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G5Y

Mode Detection

You recently had a letter in "Feedback" (April 1992) asking how to distinguish between the various 128 modes of operation. I have compiled a list of PEEKs that can distinguish between most 8-bit Commodore computers. (See table printed at right.)

Location 65288 is the place to start. This location can distinguish between all the major variations of the different machines. After determining the variation, you can then find out the specific ROM version it is using by checking other locations. Because of hardware and software considerations native to certain machines, you must first poke in the values at the bottom of the table before peeking the addresses listed for those machines.

WILLIAM LEVAK
ANN ARBOR, MI

BASIC	Version	Address					
		47727	50003	50575	58480	65288	65408
PET	1.0		0	1[1]	238	169	64
PET	1.0r		0	152[1]	238	169	64
PET	2.0		1	47	72	6	167
CBM	2.0		1	47	72	6	167
CBM	4.0	4	160	135	170	170	170
PET	4.0	4	160	135	170	170	170
8032	4.0r	234	160	135	176	170	170
PET-12	4.0r	234	160	135	196	170	170
VIC-20	2.0		194	32	198	16	100
B128	4.0	165[2]			249[2]	72[2]	224[2]
64	2-01	133			69	147	170
64	2-02	133			69	149	0
64	2-03	133			69	149	3
4064	2.0	133			69	149	100
SX-64	2.0	133			69	149	67
PLUS/4	3.5					255	
C128	7.0	161[3]	14[3]	211[3]	229[3]	72[3]	0[3]

[1] POKE 1018,173: POKE 1021,133: POKE 1022,2: POKE 1023,96
POKE 1019,143:POKE 1020,197:SYS 1018:PRINT PEEK(2)
[2] POKE 599,15
[3] POKE 981,15

Here's a way to detect modes of operation on any Commodore 8-bit computer, and a look at what's happening while a program runs.

All at Once

I've tried and tried to figure out how you can play music in the background, move sprites around the screen, animate background sprites, and read a user's joystick all at once in BASIC. It seems impossible. Is machine language needed?

JON LANE
PLANT CITY, FL

Computer games might seem to be doing many things at once, but they're actually doing only one thing at a time. It's just that they do things quickly. Computers follow instructions sequentially.

To give your program the appearance of simultaneous action, you need to plan ahead. Separate the actions into subroutines. An IF-THEN statement can decide whether or not you want to use GOSUB to go to the appropriate routine. It might help to write the conditions and their consequences in plain English. For example, if the fire button is pressed, then launch missile and set the missile flag. If the joystick moves, then move the ship sprite. If one second has passed, then play another note of the song. If the missile flag is set, then move the missile sprite again. Repeat the loop.

First, you check for the joystick fire button. If it's pressed, use GOSUB to go to the appropriate routine. If it's not pressed, forget about launching the missile until the next time through the loop. Once you've launched the missile, you want it to continue moving, which is the reason for the missile flag. Next, PEEK the joystick to see if the player wants to move. If so, update the ship's position. Third, check the jiffy clock, the variable TI or TI$, to see how much time has gone by. If a second (or whatever time period you've chosen) has passed, play the next note of the song. Next, if the flag is still set, move the missile sprite. Then go back and do it all again.

The program loops around and around, taking necessary actions one at a time. The computer works quickly, and if the individual actions are coordinated, they appear to happen simultaneously.

By the time you create a few more subroutines to make your game more playable, the computer will have to execute numerous instructions. Converting these instructions from BASIC can take too much time for a fast-paced game. If you want speed, it's a good idea to switch to machine language.

Another technique, which is even closer to simultaneous action, requires an intermediate-to-advanced knowledge of machine language. Sixty times a second, the computer stops what it's doing and redraws the image on the screen. The main program is being constantly interrupted. Using a wedge, or redirection, you can divert the interrupt to your own ML program, which could play music, move sprites, or whatever you choose. Such interrupt-driven routines are sometimes difficult to implement but can be very effective. ❐

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PUBLIC DOMAIN SOFTWARE IS A LOT LIKE PIRATE TREASURE.
IT'S FREE FOR THE TAKING, BUT YOU'LL
HAVE TO DO A LOT OF DIGGING BEFORE YOU FIND THE GEMS.

BURIED TREASURE

BY HENNING VAHLENKAMP

The wealth of public domain and shareware programs available to 64 and 128 users can be accurately referred to as buried treasure. Thousands upon thousands of these programs have been written over the years, and they span the spectrum from entertainment to productivity. Best of all, these programs are available for the taking.

Unfortunately, many 64/128 users don't take advantage of these programs, since the sheer volume of them makes it difficult to separate the gems from the duds. Also, like finding buried treasure left by pirates of yesteryear, locating these treasures can sometimes be a problem.

In this article, you'll find a survey of what I've found to be excellent public domain and shareware programs. Don't simply take my word for it, however; download some of these programs and try them for yourself. Plus, I'll show you where and how to dig up some of these treasures as well.

PD or SW?

First, let's clarify our terms. A public domain (PD) program is one which you can use and distribute freely. It's also the oldest type of noncommercial software available to the public. Like PD programs, shareware (SW) can be freely distributed, but the author requests a donation (usually a modest one) if you find the software useful. In many cases, SW authors will provide enhanced versions, written documentation, and updates to users in return for payment.

Software Sources

Both PD and SW programs are more readily available than you might think. For instance, most major online services have enormous selections of Commodore software. The only charge for the programs is the service's connect-time charge. Many services have a listing of available programs that you can download to get an idea of what's available. Others may have a printed catalogue. If you need a program to do a specific job, leave a message online, and someone will probably offer a suggestion or two.

Local BBSs and user groups also can be treasure troves of wonderful programs. Even if a BBS is running on an Amiga or IBM, it may have a large selection of PD and SW programs for the 64 and 128. Most user groups have hundreds of programs available, charging only a modest fee to cover the cost of the disk.

Downloading more than a few programs from a local BBS can take quite some time, even at 2400 bps. Connect charges for online services and telephone bills for long-distance calls to BBSs can add up. If you're looking for a large number of programs to build your library in a hurry, mail-order disk services may make more sense. Disk services typically offer hundreds of PD and SW disks at reasonable prices. The only downside is that their collections are rarely as up-to-date as those of networks and BBSs. Check the listing at the end of this article for several popular commercial sources for PD and SW programs.

Best of the Bunch

Now that we've touched on where to find programs, here are some outstanding ones to watch for. Since a significant number of PD and SW programs are of high quality, it's impossible to mention all of the outstanding ones in one article. Nevertheless, I've selected several in a variety of categories that are among the best. They are definitely worth having. Now, on to the treasure!

CREATIVITY

Demo Designer 2

If you've ever wanted to make a professional-quality graphics and sound demo on your 64, Demo Designer 2 is an excellent choice. First, you select a font and musical selection from the many available ones and enter a Koala picture filename. Next, write your scrolling message with the built-in editor. Your stand-alone demo is then saved to disk. What could be easier than that?

Fun Graphics Machine V3.42

Fun Graphics Machine is unique SW for the 64. It's a powerful monochrome hi-res graphics editor, not a paint program. FGM features the ability to use Print Shop graphics,

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text fonts, rotation and flipping, reduction and enlargement, reversing, scrolling, and rudimentary drawing. The finished product can be exported to a paint program for further embellishment.

Graphics Assault System

GAS (by COMPUTE's Bruce Bowden) provides more graphics-manipulation capabilities. This useful PD program can compress, magnify, flip, rotate, scroll, diagonally shift, and invert hi-res and multicolor pictures. Best of all, it can convert hi-res to multicolor and vice versa. GAS is available in separate 64 and 128 40-column versions. If you're into graphics, you must have this one.

DEMOS

Batmania

This outstanding demo was inspired by the Batman movie of a few years ago. Batmania begins with an introduction to the dark knight and then erupts with a wonderfully arranged soundtrack from the movie. Minor animation plus topnotch graphics add the finishing touches to this fine demo.

El Gato

You need a 1764 or 1750 REU to run El Gato, an animation of a cat. The cat is shown walking in a rectangular plane, which simultaneously rotates about a vertical axis. This produces a realistic 3-D effect. Pressing various keys lets you change the speed of the animation. PD versions of this 141K program are available for both the 64 and the 40-column 128.

Eyesoteric

What makes this PD program for the 64 unique is the subject. A large eye opens and closes as it bounces around the screen. Other spheres bounce, too, resulting in 20 sprites onscreen at once—an amazing accomplishment! The music has a nice high-tech sound to it.

Juggler

Perhaps the finest 64 animation ever done, Juggler is based on the famous Amiga animation of the same name. Run this PD program on your 64, and you'll see a robotic figure standing on a checkerboard floor, juggling three reflective glass spheres. Numerous superb multicolor frames make this animated demonstration appear almost as impressive as its Amiga predecessor.

Outspace

Upon loading this PD program for the 64, you'll be treated to a graphics and sound extravaganza. Highlights include impressive use of sprites and raster interrupts, creating all sorts of movement. On the final screen is an astronaut/alien backed up by superb digitized music. You can select a picture and music with a joystick.

Reticulate

This PD program for the 64 does the seemingly impossible. It presents an unprecedented 320 × 400 pixel interlace on the composite screen. The effect isn't fake, and interlace flickering is no worse than on the Amiga. A variety of great pictures can be loaded by pressing the space bar after the introductory screen. The program won't run from a 1581 because of its custom fastloader. The music is excellent as well. A must-have!

Space Movie

Space Movie is another classic demo for the 64. Although small in size (43 blocks), it's a lengthy minimovie with an equally long soundtrack. It consists of a tribesman beating a drum while a space drama with aliens unfolds on the other side of the screen. All of this is in rhythm with the music.

Swinth

Swinth is by far the most well-known 64 demo of all. A combination of Swish and Synth Sample, it features a colorful, symmetrical kaleidoscope of lines synchronized to music. Most parameters such as colors, display attributes, and music are user-selectable. Viewing it is a relaxing, almost hypnotic, experience that you shouldn't miss.

GAMES

128 Invaders

Taking advantage of the 128's often neglected 80-column screen, 128 Invaders, a Space Invaders clone, delivers a lot of fun. This PD game also features smooth animation and full color! Although the theme is nothing new, its implementation makes 128 Invaders shine.

Adventure/80

Here's another superb 80-column PD game. Players can look forward to an excellent condensed version of the original mainframe Adventure game by William Crowther. All the key elements are preserved in this text journey through Colossal Cave. Fans of the Infocom classics will especially like this one.

Ceviuz

Ceviuz is an automated helicopter assigned to dangerous missions. With it you fly over large, detailed landscapes while avoiding enemy fire. Program options in this SW package for the 64 include three day or night missions, several levels, high-score saves, an indestructible mode, and a terrain editor for added replay value.

Krakout

Krakout, a commercial-quality game, at least equals its inspiration, Arkanoid. Distinguishing this PD 64 program are great graphics and sound, real playability, and a multitude of options such as bat speed, ball speed, number of bats, and type of background. This one's a winner.

Mah-Jongg

Mah-Jongg is a high-quality clone of Shanghai by Activision. The object of this 128 PD game is to remove all the tiles by clicking on matching pairs with the onscreen pointer. This ancient Chinese game is addicting and requires good strategy. It runs in 40-column mode and supports a joystick or mouse.

Qix

This PD clone of a Taito hit scores high marks for fun with a 64. You guide a diamond and try to cut off sections of the screen to trap the enemy in the smallest space possible. You must also avoid two little bugs that try to get you. The time limit makes Qix all the more challenging.

Rotations!

Once again, a commercial game (Tetris) inspires a good PD clone for the 64. In Rotations!, you manipulate different falling pieces to form horizontal lines on the playfield. Graphics are clean, multiple levels add challenge, and the pause feature comes in handy.

GEOS

Blue Pencil

If you do a lot of writing at home, school, or work, you need Blue Pencil, a PD program for the 64. It's a complete geoWrite document analyzer that counts words, sentences, paragraphs, pages, and graphics. Plus, it figures a variety of averages to help you analyze your writing. The only shortcoming is that it has trouble working with very large documents.

Combiner

Combiner is a SW program that lets you combine two geoWrite documents in many different ways. If you're working on one document, for example, a second document can be appended to it, inserted, or merged as part of your original document. Versatility and

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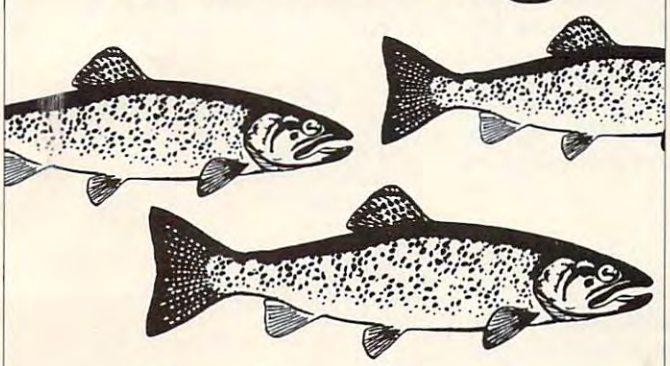

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the ability to handle different geoWrite versions make Combiner for 64 users an indispensable utility around the home, school, or office.

Convert 2.5

With this PD program, 64 users can convert documents from GEOS format to SEQ or PRG text files and vice versa. Conversion is a snap. It's a must-have for serious writers who use multiple word processors or GEOS fans who want to send text on disk to people who don't use GEOS.

Graphic Storm

A graphics importer, Graphic Storm will convert standard hi-res screens or Doodle pictures into geoPaint format. This SW program converts Print Shop, Print Master, and Newsroom graphics into photo album graphics like Graphics Grabber does. This is another useful program that should be in every GEOS user's library.

GRAPHICS

CSlide5

This SW viewer displays both compressed and uncompressed Koala and Doodle pictures. CSlide5 also compresses and decompresses them, which is a very useful feature, and it's lightning fast.

Disp/Lace

Imagine a 640 × 600 pixel interlace on the 80-column screen! That's what this incredible PD program can accomplish if you have 64K VDC RAM in your 128. It takes any six Doodle pictures and displays them simultaneously with their colors intact. Graphics fans shouldn't miss this unbelievable feat of programming.

Artwork

Here's a sampling of beautiful Commodore artwork to watch for. Each of these compressed Doodle files has a GG prefix: BOTTLE, CABIN, CASTLEJS, EGO, FROG.LILY.PAD, GRAYLIBR, HALOWAYN, IGARDEN, KINGFISHER, SERENE, LINCOLN, SCHLOS.CASTLE, SPAZOZ, and URCHINOD. These pictures and JJ MIDDLE EARTH, which is a Koala file, reflect the talent of a few of the best artists in the Commodore community.

MUSIC

StereoPlayer 10.3

Without a doubt, this is the best SID player available in the public domain. A huge program, StereoPlayer plays both mono and stereo SIDs, features a keyboard and animated band, and has almost every conceivable musical option. The opening screen is spectacular. In fact, this whole program is thoroughly professional. It's PD software at its best.

SID Player Music

There are many outstanding SID player songs. These songs usually have a MUS suffix. Here are a select few: BACK FUTURE, BADMEDICINE, BLAZER THEME, BLESS USA, ETERNL FLAME, GALACTICA, LEAN ON ME, LIKE A PRAYR, MISSION IMP, MY/DREAMS, NEVERENDING, OLD TME ROCK, STAR WARS, WILD/WEST, and YEARS. All are magnificently arranged. These are just a few of the many excellent musical works available for downloading.

PRODUCTIVITY

Power Budget

Similar to a spreadsheet, this SW budgeting program for the 64 is quite versatile. It allows you to enter and change data quickly, and the computer handles the calculations. Furthermore, budget projections can be calculated for an entire year. Clear instructions are included with this easy-to-use financial program.

The Data Base

This SW program is a superb flat-file database that possesses as much power and flexibility as some commercial ones. All the expected features are here, including multiple records, sorting by several keys, report writing, SEQ translation, searching, and so on. This program is excellent for most database needs. There are separate versions for the 64 and 128, and the 128 version has both 40-column and 80-column versions available.

UTILITIES

CS-DOS

CS-DOS is more than a DOS shell; it's an entire operating system similar to MS-DOS. For instance, this SW program for the 128 features a command line, batch files, and so on. A number of programs are available to run under CS-DOS. I think you'll find this to be quite an interesting offering.

Vector Drive

Disk editing requires good tools, and Vector Drive is a PD program that fills those needs. It packs as much power as its many commercial competitors. This menu-driven program for the 64 features search and replace, sector fill, copy, memorize, and BAM display, plus all the other options you'd expect on an outstanding disk editor. It works with any 1541 or compatible drive.

MISCELLANEOUS

Star Trek

Commodore owners who have a 1764 or 1750 REU will get a real treat with this one. This PD program for the 64 fills an entire disk and utilizes digitized sound. You'll hear the entire introduction to the original "Star Trek" TV series, beginning with "Space, the final frontier. . . ." Very impressive! ❐

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TEENAGE MUTANT NINJA TURTLES—THE ARCADE GAME

Hey, man! That Shredder creep is back in town with the Foot Clan! Yeah, dudes! And he's got April! We've got to rescue her! He's holding her somewhere in New York. Let's go! Cowabunga!

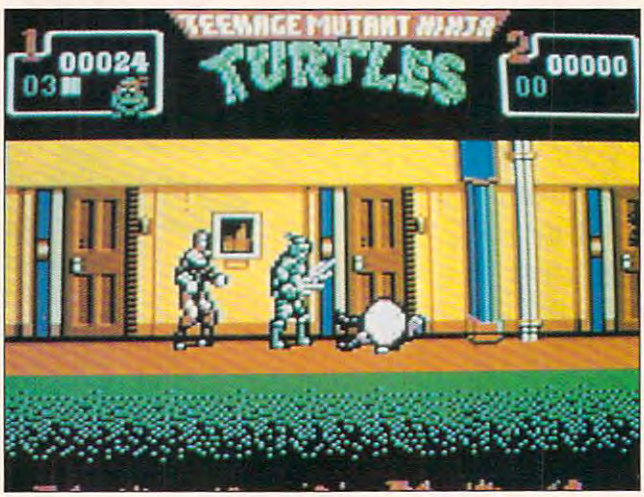
Sound familiar? What could be the start of an outline for a Teenage Mutant Ninja Turtles screenplay is actually the premise for the latest in Turtle games from Konami—and a hot game it is. Based on the arcade game, this game follows the Turtles through eight levels of battle against Shredder and his henchmen, including key figures Bebop and Rock Steady as well as the highly trained Foot Clan.

You can choose to be any one of the four Turtles: Leonardo, Donatello, Michaelangelo, or Raphael. Then take off after the bad guys. Your first stop is April's flaming apartment. You battle member after member of the Foot Clan. Some are armed, while others have only their ninja skills as weapons. If you defeat all of them and outlast Rock Steady, then it's on to Times Square.

Pick up a pizza for an extra life; watch out for Bebop by the convertible! Next, it's the SoHo Sewers, complete with rats and robots! Then, Vinnie's Valet Parking Garage, Madison Square Avenue, Rock-a-fella Expressway, the Rock Quarry Factory (lair of the Stone Warrior), and finally, level 8, the Technodrome! This is where you meet all your opponents for the ultimate showdown.

As you take on a Turtle persona, you need to realize that each Turtle prefers a different weapon. This means that each fights a little differently. Experimentation will tell you which Turtle best fits your style of gameplay. One hint: Each Turtle has an awesome side drop kick.

We found a lot to like about this game. There is something in Teenage Mutant Ninja Turtles for everyone. We'll let the players speak for themselves:



Raphael, armed with a pair of Sai daggers and a bad attitude, takes on Shredder's goons in April's burning apartment.

Michael, age 4: "I like the Turtles! It's my new Turtle videogame. I'm Michaelangelo, and I get rid of those guys! Even the robots. I got 67 points—all by myself!"

Katelyn, age 6: "I like this game 'cause it's fun. I think it's a little hard, though. I like using Leonardo because he has longer swords."

Meaghan (our family's top scorer), age 10: "I like the Turtles Arcade Game. I like Raphael the best. The graphics are great. It's easy, too. Not complicated. But it's a challenge to really win."

Robin, age of discretion: "The graphics are good; the sound, even better. I don't have to go blind to find the password, since it's printed on white paper. I like the fact that the Turtles have different abilities. It makes things more individual and less boring. Donatello is my preferred hero. The game is challenging, but not so much so that you give up on it. But I have to admit that it makes my hand sore."

David, age 40 or so: "It's one of the few arcade games I like. Maybe because it's one of the few I find playable. Great graphics and sound. Now, if I could just outscore my daughter!"

Kacey and Kelsey, age 15 months, are twins of few words. We can only go by their reaction whenever they hear the music. They love it. They bob, dance, grin, and clap their hands.

OK, so much for the family's individual opinions. We like a game that gives the little kids a chance. Many arcade games require too much coordination for small hands. This can be frustrating to a little guy who's just trying to have some fun. This game has familiar characters, exciting battles, and an ease of play that enables little people to play like the big kids. I'm not advocating that such a game should take the place of an educational game, but everyone likes something that's just plain fun.

Konami is generally pretty thorough in what it does. This program is no exception. One manual serves all versions, with an insert to amend instructions to accommodate Commodore differences. The manual is just what you need to get going. It's concise, informative, and entertaining. However, it is misleading in one item. The manual claims that after your last Turtle life ends (you get three), you are offered two options, Continue or End Game. The Continue option allows you to pick up at the scene where you left off, and you're allowed to do this up to three times. It doesn't happen this way, however, in the 64 version. The death of the last Turtle means the end of the game. There's no explanation of why the 64 doesn't have this option. It's a shame, because such a feature would be a terrific plus.

This misinformation in the manual seems to be the only negative point in a game that is otherwise exciting and lots of fun. When an arcade game is translated into a computer videogame, it can bring the fun home—and even save a few quarters. Teenage Mutant Ninja Turtles—The Arcade Game does this in a very capable, enjoyable fashion that appeals to those aged 4 to 40

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THE SIMPSONS ARCADE GAME

Hey, dudes! Grab your skateboards and get ready for action with The Simpsons Arcade Game by Konami. Homer, Marge, Bart, and Lisa will lead you on a wild chase through the streets of Springfield. They're trying to rescue little Maggie Simpson from the jewel thieves who kidnapped her after she accidentally swallowed a valuable jewel.

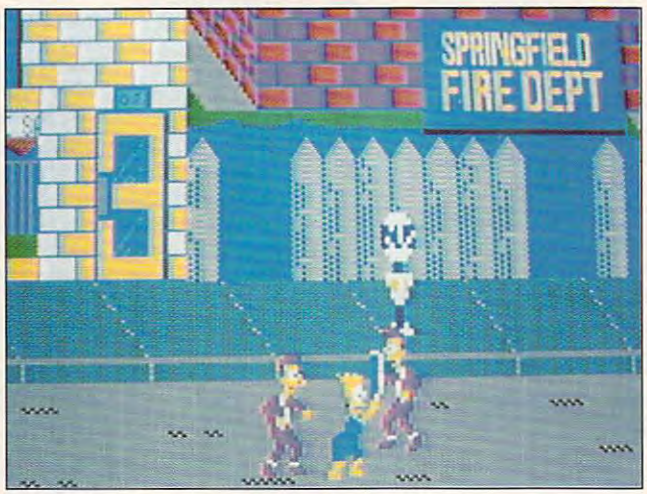
Simpsons fans will enjoy the colorful graphics and lively music in the opening animation sequence, which sets the scene for the game. You can bypass the animation with a click of your fire button.

The game has two double-sided disks that offer you eight increasingly difficult levels of play. On each level you'll meet a variety of foes who attempt to prevent you from finding Maggie.

You'll face off against ghosts, zombies, tavern thugs, yes-men, and other foes too numerous to mention. The bad guys seldom appear alone. Since the game offers you a two-player option, you can team up with another player and use tag-team tactics against the bad guys.

The Simpson characters are easily recognizable, even though the game relies more on color than on detail to portray them. Other characters from the popular television show, like Krusty the Clown, Mr. Burns, and Smithers, will join in the campaign to stop you from advancing in your search.

Each Simpson is equipped with a special weapon to help him or her fight any villains who block the way. Lisa lashes with her jump rope, Bart bashes with his skateboard, Homer hammers with his fists, and Marge is a maniac with her vacuum cleaner and towering hairdo.



Each Simpson is equipped with a special weapon to help him or her fight any villains who block the way.

Each Simpson begins the game with four lives, but you should plan to lose a few until you get the hang of the game. You'll have fun testing each character's fighting skills alone and in combination until you find the single character or team that suits you best.

A status window at the bottom of the screen will keep you advised of how well you're doing throughout the game. It shows how many villains you've defeated, the number of lives you have left, and the amount of energy remaining for your character (or characters). The energy level tells you when it's time to look for burgers and other goodies to restore some of your strength.

From time to time, comments from your character appear in a message balloon that's also in the status box. These comments are typical of whichever Simpson you're playing, but they won't help with the game. Nor do they have much to do with what's happening on the screen.

One of the drawbacks of the game is that the status window doesn't show you the hit power or the energy of your foes. This makes it difficult to judge how well you're doing during an attack. Since the competition gets tougher on every level, your character will lose more energy when hit, but you won't be able to tell how much damage you're inflicting on your foes.

Most levels have a particularly strong "boss" character whom you must defeat in order to advance to the next level. It would be especially helpful to know how much damage your blows have inflicted on these super bullies. In most cases, you'll find it takes 1–3 hits to best an ordinary bad guy and about 20 hits to finish off a boss. When you've defeated 50 bad guys, your character earns another life.

Don't expect the instruction manual to offer you much help. This is one of those games that you'll learn while you play it. In fact, there are times when the manual is a bit misleading. For example, the pictures of level 2 and level 5 are reversed in the manual. It also tells you that since the undead creatures on the cemetery level can't be killed, you must try to find an escape route. However, it doesn't offer any clues as to which enemies are undead and which are living.

Appearances are deceiving, too. The ghost dangling from a rope isn't a ghost at all. It's a bad guy hiding in a tree. (Jump up and hit the tree to knock him down.)

As for that escape route, you'll quickly discover that you can't run away from the enemies. You'll be unable to move beyond the end of any screen as long as there are foes alive onscreen. Don't toss the manual away, though; you'll need it for the passwords that are printed in the back to start the game. After that you're on your own.

The more you play The Simpsons Arcade Game, the more you learn! That's part of the appeal of this challenging game.

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Check Register's main menu is extensive, but easy to use and understand. From there you can enter check information, record deposits and withdrawals, check off transactions that have cleared the bank, print checks, load files, and perform numerous other functions. Most selections are made by pressing a function key.

Each selection has its own menu, which allows you to carry out specific tasks easily. Any transaction can be edited at any time, making the correction of errors hassle-free. You can edit and delete transactions, insert memos, and swap transactions. Check Register also allows you to format new data disks from within the program, a feature I appreciate in any software.

Before setting up your business or personal checking files, it would be wise to browse through the sample files that come with the program. These are the files of a Mr. Jones, which include his check register, recurring payee file, and check format file. Read through these and experiment with the program's various functions to become familiar with them.

Depending on how large your files are, entering your records can be time-consuming. This doesn't need to be done at one sitting, however; you can save your files and add to them or edit them at a later time.

Check Register can do more than simply keep track of your checking account; it can write checks as well. If your bank doesn't supply form-feed checks, you can order checks and other computer forms from the address given in the manual.

A computer printout ruler, available in most office supply stores, will prove useful when setting up your check format file. This ruler can help you determine the exact spacing required for printing out your checks. Check Register is quite flexible, limited only by your printer and interface features.

Check Register also offers the feature of printing out reports, useful for tax or budgeting purposes. Your register data may be printed out by transaction and reference numbers, by reference numbers and date, by date only, or by payee.

Two other routines allow you to address large and small envelopes for recurring payees with addresses on file. This saves you the trouble of switching to a program to print out labels or addressing them by hand.

The check register portion of the program is easy to use. The initial setup will be the most difficult part of using the program. One minor item to note: When first signing on, you're asked to enter the date in MMDDYY format. Don't put spaces between the numbers; the program won't accept them.

The second part of this program is the S.E.C. Financial Loan Consultant. There's no mention of this section in the manual. Although this part of the program is easy to use, a few words of guidance would've been appreciated.

There are six parts to this section, with room for expansion. When you supply financial information at the prompts, the program will determine the amount of your recurring loan payment and the amount of the final payment. It will also determine terms of a loan, the balance of a loan, and what the total cost would be to borrow an amount of money. It will also analyze the loan and provide amortization information. This feature can help you decide whether or not to buy a car or equipment for your business.

I'd like to see two items improved in future releases. My first request would be for a bit more guidance in the manual; I like lots of detailed instruction. Although Check Register is a very easy program to use, there were a couple of times when I had to stop and decipher what was happening. My other suggestion would be to let the user alter the black and green screen colors.

Otherwise, I consider this a well-thought-out program that can take some of the time-consuming burden out of running a small business or managing your personal checking account.

CHERYL TURNEY

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PROGRAMMER'S PAGE

Randy Thompson

REAL PROGRAMMERS OWN 64S

Computing has changed in the last few years. It used to be that owning a computer meant learning about how it worked and how to program it. In fact, you couldn't even run a program without first getting acquainted with BASIC's LOAD and RUN commands.

This isn't true anymore. Today's software boots automatically, and programming languages such as BASIC are considered optional. The computer industry believes that the less you have to know about a computer the better. Beware this user-friendly attitude that ignorance is bliss.

If you want to be a hot programmer, learn how your computer works. Learn all you can. Learn its capabilities and its limitations. Most important, learn its hardware. Why? Because when you know this, you'll know what your computer can do and how to do it.

Commodore 64 programmers understand this. With a built-in BASIC that lacks commands even to change the screen's colors, 64 owners learn quickly what a hardware register is and where it's located in memory. For example, how many of you don't know the function of location 53280? What about 53281 or 54296? And what true Commodore hacker doesn't know what's stored in memory between 1024–2023 or what important value is kept in location 646?

Those who program the 64 don't care if their computer is considered crude by the rest of the industry. That's because they realize that hacking the bare metal is what programming is all about. Experimenting with the computer's operating system, interrupts, and video chips is what makes owning a computer so much fun. Sure, the 64 may be primitive compared to the Amiga, but it's still one of the greatest machines around for the hobbyist.

Today's more powerful computers come with high-level languages that take the work out of programming. Ironically, I believe that programmers are losing their edge because of it. You no longer need to understand what binary is to display a bitmapped picture, or how your computer's DOS works to open a file, or where your video registers are located to darken your screen. Unfortunately, too many programmers aren't bothering to try. They're spending more time learning about programming languages than learning about the computers they program on.

I think you should understand your computer first. Whatever programming language you choose to learn is, for the most part, incidental. If you know how your computer operates, you'll know the most efficient ways to control it, no matter what language you select. High-level languages are good as long as you don't forget the computers they're designed to control.

There's also a trend toward writing generic, abstract code. This type of programming produces software that can be easily maintained and transferred to other computers. This is fine (and crucial) for many business applications. But these types of programs are, by nature, bigger and slower than programs that have been written specifically for one computer by a programmer who takes advantage of what that machine has to offer. In my opinion, the best programs don't run on other brands of computers without significant modifications to the programs' codes.

Whether you own a 64, 128, Amiga, or MS-DOS clone, it's your duty to understand the hardware you program. Let's push these machines to the limit. After all, isn't that what owning a computer is all about?

Stepping down off my soapbox for a second, I'd like to make a request. I'm looking for some neat raster interrupt routines. I'd like to publish a column of impressive raster video tricks. Such routines may display a multitude of sprites, change video modes on the fly, animate the screen's borders, or whatever else you can imagine. Your program should be as short as possible (certainly no larger than what can be listed on this page) and preferably submitted on disk. If possible, try to make your routine something that can be easily included in a BASIC program. This way, all programmers will be able to make use of your efforts. As usual, we'll pay you for any tip we publish.

If you want to be a hot programmer, learn how your computer works. Learn all you can.

In the meantime, try running the following pseudo raster interrupt program on your 64. (Your 128 can run this, too, but the effect will be different). Enter it exactly as shown here, with no spaces. Watch carefully. Enter a comma, a period, and 18 colons after the first POKE53280. Also, notice that there's no line number after the GOTO command. Sure, it's weird looking, but try it anyway. It might surprise you.

```
0 POKE53280,.::::::::::::::::::
  POKE53280,7:GOTO
```

"Programmer's Page" is interested in your programming tips and tricks. Send them to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We pay $25–$50 for each tip we publish. ❐

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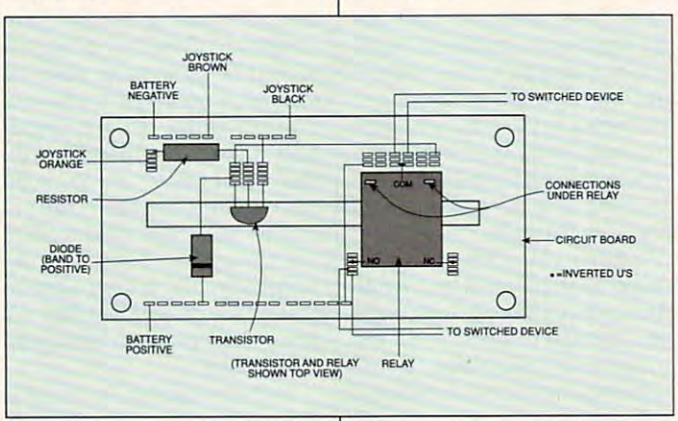
Larry Cotton

MORE JOYSTICK OUTPUT

Build this simple interface, and you can use your 64's joystick port to control small electrical devices.

Last month we saw how to use a joystick port as a miniature user port. With a short BASIC program, we controlled an LED connected to a joystick cable. Now let's expand on that idea so that we may control a small electrical device. To do this, we'll build an interface on a Radio Shack IC breadboard that will connect the 64 and the device. The interface will use the fire button wire to control a small relay.



WARNING: You must be thoroughly familiar with electronic construction techniques and associated safety precautions before attempting this project. The relay must switch only small electrical circuits operating on voltages safe to handle. In no case should switched currents exceed 1 amp (1000 milliamperes). Use adequate-sized wiring from the relay to your appliance, or use several wires in parallel. Carefully follow these step-by-step instructions based on the parts list printed at the bottom of the page. Also, refer to the accompanying diagram.

1. Of the five relay leads, bend the three thick ones to a horizontal position. The center lead at one end of the relay is the common contact; the other two are the normally open (NO) and normally closed (NC) contacts.

2. Make three small inverted-U loops of bare connecting wire approximately one-half inch long. Use these to connect the three main relay switching contacts to the circuit board.

3. Solder the tops of the inverted-U loops to the three main relay leads, with the six short (one-fourth inch) leads pointing down.

4. Plug all six leads into the circuit board so that the common contact is in one group of socket holes and the normally open/normally closed contacts are in another. (The two groups of holes are electrically divided by the channel that runs down the middle.) Ensure that the two small coil contacts under the relay are plugged into the same group of holes as the common switching contact. Make sure that any wire or wires running from the relay contacts to your electrical device are of adequate size to handle the associated current.

5. Solder short pieces of connecting wire to the nine-volt battery connector; plug them into the two outside rows of holes on the board carefully noting polarity. Don't connect the battery yet.

6. Plug in the transistor with the flat face as shown in the diagram printed above.

7. Connect the diode from the transistor to the positive edge of the board. The band on the diode should be toward the positive terminal.

8. Connect the resistor between the transistor and an unused row of holes.

9. Connect wires from the transistor and the positive edge of the board to the two hidden relay coil leads.

10. Connect a short jumper from the transistor to the negative edge of the board.

This completes the construction of the interface. Now run last month's program and make sure that the LED still flashes. Turn off the computer and unplug the joystick cable from the computer. Remove the LED; plug the orange, black, and brown wires into the circuit board as shown; and then enter this program.

```
AS 10 PRINT"{CLR}"
DM 20 PRINT"{2 DOWN}PLUG
      CABLE INTO PORT 1
      {DOWN}
HH 30 NT=400:FT=400:B=3:
      REM ON TIME, OFF T
      IME AND NUMBER OF
      {SPACE}BLINKS
BS 40 IFPEEK(56321)=255T
      HEN40
QP 50 POKE56323,17
CS 60 POKE56321,16:PRINT
      "ON"
EH 70 FORT=1TONT:NEXT
RK 80 POKE56321,0:PRINT"
      OFF"
MD 90 FORT=1TOFT:NEXT
CM 100 IFPEEK(56321)=238
      THEN120
CP 110 GOTO60
PX 120 POKE198,0
QB 130 POKE56323,0
```

Connect the nine-volt battery and run the program. At

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the prompt, plug the joystick cable into port 1. The relay should now start clicking regularly. Its contacts are alternately opening and closing, with their status printed on the computer screen. Note that the keyboard won't respond as long as the joystick cable is plugged in.

Now unplug the cable. The program ends, the relay stops clicking, and the keyboard again responds normally. Disconnect the battery. If you are experiencing any problems at this point and your circuit isn't performing as described, check your wiring carefully and make sure you have a good battery.

Use the common contact and either the normally open or the normally closed contact of the relay to switch a small electrical device. Observe the precautions stated above. Always use electrical tape or shrink tubing to insulate live leads from each other, yourself, and others.

Of course, this project only hints at your computer's potential for controlling electrical devices. The two basic categories of devices which can be controlled are those which need sophisticated timing and those which sense external events. By modifying the program and adding more interfaces, up to five circuits can be controlled independently from one joystick port.

In the first category, your computer can control devices such as solenoids. Timing can be implemented by using either the TI function (the most accurate) or by using FOR-NEXT loops. I had fun building a model of a "drummer boy" which uses low-voltage relays and small solenoids to control its drumsticks. By paying careful attention to its construction, I was able to make the model look realistic. With a few changes in the program, I was able to make his marching drum patterns varied and sound even more authentic.

In the second category, the computer can sense various parameters of the environment. The other joystick (or user) port could be connected to sensors which detect electrical resistance changes or on/off signals. Resistance can vary by light with photoresistor cells or by heat with a thermistor. It can also be changed manually by using a potentiometer, such as that found in computer paddles. By using your imagination and a little knowledge of electronics, you can have your 64 controlling any number of sophisticated appliances and gadgets.

The following list of parts has Radio Shack stock numbers listed as a convenience. Similar items should be available at any well-stocked electronics store for less than $20.

PARTS LIST

- Circuit board, RS 276-175
- 2A SPDT nine-volt coil relay, RS 275-005
- MPS2222A transistor, RS 276-2009
- 1N914 diode, RS 276-1122
- 1000-ohm resistor, RS 271-023
- Nine-volt battery connector, RS 270-325
- Nine-volt battery
- Joystick cable
- 24-gauge solid wire
- Electrical tape or shrink tubing for exposed wires ❐

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MACHINE LANGUAGE

Jim Butterfield

SCREEN EFFECTS

When a program is doing a great deal of computation, it may step the border color to indicate that the computer is active. Machine language programs can do this with a single instruction: INC $D020. Since this instruction doesn't affect the A, X, or Y registers, it's easy to slip it into a program loop. It'll produce a dazzling color display.

The address shown above produces a whole-screen effect by means of a single data store to memory. Sometimes, however, we have good reason to go after the individual characters on the screen. Modifying a thousand distinct character positions in a reasonable amount of time calls for machine language speed.

Modifying a thousand distinct character positions calls for machine language speed.

The character cells of the 64's screen can be referenced directly. Each character occupies a byte of memory. Screen memory usually starts at address $0400 (decimal 1024), with the last byte at $07E7 (decimal 2023). There are also 1000 color nybble locations starting at $D800 (decimal 55296). If we wish to perform screen work without flicker, it's best to wait until retrace time. The video screen is "painted" 60 times a second (50 in Europe). After drawing the screen, the video beam moves back to the top, or retraces. That's the moment we've been waiting for. Our program may then go to work without screen jitter. The action must be performed quickly, but machine language is fast enough for the job.

Our program is called Wipe, and it'll run through the screen 40 times. Each time it'll reverse one column of screen data. The effect is that of a video wipe effect, moving from left to right.

The 40 separate runs are counted in the Y register. The contents of Y also serve to specify the column to be modified on each pass.

```
2000 A0 00      LDY #$00
2002 . . .
202F C8         INY
2030 C0 28      CPY #$28
2032 D0 CE      BNE $2002
2034 60         RTS
```

Within each pass of the loop, we wait until screen retrace takes place. This serves two purposes: It keeps the screen free from flicker and slows down the wipe effect so that it looks better. To check for retrace, watch the two highest bits of location $D011; when its value goes down, we know that the screen has just begun to retrace.

```
2002 AD 11 D0   LDA $D011
2005 29 C0      AND #$C0
2007 CD 08 21   CMP $2108
200A 8D 08 21   STA $2108
200D B0 F3      BCS $2002
```

Note that there's an instruction sandwiched between the test (CMP for CoMPare) and the Branch (BCS for Branch Carry Set). This STA instruction doesn't affect the flags produced by CMP.

As our program goes down the screen a line at a time, it sets the top-of-screen address, $0400, into the indirect address at $FC and $FD. After each line has been handled, the program adds 40 to this address, moving to the next line. Before looping, the program tests the address to see if it's reached the end of the screen address area.

```
200F A2 04      LDX #$04
2011 A9 00      LDA #$00
; store a screen line pointer in FC/
FD
2013 86 FD      STX $FD
2015 85 FC      STA $FC
. . .
; move to next screen line (add 40
to FC/FD)
201D A6 FD      LDX $FD
201F A5 FC      LDA $FC
2021 18         CLC
2022 69 28      ADC #$28
2024 90 01      BCC $2027
2026 E8         INX
; compare pointer to end-of-
screen
2027 E0 07      CPX #$07
2029 90 E8      BCC $2013
202B C9 E8      CMP #$E8
202D 90 E4      BCC $2013
```

The code for the innermost loop is quite simple. The start-of-line has been stored in indirect address FC/FD; the column to be modified is in Y. To reverse the character, use the EOR (Exclusive OR) instruction to flip the high-order bit.

```
2017 B1 FC      LDA ($FC),Y
2019 49 80      EOR #$80
201B 91 FC      STA ($FC),Y
```

That's the whole machine language program. To put the program into a more convenient form for BASIC entry, a complete demonstration called Screen Wipe is supplied below.

```
BD 100 DATA 160,0,173,17
       ,208,41,192,205,8
       ,33,141,8,33,176,
       243
BQ 110 DATA 162,4,169,0,
       134,253,133,252,1
       77,252,73,128,145
       ,252
JE 120 DATA 166,253,165,
       252,24,105,40,144
       ,1,232
XG 130 DATA 224,7,144,23
       2,201,232,144,228
       ,200,192,40,208,2
       06,96
HA 200 FOR J=8192 TO 824
       4
DP 210 READ X
CG 220 T=T+X
FQ 230 POKE J,X
QF 240 NEXT J
HP 250 IF T<>7508 THEN S
       TOP
BQ 300 PRINT "SCREEN WIP
       E!"
FF 310 SYS 8192
GH 320 FOR J=1 TO 1000:N
       EXT J
RH 330 SYS 8192
```

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WORLD VIEW

Steve Jarratt

VIEW FROM THE U.K.

Few (if any) utilities are now released for the 64 in the U.K., so serious users look elsewhere for their software. Here are some sources.

A useful contact for hardened keypunchers is the Independent Commodore Products User Group. If you want more from your 64 than just a high score, write to Jack Cohen at ICPUG, P.O. Box 1309, London N3 2UT. For a fee of under $30, you get a bimonthly magazine, contact with other like-minded 64 users, and access to a massive library of public domain software.

Alternatively, you could try FSSL Computer Software, which stocks everything from video digitizers to GEOS-compatible programs—all for the 64. I don't have the address, but from the U.S., pick up the phone and dial 011 44 386-553153. (Remember the time difference!) Ask for its catalogue and then gasp in awe at its amazing range of peripherals and utilities.

Even though the 64 is a lowly 8-bit machine, that doesn't mean that you can't teach the old dog some new tricks. The most recent acquisition on the serious side of 64 software is Intro, a starter pack for electronic musicians. If you possess a MIDI-compatible synthesizer but have fingers like a gorilla, this sequencing software lets you use the 64 as an interface between you and the synthesizer's brain. Basically, it's like a word processor for music.

The package includes a hardware MIDI interface with a MIDI-In and two MIDI-Out ports, two five-foot MIDI cables, and version 2 of Dr. T's Keyboard Controlled Sequencer on disk. It's all good stuff, but then for around $250 (U.K. prices) it ought to be.

While the pack is ostensibly aimed at beginners, its user-friendliness is on a par with that of a four-year-old Doberman called Adolf. If you're not daunted by its alphanumerical tables and machine language–like instructions, then you're obviously from the planet Zog. The kit, however, is very powerful and covers an extensive range of editing and sequencing functions. I won't give you that bull about its making you the next Rick Wakeman (aged hippy keyboarder), but at least it'll keep you off the streets or give your joystick a rest. Intro is already available in the U.S., so if you're interested, write to Dr. T's Music Software, 100 Crescent Road, Needham, Massachusetts 02194 or call (617) 455-1454.

That's one for the musicians, so what about one for the artists? Well, there are enough paint packages around for the 64, but what about trying to create your own 3-D environment? Domark's 3-D Construction Kit enables you to do just that.

Using the Freescape 3-D modeling system pioneered by Incentive Software, this kit allows the user to build houses, rooms, spaceships—even small worlds—given enough time and patience. Once the modeling is finished, you can move around your construction and examine it in 3-D space. (I refuse to use anything as pretentious as virtual reality.)

There are special functions included that enable you to dictate what happens under certain criteria. For instance, you can fire a laser beam at a block, causing it to disappear, move sideways, or fall on top of your 3-D character! These functions are there as the foundation stones of puzzles, and while the kit is primarily designed as an interactive game-making package, the more ingenious modelers can indulge in all sorts of CAD-based diversions.

The 3-D Construction Kit, which includes a tutorial video, costs about $40 and can be obtained from Domark, Ferry House, 51–57 Lacy Road, London SW15 1PR.

One of the treats of being in touch with so many 64 users is the constant influx of demos. I'm not sure if this phenomenon is as big in the States, but in Europe there are hundreds of small bands of coders who like nothing more than making the 64 do things it was never designed to do.

These punk programmers push the beige box to its limit, producing visual and audial extravaganzas. Demo teams can create dozens of sprites on screen, rapid 3-D vector graphics, full-screen images without borders, pictures with more than three colors per character block, crisp sampled tunes, and clever raster line tricks. Sometimes it's difficult to believe that the 64 is responsible for such feats of computing prowess!

There are thousands of such demos in British PD libraries, but be warned: Since America's television system and electricity differ from Europe's, some demos won't work. For instance, it's a lot more difficult to put sprites in the border on a U.S. 64 because of the screen timing. For those that do work, however, it's well worth the cost of the airmail. You'll make your 64 sing and dance like never before.

Try dropping these guys in England a note: Binary Zone, 153 Farriers Corner, Westlands, Droitwich, Worcestershire WR9 9EX; Kingsway Computer Services, 72 Glencoe Road, Sheffield; Phoenix, 64 Plumberow, Basildon, Essex; and Silver Wing Software, 185 Callowbrook Lane, Rubery, Birmingham B45 9TG. ❐

Serious products and exciting new demo programs are still available for the 64 in England. Here are some sources for both.

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GEOS

Steve Vander Ark

GEOS GRAB BAG

Here's a look at a variety of old and new products and services of interest to GEOS users.

Well, it's been a year now since I first wrote this column. Over the past 11 months—remember that little "hiccup" in April?—I've covered a lot of GEOS ground. I've also heard from many of you, either via the U.S. Snail Mail or E-mail on QuantumLink. It's been interesting, to say the least.

A lot of the mail lately has been in response to the December column, in which I discussed Susan Lamb's geoStore. Susan has been unable to make a go of geoStore, unfortunately, and as a result hasn't been answering the many requests she's received for a catalog. It's always sad to see this kind of thing happen, especially since it means that most of you will never get to see any of Susan's excellent graphics.

If you're in the market for exceptionally high-quality clip art for GEOS, however, there's another place to turn. The folks who run a company called DigiClips (1401-7235 Salisbury Avenue, Burnaby, British Columbia, Canada V5E 4E6) have been proving themselves lately on Q-Link, where they go by the name Fasung Jai. These guys are dedicated to the Commodore computer; they pledge to support GEOS until their equipment melts down. They've been backing up their promise with exceptionally high-quality clip art uploaded to Q-Link. Their work includes line art, such as you'll find on a Newsroom disk, and highly detailed gray-scale images. Their graphics are some of the best I've seen for the Commodore, easily on a par with the kind of art files you'd find in a Mac or IBM package. Q-Link's libraries have a nice selection of DigiClips files available.

This brings up the subject of uploading and downloading files for GEOS, which is the best way to get the new utilities, graphics, fonts, and so on that come from other GEOS users. (It's also about the only way!) A new utility recently made available on Q-Link called geoPack (filename GEOPACK, uploaded by PeterMC3) lets you not only convert files back and forth between GEOS and standard Commodore formats, which is essential for any transfer of GEOS files via modem, but also archive (combine into one large file) groups of files for easier transfer. GeoPack does all this from within GEOS itself, which is a treat for people like me who hate to leave GEOS and stumble around, typing in clumsy DOS commands.

A lot of you have written to ask where you can find all these great GEOS files I talk about if you don't happen to be a Q-Link user. Last year, I published a phone number of a BBS in Grand Rapids, Michigan (where I live), that had an extensive GEOS file section. Unfortunately, the sysop of that board has decided to no longer support GEOS, so I've had to switch my allegiance to another local BBS. This board, Rogue River BBS, is one of the longest-running BBSs in the area. It's running on an Amiga, but the sysop, Jim Foley, cheerfully supports our local Commodore users group and has agreed to let me print his number. I'll be uploading to his board all of the public domain and shareware files that I've mentioned in my columns. Now, any GEOS fan can download them for the price of the long-distance call. The sysop assures me that you should have no trouble downloading on the first call since his BBS has no ratios or file points. Rogue River BBS can be reached 24 hours a day at (616) 361-8267.

Several other new products have been showing up in demo form on Q-Link. (Demo form means that all the features of the programs are not enabled, but users have a chance to sample before buying.) One eagerly awaited program is geoCanvas, a new paint program that allows you to open several windows on one or more documents.

GeoCanvas features many excellent drawing tools for creating high-resolution bitmaps, including some not available in geoPaint. As of this writing, geoCanvas is in Beta testing and is available to the public in demo form only.

Dave Ferguson, whose Dweezil Disks are a must for any GEOS user, has recently released Dweezil Label, a label-making program for GEOS. A new version of his popular geoStamp program, called GeoSTAMPbig, is also available. This new version will allow stamps that are four times the size of the old stamps. The stamp file-handling routines have been improved to make it a cinch to move through your collections and choose a stamp. Each of these great programs is available on Q-Link in demo form. You can order the Dweezil Disks direct from Quincy Software, 9479 East Whitmore Avenue, Hughson, California 95326-9745. Disk 1 ($17.95) features NewTools, and Disk 2 ($15.95) includes UltiPatt, the ultimate pattern editor. While you're at it, send Dave $4.00 for his *GeoPublish Compendium,* a ten-page booklet with supplemental sheets telling you everything you need to laser-print documents from GEOS, even if you don't own a laser printer.

Send your GEOS-related questions to Steve Vander Ark in care of COMPUTE. He can also be reached on QuantumLink as SteveV14. ❐

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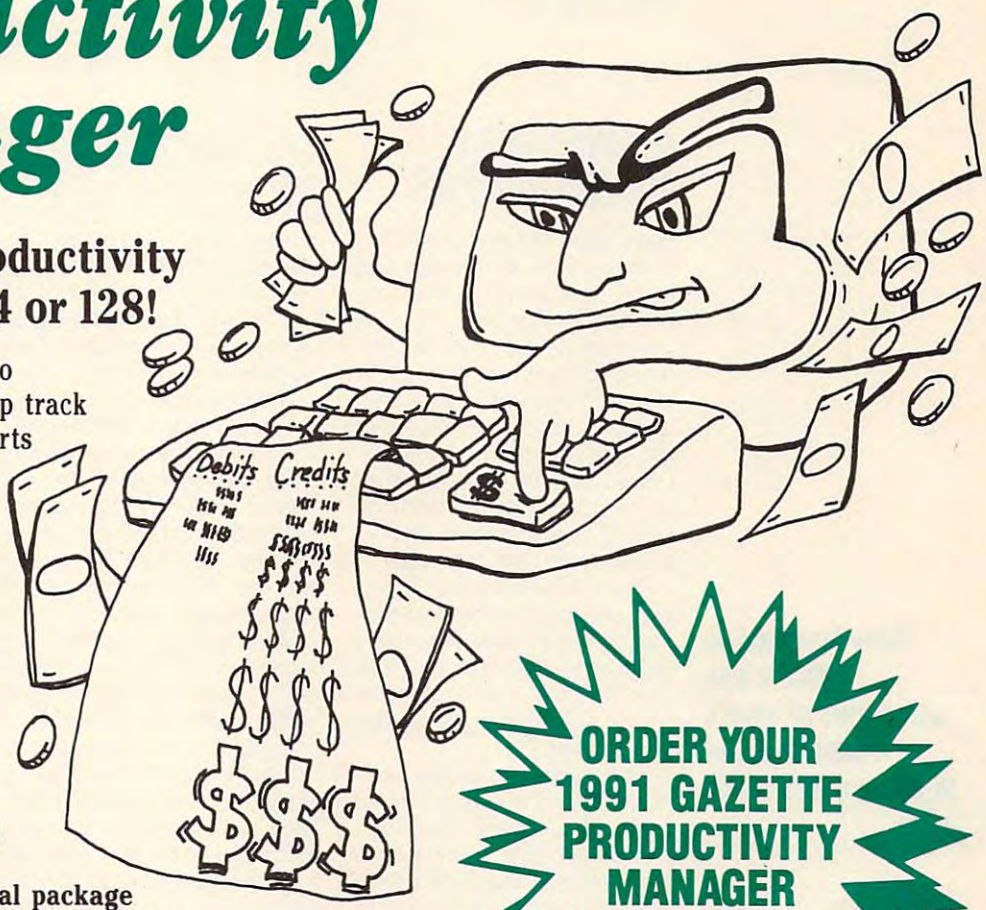

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D'IVERSIONS

Fred D'Ignazio

A SWARM OF NAKED PUPPIES

Have you ever thought of the contrast between the way you learn now and the way you learned as a child?

Recently, I've been an observer of two laboratories of learning: one in a high school and one here in my study. In the high school, I watch teachers learning on computers. At home, I watch two toddlers—Laura, 3, and Tommy, 2½—also learning on computers.

Body language is like a true confession of what's really going on in the learner's mind.

The contrast in their learning styles couldn't be more dramatic. And it's all in their body language. Body language is like a true confession of what's really going on in the learner's mind.

The teachers enter the computer lab at the high school in tight little clusters. They joke nervously and loudly, and they immediately ask where the rest rooms are and how soon they can have their first coffee break. When they sit at the computers, they push their chairs as far away from the tables as possible, sometimes so far that it's impossible to reach the computer keys.

Once the class begins, the teachers are supposed to begin team projects that encourage them to get up and move about. However, most teachers stay glued to their chairs, as if to say, "This is where we are supposed to learn. We are the audience; you are the performer. You jump up and down and be interesting, and we'll stay seated."

Tommy and Laura enter the study in a slightly different manner, more like shock troops, gangbusters, and tornadoes! By the time they get to the study, they have managed to lose most or all of their clothing and have become "naked puppies." And these puppies don't just mosey into the study—they swarm, they gallop, and they stampede! They bang open the study door; attack both of the computers by immediately pressing all the keys and jerking the poor little computer mice this way and that; and all the while giggle, shout, and jump around. And they never sit down!

The computers are usually in "sleep" mode when the puppies arrive. Their screens are lit up with little fishbowls or scenes of sleepy cityscapes. "Wake up, computer!" Laura yells, as she clicks the mouse and knock-knock-knocks on the computer screen.

"L-M-N-O-Z!" shouts Tommy, as he simultaneously presses 11 keys, using both his hands and his forehead.

Puppies swarm around the computers, and they love to print. They print immediately. They print constantly. They both know the key combinations to crank up the printer, and within a moment after they've entered the study, the printer starts spitting out pictures of crabs, cats, moons, and unicorns on skateboards.

As the puppies' teacher, I try to maintain a semblance of order in the classroom and break up fights. But, overall, the puppies get along pretty well, and I never have to remind them to stay on task.

What is their task? As their teacher, I try to lead them through their early learning programs, beginning at the beginning of the manuals and working toward the end. For some reason, this isn't the way puppies learn. While I'm still at the beginning of a manual, Laura is somehow in the icon-edit section of chapter 33, zooming in on icons, painting red hair on the sun ("See, Daddy. It's a happy face!"), and drawing legs on a pine tree. Meanwhile, Tommy is supposed to be using a music program, but he's found a key combination that turns the musical keyboard into a talking parrot. A moment later, he and Laura are talking into the computer microphone, trading insults with the parrot.

The teachers in the high-school lab spend six hours in a workshop, trying to learn more like naked puppies learn. And the miracle is that they succeed. Sometimes it takes the entire six hours, sometimes not. By the time they leave the lab, they, too, are swarming over the machines, talking, laughing, pressing buttons a mile a minute, making mistakes, and doing crazy, unpredictable, wonderful things.

Their body language tells all. As they transform from audience to performers, the teachers begin standing, walking, crouching, and crawling under tables, examining wires and cables. They carry a video camera up onto a table and shoot the classroom from a lofty angle, or they fall to the floor and adopt a toddler's eye view. As they begin to imitate my two little puppies, their excitement goes up, their enthusiasm goes up, and their noise goes up. And their learning. And their self-confidence. And their self-esteem. And their independence from their teacher.

I like adults who act like puppies. At the end of a long, exhausting workshop day, if I have a room full of big puppies (all with their clothes on, thank goodness!), I consider the workshop a success. And the teachers do, too. In fact, at this point, they don't care a bit what I think. They're too busy running around the room with video cameras, microphones, magic markers, and colored construction paper, working on projects galore. They're too busy to notice whether they even have an instructor.

That's when I know I've been a good teacher. ❐

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SUPERWINDOWS

By Cameron Kaiser

A problem with most computers is that your work is limited to one screen. That is, you have to deal either in text only or graphics only. Some programs offer double screens, but, invariably, one is too large and one is too small. Or they won't act like you want them to. In most cases, they're just a hassle. On the 64, the only way to circumvent this one-screen rule is through raster interrupts, but who wants to do all that work? With SuperWindows, you might not have to.

SuperWindows is a patch that forks into your VIC chip, giving you three screens instead of one. Each screen carries its own attributes, its own background color, its own screen memory (if you want it), and its own screen mode (the screens handle hi-res, too). Each screen can also be shrunk and enlarged to fit your program's needs.

Entering the Program

SuperWindows consists of two programs, Windowboot and Windows. Windowboot is written entirely in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader; see "Typing Aids" elsewhere in this section. When you've finished entering this short boot program, save it to disk before exiting Proofreader.

The main program, Windows, is written in machine language. To enter it, use MLX, our machine language entry program; again, see "Typing Aids." When MLX prompts, respond with the following.

Starting address: C000
Ending address: C10F

Be sure to save a program copy with the filename WINDOWS, because this is the name the boot program expects to load.

For some ideas on how to use SuperWindows effectively, examine Windows Demo. By following this demonstration program closely, you can discover many of the more extraordinary features of SuperWindows. It's written entirely in BASIC. Once again, enter it with The Automatic Proofreader to help avoid typing errors. Save it and Windows on the same disk.

Running the Program

To get SuperWindows up and running, run Windowboot. It loads and executes the main program and then returns you to BASIC. Four SYS codes control SuperWindows. SYS 49170 turns it on.

SYS 49346,*SM,MP,MB,SP,SC,EW* is the syntax for editing Window 1. *SM* is screen mode, the value normally going into location 53265. For text this value is 27; for hi-res, the value is 59.

MP is memory pointer, the value normally going into location 53272. Usually this value is 21 or 23.

MB is memory block, the value normally going into location 56576. Usually this value is 151.

SP is screen page, the value normally going into location 648. Usually this value is 4.

SC is screen color, the value normally going into location 53281. Set this value to whatever color you wish (0–15).

EW is end of window. For Window 1, the default value is 100. Any value less than 49 will go offscreen. Conflicts will result if the value exceeds the end of Window 2's value. Press Run/Stop–Restore if you have problems.

Window 2

SYS 49306,*SM,MP,MB,SP,SC,EW* is the syntax for editing Window 2. Note that the SYS code is less than that for Window 1. Watch out! The codes work the same as those in Window 1, with the exception that the default value for end of window is 192. Again, any value less than 49 will go offscreen and probably conflict with Window 1. Also, the end of window value for Window 2 mustn't exceed that of Window 3.

Window 3

SYS 49383,*SM,MP,MB,SP,SC,EW* is the syntax for editing Window 3. The default value for end of window is 255. Again, the end of window value should be greater than 49. It doesn't matter if the end of window value doesn't cover all the screen; Window 1 will wrap around to fill in the rest. Should you need to turn SuperWindows off, simply press Run/Stop–Restore. The values for the window parameters can be 0–65535; however, the high byte of the values provided, if any, will be stripped off.

One warning: Never use the disk drive while SuperWindows is active. Disable SuperWindows first, or disk damage could result.

WINDOWBOOT

```
CP 1 REM COPYRIGHT 1992 - COMP
     UTE PUBLICATIONS INTL LTD
      - ALL RIGHTS RESERVED
FH 5 IFA=0THENA=1:LOAD"WINDOWS
     ",8,1
FX 10 SYS49170:SYS49346,27,23,
     151,4,6,100:SYS49308,27,
     23,151,4,6,192
QD 20 SYS49383,27,23,151,4,6,2
     55:PRINT"{CLR}SUPERWINDO
     WS3.2 ENABLED"
HB 30 PRINT"DO NOT USE DISK DR
     IVE WHILE ONLINE";:NEW
```

WINDOWS

```
C000:00 00 00 00 00 00 00 00 81
C008:00 00 00 00 00 00 00 00 89
C010:8E C0 78 A9 7F 8D 0D DC DB
C018:A9 01 8D 1A D0 A9 03 85 BA
C020:02 A9 1B 8D 11 D0 AD 7C EC
C028:C0 8D 12 D0 A9 38 8D 14 1A
C030:03 A9 C0 8D 15 03 58 60 54
C038:AD 19 D0 8D 19 D0 29 01 29
C040:F0 19 C6 02 10 04 A9 02 5F
C048:85 02 A6 02 BD 7F C0 8D FC
C050:11 D0 BD 82 C0 8D 18 D0 AB
C058:BD 85 C0 8D 00 DD BD 88 86
C060:C0 8D 88 02 BD 8B C0 8D 02
C068:21 D0 BD 7C C0 8D 12 D0 5F
C070:8A F0 06 68 A8 68 AA 68 5F
C078:40 4C 31 EA 5A 38 01 1B D2
C080:1B 1B 17 17 17 97 97 97 88
C088:04 04 04 04 03 06 00 00 FD
C090:20 FD AE 20 9E AD 20 F7 5D
C098:B7 A5 14 60 20 90 C0 8D 3A
C0A0:7F C0 20 90 C0 8D 82 C0 21
C0A8:20 90 C0 8D 85 C0 20 90 4F
C0B0:C0 8D 88 C0 20 90 C0 8D 65
C0B8:8B C0 EA 20 90 C0 8D 7C AE
C0C0:C0 60 20 90 C0 8D 80 C0 C5
C0C8:20 90 C0 8D 83 C0 20 90 5F
C0D0:C0 8D 86 C0 20 90 C0 8D 45
C0D8:89 C0 20 90 C0 8D 8C C0 72
C0E0:20 90 C0 8D 7D C0 60 20 57
C0E8:90 C0 8D 81 C0 20 90 C0 15
C0F0:8D 84 C0 20 90 C0 8D 87 9E
C0F8:C0 20 90 C0 8D 8A C0 20 39
C100:90 C0 8D 8D C0 20 90 C0 EE
C108:8D 7E C0 60 9E 9E BE BE BB
```

WINDOWS DEMO

```
FX 1 IFPEEK(49170)<>120THENLOA
     D"WINDOWS",8,1
XE 10 PRINT"{CLR}{BLK}{N}{H}";
     :SYS49170:SYS49346,27,23
     ,151,4,3,100:POKE808,237
MK 20 SYS49308,27,23,151,4,14,
     192:SYS49383,27,23,151,4
     ,1,255:POKE53280,14
CM 30 PRINT"{HOME}{3 DOWN}"TAB
```


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```
      (14)"SUPERWINDOWS"
GA 40 PRINT"{7 DOWN}"TAB(6)"CO
      PYRIGHT 1992 COMPUTE INT
      'L"
JM 50 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED."
JX 60 PRINT"{8 DOWN}"TAB(6)"PR
      OGRAMMED BY CAMERON KAIS
      ER"
MA 70 FORX=8192TO10240:POKEX,0
      :NEXT
CH 80 POKE53280,15:SYS49346,27
      ,23,151,4,15,100:SYS4930
      8,27,23,151,4,15,192
QB 90 SYS49383,27,23,151,4,15,
      255
QE 100 POKE53280,12:SYS49346,2
      7,23,151,4,12,100:SYS49
      308,27,23,151,4,12,192
PB 110 SYS49383,27,23,151,4,12
      ,255
ER 120 POKE53280,11:SYS49346,2
      7,23,151,4,11,100:SYS49
      308,27,23,151,4,11,192
KB 130 SYS49383,27,23,151,4,11
      ,255
DD 140 POKE53280,0:SYS49346,27
      ,23,151,4,0,100:SYS4930
      8,27,23,151,4,0,192
KS 150 SYS49383,27,23,151,4,0,
      255:FORX=1TO900:NEXT
EX 160 PRINT"{CLR}{5}{8 DOWN}N
      ORMALLY YOU'VE GOT ONLY
       ONE SCREEN TO
      {2 SPACES}WORK WITH."
FM 170 FORX=10240TO12288:POKEX
      ,0:NEXT
GH 180 PRINT"THAT'S THE IDEA B
      EHIND SUPERWINDOWS."
GD 182 FORX=12288TO14336:POKEX
      ,0:NEXT
EK 190 PRINT"IT GIVES YOU THRE
      E SEPARATE SCREENS TO
      {2 SPACES}CONTROL."
RD 200 FORX=14336TO16383:POKEX
      ,0:NEXT
RA 210 PRINT"{CLR}SEE?";
BR 220 SYS49308,59,29,151,4,0,
      230:SYS49346,27,23,151,
      4,0,60:GOSUB63000
RS 230 PRINT"{CLR}SCREENS CAN
      {SPACE}BE RESIZED TOO..
      EVEN SHRUNK!";
BA 240 FORX=1TO84:SYS49308,59,
      29,151,4,0,230-X:SYS493
      46,27,23,151,4,0,X+60:N
      EXT
DF 250 SYS49308,27,23,151,4,0,
      230
HK 252 SYS49346,27,23,151,4,0,
      60
QB 253 PRINT"{CLR}AND THE SCRE
      ENS ACT INDEPENDENTLY O
      F{4 SPACES}EACH OTHER!"
QJ 254 FORX=1TO2500:NEXT
AJ 260 PRINT"{CLR}THIS SCREEN
      {SPACE}WON'T CHANGE..."
      :FORX=1TO1000:NEXT
QH 270 PRINT"{HOME}{8 DOWN}...
      BUT THIS ONE WILL!"
FH 280 FORX=1TO100:SYS49308,27
      ,21,151,4,11,230:SYS493
      08,27,23,151,4,0,230:NE
      XT
CQ 290 PRINT"{CLR}SO MANY EFFE
      CTS ARE POSSIBLE THAT T
      HIS{2 SPACES}DEMO CAN'T
       POSSIBLY SHOW";
HA 300 PRINT" THEM ALL!"
CC 310 FORX=1TO128:SYS49346,27
      ,23,151,4,X,100:SYS4930
      8,27,23,151,4,X+1,192
XD 320 SYS49383,27,23,151,4,X+
      2,255:NEXTX:PRINT"{CLR}
      ";
EB 330 SYS49308,27,23,151,4,0,
      192:SYS49383,27,23,151,
      4,0,255:FORX=1TO1000:NE
      XT
DS 340 PRINT"PRESS D TO SEE TH
      IS DEMO AGAIN."
KS 350 PRINT"PRESS RUN/STOP-RE
      STORE TO QUIT."
EJ 360 WAIT198,1:GETA$:IFA$<>"
      D"THEN360
QA 62999 RUN
DR 63000 FOR X=0 TO 289 STEP1.
      5
KQ 63010 Y=INT(90+80*SIN(X/10)
      )
XM 63020 CH%=X/8:RO%=Y/8
RX 63030 LN=Y AND 7
FP 63040 BY=8192+RO%*320+CH%*8
      +LN
FX 63050 BI=7-(X AND 7)
SP 63060 POKE BY,PEEK(BY) OR 2
      ↑BI
SR 63064 IFX=60THENPRINT"{CLR}
      {WHT}EXCITING!
      {6 SPACES}":SYS49346,
      27,23,151,4,14,60
PX 63065 IFX=120THENPRINT"
      {CLR}{BLK}PRETTY, RIG
      HT? ":SYS49346,27,23,
      151,4,4,60
DB 63066 IFX=240THENPRINT"
      {CLR}{5}BUT THERE'S S
      TILL MORE!":SYS49346,
      27,23,151,4,0,60
AC 63067 IFX=180THENPRINT"
      {CLR}{WHT}A POWERFUL
      {SPACE}UTILITY!":SYS4
      9346,27,23,151,4,3,60
KP 63070 IFX=60THENPRINT"
      {HOME}{23 DOWN}{BLK}I
      T CAN'T BE!"
JM 63071 IFX=60THENSYS49383,27
      ,23,151,4,15,255
AA 63072 IFX=120THENPRINT"
      {HOME}{23 DOWN}{WHT}T
      HIS IS AMAZING!"
BQ 63073 IFX=120THENSYS49383,2
      7,23,151,4,2,255
BH 63074 IFX=180THENPRINT"
      {HOME}{23 DOWN}{CYN}T
      HIS DEMO IS GREAT!"
GG 63075 IFX=180THENSYS49383,2
      7,23,151,4,11,255
XS 63076 IFX=240THENSYS49383,2
      7,23,151,4,0,255
FX 63079 NEXT
HF 63080 RETURN
```

Cameron Kaiser lives in La Mesa, California. He's the author of Batch File 64 (May 1992).

REVELATION

By Matthew Spinks

Most people who are familiar with the 64's graphics capabilities have used sprites at one time or another. They may have used one to create a pointer in a graphic-driven menu system or to display alien spaceships in a game. In most cases when sprites are used, they are high-resolution or multicolored objects, which contrast well against the background color. In some situations, however, sprites need not be visible to be effective. For example, setting a sprite to the background color enables it to reveal onscreen text smoothly, a pixel at a time.

To achieve this, an unexpanded sprite is created as a solid block measuring 8 × 8 pixels, or one character in size. The color of the sprite is set to that of the background color, and the sprite is then placed on the screen where the first character of the text is to be displayed. The first character is poked into the screen position where it's hidden by the sprite. As the sprite moves across the screen, the character is slowly revealed, pixel by pixel. When the character has been completely displayed, the next character is poked into position beneath the sprite. As the sprite continues to move across the screen, it reveals the text as it goes. This process is repeated until all the text has been displayed. The overall effect is that the text has been revealed pixel column by pixel column.

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are patterned or shaped. Thus, by having a sprite shaped as a right-angled triangle, characters could reveal a pixel a row at a time, pixel column by pixel column. By making use of sprite priorities, sprites could reveal first each other and then text, thereby producing a three-dimensional effect. Sprites can work together to reveal text in different places on the screen simultaneously or to reveal text vertically instead of horizontally.

Entering the Program

Revelation is written entirely in machine language. To enter it, use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: CDDC
Ending address: D003

Be sure to save a copy of the program before exiting MLX.

A demonstration program is also provided to show off some of Revelation's features. It's written in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader; again, see "Typing Aids." To use the demonstration, first load Revelation with the ,8,1 extension and then type NEW. Then load and run Demo.

Other Techniques

These are only some of the ways you can use Revelation. The technique can be adapted for all sorts of purposes. The only limitations on the process are those imposed by your own ingenuity. To use Revelation in your own programs, give the command SYS 52700,*X,Y,SP,A$*. After the SYS call, *X* and *Y* are the *x* and *y* coordinates of where the text is to be placed on the screen (ranges 0–39 and 0–255 respectively), *SP* is the speed at which the text is to be revealed (0 is the fastest speed, 99 is the slowest), and *A$* is the text string to be revealed. Be sure to put A$ text in quotation marks. For example, SYS 52700,0,0,0,"HELLO THERE" would print those words in the upper left corner of the screen at the fastest possible speed.

Revelation has considerable scope and flexibility. First, Revelation occupies the upper portion of the area $C000–$CFFF (49152–53247) so that the lower part of the area is still available for use by other programs.

Interrupts

Revelation is interrupt-driven as well. After you've given the SYS command to activate Revelation, you're free to continue with other processing. Revelation also has a latch mechanism so that if you give two Revelation SYS commands in succession, the computer will wait until the first command has finished before it attempts to process the second. This is useful if you only want to reveal text and do nothing else. (See the demonstration program for an example of this.)

Revelation will, as nearly as possible, emulate the standard PRINT command. All color codes, as well as reverse on and off, are supported. All parameters are fully evaluated. Thus the command SYS 52700,0,0,0, CHR$(5)+CHR$(18)+"HELLO THERE" will reveal the text in white reversed characters at the top left hand corner of the screen, at the fastest possible speed. Note that you must use plus signs to connect the character strings and text in this mode.

If a Y value of more than 24 is specified, Revelation will cause the screen to scroll, with the text being revealed on the bottom line of the screen. This is to allow scrolling of the screen, similar to the ordinary PRINT command.

Error checking is another supported feature. If any unprintable characters are entered—CHR$(0), for example—they won't be printed. This includes any cursor or other control characters not previously mentioned. Also, if the text to be revealed would wrap around onto the next screen line, either because the text to be printed is more than 40 characters long or because the specified *x* coordinate is too large, then an ILLEGAL QUANTITY error will be generated, because Revelation will reveal only one screen line at a time.

Revelation also includes a facility that allows you to define your own sprites. This is useful if you wish to employ one of the more complex revealing methods outlined above, such as using a shaped sprite, or if you need to use a VIC bank other than bank 0: Simply poke location 52916 with a 1 to use your own sprite.

Revelation expects you to use sprite 0. It's entirely up to you to specify sprite size, color, data location, and so on. Revelation will handle sprite positioning for you, however. Use POKE 52916,0 to return Revelation to its normal mode of setting up the invisible sprite for you.

Revelation should also peacefully coexist with any other software interrupt programs you may wish to use, so long as they aren't raster based. If you're using other software interrupt programs, enable them first and Revelation last. This will ensure that all programs receive their fair share of interrupts. Revelation also uses memory from the cassette buffer to store sprite and character data, so avoid this area while Revelation is in use.

REVELATION

```
CDDC:AD 15 03 C9 CF D0 07 AD 0F
CDE4:14 03 C9 35 F0 F2 20 00 6B
CDEC:E2 E0 28 90 03 4C 48 B2 CC
CDF4:8E F4 CF 20 00 E2 E0 19 77
CDFC:90 05 20 EA E8 A2 18 8E 65
CE04:F5 CF 20 00 E2 E0 64 B0 A8
CE0C:E4 8E F7 CF 8E F6 CF 20 CB
CE14:FD AE 20 9E AD 20 A6 B6 3C
CE1C:C9 00 F0 47 8D F8 CF A0 C1
CE24:00 8C FA CF 8C FF CF B1 F6
CE2C:22 A2 11 DD E0 CF D0 05 70
CE34:8A 09 80 D0 1A CA 10 F3 86
CE3C:C9 FF D0 02 A9 7E 48 4A 1B
CE44:4A 4A 4A 4A AA 68 38 FD EC
CE4C:D8 CF 90 0C EE FA CF AE CE
CE54:FF CF 9D 80 03 EE FF CF 45
CE5C:C8 CE F8 CF D0 C9 AD FA 32
CE64:CF D0 01 60 18 6D F4 CF 74
CE6C:C9 29 B0 81 AD F4 CF C9 12
CE74:1D 90 0C 48 AD 10 D0 09 23
CE7C:01 8D 10 D0 68 29 DF 0A BE
CE84:0A 0A 69 18 8D 00 D0 AD 14
CE8C:F5 CF 0A 0A 0A 69 32 8D E2
CE94:01 D0 AE F5 CF AD F4 CF 0B
CE9C:18 7D F0 EC 85 F9 85 F7 A9
CEA4:B5 D9 29 03 69 D8 85 FA 9D
CEAC:29 27 0D 88 02 85 F8 A9 94
CEB4:00 D0 31 A2 3F A9 00 9D 15
CEBC:40 03 CA 10 FA A2 15 A9 CB
CEC4:FF 9D 40 03 CA CA CA 10 29
CECC:F8 AD 17 D0 29 FE 8D 17 B9
CED4:D0 AD 1D D0 29 FE 8D 1D 74
CEDC:D0 AD 21 D0 8D 27 D0 A9 D3
CEE4:0D 8D F8 07 AD 15 D0 09 68
CEEC:01 8D 15 D0 AD 86 02 8D 37
CEF4:FD CF A9 00 8D FB CF 8D 44
CEFC:FC CF 8D FE CF 8D F9 CF 27
CF04:78 AD 14 03 8D 9F 02 AD 9A
CF0C:15 03 8D A0 02 A9 35 8D 61
CF14:14 03 A9 CF 8D 15 03 A9 21
CF1C:7F 8D 0D DC 2D 11 D0 8D 2B
CF24:11 D0 A9 FF 8D 12 D0 AD B9
```

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```
CF2C:1A D0 09 81 8D 1A D0 58 15
CF34:60 AE F7 CF F0 08 CE F6 E7
CF3C:CF 10 55 8E F6 CF CE FC EC
CF44:CF 10 3B AC F9 CF CC FF AA
CF4C:CF F0 57 EE F9 CF B9 80 EC
CF54:03 10 16 29 7F C9 10 90 A2
CF5C:0B 29 EF AA BD F2 CF 8D 5B
CF64:FE CF B0 DF 8D FD CF 90 20
CF6C:DA AC FB CF 0D FE CF 91 B6
CF74:F7 AD FD CF 91 F9 EE FB 86
CF7C:CF A9 07 8D FC CF AD 12 BC
CF84:D0 D0 FB EE 00 D0 D0 08 1C
CF8C:AD 10 D0 09 01 8D 10 D0 E0
CF94:A9 01 8D 19 D0 AD 0D DC C0
CF9C:29 01 F0 03 6C 9F 02 4C 91
CFA4:BC FE AD 15 D0 29 FE 8D 20
CFAC:15 D0 A9 00 8D 00 D0 8D DB
CFB4:01 D0 AD 10 D0 29 FE 8D 76
CFBC:10 D0 20 84 FF AD 1A D0 A0
CFC4:29 7E 8D 1A D0 AD 9F 02 6A
CFCC:8D 14 03 AD A0 02 8D 15 B0
CFD4:03 4C 94 CF FF 00 40 20 39
CFDC:FF 40 80 80 90 05 1C 9F 15
CFE4:9C 1E 1F 9E 81 95 96 97 4F
CFEC:98 99 9A 9B 12 92 80 00 28
CFF4:00 00 00 00 00 00 00 00 94
CFFC:00 00 00 00 00 00 00 00 9C
```

DEMO

```
MQ 100 REM COPYRIGHT 1992 - CO
       MPUTE PUBLICATIONS - AL
       L RIGHTS RESERVED
CE 110 REM WRITTEN BY M. SPINK
       S
HJ 120 :
MK 130 REM MAKE SURE LOADER IS
        IN MEMORY
XK 140 :
XA 150 V=53248:SA=52700:POKEV+
       32,0:POKEV+33,0:PRINTCH
       R$(147);:POKE646,14
AX 160 BL=52916:SYSSA,0,1,0,"T
       HIS DEMONSTRATION SHOWS
        HOW TEXT CAN BE"
RG 170 SYSSA,0,3,0,"REVEALED S
       MOOTHLY":SYSSA,27,3,0,"
       ON THE SCREEN"
MD 180 SYSSA,18,3,0,"ANYWHERE"
       :SYSSA,3,5,0,"TEXT CAN
       {SPACE}BE DISPLAYED IN
       {SPACE}ANY":A$=""
CJ 190 B$="COLOR":FORT=1TOLEN(
       B$):READX:A$=A$+CHR$(X)
       +MID$(B$,T,1):NEXT
BG 200 SYSSA,32,5,0,A$:A$=CHR$
       (18)+CHR$(158)+"OR WITH
        REVERSE ON AND OFF"
QB 210 SYSSA,7,7,0,A$:SYSSA,0,
       0,0,"":POKE646,4:POKEBL
       ,1:POKEV+39,5:POKEBL,1
QF 220 POKEV+39,4:SYSSA,5,9,0,
       "TEXT CAN ALSO BE CURSO
       R DRIVEN":SYSSA,0,0,0,"
       "
SF 230 POKEBL,0:SYSSA,4,11,0,"
       AND CAN BE REVEALED AT
       {SPACE}ANY":A$="SPEED"
BG 240 FORT=1TOLEN(A$):SYSSA,3
       0+T,11,T,MID$(A$,T,1):N
       EXT
QG 250 SYSSA,2,13,0,"TEXT CAN
       {SPACE}SCROLL LIKE NORM
       AL AS WELL:":POKE646,10
SR 260 Y=14:FORT=3.14TO6.28STE
       P.2:C=COS(2*T)+SIN(T):X
       =6*C+12:Y=Y+1
GE 270 SYSSA,X,Y,0,"SCROLLING"
       :NEXT:SYSSA,X,Y,0,"":FO
       RT=0TO1E3:NEXT:POKE646,
       3
FG 280 PRINTCHR$(147);:SYSSA,0
       ,1,0,"DISPLAY OF TEXT I
       S INTERRUPT DRIVEN TOO:
       "
MA 290 POKE646,13:A$=CHR$(18)+
       "THAT'S ALL FOLKS !!!":
       SYSSA,10,3,3,A$
XC 300 FORT=0TO4:PRINTCHR$(17)
       :NEXT:END
PH 310 DATA158,30,31,153,150,5
```

Matthew Spinks lives in Erica, Victoria, Australia. He's the author of Medium-Density Driver (September 1991).

FORMATTED LIST

By R. Markland

Formatted List is a programmer's utility designed to create more manageable hard copies of BASIC program listings for the 64. Formatted List produces uniform page breaks, rather than printing program lines over page perforations, and prints an identifying header and page number at the top of each page.

Typing It In

Formatted List is written entirely in machine language. To enter it, use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: C000
Ending address: C3B7

Be sure to save a copy of the program before you exit MLX.

Compatibility

In general, Formatted List is compatible with any printer, with or without an interface, that will normally print a program listing with OPEN4,4: CMD4: LIST and recognizes CHR$(12) as a one-byte form feed. Should you need another form-feed command, you may poke appropriate decimal values to 49424 and 49549 after Formatted List is loaded. Because Formatted List cannot recognize every conceivable printer/interface combination, it processes 50 BASIC program lines per page and then sends a standard ASCII form feed before starting the next page. You may also need to determine if your printer/interface must be set with linefeeds on or off. When some interfaces encounter cursor control or character color symbols, they automatically convert the symbols into words (*up, down, blue,* and so on). An 80-character BASIC program line may thus require more than one printer line. Usually, Formatted List can compensate for this. On rare occasions a program may contain a series of lines packed with control characters that, when expanded, will corrupt the page formatting. If you can set your interface to print the actual Commodore characters, it's advisable to do so to eliminate the potential problem. After Formatted List is loaded, you may adjust the number of BASIC lines per page by poking 49415 with a decimal value less than 50.

Features and Conventions

Formatted List should be loaded at the beginning of a programming session immediately after power-up by typing LOAD"FORMATTED LIST",8,1. Press Return and then type NEW and press Return again. Now load a program to be edited or begin work on a new program. To use Formatted List, in direct mode type SYS49152 and press Return. Screen prompts will ask for a header line, remind you to check the printer, and inform you that the listing may be aborted by pressing Run/Stop.

Formatted List will print a listing of virtually any BASIC program, from a single line up to more than 30K in length. The listing requires tractor feed paper and should be started with the printhead centered on a perforation if your interface expands lines. Otherwise, you may prefer to adjust the paper to center the text top and bottom. It's advisable to turn the printer off and on after the paper is aligned to establish proper page length.

In the interests of simplicity and compactness, Formatted List assumes that there's a BASIC program in memory and that a printer is connected, on-

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line, and loaded with paper. If you run the program without these conditions in place, Formatted List is likely to crash and/or lock up the keyboard. The title line may consist of 1–32 characters and may contain any combination of characters with CHR$ values in the range of 32–95 decimal values.

Formatted List will list the entire program from beginning to end. If you wish to list only a portion of a program, formatting is unnecessary. A range of lines may be specified in a standard CMD4:LIST *range* command. Should you decide that you need Formatted List after you have a BASIC program in memory, in direct mode, type PRINTPEEK(45);PEEK(46) and press Return. Record the values displayed. Then type LOAD"FORMATTED LIST"8,1 and press Return. Then enter POKE45,*v1*: POKE,*v2* and press Return (*v1* and *v2* are the values previously recorded).

Here's an important note: If you're test running a BASIC program that loads to or uses memory from address 49152, you'll overwrite Formatted List. Should this happen, reload Formatted List using the alternate loading method described immediately above. Keep in mind that if Formatted List has been overwritten or corrupted, any SYS 49152 call will no doubt send you on a one-way trip into the Silicon Cosmos, so be sure to save your work first as a precautionary measure.

FORMATTED LIST

```
C000:A9 01 85 CC A9 20 20 D2 F4
C008:FF A9 0D 20 D2 FF A2 00 73
C010:A9 20 9D 91 C3 E8 E0 20 DE
C018:D0 F8 A2 00 BD 71 C2 C9 97
C020:00 F0 06 20 D2 FF E8 D0 D9
C028:F3 A9 0D 20 D2 FF 20 D2 5B
C030:FF A9 20 20 D2 FF A2 00 FD
C038:8E 8E C3 86 CC AD 86 02 B1
C040:8D 87 02 20 E4 FF C9 0D 74
C048:F0 34 C9 14 D0 10 AC 8E 78
C050:C3 C0 01 90 E8 CE 8E C3 70
C058:20 D2 FF 4C 3D C0 AC 8E 38
C060:C3 C0 20 F0 D8 C9 20 90 C5
C068:D4 C9 60 B0 D0 20 D2 FF 8A
C070:AC 8E C3 99 91 C3 EE 8E 06
C078:C3 AC 8E C3 D0 BF A9 01 EE
C080:85 CC A5 C7 C9 00 D0 FA 14
C088:A9 20 20 D2 FF A9 0D 20 F8
C090:D2 FF 20 D2 FF 20 D2 FF D2
C098:A2 00 BD F1 C2 C9 00 F0 70
C0A0:06 20 D2 FF E8 D0 F3 A9 A3
C0A8:0D 20 D2 FF 20 E4 FF F0 98
C0B0:FB A9 30 8D B1 C3 A9 31 9A
C0B8:8D B2 C3 A5 2B 85 FB A5 8D
C0C0:2C 85 FC A0 02 B1 FB 8D BF
C0C8:B3 C3 C8 B1 FB 8D B4 C3 8C
C0D0:A9 00 AA A8 20 BD FF A9 A8
C0D8:04 A2 04 A0 00 20 BA FF 85
C0E0:20 C0 FF A2 04 20 C9 FF 01
C0E8:20 A0 C1 A9 00 8D B5 C3 DA
C0F0:20 E1 FF D0 03 4C 91 C1 36
C0F8:20 1A C1 A9 0D 20 D2 FF 72
C100:EE B5 C3 AD B5 C3 C9 32 3E
C108:D0 E6 A9 00 8D B5 C3 A9 57
C110:0C 20 D2 FF 20 A0 C1 4C 4F
C118:F0 C0 AD B3 C3 85 14 AD 3F
C120:B4 C3 85 15 20 13 A6 A5 31
C128:5F 85 FB A5 60 85 FC A0 4A
C130:00 B1 FB 8D 8F C3 C8 B1 47
C138:FB 8D 90 C3 AD 8F C3 85 24
C140:FB AD 90 C3 85 FC A0 02 DE
C148:B1 FB 8D B3 C3 C8 B1 FB 31
C150:8D B4 C3 A0 00 B1 FB D0 D9
C158:43 C8 B1 FB D0 3E 20 FF 65
C160:C1 A9 0D 20 D2 FF 20 D2 7C
C168:FF 20 D2 FF A2 00 A9 20 D6
C170:20 D2 FF E8 E0 21 D0 F8 6D
C178:A2 00 BD E2 C2 C9 00 F0 61
C180:06 20 D2 FF E8 D0 F3 A9 85
C188:0D 20 D2 FF A9 0C 20 D2 85
C190:FF A9 04 20 C3 FF 20 CC 2C
C198:FF 4C 74 A4 20 FF C1 60 EC
C1A0:A2 04 20 C9 FF A9 0D 20 F7
C1A8:D2 FF 20 D2 FF A2 00 BD 0F
C1B0:B2 C2 C9 00 F0 06 20 D2 2A
C1B8:FF E8 D0 F3 A2 00 BD 91 F1
C1C0:C3 20 D2 FF E8 E0 20 D0 64
C1C8:F5 A2 00 BD C0 C2 C9 00 70
C1D0:F0 06 20 D2 FF E8 D0 F3 B8
C1D8:AD B1 C3 20 D2 FF AD B2 BE
C1E0:C3 20 D2 FF A9 0D 20 D2 3D
C1E8:FF 20 D2 FF EE B2 C3 AD 46
C1F0:B2 C3 C9 3A D0 08 EE B1 D1
C1F8:C3 A9 30 8D B2 C3 60 A0 AD
C200:01 84 0F B1 5F F0 40 20 83
C208:2C A8 C8 B1 5F AA C8 B1 EA
C210:5F C5 15 D0 04 E4 14 F0 33
C218:02 B0 2C 84 49 20 CD BD BC
C220:A9 20 A4 49 29 7F 20 47 7A
C228:AB C9 22 D0 06 A5 0F 49 75
C230:FF 85 0F C8 F0 11 B1 5F 14
C238:D0 0E A8 B1 5F AA C8 B1 C2
C240:5F 86 5F 85 60 D0 B8 60 73
C248:10 DC C9 FF F0 D8 24 0F 88
C250:30 D4 38 E9 7F AA 84 49 C1
C258:A0 FF CA F0 08 C8 B9 9E 0C
C260:A0 10 FA 30 F5 C8 B9 9E 81
C268:A0 30 B7 20 47 AB 4C 65 2A
C270:C2 20 20 20 20 20 20 20 47
C278:45 4E 54 45 52 20 54 49 18
C280:54 4C 45 20 46 4F 52 20 22
C288:48 45 41 44 45 52 20 49 EC
C290:44 2E 0D 20 20 20 20 20 49
C298:20 20 20 20 20 28 31 20 60
C2A0:54 4F 20 33 32 20 43 48 3C
C2A8:41 52 41 43 54 45 52 53 6F
C2B0:29 00 4C 49 53 54 49 4E B5
C2B8:47 20 46 4F 52 3A 20 00 63
C2C0:20 20 20 20 20 20 20 20 46
C2C8:20 20 20 20 20 20 20 20 4E
C2D0:20 20 20 20 20 20 20 20 56
C2D8:20 20 50 41 47 45 20 23 47
C2E0:20 00 45 4E 44 20 4F 46 8B
C2E8:20 4C 49 53 54 49 4E 47 9B
C2F0:00 20 20 20 20 20 43 48 D4
C2F8:45 43 4B 20 50 52 49 4E 0A
C300:54 45 52 20 41 4E 44 20 3B
C308:50 41 50 45 52 20 53 55 75
C310:50 50 4C 59 0D 20 20 20 3C
C318:20 20 20 20 20 20 20 20 9F
C320:20 20 20 20 20 20 20 54 DB
C328:48 45 4E 0D 20 20 20 20 A1
C330:20 50 52 45 53 53 20 41 E3
C338:4E 59 20 4B 45 59 20 54 1A
C340:4F 20 50 52 49 4E 54 20 F2
C348:4C 49 53 54 49 4E 47 0D 17
C350:0D 20 20 20 20 20 20 20 4E
C358:20 20 20 20 20 20 20 44 04
C360:55 52 49 4E 47 20 50 52 E2
C368:49 4E 54 0D 20 20 20 20 65
C370:20 20 48 4F 4C 44 20 44 06
C378:4F 57 4E 20 52 55 4E 2F FC
C380:53 54 4F 50 20 54 4F 20 C6
C388:41 42 4F 52 54 00 00 00 F2
C390:00 00 00 00 00 00 00 00 18
C398:00 00 00 00 00 00 00 00 20
C3A0:00 00 00 00 00 00 00 00 28
C3A8:00 00 00 00 00 00 00 00 30
C3B0:00 00 00 00 00 00 00 00 38
```

R. Markland, who lives in Rawlins, Wyoming, has seen listing questions in Gazette many times and says it's time for a definitive solution.

BLANKER

By Charles W. Bozarth

Even with today's newer monitors, there's still a concern about burning a screen image into the picture tube. This can occur if the image on the monitor stays the same for long periods of time. IBM computers have a variety of utilities for blanking the screen while the computer isn't being used. Blanker is a similar screen-blanking utility for GEOS on the 64. It provides various ways to blank the screen from any GEOS program that uses desk accessories.

Entering the Program

Blanker is written in machine language. To enter it, use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: 0247
Ending address: 076E

Be sure to save two copies of the program to a GEOS work disk before exiting MLX. Since you can't enter GEOS

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programs directly, Blanker must be converted to GEOS format before it can be used. One copy of Blanker will be converted by GeoConverter 2.0 into a desk accessory. Keep the other copy as a backup in case something goes wrong with the conversion.

If you don't already have a copy of GeoConverter, we've included the listing here. The converter can be found on COMPUTE's GEOS Collection disk, and it was printed in "The GEOS Column," March 1990. Be sure to use "The Automatic Proofreader" (again, see "Typing Aids") to help prevent typing errors when you enter the program. Save a copy of GeoConverter to the disk that contains Blanker.

To prepare Blanker for use with GEOS, load and run GeoConverter. When prompted for a filename, enter the name you used to save Blanker. GeoConverter will then convert the file into a GEOS desk accessory format. Those who get Gazette Disk should copy Blanker to a work disk before making the GEOS conversion.

Using the Program

To start Blanker in most programs, select it either from the deskTop, or from the GEOS menu in other programs. A dialog box appears on the screen with four choices to blank the screen. Selecting Cancel will return to the application without blanking. Select one of the choices and then click on the OK icon to start the process.

Each option has its own unique way of clearing the screen. For example, Blank is the option that goes directly to blanking the screen with the border color. This is most effective if the border is a dark color such as the GEOS default of black. The Blank option has the same effect as turning off the monitor. Tilt, Dissolve, and Drip are additional choices. Drip is an especially amusing and realistic effect. You'll probably want to touch the screen to make sure it isn't wet. All of these options have the effect of turning off the monitor once the screen is erased.

While the screen is being erased, the mouse pointer moves to the bottom right corner of the screen. The blanking process can be stopped at any time and control returned to the application by pressing any key or clicking the mouse button.

Blanker was written for the 64 version of GEOS 2.0 using geoProgrammer software.

BLANKER

```
0247:0F 03 15 BF FF FF FF 80 B2
024F:00 01 BF FF FD B0 00 0D 4B
0257:A0 00 05 A0 00 05 A0 00 AB
025F:05 A0 00 05 A0 00 05 A0 0E
0267:00 05 A0 00 05 A0 00 05 70
026F:A0 00 05 A0 00 05 B0 00 E3
0277:0D BF FF FD 80 00 01 FF D7
027F:FF FF 4F FE 72 20 00 04 75
0287:3F FF FC 83 05 00 00 04 2F
028F:BA 2C 00 04 53 63 72 6E B7
0297:20 42 6C 61 6E 6B 65 72 3E
029F:56 31 2E 30 00 00 00 00 E3
02A7:43 68 61 72 6C 65 73 20 BA
02AF:57 2E 20 42 6F 7A 61 72 AD
02B7:74 68 20 0F 2C 00 00 44 AA
02BF:65 73 6B 20 61 63 63 65 87
02C7:73 73 6F 72 79 20 66 6F FF
02CF:72 20 62 6C 61 6E 6B 69 2D
02D7:6E 67 20 74 68 65 20 47 98
02DF:45 4F 53 20 73 63 72 65 3A
02E7:65 6E 2E 0F 34 00 00 20 B2
02EF:4E C1 20 B7 C1 00 60 99 73
02F7:08 40 1F 20 53 C2 00 C8 64
02FF:00 00 40 01 A9 80 85 2F A5
0307:20 B7 C1 1F 85 1E 29 9C C8
030F:03 20 B6 06 20 31 07 20 C9
0317:E6 06 A5 02 C9 02 F0 38 57
031F:A9 00 85 39 A9 04 8D A2 59
0327:84 A9 69 8D A1 84 A9 04 56
032F:8D A4 84 A9 69 8D A3 84 9D
0337:A9 01 85 3B A9 3F 85 3A 46
033F:A9 C7 85 3C A5 16 0A A8 C2
0347:88 88 B9 29 07 8D 9B 84 A7
034F:C8 B9 29 07 8D 9C 84 60 06
0357:AD 11 D0 09 10 8D 11 D0 CC
035F:A9 30 85 01 20 B7 C1 1E 88
0367:29 1F 85 9C 03 20 A5 C1 E9
036F:00 C8 00 00 40 01 20 B7 A5
0377:C1 99 08 00 60 40 1F 4C 54
037F:3E C2 A9 00 8D 9C 84 A9 1C
0387:00 8D 9B 84 A9 35 85 01 DA
038F:AD 11 D0 29 EF 8D 11 D0 06
0397:60 A9 04 8D 9C 84 A9 C7 A3
039F:8D 9B 84 A9 A0 85 03 A9 49
03A7:00 85 02 A9 00 85 05 85 8F
03AF:06 A9 5A 85 07 60 A6 05 D2
03B7:A4 06 B9 28 05 A8 B1 02 7B
03BF:3D 20 05 91 02 20 0A 05 CF
03C7:18 A9 0A 65 02 85 02 90 96
03CF:02 E6 03 A5 03 C9 BF D0 DA
```

(not typed in)

GEOCONVERTER 2.0

```
BA 10 REM COPYRIGHT 1992 COMPU
      TE PUBLICATIONS INTL LTD
       - ALL RIGHTS RESERVED
SE 20 IF(PEEK(772)+PEEK(773)*2
      56)=42364THEN40
PD 30 LIST0,1:LIST4,1:LIST6,1:
      SA=PEEK(4625)*256+PEEK(4
      624):GOTO50
SX 40 POKE56,PEEK(46)+40:CLR:P
      OKE53280,0:POKE53281,0:S
      A=PEEK(56)*256+PEEK(55)
QQ 50 PRINT"{CLR}{8}{N}{DOWN}"
      TAB(12)"{RVS}GEOCONVERTE
      R 2.0{OFF}{GRN}{3 DOWN}"
      :PRINTTAB(13)"COPYRIGHT
      {SPACE}1992{DOWN}"
KR 60 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS INC.{DOWN}":PR
      INTTAB(11)"ALL RIGHTS RE
      SERVED{2 DOWN}"
MK 70 N=8:PRINT"DRIVE NUMBER "
      N"{4 LEFT}";:INPUTN:IFN<
      8ORN>11THEN70
QE 80 K$="N":PRINT"IS DRIVE"N"
      A 1581? "K$"{3 LEFT}";:I
      NPUTK$:IFK$<>"N"ANDK$<>"
      Y"THEN80
SB 90 T$=CHR$(18):S$=CHR$(1):I
      FK$="Y"THENT$=CHR$(40):S
      $=CHR$(3)
RS 100 INPUT"FILE TO CONVERT";
      NM$:OPEN15,N,15:OPEN1,N
      ,8,"0:"+NM$+",P,R"
BX 110 GOSUB440:IFEN<>0THENPRI
      NT"{RVS}"EN$" "EM$ET$EE
      $:GOTO400
FF 120 GET#1,K$,V$:IFK$<>CHR$(
      71)ORV$<>CHR$(2)THENCLO
      SE1:CLOSE15:GOTO220
BR 130 PRINT"{DOWN}DECOMPRESSI
      NG...":Z$=CHR$(0):GET#1
      ,ESC$:ESC=ASC(ESC$+Z$):
      AD=SA
RQ 140 GOSUB170:IFV<>ESCTHENPO
      KEAD,V:AD=AD+1:GOTO140
PP 150 GOSUB170:CT=V:GOSUB170:
      CT=CT+V*256:GOSUB170:GO
      SUB160:GOTO140
DH 160 FORI=1TOCT:POKEAD,V:AD=
      AD+1:NEXTI:CT=0:RETURN
PK 170 GET#1,V$:S=ST:V=ASC(V$+
      Z$):IFST=0THENRETURN
SJ 180 IFS<>64THENGOSUB440:PRI
      NT"{DOWN}LOAD ERROR ~
      {RVS}"EN$" "EM$ET$EE$:G
      OTO400
AF 190 IFCT<>0THENGOSUB160:AD=
      AD-1
DG 200 PRINT"{DOWN}WRITING..."
      :CLOSE1:PRINT#15,"S0:"+
      NM$:CLOSE15
EF 210 OPEN1,N,8,"0:"+NM$+",P,
      W":FORI=SATOAD:PRINT#1,
      CHR$(PEEK(I));:NEXTI:CL
      OSE1
GP 220 PRINT"{DOWN}CONVERTING.
      ..":HD$="":FORI=1TO4:RE
      ADHE:HD$=HD$+CHR$(HE):N
      EXTI
CF 230 FORI=1TO5:READIE:ID$=ID
      $+CHR$(IE):NEXTI
DR 240 NL$="":OPEN15,N,15,"I0:
      ":OPEN2,N,2,"#"
MM 250 GOSUB410:GET #2,NT$,NS$
      :FORE=0TO7:D$=NL$:GET#2
      ,B$:I=1:IFB$=NL$THEN310
PE 260 IF ASC(B$)<>130 THEN310
```


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```
AE 270 GET#2,HT$,HS$:I=3:IFHS$
       =""THENHS$=CHR$(0)
DJ 280 GET#2,B$:I=I+1:IFB$=""T
       HENB$=CHR$(0)
BM 290 IF(ASC(B$)=160)OR(I=19)
       THEN310
SF 300 D$=D$+B$:GOTO280
EB 310 FORI=1TO31:GET#2,B$:NEX
       TI:IFD$=NM$THEN340
JX 320 NEXTE:IFNT$=NL$THEN340
CH 330 T$=NT$:S$=NS$:GOTO250
GA 340 IFD$=NL$THENPRINT"
       {DOWN}DISK ERROR!":GOTO
       400
PD 350 DT$=T$:SS$=S$:T$=HT$:S$
       =HS$:GOSUB410:GET#2,MT$
       ,MS$:IFMS$=""THENMS$=CH
       R$(0)
GF 360 FORI=0TO65:GET#2,B$:NEX
       TI:GET#2,CT$,GT$:GOSUB4
       10:PRINT#2,HD$;:GOSUB42
       0
RX 370 T$=DT$:S$=SS$:GOSUB410:
       FORI=1TO32*E+2:GET#2,B$
       :NEXTI:PRINT#2,CT$;MT$;
       MS$;
MB 380 FORI=0TO15:GET#2,B$:NEX
       TI:PRINT#2,HT$;HS$;CHR$
       (0);GT$;ID$;:GOSUB420
GR 390 PRINTNM$" CONVERTED!"
HB 400 CLOSE1:CLOSE2:CLOSE15:E
       ND
DQ 410 U$="U1":GOTO430
CS 420 U$="U2"
PA 430 PRINT#15,U$;2;0;ASC(T$+
       "0");ASC(S$+"0"):RETURN
JJ 440 INPUT#15,EN,EM$,ET,EE:E
       N$=STR$(EN):ET$=STR$(ET
       ):EE$=STR$(EE):RETURN
EH 450 DATA 0,255,3,21,87,10,1
       ,0,0
```

Charles W. Bozarth, who lives in Kalamazoo, Michigan, began programming on a VIC-20. He recently earned a degree in mechanical engineering, but continues to program as a hobby.

SUPERSAVE

By Jason P. Lewis

Saving your work periodically is a concept that looks great on paper, but applying it is a whole different matter when at the computer. Some programmers avoid it, saying,"I'll never lose any files. It could never happen to me." Others complain that saving takes too much time when they're busy.

SuperSave is a short utility that will greatly assist you in saving your BASIC programs or BASSEM source code files. In the case of a power outage, your chances of recovering most of your file would be greatly improved with SuperSave.

Typing It In

SuperSave is a two-part program. The main program is written in machine language. To type it in, you'll need MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts you, enter the following values.

Starting Address: $CF64
Ending Address: $CFFF

When you've finished entering the program, save it with the filename SuperSave.ML before you exit MLX.

The second part of SuperSave is a BASIC loader or boot program. It's quite short, but you may want to use The Automatic Proofreader to help avoid typing errors. Again, see "Typing Aids." Be sure to save a copy of Boot on the same disk as SuperSave.ML. When you run Boot, it automatically loads and runs SuperSave.ML.

Using SuperSave

When you load and run SuperSave, you'll see a message that the program has been enabled. You'll also see the READY prompt.

In order to use SuperSave, you must either load a program you wish to work on or save a file. This will make that filename active for a short period of time. That filename will remain active from the time the save or load was performed until any other BASIC command is executed. During this time, press Ctrl-Restore. This will make the filename permanently active, at least until you reset or turn off the computer.

Once you have an active filename, you can use SuperSave as many times as you wish. This is done simply by pressing Restore. Each time you've made some changes and want to update the file on your disk, simply press Restore.

SuperSave actually performs two functions during a save. First, it scratches the old version of the file, bypassing the save-with-replace bug on older 1541 and 1571 drives. Then, SuperSave performs a normal BASIC save.

When you press Restore, you won't see the usual message indicating that a file is being saved. In fact, the only visual sign that you should notice is the drive light coming on to indicate that something is happening. By not printing a message, nothing on the screen is corrupted. After the SuperSave process, you should notice no difference in your program whatsoever.

This permits you to update your file whenever you like, giving you no excuse for losing valuable data during a power outage or similar occurrence. SuperSave will also save you several keystrokes (pun intended).

How It Works

Each time you press Restore, the 64 executes the machine language instructions pointed to by locations 792 and 793. The actual address of the ML program is the contents of 793 multiplied by 256 and then added to location 792 (LC=PEEK(792)+PEEK(793)*256).

SuperSave changes these locations to make the computer execute SuperSave rather than its normal routine. If SuperSave doesn't recognize a keypress in conjunction with Restore, it'll ignore it. Instead, it'll execute the 64's normal Restore routine. This means Run/Stop–Restore retains its usual function and it will disable SuperSave. To enable it again, enter SYS 53092.

Customizing the Boot Program

You may want to customize the boot program for each program you work on. You can replace the new statement in line 40 with a LOAD statement to load your program. For example, if your program's name were HELP, then you would change line 40 to LOAD "HELP",8.

Then, whenever you execute the SuperSave boot program, your working program will automatically load. Press Ctrl-Restore to make that filename active, and you'll be ready for another work session.

SUPERSAVE.ML

```
CF64:AD 18 03 8D E8 CF AD 19 15
CF6C:03 8D E9 CF A9 7B 8D 18 99
CF74:03 A9 CF 8D 19 03 60 AD 16
CF7C:8D 02 C9 04 F0 4F 20 E1 C3
CF84:FF F0 60 AD EA CF 18 69 77
CF8C:03 A2 EC A0 CF 20 BD FF 78
CF94:A9 01 AE EB CF A0 0F 20 1D
CF9C:BA FF 20 C0 FF 20 C3 FF B1
CFA4:A9 01 AE EB CF A0 FF 20 0F
CFAC:BA FF AD EA CF A2 EF A0 97
```


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```
CFB4:CF 20 BD FF A9 00 20 90 1A
CFBC:FF A9 2B A6 2D A4 2E 20 0F
CFC4:D8 FF A9 C0 20 90 FF 20 75
CFCC:E7 FF 4C E7 CF A5 B7 8D 7A
CFD4:EA CF A5 BA 8D EB CF A0 9A
CFDC:00 B1 BB 99 EF CF C8 C4 0F
CFE4:B7 D0 F6 4C 01 00 00 00 40
CFEC:53 30 3A 20 20 20 20 20 6D
CFF4:20 20 20 20 20 20 20 20 94
CFFC:20 20 20 00 00 00 00 00 B8
```

BOOT

```
MM 5 REM COPYRIGHT 1992 - COMP
     UTE PUBLICATIONS INTL LTD
     - ALL RIGHTS RESERVED
FE 10 IF A=0 THEN A=1:LOAD"SUP
     ERSAVE.ML",8,1
GP 20 SYS 53092
DD 30 POKE 53281,0:POKE 53280,
     15:PRINT"{WHT}{CLR}{RVS}
     SUPERSAVE ENABLED."
KG 40 NEW
```

Jason P. Lewis is a junior in high school in Ascutney, Vermont. He wrote SuperSave to help him with his other programming efforts.

BALLOON POP

By Maurice Yanney

If you're the kind of person who gets a kick out of popping balloons, you'll love this game for the 64. You can either drop pins on the balloons as they rise toward the top of the screen or go for the extra points by intercepting the balloons with your pin-dropper. It slides left and right across the top of the screen, and you can control it in an effort to pop any elusive balloons before they slip by you. Pop them all and move to a more difficult level. See how many levels you can complete in this fast-paced game.

Getting Started

Although Balloon Pop is written entirely in machine language, the program loads and runs like a BASIC program. To type it in, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts you, respond with the following values.

Starting address: 0801
Ending address: 11C0

Be sure to save a copy of the program before exiting MLX. The program works with a joystick in either port or from the keyboard with cursor keys and space bar.

Playing the Game

The object of the game is to pop all the rising balloons without letting any get by. You control a pin-dropper, which is located at the top of the screen. Use the pin-dropper to pop the rising balloons by dropping pins on them, or maneuver it so that it breaks balloons as they reach the top of the screen.

To move the pin-dropper to the left, use the Crsr up/down key; to move to the right, use the Crsr left/right key. A joystick (in either port) may also be used to move. Press the space bar or the joystick button to fire a pin downward toward the rising balloons. Only one pin can be fired at a time.

When a pin hits a balloon, you receive 10 points, and the number of popped balloons increases by 1. If the balloon hits the pin-dropper, you receive 50 points, and the number of hits is incremented by 1. To complete the first level, the number of hit and popped balloons must be 10; an additional 5 balloons are needed for each subsequent level (up to 50).

The score, the level, the number of popped balloons on the current level, the number of hit balloons on the current level, and the extra balloons are displayed at the bottom of the screen. Initially, there are five extra balloons. When a balloon reaches the top without being hit or popped, an extra balloon is lost. When there are no more extra balloons, the game is over. An extra balloon is awarded for each 500 points reached.

Complete a level, and you'll get 10 bonus points for each popped balloon and 50 points for each hit balloon. Each level becomes more difficult with the addition of another balloon to the number of balloons that are approaching your pin-dropper. Level 1 begins with three balloons simultaneously rising. The pin-dropper is positioned closer to the rising balloons on higher levels, and five more balloons are required to complete each level.

To quit playing the game, press the Q key. To pause the game, hold down the Shift key or press the Shift Lock key. To continue playing, release the Shift key or the Shift Lock key.

BALLOON POP

```
0801:0B 08 0A 00 9E 20 32 30 A4
0809:36 32 00 00 00 00 A9 64 A0 D0
0811:11 20 1E AB A9 80 8D 91 2C
0819:02 A9 00 8D 20 D0 8D 21 ED
0821:D0 20 A6 08 20 33 09 20 F6
0829:AE 0C AD 01 DC 29 10 F0 F5
0831:0D AD 8D 02 C9 01 D0 06 FE
0839:20 E0 0E 4C 2B 08 20 81 53
0841:0B 20 16 0A AD 27 12 D0 41
0849:06 20 21 0E 4C 5E 08 AE 04
0851:27 12 E0 01 F0 03 20 91 0B
0859:0F CA 8E 27 12 AC 26 12 89
0861:C8 8C 26 12 98 29 03 D0 1F
0869:0F 20 90 09 20 16 0A 20 39
0871:78 0A 20 16 0A 20 36 0A EC
0879:AD C2 11 C9 FF D0 06 20 3F
0881:CF 0C 4C 2B 08 AD C1 11 44
0889:18 6D C0 11 CD 1E 12 90 C5
0891:06 20 42 0D 4C 2B 08 A5 8A
0899:C5 C9 3E D0 8D 20 E0 0E 90
08A1:A9 00 85 C6 60 A9 30 85 33
08A9:34 85 38 AD 0E DC 29 FE 4C
08B1:8D 0E DC A5 01 29 FB 85 2C
08B9:01 A0 00 A9 00 85 FB A9 C4
08C1:D0 85 FC A9 00 85 FD A9 91
08C9:30 85 FE A2 00 A0 00 B1 91
08D1:FB 91 FD C8 D0 F9 18 A5 D4
08D9:FC 69 01 85 FC 18 A5 FE CD
08E1:69 01 85 FE E8 E0 10 D0 43
08E9:E6 A5 01 09 04 85 01 AD 6D
08F1:0E DC 09 01 8D 0E DC 18 E7
08F9:AD 18 D0 29 F0 69 0C 8D 66
0901:18 D0 A2 00 A0 00 8E BA 84
0909:11 BD DE 10 99 C0 37 C8 F6
0911:E8 98 29 0F D0 F3 AD BA 40
0919:11 18 69 02 8D BA 11 AA 2B
0921:E0 08 D0 E5 A0 00 B9 44 DA
0929:11 99 A0 37 C8 C0 20 D0 0C
0931:F5 60 A2 17 A0 00 18 20 71
0939:0A E5 A9 F4 A0 10 20 1E F1
0941:AB A9 A0 8D E7 07 60 A9 46
0949:01 8D BB 11 A9 32 8D 24 1D
0951:12 8D 22 12 A9 00 8D C3 61
0959:11 8D C4 11 8D BF 11 8D 1C
0961:C2 11 8D 27 12 8D 18 12 46
0969:8D 19 12 8D 1B 12 8D 25 05
0971:12 8D 23 12 20 5E 0F A2 B0
0979:05 20 AF 10 CA D0 FA 60 FC
0981:A0 00 20 74 0F A9 79 91 D2
0989:FB C8 C0 28 D0 F9 60 A5 3B
0991:C5 C9 07 D0 03 20 EE 09 66
0999:A5 C5 C9 02 D0 03 20 01 1D
09A1:0A A5 C5 C9 3C D0 03 20 C2
09A9:56 0B AD 00 DC 8D 1F 12 CC
09B1:29 04 D0 03 20 EE 09 AD 20
09B9:1F 12 29 08 D0 03 20 01 59
09C1:0A AD 1F 12 29 10 D0 03 77
09C9:20 56 0B AD 01 DC 8D 1F 73
09D1:12 29 04 D0 03 20 EE 09 44
09D9:AD 1F 12 29 08 D0 03 20 09
09E1:01 0A AD 1F 12 29 10 D0 C4
09E9:03 20 56 0B 60 AC BC 11 41
09F1:F0 FA 20 25 0A AC BC 11 1F
09F9:88 8C BC 11 20 2D 0A 60 46
0A01:AC BC 11 C0 27 F0 E5 20 B1
0A09:25 0A AC BC 11 C8 8C BC 15
0A11:11 20 2D 0A 60 A0 00 A2 24
0A19:00 20 BA 0A C8 C8 E8 E0 49
```


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```
0A21:14 D0 F6 60 20 1C 0F A9 91
0A29:20 91 FB 60 20 1C 0F AD 74
0A31:BE 11 91 FB 60 A0 00 A2 03
0A39:00 BD 02 12 D0 31 B9 DA B7
0A41:11 19 DB 11 F0 29 20 28 45
0A49:0F BD C6 11 8C BA 11 A0 50
0A51:00 91 FB A5 FC C9 07 90 51
0A59:09 A5 FB C9 70 90 03 4C 8F
0A61:6D 0A A0 28 BD C6 11 18 88
0A69:69 01 91 FB AC BA 11 C8 9F
0A71:C8 E8 E0 14 D0 C3 60 A0 78
0A79:00 A2 00 BD 02 12 F0 09 55
0A81:38 E9 01 9D 02 12 4C B2 C9
0A89:0A B9 DA 11 19 DB 11 F0 C8
0A91:20 BD C6 11 C9 FE D0 13 0E
0A99:38 B9 DA 11 E9 28 99 DA A2
0AA1:11 B9 DB 11 E9 00 99 DB 97
0AA9:11 A9 F6 18 69 02 9D C6 66
0AB1:11 C8 C8 E8 E0 14 D0 C3 E4
0AB9:60 8C 17 12 8E 16 12 20 36
0AC1:28 0F A0 00 B1 FB C9 79 4C
0AC9:D0 09 20 0A 0B 20 C0 10 97
0AD1:4C 03 0B AD 1B 12 F0 0F 1B
0AD9:B1 FB C9 1B 90 03 4C E5 BF
0AE1:0A 20 0A 0B 4C 03 0B B1 2B
0AE9:FB C9 F5 F0 04 C9 F4 D0 3E
0AF1:06 20 1B 0B 4C 03 0B C9 73
0AF9:F7 F0 04 C9 F6 D0 03 20 84
0B01:47 0B AC 17 12 AE 16 12 0E
0B09:60 A0 00 20 33 0F A0 28 B8
0B11:20 33 0F 20 0E 0C 20 BA 83
0B19:0D 60 20 48 0E A9 00 8D FA
0B21:18 12 8D 19 12 A0 00 A9 C7
0B29:F5 91 FB 20 91 0F A9 20 5C
0B31:91 FB 20 0A 0B A9 F7 8D 30
0B39:BE 11 20 2D 0A A9 01 20 E2
0B41:F7 0F 20 56 10 60 20 60 23
0B49:0E A9 05 20 F7 0F 20 81 31
0B51:10 20 0A 0B 60 AD BE 11 B1
0B59:C9 F6 F0 23 20 90 0E AE 70
0B61:BB 11 AC BC 11 20 74 0F FB
0B69:A5 FB 8D 18 12 A5 FC 8D 33
0B71:19 12 A9 F5 8D 1A 12 A9 CF
0B79:F6 8D BE 11 20 2D 0A 60 81
0B81:AD 18 12 0D 19 12 F0 56 D0
0B89:20 3E 0F A0 00 AD 1A 12 28
0B91:C9 F4 F0 41 B1 FB C9 F5 03
0B99:F0 02 D0 04 A9 20 91 FB EF
0BA1:18 AD 18 12 69 28 8D 18 72
0BA9:12 85 FB AD 19 12 69 00 68
0BB1:8D 19 12 85 FC C9 07 90 1D
0BB9:18 AD 18 12 C9 98 90 11 4E
0BC1:A9 00 8D 18 12 8D 19 12 EA
0BC9:A9 F7 8D BE 11 20 2D 0A BD
0BD1:60 A9 F4 D0 02 A9 F5 8D 5E
0BD9:1A 12 A0 00 91 FB 60 A9 7C
0BE1:02 18 6D BF 11 C9 14 90 11
0BE9:02 A9 14 8D 1C 12 A0 00 31
0BF1:A2 00 8C 17 12 8E 16 12 65
0BF9:20 0E 0C 20 BA 0D AC 17 A1
0C01:12 AE 16 12 C8 C8 E8 EC D9
0C09:1C 12 D0 E6 60 20 97 E0 CF
0C11:A5 8F 29 1F 69 05 AE 16 C9
0C19:12 AC 17 12 9D 02 12 A9 2C
0C21:F8 9D C6 11 A9 07 99 DB 7F
0C29:11 20 97 E0 A5 8F 29 1F AF
0C31:8D 1D 12 20 97 E0 A5 8F B6
0C39:29 07 18 6D 1D 12 8D 1D EA
0C41:12 20 97 E0 A5 8F 29 01 2A
0C49:18 6D 1D 12 69 6F AC 17 07
0C51:12 99 DA 11 60 A9 01 8D 7E
0C59:1B 12 A0 10 20 49 0F A9 86
0C61:74 A0 11 20 1E AB A2 0B EF
0C69:A0 05 18 20 0A E5 A9 7C CF
0C71:A0 11 20 1E AB A5 C5 C9 4D
0C79:40 D0 25 AD 00 DC C9 7F EB
0C81:D0 1E AD 01 DC C9 FF D0 2E
0C89:17 20 78 0A 20 16 0A 20 72
0C91:36 0A 20 E0 0E A2 04 20 7C
0C99:91 0F CA D0 FA 4C 76 0C A6
0CA1:20 33 09 20 48 09 20 2A 8A
0CA9:10 20 FC 0C 60 20 5E 0F 81
0CB1:20 2A 10 A2 00 20 81 09 1D
0CB9:20 EB 0E A9 68 A0 11 20 41
0CC1:1E AB A9 01 8D BF 11 20 C6
0CC9:E0 0B 20 56 0C 60 20 16 B6
0CD1:0A 20 EB 0E A9 9B A0 11 63
0CD9:20 1E AB 20 E0 0E A2 96 1C
0CE1:20 91 0F E8 D0 FA AD 18 C4
0CE9:12 0D 19 12 F0 09 20 3E BC
0CF1:0F A0 00 A9 20 91 FB 20 B3
0CF9:56 0C 60 20 3E 10 AE BB 99
0D01:11 E0 05 F0 04 E8 8E BB 28
0D09:11 A9 14 8D BC 11 A9 05 F3
0D11:AC BF 11 18 69 05 C9 32 3A
0D19:F0 03 88 D0 F6 8D 1E 12 C6
0D21:A9 FF 8D C0 11 8D C1 11 21
0D29:20 56 10 20 81 10 20 E0 5A
0D31:0B AE BB 11 CA 20 81 09 E7
0D39:A9 F7 8D BE 11 20 2D 0A 31
0D41:60 20 E0 0E A0 0D 20 49 53
0D49:0F A9 A6 A0 11 20 1E AB 25
0D51:A0 1A 20 49 0F A9 00 AE A8
0D59:BF 11 20 CD BD A2 0A A0 A5
0D61:0F 18 20 0A E5 A9 B3 A0 8B
0D69:11 20 1E AB A9 00 8D 20 1B
0D71:12 8D 21 12 AD C0 11 F0 C0
0D79:16 18 AD 20 12 69 0A 20 C6
0D81:F4 0E A9 01 20 F7 0F 20 FD
0D89:60 10 AD C0 11 D0 EA AD E8
0D91:C1 11 F0 16 18 AD 20 12 1A
0D99:69 32 20 F4 0E A9 05 20 89
0DA1:F7 0F 20 8B 10 AD C1 11 04
0DA9:D0 EA 20 2A 10 A9 00 8D 42
0DB1:18 12 8D 19 12 20 FC 0C B6
0DB9:60 AC 17 12 B9 DA 11 8D 1C
0DC1:BA 11 B9 DB 11 8D BD 11 BD
0DC9:A0 00 A2 00 EC 16 12 F0 5D
0DD1:15 38 B9 DA 11 ED BA 11 30
0DD9:8D C5 11 B9 DB 11 ED BD A6
0DE1:11 0D C5 11 F0 08 C8 C8 93
0DE9:E8 E0 14 D0 DF 60 20 0E 0F
0DF1:0C 4C BA 0D 38 AD C3 11 5E
0DF9:ED 22 12 8D BA 11 AD C4 E8
0E01:11 ED 23 12 0D BA 11 90 AC
0E09:16 18 AD 22 12 6D 24 12 AE
0E11:8D 22 12 AD 23 12 6D 25 FA
0E19:12 8D 23 12 20 AC 10 60 5B
0E21:AD 26 12 29 07 D0 19 A9 C9
0E29:90 8D 01 D4 A9 81 8D 04 D0
0E31:D4 A9 0F 8D 05 D4 A9 F0 9C
0E39:8D 06 D4 A9 09 8D 18 D4 56
0E41:20 91 0F 20 E0 0E 60 A9 5F
0E49:05 8D 01 D4 A9 81 8D 04 2B
0E51:D4 A9 09 8D 05 D4 A9 F0 FB
0E59:8D 06 D4 20 50 0F 60 A9 83
0E61:37 8D 01 D4 A9 83 8D 04 64
0E69:D4 A9 F0 8D 05 D4 A9 0F 2F
0E71:8D 06 D4 20 50 0F 60 A9 9B
0E79:C8 8D 01 D4 A9 13 8D 04 83
0E81:D4 A9 FF 8D 05 D4 A9 0F 29
0E89:8D 06 D4 20 50 0F 60 A9 B3
0E91:C8 8D 01 D4 A9 85 8D 04 65
0E99:D4 A9 0F 8D 05 D4 A9 FF 14
0EA1:8D 06 D4 20 50 0F 60 A9 CB
0EA9:37 8D 01 D4 A9 13 8D 04 EA
0EB1:D4 A9 00 8D 05 D4 A9 F0 3B
0EB9:8D 06 D4 20 50 0F 60 A9 E3
0EC1:58 8D 01 D4 A9 81 8D 04 4D
0EC9:D4 A9 09 8D 05 D4 A9 F0 74
0ED1:8D 06 D4 A9 0F 8D 18 D4 1F
0ED9:20 91 0F 20 E0 0E 60 A2 F0
0EE1:19 A9 00 9D FF D3 CA D0 84
0EE9:FA 60 A2 07 A0 0E 18 20 ED
0EF1:0A E5 60 8D 20 12 AD 21 37
0EF9:12 69 00 8D 21 12 20 C0 A4
0F01:0E A2 0A A0 16 18 20 0A 75
0F09:E5 AD 21 12 AE 20 12 20 05
0F11:CD BD A2 F0 20 91 0F E8 37
0F19:D0 FA 60 AE BB 11 AC BC 8D
0F21:11 20 74 0F A0 00 60 B9 CE
0F29:DA 11 85 FB B9 DB 11 85 4E
0F31:FC 60 B1 FB C9 F8 90 04 33
0F39:A9 20 91 FB 60 AD 18 12 22
0F41:85 FB AD 19 12 85 FC 60 69
0F49:A2 09 18 20 0A E5 60 A9 52
0F51:0F 8D 18 D4 20 91 0F A9 B9
0F59:05 8D 27 12 60 A9 00 A0 AD
0F61:00 99 C6 11 99 DA 11 99 C3
0F69:EE 11 99 02 12 C8 C0 14 DF
0F71:D0 EF 60 98 85 FB A9 04 FC
0F79:85 FC E0 00 F0 11 18 A5 57
0F81:FB 69 28 85 FB A5 FC 69 2F
0F89:00 85 FC CA 4C 7B 0F 60 24
0F91:A9 B6 8D BA 11 69 01 D0 90
0F99:FC AD BA 11 18 69 01 8D FF
0FA1:BA 11 D0 F1 60 38 A9 0F E0
0FA9:ED BA 11 8D C5 11 A9 27 55
0FB1:ED BD 11 0D C5 11 90 3D F9
0FB9:C8 38 A9 E7 ED BA 11 8D 08
0FC1:C5 11 A9 03 ED BD 11 0D 02
0FC9:C5 11 90 29 C8 38 A9 63 91
0FD1:ED BA 11 8D C5 11 A9 00 56
0FD9:ED BD 11 0D C5 11 90 15 F9
0FE1:C8 38 A9 09 ED BA 11 8D 42
0FE9:C5 11 A9 00 ED BD 11 0D F9
0FF1:C5 11 90 01 C8 60 18 6D BE
0FF9:C3 11 8D C3 11 AD C4 11 06
1001:69 00 8D C4 11 A2 18 A0 B7
1009:01 AD C3 11 8D BA 11 AD C5
1011:C4 11 8D BD 11 20 A6 0F CA
1019:18 20 0A E5 AD C4 11 AE 3E
1021:C3 11 20 CD BD 20 F5 0D AF
1029:60 A0 00 A9 20 99 00 04 A7
1031:99 00 05 99 00 06 99 98 3C
1039:06 C8 D0 F1 60 AC BF 11 0E
1041:C8 8C BF 11 A2 18 A0 0B B3
1049:18 20 0A E5 A9 00 AE BF 87
1051:11 20 CD BD 60 AC C0 11 DF
1059:C8 8C C0 11 4C 70 10 AC 1B
1061:C0 11 88 8C C0 11 C0 09 D4
1069:D0 05 A9 20 8D D3 07 A2 D6
1071:18 A0 12 18 20 0A E5 A9 28
1079:00 AE C0 11 20 CD BD 60 82
1081:AC C1 11 C8 8C C1 11 4C F0
1089:9B 10 AC C1 11 88 8C C1 B2
1091:11 C0 09 D0 05 A9 20 8D 35
1099:D9 07 A2 18 A0 18 18 20 F3
10A1:0A E5 A9 00 AE C1 11 20 34
10A9:CD BD 60 20 78 0E AC C2 46
```


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```
10B1:11 C0 0A F0 09 C8 8C C2 22
10B9:11 A9 FE 99 DC 07 60 AD B7
10C1:1B 12 D0 18 20 A8 0E AC FB
10C9:C2 11 F0 08 A9 20 AC C2 18
10D1:11 99 DC 07 C0 FF F0 04 D8
10D9:88 8C C2 11 60 00 00 00 CD
10E1:00 00 00 3C 66 C3 C3 66 F5
10E9:3C 0C 06 00 00 00 00 00 EB
10F1:00 00 00 12 20 53 43 4F 57
10F9:52 45 3A 20 20 4C 45 56 F0
1101:45 4C 3A 20 20 50 4F 50 53
1109:3A 20 20 48 49 54 3A 20 09
1111:20 45 58 54 52 41 3A 20 11
1119:20 20 20 20 20 92 30 30 35
1121:30 30 30 30 12 20 20 92 54
1129:20 20 20 20 20 20 12 20 2F
1131:20 92 20 20 20 20 12 20 D3
1139:20 92 20 20 20 20 12 20 DB
1141:20 92 00 3C 18 18 18 00 2D
1149:00 00 00 00 00 00 00 3C A7
1151:18 18 18 00 FF FF FF C3 4C
1159:00 00 00 00 FF FF FF FF 7B
1161:18 18 18 8E 1C 93 00 42 F2
1169:41 4C 4C 4F 4F 4E 20 50 02
1171:4F 50 00 54 4F 20 50 4C 7C
1179:41 59 00 50 52 45 53 53 39
1181:20 41 4E 59 20 4B 45 59 75
1189:20 4F 52 20 4D 4F 56 45 75
1191:20 4A 4F 59 53 54 49 43 97
1199:4B 00 1D 47 41 4D 45 20 63
11A1:4F 56 45 52 00 45 4E 44 C4
11A9:20 4F 46 20 4C 45 56 45 E3
11B1:4C 00 42 4F 4E 55 53 3A DF
11B9:00 00 00 00 00 00 00 00 DB
```

Maurice Yanney used Fast Assembler from the Gazette Power Tools disk to write this program. He lives in Lebanon, Pennsylvania.

SUB ATTACK II

By Tai Bush

If you like underwater arcade-style games, you're going to love Sub Attack II. This fast-paced game for the 64 can accommodate up to eight players. Enemy targets include submarines, airplanes, trawlers, and helicopters, and you can play on any of 40 levels. Scenarios are played in different combinations of clear or murky waters and clear or cloudy skies.

Entering the Game

Sub Attack II is written entirely in machine language, but it loads and runs like a BASIC program. To enter it, you'll need MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following.

Starting address: 0801

Ending address: 1B18

Be sure to save a copy of the program before exiting MLX.

Prepare for Action

From the opening menu, select the level and number of players desired. Press f1 to start the game. You control the black ship in the center of the screen. Use a joystick to move the ship left or right. Press the fire button to fire straight up. Tilt the joystick left or right and press the fire button to fire toward the sides. Pull back on the joystick and press the fire button to drop a depth charge. Each level lasts approximately one minute.

Enemy Forces

You'll face a formidable fleet of enemy forces. Here are some important facts about their weapon systems.

Blue submarines fire torpedoes randomly toward the top of the screen. These torpedoes are deadly if they hit your ship or if your ship plows into a water spout created by their explosions.

Airplanes drop bombs as they pass directly over your ship. They also drop bombs whenever they're hit. If you shoot one down, avoid it as it crashes into the water.

Trawlers travel half the distance across the screen, then turn and leave. They drop mines that explode at random intervals.

Helicopters have unlimited ammunition. They drop bombs above your ship. Be careful whenever they hover—they drop bombs continuously.

Turtles are replicas of the first operational submarine, built in 1776 by David Bushnell and called the *Turtle*. These Turtles are black and white, and they fire yellow missiles that explode when they reach the surface.

Gray submarines fire missiles that enter the atmosphere, turn, and explode when they fall back to the surface.

Jet planes drop parachute bombs.

Scoring

Blue submarines, airplanes, and trawlers earn you 10 points each when hit; all other enemies are worth 20 points each. Levels 1–10 are played in clear waters and are considered easy. Levels 11–20 are played in murky waters and are moderate. Skies are clear in these levels. Levels 21–30 are played in clear waters and cloudy skies, and levels 31–40 are played in murky waters and cloudy skies. These last 20 levels are difficult.

Press P at any time to pause the game. Press it again to continue.

SUB ATTACK II

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 E1 85 2D A9 1F 85 10
0839:2E 4C 00 01 14 E0 00 E1 89
0841:1F 8F 19 B9 6E 09 99 E8 37
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0C 20 34 C3
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 0D 08 A4 A8 F0 49
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 00 0C 08 75
0971:01 00 9E 32 30 36 31 E3 9B
0979:25 A9 1C 47 09 18 A9 80 EC
0981:8D 8A C9 0F 8D 18 65 51 10
0989:A0 9E 20 23 19 20 07 09 2A
0991:6D 04 84 7E 8D BA 03 20 51
0999:AC 0B 20 7F 0E 20 38 10 32
09A1:20 D5 0C D1 C1 0D 20 C0 1B
09A9:15 20 9F FF 81 1B C4 DB 20
09B1:73 45 50 D0 F9 4C 27 B8 ED
09B9:59 AA F3 78 6D 04 15 44 13
09C1:BD DA 15 05 D4 04 35 C1 3F
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09C9:86 02 A9 F8 99 06 B0 05 AF
09D1:E9 52 01 D4 BD F8 08 99 56
09D9:00 D4 20 FC 99 42 2E A6 CD
09E1:FC A4 FB 60 94 66 5A A7 BB
09E9:65 23 AA A5 FC C3 2E E6 61
09F1:BD CB 08 32 99 12 63 A2 78
09F9:00 86 FC 8A D9 BD EE 67 01
0A01:21 E0 8D 04 D4 4C 8A 08 C4
0A09:84 FB A0 07 4C B4 08 E5 0E
0A11:01 90 50 18 11 21 D0 81 85
0A19:21 21 81 1C 12 A0 E4 0C E0
0A21:64 04 0B 0B 60 A0 03 02 08
0A29:02 01 17 10 57 1C 21 0C DB
0A31:19 19 86 0D 12 F4 F6 7D 89
0A39:FA B5 F6 23 31 87 92 1E 34
0A41:1E 1E 4E D1 72 C1 4F BE CA
0A49:06 09 D9 8D 22 D0 18 A0 DB
0A51:10 A2 C1 65 E1 F1 00 19 94
0A59:B1 AD 1E D0 AD 1F B6 3F 19
0A61:4C CA 2E A4 6C 2B 09 00 80
0A69:01 02 03 04 05 08 07 1F 94
0A71:70 6C 61 79 65 72 AB 3F 28
0A79:11 11 D0 40 46 9D 9D 9D F9
0A81:67 65 74 A0 A0 72 65 61 36
0A89:64 79 00 80 73 69 21 3C F5
0A91:71 8D A7 05 A9 5B 99 A4 99
0A99:A0 90 82 13 39 A4 07 A9 B7
0AA1:AC 8D 00 B3 99 8D 01 D0 80
0AA9:A0 01 8C 15 D0 88 8C 01 F3
0AB1:79 5E 1B 8D 11 D0 B9 9D 33
0AB9:09 F0 35 C8 73 9C E5 91 2D
0AC1:09 93 90 11 71 15 36 26 D4
0AC9:46 C3 61 43 61 83 78 34 90
0AD1:16 8A 84 42 FA E1 05 20 D1
0AD9:20 90 0D 00 36 15 0D 4A 2E
0AE1:20 E2 0A 1D D1 A8 8C AA C6
0AE9:27 8C 42 18 E8 C8 CA AC 2B
0AF1:13 DA 3A A4 EE 40 04 A0 F8
0AF9:30 4C E9 09 8C 41 04 0E 86
0B01:39 5D 81 2F 31 8D 4A 04 86
0B09:64 5B A8 C0 1E B0 37 C0 2C
0B11:14 B0 0E A9 C7 5B 8A 9D 18
0B19:08 05 E8 BC C0 0A B0 25 12
0B21:A2 C7 A9 9A 13 8E E7 66 62
0B29:38 02 45 49 1C 34 E6 07 9F
0B31:55 4C 0E 8D E6 DB A6 4B DE
0B39:4C 71 0A A0 00 A2 28 B9 B1
0B41:A2 C5 0B B9 A7 B2 6A 00 F3
0B49:CA D0 F7 A2 50 C8 C0 05 4E
0B51:D0 EA 8F DF 00 E0 29 D6 27
0B59:8C 46 33 04 C0 88 8D E7 19
0B61:DB 1C 02 60 A0 0B 14 90 9C
0B69:1C A2 07 A0 02 C1 25 03 85
0B71:BC 98 0A 3E E8 BF 0A AA 36
0B79:C6 31 A0 82 4C 85 0A 60 68
0B81:01 0D 03 69 2A E6 60 80 80
0B89:82 02 9D 01 02 01 11 01 5C
0B91:01 1D 04 02 0D 02 03 0F 95
0B99:06 0F 00 05 E8 F8 C7 46 C7
0BA1:43 87 C7 41 1D 03 66 39 43
0BA9:01 65 20 65 86 FB 84 FC 1E
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0BB9:12 00 CF 26 12 A0 00 12 5A
0BC1:32 44 08 64 A2 28 69 00 D1
0BC9:9D 6C D8 90 8B 33 7A 14 20
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0BD9:35 7A 14 60 04 2E E2 36 86
0BE1:61 C8 98 12 4A 46 21 37 F3
0BE9:04 BD 3C 03 29 0F 18 69 48
0BF1:30 8D 38 04 98 5D 44 03 90
0BF9:09 0F 49 0F F0 0D 5F F0 DD
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0C21:90 04 9E 0B 0A 1A 04 D0 98
0C29:F5 88 34 E1 A2 50 28 05 AE
0C31:D2 FF A9 04 C0 10 0A 20 A2
0C39:9A 9F 98 1E 90 A3 63 64 B9
0C41:65 66 92 83 DC 49 FF A8 E4
0C49:20 B8 0B 4C 06 0C 18 AF 06
0C51:82 04 20 08 28 C9 08 F0 99
0C59:25 73 49 36 28 8A 86 18 FD
0C61:86 A4 10 CE 68 48 C9 FE CB
0C69:D0 F6 AA 01 77 AA 37 74 56
0C71:F0 72 8A E1 C9 40 80 30 8E
0C79:0A 81 EE 46 00 24 F0 DD 89
0C81:AA 9E C2 29 61 68 10 1A 68
0C89:58 20 8C B0 23 38 0B EC 6F
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0CA9:0C 0A 0C F0 10 C9 04 95 20
0CB1:D8 66 91 10 8D A8 A8 60 C3
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0CD9:59 01 81 EE 66 60 40 04 37
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0CF9:64 04 14 43 32 38 E9 AA EC
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0D19:4C B8 0C 90 3F 10 01 A2 F0
0D21:01 60 A0 DC 0C 18 6D F8 4A
0D29:1E 56 08 A9 08 79 05 EE A2
0D31:8C AD 01 00 85 29 D0 E4 74
0D39:55 05 16 DE 3E 02 00 96 80
0D41:FF D0 1E 97 7F E1 E5 0D 29
0D49:95 3F 18 4F 48 95 EC 88 F0
0D51:37 FB A2 09 A4 BE 44 23 B6
0D59:C9 33 9F 40 9C AD CA F0 3F
0D61:11 A8 B9 AE 49 90 03 4C 2F
0D69:2E 66 95 0C 03 81 00 51 17
0D71:8E 24 AD BD B0 24 14 10 BB
0D79:4F A2 89 EC 08 F0 2F BD 04
0D81:5D B4 F4 FE F0 28 8E E8 34
0D89:B9 C4 E5 0A BD BE 01 3E 38
0D91:00 CA 43 B9 DF 0D C7 07 2C
0D99:20 0C A0 00 B9 31 04 FA 70
0DA1:C8 C0 08 D0 3D 4C 63 10 50
0DA9:22 E0 C6 0D 91 5E E0 19 97
0DB1:D0 F5 66 C9 87 D0 F9 68 F6
0DB9:68 4C 0D 08 93 11 11 05 45
0DC1:4D 41 4E 20 20 53 43 4F C2
0DC9:E2 76 07 90 05 1C 9F 9C 51
0DD1:1E 81 9E E1 18 3C 20 50 8F
0DD9:A6 53 20 46 35 20 54 4F A6
0DE1:20 52 45 D0 71 D7 D5 20 0D
0DE9:3E 0D 0D 60 61 62 05 90 3D
0DF1:47 41 4D 45 20 4F E8 8E 9C
0DF9:52 00 04 94 71 7A DA 70 A2
0E01:9B E0 38 90 F2 AD 6E 29 87
0E09:FC D0 6A A2 0D A0 0F 18 70
0E11:30 F1 4F 25 7A BD 73 0E BD
0E19:F0 07 20 D2 FF E8 4C 12 EE
0E21:0E A0 0D A2 06 20 7C 13 F4
0E29:CA D0 FA AD 5D F0 0E 00 E3
0E31:1A 06 D0 11 5C 49 BD 37 C1
0E39:09 17 A9 09 20 56 08 4C 1C
0E41:20 0E A9 0A 20 8F 08 A9 BF
0E49:06 8D 20 D0 88 D0 D1 51 59
0E51:77 16 04 D4 8D 0B D4 AE 6D
0E59:A2 7F FE 44 BD 40 10 E0 BA
0E61:58 05 99 C3 54 03 20 95 DE
0E69:0C F6 69 4C 07 09 60 90 E8
0E71:4E 45 58 54 29 7E B2 00 FE
0E79:AD 70 11 F0 04 CE BB E0 6D
0E81:B2 1B D4 A8 C9 38 B0 10 83
0E89:4A 4A 4A 0A 0A 0A 18 6D 5D
0E91:11 BD AA BD 65 03 1B 1F 63
0E99:C0 20 90 1C C0 28 B0 18 12
0EA1:AD 05 3A 7E 30 07 CF 41 83
0EA9:AD 09 D0 C9 9A BC 5D 86 9E
0EB1:FB 41 09 AE 15 54 4B 29 E1
0EB9:02 05 09 00 92 B0 08 D0 71
0EC1:05 A2 01 4C E4 0E 8A 29 8B
0EC9:C7 13 BE A2 02 2C 26 E4 82
0ED1:B4 61 0C B4 03 9D B7 03 6E
0ED9:A9 18 8D BB 03 8A A6 FB C9
0EE1:DE 65 03 AA AA 57 0D 86 25
0EE9:CE AD 0E 02 94 8D 1C 3C 0A
0EF1:0E 0A AA B9 B4 58 04 20 B7
0EF9:43 EC 12 05 D0 8A 4A AA 75
0F01:98 A0 FF C8 38 E9 04 B0 42
0F09:FA B9 91 21 DD FA 07 B9 F9
0F11:2A 02 07 20 F8 34 22 10 94
0F19:D0 98 4A A8 B9 AD 0F 9D D9
0F21:29 3A 8E 00 42 A0 51 04 6F
0F29:04 44 91 03 1D 4C 43 9F FC
0F31:3C 0D F0 B1 B1 2A 44 B9 62
0F39:A6 0F F0 1B AC 06 3F A9 E3
0F41:C9 1E B0 11 C9 0A 90 04 8E
0F49:C9 14 1E FF 87 B6 20 16 82
0F51:00 1B D0 60 6F D3 D6 E0 AF
0F59:E1 DB DB E4 E5 E7 E9 C2 8E
0F61:C7 41 B9 41 C6 61 21 50 4D
0F69:14 01 0D 04 07 01 07 05 03
0F71:0B 36 FC 23 C6 57 6F 87 6E
0F79:9F B7 CF E7 FF 87 1F D4 FE
0F81:71 50 47 01 01 00 05 57 CE
0F89:57 B4 B4 D0 D0 C2 C2 DE 1A
0F91:DE 18 3F A8 88 88 74 74 5B
0F99:7E 7E 6A 6A 87 0F 64 04 CF
0FA1:ED ED D0 40 46 9A 9A 8F B1
0FA9:8F 7B 7B 85 85 71 71 BB C6
0FB1:BB D7 D7 C9 C9 E5 E5 04 F0
0FB9:08 80 76 0E 40 80 3A 88 AC
0FC1:A3 97 88 00 10 26 A2 00 07
0FC9:20 4D 10 E0 03 82 3B 1B 0F
0FD1:A2 10 20 13 11 E8 E0 06 6E
0FD9:D0 EE C7 A9 32 F8 82 80 AA
0FE1:02 FB D0 F0 41 C0 58 90 77
0FE9:41 96 CA B8 29 93 D1 25 93
0FF1:66 AE 58 00 58 91 E3 B1 7C
0FF9:08 A9 0E 7B 28 48 85 10 7D
1001:09 6B C4 05 A9 AA A2 C1 68
1009:A0 28 C8 40 8E 05 60 C0 AA
1011:00 F0 BF 85 AB 24 07 06 BF
1019:4E 96 E1 28 30 3E 01 8E CF
1021:09 68 0B C9 C3 90 19 D5 46
1029:2F B0 15 4C 64 11 BD E6 3E
1031:16 0B F0 06 3D FF 4C C6 E6
1039:10 4C 63 36 D3 4E 14 D9 1E
1041:1A 85 95 13 C9 E0 52 A1 CB
1049:E3 51 A6 68 8C DB 44 A1 09
1051:DF 51 1D 68 14 E4 44 A1 3E
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1059:E6 51 B7 68 6E E7 44 A3 FD
1061:EB D1 3C 18 60 8A 28 1F 91
1069:86 68 01 D0 01 AD 70 D3 87
1071:CC 51 D3 68 14 71 12 C9 A1
1079:D9 CA 8F DB E6 A3 28 39 38
1081:DF 17 83 A0 16 C9 E3 D2 44
1089:A0 B1 15 C9 E6 84 0F 40 4D
1091:17 C9 EB 52 A1 EE 51 DB 99
1099:18 C9 EE 90 68 17 F0 B0 51
10A1:68 DC 17 60 C1 E2 8B B5 7C
10A9:0C 1A 0B 12 1A 0B 50 9C 13
10B1:F9 21 9A E0 2F 08 11 E8 1D
10B9:CD 19 B0 1F 13 C9 9F F0 FE
10C1:38 93 30 30 79 44 2B 72 91
10C9:44 26 72 E8 8B 4C C4 11 9A
10D1:C9 32 B0 1C E0 C1 82 E5 34
10D9:F0 15 18 69 FB 5E 0D 3A FE
10E1:EF 85 08 F3 5E F0 03 FE 57
10E9:5C DE 82 B0 05 31 03 7D BB
10F1:B7 03 1C 0A 10 A1 A4 E1 05
10F9:E5 11 05 0C 1A D3 20 4F 62
1101:CF 34 D0 61 D0 1D 44 02 CD
1109:00 9E 1B A3 0A 29 C7 80 75
1111:00 D3 1B 70 D4 83 85 47 99
1119:4E C6 F0 14 C9 CB F0 10 E2
1121:06 E7 04 C2 C2 C9 05 90 C4
1129:03 40 8B C1 13 30 32 03 2B
1131:03 87 5F 30 B0 86 FE A1 E4
1139:CC 10 22 3A 86 04 0E 29 37
1141:C0 C2 51 04 22 01 5A CD 76
1149:4C 6B 12 A9 11 6A 45 C0 C6
1151:CC F9 11 C9 CE B0 2C 38 E0
1159:35 89 C9 96 F0 11 94 C9 D9
1161:CD F0 05 23 28 D6 80 02 19
1169:4C E2 02 CE C6 0C 30 70 CE
1171:4A 0E 67 85 30 42 8F 08 33
1179:C8 AA EC A9 01 29 8C 4C F4
1181:C0 D2 F0 0D FE 94 04 D0 CA
1189:26 0C 30 0E 96 08 20 6F 2D
1191:10 05 4C C4 08 B8 8B 8D 9A
1199:9C 8C 08 C8 99 23 0E 72 A2
11A1:E6 28 80 9C 8C 2C C8 C9 8B
11A9:50 25 8C 84 8D A1 22 27 75
11B1:A3 07 2E E2 18 65 BA C8 EF
11B9:B0 59 25 22 7D E8 60 B1 53
11C1:B9 91 02 38 E5 FB 13 90 BE
11C9:E9 A9 12 38 E9 B2 12 E2 32
11D1:28 80 2D 20 98 07 23 00 F6
11D9:08 33 21 82 85 20 1D 38 38
11E1:DA 8A 70 85 FB A5 32 07 5C
11E9:0E 8C 05 FB 8A 72 88 84 4A
11F1:39 18 32 10 82 00 1C 42 8C
11F9:71 15 70 C6 81 0F 24 0A 2F
1201:83 D0 F9 AD 12 CD 55 33 DA
1209:F0 F9 4B 8D 0E DC 60 C9 D4
1211:D6 E0 20 21 C0 44 A6 07 5A
1219:09 A8 00 E3 26 D4 F0 54 E4
1221:C9 D7 F0 50 C9 D5 F0 63 2E
1229:C9 D8 F0 5F A3 D7 CF 12 AA
1231:93 18 74 84 88 A9 05 56 47
1239:7D 06 D0 3F FE 81 3D C1 E5
1241:2A 10 0C 80 D3 C3 04 03 C0
1249:8C 2F DA 4C F6 E0 11 04 01
1251:48 59 A9 D9 E5 23 16 1E C8
1259:BC 41 E1 31 14 18 3B 81 74
1261:06 53 37 18 4C 83 A5 F3 75
1269:26 44 04 10 B0 4C 82 0A F8
1271:58 41 98 00 12 A9 02 A7 08
1279:16 C4 5A 96 E0 A4 42 5D 0A
1281:35 E0 D4 05 D9 0B D6 E6 F2
1289:91 90 0E DA F0 10 5E 42 D0
1291:DA CE 43 05 F3 B0 D0 60 F3
1299:95 90 CA 63 14 1A 1F B0 34
12A1:C0 60 C0 FD 09 41 01 74 F9
12A9:85 C2 44 F0 12 64 DD 0F C5
12B1:07 A5 FC 77 85 FC A5 FB 41
12B9:D9 0A D0 51 F0 D7 62 01 29
12C1:FC 83 25 FC F0 09 49 01 F8
12C9:16 13 F0 02 18 60 38 60 0F
12D1:BA A6 1A 9E 44 90 31 27 18
12D9:A4 A9 18 9A 04 22 10 E0 11
12E1:0B 19 16 E2 0A 08 82 80 B8
12E9:0B 20 B0 08 F3 09 88 85 8C
12F1:BD 06 29 0F C9 07 D0 03 9B
12F9:FE 29 41 F8 2A 68 C0 4F 63
1301:E0 F0 0C 1E 64 0D 93 09 BE
1309:4C 03 15 7A FB A0 20 78 7B
1311:15 37 56 30 64 51 C8 C8 20
1319:C0 06 D0 02 78 F0 55 B8 46
1321:02 44 9C A1 C2 0D D0 98 8B
1329:10 D1 E1 F0 0A AB CB 68 16
1331:2A E1 24 1B 60 18 24 20 E6
1339:62 42 83 E2 E0 1E 8A C9 1E
1341:02 D0 E6 D2 A8 06 1E 19 59
1349:A9 E2 4C 39 15 8A 0A A8 A9
1351:60 38 13 6A F0 BA C9 7E 43
1359:F0 B6 4C 41 15 E0 F1 ED 41
1361:6C 79 38 E2 F0 08 F2 18 F6
1369:70 14 90 5D 32 51 41 03 11
1371:3B 03 33 34 18 E1 73 18 E6
1379:84 07 39 00 A9 E3 2A B7 B3
1381:70 04 C2 2F C9 96 D0 34 AA
1389:A9 03 E8 8D C0 98 EE 17 98
1391:01 AD BC 03 29 07 A0 00 12
1399:AA E1 04 80 20 DA 15 A0 4D
13A1:40 D9 07 08 AA BD ED 44 2C
13A9:16 24 48 FD 15 99 25 38 5E
13B1:BD 0D 16 99 26 38 60 81 AA
13B9:F2 7C C2 20 C9 40 C8 00 B3
13C1:31 D8 15 05 01 05 04 36 04
13C9:C2 20 03 01 3C 8D 50 21 A3
13D1:40 50 54 B0 C4 22 BC 48 32
13D9:C9 DB F0 18 93 F3 0E E4 E8
13E1:DD D0 1A BC D0 0C 9C D0 FA
13E9:22 75 8E 78 08 0A 0C 1D 75
13F1:C0 82 26 30 18 60 73 98 A2
13F9:E7 17 AD 7F C3 FC 11 B9 75
1401:DF E6 39 07 E7 2C E0 20 3C
1409:61 BD 7E 16 D9 C6 95 06 9D
1411:4C F1 12 BE C8 D2 20 38 14
1419:37 10 FA 01 D0 06 C1 C5 38
1421:95 16 65 C5 C7 21 02 B0 1A
1429:03 9D B4 98 26 A0 13 70 A4
1431:EC 81 1C 4D B0 07 1A 64 C2
1439:80 41 9A F0 25 BD 51 12 29
1441:40 4E 10 19 60 E2 20 56 D5
1449:08 60 87 80 A2 A3 03 98 C8
1451:80 0D 83 09 A9 0C 9D AE 65
1459:03 4C FB 04 1F 85 BF 10 74
1461:7A FE DB 16 B2 FE E5 72 33
1469:FE EA 07 F9 8B C3 21 AC A6
1471:D0 08 8F AC 49 01 0A 2D 50
1479:62 6F 90 45 C9 EC B0 41 B9
1481:32 78 59 D0 39 5C 25 32 D0
1489:F1 3C E6 E6 48 02 86 62 BE
1491:C6 66 61 94 21 07 D2 6C 63
1499:C9 5B B0 13 95 68 0A B0 D7
14A1:59 8B 00 04 CF 6A D1 60 C5
14A9:DC 50 80 1C 0E 70 01 4C A6
14B1:E5 11 78 59 71 14 C3 01 1A
14B9:14 87 37 30 01 52 5C B8 7A
14C1:80 BD 3D 0E 18 69 01 2D B7
14C9:98 05 F7 C9 01 44 DD 20 10
14D1:DB 0F B9 04 D0 CD AD F0 2D
14D9:14 B0 90 95 C2 4C B5 17 6D
14E1:A9 C7 9D 00 BF 00 03 C0 49
14E9:03 90 F2 07 0A A9 00 A0 1E
14F1:18 80 A9 EE EA 2F FE C7 44
14F9:72 AE A9 09 20 05 D1 3F C4
1501:C9 EF F0 3C 73 27 23 D0 3D
1509:25 0F 04 AD 98 20 0A D0 0F
1511:A0 18 1D 1A 86 0D 11 09 6A
1519:AD A0 0A 5D 04 8D 10 97 67
1521:42 20 84 A3 60 C9 9D B0 55
1529:06 15 28 04 20 1A 01 4C 98
1531:2B F2 DD 9C 41 08 96 46 D0
1539:B8 A9 05 20 1D 5C 80 5E 86
1541:10 28 04 0A DF C2 BC C9 EB
1549:E9 9A 81 83 CB 66 4D 18 22
1551:A9 02 20 E3 8A 41 41 C9 B8
1559:E8 86 02 E1 A8 C9 9E 90 32
1561:0A DE 15 BD B4 20 5D 03 AA
1569:D0 28 20 FB 12 C9 A4 D0 9B
1571:E2 88 90 10 84 B0 08 C9 03
1579:EA F0 DC AD BA 03 3D 24 4C
1581:51 F2 1E 0E FE FA 3B 20 30
1589:20 E5 0A A9 0E 4C 56 08 6F
1591:22 2E 07 04 F0 09 DE F6 D9
1599:20 F1 12 4C B6 18 B9 01 E1
15A1:BC 00 8A 07 CD 05 8C 0A 91
15A9:CD 07 D0 F0 05 CD 09 D0 E7
15B1:D0 05 A9 14 9D B7 03 AD 7B
15B9:15 D0 3D 27 10 F0 01 60 63
15C1:AD 1B D4 C9 40 B0 C0 07 0E
15C9:4F EB 9D 4D 3F A9 01 9D 5F
15D1:2C D0 20 3F 13 4C 65 13 E5
15D9:73 72 83 C9 A1 D0 0C B9 89
15E1:B6 38 E9 0A 99 0B D0 4C 3A
15E9:8D 12 80 B8 44 21 20 5C 3E
15F1:2A 00 52 A0 03 46 60 BD 35
15F9:65 C9 ED F0 B6 FE FD 07 CA
1601:A9 06 9D 60 1C 60 F0 E2 64
1609:4C F8 18 DE 01 B8 BD B1 A2
1611:03 29 01 D0 9E 4C 35 13 D9
1619:A0 00 80 72 90 A9 33 0A 68
1621:03 0A D0 A4 28 40 0A D1 DD
1629:A4 29 B9 00 D3 99 00 2B 59
1631:00 F8 EB A9 37 85 01 C8 4E
1639:8C 0E DC 88 85 F1 2A B0 4C
1641:30 68 2C 98 AA 91 FB C8 0B
1649:D0 B8 FC 43 74 0D D0 F4 4E
1651:AA A9 55 D8 A9 1B 85 FC 37
1659:08 0B FD E8 BD E5 1A 85 D9
1661:FE E8 B1 FB F2 F8 D0 02 5C
1669:E6 FC C9 DF F0 0F C9 DD B4
1671:F0 E4 91 FD E6 FD D0 EA 1D
1679:E6 FE 4C 75 19 8F 0B 9E 75
1681:8A 9D 3C C9 AC 18 D0 F8 DE
1689:BA B0 8D C5 C2 07 10 FF 9F
1691:85 FB 38 33 0D A0 0D E8 A7
1699:18 20 F0 FF E6 FB A6 FB 68
16A1:E0 66 F0 0B BD 4E 1A F0 F2
16A9:E8 DA AE 93 B7 19 20 E4 57
16B1:FF C9 86 F0 34 C9 87 F0 F8
16B9:4D C9 88 F0 46 C9 85 D9 5D
16C1:29 00 A9 02 EC 4A 16 F0 85
16C9:04 90 02 A9 FE 9D 5D 03 23
16D1:E8 E0 08 D0 ED A2 07 E9 AA
16D9:30 9D 8D CA D0 FA A9 93 3D
16E1:20 D2 FF 4C B4 8A F1 5C A7
```


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```
16E9:68 C9 38 D0 0A A9 FF E0 A8
16F1:D3 E2 A3 10 22 68 3E 80 E5
16F9:13 5C 4C E2 FC EE 4A 01 B7
1701:AD 41 C9 28 D0 0D A9 00 20
1709:8D 00 9E 09 14 C5 03 44 64
1711:EE 34 02 AD B2 C9 3A D0 E0
1719:87 EE 49 06 A9 30 8D 4A C3
1721:06 4C CA 19 00 3D 11 11 78
1729:11 9A 53 40 4D 20 41 54 B6
1731:AC 43 4B 20 49 49 45 1F 0B
1739:50 59 52 49 47 48 54 32 FA
1741:38 39 39 32 8B 39 43 4F 3B
1749:4D 18 54 45 01 59 55 42 5D
1751:4C 2E 00 11 B0 31 82 28 B9
1759:53 54 41 52 54 A8 43 33 92
1761:E3 50 4C 41 59 45 52 53 0B
1769:20 20 DC 21 35 C7 4C 45 04
1771:56 45 4C 20 20 30 31 00 CB
1779:3C 46 37 3E 20 51 55 49 5C
1781:54 A9 09 8D C1 BB CE 80 59
1789:14 20 C5 1A AD 60 D0 F5 AA
1791:60 AC 5C 03 B9 54 03 AA A6
1799:BD C9 81 F2 02 65 03 BD E1
17A1:F1 1E 99 6D 03 98 E2 04 9E
17A9:08 A8 8A 18 69 28 AA 90 AA
17B1:E8 60 27 30 AC 30 EC 30 84
17B9:2C 31 6C 31 77 31 AC 31 F5
17C1:B8 31 EA 31 2A 32 6A 32 2A
17C9:AA 32 B6 32 EA 32 F6 32 14
17D1:3A 33 7A 33 B7 33 F4 33 14
17D9:2E 34 74 34 B7 34 E5 34 8C
17E1:0D 35 4F 35 A4 35 CC 35 E9
17E9:11 36 76 36 B7 36 EB 36 05
17F1:2E 37 71 37 DC 37 24 38 EA
17F9:64 38 A4 38 F7 38 1A 39 8E
1801:58 39 B1 39 D2 39 12 3A 4F
1809:54 3A 94 3A E5 3A 13 3B A1
1811:53 3B 9B 3B DB 3B DC 78 DE
1819:37 0E D4 F8 07 18 D0 1B E7
1821:D0 20 D0 08 3C 10 86 7E 0A
1829:61 7F FF FE 3F FF FC EF BD
1831:13 19 10 C5 44 40 53 55 AE
1839:AA 96 41 AA A8 50 4F DC 39
1841:81 06 05 11 22 12 DD C4 3F
1849:06 CE C0 4E 41 1C 0A 88 44
1851:88 59 0A 19 EF 81 40 08 FC
1859:08 DD C0 DD 80 C1 5F 83 48
1861:C2 03 B1 28 96 AA 55 2A A0
1869:AA 41 A8 2B 2E 3C E4 A0 D3
1871:A0 84 88 44 AB D8 28 D8 52
1879:88 04 A2 20 0E 85 22 22 32
1881:6A 61 03 11 08 53 20 01 7F
1889:DD E0 82 02 24 DD FF 80 6A
1891:44 E2 A8 C8 F0 A0 05 8D DF
1899:58 C0 38 D8 30 05 DD 18 24
18A1:6A 18 49 26 C0 9A 3F B0 38
18A9:07 30 EE A6 B0 E6 B0 90 C4
18B1:33 F8 03 17 AF 8C 8E 0B 63
18B9:8F 88 62 21 A3 FA B9 80 2F
18C1:04 A5 44 15 70 80 C6 A0 EA
18C9:60 A5 47 25 40 28 40 63 55
18D1:AE 78 04 3D 06 1D 08 00 80
18D9:5F 0A 40 12 81 45 F8 A5 1E
18E1:A0 10 B9 54 20 65 50 29 43
18E9:33 05 55 30 15 56 C0 15 3B
18F1:53 B5 70 01 4C 59 03 04 29
18F9:1C 8A 00 14 03 0C D0 0E 14
1901:0E 9A BB 0E 3C DE 0C 21 CF
1909:20 C0 C1 78 41 4C 91 52 EB
1911:74 54 78 2C 64 14 6E AF 64
1919:0D 5A 05 0D 54 64 70 01 EF
1921:50 05 2A C8 C0 01 58 20 69
1929:01 40 01 40 A1 F7 01 7C 7B
1931:4A 74 01 A0 F5 15 42 84 DC
1939:55 5A 00 15 6E 56 39 59 96
1941:08 21 25 68 0C 55 50 03 44
1949:95 B1 C5 80 84 31 88 40 AD
1951:B1 5C BC 8C 37 02 3E 00 12
1959:01 8C DD 63 2C F9 20 04 AE
1961:63 D2 90 64 A3 B0 71 B0 C5
1969:61 56 9C 16 01 60 0C 05 7D
1971:19 02 45 05 24 01 4C F0 58
1979:0A 90 3A AA 94 F0 02 95 C8
1981:5C 9C A8 44 32 00 0F FC 0F
1989:DD C6 30 A0 03 16 06 A0 89
1991:0F 16 AA AC 56 80 0F 2A ED
1999:8C FF 3F F0 6F 29 C2 00 AE
19A1:02 0B 19 16 02 85 05 80 CC
19A9:40 0A C9 0C C0 00 30 30 0F
19B1:82 6A D7 DD 20 25 E0 20 10
19B9:13 50 03 20 A0 00 20 A8 D9
19C1:30 20 20 1C A3 A8 54 DD 20
19C9:A0 82 0B E6 7B 08 C0 2A 64
19D1:2F 0A 08 0C 2A 1B 07 55 01
19D9:15 55 55 DD 42 B8 60 7E A8
19E1:27 B6 20 42 10 89 00 7B 9F
19E9:24 40 44 22 DD 40 2E 01 36
19F1:50 A9 54 00 40 1A A9 D0 CF
19F9:12 A8 6A 55 A0 B0 93 02 F2
1A01:10 46 20 36 1A 15 01 08 65
1A09:A2 8E 54 28 2E 74 15 00 AC
1A11:6A A4 AA AA A9 0A 55 A9 6D
1A19:8C 0B 10 04 00 04 DD A8 0D
1A21:45 1D 05 71 08 38 34 4C CC
1A29:85 C5 10 3C 0B FE 00 01 AC
1A31:96 03 01 80 01 01 A3 02 EE
1A39:82 22 50 10 7C 48 43 06 D3
1A41:44 1C 07 DD 39 05 07 4D 96
1A49:08 08 14 50 03 DD 55 46 8B
1A51:86 7F 3F 77 90 3C 7E 35 AF
1A59:02 39 10 61 FE FC 99 07 1B
1A61:19 02 50 00 1C C5 40 51 76
1A69:08 00 41 03 19 01 CC 33 93
1A71:34 90 11 FF FF DD 80 80 FE
1A79:A0 0C 80 DD C0 C1 DD 1B D2
1A81:DD 01 DD 06 06 C8 41 03 D9
1A89:72 12 DF 28 68 A0 08 00 CF
1A91:84 14 C6 03 10 0F 04 21 FB
1A99:23 AB 40 C8 48 C8 08 14 68
1AA1:10 D6 38 4E 20 25 19 47 8E
1AA9:A3 40 D9 40 DA 05 B1 28 75
1AB1:10 0A 93 05 26 B3 88 80 C4
1AB9:A2 28 7A 28 37 F0 EA 08 76
1AC1:DC 40 C8 B8 83 CF E2 11 4B
1AC9:84 EE 88 88 A3 64 C3 03 CE
1AD1:61 63 63 43 2A E3 A9 98 FC
1AD9:98 03 A1 28 AB 03 A1 98 17
1AE1:98 43 A0 48 88 05 05 2B 59
1AE9:00 4E E6 30 0F 90 91 0A 79
1AF1:8F 89 0D 04 E8 00 90 84 1F
1AF9:8C 87 0F 0F AC 89 3B 0A 35
1B01:20 61 14 0A 0A 19 33 61 3F
1B09:8E 83 05 46 A0 00 00 00 71
1B11:0A 00 0F 05 E0 00 00 00 85
```

Tai Bush, a computer science student at the University of Colorado at Colorado Springs, enjoys radio-controlled boats, electronics, and classical music.

TAG IT

By Farid Ahmad

While working on a specific area of a program, you may find it necessary to list the same lines repeatedly. You must either hunt through the entire listing until you find the lines you need or remember and enter the proper numbers each time.

There's an easier way. Tag It is a handy, relocatable utility that makes it possible to list different parts of a BASIC program with a single keystroke. With Tag It you can mark different parts of a listing with different tags and list them easily.

Tag It offers other features as well. These include definable function keys, editing keys, and an escape key to cancel quote or insert mode.

Entering the Program

Tag It is written in machine language. To enter it, you'll need MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following.

Starting address: 0801
Ending address: 1330

Be sure to save a copy of the program before exiting MLX.

Using the Program

When you load and run Tag It, it'll install and activate a machine language routine. Tag It will display the memory area where it has put the routine and then ask if you want to create an object file. For now, answer no. Any response other than Y is taken as a no.

Now hold down the Commodore key and press any of the following keys: Z, P, R, A, S, D, or F. Each combination lists a different portion of the program. You can quickly move the cursor for editing by using other combinations with the Commodore key.

Press Commodore-< to move the cursor to the beginning of a line. Press Commodore-> to move the cursor to the end of a line. Press Commodore-? to move to the middle of a line. Commodore–Crsr Down moves the cursor to the bottom left corner of the screen.

Enter the quote or insert mode. Press the Ctrl key to confirm that you're in this mode. To escape from the

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quote mode, press the Ctrl key and Commodore key simultaneously.

Tags

A tag consists of a REM statement and a letter of the alphabet. You saw a demonstration of a tag if you pressed the Commodore key and one of the letters listed above. For an example, list line 10. If you have entered the line correctly, you should see REM-A. The letter is the tag identifier. You can use any letter of the alphabet as an identifier. Now hold down the Commodore key and press A. You'll notice that the program lists from line 10 onward. Suppose you want to list your program from line 600 onward. Add the following line to your program.

```
599 REM-T
```

By using different letters for different lines, you can create up to 26 tags. Note that there's no space between REM, the minus sign, and the letter. This is important.

Tips and Caveats

Most programs are written with many subroutines, each with a specific job. You can use descriptive tags to list them. If a subroutine starting at line 1000 produces a display, you might add 999 REM-DISPLAY to your program. Commodore-D will list this subroutine. Note, however, that Tag It uses only the first letter in the word for identification.

For another example, if in the same program you added 2000 REM-DRAW TITLE, Commodore-D would still list the program from line 999 onward. This is because Tag It reads only REM-D in both of the above lines; and since line 999 is found first, the listing starts from there. In general, whenever the same letter is used in two or more tags, the listing starts from the first occurrence of that tag. If you press Commodore-D with Tag It on the screen, you'll see the program list Data statements that begin with line 480.

Normally, when you press the Commodore key along with a letter key, a graphic character is displayed. These characters are generally typed within print statements. Tag It checks for the quote and insert modes. If either of these is active, the normal graphic character is displayed. If a tag isn't found in the listing, nothing happens.

Tag It will be disabled when you press Run/Stop-Restore. Reactivate it with SYS and the starting address.

Function Keys

Now, hold down the Commodore key and press any of the function keys. The default function key definitions will be displayed. These can be altered.

List the program to see the default function key definitions in lines 220–250, or press Commodore-F if Tag It is active. You can change these definitions at will. However, the total length of the text of the four function keys (including carriage returns, if used) must not exceed 250 characters. A warning is given if this happens.

Relocation

The BASIC loader puts Tag It at location 49152. This can be changed easily by assigning a new address to variable SA in line 30. The amount of memory used will depend upon the length of the function key definitions.

If you answer yes when the program asks if you want to create an object file, you'll be asked for a filename. After that, a machine language file of Tag It is saved on disk. You can install Tag It from the object file by using the following commands.

```
LOAD"TAG IT",8,1
NEW
SYS starting address
```

Before saving the object file, you may want to change the function key definitions to your liking.

If you plan to use Tag It from the BASIC loader, add the following line to it: 395 NEW. When you run this new version of Tag It, you'll not be asked if you want to create an object file. The program will then execute the NEW command after it installs the machine language in memory.

Compatibility

Tag It is compatible with BASSEM and MetaBASIC. If you use Tag It with MetaBASIC, the 8 function keys provided by MetaBASIC will still be active, giving you a total of 12 function keys.

TAG IT

```
0801:09 08 0A 00 8F 2D 5A 00 BE
0809:3F 08 14 00 97 35 33 32 67
0811:38 30 2C 30 3A 97 35 33 9F
0819:32 38 31 2C 30 3A 97 36 09
0821:34 36 2C 33 3A 99 22 93 A1
0829:54 41 47 20 49 54 20 12 8C
0831:57 4F 52 4B 49 4E 47 2E FF
0839:2E 2E 2E 2E 22 00 4C 08 46
0841:1E 00 53 41 B2 34 39 31 E8
0849:35 32 00 5A 08 28 00 45 4C
0851:41 B2 53 41 AA 33 37 35 F2
0859:00 6B 08 32 00 8F 2D 50 51
0861:4F 4B 45 20 49 54 20 49 BB
0869:4E 00 8B 08 3C 00 81 49 C0
0871:B2 53 41 A4 45 41 3A 87 4D
0879:20 44 3A 43 4B B2 43 4B 1D
0881:AA 44 3A 97 49 2C 44 3A 76
0889:82 00 B8 08 46 00 8B 43 FE
0891:4B B3 B1 34 36 31 33 39 C3
0899:A7 99 22 45 52 52 4F 52 49
08A1:20 49 4E 20 44 41 54 41 F0
08A9:20 53 54 53 54 45 4D 45 F5
08B1:4E 54 53 22 3A 80 00 C7 26
08B9:08 50 00 8F 2D 52 45 4C 64
08C1:4F 43 41 54 45 00 D5 08 95
08C9:5A 00 46 4B B2 53 41 AA 94
08D1:33 37 36 00 FD 08 64 00 E8
08D9:48 31 B2 B5 28 28 53 41 D5
08E1:AA 31 33 29 AD 32 35 36 63
08E9:29 3A 4C 31 B2 28 53 41 D7
08F1:AA 31 33 29 AB 48 31 AC 2A
08F9:32 35 36 00 27 09 6E 00 71
0901:48 32 B2 B5 28 28 53 41 3F
0909:AA 33 34 31 29 AD 32 35 70
0911:36 29 3A 4C 32 B2 28 53 94
0919:41 AA 33 34 31 29 AB 48 ED
0921:32 AC 32 35 36 00 51 09 6E
0929:78 00 48 33 B2 B5 28 28 98
0931:53 41 AA 33 34 32 29 AD 30
0939:32 35 36 29 3A 4C 33 B2 27
0941:28 53 41 AA 33 34 32 29 07
0949:AB 48 33 AC 32 35 36 00 47
0951:7B 09 82 00 48 34 B2 B5 E1
0959:28 28 53 41 AA 33 37 36 CE
0961:29 AD 32 35 36 29 3A 4C 24
0969:34 B2 28 53 41 AA 33 37 CE
0971:36 29 AB 48 34 AC 32 35 D0
0979:36 00 93 09 8C 00 97 53 90
0981:41 AA 30 32 2C 4C 31 3A 37
0989:97 53 41 AA 30 37 2C 48 0E
0991:31 00 AB 09 96 00 97 53 79
0999:41 AA 35 36 2C 4C 32 3A 32
09A1:97 53 41 AA 35 37 2C 48 4E
09A9:32 00 C3 09 A0 00 97 53 65
09B1:41 AA 36 31 2C 4C 32 3A 1A
09B9:97 53 41 AA 36 32 2C 48 5A
09C1:32 00 DB 09 AA 00 97 53 D0
09C9:41 AA 36 36 2C 4C 33 3A 84
09D1:97 53 41 AA 36 37 2C 48 86
09D9:33 00 F3 09 B4 00 97 53 BC
09E1:41 AA 39 36 2C 4C 34 3A FE
09E9:97 53 41 AA 39 37 2C 48 B6
09F1:34 00 0D 0A BE 00 97 53 D8
09F9:41 AA 31 30 37 2C 4C 34 B7
0A01:3A 97 53 41 AA 31 30 38 49
0A09:2C 48 34 00 13 0A C8 00 1E
0A11:3A 00 21 0A D2 00 8F 2D E9
0A19:46 4E 20 4B 45 59 53 00 D2
```


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```
0A21:56 0A DC 00 46 24 28 31 C2
0A29:29 20 B2 22 50 4F 4B 45 ED
0A31:35 33 32 38 30 2C 31 3A 45
0A39:50 4F 4B 45 35 33 32 38 1A
0A41:31 2C 32 3A 50 4F 4B 45 7E
0A49:36 34 36 2C 33 22 AA C7 4E
0A51:28 31 33 29 00 72 0A E6 83
0A59:00 46 24 28 32 29 20 B2 2F
0A61:22 46 55 4E 43 54 49 4F F4
0A69:4E 20 4B 45 59 20 32 22 3C
0A71:00 8B 0A F0 00 46 24 28 42
0A79:33 29 20 B2 22 4C 49 53 C8
0A81:54 3A 22 AA C7 28 31 33 B1
0A89:29 00 A3 0A FA 00 46 24 CF
0A91:28 34 29 20 B2 22 52 55 06
0A99:4E 3A 22 AA C7 28 31 33 C6
0AA1:29 00 A9 0A 04 01 99 00 77
0AA9:CC 0A 0E 01 81 20 52 B2 5C
0AB1:31 20 A4 20 34 20 3A 8B 1F
0AB9:46 24 28 52 29 B2 22 22 9E
0AC1:A7 46 24 28 52 29 B2 22 01
0AC9:20 22 00 D2 0A 18 01 82 D8
0AD1:00 0D 0B 22 01 81 20 52 4D
0AD9:B2 31 A4 34 3A 4C B2 4C 20
0AE1:AA C3 28 46 24 28 52 29 35
0AE9:29 3A 82 3A 20 20 20 8B 62
0AF1:4C B1 32 35 30 A7 99 22 A7
0AF9:46 4E 20 4B 45 59 53 20 D3
0B01:54 4F 4F 20 4C 4F 4E 47 84
0B09:22 3A 80 00 1F 0B 2C 01 4D
0B11:54 54 B2 AB 31 3A 81 20 0D
0B19:52 B2 31 A4 34 00 31 0B 84
0B21:36 01 81 49 B2 31 A4 C3 BE
0B29:28 46 24 28 52 29 29 00 75
0B31:58 0B 40 01 54 24 B2 CA B1
0B39:28 46 24 28 52 29 2C 49 D4
0B41:29 3A 54 54 B2 54 54 AA 84
0B49:31 3A 97 46 4B AA 54 54 DF
0B51:2C C6 28 54 24 29 00 5F 9E
0B59:0B 4A 01 82 49 00 74 0B 0E
0B61:54 01 54 54 B2 54 54 AA EB
0B69:31 3A 97 46 4B AA 54 54 FF
0B71:2C 30 00 7B 0B 5E 01 82 B7
0B79:52 00 89 0B 68 01 45 41 AD
0B81:B2 45 41 AA 4C AA 35 00 8C
0B89:98 0B 72 01 8F 2D 41 43 04
0B91:54 49 56 41 54 45 00 A0 5B
0B99:0B 7C 01 9E 53 41 00 BE BC
0BA1:0B 86 01 99 22 13 1D 1D 4D
0BA9:1D 1D 1D 1D 1D 12 41 43 02
0BB1:54 49 56 41 54 45 44 20 83
0BB9:20 20 20 22 00 E1 0B 90 3C
0BC1:01 99 3A 20 99 22 4C 4F 45
0BC9:43 41 54 45 44 20 41 54 2A
0BD1:20 3A 22 3B 53 41 3B 22 B6
0BD9:20 2D 20 22 3B 45 41 00 E2
0BE1:15 0C 9A 01 99 3A 99 22 F3
0BE9:53 41 56 45 20 4F 42 4A 26
0BF1:45 43 54 20 46 49 4C 45 3D
0BF9:20 28 59 2F 4E 29 20 3F DE
0C01:22 3A 97 31 39 38 2C 30 F1
0C09:3A 92 31 39 38 2C 31 3A AB
0C11:A1 41 24 00 24 0C A4 01 6A
0C19:8B 41 24 B3 B1 22 59 22 F1
0C21:A7 80 00 3A 0C AE 01 99 87
0C29:3A 20 85 22 46 49 4C 45 6E
0C31:4E 41 4D 45 22 3B 46 24 6D
0C39:00 4E 0C B8 01 8F 2D 53 E5
0C41:41 56 45 20 4F 42 4A 20 72
0C49:46 49 4C 45 00 85 0C C2 A5
0C51:01 9E 35 37 38 31 32 46 DC
0C59:24 2C 38 3A 97 31 37 33 5C
0C61:2C 53 41 AD 32 35 36 3A 74
0C69:97 31 37 32 2C 53 41 AB 80
0C71:C2 28 31 37 33 29 AC 32 58
0C79:35 36 3A 97 37 38 30 2C A1
0C81:31 37 32 00 AF 0C CC 01 8E
0C89:97 37 38 32 2C 45 41 AD 0C
0C91:32 35 36 3A 97 37 38 31 B5
0C99:2C 45 41 AB C2 28 37 38 59
0CA1:32 29 AC 32 35 36 3A 9E 6B
0CA9:36 35 34 39 36 00 BA 0C 77
0CB1:D6 01 8F 2D 44 41 54 41 4B
0CB9:00 08 0D E0 01 83 31 32 2E
0CC1:30 2C 31 36 39 2C 30 31 92
0CC9:31 2C 31 34 31 2C 31 34 BF
0CD1:33 2C 30 30 32 2C 31 36 72
0CD9:39 2C 31 39 32 2C 31 34 2C
0CE1:31 2C 31 34 34 2C 32 2C E9
0CE9:38 38 2C 30 39 36 2C 31 E0
0CF1:37 33 2C 31 34 31 2C 30 F9
0CF9:30 32 2C 32 30 31 2C 30 2E
0D01:30 32 2C 32 34 30 00 53 1E
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1319:30 2C 30 33 31 2C 30 30 66
1321:39 2C 30 32 33 2C 30 32 F4
1329:35 2C 30 31 32 00 00 00 9F
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Farid Ahmad says he'd still love Gazette even if we didn't publish Tag It. He lives in Islamabad, Pakistan. ❐

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and *The Automatic Proofreader* are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each *Gazette Disk* and are printed in all issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free printed copies of both of these handy programs for you to type in. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Send a self-addressed disk mailer with appropriate postage to receive these programs on disk.

Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Gazette is looking for utilities, games, applications, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it on disk to

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Please enclose an SASE if you wish to have the materials returned.

ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, Gazette Disk offers bonus programs. Here's a special program that you'll find only on this month's disk.

Pyramid
By Robert Cook
Watertown, MA

This month's bonus program, Pyramid, is a commercial-quality solitaire card game that is actually two games in one: Pyramid1 and Pyramid9. In both games, cards are stacked to form a pyramid. The object of both games is to remove as many cards as possible.

In Pyramid1, you must remove from the bottom of the pyramid-shaped pile a card whose number is one more or one less than that of the top card in the discard pile. Draw from the deck when you have no play.

In Pyramid9, you are to select two cards whose numbers total 9. Both cards may be from the pyramid, or one from the pyramid may be combined with the top card on the discard pile. Once again, you must pull cards from the bottom of the pyramid.

Both of these games are simple, addictive, and a lot of fun. They're ready to play on this month's Gazette Disk.

You can have this program and all the others that appear in this issue by ordering the August Gazette Disk. The price is $9.95 plus $2.00 shipping and handling. Send your order to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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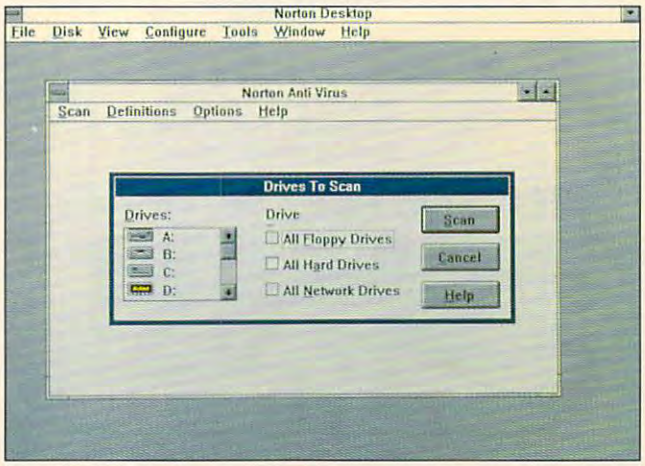
THE NORTON ANTIVIRUS

One of the most frightening catastrophes that can befall serious computer users is the introduction of a virus into their systems. Since the very first time I heard whisperings of viruses (a topic too terrible to utter aloud), I've been using one form of virus protection or another.

Virus programs come in many different forms. Some require a tremendous amount of setup effort, such as entering the names of all executable programs on your system and giving each of them "permissions." Others track your system and stop you each time any read or write occurs. Predictably, the inconvenience of either of these strategies would probably keep you from using a virus-protection program: If you can't install the program easily or if it interrupts your work, you aren't going to use it. The Norton AntiVirus sidesteps both of the usual problems.

The installation is so simple that even the most inexperienced user can do it quickly and easily. The instruction pamphlet is clear, concise, and to the point. I installed the program and was ready to go in about ten minutes. If you start the install program and choose only the defaults, your system will be protected from most, if not all, infection scenarios. If you have Microsoft Windows on your system, you only need to add NAVW.EXE to any program group, and The Norton AntiVirus will be installed for Windows.

Once the program was installed, I was able to continue with my work as if nothing in my system were different—until I placed a floppy disk in my A: drive and tried to get a directory. The disk had the FORM virus on it and The Norton AntiVirus Intercept quickly alerted me to the fact that the disk in drive A: had a boot-sector virus. I then launched The Norton Virus Clinic and scanned the disk. The Virus Clinic confirmed that the disk indeed had a virus, identifying the FORM virus by name.



Practice safe computing with The Norton AntiVirus, which finds viruses, alerts you to their presence, and helps you remove them.

Unfortunately, selecting the Repair option failed to remove the virus—although the program did inform me that the virus hadn't been removed. I called customer support and learned there was a way to remove the virus "by hand." Norton's customer-support staff talked me through the procedure. If the virus is on a hard drive or bootable disk, all you have to do is boot with a clean DOS disk and reissue the DOS command SYS.COM. In my case, however, the virus was on a nonbootable floppy disk. I was told to do the following: Copy (using COPY or XCOPY, not DISKCOPY) the files from the disk, reformat the floppy, and copy the files back onto the floppy.

There are not only many different viruses but also many different strains of certain viruses. No product can possibly detect and fix every single one. Many new viruses are found weekly, which would lead you to believe that any product you buy will be useless in about a month. Fortunately, The Norton AntiVirus can also overcome those difficulties. The program works by using virus "definitions"; these are like little pictures of the virus's signature. For support, there's a free bulletin board service from which you can download new virus definitions as needed. These definitions can easily be installed into your existing program, making your system as current as the technology at Symantec.

For those of you without a modem, there are two alternate ways to update your virus definitions. First, for the cost of shipping and handling, Symantec will send you a disk containing update information. Second, it has a fax service from which you can get definitions that you can install by typing them in. The latter may not sound optimal, but if you happen to have a particular virus on your system and you need a new definition for only that one, it won't take more than five to ten minutes for even the worst hunt-and-peck typist to update that particular definition.

After using The Norton AntiVirus, I can clearly see that Symantec has taken great pains to create a program capable of preserving data. It will work well on almost any system and in most cases will provide the protection you need. It's easy to install, convenient to use, and simple to update.

In these days of both software and hardware being shipped already infected with viruses, the virus problem is no longer the exclusive province of the modem enthusiast. Everyone needs virus protection, and The Norton AntiVirus is a good place to get it.

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AST ADVANTAGE!

The AST Advantage! notebook computer actually presents a bad omen for a large sector of the PC industry. No, it doesn't bode negatively for the future of laptops, but it could be a sign of eventual doom for the behemoth desktop PCs that currently inhabit our work areas. When manufacturers can create laptops with all

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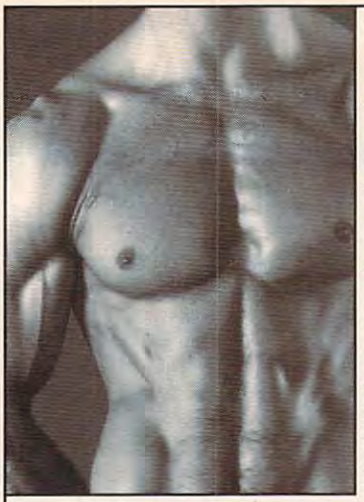

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Circle Reader Service Number 246

the functionality, performance, and ergonomics of a full-size computer, there's little justification for most people to give up the top of their desks to a mammoth PC.

No, the Advantage! doesn't have expansion slots, a CD-ROM drive, or a 4-billion-color graphics card. What it does have, though, is a set of features that will probably satisfy all the computing needs of a large percentage of the PC-using public, all packed into a case that's small enough to slide over to a corner of your desk. And since the Advantage! is sold through mass-market outlets such as Circuit City, its street price should be competitive with prices of brand-name desktop PCs.

When you go on the road, you don't have to settle for a stripped-down machine to get the advantage of portability. With a 20-MHz 386SX processor, a 40MB hard drive, 4MB of RAM (expandable to 8MB), an internal 2400-bps modem, and VGA graphics, the Advantage! packs a lot of utility into a six-pound package.

The machine is solidly constructed, with a heavy-gauge plastic case. In three months of use, including numerous airplane trips, I never experienced a problem with it. Its size is just about right to fit on an airline tray table, although it's a little deep; you'll find the keyboard pretty close to your belly if you're sitting in coach.

The Advantage! has one of the best laptop keyboards I've used. The keys have a deep throw, and their feel is very similar to the feel of a desktop's keys. A PS/2-style keyboard port on the back of the machine allows you to connect a full-size keyboard (or a separate numeric keypad) when using the machine in the office. The same port can also accommodate a PS/2-style mouse.

The gray-scale LCD screen on this laptop is sharper and clearer than that of any other laptop I've ever used. It exhibits none of the ghosting problems of earlier-technology laptop screens. The onscreen clarity of the sharp black-on-white text was the primary reason I chose to do all my writing on the Advantage! instead of my desktop PC. If you do need color, the Advantage! has a monitor port on the back that supports all standard VGA modes. Also present are parallel, serial, and power-adapter ports.

The Advantage! has a host of power-saving utilities built in, including the automatically timed shutdown of both backlighting and the hard disk. The modem and speaker can be shut off if they're not needed, and a sleep mode slows the processor to a crawl if the computer is idle for a period of time, saving even more power. On average I was able to get about three hours of usage from a single charge. If you buy an extra battery, you'll find swapping batteries a literal snap. Just open the battery cover, pull out the old battery, and slide in the new one—a welcome change from the days of removing nicad battery wires with a screwdriver. Using a standard bulky power brick, charging takes only 3 hours when the Advantage! is turned off and 10–16 hours when it's on. If you need more portability, you can purchase a trickle charger—a small, light unit that charges the machine overnight with the power off. You can't run the computer from the trickle charger, though. You can also buy an automatic adapter and an external battery charger for the unit.

The only really negative aspect of the machine is its poor documentation. The 38-page user's guide is probably all an experienced computer user will need to get up and running, but its short, one-line definitions of DOS commands will do little to help the novice. Considering that this model is designed to be sold in mass-market outlets, where the sales staff's computer knowledge is inconsistent at best, AST should have included more thorough documentation.

That minor caveat aside, the Advantage! is a real winner. Its speedy performance, power-saving features, and crystal-clear LCD screen make it a standout among laptops. All but the most power-hungry PC users will find the Advantage! a better choice than either underpowered notebook computers or desk-hogging PCs.

DENNY ATKIN

AST Advantage!—$1,899

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HARE RAISING HAVOC

Remember what it was like to go to the movies to see a Disney feature-length animated film, such as *Snow White, Pinocchio,* or *Who Framed Roger Rabbit?* Disney's new computer game, Hare Raising Havoc, may be too short to merit comparison to a feature film, but the Disney style and quality are there. It may be trite to say so, but a great computer game requires the same attention to detail needed with a movie production.

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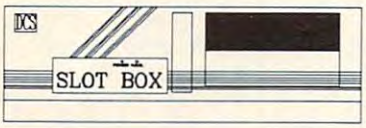

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Sam Palahnuk assembled a team who worked on the game for almost two years. Charles Fleischer and other voice talents from the cartoons re-created the voices that were digitized for the game from a script written especially for the production. It really sounds like Roger Rabbit when he reminds you, "I had better get moving," as you race to beat the clock. A movie sound-effects company digitized more than 240 effects, so when Roger gets hit on the head with an ironing board, it's a totally different sound from when he breaks dishes. The soundtrack of opening, ending, and transition music was composed and arranged by a movie composer and digitized from a sound-studio performance, so the game sounds like a Maroon Cartoon. Stings—short music pieces designed to evoke emotion—have been digitized to punctuate the action. The 1MB+ audio portion of the game is remarkably effective.

Animation is what Disney does best. The Hare Raising Havoc animation started at the Disney storyboard with pencil drawings. The pencil drawings were expanded to detailed action drawings, which were approved by the animation department before being digitized into computer graphics. Video footage from *Who Framed Roger Rabbit* was captured, modified, and digitized for the animation sequences, such as Roger's authentic and goofy 16-stage walk cycle. The animated characters were then layered over detailed, realistic, and believable backgrounds as in all Disney animated features. The drawings and backgrounds were painted with a computer paint program. The result is some of the best computer animation seen in a game of this type. Remarkably, the action is smooth and runs surprisingly fast on a slow 386 machine.

Beyond the dazzle and glitz of Hollywood and Disney animation technology, the Disney design team had to tackle a new area of interactive silicon-based entertainment. Hare Raising Havoc is accurately described by Palahnuk as a "puzzle and arcade game." As a game, it differs significantly from the other animation-based productions, such as the Dynamix adventure game Willy Beamish. Roger's puzzles are obscure, at best, and their solution requires imagination and the ability to think like a "toon." Roger must be squashed, pounded, tripped, and burned to complete the episode, all as a race against the ever-moving hands of the clock. The seeming lack of time is corrected by repeating certain actions that earn Roger extra time. The solution to the Roger game is a difficult sequence of arcade events which, when combined with the lack of a save-game feature, leave no margin for error. Many will find this game too frustrating, but its visual and audio features will keep others coming back for more.

Hare Raising Havoc offers Disney animation, but the game is difficult and, with no save-game feature, potentially frustrating.

In spite of the short length, lack of locations to explore, and difficult and obscure puzzles, Hare Raising Havoc emerges as a landmark in the production of computer games. The animation, detailed backgrounds, wonderful music, elaborate sound effects, and voice track make me hope that producer Palahnuk will bring Roger back for a longer and more involved romp in a sequel to this excellent game.

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CANON BJ-5

Canon's BJ-5 printer is nearly indistinguishable from the other entries in its portable BJ line. It uses the same bubble-jet technology that brought ink-jet printers out of the closet and put them in the briefcases of mobile executives and on the desks of home office workers. In fact, except for the color of the case—a traditional computer cream, rather than the dark gray of the BJ-10e—you won't be able to tell much difference between this and the original.

Like the other BJ printers, the BJ-5 draws power from either an AC adapter or a rechargeable ni-cad battery pack. And, though larger than some other portable printers, the BJ-5 makes a good traveling companion for sales personnel or anyone else needing access to high-quality printing while on the road. But don't sell this unit short if you're looking for a desktop printer. The compactness—12.2 × 8.5 × 1.9 inches—that makes it such a good traveling companion also serves well in a home office, where space is at a premium. When coupled with the automatic sheet feeder, the BJ-5 rivals

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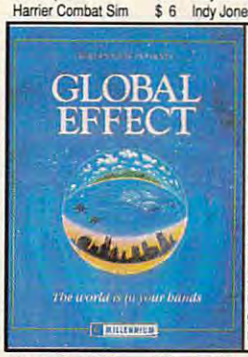

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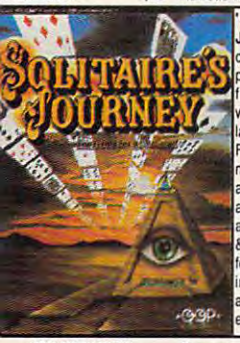

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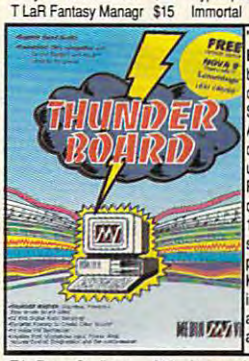

'THUNDER BOARD' is a sound board that is 100% compatible with Soundblaster and Adlib. It reproduces digitized sounds using an 8 bit DAC. Features include dynamic filtering, 11 Voice FM music synthesizer, sampling rate up to 22 KHz, microphone input, joystick port, and a 2 watt power amplifier. **$84**

'MIGHT AND MAGIC 3' is the latest in the Might & Magic roleplaying series. Features an elaborate world in which to adventure, thousands of illustrated inhabitants, stunning music, sound effects & speech, automatic help with pop-up maps. Includes full color map of the Isles of Terra. **$37**

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Circle Reader Service Number 149

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many more expensive printers, including low-cost laser printers.

The BJ-5 setup procedure is simple and is aided by clear instructions from the brief but complete manual. The process of installing a ribbon cartridge and printing a test pattern takes about eight minutes. Characters come out clean and without smearing, though not quite as dark as characters printed from a laser printer. The quality of the BJ-5's printing certainly offers competition to 24-pin printers, however. The BJ-5 is much quieter than either a laser printer or a dot-matrix printer.

It took me about ten minutes to print a five-page, 14K text file using Ami Pro 2.0 under Windows, with a standard Helvetica typeface and the printer set to IBM ProPrinter emulation (other emulation modes include Epson 24-pin and BJ-130e). A file of the same size took six minutes using a DOS-based word processor in a Courier typeface. Both speeds are acceptable for home office and other light-duty print jobs. For Windows applications, there is a driver available from Canon (call 800-423-2366); alternatively, you can download the file BJWIN.ZIP from the Canon forum on CompuServe. With the Windows driver, you can take full advantage of the printer's 360 × 360 dpi resolution for graphics printing.

Clearly labeled touch-panel controls are located on the front of the printer. From here you can set the top of form, adjust the line and form feeds, set pitch for condensed or regular spacing, and switch back and forth between the two printing modes: Economy and High Quality. Economy saves ink but is no faster than High Quality.

Paper can feed into the printer from the top or bottom. Envelopes or thick paper should move through the bottom slot, as it has the straightest paper path and is least susceptible to jamming. An optional sheet feeder holds about 30 sheets of paper, is very simple to operate, and installs in less than five minutes (including time spent reading the directions). In weeks of testing, the BJ-5 didn't jam once, either from the sheet feeder or in the main printer mechanism. Plain bond typewriter paper is recommended.

The BJ-5 makes a solid component for the home office desktop. With simplicity of operation and very good print quality, low noise levels, portability, reliability, and low maintenance requirements, this printer is very easy to work with. And that makes it easy to live with.

PETER SCISCO

Canon BJ-5—$499, $589 with sheet feeder

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MICROCAMP 2.0

Planning a family camping trip to Yosemite this summer? How about the Grand Canyon? With MicroCamp at your fingertips, you can stop worrying about whether you'll find a suitable campground and start dreaming about those hiking trails and fishing holes.

MicroCamp is a campground directory from Corinthian Concepts which finds the campgrounds and RV parks of the West that meet your needs. No longer do you have to search through piles of brochures and information sent from your local travel agency. Just pop in the MicroCamp disk, install it on your hard drive, and decide where you want to go.

Twelve states are included in the database: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. You simply select the state you'll be visiting and begin narrowing your search.

MicroCamp allows you to decide whether you're interested in campgrounds within a certain geographical region or recreation area, or campgrounds close to a specific town. Then, you consider whether you prefer to stay in federal, state, or private campgrounds—or whether you're interested in them all.

Next, you determine what sort of accommodations you require. Are RV hookups and disposal important to you? You can decide whether you want a campground that has boating, fishing, or hiking trails, or one that lies at a certain elevation. If you'll be traveling in the fall, winter, or spring, you'll want MicroCamp to help you find campgrounds open then. There are 14 options on the Features screen to help you limit your search.

My fiancé and I are planning a trip to New Mexico and Yellowstone. MicroCamp found many campgrounds in north-central New Mexico that met our basic requirements: open by May 20, pets allowed, and 15 or more tent sites, with flush toilets, drinking water, and showers available. Five of the campgrounds are right on our intended route, so I printed their reports. Now, when we get close to our destinations, we'll have directions to the campgrounds, their phone numbers, and other helpful information.

I repeated the search in Colorado and Wyoming, finding several campgrounds along the route we'll be taking. It was so easy that I had all the reports printed out an hour after I opened the MicroCamp package.

The program is menu driven and very easy to negotiate. Context-sensitive help is available at every screen, but the program is so intuitive that you probably won't need the help. If you dislike the screen colors and have a color monitor, it's easy to change them. You can adjust screen contrast if you have a monochrome monitor or an LCD screen—handy if you plan to take MicroCamp with you on your laptop.

The only fault I find is that there aren't enough states in the database. Traveling from the East Coast, we have a lot of miles to cover before reaching the part of the West included in MicroCamp 2.0. But begging for more is a compliment rather than a complaint.

We leave on our trip in a week, and yesterday we were concerned about being able to find appropriate campgrounds. Today, our MicroCamp reports are packed with our maps, and all we have left to do is load the car. Westward ho!

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QUANTUM PASSPORT XL

There's an old adage about not needing something until you don't have it—and then needing it real bad. That adage might well describe the Quantum Passport XL disk drive system. Not everyone needs a removable hard drive, but those who do *really* do. For about 1½ to 2 times the cost of a nonremovable hard drive, you can have a removable one. That expense may seem like a lot, but consider the justification for it.

There are several scenarios in which a removable hard drive is necessary. Absolute data security, such as being able to lock your data in a safe—or at least take it with you upon leaving your work area—is one. Then there's convenience—the ability to have exactly the same setup at home and at your office, or simply to take massive files home. A removable hard drive would work better than a remote control program which operates your office computer. You may also need a mirrored (exact working duplicate) file system.

The Quantum Passport XL drive system takes care of those needs, and it's easy to install, as well. When it comes to hardware installation, I usually experience only one emotion: fear! This feeling was quickly alleviated when I began installing the Quantum Passport XL. As a matter of fact, within about 12 minutes I not only had the drive installed but also had my complete 40MB hard drive copied over to it. The instructions were thorough, clear, and concise.

The system I have came with a SCSI card, an external chassis, and a 240MB disk drive. The list price for the system I tried is $1,787, but I've been informed that the street price is more like $1,429. My system came with the external chassis; this was necessary because my computer lacked an open exposed drive bay. This accounts for some of the external system's cost. If you have a free exposed drive bay, you can install the internal chassis and save $110.

There are a few things worth noting about a SCSI interface. Many SCSI devices can be daisychained (each connected to the previous) without a second card. Since the SCSI interface has its own BIOS, it can coexist with other interfaces and even other disk controllers. It should also be noted that even though a SCSI interface does carry a greater cost, the cost may be offset by its ability to run devices not necessarily designed for the microcomputer industry, such as many of the very large hard drives, as well as most nine-track (reel-to-reel) tape drives.

Changing a drive controller address for the Quantum Passport XL was as simple as reading a diagram and moving one jumper. Beyond that minor adjustment, I was able to install the card without much thought or effort.

The chassis installation was actually fun. The chassis has ingenious little feet that can be configured so that it will sit up either vertically or horizontally. The instructions even explain that there is a "right side up" in both configurations. After putting the feet on, all I had left to do was connect the external SCSI cable from the back of the SCSI card to the back of the chassis and turn the disk drive on.

On the back of the disk drive are two switches. One of them is labeled BOOT, and the other PROTECT. The BOOT switch determines whether or not to boot from the removable disk, and the PROTECT switch is like the write protect tab on a floppy disk. I set them both to OFF and placed the drive in the chassis (it only fits in one way unless you really force it). I then turned on the computer, placed the installation software in my A: drive, and ran the installation program; it asked all the right questions and did all the work itself.

After the installation was through, I set the BOOT switch to ON and rebooted the computer. The only difference was a crucial one: This disk is extremely fast—perhaps *crisp* would be a better adjective. It's a 9-ms drive that leaves everything else I've tried in the dust.

BRADLEY M. SMALL

Quantum Passport XL—$449 (50MB), $629 (105MB), $799 (120MB), $949 (240MB) AT internal kit with adapter—$578 Microchannel internal kit with adapter—$688 AT external kit with adapter—$688 Microchannel external kit with adapter—$798

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Don't be fooled by the name: MyBusinessCheckbook is more than a simple checkbook balancer. It's a low-end home and small business money manager that also prepares budgets and reports. You can import financial data from Quicken and Checkfree and export it to Lotus worksheets or as ASCII files. Continuous-feed check blanks are available.

You can set up multiple accounts and track them by user-defined categories, with a ceiling of 50,000 entries. Installation is uncomplicated. The fairly intuitive user interface drops down menus over its main working screen, which features scrolling check blanks and a running account balance.

The package offers neither written documentation nor an F1 help key; instead, you'll find instructions in a separate file within the program. Telephone support is prompt and knowledgeable. While not recommended for a large business or an individual with a complex financial portfolio, MyBusinessCheckbook is fine for consumers and companies with minimal cash flow.

KATHY YAKAL

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EPSON NB3S

Now that Epson is shipping its new NB-SL line of notebook computers, the company has discontinued its previous notebook—the NB3s. As a result, the NB3s can now be bought at a bargain price, making it a highly competitive machine.

For an early-generation notebook, the NB3s is extremely small and lightweight. It's only 1.7 inches high, and it weighs just 5.8 pounds including the battery. The hard drives come in 20MB, 40MB, and 60MB

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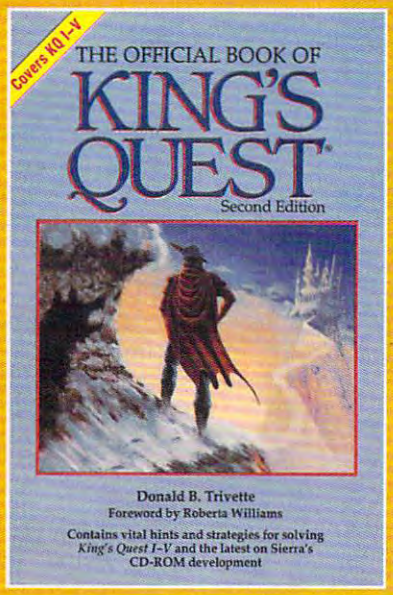

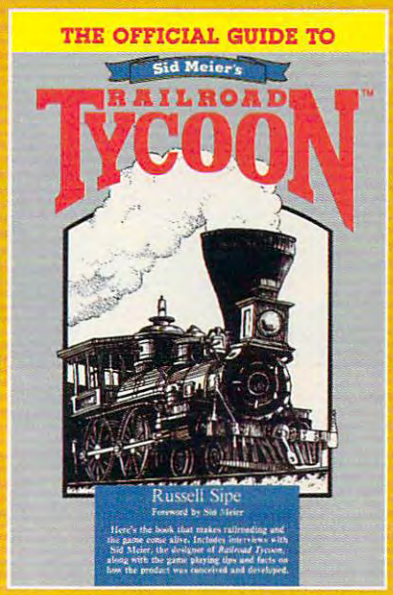

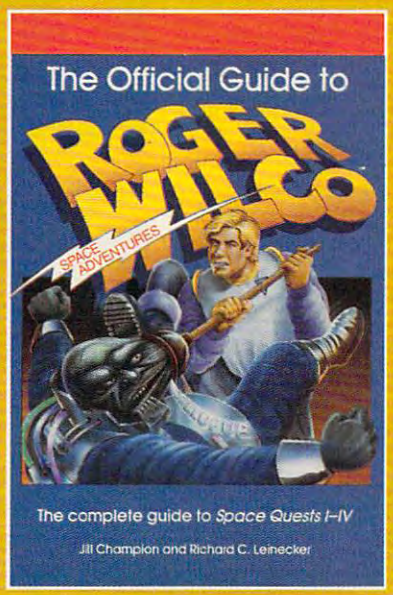

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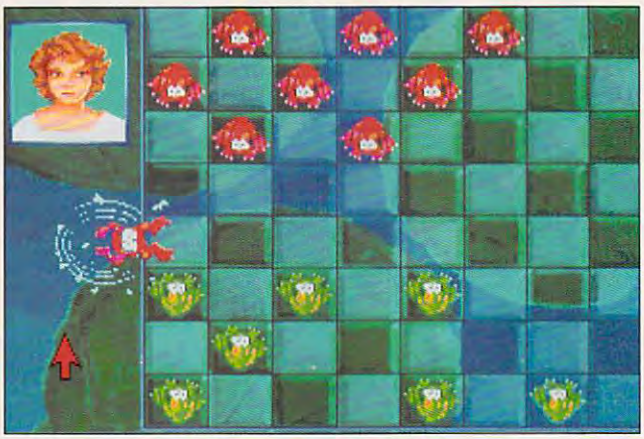
sizes, and they're removable—so you can easily carry an extra hard drive with you. The 60MB drive I tested worked fine with Stacker 2.0, providing a 120MB hard drive in a very small package.

Epson also offers an optional lightweight docking station that lets you add two standard 16-bit cards and a proprietary 200MB hard drive. The docking station has its own handle and can be carried with the NB3s attached. Epson even offers a special carrying case that accommodates both units, which together weigh only ten pounds. This combination, unique at this price, would allow you to add both network and multimedia cards and easily move the whole thing between your office and home.

For a notebook computer, the keyboard has an excellent feel. The NB3s uses the much-preferred inverted-T cursor-key layout, though the Insert and Delete keys are awkwardly placed to the right of the space bar. There's also a standby button that you can use to shut down most of the unit's power quickly without having to reboot. As is true with most early notebooks, pressing the standby button will lock up the system when you're in Windows' 386-enhanced mode.

As for the NB3s's disadvantages, there are three main ones: a very short battery life, a slower-than-usual processor, and the inability to switch automatically between normal and inverse modes while in Windows. The rechargeable battery runs only 1 to 1½ hours, though this is somewhat mitigated by Epson's including two batteries with the unit. The processor runs at 16 MHz, rather than the 20- and 25-MHz speeds more common in today's notebook computers.



Hoyle's Official Book of Games, Volume 3, allows children and adults to play several fine games, including frog checkers.

Not being able to switch automatically between normal and inverse modes requires a bit of explanation. Because white text against a black background can be hard to read on an LCD screen, most notebook computers switch from inverse to normal when moving from a text-based to a graphics-based application. The NB3s doesn't do this automatically, but it does include a program that you can use in your batch files to make the switch for you. Unfortunately, this program doesn't work under Windows. If you prefer black text against a white background and use Windows, you'll have to put up with a certain amount of frustration. If you prefer white text against a black background or don't use Windows, you'll feel perfectly at home.

If the slower processor, shorter battery life, and inverse-mode problems don't bother you, the NB3s is a nice little notebook. Its small size and lightweight docking station make it a good choice for shuffling between your office and home. Since the NB3s was discontinued earlier this year, if you see one for a bargain price at your local discount store—as I did recently—consider picking it up and giving it a try.

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HOYLE'S OFFICIAL BOOK OF GAMES, VOLUME 3

In Hoyle's Official Book of Games, Volume 3, Sierra returns once again to the tried-and-true games format used in its two earlier versions. Hoyle's 3 presents us with six new game challenges: Checkers, Backgammon, Dominoes, Snakes and Ladders, Yacht (a variation on Yahtzee), and Pachisi (a variation on Parcheesi). The third Hoyle's presents board games as opposed to the card games that were offered in Hoyle's 2.

I was pleased to see that the computer opponents presented in Hoyle's 3 are, as in the first Hoyle's, nine heroes and nine villains of other Sierra games. (Hoyle's 2 is a solitaire game; there are no opponents other than you and the cards.) You can now pit your Pachisi prowess against Passionate Patty and her pulsations. You can overhaul Vohaul's Yacht. The nine heroes are arranged in order of their difficulty as opponents, from Mother Goose, whose digitized voice prompts you when you make a mistake, to Sonny Bonds, whose ruthless play is mirrored in his squinty-eyed computer visage. The villains are similarly ordered according to their play proficiency. If you don't like computer opponents, you can play against human ones.

Checkers is by far the cutesiest game in the box, with little green and red frogs sitting and croaking on lily pads configured in the familiar 8 × 8 checkerboard pattern. A frog can jump from anywhere to anywhere, even to the top of your opponent's head. It will then jump back to its original position, while your opponent's digitized voice informs you that you've made an illegal move. If a legal move is made, the game proceeds as usual. If you make a double jump, your opponent will acknowledge your obvious demonstration of skill with a compliment. Once jumped, frogs dive deep into a pond. Should you choose, traditional button-shaped checkers can be used, but I strongly recommend playing with the frogs at least once.

Yacht and Pachisi are similar to the board versions of the games Yahtzee and Par-

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cheesi, but not identical. In Yacht, you use five dice to build poker hands. The flashy color-cycling background where the dice are rolled is animated to increase variety and interest. In Pachisi, you can play with up to four players, either computer-controlled or human. Cowrie shells, which were used in the ancient game, can be rolled instead of dice, with the clear or slitted side of the shells indicating the number of moves. An alternate board layout can be selected for gameplay. Neither Yacht nor Pachisi has a board exactly the same as that of its respective board game.

Dominoes, Backgammon, and Snakes and Ladders are the traditional games with no differences in this version. Dominoes can be played with two players and six different sets of rules. Backgammon can be played with two players and allows for use of the doubling cube if desired. Backgammon also lets you play with acey-deucy rules against a human, and two board designs are available. Snakes and Ladders is played with up to four computer or human players. The playing pieces are animated children who automatically climb the ladders and slide down the snakes. The animation is fluid, well done, and fascinating to watch. The rules can be varied, and the game can be configured so it prompts younger players to make the correct moves.

Hoyle's backgrounds, opponents, and playing pieces are animated, with digitized voices and a varied musical score accompanying play. The music is impressive throughout, as are the digitized voices. While playing the games, you can carry on conversations with the computer players to get information on the history of the games. Hoyle's 3 comes in 256-color and 16-color VGA and EGA with two sets of 3½- and 5¼-inch disks. Modem play is not supported by the game. If you wish to play a human opponent by modem, you must subscribe to The Sierra Network (TSN), a new electronic database service recently established by Sierra, and play Hoyle's 3 on the TSN board. Some voice bugs have been reported, such as conflicts with the mouse and partial rather than complete phrases and words.

On the whole, Hoyle's 3 is a great game for adults and children alike. Small children will learn about the games by choosing opponents like Mother Goose, who will not only teach them how to play but also tell them about the history of the games. If my experience is any indication, grownups will be equally entertained. Hoyle's 3 will probably be a permanent addition to my hard drive.

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DICONIX COLOR 4

Kodak's Diconix Color 4 is a lightweight and quiet desktop color ink-jet printer that uses four drop-in cartridges of black, magenta, cyan, and yellow ink to produce an expansive palette of color combinations.

The Color 4 offers 192 × 192 dpi resolution on both plain paper and ink-jet transparencies. Its ability to print transparencies could be a real boon to anyone who needs to create display or presentation transparencies for use in overhead projectors. The Color 4 accepts both cut-sheet and tractor-feed paper.

Setting up the Color 4 is simple. A system card which contains driver information slips into a slot in the back of the printer, and the four color cartridges drop easily into their color-coded receptacles in the printhead assembly. The cartridges do have to be primed for use first. This involves using a paper clip to start the flow of ink before the cartridges are inserted. A small sheet of blotter paper supplied with the printer must also be inserted in a special receptacle. This blotter absorbs excess ink and helps prevent smearing.

The printer's display panel contains the usual online, linefeed, and form-feed buttons, plus a 16-character LCD display window. This display keeps you informed of any errors, and it also serves as a menu from which to select printing functions. From this menu, you can select either paper or transparency, print quality, any of three resident fonts, text color, and text mode.

This display is especially useful whenever a malfunction occurs. The Color 4 can diagnose most problems and flash an appropriate message on the screen. Some messages, such as *ADD PAPER*, are easy to understand, while others, such as *CARTRIDGE D 41*, require help from the manual in locating a possible cause and remedy.

I experienced this latter message a number of times when I first used the Color 4 near an office window. One possible remedy involved removing, inspecting, and priming the black ink cartridge. This error persisted intermittently and became quite annoying. Later, I discovered that ambient light could be the culprit, causing such repeated errors to occur. An optical sensor tracks carriage and printhead movement, and bright light on this sensor can cause errors. After I made certain that the printer's lid was closed and I moved it away from the window, the Color 4 worked very well.

I tried the printer with a number of color printing programs, but very few of them had a printer driver for this new model. The manual recommends selecting a Hewlett-Packard PaintJet driver as an alternative.

Whenever this driver was available, the Color 4 performed quite well and the quality of its color images was impressive. Drivers are supplied on a separate disk for using the Color 4 with Microsoft Windows.

On the negative side, I was not impressed with the quality of the Color 4's text printouts. Draft, NLQ, and Quality modes are available, but even at its highest resolution, I'd hesitate to recommend the Color 4 for business correspondence. I *would* recommend it, however, for use at home, at school, or anywhere else that low-cost color printouts are needed.

TOM NETSEL

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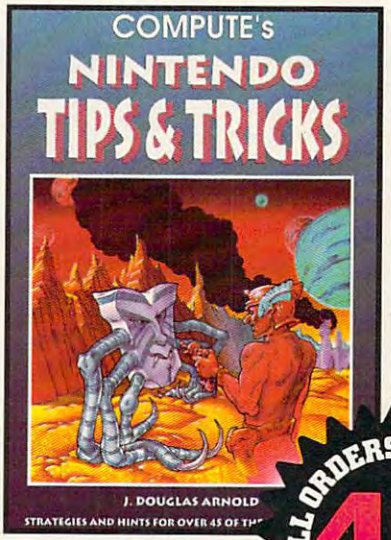

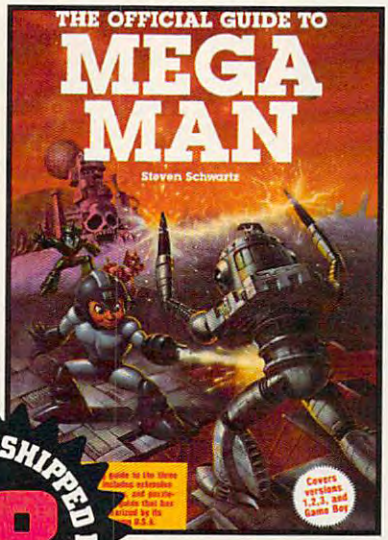

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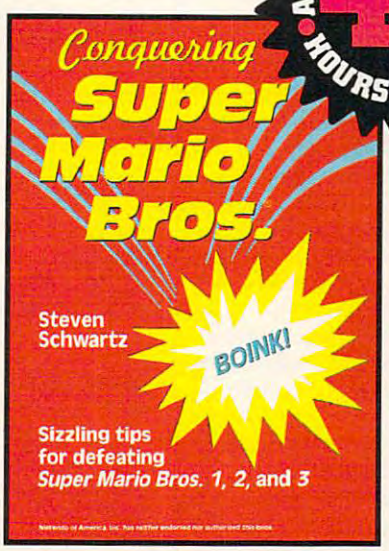

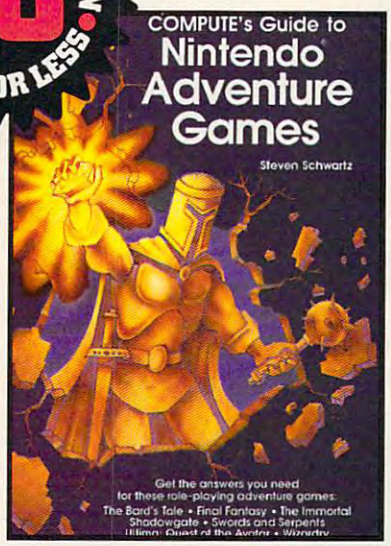

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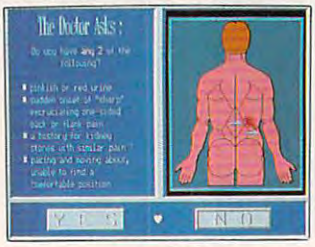

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REVIEWS

DESIGN YOUR OWN HOME

For many years, I've dreamed of designing my own house, and I've covered an untold number of sheets of paper with sketches and plans. But the effort made one thing abundantly clear. I'm no architect, and it shows.

Then I discovered the Design Your Own Home software from Oregon-based Abracadata. Its three modules (Architecture, Interiors, and Landscape) brought my PC into the picture. Ah . . . Just the thing for a would-be Frank Lloyd Wright like me!

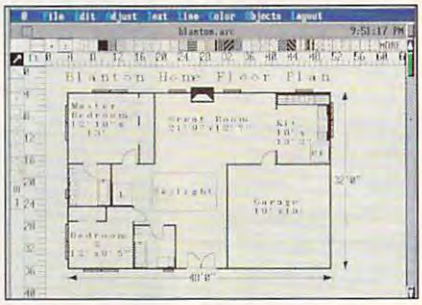
The DYOH modules are, in essence, a set of specialized CAD programs with reasonable price tags and gentle learning curves. At the heart of each one is an intuitive, Windows-like user interface with pull-down menus. Each module offers a variety of appropriate tools for creating and labeling your designs; a mouse is highly recommended for DYOH.

One key to successful PC-based design is the ability to create and export layers, and this is easily done in the DYOH modules. For instance, you can create a floor plan in DYOH Architecture with separate overlays showing wiring and plumbing. You can then import the basic plan into DYOH Interiors to lay out furniture and plan the decor. Finally, you can use DYOH Landscape to plan the plantings and gardens. It's straightforward, and it's fun!

Although each module is a stand-alone package, many users will want to start by designing a floor plan and elevations (side views) with DYOH Architecture. Features such as automatic scaling and snap-to-grid speed the process, and a library of predrawn architectural symbols (stairs, doors, and so on) eliminates tedious detail drawing. You can modify a built-in sample plan, work with a plan from one of the optional libraries, or (like me) start from scratch and design your own. Plan size can range from one page wide by one page high (a single screen) to eight pages wide by eight pages high.

With the floor plan done, DYOH Interiors helps you design the interior and arrange the furniture. You have control over color, texture, and even simulated wallpaper patterns. Interiors also offers a library of common furnishings, which you can move anywhere you want. Finished with your arrangement? Check it out from four different sides and from above. Don't like it? Just click on the offending piece of furniture and drag it somewhere else. At last—a way to move sofas without working up a sweat!

Finally, DYOH Landscape helps you plan the plantings around the structure you've designed. The program automatically generates four side views from your top-view drawing. You can also preview the landscape at different



Abracadata's Design Your Own Home gives a total picture at a good price.

seasons and even at different ages (helpful for seeing how your landscaping will look once it's "grown out"). The program includes a basic library of plant types, although you may want to add one of five optional regional plant libraries, too. DYOH Landscape even prepares a shopping list for you to take to the local nursery.

As you might expect, the DYOH packages are not quite so gutsy as their full-blown CAD cousins. But neither are they as expensive or as complex. You'll master any of them in just a couple of hours, and you'll be turning out the plans for your dream house in no time at all.

STEVE HUDSON

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WordStar's Lexica describes itself as "a memory-resident, multilingual, translating thesaurus that can quickly translate words and phrases from one language to another." While Lexica won't exactly undo the curse of Babel, it may well make dealing with foreign languages easier—*if* you already know them.

Lexica's thesaurus contains a generous selection of words from English, Dutch, German, French, and Spanish (any or all of these languages may be loaded on your hard drive). The program may be called up from within a

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word processor or at the system prompt. To access Lexica from your word processor, you place the cursor on the word you want translated and press the hot keys. The memory-resident Lexica will take you to the Translation Screen, which consists of three main windows. The top window displays the word you want translated, as well as a sampling of its context. The

Lexica can give multilingual synonyms to bilingual or multilingual people.

lower left window contains your word in the primary language you're working in (called the Source Language); a list of its synonyms; and, in some cases, idiomatic phrases in which the word typically occurs. The lower right window displays the Target Language translation, with the primary translation highlighted, along with a collection of the word's synonyms.

Even more information is available on the Concept Detail Screen. Here, you may highlight each of the Source Language synonyms in turn, and the Target Language Window will indicate the most appropriate primary and secondary translations for the word chosen. Move the highlight to the translation you prefer and press Enter. If Lexica supports your word processor, it will erase the original word and substitute the translation. If Lexica doesn't support your word processor, the translation will be inserted, but you'll have to delete the original word yourself.

Once in Lexica, you can easily switch from language to language to provide a multilingual sampling of translations. If you want to translate another word, you don't have to return to your text; Lexica allows you to type in a new word in any of the supported languages at any time. If the word contains international characters (accents or other diacritical marks) not on your keyboard, Lexica also provides a Compose Characters screen that shows you how to produce the character you need.

If you think you've finally happened across Star Trek's fabled Universal Translator—sorry. Lexica will be of limited use if you don't already know at least some of the basic grammar of your target language. Lexica doesn't,

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for example, conjugate verbs. If you ask it for, as an example, the French equivalent of the verb *try*, you'll get the infinitive forms: *essayer, examiner, mettre à l'essai,* as well as many other synonymous verbs. But deciding on the person, number, and tense of the verb is up to whatever you've retained of high school or college language study. (Lexica does, however, helpfully indicate whether the verbs are transitive or intransitive.) Similarly, because words don't translate from one language to another with mathematical exactitude, you'll have to know a little about the connotations of the Target Language words and their appropriateness in the context of your writing—a basic requirement for the use of any thesaurus.

Lexica is quite easy to learn and use. Most of its functions can be performed either through function keys or the handy pull-down menus, and the user's guide provides clear instructions in all five of the supported languages. Those who are cursed with slower PC systems may experience a wait of up to 30 seconds for Lexica to appear, but once you're in the system, it performs with gratifying speed. For people who frequently deal with other languages, Lexica is a wonderful remedy for those momentary bouts of aphasia.

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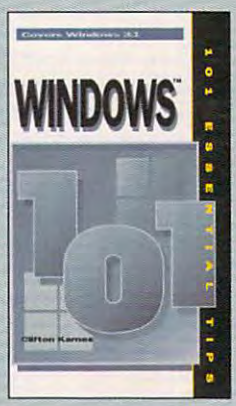

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er statistics, fire and hire players, and buy new equipment. A splendidly crafted 3-D control panel—including player portraits, equipment display, moving buttons, and panel lights—guides you through this portion of the game.

When your team is ready, it's off to the playfield where the fun really revs up. The object of the game is to get the speedball into your opponent's goal, but the playfield contains myriad devices and special items that complicate gameplay wonderfully. The score multiplier ramp, for example, increases the value of your goals each time you manage to roll the ball through it. In addition, electrobounce units change the speedball into an electrified menace, stars on the side wall light up and give extra points when hit, and warp gates suck the ball up and spit it out in a new location.

Also on the field are coins you can scoop up and use to buy new equipment, and tokens you can grab, each of which affects some facet of gameplay. Tokens can reduce your opponent's statistics to their minimum, move the speedball instantly to one of your players, lock your goal, boost a player's energy, increase your players' statistics to their maximum, and more. Pieces of equipment, which appear sporadically on the playfield, boost one of a player's statistics when picked up.

Sensational graphics, convincing animation, snappy music, savory sound effects, and smooth gameplay combine to make Speedball 2 a guaranteed hit. Computer sports fans won't want to overlook this one.

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The PC Partner LX comes with two floppy drives (5¼- and 3½-inch), allowing you to use both disk formats. It's equipped with a 40MB hard drive, a full megabyte of memory (many new software packages require a meg), and a VGA monitor. In short, the package has everything you need to run all your favorite—or soon-to-be-favorite—applications.

It took me less than ten minutes to set up the unit. The ports at the back of the machine are clearly marked, so there was no confusion as to where to plug what. There are ports marked for the keyboard, mouse, joystick, and monitor, in addition to two serial ports and one parallel port for the printer. The connectors are the thumbscrew type, so no tools are needed.

The documentation that accompanies this unit is logical and easy to read. The layout of the manuals and an extensive index make it easier to find that one bit of information you don't have.

The PC Partner comes with HyperDOS already loaded on the hard drive. HyperDOS is the neophyte computer user's best friend. In clear and concise language, this GUI (Graphical User Interface) teaches you what you need to know about your computer and gives you a great environment in which to apply your knowledge.

HyperDOS is split into two basic sections: Knowledge and Accessories. In the Knowledge group you can find information on computer care, hardware components, warranty issues, repair, and technical support. It's nice knowing that when you need it, the information is easily accessible even if—God forbid—your children colored on the tech support pages of your manual.

The Accessories section provides you with all the desktop features you need to keep up with your busy schedule: a calendar for all your important activities, a letter writer for your correspondence, an address book for your friends' whereabouts, and a calculator for your finances. The DOS operations screen shows note cards with DOS commands (in perfect syntax) written on the top, with an explanation of the commands below. All you do is click on the card to execute the command. You can use the DOS Shell to explore your operating system and actually see and learn how it works. There's even a Program Manager section that enables you to access your favorite add-in programs from the GUI. The instructions on how to add programs are clear and easy to follow.

If you like, this can be the computer that you built. Leading Technology offers many options at reasonable prices. Larger hard drives, memory upgrades (to 4MB), internal and external modems, mice, sound boards, high-resolution video cards, and CD-ROM drives are some of the options available. The unit that I worked with had the standard 640 × 480, .52-resolution VGA monitor, and if I were purchasing one of these units (which I'd certainly consider), I'd opt for the higher-resolution monitor. When you're doing marathon stretches of computer work (such as when you discover the hottest new action game and play it for eight hours straight), the first thing to go is your eyes. Anything to eliminate the itching and burning eyes and headache is worth a few dollars more.

You may also opt for additional software. Leading Technology offers several types of bundled software. Preschool, Grammar School, High School, Entertainment, Personal Home Manager, and Business Manager bundles are available. Each bundle contains six software programs. Window Works and Lotus Works are also offered.

At $1,199 for the basic computer, the PC Partner LX is priced well under its competitors. For someone who's just breaking into the money pit of home computing (there's always another gadget or some new software package with better . . . *whatever* to put on your wish list), it's a reasonable price for better than reasonable performance.

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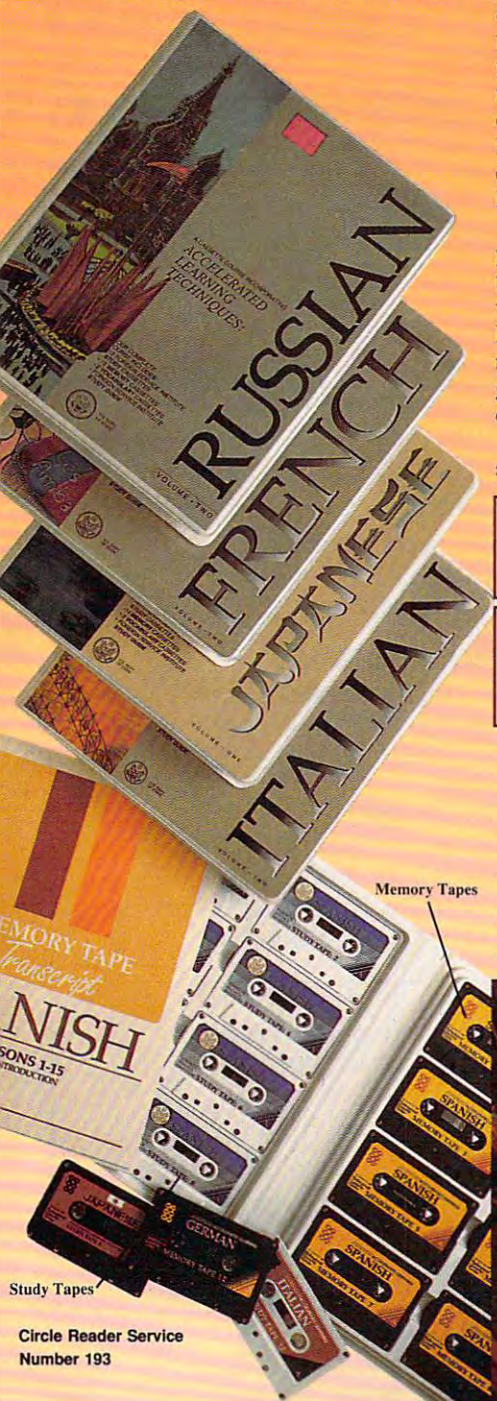

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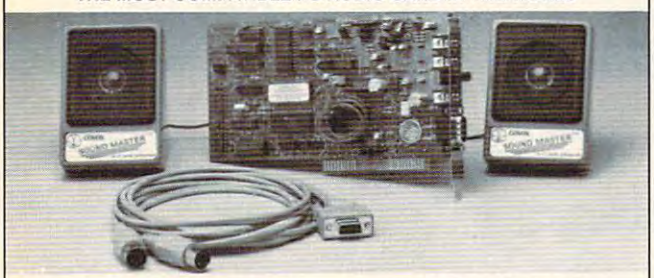

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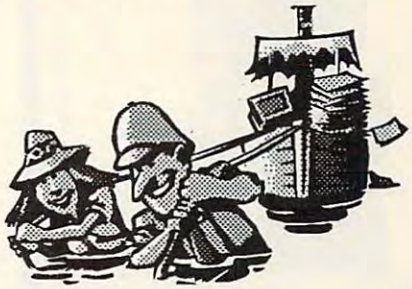

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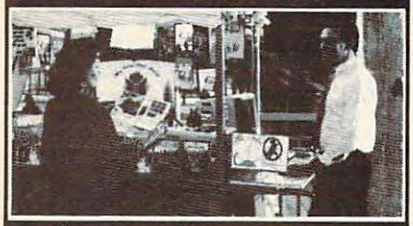

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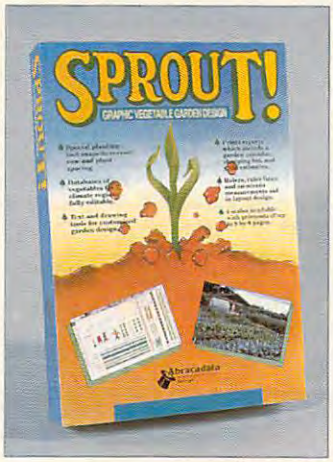

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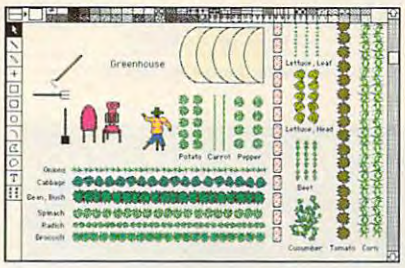

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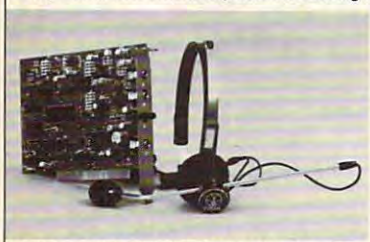

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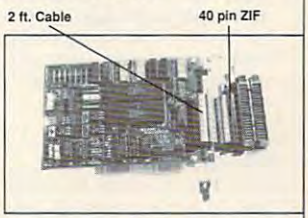

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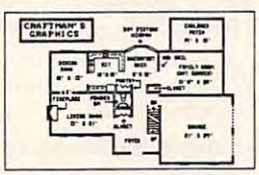

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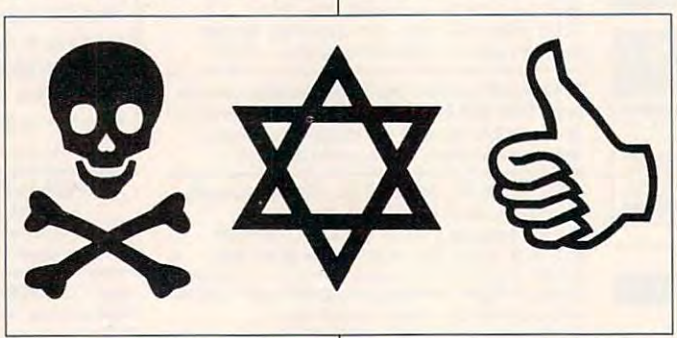
Against All Odds

In the wake of the riots following the Rodney King verdict last April, it should come as no surprise that heightened racial tensions sometimes lead to erroneous accusations. Take the case of an April 29 *New York Post* story in which an unnamed computer consultant discovered what he thought was an anti-Semitic message in Microsoft's Word for Windows program. When the letters *NYC* (for New York City) are changed to their corresponding Wingdings font symbols, a skull and crossbones, Star of David, and thumbs-up sign appear. Accusations began flying when the consultant and others who saw the sequence of symbols were quick to interpret it as a code deliberately placed to convey an anti-Semitic message asserting "Death to Jews in New York City."

A curious sequence of Wingdings characters in the font turned out to be an extraordinary coincidence.



One friend of the consultant's who also believed that the symbols were an intentionally placed code calculated the odds of such symbols appearing in sequence while corresponding to the letters *NYC* at about a trillion to one.

Microsoft absolutely denies that the sequence is anything but an unfortunate coincidence, a conclusion supported by the Anti-Defamation League, which investigated the incident. Microsoft points out that the dingbats aren't intentionally mapped to specific keys; rather, they're grouped according to symbol, which you'll notice if you type out the entire alphabet in the Wingdings font. To avoid offending anyone, Microsoft says it will probably change the mapping of the Wingdings symbols in future versions of the font.

The Best on the Continent

The award season wouldn't be complete without the 1992 European Computer Trade Show Awards, handed out in London this past April. The winners were the following: Best Action Game—Turbo Challenger II, Best Adventure/Role-Playing Game—Eye of the Beholder, Best Art Package—DeluxePaint IV, Best CD Game—SimCity, Best Graphics—Wing Commander II, Best Home Productivity Package—Amos 3-D, Best Packaging—3-D Construction Kit, Best Simulation Game—Railroad Tycoon, Best Sound—Wing Commander II, Best Sports Game—Jimmy White's Whirlwind Snooker, Best Videogame—Sonic the Hedgehog, Game of the Year—Lemmings, Most Original Game—Civilization, Software Publisher of the Year—MicroProse, Hardware Manufacturer of the Year—Sega, Going Live! Viewers Award—Sonic the Hedgehog, and LOG-IN Award—4-D Boxing. The COMPUTE Magazine Award was won by Stacker.

Game Developers Conference

Also in April, the 1992 Game Developers Conference was held in San Jose, California. Winners for best games overall, voted by the game developers themselves, were Monkey Island 2, SimAnt, Willy Beamish, and Wing Commander II. Conference topics included trends in game development for the coming year, such as games that learn as you play. In these games, artificial-intelligence techniques allow the game to "get to know you" over time and anticipate your actions. Also in the cards: more graphics and sound in games, which will most likely translate into higher retail prices for the consumer, and a 386-16 as the minimum gaming system.

Gardening Mars

At age 74, science fiction's venerable Arthur C. Clarke, in his isolated Sri Lankan home, still plugs away at predicting the future of humankind. This time, however, for his work in progress titled *The Snows of Mt. Olympus: A Garden on Mars,* he's crafting more pictures than words.

Clarke's rendering of a "gardened" Mars of the future will include some 60 color plates of a grassy, forested Mars with rivers, oceans, and condominiums. Even Mt. Olympus, the largest volcano in our solar system, is covered in crops and pine trees.

The renowned science fiction author is creating his "gardened Mars" pictures using VistaPro, an artificial-intelligence/virtual-reality software program developed by Virtual Reality Labs in San Luis Obispo, California. Using NASA data gained from the Viking mission, VistaPro produces a map of Mars to which Clarke adds detail, turning the Red Planet green. The book is expected to be completed in 1993. ❐

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I. Do you own a ☐ CD-Rom Drive (34) ☐ Sound Card (35) ☐ Fax/Modem Board (36)

J. What is your total household income? ☐ <$30,000 (37) ☐ $30,000+ (38) ☐ $50,000+ (39) ☐ $75,000+ (40)

K. What is your age? ☐ 18–24 (41) ☐ 25–34 (42) ☐ 35–49 (43) ☐ 50+ (44)

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