINES BEFO
RE COMPILING
XB 30 REM SCREEN
KJ 40 REM WRITE"FURELISE.EXE":
REM COMPILES AS "FURELIS
E.EXE"
HG 50 SPEED 8:FOLLOW 0:OCTAVE
[SPACE]0,0,0
CE 60 ATT 2,2,1:SUS0,0,0:DEC10
,10,10:REL4,4,4
AK 70 VOICES,3,3:PULSE8,8,8
MC 80 KEY C
PM 90 FOR J=1 TO 2

```

```

RM 100 FOR I=1 TO 2
EM 110 MUSE5,,,2:MUS,D5#,,,2:MU
SE5,,,2:MUS,D5#,,,2
HD 120 MUSE5,,,2:MUS,B4,,,2:MUS
D5,,,2:MUS,C5,,,2
KC 130 MUSA4,,A2,2
EK 140 MUS,E3,,,2:MUS,,A3,2
XJ 150 MUS,C4,,,2:MUSE4,,,2:MUS
,A4,,,2:MUSB4,,E2,2
KE 160 MUS,E3,,,2:MUS,,G3#,2
GB 170 MUS,E4,,,2:MUSG4#,,,2:MU
S,B4,,,2
GD 180 MUS C5,,,A2,2:MUS,E3,,,2:
MUS,,A3,2
FX 190 MUS ,E4,,,2
PA 200 MUSE5,,,2:MUS,D5#,,,2:MU
SE5,,,2:MUS,D5#,,,2
BK 210 MUSE5,,,2:MUS,B4,,,2:MUS
D5,,,2:MUS,C5,,,2
RE 220 MUSA4,,A2,2:MUS,E3,,,2:M
US,,A3,2
QF 230 MUS,C4,,,2:MUSE4,,,2:MUS
,A4,,,2:MUSB4,,E2,2
QX 240 MUS,E3,,,2:MUS,,G3#,2
DM 250 MUS,E4,,,2:MUSC5,,,2:MUS
,B4,,,2
QG 260 IF I=2 THEN280
QJ 270 MUSA4,,A2,2:MUS,E3,,,2:M
US,,A3,2:MUS,X,X,2:NEXT
KM 280 MUSA4,,A2,2:MUS,E3,,,2:M
US,,A3,2:MUSB4,,E2,2:MUS,
C5,,,2:MUSD5,,,2
QG 290 MUSE5,,,C3,2:MUS,G3,,,2:M
US,,C4,2
RQ 300 MUS,G4,,,2:MUSF5,,,2:MUS
,E5,,,2
DA 310 MUSD5,,,G2,2:MUS,G3,,,2:M
USB3,,,2
AS 320 MUS,F4,,,2:MUSE5,,,2:MUS
,D5,,,2
QJ 330 MUSC5,,,A2,2:MUS,E3,,,2:M
US,,G3,2
HA 340 MUS,E4,,,2:MUSD5,,,2:MUS
,C5,,,2
HK 350 MUSB4,,E2,2:MUS,E3,,,2:M
US,,E4,2
DE 360 MUSE5,,,2:MUS,E5,,,2:MUS
,,E4,2:MUS,E5,,,2:MUSE5,
,,2:MUS,E6,,,2
FA 370 MUS,D5#,,,2:MUS,E5,,,2:MU
SD5#,,,2:MUS,E5,,,2
AJ 380 MUSD5#,,,2:MUS,,E5,2:
AM 390 :
EJ 400 MUS,D5#,,,2
JC 410 REM
GB 420 FOR I=1 TO 2
AX 430 MUSE5,,,2:MUS,B4,,,2:MUS
D5,,,2:MUS,C5,,,2
BG 440 MUSA4,,A2,2
CR 450 MUS,E3,,,2:MUS,,A3,2
DE 460 MUS,C4,,,2:MUSE4,,,2:MUS
,A4,,,2:MUSB4,,E2,2
BK 470 MUS,E3,,,2:MUS,,G3#,2
EC 480 MUS,E4,,,2:MUSG4#,,,2:MU
S,B4,,,2
AH 490 MUS C5,,,A2,2:MUS,E3,,,2:
MUS,,A3,2
XB 500 MUS ,E4,,,2
SS 510 MUSE5,,,2:MUS,D5#,,,2:MU
SE5,,,2:MUS,D5#,,,2
KM 520 MUSE5,,,2:MUS,B4,,,2:MUS
D5,,,2:MUS,C5,,,2
MJ 530 MUSA4,,A2,2:MUS,E3,,,2:M
US,,A3,2
GB 540 MUS,C4,,,2:MUSE4,,,2:MUS
,A4,,,2:MUSB4,,E2,2
CQ 550 MUS,E3,,,2:MUS,,G3#,2
SG 560 MUS,E4,,,2:MUSC5,,,2:MUS
,B4,,,2
RX 570 IF I=2 THEN590
SQ 580 MUSA4,,A2,2:MUS,E3,,,2:M
US,,A3,2:MUS,X,X,2:NEXT
EQ 590 MUSA4,,A2,2:MUSX,X,X,8
CR 600 OCTAVE1,1,0:NEXT J
HK 610 END:REM KILL:END

```



```

EK 620 POKE53281,6:POKE53280,6
      PRINT"[CLR][CYN]
      {3 SPACES}COPYRIGHT 198
      8 COMPUTE! PUB., INC."
JJ 630 PRINTTAB(11)"ALL RIGHTS
      RESERVED[7 DOWN]"
AH 640 PRINTTAB(14)"FUR ELISE"
      :PRINTTAB(9)"OR THE AUT
      UMN LEAVES"
RR 650 PRINT:PRINT:PRINT:PRINT
      :PRINT:PRINT
CR 660 PRINTTAB(9)"LUDWIG VAN
      {SPACE}BEETHOVEN":RETUR
      N

```

Big Screen

See instructions in article on page 66
before typing in.

```

0801:0B 08 FF FF 9E 32 31 33 EB
0809:34 00 29 08 FF FF 8F 14 0C
0811:14 14 14 14 14 14 14 21
0819:43 4F 50 59 52 49 47 48 CC
0821:54 20 31 39 38 38 20 43 43
0829:4F 4D 50 55 54 45 21 20 AD
0831:50 55 42 4C 49 43 41 54 F9
0839:49 4F 4E 53 20 20 20 20 A2
0841:47 52 45 45 4E 53 42 4F 1A
0849:52 4F 2C 20 4E 2E 43 2E BD
0851:20 20 00 00 00 20 B0 1D 78
0859:20 4C 09 20 75 09 A9 0F E1
0861:8D 21 D0 8D 20 D0 4C A4 F4
0869:09 D0 D2 CF C7 D2 C1 CD 64
0871:A0 C2 D9 A0 D2 CF C2 C5 E8
0879:D2 D4 A0 C2 C9 D8 C2 D9 79
0881:B3 B0 B0 B6 A0 D3 D4 CF E6
0889:CE C5 C3 D5 D4 D4 C5 D2 A0
0891:A0 D4 C5 D2 D2 C1 C3 C5 F7
0899:C7 D2 C5 C5 CE D3 C2 CF 72
08A1:D2 CF AC A0 CE AE C3 AE 16
08A9:A0 B2 B7 B4 B0 B5 A9 20 C8
08B1:85 4C A9 40 85 4E A9 60 E9
08B9:85 50 A9 80 85 52 A9 00 A6
08C1:85 4B 85 4D 85 4F 85 51 B2
08C9:A0 00 A2 00 60 20 AF 08 69
08D1:B1 4B 8D 00 A0 B1 4D 8D 33
08D9:01 A0 B1 4F 91 4B B1 51 2C
08E1:91 4D AD 00 A0 91 4F AD 5B
08E9:01 A0 91 51 C8 C0 D0 D0 04
08F1:DF 20 7F 0B EF E0 20 D0 76
08F9:D7 60 20 AF 08 B1 4B 8D 38
0901:00 A0 B1 4F 8D 01 A0 B1 C9
0909:4D 91 4B B1 51 91 4F AD C7
0911:00 A0 91 4D AD 01 A0 91 96
0919:51 C8 C0 00 D0 DF 20 7F E3
0921:0B E8 E0 20 D0 D7 60 AD 65
0929:02 DD 09 03 8D 02 DD AD E2
0931:00 DD 29 FC 09 03 8D 00 1F
0939:DD A9 15 8D 18 D0 A9 1B 92
0941:8D 11 D0 A9 00 85 CE 8D 44
0949:15 D0 60 A5 01 29 FE 85 B0
0951:01 AD 02 DD 09 03 8D 02 DE
0959:DD AD 00 DD 29 FC 09 03 F5
0961:8D 00 DD AD 18 D0 09 08 EE
0969:8D 18 D0 AD 11 D0 09 20 3B
0971:8D 11 D0 60 A9 04 85 FC 14
0979:A9 00 85 FB A2 00 A9 01 3A
0981:A0 00 91 FB C8 C0 8D 0E EF
0989:F9 E6 FC E8 E0 04 D0 F2 2C
0991:60 20 AF 08 91 4B C8 C0 5E
0999:00 D0 F9 E6 4C E8 E0 20 75
09A1:D0 F2 60 A5 C5 C9 4D D0 E5
09A9:03 4C 5D 0A C9 39 D0 06 77
09B1:20 AF 1D 4C A4 09 C9 0C 11
09B9:D0 08 A9 01 8D B3 02 4C 07
09C1:0C 16 C9 25 D0 06 20 0C D5
09C9:10 4C A9 C9 22 D0 06 9A
09D1:20 E9 11 4C A4 09 C9 2B 5D
09D9:D0 06 20 05 0F 4C A4 09 26
09E1:C9 24 D0 C0 20 55 18 20 63
09E9:4C 09 20 75 09 4C A4 09 8B
09F1:C9 3F D0 0A AD 8D 02 C9 E4

```

```

09F9:07 D0 03 20 E2 FC C9 02 C6
0A01:D0 06 20 FB 08 4C A4 09 86
0A09:C9 07 D0 06 20 CE 08 4C D6
0A11:A4 09 C9 33 D0 13 AD 8D E1
0A19:02 C9 00 D0 06 20 75 09 52
0A21:4C A4 09 20 92 09 4C A4 9D
0A29:09 C9 31 D0 06 20 9B 0D 5C
0A31:4C A4 09 C9 29 D0 11 AD AE
0A39:8D 02 D0 06 20 BE 1C 4C 8F
0A41:A4 09 20 FF 1A 4C A4 09 42
0A49:C9 0D D0 06 20 24 0F 4C FB
0A51:A4 09 C9 2A D0 06 20 9C 51
0A59:0F 4C A4 09 AD 00 DC 29 7D
0A61:0F C9 0F D0 03 4C A4 09 F9
0A69:C9 0E D0 06 20 94 0A 4C 14
0A71:A4 09 C9 0D D0 06 20 AF B2
0A79:0B 4C A4 09 C9 0B D0 06 6D
0A81:20 62 0C 4C A9 09 C9 07 68
0A89:D0 06 20 17 0D 4C A4 09 E8
0A91:4C A4 09 20 AF 08 20 9D 93
0A99:0A 4C E3 0A B1 4B 99 00 D0
0AA1:A0 B1 4D 99 40 A1 B1 4F F0
0AA9:99 80 A2 B1 51 99 C0 A3 30
0AB1:C8 C0 00 D0 E7 20 7F 0B 31
0AB9:B1 4B 99 00 A1 B1 4D 99 B4
0AC1:40 A2 B1 4F 99 80 A3 B1 91
0AC9:51 99 C0 A4 C8 C0 4D D0 E9
0AD1:E7 A0 00 20 1B 0B B9 4B C7
0AD9:00 99 53 00 C8 C0 08 D0 E8
0AE1:F5 60 20 AF 08 20 EC 0A AC
0AE9:4C FD 0A B1 53 91 4B B1 29
0AF1:55 91 4D B1 57 91 4F B1 2B
0AF9:59 91 51 60 C8 C0 00 F0 89
0B01:06 20 EC 0A 4C FD 0A 20 EE
0B09:7F 0B 20 EC 0A C8 C0 40 A9
0B11:D0 F8 A0 00 20 1B 0B 4C B1
0B19:38 0B B9 4B 00 18 69 40 6D
0B21:99 4B 00 09 09 B9 4C 00 A7
0B29:18 69 01 99 4C 00 C8 C8 1C
0B31:C0 10 D0 E6 A0 00 60 E8 E2
0B39:E0 18 F0 06 20 EC 0A 4C 59
0B41:FD 0A A0 00 20 49 0B 60 89
0B49:B9 00 A0 91 4F B9 40 A1 EC
0B51:91 51 B9 80 A2 91 4B B9 6F
0B59:C0 A3 91 4D C8 C0 00 D0 D9
0B61:E7 20 7F 0B B9 00 A1 91 B6
0B69:4F B9 40 A2 91 51 B9 80 8D
0B71:A3 91 4B B9 C0 A4 91 4D CB
0B79:C8 C0 40 D0 E7 60 E6 4C 14
0B81:E6 4E E6 50 E6 52 E6 54 23
0B89:E6 56 E6 58 E6 5A 60 A9 16
0B91:3E 85 4C A9 5E 85 4E A9 9B
0B99:7E 85 50 A9 9E 85 52 A9 4E
0BA1:00 85 4B 85 4D 85 4F 85 7F
0BA9:51 A0 00 A2 00 60 20 90 0D
0BB1:0B B1 4B 99 00 A0 B1 4D EF
0BB9:99 40 A1 B1 4F 99 80 A2 80
0BC1:B1 51 99 C0 A3 C8 C0 00 06
0BC9:D0 E7 20 7F 0B B1 4B 99 8D
0BD1:00 A1 B1 4D 99 40 A2 B1 20
0BD9:4F 99 80 A3 B1 51 99 C0 0F
0BE1:A4 C8 C0 40 D0 E7 A0 00 FF
0BE9:20 1B 0B 20 2A 0C 20 2A 26
0BF1:0C B9 4B 00 99 53 00 C8 C8
0BF9:C0 08 D0 F5 20 90 0B 20 65
0C01:EC 0A 4C 06 0C C8 C0 00 01
0C09:F0 06 20 EC 0A 4C 06 0C 87
0C11:20 7F 0B 20 EC 0A C8 C0 5E
0C19:40 D0 F8 A0 00 20 1B 0B 70
0C21:20 2A 0C 20 2A 0C 4C 50 C1
0C29:0C B9 4B 00 28 E9 40 99 A2
0C31:4B 00 B0 09 B9 4C 00 38 CC
0C39:E9 01 99 4C 00 B9 4C 00 FD
0C41:38 E9 01 99 4C 00 C8 C8 66
0C49:C0 10 D0 D0 A0 00 60 E8 6C
0C51:E0 18 F0 06 20 EC 0A 4C 73
0C59:06 0C 20 AF 08 20 49 0B D4
0C61:60 20 AF 08 B1 4B 99 00 16
0C69:A0 B1 4D 99 10 A0 B1 4F 37
0C71:99 20 A0 B1 51 99 30 A0 7F
0C79:C8 C0 10 D0 E7 A0 00 B9 B0
0C81:4C 00 99 54 00 B9 4B 00 B5
0C89:18 69 10 99 53 00 90 09 68
0C91:B9 4C 00 18 69 01 99 54 F1
0C99:00 C8 C8 C0 08 D0 E0 A0 EE

```

```

0CA1:00 20 EC 0A C8 C0 00 D0 1A
0CA9:F8 20 7F 0B 20 EC 0A C8 78
0CB1:C0 40 D0 F8 A0 00 A9 30 6C
0CB9:85 5B 20 E9 0C B9 00 A0 F5
0CC1:91 4D B9 10 A0 91 4B B9 C9
0CC9:20 A0 91 51 B9 30 A0 91 C2
0CD1:4F C8 C0 10 D0 E7 A0 00 44
0CD9:A9 10 85 5B 20 E9 0C E8 DA
0CE1:E0 19 D0 01 60 4C 65 0C E5
0CE9:B9 4B 00 18 65 5B 99 4B 4A
0CF1:00 90 09 B9 4C 00 18 69 E6
0CF9:01 99 4C 00 C8 C8 C0 08 75
0D01:D0 E6 A0 00 60 C6 4C C6 CE
0D09:4E C6 50 C6 52 C6 54 C6 8F
0D11:56 C6 58 C6 5A 60 20 AF C3
0D19:08 20 7F 0B A0 3F B1 4B 90
0D21:99 D0 9F B1 4D 99 E0 9F 7D
0D29:B1 4F 99 F0 9F B1 51 99 32
0D31:00 A0 88 C0 2F D0 E7 A0 BD
0D39:00 B9 4C 00 99 54 00 B9 23
0D41:4B 00 38 E9 10 99 00 00 34
0D49:00 09 B9 54 00 38 E9 01 30
0D51:99 54 00 C8 C8 C0 08 D0 04
0D59:E0 A0 3F 20 EC 0A 88 C0 57
0D61:FF D0 F8 20 06 D0 20 EC 62
0D69:0A 88 C0 FF D0 F8 A0 0F 7D
0D71:B9 00 A0 91 4D B9 10 A0 A7
0D79:91 4B B9 20 A0 91 51 B9 10
0D81:30 A0 91 4F 88 C0 FF D0 1B
0D89:E7 A0 00 20 7F 0B 20 1B 45
0D91:0B E8 E0 19 F0 03 4C 1A 5F
0D99:0D 60 A9 A0 85 FC A9 20 25
0DA1:85 FE A9 00 85 FB 85 FD 98
0DA9:85 5D 85 5E 85 5F 85 60 89
0DB1:A2 00 A0 00 20 0B D0 4C 87
0DB9:CE 0D B1 FD 91 FB C8 C0 63
0DC1:00 D0 F7 E6 FC E6 FE E8 E7
0DC9:E0 20 D0 EE 60 20 AF 08 50
0DD1:A9 20 85 FE A9 A0 85 FC 41
0DD9:20 DF 0D 4C B2 0E A9 80 04
0DE1:85 5B 85 5C A2 00 A0 00 62
0DE9:84 FB 84 5D 84 5E 84 60 B2
0DF1:A9 00 91 FD B1 FB 25 5B 16
0DF9:C5 5B D0 06 B1 FD 05 5C 34
0E01:91 FD A5 5B 18 4A 4A 90 DE
0E09:02 A9 80 85 5B A5 5C 18 3B
0E11:4A 90 02 A9 80 85 5C E8 0D
0E19:E0 04 D0 D8 A2 00 A5 FB AA
0E21:18 69 08 85 FB 90 02 E6 0A
0E29:FC E6 5D A5 5D C9 02 D0 6A
0E31:C3 A9 00 85 5D A5 5D 18 87
0E39:69 08 85 FD 90 02 E6 FE F5
0E41:E6 5E A5 5E C9 14 D0 A8 EB
0E49:A9 00 85 5E E6 5F A5 5F 30
0E51:C9 08 F0 2B C9 4D D0 03 28
0E59:20 A6 0E A5 FD 38 E9 9F 8F
0E61:85 FD B0 02 C6 FE A5 5F D2
0E69:C9 04 D0 03 4C F1 0D A5 9F
0E71:FB 38 E9 3E 85 FB B0 02 3A
0E79:C6 FC C6 FC 4C F1 0D A9 CE
0E81:00 85 5F A5 FD 18 69 99 02
0E89:85 FD 90 02 E6 FE A5 FB 94
0E91:38 E9 06 85 FB B0 02 C6 CA
0E99:FC E6 60 A5 60 C9 0D D0 69
0EA1:01 60 4C F1 0D A5 0B 38 2E
0EA9:E9 06 85 FB B0 02 C6 FC C4
0EB1:60 A9 2F 85 FE A9 04 85 D2
0EB9:FD 85 5F A9 60 85 FC 20 EF
0EC1:DF 0D A9 20 85 FE A9 A0 64
0EC9:85 FD A9 40 85 FC A9 00 D4
0ED1:85 5F 20 DF 0D A9 2F 85 7D
0ED9:FE A9 A4 85 FD A9 80 85 E9
0EE1:FC A9 04 85 5F 20 DF 0D 08
0EE9:A5 C5 C9 40 F0 FA A9 00 4E
0EF1:85 FB 85 FD A9 20 85 FC 36
0EF9:A9 A0 85 FE A0 02 00 FD
0F01:20 BB D0 60 A9 20 85 FC 9B
0F09:A9 00 85 FB A0 00 A9 FF C4
0F11:38 F1 FB 91 FB C8 C0 00 E4
0F19:D0 F4 E6 FC A5 FC C9 A0 DE
0F21:D0 EC 60 20 28 09 4C 46 35
0F29:0F 93 0E 4E 41 4D 45 20 44
0F31:4F 46 20 47 52 41 50 48 81
0F39:49 43 20 54 4F 20 53 41 F8
0F41:56 45 3A 20 00 A2 00 86 36

```


0F49:C6	BD 2A 0F F0 07 20 D2 27	11F1:C9	B4 B0 18 AD 5D 03 C9 70	1499:D0	03 E8 B9 48 21 9D D0 76
0F51:FF	E8 4C 4A 0F A0 00 20 F2	11F9:11	90 11 AD 5B 03 C9 11 51	14A1:03	E8 C8 C0 08 D0 ED A0 AA
0F59:CF	FF 99 EB 07 C8 C9 0D 4D	1201:90	0A AD 5B 03 C9 DC B0 05	14A9:00	A2 00 BD C0 03 99 80 1C
0F61:D0	F5 C0 02 B0 07 20 75 F4	1209:03	4C 15 12 A9 11 8D 5D 8F	14B1:03	E8 C8 BD C0 03 99 80 50
0F69:09	20 4C 09 60 8C E8 07 3C	1211:03	8D 5B 03 A9 00 8D 6B 89	14B9:03	E8 C8 A9 F8 99 80 03 83
0F71:A9	08 A2 08 A0 FF 20 BA 3B	1219:03	AD 00 DC 29 10 8D 71 0E	14C1:C8	C0 30 D0 E6 4C D9 14 C1
0F79:FF	AD E8 07 A2 EB A0 07 9D	1221:03	AD 00 DC 29 0F C9 0E 27	14C9:00	00 00 00 00 00 00 00 F1
0F81:20	BD FF A9 00 85 22 A9 BD	1229:D0	13 CE 5D 03 AD 6E 03 D8	14D1:00	00 00 00 00 00 00 00 F9
0F89:20	85 23 A9 22 A2 FF A0 54	1231:D0	08 AD 71 03 F0 03 20 8E	14D9:A0	00 B9 C9 14 99 B0 03 91
0F91:9F	20 D8 FF 20 4C 09 20 07	1239:8D	15 4C F4 12 C9 0D D0 E4	14E1:C8	C0 0F D0 F5 60 20 50 4F
0F99:75	09 60 20 28 09 4C BB 7C	1241:13	EE 5D 03 AD 6E 03 D0 84	14E9:15	A2 00 A0 00 8C 6F 03 63
0FA1:0F	93 0E 4E 41 4D 45 20 BC	1249:F1	AD 71 03 F0 EC 20 60 0C	14F1:8C	70 03 AD 5B 03 8D 71 2B
0FA9:4F	46 20 46 49 4C 45 20 8F	1251:15	4C F4 12 C9 07 D0 13 F1	14F9:03	AD 5D 03 8D 72 03 A9 D0
0FB1:54	4F 20 4C 4F 41 44 3A D8	1259:EE	5B 03 AD 6E 03 D0 DA 03	1501:80	8D 6D 03 B9 C0 03 2D B0
0FB9:20	00 A2 00 86 C6 BD A2 A9	1261:AD	71 03 F0 D5 20 E1 15 30	1509:6D	03 F0 11 8C 6F 03 8E 90
0FC1:0F	F0 07 20 D2 FE E8 4C 3B	1269:4C	F4 12 C9 0B D0 13 CE 60	1511:70	03 A0 00 20 15 11 AC 6C
0FC9:BF	0F A0 00 20 CF FF 99 79	1271:5B	03 AD 6E 03 D0 C3 AD 31	1519:6F	03 AE 70 03 EE 5B 03 26
0FD1:EB	07 C8 C9 0D D0 F5 C0 B5	1279:71	03 F0 BE 20 BA 15 4C 83	1521:4E	6D 03 90 DF A9 80 8D 6B
0FE9:02	B0 07 20 75 09 20 4C 64	1281:F4	12 C9 06 D0 19 CE 5D 24	1529:6D	03 C8 E8 E0 02 90 D4 77
0FE1:09	60 8C E8 07 A9 08 A2 4E	1289:03	EE 5B 03 AD 6E 03 D0 84	1531:A2	00 AD 5B 03 38 E9 10 F4
0FE9:08	A0 FF 20 BA FF AD E8 50	1291:A9	AD 71 03 F0 A4 20 E1 90	1539:8D	5B 03 EE 5D 03 C0 20 E8
0FF1:07	A2 EB A0 07 20 BD FF F7	1299:15	20 8D 15 4C F4 12 C9 77	1541:90	C2 AD 71 03 8D 5B 03 39
0FF9:20	4C 09 A9 00 A2 FF A0 22	12A1:05	D0 19 EE 5D 03 EE 5B BE	1549:AD	72 03 8D 5D 03 60 A9 81
1001:FF	20 D5 FF 20 75 09 20 EC	12A9:03	AD 6E 03 D0 8C AD 71 3E	1551:0E	8D F8 07 A9 01 8D 15 F6
1009:4C	00 60 A9 02 8D 5C 03 3A	12B1:03	F0 87 20 60 15 20 E1 FF	1559:D0	A9 03 8D 27 D0 60 A0 6D
1011:A9	00 8D 20 D0 AD 6E 03 D6	12B9:15	4C F4 12 C9 09 D0 19 68	1561:02	AD C0 03 8D BE 03 AD 5B
1019:D0	09 20 A8 14 20 50 15 49	12C1:EE	5D 03 CE 5B 03 AD 6E B2	1569:C1	03 8D BF 03 B9 C0 03 66
1021:4C	27 10 20 2C 14 AD 1A 5C	12C9:03	D0 28 AD 71 03 F0 23 20	1571:88	88 99 C0 03 C8 C8 C8 D6
1029:D4	C9 0C 90 72 AD 19 D4 02	12D1:20	60 15 20 BA 15 4C F4 7A	1579:C0	20 90 F1 AD BE 03 8D 39
1031:C9	0C 90 6B AD 19 D4 8D 0B	12D9:12	C9 0A D0 16 CE 5D 03 71	1581:DE	03 AD BF 03 8D DF 03 9E
1039:6C	03 20 1E 14 A5 C5 C9 C2	12E1:CE	5B 03 AD 6E 03 D0 0B AB	1589:20	A8 14 60 A0 1E AD DE 2E
1041:01	D0 03 4C E5 10 AD 19 1F	12E9:AD	71 03 F0 06 20 8D 15 91	1591:03	8D BE 03 AD DF 03 8D 29
1049:D4	CD 6C 03 D0 8D 38 E9 49	12F1:20	BA 15 A5 C5 C9 37 D0 66	1599:BF	03 B9 C0 03 C8 C8 99 0E
1051:06	C9 F0 B0 D1 8D 5B 03 8E	12F9:0E	A9 00 8D 6E 03 20 A8 D0	15A1:C0	03 88 88 88 C0 FF D0 9E
1059:AD	1A D4 8D 6C 03 20 1E 18	1301:14	20 50 15 4C 1A 12 C9 4D	15A9:F1	AD BE 03 8D C0 03 AD 63
1061:14	AD 1A D4 CD 6C 03 D0 7E	1309:2C	D0 0B A9 01 8D 6E 03 93	15B1:BF	03 8D C1 03 20 A8 14 48
1069:BD	38 E9 06 8D 5D 03 18 14	1311:20	2C 14 4C 1A 12 C9 12 58	15B9:60	A0 00 18 B9 C0 03 6A FE
1071:69	32 8D 01 D0 AD 5B 03 8B	1319:D0	B0 20 7A 14 A9 00 8D EA	15C1:99	C0 03 C8 B9 C0 03 6A 17
1079:18	69 18 00 D0 D0 AD 01 7B	1321:6E	03 4C 1A 12 C9 35 D0 5D	15C9:99	C0 03 90 A0 88 B9 C0 01
1081:DC	29 04 8D 27 D0 C9 04 C7	1329:5D	AD 8D 02 D0 06 8D 5C 51	15D1:03	09 80 99 C0 03 C8 C8 D5
1089:F0	15 A9 0D 8D 27 D0 AD C5	1331:03	4C 1A 12 C9 01 D0 08 4C	15D9:C0	20 90 DF 20 A8 14 60 A8
1091:6E	03 C9 00 8D 06 20 E7 A9	1339:A9	02 8D 5C 03 4C 1A 12 BB	15E1:A0	01 18 B9 C0 03 2A 99 3B
1099:14	4C A0 10 20 15 11 A5 09	1341:C9	04 D0 06 8D 5C 03 4C F7	15E9:C0	03 88 B9 C0 03 2A 99 E1
10A1:C5	C9 01 D0 03 4C E5 10 69	1349:1A	12 C9 02 D0 08 A9 20 74	15F1:C0	03 90 0C C8 B9 C0 03 C1
10A9:C9	37 D0 0E A9 00 8D 6E 4E	1351:8D	5C 03 4C 1A 12 C9 05 2C	15F9:09	01 99 C0 03 4C 02 16 8B
10B1:03	20 A8 14 20 50 15 4C 6A	1359:D0	08 A9 40 8D 5C 03 4C 53	1601:C8	C8 C8 C0 20 90 DB 20 04
10B9:0C	10 C9 2C D0 0B A9 01 E6	1361:1A	12 C9 05 D0 08 A9 40 DC	1609:A8	14 60 20 20 17 A9 00 4D
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10C9:10	C9 12 D0 11 20 7A 14 C5	1371:D0	08 A9 80 8D 5C 03 4C 6F	1619:8D	A8 02 8D 2B 18 85 FB 10
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10F1:00	DC 29 0F C9 0D D0 04 87	1399:08	A9 01 8D 6B 03 4C 1A 41	1641:B1	FB 2D BB 02 AC B9 02 DE
10F9:20	AF 0B 60 C9 0E D0 04 A9	13A1:12	C9 2B D0 08 A9 00 8D 2A	1649:C0	F0 0F 04 A9 00 91 FD A9
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1109:20	62 0C 60 C9 07 D0 03 6A	13B1:F0	0E AD 6E 03 D0 06 20 F7	1659:D0	DC 20 28 09 20 48 17 1C
1111:20	17 0D 60 AD 5B 03 C9 5B	13B9:E7	14 4C C1 13 20 15 11 D2	1661:20	C0 16 4C A4 09 C8 8C BC
1119:E9	90 01 60 4A 4A 8D 18	13C1:20	1E 14 AD 5B 03 69 18 AE	1669:B9	02 C0 00 D0 02 E6 FE 66
1121:5F	03 AD 5D 03 C9 B9 90 82	13C9:8D	00 D0 AD 5D 03 69 32 A7	1671:AD	BB 02 18 4A 8D BB 02 27
1129:01	60 4A 4A 8D 60 03 1E	13D1:8D	01 D0 AD 5B 03 C9 D8 47	1679:B0	01 60 A9 80 8D BB 02 98
1131:AD	5D 03 29 07 8D 5E 03 A2	13D9:90	0C 38 E9 10 8D 5B 03 61	1681:A5	FB 18 69 08 85 FB 90 F7
1139:AE	60 03 A9 00 8D 61 03 C1	13E1:20	62 0C 4C 1A 12 C9 11 B4	1689:02	E6 FC E8 E0 05 F0 01 9C
1141:8D	62 03 E0 00 F0 15 AD CC	13E9:F0	0E B0 0C 18 69 10 8D F6	1691:60	A2 00 A5 FB 38 E9 27 AC
1149:61	03 18 69 40 8D 61 03 74	13F1:5B	03 20 17 0D 4C 1A 12 DB	1699:85	FB B0 02 C6 FC EE A8 6E
1151:90	03 EE 62 03 EE 62 03 1C	13F9:AD	5D 03 C9 09 F0 0E B0 24	16A1:02	AD A8 02 C9 08 F0 01 C0
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1161:64	03 AD 5F 03 18 0A 0A B8	1409:AF	0B 4C 1A 12 C9 A9 90 92	16B1:18	A5 FB 18 69 38 85 FB 87
1169:0A	90 03 EE 64 03 18 6D D0	1411:09	38 E9 08 8D 5D 03 20 91	16B9:90	02 E6 FC E6 FC 60 A9 F0
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1179:64	03 AD 61 03 18 6D 63 11	1421:00	C8 D0 FD E8 EC 5C 03 2C	16C9:02	8D A8 02 8D 2B 18 85 5E
1181:03	8D 63 03 90 03 EE 64 F7	1429:D0	F7 60 A9 0E 8D F8 07 FD	16D1:FB	A9 04 85 FE A9 20 85 A3
1189:03	AD 62 03 18 6D 64 03 57	1431:A9	01 8D 15 D0 A9 03 8D 32	16D9:FC	A0 00 A2 00 A9 80 8D 8C
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1199:03	8D 64 03 AD 5B 03 29 67	1441:B8	00 00 B4 00 00 BA 00 86	16E9:FB	AC B9 02 B1 FD 29 80 EE
11A1:07	8D 65 03 A9 07 38 ED 4F	1449:00	B5 00 00 B2 80 00 B1 28	16F1:F0	0A AC BA 02 B1 FB D0 36
11A9:65	03 8D 65 03 A9 01 A2 AA	1451:40	00 B0 A0 00 B0 50 00 1D	16F9:BB	02 91 FB AC B9 02 A5 6C
11B1:00	EC 65 03 F0 05 0A E8 84	1459:B0	28 00 B0 14 00 B0 0A FA	1701:FB	8D A9 02 20 67 16 AD 5E
11B9:4C	B2 11 8D 66 03 AD 64 A8	1461:00	A0 00 B9 3E 14 99 80 43	1709:2B	18 C9 03 D0 07 20 4C 6A
11C1:03	85 22 AD 63 03 85 21 39	1469:03	C8 C0 24 D0 F5 A9 00 51	1711:09	20 75 09 60 A5 FB CD 6A
11C9:A0	00 AD D7 1D F0 08 B1 DD	1471:99	80 03 C8 C0 40 D0 F8 15	1719:A9	02 F0 CD 4C E3 16 A9 5F
11D1:21	0D 66 03 91 21 60 A9 40	1479:60	A0 00 A2 00 B9 00 20 2B	1721:00	85 FD 85 FB A9 D8 85 86
11D9:FF	38 ED 66 03 8D 66 03 4C	1481:9D	C0 03 E8 B9 08 20 9D 63	1729:FC	A9 04 85 FE A0 00 A9 3D
11E1:B1	21 2D 66 03 91 21 60 32	1489:C0	03 E8 C8 C0 08 D0 ED 32	1731:00	91 FB A9 20 91 FD C8 E9
11E9:A9	03 8D 20 D0 AD 5D 03 50	1491:A0	00 A2 00 B9 40 21 9D 0D	1739:C0	00 D0 F3 E6 FE E6 FC 1F

1741:A5 FC C9 DC D0 E9 60 20 97	19E9:55 0D 0D 44 20 44 45 46 D2	1C91:00 E8 E0 08 D0 DD A2 00 E3
1749:22 18 A0 00 A5 C5 C9 01 7B	19F1:49 4E 45 53 20 42 52 55 3E	1C99:A0 00 B9 84 03 91 FB C8 C0
1751:D0 04 20 1E 14 60 AD 00 4C	19F9:53 48 0D 2F 20 53 45 4C A1	1CA1:C0 08 D0 F6 A0 00 A5 FB 12
1759:DC 29 0F C9 0F D0 06 20 A6	1A01:45 43 54 53 20 42 52 55 6C	1CA9:1F 69 08 85 FB 90 09 E6 BC
1761:2D 18 4C 4D 17 C9 0E D0 57	1A09:53 48 0D 2E 20 53 45 4C A2	1CB1:FC A5 FC C9 A0 D0 01 60 B8
1769:06 20 C2 17 4C 4D 17 C9 FB	1A11:45 43 54 53 20 50 45 4E 93	1CB9:A2 00 4C 5C 1C 20 3F 1C 8E
1771:06 D0 09 20 C2 17 20 F2 9F	1A19:50 4F 49 4E 54 0D 2B 20 A4	1CC1:2D AF 08 20 CC FF A9 00 B2
1779:17 4C 4D 17 C9 07 D0 06 73	1A21:44 52 41 57 2F 45 52 41 1E	1CC9:80 6A 03 A2 FF A0 FF 20 90
1781:20 F2 17 4C 4D 17 C9 05 83	1A29:53 45 0D 2D 20 53 54 4F 13	1CD1:BD FF A9 04 A2 04 A0 05 C9
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1791:4C 4D 17 C9 0D D0 06 20 90	1A39:4E 47 0D 46 49 52 45 20 AA	1CE1:20 C9 FF A0 00 4C EE 1C D1
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17A9:4D 17 C9 0B D0 06 20 0A 17	1A51:4C 49 4E 47 0D 3D 20 46 20	1CF9:A2 00 20 05 1D 4C 13 1D 35
17B1:18 4C 4D 17 C9 0A D0 06 38	1A59:4C 41 4E 4B 20 53 50 45 B6	1D01:1B 7A C0 03 A0 C0 B9 01 29
17B9:20 0A 18 20 C2 17 4C 4D D7	1A61:45 44 0D 20 2B 53 48 89	1D09:1D 20 D2 FF C8 C0 04 D0 56
17C1:17 A5 FB 38 E9 28 85 FB DE	1A69:49 46 54 4E 55 4C 4C CC	1D11:F5 60 A0 00 B1 4B 20 D2 40
17C9:B0 0B C6 FC A5 FC C9 03 73	1A71:0D 20 20 2B 43 54 52 4C 47	1D19:FF 20 D2 FF 20 D2 FF C8 CA
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17D9:60 A5 FB 18 69 28 85 FB 95	1A81:43 4F 4D 4D 4F 44 4F 52 26	1D29:20 D2 FF 20 D2 FF 20 D2 D3
17E1:90 0B E6 FC A5 FC C9 08 84	1A89:45 20 41 45 59 20 53 4C 64	1D31:FF C8 C0 40 D0 FF A5 4B 9A
17E9:D0 03 20 22 18 20 2D 18 1B	1A91:4F 57 0D 45 20 45 52 41 35	1D39:18 69 40 85 4B 90 02 E6 C1
17F1:60 A5 FB 18 69 01 85 FB 11	1A99:53 45 0D 57 20 44 52 41 D7	1D41:4C 20 05 1D A0 00 B1 4D D1
17F9:90 0B E6 FC A5 FC C9 08 9C	1AA1:57 0D 0D 5B 52 45 54 55 C1	1D49:20 D2 FF 20 D2 FF 20 D2 F3
1801:D0 03 20 22 18 20 2D 18 34	1AA9:52 4E 5D 00 93 54 4F 55 28	1D51:FF C8 C0 00 D0 F0 E6 4E 3C
1809:60 A5 FB 38 E9 01 85 FB 30	1AB1:43 48 54 41 42 4C 45 54 5A	1D59:B1 4D 20 D2 FF 20 D2 FF 17
1811:B0 0B C6 FC A5 FC C9 03 BC	1AB9:20 4D 45 4E 55 0D 0D 44 1C	1D61:20 D2 FF C8 C0 40 D0 F0 86
1819:D0 03 20 22 18 20 2D 18 4C	1AC1:2C 20 2F 2C 20 2E 2C 20 EE	1D69:A5 4D 18 69 40 85 4D 90 A6
1821:60 A9 06 85 FC A9 B9 85 8C	1AC9:45 2C 20 57 20 53 41 4D 43	1D71:02 E6 4E E8 20 A9 1D E0 81
1829:FB 60 00 0B F1 B8 8D 2C 34	1AD1:45 20 41 53 20 4A 4F 59 30	1D79:19 F0 07 E0 32 F0 15 4C 37
1831:18 A9 5B 91 FB 20 1E 14 0D	1AD9:53 54 49 43 4B 0D 4A 4F 9C	1DB1:FB 1C A0 00 B9 4F 00 99 79
1839:AD 2C 18 91 FB A5 C5 C9 33	1AE1:59 53 54 49 43 4B 20 4D 8B	1DB9:4B 00 C8 C0 04 D0 F5 4C 2A
1841:40 F0 10 C9 2C D0 04 A9 C2	1AE9:4F 56 45 53 20 43 41 4E 18	1D91:FB 1C 1B 00 A0 00 B9 93 40
1849:A0 91 FB C9 2F D0 04 A9 B8	1AF1:56 41 53 0D 0D 5B 52 45 9C	1D99:1D 20 D2 FF C8 C0 02 D0 E2
1851:20 91 FB 60 20 28 09 A2 D1	1AF9:54 55 52 4E 5D 00 20 CC D4	1DA1:F5 20 CC FF 20 3F 1C 60 0F
1859:00 86 C6 BD AA 18 D0 06 3D	1B01:FF A2 FF A0 FF 20 BD FF E5	1DA9:A9 0A 20 D2 FF 60 60 78 27
1861:20 A1 18 4C 6E 18 20 D2 B8	1B09:A9 04 A2 04 A0 00 20 BA A9	1DB1:A9 BD 8D 14 03 A9 1D 8D A9
1869:FF E8 4C 5C 18 BD A9 19 47	1B11:FF 20 C0 FF A2 04 20 C9 96	1DB9:15 03 58 60 A5 C5 C9 0E 36
1871:D0 06 20 A1 18 4C 80 18 B4	1B19:FF A9 38 85 4B 85 4D 85 A9	1DC1:D0 08 A9 00 8D D7 1D 4C ED
1879:20 D2 FF E8 4C 6E 18 BD 07	1B21:4F 85 51 A9 41 85 4C A9 87	1DC9:D4 1D C9 09 D0 05 A9 01 6E
1881:DC 19 D0 06 20 A1 18 4C E4	1B29:81 85 4E A9 21 85 50 A9 4F	1DD1:8D D7 1D 4C 31 EA 00 52 B8
1889:92 18 20 D2 FF E8 4C 80 F6	1B31:61 85 52 A2 00 A0 00 20 90	1DD9:4A 20 42 49 58 42 59 00 9C
1891:18 BD AD 1A D0 03 4C A1 61	1B39:1C 1C B1 4B 20 2B 1C C0 16	
1899:18 20 D2 FF E8 4C 92 18 ED	1B41:08 90 F4 E8 E6 4C A5 4B CB	
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18A9:60 93 42 49 47 53 43 52 2C	1B51:4C E0 19 90 E0 A2 00 A0 44	
18B1:45 45 4E 0D 20 20 20 20 52	1B59:00 20 1C 1C B1 4D 20 2B 0B	
18B9:20 20 20 20 20 0D 0D 0D 64	1B61:1C C0 08 90 F4 E8 A5 4D C3	
18C1:4A 4F 59 53 54 49 43 4B E4	1B69:20 3B 1C 85 4D 90 02 E6 F1	
18C9:20 4D 4F 56 45 53 20 43 A7	1B71:4E E6 4E E0 19 90 E0 A2 CF	
18D1:41 4E 56 41 53 0D 5A 20 B8	1B79:00 A9 0A 20 D2 FF A5 4B 8A	
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18F1:53 45 4C 45 43 54 53 20 2D	1B99:02 C6 4E A5 4E 20 26 1C 02	
18F9:4A 4F 59 53 54 49 43 4B 1D	1BA1:85 4E C9 80 B0 8F A0 00 74	
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1911:20 42 49 52 44 27 53 20 B7	1BB9:3B 1C 85 4F 90 02 E6 50 E4	
1919:45 59 45 20 56 49 45 57 A8	1BC1:E6 50 E0 19 90 E0 A2 00 7A	
1921:0D 53 20 53 41 56 45 53 29	1BC9:A0 00 20 1C 1C B1 51 20 80	
1929:20 47 52 41 50 48 49 43 15	1BD1:2B 1C C0 08 90 F4 E8 A5 0D	
1931:0D 4C 20 4C 4F 41 44 53 21	1BD9:51 20 3B 1C 85 51 90 02 7E	
1939:20 47 52 41 50 48 49 43 25	1BE1:E6 52 E6 52 E0 19 90 E0 8F	
1941:0D 50 20 50 52 49 4E 54 BF	1BE9:A2 00 A9 0A 20 D2 FF A5 39	
1949:53 0D 2D 20 50 48 4F 54 A6	1BF1:4F 20 22 1C 85 4F B0 02 AA	
1951:4F 20 4E 45 47 41 54 49 82	1BF9:C6 50 A5 50 20 26 1C 85 B8	
1959:56 45 0D 43 55 52 53 4F C7	1C01:50 A5 51 20 22 1C 85 51 D4	
1961:52 20 4B 45 59 53 20 46 21	1C09:B0 02 C6 52 A5 52 20 26 F4	
1969:4C 49 50 20 53 43 52 45 B1	1C11:1C 85 52 C9 60 B0 8F 20 A4	
1971:45 4E 20 54 4F 20 53 43 08	1C19:CC FF 60 A9 08 20 D2 FF C4	
1979:52 45 45 4E 0D 43 4C 45 07	1C21:60 38 E9 48 60 38 E9 1F 30	
1981:41 52 20 4B 45 59 20 45 B6	1C29:60 00 8D 2A 1C 29 80 4A B6	
1989:52 41 53 45 53 20 56 49 05	1C31:0D 2A 1C 09 80 20 D2 FF B8	
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19A9:93 5A 4F 4F 4D 20 4D 45 E5	1C51:A7 02 C8 18 4A C0 08 D0 AE	
19B1:4E 55 0D 0D 2E 20 41 44 8B	1C59:F6 A0 00 A9 00 99 84 03 42	
19B9:44 53 20 50 49 58 45 4C 6E	1C61:C8 C0 08 D0 F6 A0 00 B1 28	
19C1:0D 2C 20 52 45 4D 4F 56 03	1C69:FB 99 8C 03 C8 C0 08 D0 F1	
19C9:45 53 20 50 49 58 45 4C FE	1C71:F6 A0 00 BD 8C 03 39 A7 B3	
19D1:0D 0D 5B 52 45 54 55 52 D6	1C79:02 D0 0F BD A7 02 8D B0 B5	
19D9:4E 5D 00 93 4A 4F 59 53 59	1C81:02 B9 84 03 0D B0 02 99 B2	
19E1:54 49 43 4B 20 4D 45 4E BC	1C89:84 03 C8 C0 08 D0 E4 A0 D7	

Oil Defense

See instructions in article on page 45 before typing in.

0801:0E 08 0A 00 9E 20 32 30 65
0809:36 32 00 00 00 A0 00 A9 EC
0811:00 99 00 C0 A9 FF 99 FF 14
0819:32 B9 68 0F 99 00 30 B9 95
0821:68 10 99 00 31 B9 68 11 EE
0829:99 00 32 B9 67 12 99 BF 5E
0831:33 88 D0 DB 8C 29 D0 8C 0C
0839:2A D0 8C 2B D0 8C 20 D0 A0
0841:8C 21 D0 8C 08 D0 A0 02 89
0849:8C 2C D0 8C 2D 8C 2E 81
0851:D0 8C 06 C0 2D 8C 25 D0 4D
0859:C8 8C 26 D0 8C 8C 27 D0 5A
0861:C8 8C 24 D0 8C 8C 23 D0 1A
0869:8C 28 D0 A0 8A 8C 07 C0 3F
0871:C8 8C 22 D0 A0 0F 8C 00 B4
0879:C8 8C 18 D4 C8 8C 10 D0 C6
0881:8C 14 C0 8C 16 C0 A0 1C CE
0889:8C 17 D0 8C 8C 1D D0 A0 67
0891:CA 8C F8 07 C8 8C F9 07 2D
0899:C8 8C FA 07 C8 8C FB 07 78
08A1:C8 8C FC 07 C8 8C FD 07 C4
08A9:8C FE 07 8C FF 07 A9 E0 B9
08B1:8D 1C D0 A9 A0 8D 0D 50
08B9:A9 D3 8D 01 D0 A9 90 8D 31
08C1:05 D0 8D 07 D0 8D 09 D0 4A
08C9:A9 30 8D 04 D0 A9 98 8D 98
08D1:06 D0 A9 FD 8D 15 D0 A9 3A
08D9:8E 20 D2 FF AD 1E D0 18 33
08E1:AD 18 D0 29 F0 69 0C 8D 4E
08E9:18 D0 AD 11 D0 09 40 8D B9
08F1:11 D0 20 AA 0E 20 10 0D 8B
08F9:EA 20 20 9F 0E 20 75 0E 22
0901:20 2A 0E 20 FF 0B A2 06 E8
0909:20 66 0B AD 00 C0 4A F0 89
0911:10 A8 88 F0 0C 8C 01 C0 CA


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0919:20 F9 0D AC 01 C0 4C 13 DC
0921:09 20 43 0A 20 FF 0B CE AE
0929:05 C0 AE 05 C0 D0 17 CE 5A
0931:06 C0 AE 06 C0 D0 0F AD C1
0939:00 C0 C9 0E 0B 03 EE 00 05
0941:C0 A2 03 8D 06 C0 20 66 6F
0949:0B 20 2A 0E 20 7A 09 20 2C
0951:E4 FF F0 0B 20 75 0E 20 B7
0959:9F 0E 20 E4 FF F0 F5 20 E0
0961:2A 0E 20 FF 0B 20 63 0D BC
0969:20 E1 FF D0 06 A9 15 8D 9F
0971:18 D0 60 20 CF 0C 4C FB 15
0979:08 AD 08 C0 F0 20 AD FD 69
0981:07 C9 FF F0 06 EE FD 07 87
0989:4C 9F 09 A9 00 8D 0A D0 80
0991:8D 0B D0 8D 08 C0 A9 CF 86
0999:8D FD 07 20 EA 09 AD 09 B4
09A1:C0 F0 20 AD FE 07 C9 FF D6
09A9:F0 06 EE FE 07 4C C4 09 7F
09B1:A9 00 8D 0C D0 8D 0D D0 B2
09B9:8D 09 C0 A9 CF 8D FE 07 41
09C1:20 EA 09 AD 0A C0 F0 20 EF
09C9:AD FF 07 C9 FF F0 06 EE EE
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C49C:32	46	A9	C7	8D	CB	93	A9	EE	C744:2D	AD	6C	42	8D	8E	42	4C	FE	C9EC:2B	BA	20	0F	BC	A0	75	A9	B6
C4A4:C4	8D	CC	93	A9	BE	8D	8A	B4	C74C:7B	C7	A9	B4	38	ED	6C	42	A0	C9F4:00	20	91	B3	20	14	BB	20	E6
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C604:09	C6	4C	66	CB	A2	00	8E	2F	C8AC:C8	A9	B4	38	ED	81	42	8D	AE	CB54:C9	68	B0	08	A9	04	8D	8B	85
C60C:EF	03	38	E9	30	AA	E0	00	E5	C8B4:8E	42	A9	00	ED	82	42	8D	DE	CB5C:42	4C	65	CB	A9	05	8D	8B	99
C614:F0	0D	AD	EF	03	18	69	0A	67	C8BC:8F	42	4C	E6	C8	A9	B4	18	0D	CB64:42	60	A9	01	8D	15	D0	60	3D
C61C:8D	EF	03	CA	4C	12	C6	4C	FD	C8C4:6D	81	42	8D	8E	42	A9	00	5F	CB6C:20	36	87	A9	28	8D	6E	03	84
C624:BA	C5	A5	02	8D	71	42	A5	B1	C8CC:6D	82	42	8D	8F	42	4C	E6	DB	CB74:A9	19	8D	6F	03	AD	41	03	24
C62C:03	8D	72	42	AD	49	03	8D	37	C8D4:C8	A9	68	38	ED	81	42	8D	4D	CB7C:8D	90	42	20	82	86	A5	C6	89
C634:73	42	AD	4A	03	8D	74	42	DF	C8DC:8E	42	A9	01	ED	82	42	8D	17	CB84:F0	03	4C	AA	CE	A5	02	8D	28
C63C:AD	4B	03	8D	75	42	AD	3F	FB	C8E4:8F	42	AD	8E	42	18	6D	EF	AA	CB8C:71	42	A5	03	8D	72	42	AD	BA
C644:03	8D	76	42	AD	43	03	8D	B7	C8EC:03	8D	8E	42	AD	8F	42	69	F2	CB94:49	03	8D	73	42	AD	4A	03	DA
C64C:77	42	AD	6E	03	4A	8D	68	87	C8F4:00	8D	8F	42	AD	8E	42	8D	B9	CB9C:8D	74	42	AD	4B	03	8D	75	32
C654:42	C9	00	F0	0B	8D	6A	42	2A	C8FC:8C	42	AD	8F	42	8D	8D	42	B9	CBA4:42	AD	3F	03	8D	76	42	AD	59
C65C:20	A9	83	CE	6A	42	D0	F8	B8	C904:20	11	CB	A9	00	8D	84	42	81	CBAC:43	03	8D	77	42	A9	00	8D	16
C664:AD	6F	03	4A	8D	69	42	C9	0A	C90C:AD	8B	42	C9	02	F0	1D	C9	16	CBBA:45	03	A9	00	85	3F	A9	04	65
C66C:00	F0	33	8D	6A	42	20	57	69	C914:03	F0	2F	C9	04	F0	3F	C9	14	CBBC:85	40	AD	18	D0	29	F7	8D	07
C674:84	CE	6A	42	D0	F8	AC	69	96	C91C:05	F0	51	AD	8E	42	8D	83	8F	CBCC:18	D0	AD	11	D0	29	DF	8D	DB
C67C:42	A9	00	20	91	B3	20	0F	42	C924:42	A9	01	8D	86	42	8D	88	1D	CBCC:11	D0	AD	4D	03	8D	86	02	09
C684:BC	A0	75	A9	00	20	91	B3	39	C92C:42	4C	81	C9	A9	B4	38	ED	3F	CBDD:AD	4E	03	8D	20	D0	8D	21	90
C68																										

CC8C:3E 03 29 10 F0 08 A9 01 28
 CC94:8D 6A 42 4C C4 CC CE 6A FD
 CC9C:42 D0 25 A9 14 8D 6A 42 B8
 CCA4:A0 00 B1 3F C9 A0 0F 7A
 CCAC:A9 A0 91 3F A9 01 8D 41 17
 CCB4:03 20 1D 94 4C C4 CC A9 7D
 CCB4:20 91 3F A9 00 4C B2 CC B0
 CCC4:AD 3E 03 29 08 D0 3B EE A0
 CCC4:CC 42 AD CC 42 C9 29 D0 3C
 CCD4:08 A9 28 8D CC 42 4C 06 C8
 CCDC:CD 20 A9 83 A2 01 8E 6A 73
 CCE4:42 A2 08 EE 02 D0 D0 0A 37
 CCEC:A9 02 8D 10 D0 A9 FE 8D 47
 CCF4:F9 07 CA D0 EE A5 3F 18 58
 CCF4:69 01 85 3F A5 40 69 00 31
 CD04:85 40 AD 3E 03 29 04 D0 A1
 CD0C:39 CE CC 42 AD CC 42 D0 AB
 CD14:08 A9 01 8D CC 42 4C 46 65
 CD1C:CD 20 E7 83 A2 01 8E 6A 7C
 CD24:42 A2 08 CE 02 D0 D0 0A 76
 CD2C:A9 00 8D 10 D0 A9 FF 8D 0A
 CD34:F9 07 CA D0 EE A5 3F 38 B9
 CD3C:E9 01 85 3F A5 40 E9 00 B3
 CD44:85 40 AD 3E 03 29 01 D0 DB
 CD4C:2D CE CD 42 AD CD 42 D0 0A
 CD54:08 A9 01 8D CD 42 4C 7A E1
 CD5C:CD 20 25 84 A2 01 8E 6A 74
 CD64:42 A2 08 CE 03 D0 CA D0 79
 CD6C:FA A5 3F 38 E9 28 85 3F 94
 CD74:A5 40 E9 00 85 40 AD 3E F6
 CD7C:03 29 02 D0 2F EE CD 42 44
 CD84:AD CD 42 C9 1A D0 08 A9 1D
 CD8C:19 8D CD 42 4C B0 CD 20 D6
 CD94:57 84 A2 01 8E 6A 42 A2 A6
 CD9C:08 EE 03 D0 CA D0 FA A5 9A
 CDA4:3F 18 69 28 85 3F A5 40 4A
 CDAC:69 00 85 40 4C 74 CC C9 49
 CDB4:91 F0 2B C9 1D F0 3C C9 46
 CDBC:11 F0 4D C9 9D F0 5E C9 9A
 CDC4:41 F0 03 4C 36 CE EE 28 55
 CDC4:D0 28 D0 C9 10 D0 05 83
 CDD4:A9 00 8D 28 D0 AD 28 D0 D7
 CDDC:8D 27 D0 4C 88 CC 20 81 21
 CDE4:CE 20 25 84 20 25 84 20 9B
 CDEC:25 84 20 25 84 20 25 84 06
 CDF4:4C 89 CB 20 81 CE 20 A9 C5
 CDFC:83 20 A9 83 20 A9 83 20 9E
 CE04:A9 83 20 A9 83 4C 89 CB 22
 CE0C:20 81 CE 20 57 84 20 57 5A
 CE14:84 20 57 84 20 57 84 20 B6
 CE1C:57 84 4C 89 CB 20 81 CE 59
 CE24:20 E7 83 20 E7 83 20 E7 B3
 CE2C:83 20 E7 83 20 E7 83 4C BC
 CE34:89 CB A9 93 20 D2 FF 20 64
 CE3C:81 CE AD 18 D0 09 08 8D CD
 CE44:18 D0 AD 11 D0 09 20 8D 61
 CE4C:11 D0 A9 00 85 3F A9 04 5C
 CE54:85 40 A0 00 AD 4F 03 91 1B
 CE5C:3F E6 3F D0 02 E6 40 A5 1A
 CE64:40 C9 07 D0 EF A5 3F C9 E0
 CE6C:E8 D0 E9 A9 0E 8D F9 07 2C
 CE74:A9 1E 8D 15 D0 A9 00 8D 2C
 CE7C:45 03 4C 7F CB AD 71 42 39
 CE84:85 02 AD 72 42 85 03 AD 1E
 CE8C:73 42 8D 49 03 AD 74 42 B4
 CE94:8D 4A 03 AD 75 42 8D 4B E1
 CE9C:03 AD 76 42 8D 3F 03 AD 37
 CEA4:77 42 8D 43 03 60 A9 01 62
 CEAC:8D 15 D0 AD 90 42 8D 41 35
 CEB4:03 A9 00 8D 45 03 60 20 2E
 CEB4:E6 86 A9 1E 8D 78 86 8D 6F
 CEC4:15 D0 A9 02 8D 46 03 20 22
 CECC:23 86 A5 C6 F0 F4 A9 01 6E
 CED4:8D 78 86 8D 15 D0 60 A5 53
 CEDC:02 8D 6C 42 A5 03 8D 6D 52
 CEE4:42 A5 01 29 FE 85 01 A9 79
 CEEC:00 8D 15 D0 A9 00 85 02 F7
 CEF4:A9 A0 85 03 A9 20 85 3F 88
 CEF4:A9 4E 85 40 20 57 CF A9 5F
 CF04:00 85 02 A9 20 85 03 A9 A6
 CF0C:00 85 3F A9 A0 85 40 20 4B
 CF14:57 CF A9 20 85 02 A9 4E 60
 CF1C:85 03 A9 00 85 3F A9 20 11
 CF24:85 40 20 57 CF A9 01 8D C4
 CF2C:15 D0 AD 6C 42 85 02 AD E0

CF34:6D 42 85 03 A5 01 09 01 40
 CF3C:85 01 AD C2 94 C9 57 F0 2C
 CF44:11 A9 02 85 C6 A9 43 8D 60
 CF4C:77 02 8D 78 02 A9 57 8D 54
 CF54:C2 94 60 A9 20 8D C3 94 74
 CF5C:A9 40 8D C4 94 A0 00 B1 B7
 CF64:02 91 3F A5 02 18 69 01 EF
 CF6C:85 02 A5 03 69 00 85 03 8D
 CF74:A5 3F 18 69 01 85 3F A5 92
 CF7C:40 69 00 85 40 CE C4 94 4A
 CF84:D0 DD CE C3 94 D0 D8 60 14

BEFORE TYPING ...

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

XpressCard 128

See instructions in article on page 70 before typing in.

1C01:08 1C FE FF DE 9C 00 19 A6
 1C09:1C FF FF 9E 28 D1 28 22 34
 1C11:31 43 34 33 22 29 29 00 74
 1C19:41 1C FF FF 8F 22 14 14 3A
 1C21:14 14 14 14 14 14 14 59
 1C29:28 43 29 20 31 39 38 84
 1C31:20 43 4F 4D 50 55 54 45 CE
 1C39:21 20 50 55 42 2E 20 00 74
 1C41:00 00 A0 00 A9 01 99 00 12
 1C49:10 C8 C0 08 90 F8 A0 00 FD
 1C51:84 FC 84 FE B9 0B 22 99 63
 1C59:0A 10 C8 C0 08 90 F5 20 4E
 1C61:BE 1D 20 A2 24 85 FD A9 4B
 1C69:0F 8D 20 D0 8D 21 D0 20 50
 1C71:F1 21 AD E8 23 C9 2F F0 BE
 1C79:08 A9 2F 8D E8 23 D0 8B CB
 1C81:1E 20 F4 1D A0 00 8C E9 49
 1C89:23 20 E4 FF 20 8D 1E F0 5C
 1C91:F8 C9 11 D0 18 AD E9 23 56
 1C99:18 69 27 90 08 A9 13 20 53
 1CA1:D2 FF 4C 85 1C 8D E9 23 33
 1CA9:A9 11 4C 1D 1D C9 87 D0 46
 1CB1:03 4C 20 1F C9 91 D0 18 C2
 1CB9:AD E9 23 38 E9 29 B0 08 88
 1CC1:A9 13 20 D2 FF 4C 85 1C 1D
 1CC9:8D E9 23 A9 91 4C 1D 1D 57
 1CD1:C9 9D D0 09 CE E9 23 CE 34
 1CD9:E9 23 4C 1D 1D C9 94 D0 35
 1CE1:03 4C 15 21 C9 13 D0 05 A4
 1CE9:A0 00 4C 32 1D C9 14 D0 28
 1CF1:03 4C 45 21 C9 8D D0 03 A2
 1CF9:4C EA 20 C9 93 D0 08 20 C3
 1D01:00 22 A9 13 4C E5 1C C9 26
 1D09:0D D0 03 4C 8A 1C C9 85 01
 1D11:90 0A C9 8D B0 06 20 41 47
 1D19:1D 4C 85 1C AC E9 23 C8 83
 1D21:C0 FF 90 0D 8D EA 23 A0 9D
 1D29:00 A9 13 20 D2 FF AD EA 0F
 1D31:23 8C E9 23 20 D2 FF 4C 28
 1D39:8A 1C 90 0E 08 93 13 00 67
 1D41:C9 85 D0 03 4C 08 24 C9 A0
 1D49:89 D0 03 4C F3 23 C9 86 E7
 1D51:D0 03 4C 08 24 C9 8A D0 EC
 1D59:03 4C B0 1E C9 8B D0 0B 49
 1D61:20 A2 24 A9 00 8D ED 23 A8
 1D69:4C F4 1D C9 88 D0 27 20 3D
 1D71:D8 1D E6 FF A5 FF C9 FE FB
 1D79:90 19 AD ED 23 F0 0B 20 E9
 1D81:A2 24 A9 00 8D ED 23 4C 02
 1D89:94 1D A9 01 8D ED 23 A9 AE
 1D91:04 85 FF 4C F4 1D C6 FF 9D
 1D99:AD ED 23 F0 0E A5 FF C9 6A
 1DA1:04 B0 17 A9 00 8D ED 23 BC
 1DA9:4C B7 1D A5 FF C9 25 B0 18
 1DB1:09 A9 01 8D ED 23 A9 FD 21
 1DB9:85 FF 4C F4 1D A0 00 A9 A4

1DC1:D8 85 FD A9 00 85 FC A9 DD
 1DC9:0B 91 FC C8 D0 F9 E6 FD 54
 1DD1:A5 FD C9 DC 90 F1 60 A0 13
 1DD9:00 8C EE 23 AE ED 23 A9 64
 1DE1:FE 08 B9 02 B9 02 C3 94 74
 1DE9:77 FF AC EE 23 C8 D0 E9 2C
 1DF1:4C 0F 1E A0 01 20 F3 21 75
 1DF9:A0 00 8C EE 23 AE ED 23 D7
 1E01:A9 FE 20 74 FF 99 00 04 87
 1E09:AC EE 23 C8 D0 EC 20 7E 41
 1E11:24 A9 20 99 FE 04 C8 D0 D1
 1E19:FA A5 FF AE ED 23 F0 06 0B
 1E21:38 E9 03 4C 2A 1E 38 E9 3D
 1E29:24 A2 2F 38 E9 64 E8 90 CC
 1E31:03 4C 2C 1E 18 69 64 8E 27
 1E39:03 05 A2 2F 38 E9 0A E8 E5
 1E41:90 03 4C 3D 1E 18 69 0A 12
 1E49:8E 04 05 A2 2F 38 E9 01 C7
 1E51:E8 90 03 4C 4E 1E 8E 05 58
 1E59:05 AD ED 23 D0 01 60 AD 6C
 1E61:05 05 18 69 07 C9 3A 90 5F
 1E69:06 EE 04 05 38 E9 0A 8D 40
 1E71:05 05 EE 04 05 AD 04 05 7B
 1E79:C9 3A 90 09 EE 03 05 38 91
 1E81:E9 0A 8D 04 05 EE 03 05 16
 1E89:EE 03 05 60 8D EA 23 AC AF
 1E91:E9 23 B9 00 04 8D EB 23 14
 1E99:A9 64 99 00 04 A9 FF 85 43
 1EA1:E7 A9 0B 85 E4 AD EB 23 CE
 1EA9:99 00 04 AD EA 23 60 A0 53
 1EB1:00 B9 BE 1E F0 13 20 D2 FC
 1EB9:FF C8 4C B2 1E 13 43 4C EC
 1EC1:45 41 52 20 41 4C 4C 3F 50
 1EC9:00 A9 00 20 E4 FF F0 FB 77
 1ED1:C9 59 F0 03 4C F8 20 A5 C3
 1ED9:FF 85 FD A0 00 84 FC AE FB
 1EE1:ED 23 8C EE 23 A9 FC 8D A5
 1EE9:BD 02 A9 20 27 FF AC 46
 1EF1:EE 23 C8 D0 EA E6 FD A5 29
 1EF9:FD C9 FE 90 E2 AD ED 23 5D
 1F01:D0 0C A9 01 8D ED 23 A9 04
 1F09:04 85 FD 4C E0 1E A9 93 95
 1F11:20 D2 FF A9 00 8D ED 23 E3
 1F19:20 A2 24 20 F4 1D 60 A9 1D
 1F21:02 8D 20 D0 A5 D4 C9 58 41
 1F29:F0 F5 C9 01 D0 03 4C 03 D4
 1F31:21 C9 21 D0 06 20 BB 1F EA
 1F39:4C F8 20 C9 12 D0 06 20 7C
 1F41:54 20 4C F8 20 C9 15 D0 ED
 1F49:0A A5 D3 D0 03 4C 5F 21 A6
 1F51:4C 9A 21 C9 11 D0 03 4C 3B
 1F59:DB 20 C9 29 D0 03 4C EF 74
 1F61:22 C9 0D D0 06 20 2D 22 FE
 1F69:4C F8 20 C9 2A D0 06 20 6D
 1F71:25 22 4C F8 20 C9 36 D0 49
 1F79:37 A5 D3 D0 0C A9 7B 85 C7
 1F81:FF A9 00 8D ED 23 4C F8 90
 1F89:20 C9 01 D0 0C A9 F6 85 F1
 1F91:FF A9 00 8D ED 23 20 F8 48
 1F99:20 C9 02 D0 0C A9 73 85 1B
 1FA1:FF A9 01 8D ED 23 4C F8 D0
 1FA9:20 A9 CA 85 FF 4C F8 20 57
 1FB1:4C 25 1F D2 A0 C2 C9 D8 EC
 1FB9:C2 D9 20 D8 1D 20 50 20 7B
 1FC1:A9 00 85 FC 85 FA 8D EE 77
 1FC9:23 A9 01 8D F0 23 8D F1 1E
 1FD1:23 A9 FD 85 FD A9 FC 85 3A
 1FD9:FB AE F0 23 AC EE 23 A9 23
 1FE1:FA 20 74 FF 8D EF 23 AE 55
 1FE9:F1 23 AC EE 23 A9 FC 8D B5
 1FF1:B9 02 AD EF 23 20 77 FF CA
 1FF9:AC EE 23 C8 8C EE 23 D0 72
 2001:D8 C6 FB C6 FD A5 FF C9 9B
 2009:FD D0 0B A5 FD C9 03 D0 26
 2011:03 4C 4A 20 A5 FF C5 FD E7
 2019:90 08 AD F1 23 CD ED 23 C7
 2021:F0 27 AD F0 23 F0 12 A5 0F
 2029:FB C9 04 B0 0C A9 FD 85 ED
 2031:FB A9 00 8D F0 23 4C DA 3A
 2039:1F AD F0 23 CD F1 23 F0 32
 2041:98 AD 00 8D F1 23 4C D2 98
 2049:1F A9 00 8D 30 D0 60 A9 8B
 2051:01 D0 F8 20 5D 20 A9 00 BD
 2059:85 FC 85 FA 8D EE 23 AD 18
 2061:ED 23 8D F0 23 8D F1 23 78


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2069:A0 00 A5 FF 85 FD 18 69 6C
2071:01 85 FB C9 FE 90 0E AD B3
2079:F0 23 D0 5B A9 04 85 FB 2F
2081:A9 01 8D F0 23 AE F0 23 70
2089:8C EE 23 A9 FA 20 74 FF 0C
2091:8D EF 23 AE F1 23 AC EE 48
2099:23 A9 FC 8D B9 02 AD EF 6F
20A1:23 20 77 FF AC EE 23 C8 9A
20A9:D0 DB E6 FB E6 FD A5 FB 5C
20B1:C9 FE 90 11 AD F0 23 D0 5B
20B9:1E A9 04 85 FB A9 01 8D 62
20C1:F0 23 4C 86 20 A5 FD C9 92
20C9:FE 90 BA A9 04 85 FD A9 7B
20D1:01 8D F1 23 4C 86 20 4C 6F
20D9:4A 20 B9 D0 06 99 00 04 26
20E1:C8 D0 F7 20 D8 1D 4C 03 92
20E9:21 A0 00 B9 00 04 99 D0 92
20F1:06 C8 D0 F7 4C 85 1C A5 57
20F9:FF C9 FE 90 02 C6 FF 20 E0
2101:FA 1D A9 0F 8D 20 D0 8D 47
2109:21 D0 A9 00 85 D0 20 4A 3F
2111:20 4C 85 1C A0 FF 88 B9 B8
2119:D0 06 C8 99 D0 06 88 D0 78
2121:F5 AD FD 04 8D D0 06 A0 26
2129:FD 88 B9 00 04 C8 99 00 3A
2131:04 88 CC E9 23 D0 F2 A9 BB
2139:20 99 00 04 88 C0 FE B0 28
2141:F8 4C 8A 1C AC E9 23 C8 42
2149:B9 00 04 88 99 00 04 C8 0F
2151:C0 FD D0 F3 A9 20 8D FD B3
2159:04 A9 9D 4C D1 1C 20 50 10
2161:20 A2 FE E6 FF 20 F4 1D 32
2169:BD D0 06 C9 20 D0 22 CA 6F
2171:30 03 4C 69 21 4C 03 21 0E
2179:E6 FF A5 FF C9 FE 90 E5 35
2181:AD ED 23 D0 F0 A9 01 8D 45
2189:ED 23 A9 04 85 FF 4C 66 2C
2191:21 DD 00 04 D0 E2 4C 70 37
2199:21 20 50 20 A2 00 BD D0 E1
21A1:06 C9 20 F0 03 E8 D0 F6 C0
21A9:8E EA 23 E6 FF A5 FF C9 21
21B1:FE 90 14 AD ED 23 D0 0C 9E
21B9:A9 01 8D ED 23 A9 04 85 EE
21C1:FF 4C C8 21 4C F8 20 20 E8
21C9:F4 1D A2 00 A0 B0 00 9A
21D1:04 8D EC 23 BD D0 06 CD 54
21D9:EC 23 F0 08 A2 00 C8 D0 71
21E1:ED 4C AC 21 E8 EC EA 23 C9
21E9:F0 DA C8 F0 DE 4C CF 21 6B
21F1:A0 00 B9 3B 1D D0 01 60 FD
21F9:20 D2 FF C9 4C F3 21 A0 A2
2201:00 A9 20 F8 99 00 04 C8 D0 BF
2209:FA 60 85 89 86 8A 87 8B 25
2211:88 8C 13 4E 41 4D 45 3A 08
2219:20 1B 51 00 2C 50 2C 57 B0
2221:2C 50 2C 52 A9 00 8D F2 95
2229:23 4C 32 22 A9 01 8D F2 D9
2231:23 A5 FF 8D B6 23 20 A2 EF
2239:24 AD ED 23 8D E7 23 A9 E6
2241:00 8D ED 23 85 D0 AA A8 46
2249:BD 13 22 F0 07 20 D2 FF E2
2251:E8 4C 49 22 20 CF FF C9 72
2259:0D F0 0B 99 E9 07 C8 C0 19
2261:11 B0 03 4C 55 22 C0 02 36
2269:B0 01 60 A9 14 20 D2 FF B3
2271:A2 00 C8 AD F2 23 F0 06 07
2279:BD 1D 22 4C 82 22 BD 21 26
2281:22 99 E9 07 20 D2 FF E8 20
2289:E0 05 90 E6 8C E8 07 20 36
2291:F9 1D AD E8 07 A2 E9 A0 95
2299:07 20 BD FF A9 08 A2 08 DB
22A1:AC F2 23 20 BA FF 20 C0 36
22A9:FF A2 08 AD F2 23 F0 06 7E
22B1:20 C9 FF 4C BA 22 20 C6 A2
22B9:FF A0 00 8C EE 23 AD F2 41
22C1:23 F0 09 B9 00 04 20 D2 B3
22C9:FF 4C D6 22 20 CF FF AC 0B
22D1:EE 23 99 00 04 AC EE 23 5D
22D9:C8 D0 E0 20 8E 23 C9 00 69
22E1:F0 03 4C B0 22 A9 08 20 9C
22E9:C3 FF 20 CC FF 60 A9 00 B5
22F1:8D E3 23 A9 01 8D F2 23 3C
22F9:A9 28 8D E4 23 A9 01 8D 6C
2301:E5 23 A5 FF 8D E6 23 20 26
2309:A2 24 AD ED 23 8D E7 23 80
2311:A9 00 8D ED 23 20 F4 1D 5D
2319:20 CC FF A9 00 A0 FF A2 62
2321:FF 20 BD FF A9 04 AA A0 7A
2329:07 20 BA FF 20 C0 FF A2 F8
2331:04 20 C9 FF A0 00 20 40 40
2339:23 20 CC FF 4C 03 21 A2 06
2341:00 B9 00 04 C9 20 00 05 6B
2349:69 40 4C 5D 23 C9 40 90 05
2351:0B C9 60 B0 05 69 80 4C C1
2359:5D 23 A9 20 20 D2 FF C8 63
2361:CC E3 23 F0 0E E8 EC E4 4D
2369:23 D0 D6 A9 0D 20 D2 FF 79
2371:4C 40 23 A0 00 A9 0D 20 3D
2379:D2 FF C8 CC E5 23 90 F5 E1
2381:20 8E 23 C9 00 F0 05 A0 EA
2389:00 4C 40 23 60 AD F2 23 DF
2391:D0 03 20 D8 1D E6 FF A5 BC
2399:FF C9 FE B0 34 C8 E6 23 07
23A1:90 18 F0 16 AD ED 23 CD EE
23A9:E7 23 D0 0E 20 A2 24 A9 25
23B1:00 8D ED 23 20 F9 1D A9 18
23B9:00 60 AD F2 23 F0 06 20 06
23C1:F9 1D 4C CF 23 A5 90 29 CC
23C9:40 F0 03 4C AD 23 A9 01 DF
23D1:60 AD ED 23 D0 D6 A9 01 D9
23D9:8D ED 23 A9 04 85 FF 4C E3
23E1:BB 23 00 00 00 00 00 2F FD
23E9:01 00 20 00 00 FF 00 00 B4
23F1:00 00 20 7E 24 A0 00 B9 81
23F9:D0 06 8D 7C 24 8C 7B 24 12
2401:20 3F 24 C8 D0 F1 60 C9 13
2409:86 F0 06 EE 7D 24 4C 15 AA
2411:24 CE 7D 24 AD 7D 24 C9 86
2419:41 90 08 A9 3F 8D 7D 24 11
2421:4C 2D 24 C9 40 90 05 A9 F3
2429:00 8D 7D 24 20 7E 24 A0 AA
2431:00 8C 7B 24 20 51 24 99 76
2439:D0 06 C8 D0 F4 60 20 58 53
2441:24 AD 7C 24 8D 01 D6 60 57
2449:AD 00 D6 29 80 F0 F9 60 F1
2451:20 58 24 AD 01 D6 60 A9 EC
2459:12 20 74 24 AD 7D 24 8D BC
2461:01 D6 A9 13 20 74 24 AD 0F
2469:7B 24 8D 01 D6 A9 1F 20 F5
2471:74 24 60 8D 00 D6 20 49 C6
2479:24 60 FF 00 02 A9 30 8D 90
2481:A8 06 8D A9 06 AD 7D 24 F1
2489:38 E9 0A 90 06 EE A8 06 F5
2491:4C 89 24 69 0A 38 E9 01 83
2499:90 06 EE A9 06 4C 96 24 D6
24A1:60 A9 25 85 FF 60 00 00 03

```

Human Rat Race

See instructions in article on page 46
before typing in.

```

C000:A9 EA 8D 28 03 A5 A2 85 BE
C008:8C A9 00 AA 9D 3C 03 E8 B1
C010:E0 C0 D0 F8 A9 02 8D E8 35
C018:03 A9 06 8D E9 03 A9 75 43
C020:8D 71 03 A9 7B 8D 72 03 B9
C028:4C C0 C5 20 E4 FF C9 85 FA
C030:D0 03 4C 29 C9 20 52 C3 2E
C038:20 90 C4 20 4C C4 AD 61 BA
C040:03 C9 00 D0 10 20 E2 C9 53
C048:20 5D CA AD 73 03 C9 00 A0
C050:F0 03 4C F3 CA 20 3B CA E5
C058:4C 94 C8 A9 00 8D 3C 03 8A
C060:A9 04 8D 3D 03 AD 3C 03 87
C068:8D 74 C0 AD 3D 03 8D 75 47
C070:C0 A9 A0 8D FF FF AD 74 79
C078:C0 8D 88 C0 18 AD 75 C0 FD
C080:69 4D 8D 89 C0 A9 05 8D 7A
C088:FF FF 18 AD 3C 03 69 01 A9
C090:8D 3C 03 AD 3D 03 69 00 EB
C098:8D 3D 03 38 AD 3C 03 E9 62
C0A0:E8 8D 3E 03 AD 3D 03 E9 44
C0A8:07 0D 3E 03 D0 B7 60 A9 B8
C0B0:00 8D 3C 03 8D 3D 03 AC 61
C0B8:4D 03 C0 00 F0 16 18 AD F0
C0C0:3C 03 69 28 8D 3C 03 AD E1
C0C8:3D 03 69 00 8D 3D 03 88 C6
C0D0:C0 00 D0 EA 18 AD 3C 03 6E
C0D8:6D 3F 03 8D 3C 03 8D 0E 31
C0E0:C1 8D 20 C1 AD 3D 03 69 98
C0E8:04 8D 3D 03 8D 0F C1 8D 61
C0F0:21 C1 AD 0F C1 69 D4 0E 05
C0F8:15 C1 8D 19 C1 AD 0E C1 5B
C100:8D 14 C1 8D 18 C1 AD 4F D2
C108:03 C9 00 F0 0A 8D FF FF 15
C110:AD 54 03 8D FF FF 60 AD 27
C118:FF FF 29 0F 8D 55 03 AD 27
C120:FF FF 60 20 9E E0 38 A5 40
C128:62 E9 7F 4A 4A 4A 4A 46
C130:C9 04 90 03 4C 23 C1 60 AE
C138:C9 00 F0 12 C9 01 F0 18 2C
C140:C9 02 F0 1E AE 3F 03 CA 63
C148:8E 3F 03 4C 69 C1 AC 40 F3
C150:03 88 8C 40 03 4C 69 C1 EA
C158:AE 3F 03 E8 8E 3F 03 4C B5
C160:69 C1 AC 40 03 C8 8C 40 37
C168:03 60 C9 00 F0 12 C9 01 23
C170:F0 18 C9 02 F0 1E AE 3F 68
C178:03 E8 8E 3F 03 4C 9B C1 BF
C180:AC 40 03 C8 8C 40 03 4C 0F
C188:9B C1 AE 3F 03 CA 8E 3F B3
C190:03 4C 9B C1 AC 40 03 88 2D
C198:8C 40 03 60 20 BF C1 C9 26
C1A0:27 90 03 4C 9C C1 C9 04 84
C1A8:90 F2 8D 3F 03 20 BF C1 B0
C1B0:C9 18 90 03 4C AD C1 C9 C7
C1B8:02 90 F2 8D 40 03 60 20 87
C1C0:9E E0 38 A5 62 E9 7F 4A 31
C1C8:4A 0A 18 69 01 60 AD 3F B1
C1D0:03 C9 03 90 12 C9 26 B0 66
C1D8:0E AD 40 03 C9 01 90 07 81
C1E0:C9 18 03 4C A9 00 60 A9 4D
C1E8:01 60 A9 0B 8D 11 D0 20 5D
C1F0:5B C0 A9 20 8D 2B 04 AD 58
C1F8:74 03 8D 54 03 A9 03 8D C0
C200:41 03 A9 01 8D 42 03 A9 51
C208:00 8D 52 03 8D 53 03 AD D8
C210:41 03 8D 3F 03 AD 42 03 F2
C218:8D 40 03 A9 00 8D 4F 03 47
C220:20 AF C0 C9 20 D0 36 20 27
C228:23 C1 8D 51 03 20 38 C1 41
C230:20 38 C1 20 CE C1 C9 01 20
C238:F0 23 20 AF C0 C9 20 F0 5C
C240:1C A9 20 8D 4F 03 20 AF 91
C248:C0 AD 51 03 20 6A C1 20 42
C250:AF C0 AE 52 03 E8 8E 52 04
C258:03 E0 D7 F0 25 AC 42 03 05
C260:AE 41 03 E8 E8 E0 27 F0 86
C268:09 8E 41 03 8C 42 03 4C 2E
C270:0F C2 A2 03 C8 C8 C0 19 B6
C278:F0 03 4C 69 C2 A0 01 4C 3E
C280:69 C2 AD 60 03 C9 01 F0 59
C288:13 AD 63 03 8D 54 03 A9 0D
C290:3E 8D CB C2 A9 3C 8D 7F 8F
C298:C2 4C AB C2 A9 05 8D 54 05
C2A0:03 A9 BE 8D CB C2 A9 BC 3C
C2A8:8D F7 C2 20 9C C1 AC 40 D2
C2B0:03 8C 5D 03 8C D5 03 A2 1B
C2B8:02 8E 3F 03 8E 5B 03 8E 71
C2C0:C1 03 20 AF C0 A2 01 8E 08
C2C8:3F 03 A9 BE 8D 4F 03 20 9F
C2D0:AF C0 20 9C C1 AC 40 03 70
C2D8:8C 5C 03 8C D4 03 A2 26 03
C2E0:8E 3F 03 8E 5A 03 A9 20 19
C2E8:8E C0 03 8D 4F 03 20 AF 95
C2F0:C0 A2 27 8E 3F 03 A9 BC 63
C2F8:8D 4F 03 20 AF C0 A9 01 50
C300:8D 2B D8 A9 1B 8D 11 D0 D0
C308:AD 74 03 8D 2B D8 60 AE E8
C310:57 03 BD C0 03 8D 3F 03 97
C318:BD D4 03 8D 40 03 AD 50 A6
C320:03 20 38 C1 A9 00 8D 4F 0C
C328:03 20 AF C0 8D 3C 03 AD 4C
C330:55 03 C9 05 F0 11 AD 3C 10
C338:03 C9 20 F0 07 C9 A0 F0 58
C340:03 4C 27 C3 A9 00 60 A9 39
C348:01 60 7E FE 7D FD 77 F7 F2
C350:7B FB A2 00 BD 00 DC 8D 1E
C358:58 03 A0 04 BD 4A C3 CD 8D
C360:58 03 D0 02 A0 00 BD 4C DB
C368:C3 CD 58 03 D0 02 A0 02 52

```


C370:BD 4E C3 CD 58 03 D0 02 32	C618:A9 11 20 DB C4 A9 05 20 77	C8C0:02 D0 DF 4C E4 C8 52 45 7C
C378:A0 01 BD 50 C3 CD 58 03 56	C620:9F C6 A9 14 20 DB C4 A9 49	C8C8:44 20 57 49 4E 53 21 1D 23
C380:D0 02 A0 03 8E 57 03 C0 CD	C628:07 20 9F C6 A9 0F 8D 5F A5	C8D0:42 4C 55 45 20 57 49 4E D4
C388:04 D0 03 4C 9E C3 8C 50 D8	C630:03 20 B7 C6 20 D7 C6 20 B8	C8D8:53 21 49 54 27 53 20 41 D2
C390:03 20 0F C3 C9 01 F0 06 F9	C638:F9 C6 20 20 C7 20 E4 FF 03	C8E0:20 54 49 45 AE 62 03 E0 FA
C398:20 B5 C3 20 69 C9 20 4C 17	C640:C9 85 F0 12 C9 86 F0 14 B1	C8E8:00 D0 03 4C 2B C0 20 83 F3
C3A0:C4 AE 57 03 E8 E0 02 F0 11	C648:C9 87 F0 16 C9 88 D0 ED 1C	C8F0:CB AE 62 03 E0 02 F0 09 8A
C3A8:03 4C 54 C3 60 E2 E1 62 40	C650:4C A0 C7 4C 3D C6 20 B7 E6	C8F8:E0 04 F0 0A A0 14 4C 08 B0
C3B0:61 62 61 E2 E1 AE 57 03 57	C658:C6 4C 3D C6 20 D7 C6 4C AA	C900:C9 A0 00 4C 08 C9 A0 0A 18
C3B8:BD C0 03 8D 3F 03 BD D4 DE	C660:3D C6 20 F9 C6 4C 3D C6 8A	C908:A9 13 20 D2 FF A9 10 85 B2
C3C0:03 8D 40 03 BD E8 03 8D 8A	C668:12 20 20 20 11 9D 9D 2B	C910:D3 A9 12 20 D2 FF A9 00 26
C3C8:54 03 8D 59 03 AE 50 03 F8	C670:9D 9D 92 A2 00 A0 00 B9 EC	C918:8D 86 02 A2 00 B9 C6 8B BB
C3D0:BD AD C3 8D 4F 03 20 AF 6A	C678:68 C6 20 D2 FF C8 C0 08 CC	C920:20 D2 FF C8 E8 E0 0A D0 B4
C3D8:C0 AD 50 03 20 38 C1 AE 7A	C680:D0 F5 E8 E0 04 D0 EE 60 C0	C928:F4 AD 6C 03 20 D2 FF 20 CB
C3E0:57 03 AD 3F 03 9D C0 03 91	C688:05 D5 C3 C3 C9 11 9D 9D 2E	C930:1B CB A9 18 20 DB C4 AD A2
C3E8:AD 40 03 9D D4 03 4C 5D 3A	C690:9D 9D C2 46 30 C2 11 9D 5D	C938:63 03 8D 86 02 A2 00 A9 9C
C3F0:CB A9 00 8D 4F 03 20 AF 18	C698:9D 9D 9D CA C3 C3 CB 18 99	C940:0C 85 D3 BD 58 C9 20 D2 8E
C3F8:C0 AE 57 03 AD 55 03 9D 0E	C6A0:69 30 8D 94 C6 A9 07 85 5A	C948:FF E8 E0 11 D0 F5 20 E4 C6
C400:98 03 AE 50 03 BD B1 C3 A7	C6A8:D3 A2 00 BD 88 C6 20 D2 17	C950:FF C9 85 D0 F9 4C 00 C0 D5
C408:8D 4F 03 20 AF C0 20 3B 8A	C6B0:FF E8 E0 17 D0 F5 60 A9 CE	C958:50 52 45 53 53 20 46 31 5F
C410:C4 AD 50 03 20 6A C1 AE 7E	C6B8:0C 20 DB C4 AD 61 03 C9 DE	C960:20 46 4F 52 20 4D 45 4E B3
C418:57 03 BD 84 03 8D 54 03 08	C6C0:01 F0 09 20 8C C7 A9 01 06	C968:55 AD 61 03 C9 01 D0 01 63
C420:AD 64 03 8D 4F 03 20 AF 49	C6C8:8D 61 03 60 A9 17 20 8C 52	C970:60 AD 55 03 C9 07 F0 01 C7
C428:C0 AE 57 03 BD 98 03 9D CC	C6D0:C7 A9 00 8D 61 03 60 A9 07	C978:60 AD 6C 03 20 D2 FF AD 5F
C430:84 03 A9 01 8D 84 03 8D 14	C6D8:0F 20 DB C4 AD 60 03 C9 7C	C980:63 03 8D 86 02 AD 57 03 19
C438:85 03 60 A0 00 A2 00 E8 CE	C6E0:01 F0 0B A9 2E 20 8C C7 F9	C988:49 01 AA 18 BD 67 03 69 D2
C440:EC 83 03 D0 FA C8 CC 6B 8E	C6E8:A9 01 8D 60 03 60 A9 3D 6D	C990:01 9D 07 03 BD 69 03 69 C2
C448:03 D0 F2 60 AE 57 03 BD 82	C6F0:20 8C C7 A9 00 8D 60 03 3F	C998:00 9D 69 03 18 AD 65 03 36
C450:C0 03 8D 3F 03 BD D4 03 5C	C6F8:60 A9 12 20 DB C4 AC 5F 10	C9A0:E9 01 8D 65 03 AD 66 03 10
C458:8D 40 03 BD E8 03 8D 54 B7	C700:03 C8 C0 10 D0 02 A0 00 2C	C9A8:E9 00 8D 66 03 A9 13 20 4E
C460:03 A9 A0 8D 4F 03 20 AF 39	C708:A9 0B 85 D3 8C 5F 03 A9 AE	C9B0:D2 FF 18 8A 0A 0A 0A 0A EF
C468:C0 60 AD 56 03 C9 02 D0 99	C710:00 20 91 B3 20 DD BD 20 29	C9B8:0A 69 02 85 D3 BD 69 03 AF
C470:01 60 A2 02 8E 3C 03 20 92	C718:1E AB A2 4C 20 91 C7 60 F1	C9C0:BC 67 03 20 91 B3 20 DD 68
C478:9C C1 AE 3C 03 AD 3F 03 AA	C720:A9 15 20 DB C4 A9 56 20 25	C9C8:BD 20 1E AB A9 05 8D 86 C4
C480:9D C0 03 AD 40 03 9D D4 62	C728:8C C7 60 52 41 43 45 20 E2	C9D0:02 A9 20 20 D2 FF A9 20 DF
C488:03 E8 EC 56 03 D0 E5 60 58	C730:54 4F 20 54 48 45 20 4F ED	C9D8:20 D2 FF AD 63 03 8D 86 D4
C490:AD 56 03 C9 02 D0 01 60 39	C738:54 48 45 52 20 53 49 44 F6	C9E0:02 60 A5 A2 C9 3C B0 01 0E
C498:A2 02 8E 57 03 20 42 C8 21	C740:45 00 47 52 41 42 20 54 28	C9E8:60 A9 00 85 A2 AD 6C 03 17
C4A0:BD AC 03 8D 50 03 20 9E DA	C748:48 45 20 47 4F 4C 44 20 1A	C9F0:20 D2 FF AD 63 03 C9 01 DF
C4A8:E0 A5 62 C9 C8 90 06 20 A9	C750:20 20 20 20 20 20 20 DF	C9F8:D0 02 A9 05 8D 86 02 A9 2F
C4B0:23 C1 8D 50 03 20 0F C3 6D	C758:00 56 49 53 49 42 4C 45 0D	CA00:00 20 DB C4 A9 13 85 D3 DD
C4B8:C9 00 F0 03 4C AF C4 20 40	C760:20 4D 41 5A 45 20 20 00 0C	CA08:AC 6D 03 88 8C 6D 03 C0 19
C4C0:B5 C3 20 4C AC AE 57 03 71	C768:49 4E 56 49 53 49 42 4C 20	CA10:FF D0 06 A9 01 8D 73 03 5D
C4C8:AD 50 03 9D AC 03 20 42 6B	C770:45 20 4D 41 5A 45 00 20 70	CA18:60 A9 00 20 91 B3 20 DD C3
C4D0:C8 E8 EC 56 03 F0 03 4C 2A	C778:44 52 4F 4E 45 53 20 20 65	CA20:BD 20 1E AB A9 20 20 D2 FB
C4D8:9A C4 60 AA A9 13 20 D2 44	C780:00 53 54 41 52 54 20 47 EE	CA28:FF A9 18 20 DB C4 A9 13 85
C4E0:FF CA E0 FF F0 08 A9 11 45	C788:41 4D 45 00 AA A9 0C 85 4E	CA30:85 D3 A9 24 20 D2 FF 38 79
C4E8:20 D2 FF 4C E1 C4 60 93 72	C790:D3 BD 2B C7 C9 00 F0 07 92	CA38:AD 6E 03 E9 05 8D 6E 03 7D
C4F0:05 11 0D 07 A2 A2 BB BB 26	C798:20 D2 FF E8 4C 91 C7 60 14	CA40:AD 6F 03 E9 00 8D 6F 03 9F
C4F8:20 BB A2 A2 BB 20 20 BB 5A	C7A0:A9 12 8D 6C 03 A9 20 8D 8E	CA48:AC 6E 03 20 91 B3 20 DD AB
C500:20 BB BB 20 BB A2 A2 BB 6D	C7A8:64 03 A9 05 8D 20 D0 AD EC	CA50:BD 18 69 01 20 1E AB A9 82
C508:A2 A2 BB BB 20 BB 0D 07 D1	C7B0:61 03 C9 01 F0 12 20 27 32	CA58:20 20 D2 FF 60 A2 00 8E 7C
C510:20 A1 20 12 BC 92 A2 A1 50	C7B8:C8 A9 A0 8D 64 03 A9 C8 4F	CA60:57 03 8A A9 01 AA BD C0 37
C518:12 BC 92 BB 20 20 20 12 BD	C7C0:8D 83 03 A9 07 4C CF C7 C3	CA68:03 DD 5A 03 D0 66 BD D4 E2
C520:BC 92 A2 A1 A1 20 A1 A1 8F	C7C8:A9 00 8D 83 03 A9 01 8D 65	CA70:03 DD 5C 03 D0 5E A9 18 26
C528:A1 A1 12 BC 92 A2 A1 12 6F	C7D0:63 03 8D 21 D0 8D 74 03 3F	CA78:20 DB C4 AE 57 03 E0 01 22
C530:AC 92 BB A1 0D 07 20 A1 AE	C7D8:A2 00 9D 8A 03 E8 E0 12 45	CA80:F0 05 A9 03 4C 89 CA A9 FC
C538:20 A1 20 A1 12 BC 92 A2 A5	C7E0:D0 F8 AE 5F 03 E8 E8 8E FE	CA88:1F 85 D3 A9 24 20 D2 FF 6B
C540:BB 20 20 A1 20 A1 12 BC 38	C7E8:56 03 AD 60 03 C9 01 F0 52	CA90:BC 67 03 BD 69 03 20 91 C3
C548:92 A2 A1 A1 BE A1 A1 20 F3	C7F0:12 A9 05 8D 21 D0 A9 20 2D	CA98:B3 20 CA BB AD 6F 03 AC 03
C550:A1 A1 BC A1 0D 09 A2 A2 3B	C7F8:8D 64 03 A9 92 8D 6C 03 0A	CAA0:6E 03 20 91 B3 A9 57 A0 DE
C558:BB A2 A2 BB A2 A2 BB 20 B1	C800:4C 08 C8 A9 05 8D 63 03 95	CAA8:00 20 28 BA AE 57 03 BD 8D
C560:20 A2 A2 BB A2 A2 BB A2 6E	C808:20 EA C1 20 6A C4 AD 5F BF	CAB0:71 03 A0 03 20 67 B8 20 34
C568:A2 BB A2 A2 BB 0D 09 12 E8	C810:03 0A 8D 3C 03 38 A9 0F 76	CAB8:CA BB 20 DD CA 20 DD BD D4
C570:BC 92 A2 A1 12 BC 92 A2 B8	C818:ED 3C 03 C9 10 90 02 A9 1D	CAC0:18 69 01 20 1E AB AE 57 33
C578:A1 A0 A1 A0 A0 A0 12 BC A3	C820:01 8D 6B 03 4C 2B C0 A9 6D	CAC8:03 A9 00 9D 67 03 9D 69 10
C580:92 A2 A1 12 BC 92 A2 A1 6A	C828:3D 8D 6D 03 A9 F9 8D 6E 58	CAD0:03 20 AD C9 AE 57 03 E8 04
C588:A1 20 20 12 BC 92 BB 0D C6	C830:03 A9 01 8D 6F 03 20 E9 58	CAD8:E0 02 D0 83 60 AE 57 03 21
C590:09 A1 BF 20 A1 20 A1 20 F3	C838:C9 20 AD C9 A9 05 8D 86 0C	CAE0:BD 71 03 8D EB CA A2 00 BA
C598:A1 20 20 20 A1 BF 20 A1 F0	C840:02 60 A0 00 8C 51 03 BD 6C	CAE8:B5 57 9D 75 03 E8 E0 06 BD
C5A0:20 A1 12 BC 92 A2 BB 12 5B	C848:C0 03 D9 C0 03 D0 3C BD D3	CAF0:D0 F6 60 A9 7B A0 03 20 D7
C5A8:BC 92 A2 BB 0D 0D 98 11 26	C850:D4 03 D9 D4 03 D0 34 B9 13	CAF8:A2 BB A9 75 A0 03 20 5B 08
C5B0:20 43 4F 4D 50 55 54 45 A1	C858:5A 03 99 C0 03 B9 5C 03 D1	CB00:BC C9 00 F0 0C C9 01 F0 F1
C5B8:21 20 31 39 38 38 20 00 79	C860:99 D4 03 98 49 01 A8 A9 27	CB08:0D A9 04 8D 62 03 4C E4 86
C5C0:A9 00 8D 20 D0 8D 21 D0 A4	C868:00 99 67 03 99 69 03 8D 83	CB10:C8 A9 06 4C 0B CB A9 02 D8
C5C8:A2 FF E8 BD EF C4 20 D2 44	C870:04 D4 A9 0F 8D 18 D4 A9 7F	CB18:4C 0B CB A2 01 A0 00 AD 74
C5D0:FF C9 00 F0 0D C9 0D 00 58	C878:09 8D 05 D4 A9 0F 8D 06 8A	CB20:60 03 C9 01 F0 36 C8 E8 CC
C5D8:F1 E8 BD EF C4 85 D3 4C 7E	C880:D4 A9 28 8D 01 D4 A9 81 F4	CB28:8E 3F 03 8C 40 03 A9 00 61
C5E0:CA C5 A9 03 20 DB C4 A9 4C	C888:8D D4 D4 AC 51 03 C8 C0 30	CB30:8D 4F 03 20 AF C0 C9 20 F8
C5E8:06 8D 86 02 A9 02 85 D3 FF	C890:02 D0 B1 60 AD 61 03 C9 56	CB38:D0 12 AD 55 03 C9 05 F0 02
C5F0:20 73 C6 A9 03 20 DB C4 F1	C898:01 F0 03 4C 2B C0 A2 00 AD	CB40:0B 8D 54 03 A9 A0 8D 4F B5
C5F8:A9 02 8D 86 02 A9 22 85 74	C8A0:A0 01 BD C0 03 D9 5A 03 BD	CB48:03 20 AF C0 AE 3F 03 AC 90
C600:D3 20 73 C6 A9 0B 20 DB EF	C8A8:D0 13 BD D4 03 D9 5C 03 A7	CB50:40 03 E0 26 D0 D1 A2 01 5B
C608:C4 A9 01 20 9F C6 A9 0E FD	C8B0:D0 0B 18 8A 69 01 0A 6D E9	CB58:C0 17 D0 CA 60 A2 00 AD 18
C610:20 DB C4 A9 03 20 9F C6 76	C8B8:62 03 8D 62 03 E8 88 E0 C1	CB60:3F 03 DD C0 03 D0 13 AD 4F


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CB68:40 03 DD D4 03 D0 0B EC 48
CB70:57 03 F0 06 BD 84 03 4C 45
CB78:FF C3 E8 EC 56 03 D0 DF 2D
CB80:4C F1 C3 A2 00 8E 51 03 3D
CB88:A9 00 8D 04 D4 A9 1E 8D FD
CB90:01 D4 A9 0F 8D 18 D4 A9 24
CB98:09 8D 05 D4 A9 0F 8D 06 B3
CBA0:D4 A9 11 8D 04 D4 A9 64 30
CBA8:8D 6B 03 A9 00 8D 83 03 1D
CBB0:20 3B C4 AE 51 03 E8 E0 F3
CBB8:04 D0 CA 60 00 00 00 00 E5

```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Power BASIC: Color Lister

Article on page 61.

Program 1: Color Lister—64 Version

```

HE 10 REM COPYRIGHT 1988 COMPU
TEI PUBLICATIONS, INC. -
ALL RIGHTS RESERVED
RH 20 PRINT"[CLR]{3 SPACES}COP
YRIGHT 1988 COMPUTE! PUB
., INC."
RD 30 PRINTTAB(10)"ALL RIGHTS
{SPACE}RESERVED"
BD 40 FORI=828TO916:READA:POKE
I,A:X=X+A:NEXT
JH 50 IFX<>11017THENPRINT"
{DOWN}ERROR IN DATA STAT
EMENTS.":STOP
RF 60 DATA 169,75,141,6,3,169,
3,141,7,3
XP 70 DATA 169,0,133,251,96,8,
133,252,132,253
KR 80 DATA 134,254,173,141,2,2
08,251,165,251,208
BS 90 DATA 12,165,252,201,143,
208,42,169,1,133
CK 100 DATA 251,208,36,165,252
,201,49,144,26,201
FB 110 DATA 57,144,14,201,65,1
44,18,201,73,176
KM 120 DATA 14,41,15,105,7,208
,5,56,41,15
SG 130 DATA 233,1,141,134,2,16
9,0,133,251,166
HS 140 DATA 254,164,253,165,25
2,40,76,26,167

```

Program 2: Color Lister—128 Version

```

HE 10 REM COPYRIGHT 1988 COMPU
TEI PUBLICATIONS, INC. -
ALL RIGHTS RESERVED
AH 20 BANK15:PRINT"[CLR]
{3 SPACES}COPYRIGHT 1988
COMPUTE! PUB., INC."
RD 30 PRINTTAB(10)"ALL RIGHTS
{SPACE}RESERVED"
EC 40 FORI=2816TO2902:READA:PO
KEI,A:X=X+A:NEXT
QQ 50 IFX<>11087THENPRINT"
{DOWN}ERROR IN DATA STAT
EMENTS.":STOP
JB 60 DATA 169,15,141,6,3,169,

```

```

11,141,7,3
XP 70 DATA 169,0,133,251,96,8,
133,252,132,253
EP 80 DATA 134,254,165,211,208
,252,165,251,208,12
FS 90 DATA 165,252,201,143,208
,41,169,1,133,251
CQ 100 DATA 208,35,165,252,201
,49,144,25,201,57
JE 110 DATA 144,14,201,65,144,
17,201,73,176,13
AR 120 DATA 41,15,105,7,208,5,
56,41,15,233
AM 130 DATA 1,133,241,169,0,13
3,251,166,254,164
DJ 140 DATA 253,165,252,40,76,
81,81

```

Program 3: Color Lister—Plus/4 And 16 Version

```

HE 10 REM COPYRIGHT 1988 COMPU
TEI PUBLICATIONS, INC. -
ALL RIGHTS RESERVED
RH 20 PRINT"[CLR]{3 SPACES}COP
YRIGHT 1988 COMPUTE! PUB
., INC."
RD 30 PRINTTAB(10)"ALL RIGHTS
{SPACE}RESERVED"
PH 40 FORI=819TO911:READA:POKE
I,A:X=X+A:NEXT
PH 50 IFX<>10216THENPRINT"
{DOWN}ERROR IN DATA STAT
EMENTS.":STOP
SF 60 DATA 169,66,141,6,3,169,
3,141,7,3
JP 70 DATA 169,0,133,159,96,8,
133,160,132,161
DE 80 DATA 134,162,173,67,5,20
8,251,165,159,208
EA 90 DATA 12,165,160,201,143,
208,46,169,1,133
AK 100 DATA 159,208,40,165,160
,201,49,144,30,201
SJ 110 DATA 57,144,14,201,65,1
44,22,201,73,176
RQ 120 DATA 18,41,15,105,7,208
,5,56,41,15
AC 130 DATA 233,1,170,189,19,1
,141,59,5,169
FF 140 DATA 0,133,159,166,162,
164,161,165,160,40
CG 150 DATA 76,110,139

```

Dumpmaker

Article on page 65.

```

HE 10 REM COPYRIGHT 1988 COMPU
TEI PUBLICATIONS, INC. -
ALL RIGHTS RESERVED
AQ 20 PRINT"[CLR]{3 SPACES}COP
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., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
{SPACE}RESERVED"
GX 40 PRINTTAB(7)"[2 DOWN]C16/
+4 SCREEN DUMP CREATOR":
GRAPHICCLR:DIMM(47)
GQ 50 D=8:REM FOR TAPE, D=1
JJ 60 FORI=1TO583:READA:X=X+A:
NEXT:IFX<>61535THENPRINT"
DATA STATEMENT ERROR":S
TOP
QD 70 RESTORE:FORJ=1TO47:READM
(J):NEXT
DH 80 PRINT"[DOWN]IS YOUR PRIN
TER A COMMODORE 1525":PR
INT"COMPATIBLE (Y/N)":
CF 90 INPUTT$:IFT$<>"Y"ANDT$<>

```

```

"N"THENPRINT:GOTO80
BG 100 IFT$="N"THEN120
XK 110 M(23)=1:M(26)=0:M(27)=1
:M(28)=8:M(32)=1:M(33)=
15:M(37)=0:M(42)=0:M(47
)=17
RS 120 PRINT"[DOWN]NOW WRITING
THE +4SCREEN DUMP FILE.
..."
KF 130 OPEN2,D,2,"0:+4SCREEN DU
MP,P,W":PRINT#2,CHR$(1)
+CHR$(16);
AJ 140 FORJ=1TO47:PRINT#2,CHR$(
M(J));:NEXT
XJ 150 READA:IFA>-1THENPRINT#2
,CHR$(A);:GOTO 150
DS 160 CLOSE2:PRINT"[DOWN]DONE
.":END
PE 170 DATA 17,16,26,0,222,32,
156,58,158,52,49,49,54,
58,162,0
XC 180 DATA 0,0,0,76,48,16,0,1
4,4,4,3,27,65,7,0,3
PH 190 DATA 27,65,12,0,2,27,75
,0,0,2,64,1,0,0,13
BP 200 DATA 120,169,66,133,43,
169,18,133,44,173,20,3,
141,153,16,173,21
JH 210 DATA 3,141,154,16,173,2
,3,141,113,16,173,3,3,1
41,114,16
SB 220 DATA 169,98,141,2,3,169
,16,141,3,3,169,0,141,1
55,16,88
DM 230 DATA 96,120,72,169,115,
141,20,3,169,16,141,21,
3,104,88,76
EJ 240 DATA 0,0,120,72,173,155
,16,208,29,173,67,5,201
,6,208,22
QG 250 DATA 238,155,16,88,165,
253,72,165,254,72,32,16
9,16,104,133,254
FF 260 DATA 104,133,253,206,15
5,16,104,76,14,206,0,23
4,234,234,234,234
FH 270 DATA 234,234,234,234,23
4,234,234,234,169,0,141
,159,16,173,24,16
CX 280 DATA 174,25,16,172,26,1
6,32,186,255,169,0,32,1
89,255,32,192
QK 290 DATA 255,174,24,16,32,2
01,255,32,183,255,41,12
8,240,3,76,128
AB 300 DATA 17,173,27,16,162,2
8,160,16,32,25,18,174,4
7,16,240,8
AD 310 DATA 169,32,32,210,255,
202,208,248,173,37,16,1
62,38,160,16,32
MX 320 DATA 25,18,173,42,16,16
2,43,160,16,32,25,18,16
9,0,141,156
HF 330 DATA 16,141,157,16,173,
159,16,141,158,16,169,0
,141,164,16,141
JC 340 DATA 161,16,32,46,18,78
,162,16,46,161,16,238,1
58,16,238,164
DG 350 DATA 16,174,164,16,224,
7,208,234,24,46,161,16,
174,23,16,240
EC 360 DATA 19,78,161,16,169,0
,162,6,78,161,16,42,202
,16,249,9
JH 370 DATA 128,141,161,16,173
,161,16,32,210,255,238,
156,16,208,3,238
CA 380 DATA 157,16,174,156,16,
224,64,208,171,174,157,
16,224,1,208,164

```


CX 390 DATA 169,13,32,210,255,
173,159,16,24,105,7,141
159,16,201,200
JX 400 DATA 176,3,76,220,16,17
3,32,16,162,33,160,16,3
2,25,18,173
JD 410 DATA 24,16,32,195,255,3
2,204,255,96,169,163,13
3,253,169,16,133
FG 420 DATA 254,169,0,141,163,
16,173,158,16,201,200,1
76,16,173,157,16
HS 430 DATA 201,1,144,10,208,7
173,156,16,201,64,144,
1,96,173,158
EH 440 DATA 16,74,74,74,141,16
5,16,173,157,16,74,173,
156,16,106,74
DB 450 DATA 74,141,166,16,173,
158,16,41,7,141,167,16,
173,156,16,73
BJ 460 DATA 255,41,7,141,168,1
6,169,1,174,168,16,240,
4,10,202,208
AC 470 DATA 252,141,168,16,169
0,133,254,173,166,16,1
0,38,254,10,38
AR 480 DATA 254,10,38,254,24,1
09,167,16,133,253,165,2
54,105,32,133,254
KF 490 DATA 174,165,16,240,16,
24,169,64,101,253,133,2
53,169,1,101,254
CX 500 DATA 133,254,202,208,24
0,160,0,96,201,0,240,16
134,253,132,254
KM 510 DATA 160,0,170,177,253,
32,210,255,200,202,208,
247,96,169,0,141
DB 520 DATA 162,16,32,138,17,1
77,253,45,168,16,240,3,
238,162,16,96
HQ 530 DATA 0,0,0,0,0,0,-1

0909:0D 0D 0D 0D 0D 0D 0D 1B
0911:0D 0D 20 20 20 20 20 D4
0919:20 20 20 20 20 20 20 2B
0921:20 20 0D 0D 0D 0D 0D 81
0929:0D 20 20 C9 4E 53 45 52 07
0931:54 20 41 20 C7 45 4F 53 E4
0939:20 44 49 53 4B 20 41 4E 76
0941:44 20 50 52 45 53 53 20 EA
0949:D2 C5 D4 D5 D2 CE 0D 00 1A
0951:20 24 10 C9 0D D0 F9 60 1B
0959:A9 0F A2 08 A0 0F 20 BA 15
0961:FF A9 02 A2 CE A0 09 20 73
0969:BD FF 20 C0 FF B0 22 20 91
0971:D1 09 B0 1D A9 04 A2 08 41
0979:A0 04 20 BA FF A9 01 A2 D7
0981:D0 A0 09 20 BD FF 20 C0 36
0989:FF B0 06 20 D1 09 B0 01 9F
0991:60 20 03 0A A9 A4 A0 09 07
0999:20 81 10 20 51 09 68 68 08
09A1:4C 28 08 11 11 11 1C 12 0D
09A9:A8 49 53 4B 20 C5 52 52 9E
09B1:4F 52 21 92 1F 20 C8 49 A1
09B9:54 20 D2 C5 D4 D5 D2 CE 27
09C1:20 54 4F 20 D2 45 53 54 8B
09C9:41 52 54 0D 0D 49 30 23 15
09D1:A2 0F 20 C6 FF 20 24 10 42
09D9:8D 01 0A 20 24 10 8D 02 B4
09E1:0A 20 24 10 C9 0D D0 F9 A4
09E9:AD 01 0A C9 30 D0 0C AD 7B
09F1:02 0A C9 30 D0 05 20 36 D4
09F9:10 18 60 20 36 10 38 60 EA
0A01:00 00 A9 04 20 C3 FF A9 44
0A09:01 20 C3 FF A9 0F 20 C3 AB
0A11:FF 20 36 10 60 A9 13 A2 67
0A19:12 A0 00 20 B4 0F 60 AE B1
0A21:AB 13 AC AC 13 20 BA 12 D0
0A29:60 A9 01 A2 04 A0 07 20 F2
0A31:BA FF A9 00 20 BD FF 20 EF
0A39:C0 FF B0 1E A2 01 20 C9 C8
0A41:FF B0 17 A9 4F A0 0A 20 30
0A49:81 10 20 36 10 60 1B 41 03
0A51:1B 38 00 00 00 00 00 01
0A59:00 20 03 0A A9 6D A0 14
0A61:0A 20 81 10 20 51 09 68 74
0A69:68 4C 28 08 11 11 11 1C 55
0A71:12 D0 52 49 4E 54 45 52 42
0A79:20 C5 52 52 4F 52 21 92 17
0A81:1F 20 C8 49 54 20 D2 C5 69
0A89:D4 D5 D2 CE 20 54 4F 20 D5
0A91:D2 45 53 54 41 52 54 0D 19
0A99:00 A9 A1 A0 0A 4C 81 10 EA
0AA1:0D D3 54 41 4E 44 42 59 31
0AA9:2C 20 D0 52 49 4E 54 49 90
0AB1:4E 47 20 C4 49 52 45 43 70
0AB9:54 4F 52 59 2E 2E 2E 2E 60
0AC1:00 A2 01 20 C9 FF A2 17 4B
0AC9:20 5E 0B A9 ED A0 0A 20 A7
0AD1:81 10 A9 90 A0 13 20 B7 32
0AD9:10 20 78 10 A9 2D A2 50 A5
0AE1:20 D2 FF CA D0 FA 20 78 92
0AE9:10 4C 36 10 C4 49 52 45 16
0AF1:43 54 4F 52 59 20 4F 46 FB
0AF9:20 C4 49 53 4B 20 3A 20 1D
0B01:00 20 C2 0A A2 01 20 C9 3B
0B09:FF A2 20 20 5E 0B A9 2B 6B
0B11:A0 0B 20 81 10 20 78 10 58
0B19:20 78 10 AE AB 13 AC AC F9
0B21:13 A9 14 20 B4 0F 20 98 6A
0B29:0C 60 C2 4F 52 44 45 52 2B
0B31:20 4F 46 20 C4 49 53 4B 33
0B39:00 A2 01 20 C9 FF A2 23 D0
0B41:20 5E 0B A9 57 A0 0B 20 6E
0B49:81 10 AE B3 0F 20 43 11 C5
0B51:20 78 10 4C 78 10 D0 41 43
0B59:47 20 20 23 00 A9 20 20 A1
0B61:D2 FF CA D0 FA 60 A2 01 E6
0B69:8E B3 0F AE 00 13 AC 01 27
0B71:13 A9 14 20 B4 0F B0 27 6A
0B79:20 97 0B 4C 91 0B AE 00 C1
0B81:14 F0 12 AC 01 14 A9 14 AA
0B89:20 B4 0F B0 12 20 97 0B 15
0B91:EE B3 0F D0 E9 60 20 C2 CE
0B99:0A 20 3A 0B 4C 98 0C A2 34
0BA1:01 20 C9 FF A9 B9 A0 0B F9
0BA9:20 81 10 A9 B3 A0 0F 20 2B

0BB1:81 10 20 78 10 4C 91 0B F7
0BB9:C9 4C 4C 45 47 41 4C 20 9D
0BC1:D3 45 43 54 4F 52 20 D0 95
0BC9:41 47 45 20 23 00 A9 04 6D
0BD1:20 C3 FF A9 0F 20 C3 FF 04
0BD9:A2 01 20 C9 FF 20 63 0F 78
0BE1:A9 01 20 C3 FF 20 36 10 4A
0BE9:60 A9 19 A0 0C 20 81 10 BB
0BF1:20 24 10 C9 59 F0 1E C9 54
0BF9:D9 F0 1A C9 4E F0 04 C9 21
0C01:CE D0 ED A9 CE 20 D2 FF A9
0C09:A9 4F 20 D2 FF A9 4F A0 E0
0C11:0C 20 81 10 60 4C 28 08 F4
0C19:0D 11 11 1F C6 49 4E 49 51
0C21:53 48 45 44 C0 20 52 49 14
0C29:4E 54 49 4E 47 20 C4 49 19
0C31:52 45 43 54 4F 52 59 2E 16
0C39:0D 0D C1 4E 4F 54 48 45 D9
0C41:52 20 C4 49 52 45 43 54 3A
0C49:4F 52 59 3F 20 00 0D 0D E4
0C51:9E 20 20 D4 48 41 4E 4B 41
0C59:53 20 46 4F 52 20 D5 53 F2
0C61:49 4E 47 20 54 48 45 20 0B
0C69:C7 45 4F 53 20 C4 49 52 CE
0C71:45 43 54 4F 52 59 20 AE
0C79:20 20 20 20 20 20 20 20 91
0C81:20 20 20 20 20 20 20 20 99
0C89:20 20 20 20 20 20 20 20 A1
0C91:20 20 20 20 1F 0D 00 A9 9E
0C99:00 0D B1 0C 20 B2 0C AD 9D
0CA1:B1 0C 18 69 20 F0 06 8D 8D
0CA9:B1 0C 4C 9D 0C 4C 63 0F 68
0CB1:00 A9 14 85 FC AD B1 0C 1D
0CB9:85 FB 20 E7 0E 90 01 60 2B
0CC1:A0 15 B1 FB AA C8 B1 FB 3D
0CC9:A8 A9 15 20 B4 0F 08 A2 D9
0CD1:01 20 C9 FF A9 36 A0 0E 21
0CD9:20 81 10 AD B1 0C 18 69 9E
0CE1:05 A0 14 A2 10 20 A1 10 A5
0CE9:20 78 10 A9 4A A0 0E 20 AD
0CF1:81 10 A0 17 B1 FB AA C8 EF
0CF9:B1 FB 20 53 11 20 2E 10 98
0D01:20 6B 0F A0 02 B1 FB 20 E0
0D09:F1 0E 20 73 0F 20 78 10 D4
0D11:A9 51 A0 0E 20 81 10 A0 11
0D19:1E B1 FB 48 20 19 0E 38 6C
0D21:20 43 11 A9 A3 A0 0E 20 B4
0D29:81 10 20 6B 0F 68 AA 18 4A
0D31:20 43 11 20 2E 10 A9 9A EF
0D39:A0 0E 20 81 10 28 90 03 88
0D41:4C 16 0E A9 5F A0 0E 20 1D
0D49:81 10 A0 15 A9 4D 20 B7 08
0D51:10 20 78 10 A9 6D A0 0E DD
0D59:20 81 10 A0 19 B1 FB AA 22
0D61:C8 B1 FB 48 C8 B1 FB A8 FD
0D69:68 20 32 0F A9 8D A0 0E C9
0D71:20 81 10 A0 1C B1 FB 48 EF
0D79:C8 B1 FB A8 68 20 7B 0F 38
0D81:AD 45 15 C9 07 D0 0E A9 44
0D89:92 A0 0E 20 81 10 A0 15 7B
0D91:A9 75 20 B7 10 20 78 10 5F
0D99:20 27 0E B0 4C A9 7E A0 01
0DA1:0E 20 81 10 A2 15 86 FE 71
0DA9:A2 00 86 FD A0 48 20 DB 08
0DB1:0E A9 C3 A0 0E 20 81 10 C3
0DB9:A0 4A 20 DB 0E A9 C8 A0 C1
0DC1:0E 20 81 10 A0 4C 20 DB 69
0DC9:0E 20 78 10 AD 45 15 C9 79
0DD1:04 D0 05 AD 46 15 F0 11 17
0DD9:A9 A7 A0 0E 20 81 10 A0 6F
0DE1:15 A9 61 20 B7 10 20 78 D5
0DE9:10 A9 B5 A0 0E 20 81 10 3B
0DF1:A0 15 A9 A0 A2 3C 20 B9 E0
0DF9:10 C0 3C B0 0E 20 78 10 90
0E01:4C 78 10 20 78 10 A2 0D BB
0E09:20 5E 0B A0 15 A9 DC 20 61
0E11:B7 10 20 78 10 4C 78 10 4E
0E19:48 4A 4A AA 68 29 03 D0 9E
0E21:02 8A 60 E8 8A 60 AD 45 F1
0E29:15 C9 07 F0 06 C9 08 F0 8A
0E31:02 18 60 38 60 20 20 C7
0E39:20 20 20 CE 41 4D 45 20 BD
0E41:3A 20 00 20 C6 49 4C 45 48
0E49:20 D4 59 50 45 20 3A 00 F9
0E51:20 20 20 20 20 20 D3 49 FD

Directory Printer

See instruction in article on page 59
before typing in.

0801:20 08 A0 00 0E 32 30 38 8D
0809:38 3A 8F 20 44 49 52 45 E8
0811:43 54 4F 52 59 20 50 52 25
0819:49 4E 54 45 52 20 00 26 79
0821:08 AA 00 00 00 00 00 20 08
0829:8D 08 20 51 09 20 59 09 9F
0831:20 16 0A 20 20 0A B0 17 BB
0839:20 2A 0A 20 9A 0A 20 67 CB
0841:0B 20 02 0B 20 CF 0B 4C 72
0849:EA 0B A2 01 20 C9 FF 20 3E
0851:03 0A A9 60 A0 08 20 81 87
0859:10 20 51 09 4C 28 08 11 58
0861:11 11 1C 12 CE 4F 4E 2D 60
0869:C7 45 4F 53 20 C4 49 53 C7
0871:4B 21 92 1F 20 C8 49 54 BE
0879:20 D2 C5 D4 D5 D2 CE 20 0C
0881:54 4F 20 D2 45 53 54 41 22
0889:52 54 0D 00 A9 00 8D 20 02
0891:D0 A9 0C 8D 21 D0 A9 9F 0E
0899:A0 08 20 81 10 60 93 1F 60
08A1:11 0E 08 11 20 20 20 20 B1
08A9:20 20 20 20 C7 45 4F D1
08B1:53 20 C4 49 52 45 43 54 23
08B9:4F 52 59 20 D0 52 49 4E E3
08C1:54 45 52 0D 0D 20 20 20 B1
08C9:C3 4F 50 59 52 49 47 48 BD
08D1:54 20 31 39 38 38 C3 74
08D9:CF CD 0D D5 D4 C5 21 20 DC
08E1:D0 55 42 2E 2C 20 C9 4E 9E
08E9:43 2E 0D 20 20 20 20 20 AC
08F1:20 20 20 20 C1 4C 4C 0D
08F9:20 D2 49 47 48 54 53 20 C6
0901:D2 45 53 45 52 56 45 44 47


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0E59:5A 45 20 3A 20 00 C6 49 73
0E61:4C 45 20 C3 4C 41 53 53 96
0E69:20 3A 20 00 20 20 CD 4F 94
0E71:44 49 46 49 45 44 20 3A 15
0E79:20 CF 4E 20 00 20 CD 45 C6
0E81:4D 2E 20 C9 4E 46 4F 20 BA
0E89:3A 20 24 00 20 C1 54 20 20
0E91:00 20 D5 53 49 4E 47 20 D7
0E99:00 C2 4C 4F 43 4B 53 29 FB
0EA1:0D 00 CB 20 20 00 20 20 21
0EA9:20 20 C1 55 54 48 4F 52 20
0EB1:20 3A 20 00 20 20 C3 4F C8
0EB9:4D 4D 45 4E 54 53 20 3A C7
0EC1:20 00 54 4F 20 24 00 20 1F
0EC9:2D 2A 2D 20 20 C5 4E 54 B7
0ED1:52 59 20 C1 54 20 3A 20 45
0ED9:24 00 B1 FD AA 88 B1 FD F6
0EE1:20 99 10 4C 2E 10 A0 02 30
0EE9:B1 FB D0 02 38 60 18 60 EB
0EF1:29 07 A2 02 DD 0A 0F F0 FE
0EF9:07 E8 E8 E8 E8 0F F0 F4 D8
0F01:BD 0C 0F A8 CA BD 0C 0F E1
0F09:4C 81 10 00 2E 0F 01 1E 7D
0F11:0F 02 22 0F 03 26 0F 04 3F
0F19:2A 0F 63 2E 0F D3 C5 D1 84
0F21:00 D0 D2 C7 0F D5 D3 D2 1C
0F29:00 D2 C5 CC 00 3F 3F 3F 3C
0F31:00 8E 51 0F 8C 52 0F AA 84
0F39:38 20 FB 10 20 53 0F AE 17
0F41:52 0F 38 20 FB 10 20 53 09
0F49:0F AE 51 0F 38 4C FB 10 B0
0F51:00 00 48 A9 2F 20 D2 FF B2
0F59:68 60 48 A9 3A 20 D2 FF 5F
0F61:68 60 48 A9 0C 20 D2 FF FE
0F69:68 60 48 A9 28 D2 FF DE
0F71:68 60 48 A9 29 D2 FF EE
0F79:68 60 A2 00 8E B2 0F C9 5F
0F81:0C 90 0A CE B2 0F 38 E9 24
0F89:0C D0 02 A9 0C AA 38 20 58
0F91:FB 10 20 5B 0F 98 AA 38 D3
0F99:20 FB 10 20 2E 10 2C B2 87
0FA1:0F 30 04 A9 41 D0 02 A9 69
0FA9:50 20 D2 FF A9 4D 4C D2 40
0FB1:FF 00 00 8D C8 0F 18 20 7B
0FB9:D3 0F 90 01 60 A2 04 20 5D
0FC1:C6 FF 20 24 10 8D 00 10 50
0FC9:EE C7 0F D0 F5 20 36 10 EC
0FD1:18 60 8E 22 10 8C 23 10 11
0FD9:18 20 BA 12 90 01 60 A2 70
0FE1:0F 20 C9 FF A9 1A A0 10 CF
0FE9:20 81 10 A2 04 20 2E 10 B1
0FF1:18 20 FB 10 A2 00 20 2E 28
0FF9:10 18 20 FB 10 AE 22 10 79
1001:20 2E 10 18 20 FB 10 AE FF
1009:23 10 20 2E 10 18 20 FB C2
1011:10 20 78 10 20 36 10 18 63
1019:60 55 31 3A 00 55 32 3A 7C
1021:00 12 00 8A 48 20 E4 FF FA
1029:A8 68 AA 98 60 48 A9 20 2E
1031:20 D2 FF 68 60 48 8A 48 1E
1039:20 CC FF A2 FF CA D0 FD 91
1041:68 AA 68 60 48 98 48 8A 13
1049:48 48 29 0F AA BD 68 10 E2
1051:A8 68 4A 4A 4A 4A BD 5C
1059:68 10 20 D2 FF 98 20 D2 58
1061:FF 68 AA 68 68 60 30 4F
1069:31 32 33 34 35 36 37 38 81
1071:39 C1 C2 C3 C4 C5 C6 48 46
1079:A9 0D 20 D2 FF 68 60 60 A5
1081:8D 8C 10 8C 8D 10 8A 48 60
1089:A0 00 B9 00 F0 F0 06 20 A8
1091:D2 FF C8 D0 F5 68 AA 60 48
1099:20 45 10 A2 20 45 10 60 5E
10A1:20 B9 10 8E B6 10 A9 20 94
10A9:4C B0 10 20 D2 FF C8 CC 15
10B1:B6 10 90 F7 60 00 A2 FF 0B
10B9:8D C7 10 8C 80 10 8E E2 E3
10C1:10 8A 48 A0 00 B9 00 F0 77
10C9:C9 20 90 12 C9 80 B0 0E C9
10D1:C8 E2 10 B0 09 20 E3 10 BE
10D9:20 D2 FF C8 D0 E7 68 AA EC
10E1:60 00 C9 40 90 13 C9 60 34
10E9:B0 05 09 80 4C FA 10 C9 05
10F1:60 90 06 C9 7B B0 02 29 8F
10F9:DF 60 48 8A 48 90 08 A2 0B

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1101:00 8E 37 11 4C 0D 11 A2 1A
1109:30 8E 37 11 A2 00 8E 42 53
1111:11 C9 10 90 12 48 F8 AD 8A
1119:42 11 18 69 06 8D 42 11 36
1121:68 38 E9 10 D8 D0 EA F8 9C
1129:68 18 69 00 6D 42 11 90 D9
1131:03 EE 37 11 48 A9 00 20 91
1139:D2 FF 68 D8 AA 68 4C 45 34
1141:10 00 48 8A 48 98 48 A9 FB
1149:00 20 CD BD 68 A8 68 AA 6A
1151:68 60 E0 01 F0 4A E0 00 5E
1159:D0 21 C9 00 D0 01 60 A2 53
1161:02 DD 81 11 F0 07 E8 9B
1169:E8 E0 1B 90 F4 20 2E 10 39
1171:BD 83 11 A8 CA BD 83 11 65
1179:4C 81 10 A9 A8 A0 12 4C F6
1181:81 10 01 CF 11 02 DD 11 E2
1189:03 EE 11 04 F8 11 05 04 65
1191:12 06 2F 12 09 13 12 0A 08
1199:22 12 0C 41 12 63 8F 12 36
11A1:A2 02 DD BB 11 F0 07 E8 50
11A9:E8 E8 E0 F0 F0 F4 20 2E 4E
11B1:10 BD BD 11 A8 CA BD BD BD
11B9:11 4C 81 10 04 52 12 06 3C
11C1:61 12 07 74 12 08 85 12 0F
11C9:0C 52 12 63 9B 12 C2 41 EA
11D1:53 49 43 20 D0 52 4F 47 10
11D9:52 41 4D 00 C1 53 45 45 66
11E1:4D 42 4C 59 20 D0 52 4F 92
11E9:47 52 41 4D 00 C4 41 54 2B
11F1:41 20 C6 49 4C 45 00 D3 75
11F9:59 53 54 45 4D 20 C6 49 3E
1201:4C 45 00 C4 45 53 4B 20 17
1209:C1 43 43 45 53 4F 52 74
1211:59 00 D0 52 49 4E 54 45 92
1219:52 20 C4 52 49 56 45 52 AC
1221:00 C9 4E 50 55 54 20 C4 87
1229:52 49 56 45 52 00 C1 50 4E
1231:50 4C 49 43 41 54 49 4F 2B
1239:4E 20 28 D3 C5 D1 29 00 96
1241:D3 59 53 54 45 4D 20 C2 B7
1249:4F 4F 54 20 C6 49 4C 45 AE
1251:00 D3 59 53 54 45 4D 20 3D
1259:D0 52 4F 47 52 41 4D 00 0B
1261:C1 50 50 4C 49 43 41 54 77
1269:49 4F 4E 20 28 D6 CC C9 D1
1271:D2 29 00 C1 50 50 4C 49 0B
1279:43 41 54 49 4F 4E 20 C4 67
1281:41 54 41 00 C6 4F 4E 54 E7
1289:20 C6 49 4C 45 00 D5 4E 81
1291:4B 4E 4F 57 4E 20 D3 C5 AE
1299:D1 00 D5 4E 4B 4E 4F 57 CF
12A1:4E 20 D6 CC C9 D2 00 D5 0C
12A9:4E 4B 4E 4F 57 4E 20 D3 8E
12B1:54 52 55 43 54 55 52 45 55
12B9:00 E0 00 F0 1C E0 24 B0 82
12C1:18 E0 12 B0 03 C0 15 60 1D
12C9:E0 19 B0 03 C0 13 60 E0 DE
12D1:1F B0 03 C0 12 60 C0 11 C2
12D9:60 38 60 00 00 00 00 48

```

ML Cloner

Article on page 64.

```

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ED
SD 20 IFPEEK(65530)=5THENBANK1
5:CP=128
PD 30 EA=174:SA=193:IFPEEK(655
30)=164THENC=16:EA=157:
SA=178
BD 40 B=16:Z=256:PRINTCHR$(14)
"CLR">{3 SPACES}COPYRIGH
T 1988 COMPUTE! PUB., IN
C."
JX 50 PRINTTAB(11)"ALL RIGHTS
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AX 60 PRINT"{RVS}";:FORI=1TO40
:PRINTCHR$(32);:NEXT:PRI

```

```

NTSPC(15)"{UP}ML CLONER"
CC 70 INPUT"{DOWN}FILENAME";N$
:IFN$=""THENPRINT"{CLR}"
:END
SX 80 GOSUB350:IFA=62THENPRINT
"{RVS}FILENAME NOT FOUND
ON THIS DISK.":N$="" :GO
TO70
BQ 90 IFATHENPRINT"{RVS}ERROR:
"B$":END
RF 100 PRINT"{DOWN}LOADING "N$
;:IFCP=128THENBLOAD(N$)
,B0:GOTO130
RH 110 POKEL47,0:IFCP=16THENSYS
S43115N$,8,1:SYS61516:G
OTO130
SE 120 SYS57812N$,8,1:SYS62631
PX 130 PRINT". COMPLETED."
RQ 140 L=ASC(A$+CHR$(0)):H=ASC
(B$+CHR$(0)):S=L+Z*H:E=
PEEK(EA)+Z*PEEK(EA+1)-1
MG 150 PRINTSPC(18)"{DOWN}HEX
{3 SPACES}DEC":D=S:GOSU
B330:D=E:HS$=H$:H$="" :G
OSUB330
JM 160 PRINT"STARTING ADDRESS:
"HS$TAB(23)S
BP 170 PRINT"ENDING ADDRESS:
{3 SPACES}"H$TAB(23)E
JP 180 PRINT"{DOWN}READY TO CO
PY THIS FILE NOW (Y/N)?
";:GOSUB310:IFK$<>"Y"TH
EN290
BR 190 PRINT"{DOWN}WANT TO CHA
NGE THE FILENAME (Y/N)?
";:GOSUB310
FB 200 IFK$="Y"THENPRINT"
{DOWN}OLD FILENAME: "N$
:INPUT"NEW FILENAME";N$
JE 210 PRINT"{DOWN}PRESS <RETU
RN> FOR YOUR COPY."
FC 220 GETK$:IFK$<>CHR$(13)THE
N220
PK 230 GOSUB350:IFA>0ANDA<>62T
HENPRINT"{RVS}ERROR: "B
$:GOTO180
DJ 240 IFA=0THENPRINT"{DOWN}FI
LENAME: "N$:PRINT"{RVS}
EXISTS ON THIS DISK.":G
OTO180
BK 250 PRINT"{DOWN}{RVS}COPYIN
G "N$;:IFCP=128THENBSAV
E(N$),B0,P(S)TOP(E+1):G
OTO280
BA 260 IFCP=16THENSYS43115N$,8
,1:POKESA,L:POKESA+1,H:
SYS61860:GOTO280
CR 270 SYS57812N$,8,1:POKESA,L
:POKESA+1,H:SYS62957
RD 280 PRINT". COMPLETED.":PRI
NT"{DOWN}COPY. IT AGAIN
{SPACE}(Y/N)?";:GOSUB31
0:IFK$="Y"THEN190
EB 290 PRINT"{DOWN}WANT TO RUN
THIS PROGRAM AGAIN (Y/
N)?";:GOSUB310:IFK$="Y"
THENRUN
HJ 300 END
MS 310 GETK$:IFK$<>"Y"ANDK$<>"
N"THEN310
KR 320 PRINT"{RIGHT}"K$:RETURN
KB 330 X=((D/B)-INT(D/B))*B:H$
=CHR$(7*ABS(X>9)+X+48)+
H$:D=(D-X)/B:IFDTHEN330
HP 340 RETURN
QR 350 OPEN15,8,15,"I0":OPEN8
,8,8,"0":N$="+N$+",P,R"
HD 360 INPUT#15,A,B$:IFA=0ANDS
=ETHENGET#8,A$,B$
XS 370 CLOSE8:CLOSE15:RETURN

```


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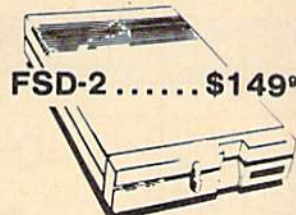
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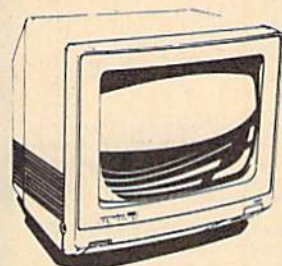


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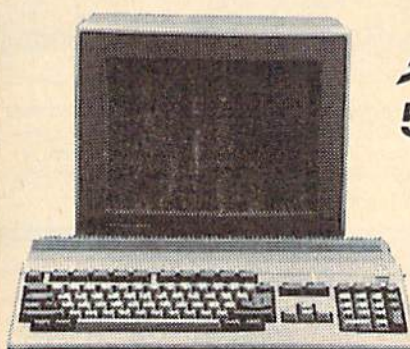
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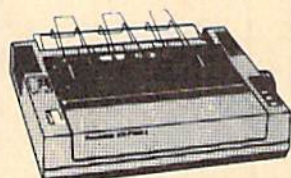
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How To Type In COMPUTE!'s Gazette Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [F3], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces.

This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is the *quote mode*.

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELETE key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{ F1 }	F1	
{ F2 }	SHIFT F1	
{ F3 }	F3	
{ F4 }	SHIFT F3	
{ F5 }	F5	
{ F6 }	SHIFT F5	
{ F7 }	F7	
{ F8 }	SHIFT F7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

[F1]	COMMODORE 1	
[F2]	COMMODORE 2	
[F3]	COMMODORE 3	
[F4]	COMMODORE 4	
[F5]	COMMODORE 5	
[F6]	COMMODORE 6	
[F7]	COMMODORE 7	
[F8]	COMMODORE 8	

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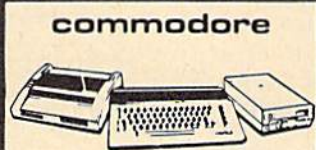


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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, `10 PRINT "THIS IS BASIC"` will generate a different checksum than `10 PRINT "THIS ISBA SIC"`.

A common typing error is transposition—typing two successive characters in the wrong order, like `PIRNT` instead of `PRINT` or `64378` instead of `64738`. The Proofreader is sensitive to the position of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of `PRINT`). If you prefer to use abbreviations, you can still check the line by LISTING it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTING the line

substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active*. When you perform a command like `GRAPHIC 1`, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you run any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP-RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (`SYS 65341` for the 128, `64738` for the 64, and `65526` for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, if you're using a 64 and activate the Proofreader after installing the other utility. For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable both programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
```

```
20 PRINT "AUTOMATIC PROOFREADER FOR ";IF VEC=42364 THEN
   [SPACE]PRINT "C-64"
30 IF VEC=50556 THEN PRINT "V1 C-20"
40 IF VEC=35158 THEN GRAPHIC CL:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=46:GRAPHIC CL:PRINT "128"
60 SA=(PEEK(LO)+256*PEEK(HI))+6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POKE ADR,BYT:ADR=ADR+1:CHK=CHK+BYT:NEXT
80 IF CHK<>20570 THEN PRINT "**ERROR* CHECK TYPING IN DATA STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:RS=SA+RF:HB=INT(RS/256):LB=RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+LF,LF:POKE SA+HF,HF:NEXT
110 IF CHK<>22054 THEN PRINT "**ERROR* RELOAD PROGRAM AND [SPACE]CHECK FINAL LINE":END
120 POKE SA+149,PEEK(772):POKE SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+14,22:POKE SA+18,23:POKE SA+29,224:POKE SA+139,224
140 PRINT CHR$(147);CHR$(17):"PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (PEEK(LO)+256*PEEK(HI))-1,0:NEW
160 DATA 120,169,73,141,4,3,16
170 DATA 9,3,141,5,3
180 DATA 88,96,165,20,133,167,165,21,133,168,169
190 DATA 0,141,0,255,162,31,181,199,157,227,3
200 DATA 202,16,248,169,19,32,210,255,169,18,32
210 DATA 210,255,160,0,132,180,132,176,136,230,180
220 DATA 200,185,0,2,240,46,201,34,208,8,72
230 DATA 165,176,73,255,133,176,104,72,201,32,208
240 DATA 7,165,176,208,3,104,208,226,104,166,180
250 DATA 24,165,167,121,0,2,133,167,165,168,105
260 DATA 0,133,168,202,208,239,240,202,165,167,69
270 DATA 168,72,41,15,168,185,211,3,32,210,255
280 DATA 104,74,74,74,74,168,185,211,3,32,210
290 DATA 255,162,31,189,227,3,149,199,202,16,248
300 DATA 169,146,32,210,255,76,86,137,65,66,67
310 DATA 68,69,70,71,72,74,75,77,80,81,82,83,88
320 DATA 13,2,7,167,31,32,151,116,117,151,128,129,167,136,137
```




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MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0-9 and the letters A-F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users can enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proof-reading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0-9 and the letters A-F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and - keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485-487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that

64 MLX Keypad

7	8	9	0
4 U	5 I	6 O	F P
1 J	2 K	3 L	E ;
A M	B ,	C .	D /
0 Space			

128 MLX Keypad

A (F1)	B (F3)	C (F5)	D (F7)
7	8	9	E (+)
4	5	6	F (-)
1	2	3	E N T E R
0	.		

can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

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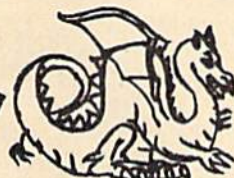
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number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should not be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different

name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT address, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RE-STORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD "filename",8 for disk (DLOAD "filename" on the 128) or LOAD "filename" for tape, and then RUN. Such

programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD "filename",8,1 for disk (BLOAD "filename" on the 128) or LOAD "filename",1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy thoroughly before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
    30,950 MODIFIED, LINES 4
    85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
    I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
    4=254:Z5=255:Z6=256:Z7=
    127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
    :BS=PEEK(55)+Z6*PEEK(56)
    :H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$=" {LEFT}"
    :S$=" ":D$=CHR$(20):Z$=
    CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
    +23:POKE I,0:NEXT:POKE
    {SPACE}SD+24,15:POKE 78
    8,52
FC 150 PRINT "{CLR}"CHR$(142)CH
    R$(8):POKE 53280,15:POK
    E 53281,15
EJ 160 PRINT T$ "{RED}{RVS}"
    {2 SPACES}{8 @}
    {2 SPACES}"SPC(28)"
    {2 SPACES}{OFF}{BLU} ML
    X II {RED}{RVS}
    {2 SPACES}"SPC(28)"
    {12 SPACES}{BLU}"
FR 170 PRINT "{3 DOWN}"
    {3 SPACES}COMPUTE!'S MA
    CHINE LANGUAGE EDITOR
    {3 DOWN}"
JB 180 PRINT "{BLK}STARTING ADD
```


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```

RESS[43];:GOSUB300:SA=A
D:GOSUB1040:IF F THEN18
0
GF 190 PRINT"[BLK]{2 SPACES}EN
DING ADDRESS[43]";:GOSUB
300:EA=AD:GOSUB1030:IF
[SPACE]F THEN190
KR 200 INPUT"[3 DOWN]{BLK}CLEA
R WORKSPACE [Y/N][43]";A
$:IF LEFT$(A$,1)<>"Y"TH
EN220
PG 210 PRINT"[2 DOWN]{BLU}WORK
ING...";:FORI=BS TO BS+
EA-SA+7:POKE I,0:NEXT:P
RINT"DONE"
DR 220 PRINTTAB(10)"[2 DOWN]
{BLK}{RVS} MLX COMMAND
[SPACE]MENU [DOWN][43]";
PRINT T$"[RVS]E[OFF]NTE
R DATA"
BD 230 PRINT T$"[RVS]D[OFF]ISP
LAY DATA":PRINT T$
[RVS]L[OFF]OAD FILE"
JS 240 PRINT T$"[RVS]S[OFF]AVE
FILE":PRINT T$"[RVS]Q
[OFF]UIT[2 DOWN]{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
MID$( "EDLSQ",I,1)THEN A
=I:I=5
FD 270 NEXT:ON A GOTO420,610,6
90,700,280:GOSUB1060:GO
TO250
EJ 280 PRINT"[RVS] QUIT ":INPU
T"[DOWN][43]ARE YOU SURE
[Y/N]";A$:IF LEFT$(A$,
1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
LEN(IN$)<4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
=MID$(IN$,3):GOSUB320:A
D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
$(B$,J,1):B=ASC(A$)-C4+
(A$>"0")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
H$,B+1,1);:B=A-B*C6:PRI
NT MID$(H$,B+1,1);:RETU
RN
RR 360 A=INT(AD/Z6):GOSUB350:A
=AD-A*Z6:GOSUB350:PRINT
A$;
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
CK+25*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+25*(CK>Z7)+A
JC 390 CK=CK+25*(CK>Z5):RETURN
QS 400 PRINT"[DOWN]STARTING AT
[43]";:GOSUB300:IF IN$<>
N$ THEN GOSUB1030:IF F
[SPACE]THEN400
EX 410 RETURN
HD 420 PRINT"[RVS] ENTER DATA
[SPACE]";:GOSUB400:IF IN
$=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
THEN PRINT IN$:PRINT"
[UP][5 RIGHT]";
GC 450 FOR I=0 TO 24 STEP 3:B$
=SS:FOR J=1 TO 2:IF F T
HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"[RVS]"B$";:IF I<
24THEN PRINT"[OFF]";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF (A$>"/"AND A$<".")OR(A
$>"0"AND A$<"G") THEN540
GS 485 A=- (A$="M")-2*(A$=",")-
3*(A$=".")-4*(A$="/")-5
*(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$="
")-9*(A$="U")-10*(A$="I
")-11*(A$="O")-12*(A$="
P")
CM 487 A=A-13*(A$="S"):IF A THE
N A$=MID$( "ABCD123E456F
0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
=1)OR F)THEN PRINT B$;:
J=2:NEXT:I=24:GOTO550
KC 500 IF A$="HOME" THEN PRI
NT B$;J=2:NEXT:I=24:NEX
T:F=0:GOTO440
MX 510 IF (A$="RIGHT")AND F TH
EN PRINT B$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
((I=0)AND(J=1))THEN GOS
UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$;:
J=2-J:IF J THEN PRINT
[SPACE]L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
[SPACE]S$;
PM 550 NEXT I:PRINT:PRINT"[UP]
[5 RIGHT]";:INPUT#3,IN$
:IF IN$=N$ THEN CLOSE3:
GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
MID$(IN$,I):GOSUB320:IF
I<25 THEN GOSUB380:A(I
/3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
B1060:PRINT"[BLK]{RVS}
[SPACE]ERROR: REENTER L
INE [43]";F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
R I=0 TO 7:POKE B+I,A(I
):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
LOSE3:PRINT"[DOWN]{BLU}
** END OF ENTRY **[BLK]
[2 DOWN]";:GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"[CLR]{DOWN}{RVS}
[SPACE]DISPLAY DATA ":G
OSUB400:IF IN$=N$ THEN2
20
RJ 620 PRINT"[DOWN]{BLU}PRESS:
[RVS]SPACE[OFF] TO PAU
SE, [RVS]RETURN[OFF] TO
BREAK[43][DOWN]"
KS 630 GOSUB360:B=BS+AD-SA:FOR
I=BTO B+7:A=PEEK(I):GOS
UB350:GOSUB380:PRINT S$
;
CC 640 NEXT:PRINT"[RVS]";:A=CK
:GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
EN PRINT"[DOWN]{BLU}** E
ND OF DATA ***:GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"[DOWN]{RVS} LOAD
[SPACE]DATA ":OP=1:GOTO
710
PC 700 PRINT"[DOWN]{RVS} SAVE
[SPACE]FILE ":OP=0
RX 710 IN$=N$:INPUT"[DOWN]FILE
NAME[43]";IN$:IF IN$=N$
[SPACE]THEN220
PR 720 F=0:PRINT"[DOWN]{BLK}
[RVS]T[OFF]APE OR [RVS]
D[OFF]ISK: [43]";
FP 730 GET A$:IF A$="T"THEN PR
INT"[T[DOWN]";:GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D[DOWN]";:OPEN15,8
,15,"I0":B=EA-SA:IN$="
0":IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+"P,W":G
OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
H*256):PRINT#1,CHR$(AL)
;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
R$(PEEK(BS+I));:IF ST T
HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
O940
GS 800 GOSUB1060:PRINT"[DOWN]
[BLK]ERROR DURING SAVE:
[43]";:GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+"P,R":G
OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
$)+256*ASC(B$+Z$):IF AD
<>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
OKE BS+I,ASC(A$+Z$):IF(
I<>B)AND ST THEN F=2:AD
=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
>0)+1 GOTO960,970
SA 860 INPUT#15,A$:IF A THEN
CLOSE1:CLOSE15:GOSUB10
60:PRINT"[RVS]ERROR: "A
$
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
187,PEEK(FA+3):POKE188,
PEEK(FA+4):IFOP=0THEN92
0
HJ 890 SYS 63466:IF(PEEK(783)A
ND1)THEN GOSUB1060:PRIN
T"[DOWN]{RVS} FILE NOT
[SPACE]FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
30):IF AD<>SA THEN F=1:
GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
2)-1:F=F-2*(A<EA)-3*(A>
EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
UB1010:ON OP GOTO950:SY
S 63591
AE 940 GOSUB1080:PRINT"[BLU]**
SAVE COMPLETED ***:GOT
O220
XP 950 POKE147,0:SYS 63562:IF
[SPACE]ST>0 THEN970
FR 960 GOSUB1080:PRINT"[BLU]**
LOAD COMPLETED ***:GOT
O220
DP 970 GOSUB1060:PRINT"[BLK}
[RVS]ERROR DURING LOAD:
[DOWN][43]";:ON F GOSUB98
0,990,1000:GOTO220
PF 980 PRINT"INCORRECT STARTIN
G ADDRESS ("":GOSUB360:
PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT "":
AD=SA+AD:GOSUB360:PRINT
D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(A
H*256):POKE193,AL:POKE1
94,AH
FF 1020 AH=INT(B/256):AL=B-(A
H*256):POKE174,AL:POKE1
75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
1050
HA 1040 IF(AD>511 AND AD<40960

```


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```

)OR(AD>49151 AND AD<53
248) THEN GOSUB1000:F=0
:RETURN
HC 1050 GOSUB1060:PRINT"[RVS]
[SPACE]INVALID ADDRESS
[DOWN][BLK]":F=1:RETU
RN
AR 1060 POKE SD+5,31:POKE SD+6
,208:POKE SD,240:POKE
[SPACE]SD+1,4:POKE SD+
4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
240:POKE SD,0:POKE SD+
1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
KE SD+4,0:POKE SD,0:PO
KE SD+1,0:RETURN

```

Program 2: MLX For Commodore 128

```

AE 100 TRAP 960:POKE 4627,128:
DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
56:Z7=127:BS=256*PEEK(4
627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
):DL$=CHR$(20):SP$=CHR$
(32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
DEF FNLB(A)=A-FNHB(A)*2
56:DEF FNAD(A)=PEEK(A)+
256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
5,"C":KEY 7,"D":VOL 15
:IF RGR(0)=5 THEN FAST
FJ 150 PRINT"[CLR]"CHR$(142):C
HR$(8):COLOR 0,15:COLOR
4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"[RED]
[RVS]{2 SPACES}[9 0]
[2 SPACES]"RT$;TAB(12)"
[RVS]{2 SPACES}[OFF]
[BLU] 128 MLX [RED]
[RVS]{2 SPACES}"RT$;TAB
(12)"[RVS]{13 SPACES}
[BLU]"
FE 170 PRINT"[2 DOWN]
[3 SPACES]COMPUTE!'S MA
CHINE LANGUAGE EDITOR
[2 DOWN]"
DK 180 PRINT"[BLK]STARTING ADD
RESS[43]":GOSUB 260:IF
[SPACE]AD THEN SA=AD:EL
SE 180
FH 190 PRINT"[BLK]{2 SPACES}EN
DING ADDRESS[43]":GOSUB
260:IF AD THEN EA=AD:E
LSE 190
MF 200 PRINT"[DOWN][BLK]CLEAR
[SPACE]WORKSPACE [Y/N]?
[43]":GETKEY AS:IF AS<>"
Y" THEN 220
QH 210 PRINT"[DOWN][BLU]WORKIN
G...":BANK 0:FOR A=BS
[SPACE]TO BS+(EA-SA)+7:
POKE A,0:NEXT A:PRINT"D
ONE"
DC 220 PRINT TAB(10)"[DOWN]
[BLK]{RVS} MLX COMMAND
[SPACE]MENU [43][DOWN]":
PRINT TAB(13)"[RVS]E
[OFF]NTER DATA"RT$;TAB(
13)"[RVS]D[OFF]ISPLAY D
ATA"RT$;TAB(13)"[RVS]L
[OFF]OAD FILE"
HB 230 PRINT TAB(13)"[RVS]S

```

```

[OFF]AVE FILE"RT$;TAB(1
3)"[RVS]C[OFF]ATALOG DI
SK"RT$;TAB(13)"[RVS]Q
[OFF]UIT[DOWN][BLK]"
AP 240 GETKEY AS:A=INSTR("EDLS
CQ",AS):ON A GOTO 340,5
50,640,650,930,940:GOSU
B 950:GOTO 240
SX 250 PRINT"STARTING AT":GOS
UB 260:IF(AD<>0)OR(AS=N
L$)THEN RETURN:ELSE 250
AS=NL$:INPUT AS:IF LEN(
AS)=4 THEN AD=DEC(AS)
PP 270 IF AD=0 THEN BEGIN:IF A
S<>NL$ THEN 300:ELSE RE
TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
[SPACE]300
PM 290 IF AD>511 AND AD<65280
[SPACE]THEN PRINT BE$;:
RETURN
SQ 300 GOSUB 950:PRINT"[RVS] I
NVALID ADDRESS [DOWN]
[BLK]":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
+Z5*(CK>27):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>27)+A
AH 330 CK=CK+Z5*(CK>25):RETURN
QD 340 PRINT BE$:"[RVS] ENTER
[SPACE]DATA ":GOSUB 250
:IF AS=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
,3
BR 360 GOSUB 310:PRINT HEX$(AD
)+":":IF F THEN PRINT
[SPACE]LS:PRINT"[UP]
[5 RIGHT]";
QA 370 FOR I=0 TO 24 STEP 3:BS
=SP$:FOR J=1 TO 2:IF F
[SPACE]THEN BS=MID$(LS,
I+J,1)
PS 380 PRINT"[RVS]"BS+LF$:IF
[SPACE]I<24 THEN PRINT"
[OFF]";
RC 390 GETKEY AS:IF (AS>"/" AN
D AS<"") OR(AS="0" AND
AS<"G") THEN 470
AC 400 IF AS="+" THEN AS="E":G
OTO 470
QB 410 IF AS="-" THEN AS="F":G
OTO 470
FB 420 IF AS=RT$ AND ((I=0) AN
D (J=1) OR F) THEN PRIN
T BS;J=2:NEXT I=24:GOT
O 480
RD 430 IF AS="{HOME}" THEN PRI
NT BS;J=2:NEXT I=24:NEX
T:F=0:GOTO 360
XB 440 IF (AS="{RIGHT}") AND F
THEN PRINT BS+LF$;:GOT
O 470
JP 450 IF AS<>LF$ AND AS<>DL$
[SPACE]OR ((I=0) AND (J
=1)) THEN GOSUB 950:GOT
O 390
PS 460 AS=LF$+SP$+LF$:PRINT BS
+LF$;J=2-J:IF J THEN P
RINT LF$;:I=I-3
GB 470 PRINT AS;:NEXT J:PRINT
[SPACE]SP$;
HA 480 NEXT I:PRINT:PRINT"[UP]
[5 RIGHT]";:LS=""
DP 490 FOR I=1 TO 25 STEP 3:GE
T#3,AS,BS:IF AS=SP$ THE
N I=25:NEXT:CLOSE 3:GOT
O 220
BA 500 AS=AS+BS:A=DEC(AS):MID$
(LS,I,2)=AS:IF I<25 THE
N GOSUB 320:A(I/3)=A:GE
T#3,AS

```

```

AR 510 NEXT I:IF A<>CK THEN GO
SUB 950:PRINT:PRINT"
[RVS] ERROR: REENTER LI
NE ":F=1:GOTO 360
DX 520 PRINT BE$B=BS+AD-SA:FO
R I=0 TO 7:POKE B+I,A(I
):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
HEN 360
CA 540 CLOSE 3:PRINT"[DOWN]
[BLU]** END OF ENTRY **
[BLK]{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"[CLR][DOWN]
[RVS] DISPLAY DATA ":GO
SUB 250:IF AS=NL$ THEN
[SPACE]220
JF 560 BANK 0:PRINT"[DOWN]
[BLU]PRESS: [RVS]SPACE
[OFF] TO PAUSE, [RVS]RE
TURN[OFF] TO BREAK[43]
[DOWN]"
XA 570 PRINT HEX$(AD)+":":GOS
UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
):PRINT RIGHT$(HEX$(A),
2);SP$;GOSUB 320:NEXT
[SPACE]I
XB 590 PRINT"[RVS]";RIGHT$(HEX
$(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
EN PRINT"[BLU]** END OF
DATA **":GOTO 220
EB 610 GET AS:IF AS=RT$ THEN P
RINT BE$;GOTO 220
QK 620 IF AS=SP$ THEN F=F+1:PR
INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"[DOWN][RVS] L
OAD DATA ":OP=1:GOTO 66
0
BP 650 PRINT BE$"[DOWN][RVS] S
AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
ME[43]";F$:IF F$=NL$ THE
N 220
RF 670 PRINT"[DOWN][BLK]{RVS}T
[OFF]APE OR [RVS]D[OFF]
ISK: [43]";
SQ 680 GETKEY AS:IF AS="T" THE
N 850:ELSE IF AS<>"D" T
HEN 680
SP 690 PRINT"DISK[DOWN]":IF OP
THEN 760
EG 700 DOPEN#1,(F$+",P"),W:IF
[SPACE]DS THEN AS=DS$:G
OTO 740
JH 710 BANK 0:POKE BS-2,FNHB(S
A):POKE BS-1,FNHB(SA):P
RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
PRINT#1,CHR$(PEEK(A));:
IF ST THEN AS="DISK WRI
TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
[BLU]** SAVE COMPLETED
[SPACE]WITHOUT ERRORS *
**":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
SE 1:INPUT"[BLK]REPLACE
EXISTING FILE [Y/N][43]
":AS:IF AS="Y" THEN SCR
ATCH(F$):PRINT:GOTO 700
:ELSE PRINT"[BLK]":GOTO
660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
"[BLK]{RVS} ERROR DURIN
G SAVE: [43]":PRINT AS:G
OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
THEN AS=DS$:F=4:CLOSE
[SPACE]1:GOTO 790

```


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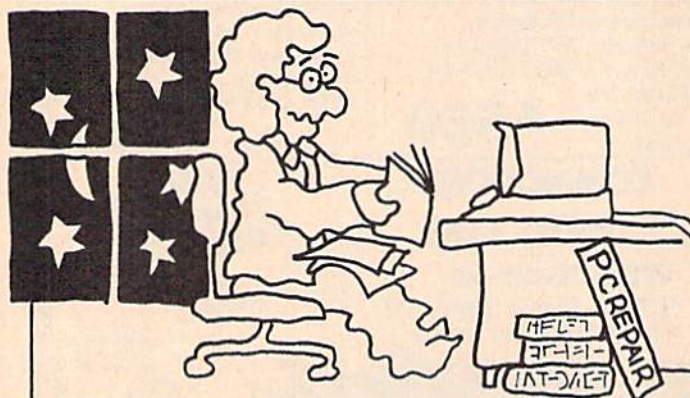
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```

PX 770 GET#1,A$,B$:CLOSE 1:AD=
ASC(A$)+256*ASC(B$):IF
{SPACE}AD<>SA THEN F=1:
GOTO 790
KB 780 PRINT"LOADING ":F$:PRIN
T:BLOAD(F$),B0,P(B$):AD
=SA+FNAD(174)-BS-1:F=-2
*(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
T"[BLU]** LOAD COMPLETE
D WITHOUT ERRORS ***":GO
TO 220
ER 800 GOSUB 950:PRINT"[BLK]
[RVS] ERROR DURING LOAD
: [43]":ON F GOSUB 810,8
20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
G ADDRESS ("HEX$(AD):"
)":RETURN
DP 820 PRINT"LOAD ENDED AT ":H
EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
NG ADDRESS ("HEX$(EA):"
)":RETURN
FP 840 PRINT"DISK ERROR ":A$:R
ETURN
KS 850 PRINT"TAPE":AD=POINTER(
F$):BANK 1:A=PEEK(AD):A
L=PEEK(AD+1):AH=PEEK(AD
+2)
XX 860 BANK 15:SYS DEC("FF68")
,0,1:SYS DEC("FFBA"),1,
1,0:SYS DEC("FFBD"),A,A
L,AH:SYS DEC("FF90"),12
8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
920:SYS DEC("E919"),3:
PRINT"SAVING ":F$:
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
UB 920:SYS DEC("EA18"):
PRINT"[DOWN]{BLU]** TAP
E SAVE COMPLETED ***":GO
TO 220
CP 890 SYS DEC("E99A"):PRINT:I
F PEEK(2816)=5 THEN GOS
UB 950:PRINT"[DOWN]
{BLK}{RVS} FILE NOT FOU
ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
":AD=FNAD(2817):IF AD<>
SA THEN F=1:GOTO 800:EL
SE AD=FNAD(2819)-1:F=-2
*(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
UB 920:SYS DEC("E9FB"):
IF ST>0 THEN 800:ELSE 7
90
XB 920 POKE193,FNLB(A):POKE194
,FNLB(A):POKE 174,FNLB(
B):POKE 175,FNLB(B):RET
URN
CP 930 CATALOG:PRINT"[DOWN]
{BLU]** PRESS ANY KEY F
OR MENU ***":GETKEY A$:G
OTO 220
MM 940 PRINT BE$"{RVS} QUIT
[43]":RT$:"ARE YOU SURE
{SPACE}[Y/N]?" :GETKEY A
$:IF A$<>"Y" THEN 220:EL
SE PRINT"[CLR]":BANK 1
5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
F=4:A$=DSS:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
SE PRINT ERR$(ER):" ERR
OR IN LINE":EL

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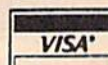
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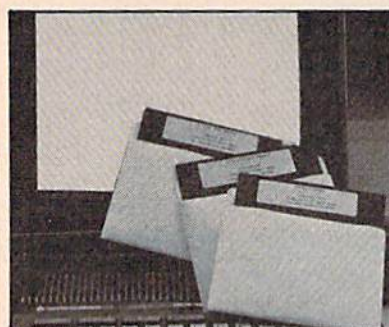
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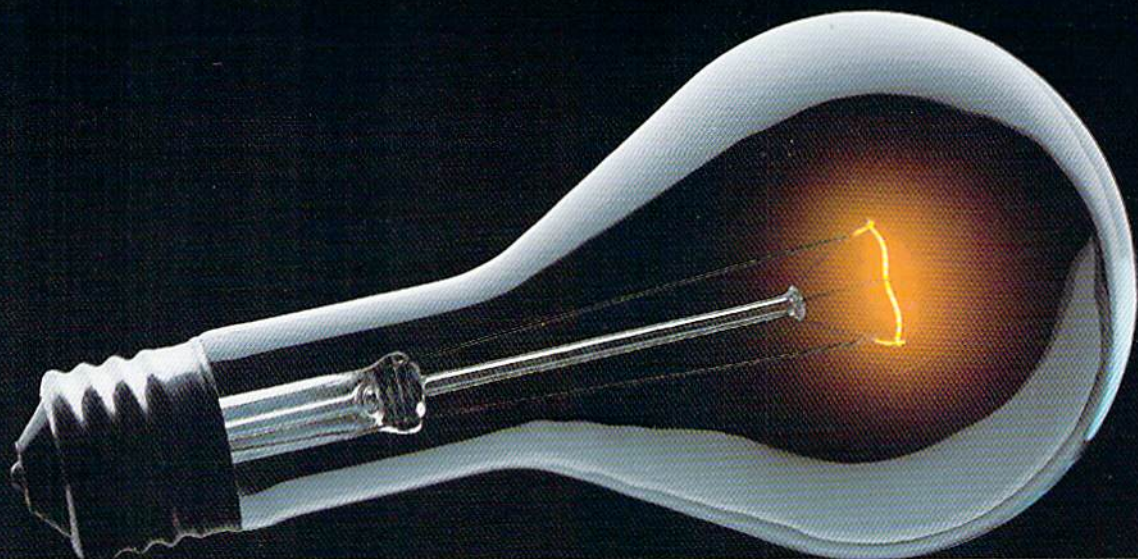
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