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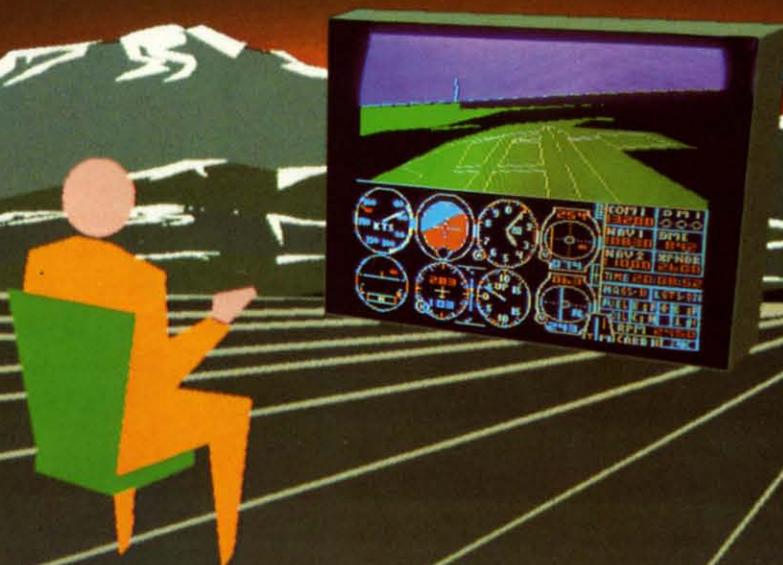
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**Includes programs: *Dice Simulator* and *Dice Analyzer* (for the VIC and 64)

***Includes programs: *The Quest* and *Response* (for the 64)

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VIEW FROM THE BRIDGE

"M

ore Programs than Ever Before?" Haven't we used that pitch already? Yes—on our March '85 cover. That issue contained 8 programs, which at the time was

more than ever before. This issue contains 14. Well—that's not entirely true. Our *Rupert Report*, *Creating Your Own Games*, and *Commodore Roots* columns include two programs each; so you could say 17. And if you count *Flankspeed* and *Bug Repellent*...

But let's not set the total too high. We don't want to make it impossible to top the next time we want to use the same cover blurb—which may be soon, as we add pages to your favorite Commodore magazine. (In fact, see next month's *View from the Bridge* for an announcement concerning an eight-page monthly addition to *Ahoy!*, covering the one major area of Commodore home computing that we've purposely neglected... until now!

In the meantime, our bursting-at-the-seams editorial policy makes it necessary to abridge our usual banter in order to describe the contents of this issue:

- Morton Kvelson continues his 128 opus with a detailed explanation of the new computer's keyboard and its 1571 disk drive. (Turn to page 47.)

- Orson Scott Card takes *Creating Your Own Games* into

a territory you've long anticipated—sprites—and provides *Pig in a Poke*, a complete game for children. (Turn to page 18.)

- Dale Rupert continues his series of *Rupert Reports* on real-world simulations with this month's *Tumbling Dice and Data Structures*. (Turn to page 37.)

- Old timers as well as new will find useful information on disk maintenance and buying software in this month's edition of Cheryl Peterson's *Cadet's Column*. (Turn to page 81.)

- Mark Andrews concludes his two-part article on assembly language addressing in this month's *Commodore Roots*. (Turn to page 77.)

- *Fastnew* will cut disk formatting time from 90 seconds to 20—and, more important, will prevent your 1541's read-write head from banging during the operation. (Turn to page 33.)

- *Ahoy! Dock* will let you organize your collection of *Ahoy!* and other computer magazines for easy access to any article by category. (Turn to page 30.)

- *Start & End File Address* will generate the load and end addresses of any program. (Turn to page 17.)

- *Go-Lister* produces a printout of all BASIC program lines called by GOTO, GOSUB, THEN, and ON statements. (Turn to page 73.)

- *Dragon Type* is the latest programming pearl from *Ahoy!* ace Bob Spirko—this one, an entertaining typing tutor. (Turn to page 61.)

- *Superhero* generates a variety of mazes that you must negotiate in order to protect the world from falling meteors. (Turn to page 17.)

- You may find yourself hurling some *Invective* of your own as our game of the same name turns the tables on you every 15 seconds, scrambling the position of the joystick. (Turn to page 15.)

- *Fish Math* offers multiplication practice for young children, arcade action for adults, and, best of all, a reason not to convert your VIC 20 to scrap metal yet! (Turn to page 29.)

- *Auto-Gen* reads machine language routines from memory and turns them into data statements. (Turn to page 59.)

- *Moxey's Porch* requires speed and dexterity to zig-zag around a freshly painted porch. (Turn to page 73.)

- *File Lock* enables you to scratchproof any program file. (Turn to page 62.)

Of course, you'll find *Commodores* at their frustrating best (turn to page 55); a new collection of reader-generated computer graphics in our *Art Gallery* (turn to page 34); reviews of products like *On-Field Football*, *Blazing Paddles*, and the *Computereyes* video acquisition system (turn to page 63); and *Scuttlebutt*, featuring all the Commodore-related news from the Summer '85 Consumer Electronics Show (turn to page 7).

We remind you that our soon-to-debut programming tips column is awaiting your submissions (see page 46); our bulletin board system is ready to take your calls 24 hours a day (see page 114); and our programs, in this issue and every issue, are available on disk or cassette (see page 23).

It was our aim in producing this issue (as with every issue) to provide enough material to keep you stimulated, challenged, and occupied until next month. Even better, well into next month. We won't rest until we've got you hopelessly backed up on your reading.

—David Allikas

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IMAGE

A Viewpoint by John C. Dvorak

Is the success of Commodore a fad? A fluke? A freak of nature? We'll all know in the next year or so. Whatever the case, it's quite likely that Commodore will have to fight an uphill battle to make a long-term success of the nifty Amiga Lorraine computer.

Commodore has created the image of a company that makes a cheap disposable computer. When articles are written about home computers sent to the closet to die, what computer do they talk about? There is always a picture of a Commodore 64 or VIC 20 languishing amongst the old ski boots. Hey, it isn't bad—it's disposable.

Image is everything in this business, as any IBM critic will tell you. The Commodore dilemma reminds me of two stories. The first goes back to the early days—the days of the SOL-20 computer. The SOL was released in 1977 and quickly found a following of users, many of whom attached a little Northstar floppy disk drive to the machine. A perfect combination, it was a compact system with the first commercial 5 1/4-inch disk drive. It was provided with a terrific BASIC and a nifty operating system. Above all it was simple and fairly inexpensive.

Processor technology, the company that made the SOL, wanted to do its own disk drive, so it spent a little over a year to come up with an expensive 8-inch hard sector clunker called the Helios. This fiasco was probably as responsible as anything for grounding the whole Proc Tech business. The key to the whole blunder of the Helios is that if the company had seen what its customers wanted (cheap 5 1/4-inch disk systems) instead of what it thought it wanted (overpriced 8-inch clunkers) it would be in business today.

To Commodore marketeers this anecdote questions the likelihood of success if Commodore changes from a company that makes disposable computers to a company that makes hi-grade machines. Let's assume it can do it. There's still the image problem.

Anecdote #2. I once attended a focus group that showed a proposed Atari computer that was MS-DOS, CP/M, Apple, and Atari compatible. It would cost \$1500. Nobody knew who the manufacturer was. The question was asked: "Would you buy this machine if it were an IBM?" It was one of those "highly likely, likely, unlikely, highly unlikely" type questions. Everyone said "highly likely." The same question was repeated, but this time the manufacturer was Apple. Again, the answer was "highly likely." The focus group jumped to Atari and the answer became "highly unlikely." The group saw the Atari as a game computer. This was a semi-serious machine—not an Atari.

Commodore was never even suggested at this group. Where would it stand? I shudder to think. Undoubtedly, it would be rated in the highly unlikely category. This will remain the case unless Commodore changes its image.

It must begin to improve its image now. Commodore isn't the first thing that comes to your mind when you think of the word "innovation." That lack is the first thing that has to go

if the company is to survive. Words like "experimental," "insightful," "advanced," or even "well-made" do not bring to mind Commodore, either. What about words like "cheap computer" and "good deal"? Right! Commodore.

The Amiga will never be a truly "cheap computer" in the near term. It might be a relative good deal, but that's not what will sell the next generation of machines. Most users can get everything from a "good deal" to "trustworthy" and "reliable" from IBM. "Innovative" is the key word necessary for success.

Few companies have the wherewithal or opportunity to offer the public an advanced machine like the Amiga. Hopefully, the company will concentrate its marketing effort towards changing the public perception of Commodore. Hopefully it will create the right new image.

We sure don't want to see the Amiga in the closet with the ski boots, do we? □

Mr. Dvorak is the former editor of InfoWorld magazine and writer of Inside Track, InfoWorld's industry news column.

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Left: Commodore, star attraction of CES. Right: Commodore's PC10 and PC20 IBM clones. READER SERVICE NO. 104

SUMMER '85 CONSUMER ELECTRONICS SHOW—THE CHIPS ARE DOWN

Still bullish on the home computer market? You weren't at June's Consumer Electronics Show. The *Wall Street Journal* aptly described the computer software section as a "ghost town." For us, the proof of the pudding was in the carrying: the bag of Commodore-related press releases we toted back to New York weighed in at twelve pounds, less than half of what we brought home from January's show in Las Vegas.

Most vendors were modest in their offerings, by comparison to the endless arrays of software displayed at last summer's show. Particularly noticeable was the dearth of educational releases for the Commodore, long the most glutted sector of the 64 market. A number of prominent manufacturers were conspicuous by their absence. Rumor has it that Atari, which had pulled out weeks before the show, was given their booth at a negligible cost to prevent the mass

desertion the show's organizers feared their cancellation would signal.

Of course, some believe that canny old Jack Tramiel cancelled primarily to convince Commodore not to rush the announcement of their new Amiga computer, since Atari's 520ST would not be there to steal the show in Amiga's absence. By reentering as an exhibitor at the eleventh hour—Jackintosh and all—Tramiel left Commodore with nowhere near sufficient time to ready an Amiga presentation. Believe this tale of corporate intrigue if you will. The fact is that, even without Amiga, Commodore dominated the floor (helped by the fact that Atari wound up tucked away in a corner of the upstairs level).

While the hordes of newshungry reporters that invaded the Commodore booth were disappointed by Amiga's absence, Commodore did display a most impressive collection of hardware—almost none of it, un-

fortunately, intended for sale in North America. Among the new computers planned for the European market are the IBM PC-compatible PC10 and PC20 (pictured on this page), the Unix-compatible Commodore 900 Business Computer (a multiuser workstation), and the 128D, featuring a built-in disk drive and independent keyboard.

Of greater interest to American and Canadian readers were the following peripherals compatible with the C-128 (and in some cases the C-64 as well), some previously announced but seen for the first time at the convention:

- The 1572 Dual Disk Drive, comprising two horizontal 5¼" drives, each reading double-sided, single-density disks with up to 340K (formatted) memory in C-128 mode and 410K in CP/M mode.

- The Commodore 1670 Modem/1200, utilizing VLSI technology to

AHOY! 7

deliver a 1200-baud rate at a price expected to be under \$100. Using "AT" Hayes command protocol, the 1670 has auto-dialing, auto answer, auto speed, and auto mode selection.

- Compatible with the C-128 and C-64, the MPS 1000 Printer offers

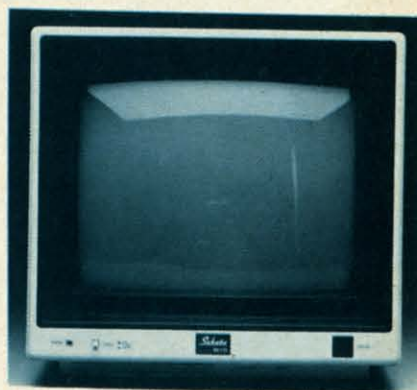
parent to the 64 throne. Consider it one more indication of the depressed state of the home computer software business. Or as support for one last rumor—that a sizeable percentage of companies have already directed the bulk of their programming efforts to-

through a series of questions and prompts, in building the correct equation to solve a problem.

Homework Helper Writing (\$32.95) guides students through organizing and outlining their ideas for book reports, essays, and research pa-



The compact (21 x 7 x 15.5") Alphapro 401 has a small desktop "foot-print" and a sound cover that minimizes noise. Paper up to 15.7" wide can be used.
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draft (100 cps), near letter quality (16 cps), and graphics modes, and a four-column display: Pica (80), Elite (96), Condensed Pica (132), and Condensed Elite (160).

- Just like the Macintosh's rodent, the Commodore Mouse will let 128 users sidestep special function keys and commands by moving the device over a desktop, thereby positioning onscreen icons.

Commodore also exhibited the software currently available for the 128: *Jane 2.0*, an integrated word processing/spreadsheet/filing program developed by Arktronics Corporation and permitting input with the Commodore mouse; the previously announced *Perfect* series from Thorn EMI (consisting of *Perfect Writer*, *Perfect Calc*, and *Perfect Filer*); and a 128 version of Commodore's own *Micro Illustrator*.

Doesn't sound like a lot? There's more: *Typing Professor* and *A Comprehensive Course in BASIC* will be coming from Commodore, as well as programs from such companies as Batteries Included, Timeworks, Scholastic, Spinnaker, Digital Solutions, Precision Software, and Melodian.

Still, an unimpressive amount of software for a computer announced five months ago—particularly a Commodore computer, the heir ap-

ward producing software for the Amiga.

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Alphacom Inc., 2323 South Bascom Ave., Campbell, CA 95008 (phone: 408-559-8000).

RGB MONITOR

An alternative to the Commodore 1902, Sakata's SC-150 is a composite/RGB high resolution monitor with 13" screen, .42mm dot pitch, and dark face finish. It will operate with NTSC Composite, Y-C, RGBI, XRGB, and RGB input. Price \$499.00.

Sakata U.S.A. Corporation, 651 Bonnie Lane, Elk Grove Village, IL 60007 (phone: 312-593-3211).

EDUCATIONAL RELEASES

Two C-64 programs for students in grades 7-12:

Homework Helper Math Word Problems (\$32.95) aids students,

pers, then writing the text with the program's word processing and printing capabilities.

Spinnaker Software, One Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200).

Four classics-based C-64 programs from Fisher-Price Learning Software (\$24.95 each):

Peter Rabbit Reading lets children 3-6 guide the famed bunny through a series of escapades, identifying consonant and vowel sounds and matching words to pictures.

Prokofiev's Peter and the Wolf Music introduces children 3-6 to the principles of music through seven games.

Jungle Book Reading teaches children 6-9 reading comprehension as they guide Mowgli the jungle boy through encounters with an assortment of animals.

The First Men in the Moon Math requires players 9-12 to help Professor Cavor solve the math problems with which the Sellenite creatures have blocked his way.

Fisher-Price Learning Software, P.O. Box 1327, Cambridge, MA 02238 (phone: 617-494-1222).

KIDWare has released 60 educational programs for the C-64, two to each tape (\$9.95) or disk (\$11.95), for children 1-16 years old. For more in-

formation contact KIDWare, P.O. Box 9762, Moscow, ID 83843 (phone: 208-882-3830).

Tales of Discovery makes the child the central character in two stories: *Pirates of the Soft Seas* (solve vocabulary and math puzzles to outwit pirates and find buried treasure) and *Fossils Alive!* (search for fossils and learn how a neighborhood looked in prehistoric times). For the C-64; \$29.95.

Scholastic Software, 730 Broadway, New York, NY 10003 (phone: 212-505-3000).

From Sierra On-Line:

Goofy's Word Factory teaches grammar via three games involving conveyor belts and a kooky machine. For the C-64; \$24.95.

Mickey's 3-in-1 (\$49.95) consists of a word processor, data file manager, and telecommunications system designed for children. For the C-128.

Sierra On-Line, Inc., Coarsegold, CA 93614 (phone: 209-683-6858).

G'WAN, HAVE S'MORE

Cardco's *S'MORE* (for Super Memory Optimized RAM/ROM Expansion) is a \$69.95 cartridge-based program that will provide your C-64 with 61,183 bytes of free RAM (that's including the 38,911 already present), over 60 new and enhanced BASIC commands and functions, full error trapping and automatic error help (which lists the error line and places a flashing cursor at the beginning of the program statement containing the error), full command selection, full up-down scrolling through program listings, and direct access to items normally PEEKed and POKEd.

Because *S'MORE*'s command structure is similar to the C-128's, C-64 programmers can make use of the advanced programming techniques available on the C-128, facilitating later conversion.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202 (phone: 316-267-3807).

SYNCALC TEMPLATES

For use with the *Syncalc* spreadsheet for the C-64, the *Syncalc Templates Disk* (\$19.95) provides 22 com-

monly used forms and formulas for financial planning, budgeting, and record keeping. The disk also illustrates basic design principles for constructing or modifying special applications spreadsheets, from simple to complex.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903 (phone: 415-479-1170).

DEATH AND REVISIONS

Tax Command Planner, which is designed to let individuals test the tax effects of various financial alternatives, has been revised to account for Treasury Department proposals to eliminate many existing tax shelters. Purchasers of earlier versions can obtain the update by returning their program to the manufacturer. For new users, price of the 64-compatible version is \$49.95.

Practical Programs, Inc., P.O. Box 93104, 625 N. Milwaukee St., Milwaukee, WI 53202 (phone: 414-278-0829).

ELECTRONIC COOKBOOK

The Electronic Cookbook lets C-64 users store, display, edit, and print recipes, 31 of which are included on the disk. Price is \$20 (Canada \$25) plus \$2.50 postage.

Arcturus Software, 2332 Palisade Dr. SW, Calgary, Alberta, T2V 3V1 Canada (phone: 403-281-1632).

KWIK-PITCH

Datamost has followed up the release of *Kwik-Load!* and *Kwik-Write!*, the first two releases in its *Kwik-Ware!* line of \$19.95 software for the C-64, with *Kwik-Spell!* (spelling checker for *Kwik-Write!* and other C-64 word processors), *Kwik-File!* (database management), *Kwik-Calc!* (spreadsheet), *Kwik-Paint!* (graphics editor), *Kwik-Check!* (check balancing and maintenance), *Kwik-Pad!* (desk secretary), and *Kwik-Phone!* (communications).

Each *Kwik-Ware!* program has the *Kwik-Load!* fast loading program built in, and most are compatible with other programs in the series.

Datamost Inc., 19821 Nordhoff St., Northridge, CA 91324 (phone: 818-709-1202).

VIDEOGAMING COLLECTORS ITEMS

WE HAVE ACQUIRED THE REMAINING COPIES OF THE FOURTEEN RAREST ISSUES OF VIDEOGAMING AND COMPUTER GAMING ILLUSTRATED. AS REFERENCE TOOLS THEY ARE INVALUABLE AND THEY CONTAIN SOME OF THE BEST INTERVIEWS YOU'LL READ ALL YEAR. PLUS DAZZLING ORIGINAL ARTWORK THAT WILL KNOCK YOUR SOCKS OFF. ALL FOURTEEN ISSUES FOR ONLY \$15.95 (INCLUDING POSTAGE AND HANDLING; OUTSIDE THE U.S. ADD \$6.00).



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BRYN MAWR, PA 19010

AHOY! 9



King's Quest II: Romancing the Throne (from Sierra On-Line, Inc.) is to our knowledge the first game announced for Commodore's Amiga computer. A C-128 version will also be available. **READER SERVICE NO. 137**

GAMES FOR THE 64, 128, AMIGA

Two graphics-and-text adventure games from Spinnaker's Telarium subsidiary:

Perry Mason: The Case of the Mandarin Murder takes place in the courtroom, where the player can do everything a courtroom lawyer might, from cross-examining and introducing evidence to consulting privately with the judge. The degree of characters' cooperativeness varies as a result of the player's interaction with them.

Based on the series of science fiction novels by Roger Zelazny, *Nine Princes in Amber* enmeshes the player in negotiation, politics, and alliances as, in the role of the prince Corwin, he battles his brothers and sisters for the throne of Amber. Again, the game's outcome depends heavily upon the player's interaction with the other characters.

For the C-64; \$32.95 each.

Telarium Corp., One Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200).

Lode Runner's Rescue casts the player as Alexandra, daughter of the original Lode Runner who is being held prisoner deep underground by the evil Bungeling Empire. She must negotiate 46 mazes on her way to free her father. Of course, included is a game editor that lets the player construct an unlimited number of mazes full of elevators, trap doors, en-

emy guards, and rushing rivers. For the C-64; \$29.95.

Synapse Software, 17 Paul Drive, San Rafael, CA 94903-2101 (phone: 415-479-1170).

Assorted new C-64 releases from Epyx:



Gato: a C-128 submarine simulation. **READER SERVICE NO. 138**

Winter Games features six sports, including ski jumping, a ski biathlon and hotdogging, speed and freestyle events, and a bobsled race.

The World's Greatest Football Game allows coaches to develop their own plays or customize existing ones, and store up to 120 of them in a play-book. The action can be viewed from a sideline, bird's-eye, or closeup view.

Joining *Ballblazer* and *Rescue on Fractalus!*, previous releases in Epyx's Lucasfilm Games Division:

The Eidolon, centering around a 19th century machine that taps psycho-kinetic forces, transporting the player to a magic realm of caverns populated with Trolls, Greps, and Guardian Dragons; and *Koronis Rift*, compelling the player to wrest the secrets of the ancients from a genetically engineered race of guardians that outlived their creators.

Jet Combat Simulator recreates actual flight situations that confront an F-15 pilot, including cross-wind turbulence and blind landings. Four options let the player progress from landing practice to air-to-air combat.

The components of the *Temple of Apshai* trilogy—*Temple of Apshai*, *Curse of Ra*, and *Upper Reaches of Apshai*—will be sold together for the price of a single game.

All of the above Epyx games will retail for \$29-\$35 (except *Jet Combat Simulator* and the *Apshai* trilogy—\$19-\$29).

Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).

New for the 64 from Activision:

As *Hacker* begins, the player has broken into an unknown computer system that conceals a mystery. With no background information, no rules, and no clues, he must find out whose system he's hooked into and what's going on.

Fast Tracks: The Computer Slot Car Construction Kit lets the user build a race course piece by piece from a variety of types of track sections, view the course as a whole, and then race his own custom-designed car. Favorite courses can be saved to disk for future use.

Though certain to bring a sneer to Orson Scott Card's lips, Garry Kitchen's *Gamemaker: The Computer Game Design Kit* joins the ranks of programs that make it possible to create games without programming knowledge. The user selects characters (rocket ship, running man, etc.) from a menu, along with their speed and direction, background, sound effects, and music.

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

Three new C-64 simulations from MicroProse, each \$34.95:

Acrojet, The Advanced Flight Simulator, for computer pilots who've won their wings in *Solo Flight*, offers a Decathlon of Sport Aviation events, including spot landings, ribbon cuts, acrobatics, and other high performance maneuvers.

Gunship, The Helicopter Simulator, simulates operation of the new AH-64 Apache attack helicopter and features multiple weapon and navigation systems.

Silent Service, The Submarine Simulation, provides a selection of historical scenarios from single ship attacks to multipatrol missions with graduated enemy skills.

MicroProse Software, 120 Lakefront Drive, Hunt Valley, MD 21030 (phone: 301-667-1151).

C-64, C-128, and Amiga releases from Sierra On-Line:

Gato, a submarine simulation previously released for IBM and Apple, will be converted to the C-128. The game transforms the player into a World War II sub commander, prowling the Pacific in search of the Japanese Imperial Fleet. Price: \$39.95.

King's Quest II: Romancing The Throne, featuring 3D animated graphics, will be available in C-128 and Amiga versions. Price: \$49.95.

Stunt Flyer (\$39.95) will let C-64 users pilot a Pitts Special through a number of aerobatic sequences.

The Black Onyx (\$39.95) takes C-64 adventurers down into a dungeon maze, then to the top of a mysterious tower.

Sierra On-Line, Inc., Coarsegold, CA 93614 (phone: 209-683-6858).

COMPUTER RACK SYSTEM

Designed for Commodore systems, the Hi-Rise computer/printer stand (\$39.95) will allow users to store their C-64 or VIC 20 monitor, printer, and disk drive (or printer paper) in less than two square feet of desktop space. Crafted of solid oak, it's a sure bet to outlive the rest of your configuration.

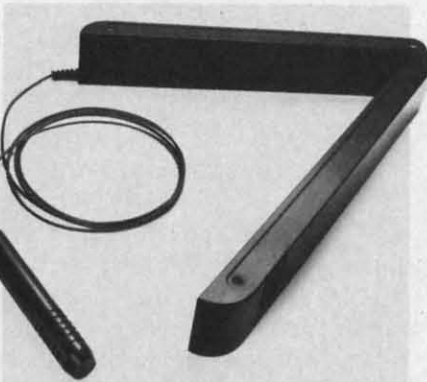
Unique Wood Products, P.O. Box 52, Mankato, MN 56001 (phone: 507-625-5123).

BIC ROGERS?

The Space Pen input device differs from other light pens in its ability to detect the third dimension, or "Z" axis, enabling the user to operate in a six foot area in front of the computer display. While no software currently available can utilize this capability, the pen will work in two dimensions with all touch tablet paint programs and an assortment of popular packages.

C-64 or VIC 20 version \$150, Amiga version \$175, including sample software.

Soniture, Inc., 480 Vandell Way, Campbell, CA 95131 (phone: 408-866-4616).



Space Pen detects third, or Z, axis.
READER SERVICE NO. 139



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Reader Service No. 106

10-20 MEG HARD DRIVE

If you can live with the irony of spending \$100 for your computer and 15-30 times that for a storage device, Fiscal Information has the peripheral to fulfill your most extravagant fantasies. Lt. Kernal, a hard disk drive for the C-64, will access data up to 43 times faster than the 1541 (though compatible with it in most applications). The drive also provides 34 additional or enhanced system commands, autoboot of a selected program, built-in CP/M-like command features, up to 10 logical drives, and the ability to keep up to seven files open simultaneously. Mass and archival backup and restore facilities are available.

10MB version \$1595; 20MB, \$1995. Streaming tape option, which backs up 10 megabytes in 2 minutes, if \$1525.

Fiscal Information Inc., 143 Executive Circle, Daytona Beach, FL 32014 (phone: 1-800-874-1890).

AHOY! II

TELECOM NEWS

General Electric is offering two hours of access to CompuServe's executive information service with the purchase of a \$99.95 GE telephone modem, model 3-8200 (see May '85 *Scuttlebutt*, page 9).

General Electric Company, Electronics Park, Syracuse, NY 13221 (phone: 315-456-2446).

BRKTHRU gives the user access to over 65 databases covering business and finance, science, medicine, education, general reference, and more. Cost is \$75 to sign up (\$25 credit) plus usage charges ranging from \$17.50-\$125 an hour.

BRS Information Technologies, 1200 Rt. 7, Latham, NY 12110 (phone: 518-783-1161).

SCREENPLAY REBATES

Software Resource Group will offer a \$5 rebate direct to the consumer on purchase of all Screenplay and Brown Bag Software.

Software Resource Group, 1095 Airport Road, Minden, NV 89423 (phone: 702-782-9731).

PRINT SHOP GRAPHICS

The Graphics Library, Disk Two, like the previously released *Disk One*, provides additional designs, symbols, and pictures for use with *The Print Shop*, this time in the categories of Jobs, Hobbies, People, Places, Travel, and Health. For the 64; \$24.95.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101 (phone: 415-479-1170).

MAKE YOUR OWN KIND OF MUSIC

The two latest additions to MasterSoft's *Mastery in Music* series, *Trumpet Master* and *Clarinet Master*, let the student personalize his practice music with his choice of key and time signatures, note type, and note range. Instant access to music facts and fingerings is always available. Scales, thirds, and intervals in every major key are included. For the C-64; \$49.95 each.

MasterSoft, P.O. Box 1027, Bend, OR 97709 (phone: 503-388-7654).

A FIRST FROM JUKI

Juki's first dot matrix printer, the 5510, churns out type at speeds ranging from 30 cps (near-letter quality mode) to 180 cps (draft mode). The printer's bidirectional, logic-seeking system combines a 9" platen with assorted printing width capabilities. Included is a built-in tractor, 3K buffer (expandable to 15K). Suggested retail price is under \$500.

Additionally, Juki has extended its current customer service warranty on all its microcomputer printers to one year from date of purchase.

Juki Office Machine Corp., 299 Market St., Saddle Brook, NJ 07662 (phone: 800-932-0590).

MORSE CODE TUTOR

IMCT offers a tutorial in International Morse Code, and a training program to increase your code speed from 1-25 words a minute. For the 64; \$18.95 (PA residents add 6% sales

tax).

AC3L Software, P.O. Box 7, New Derry, PA 15671.

ACTIVISION RELEASES

Two non-games for the C-64 from Activision:

The Complete Computer Fireworks Celebration Kit lets patriots create fireworks displays, add music and special messages, and turn their displays into computer greeting cards.

Alter Ego allows users to vicariously experience life as someone else, building a unique personality through reactions to a variety of emotional, physical, and other situations.

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

BOOKS

The Greatest Games: The 93 Best Computer Games of All Time (by *Ahoy!* reviewers Dan Gutman and Shay Addams) reviews 93 games in 18 categories. Price is \$9.95.

COMPUTE! Publications, Inc., 324 W. Wendover Ave., Suite 200, Greensboro, NC 27408 (phone: 919-275-9809).

The latest edition of the *Softsel Product Encyclopedia*, covering more than 3,000 software and hardware products in its 334 pages, is available for \$29.95.

Softsel Marketing Dept., P.O. Box 6080, Inglewood, CA 90312 (phone: 714-640-7375).

Problem Solving in BASIC with the Commodore 64 consists of a book and a 30-minute videotape that take the user on a tour of top-down programming on the 64. Price is \$59.95.

Hayden Book Company, 10 Mulholland Drive, Hasbrouck Heights, NJ 07604 (phone: 201-393-6306).

Marketing Your Software (\$16.95) offers a 26-step plan, from defining objectives and analyzing competition to investigating distribution and designing packaging.

Addison-Wesley, General Publishing Group, Reading, MA 01867.

Graphics Library: *pix for Print Shop*.
READER SERVICE NO. 150



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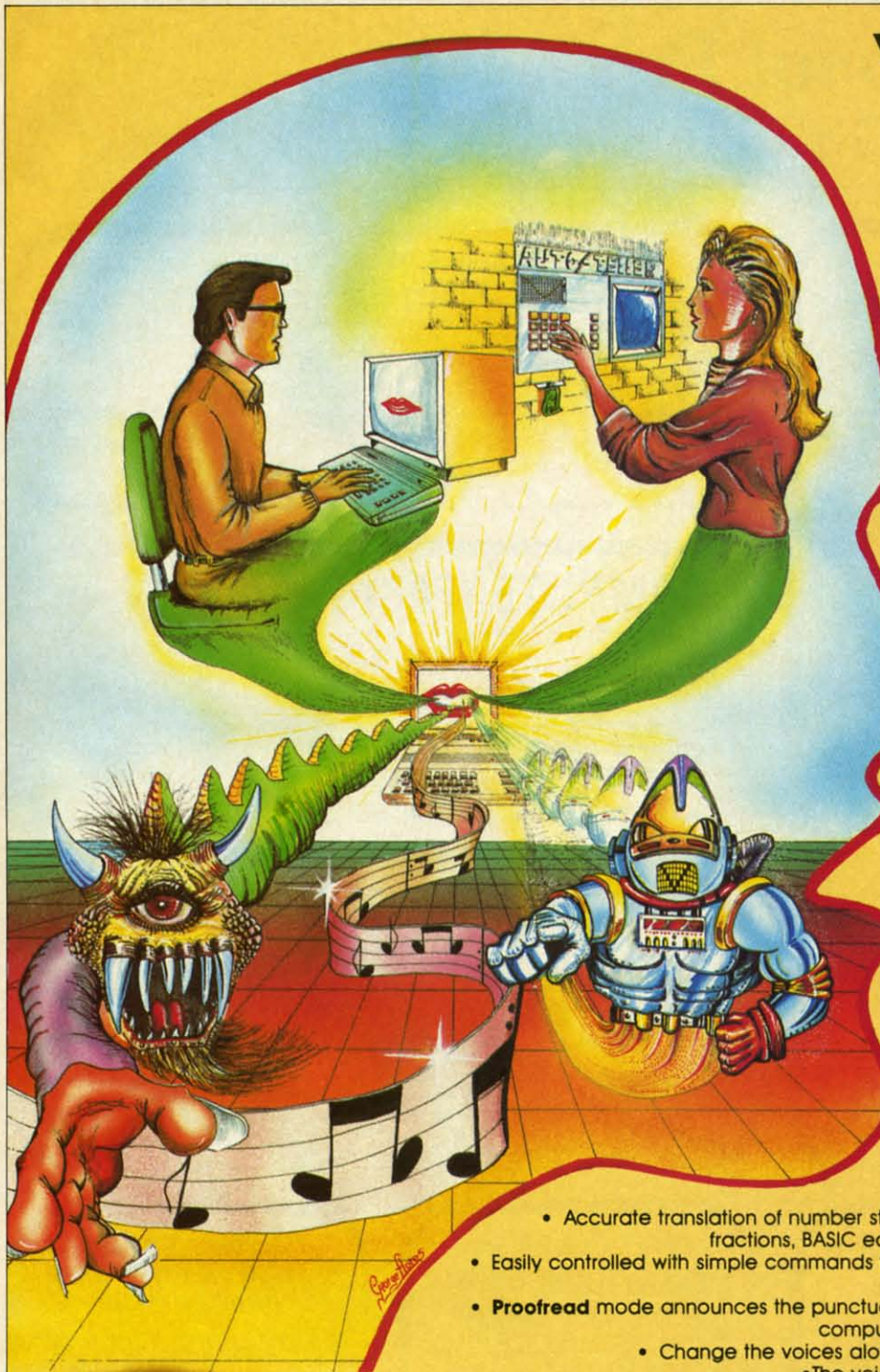
Tap into an exciting computer resource available for the VIC-20 and C64 computers: synthesized speech.

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The PPI (Parallel Printer Interface) from DSI is a high-performance graphics printer interface for your Commodore 64 or VIC-20, offered at an unbelievable price! The PPI fully emulates a Commodore printer so that all software written for Commodore computers and printers can be run with the PPI and most any parallel printer. Print true Commodore graphics and alpha-numerics as well as any special character sets offered by your specific printer. Works with Star, Epson, BMC, and many more. Comes complete with all necessary cables for quick installation and includes easy-to-follow user's manual.

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INVECTIVE

— for the C-64 —

By George Trepal

Invective isn't like any other game you've ever played. Nothing chases you and you're not shooting at anything. You simply move around the game board collecting points by snapping up green figures at 10 points each.

Of course there's a catch. The joystick is scrambled so that what used to move up now moves perhaps left, what used to move left now moves perhaps right, etc. The joystick is scrambled every 15 seconds to a new randomly chosen configuration. If you bump a blue figure the joystick gets rescrambled and you lose 20 points. If you bump a yellow figure you lose 50 points.

In the first 15 seconds of the 90 second game, the joystick operates normally. After that it's hard going all the way, since everything is against you. You'll be lucky to make a score as high as zero the first few times you play *Invective*.

That's all you need to know to play. From here on I'll just ramble about technical matters.

When you type *Invective* there is no need to copy the blank lines or REM statement lines.

Line 430 tells the computer to scramble the joystick every 15 seconds. If you'd like a different number of seconds, substitute your number for 15 at both places in the line. Line 680 limits play time to 90 seconds, which is expressed as 130 (for 1 minute 30 seconds) in the line.

Lines 750 to 850 tell you how the joystick has been scrambled. The game is much harder if you don't have this information, so you might want to leave it out. The easiest way to do this is to change the command to print brown letters to a command to print medium gray letters. Since the background is medium gray the letters will be invisible. The print brown (Commodore key and 2 key) is in line 750 and is easy to change to print medium gray (Commodore key and 5 key).

You may be wondering how the joystick can be scrambled. The normal way to use the joystick is to first get the value in the joystick address (location 56320). This value is then ANDed with 15 to get rid of the meaningless first four bits of the byte. The result is then subtracted from 15. A result of 0 means no change, 1 means up, 2 means down, 4 means left, and 8 means right. So far that's all by the book and all that remains is IF state-

ments. If the value is 1 move up, if 2 move down, and so on. But what would happen if we told the computer to move right instead of up when the value was 1? Answer: it would work just fine.

The values on how to move are held in the J() array and the pointers relating the J() values to the joystick are in the SA() array.

Lines 690 and 700 shuffle the SA() array. The algorithm starts with the first element of an array and exchanges it with a randomly chosen element of the array. It then repeats the process with the second, third, etc. elements. This technique is useful for computer card shuffling. ☐ **SEE PROGRAM LISTING ON PAGE 112**

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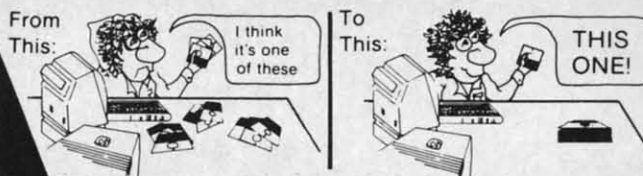
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SUPERHERO

for the C-64

By James C. Hilty

A meteor storm has caused the space shuttle to move off course and rapidly gain altitude. Upon reaching an altitude of 800 miles, the shuttle will be lost forever. The only hope of saving it is you, the *Superhero*. You must destroy 10 golden meteors before the shuttle reaches 800 miles. But beware—hitting the green Zyptonite meteor will render you powerless and the game will end.

The game opens with the title screen, then a graphics chart depicting the Superhero, the space shuttle, and the meteors. The playing screen incorporates a randomly drawn maze. The Superhero character is at the upper right of the maze, while a Zyptonite meteor is at the upper left. A joystick in Port 1 allows you to move Superhero while he tries to get the 10 gold meteors which are placed along the maze. The Zyptonite meteor moves randomly throughout the maze. Colliding with the Zyptonite meteor finishes you off.

The altitude is constantly displayed along with the score. If the shuttle reaches 800 miles, the game is over. Each meteor you destroy is worth 10 points. Getting all 10 of the meteors before the shuttle reaches 800 miles gives you bonus points, lowers the altitude, and allows you to progress to a new maze.

The running Superhero figure and the space shuttle in the maze cutouts are sprites which react to the different conditions going on in the maze.

The main loop (lines 870-950) uses a machine language joystick routine to move the Superhero character. The Superhero in the maze cutout is animated by POKEing different values into SPRITE 0's memory pointer. A replay option is incorporated at the end of the game. □

SEE PROGRAM LISTING ON PAGE 101

START & END FILE ADDRESS

for the C-64

By David S. Smart

As well as giving the start or load address of a file, this little program will give the length of a file and the end address.

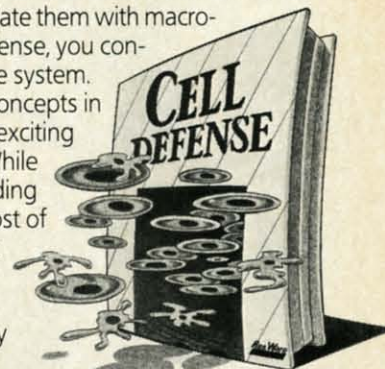
The program begins by initializing the disk and then requesting the name of the file to check. It will then give the start address in both hex and decimal and continue on to read in the file. It then gives the length of the file in bytes and finally the end address in hex and decimal.

If you have another program residing in the cassette buffer, the machine language portion of this one can be easily relocated. □

SEE PROGRAM LISTING ON PAGE 109

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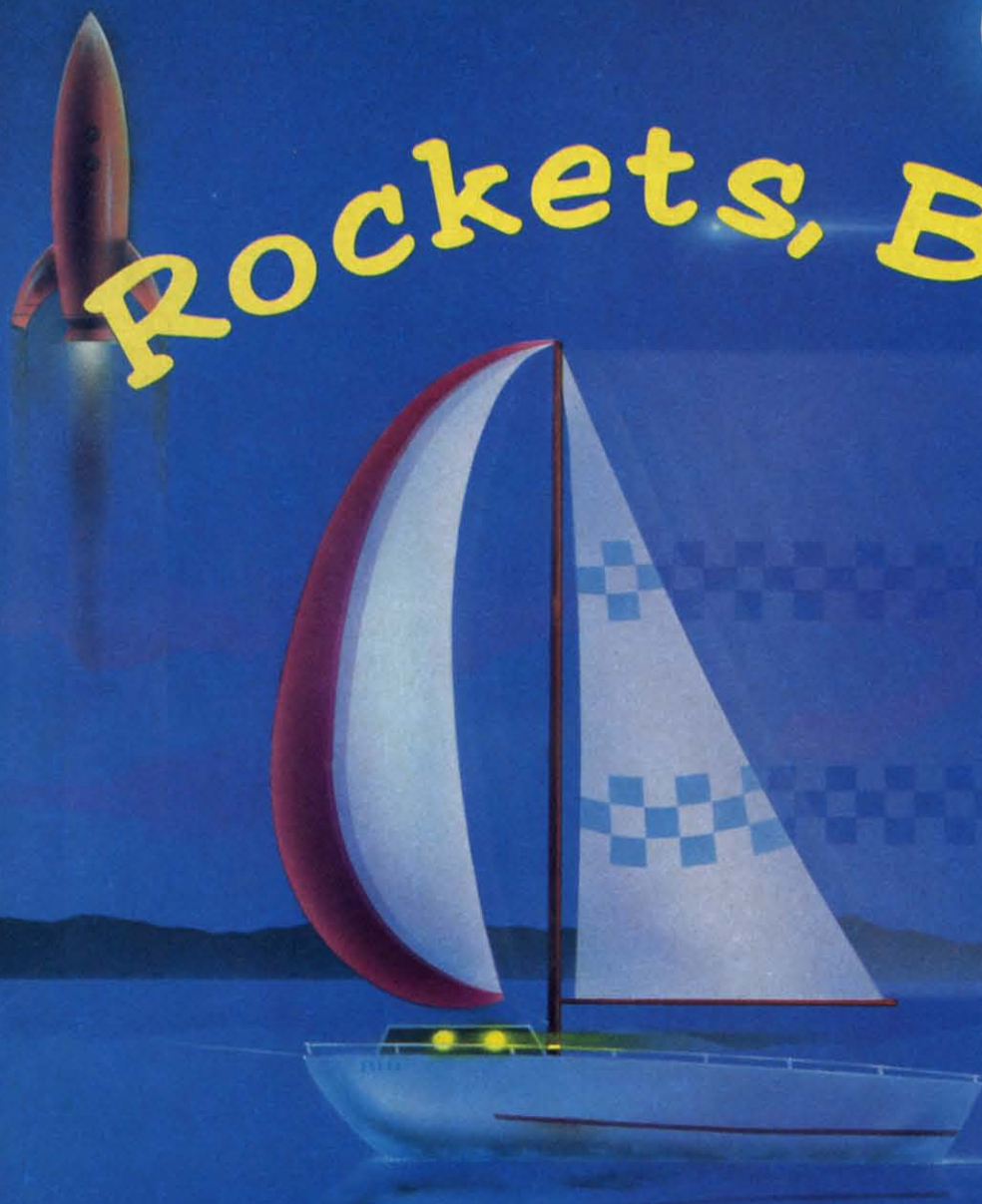
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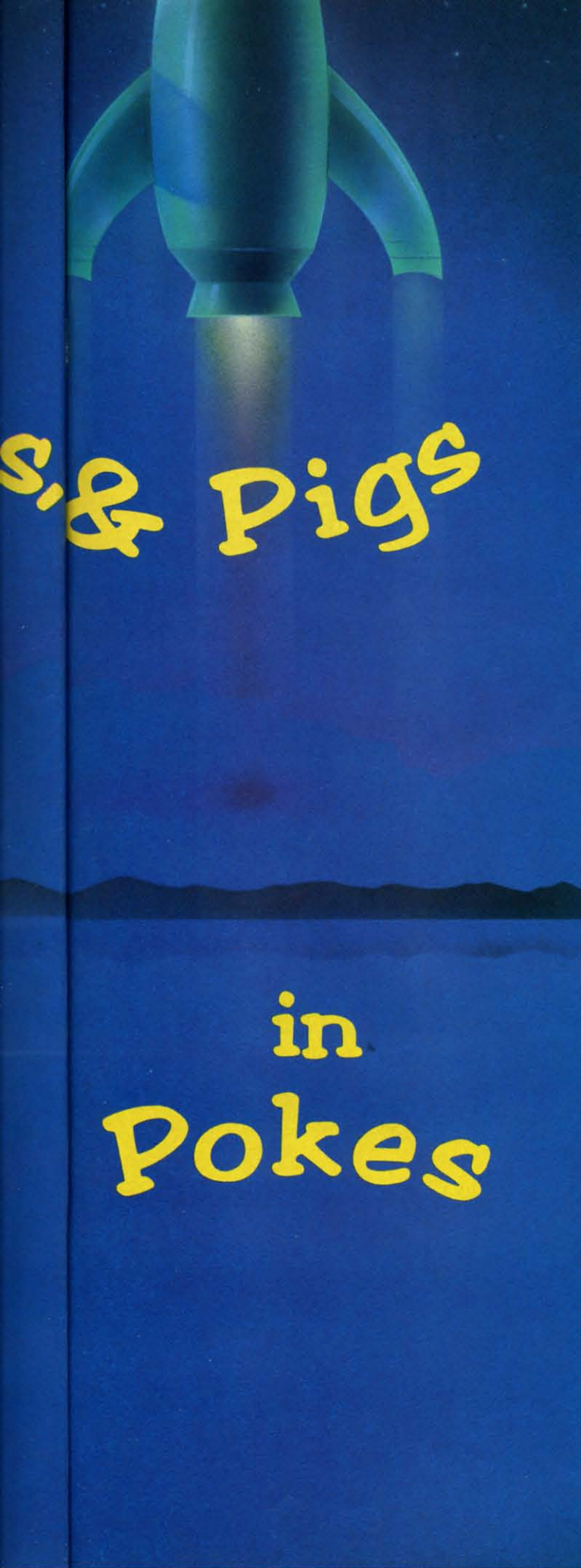
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How to use sprites effectively in your Commodore 64
action games — including *Pig in a Poke*, a simple
children's game that uses sprite movement,
shapechanging, and collision detection.

Rockets, Boats, &



Re/AN



S. & Pigs

in
Pokes

CREATING YOUR OWN GAMES ON THE VIC AND 64

In case you're one of those people who always wanted to grow up to be a swineherd, this is your lucky day. The program *Pig in a Poke*, included with this issue of *Ahoy!*, is just what you've been waiting for.

If, on the other hand, you're a nearly normal adult, you'll find that *Pig in a Poke* is not exactly challenging—it's about at the ability level of a four-year-old.

But that's all right. Four-year-olds need games, too.

And for those of you who are a bit older, the program is a clear demonstration of how to use sprites in game programming. It's very simple, using only one sprite and two sprite shapes, with the player able to control only horizontal movement. But by the time you're through studying the program, you'll know how to create sprites, move them, do shape-flipping, detect collisions, and make the sprite interact with the playfield and the player's instructions. And that's not bad for a simple program about a cute little pig trying to avoid the butcher's shop.

HOW TO PLAY

Once the program has finished setting up, you'll have a little pig on a grassy field. However, the robot swineherding machinery is in action, with moving fences sweeping across the field, trying to herd the pig toward the top of the screen.

You are the pig. All you have to do is run from side to side to avoid those fences. If they touch you, they'll push you upward, toward the top of the screen; but if you stay in the gaps between the fences, you'll be safe. Eventually, after fifty fences have gone by, the swineherds will give up and you'll be safe.

You control the pig by pressing the SHIFT key to move right and the COMMODORE key to move left. If you want to quit the game early, press SHIFT, COMMODORE, and CTRL all at the same time.

The game will end when fifty fences pass by; when you press SHIFT/COMMODORE/CTRL; or when the pig reaches the top of the screen.

WHY ARE SPRITES SO GOOD?

The pig is, of course, a sprite. But there wasn't anything I did with that pig that couldn't be done with custom characters, was there?

Shapes and Sizes. Certainly the *shape* of the pig could have been duplicated with custom characters—six characters, in fact, to make the whole shape. That's because the pig is made out of 10 rows of dots, 23 columns wide. Since each character is eight dots by eight dots, it would take six whole characters to make the pig shape, two rows of three characters.

James Regan

By Orson Scott Card

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The sprite can even be bigger than the pig. While the maximum width of a sprite is 24 dots, it can be up to 21 rows in height—more than twice as tall as my little pig.

Furthermore, the 64 allows you to change the size even more. You can double the sprite's width, or its height, or both. When you choose to expand the sprite, the VIC-2 video chip takes the shape from memory and doubles each dot; the pattern remains the same, but it is spread out over twice as many dots on the screen. If you double the width, the sprite then becomes 48 dots wide (though the *pattern* is still confined to 24 dots, each of which is doubled when it is displayed). If you double the height, the sprite becomes 42 dots high.

One-byte Registers. Sprite expansion is controlled with the two sprite expansion registers. Each bit of the single byte of the horizontal expansion register (at 53277) controls a single sprite. Sprite 0 is controlled by bit 0, sprite 1 by bit 1, and so on to sprite 7, controlled by bit 7. If a sprite's control bit contains a 1, its width will be doubled; if it contains a 0, the width remains normal.

For instance, let's say you want to double the width of sprites 0, 1, 2, and 7, but leave the other sprites alone. To turn on sprite 0, you need a 1 for bit 0, which has a decimal value of 1. Bit 1, when "on," has a decimal value of 2. Bit 2, when "on," has a decimal value of 4. You notice the pattern, of course—each bit's "on" value is double the "on" value of the bit before. Bits 3, 4, 5, and 6 have decimal values of 8, 16, 32, and 64—but since we aren't using them, we *won't* include those decimal values in our number. We *will* include the value of bit 7, however, which is 128.

Combine those, now: $1 + 2 + 4 + 128 = 135$. To double the width of sprites 0, 1, 2, and 7, you only have to POKE 53277,135.

Several of the sprite control registers control all eight sprites with a single byte, each bit serving as an on-off switch for one of the sprites. In every case, bit 0 controls sprite 0, bit 1 controls sprite 1, and so on.

That's why in *Pig in a Poke*—as with any other program where I use sprites—I set up two arrays to control the on-off switches for the different sprites. The bit-set array, BS(0-7), contains the values 1, 2, 4, 8, 16, 32, 64, and 128. Then, when I want to turn on, or "set," the bit that controls, say, sprite 4, I only have to:

POKE 53275,PEEK(53275) OR BS(4)

The other array, BC(0-7), is the bit-clear array. It contains the values 254, 253, 251, 247, 239, 223, 191, and 127. Each value is a bit-mask: every single bit is "on" *except* the bit that controls the sprite in question. (The maximum value of a byte—all bits "on"—is 255. So the bit-mask for bit 0 is 255-1, or 254; the bit-mask for bit 3 is 255-8, or 247; the bit-mask for bit 7 is 255-128, or 127.)

Then, when I want to turn off, or "clear," the bit that controls sprite 4, I only have to:

POKE 53271,PEEK(53271) AND BC(4)

Changing Shapes. The sprite is also versatile in its shape. You can store, theoretically, 64 separate sprite-shapes in the 16K block of video memory. (Actually, you need to leave at least 1K for screen memory in text mode, plus room for as much character memory as your program needs.) Each of the eight sprites on the screen can take its shape from any one of the shapes you've stored in memory.

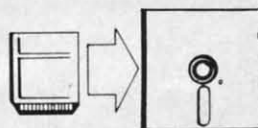
You could have all eight sprites look exactly the same by telling the VIC-2 to take their shape from the same pattern.

Or you could have one sprite cycle through dozens of different shapes in an animated sequence, with a single POKE for each change.

The sprite shape location registers aren't always in the same place, and their code is a bit complex. To understand how to use them, let's review some things we've covered in earlier columns.

Review of Video Blocks. As you remember, the VIC-2 video chip can only see 16K of RAM at a time. So all the graphics features have to be located in that 16K block: screen memory, character memory, sprite shapes, and bit-map memory. (The only exceptions are color memory, which is always at 55296-56319, and ROM charac-

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ter memory, which is really located in a switchable bank at 53248-57343, but is seen by the VIC-2 at 36864-40959 when it is using the third video block, and at 4096-8191 when the VIC-2 is using the first video block. This is automatic, so once you select one of those blocks, the character set will be present for your use.)

The four possible video blocks are at 0K (from 0 to 16383), at 16K (from 16384 to 32767), at 32K (from 32768 to 49151), and at 48K (from 49152 to 65535). When the 64 powers up, it is using the first video block, starting at 0K. It puts screen memory at 1024 and sees the character set as if it were at 4096. This won't be too helpful when you're using sprites, however, because your BASIC program starts at 2048 and runs right through this whole block—there are only a few nooks and crannies into which you can tuck a sprite shape or two without bashing the BASIC program.

Often you'll use the second video block, at 16K, especially if your BASIC program is short enough to leave you some room. However, in that block you have to define your own character set. The third video block, at 32K, allows the VIC-2 to see character memory at 36K. You also can't use the last 8K of this block, from 40K to 48K, because that is BASIC ROM! But you still have 4K to contain screen memory and sprite shapes—and most of the time that will be enough, with plenty of room below 32K for a long BASIC program. The fourth block, at

48K, contains so much ROM that it's virtually unusable for video purposes.

The first two bits of the register at 56576 tell the VIC-2 which video block to use. First you AND the register with 252 to blank out those two bits, then OR it with the code for the video block you want. The code for 0K is 3; for 16K, 2; for 32K, 1; and for 48K, 0. (You need to diddle with the data direction register at 56578.) Here's how to select the 32K block:

```
POKE 56578,PEEK(56578)OR 3:POKE 56576,(P
EEK(56576)AND 252)OR 1
```

You also need to tell the VIC-2 where screen and character memory are, which is done at 53272; and tell BASIC where to find screen memory by POKEing the page number into 648. In *Pig in a Poke*, screen memory is right at 32K, which to the VIC-2 is 0K within the video block; BASIC uses the absolute page number, which is 128. Character memory is at 36K, which to the VIC-2 is 4K within the block. So the number POKEd into 648 is 128, and the number POKEd into 53272 is *character memory 1K boundary* plus sixteen times *screen memory 1K boundary*, or $4+16*0$. (For those of you who grew up with the New Math, that adds up to 4. A lot of work just to get a dumb little one-digit number, isn't it?)

Now that we've told the VIC-2 where to find all this stuff, where are those sprite location registers? The sprite location registers are *the last eight bytes of the 1K block where screen memory resides*. That's why we had to go through all this rigmarole. You have to know where screen memory is to find out where the sprite location registers are. The address is *video block address* plus *screen memory 1K boundary times 1024* plus *1016*. In *Pig in a Poke*, that's $32768+0+1023$, or 33791.

Each sprite shape location register contains a number from 0 to 63, representing one of the 64 possible 64-byte blocks of memory within the video block. For instance, a 10 tells the VIC-2 to look for the block starting at address *video block* plus *ten times 64*. A 55 would tell the VIC-2 to look at *video block* plus *55 times 64*. Since our video block starts at 32768, sprite shape block number 10 (the eleventh block, since the first block is numbered 0) starts at $32768+10*64$, or 33408.

However, since screen memory in our program starts at 32768, and uses 1000 bytes of memory, that sprite block is *within* screen memory. Now, this doesn't cause the VIC-2 any trouble. It will merrily display *both* the screen *and* the sprite, using overlapping regions of memory. VIC-2 doesn't care. But *you* probably will. As the screen display changes, so will your sprite shape!

A Small Example. Let's throw a sprite shape onto the screen showing just how that works. Power up your 64, and enter the following program lines in direct mode. Notice that we will *not* change the video block—we're using the screen as you normally have it.

```
POKE 53269,1
```

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This enables sprite 0.

POKE 53248,175:POKE 53249,135

This puts the sprite at horizontal coordinate 175 and vertical coordinate 135. That's just about in the middle of the screen.

You'll notice that at this point the sprite is a rectangular display of garbage. But it isn't just *any* garbage—it is the garbage pointed to by the sprite shape location register for sprite 0. Remember, this is found at byte 1016 from the start of screen memory. The default screen memory for the 64 is at 1024, so that the sprite 0 location register is at 1024+1016, or 2040.

Upon powering up, my machine puts a 32 at 2040. This means that until I change it, sprite 0 will display whatever is in memory at 0+32*64 (video block 0K plus 64 times sprite shape location code 32), or 2048. It just so happens that this is the address of the beginning of the BASIC program area. Just enter a few meaningless lines, like 100 REM and 200 REM THIS IS JUST A TEST. With each line you enter, you'll see the sprite shape change as BASIC builds a program in the sprite shape block. (If your 64 shows something else, POKE 2040,32 and enter or delete program lines.)

Now let's move the sprite shape block somewhere else. In direct mode:

POKE 2040,2

Right in the middle of the sprite you'll see some flickering dots. These are the constantly changing bytes at 167 and 168, where the operating system maintains a clock.

Can't see it clearly enough? Try using the horizontal and vertical expansion features:

POKE 53271,1

That makes it nice and tall.

POKE 53277,1

And now it's fat, too. If you POKE zeroes into the same location, it becomes short and skinny again.

Bits to Make Shapes. How does the VIC-2 read the sprite shape matrix? Basically, it reads the matrix the way we read books, starting at the upper left-hand corner of the sprite shape and reading across to the right; when the line ends, it drops down to the left-hand edge of the next line. Each of the 24 dots on each row is represented by one bit in the sprite shape block. The first byte of the block contains the bits that control dots 0-7 of the first row of the shape; the second byte, dots 8-15; the third byte, dots 16-23. That's all for the first row, so the next byte in the shape block controls dots 0-7 of the second row of the shape, and so on, until the 63rd, or second to last, byte of the block controls dots 16-23 of the row 20 (the 21st row, since we began with row 0). The




very last byte of the 64-byte sprite shape block controls nothing at all—the VIC-2 ignores it, and so can you.

The example program *Basic Sprites* shows how to create sprite shapes quite easily. The routine in lines 800-810 reads some DATA statements that contain the sprite shapes as *strings*. This is so you can design the shape right there on the screen without any complicated graph paper calculations. Each string represents one row of the sprite shape, with asterisks representing "on" bits and periods representing "off" bits. The routine breaks the string into three 8-character chunks, each of which corresponds to a byte of the sprite shape block. Byte by byte, row by row, it reads, converts, and POKes in the sprite shape.

Since we're only using two sprites and three sprite shapes, they are being POKed into the cassette I/O buffer at 832 (sprite shape block 13), 896 (block 14), and 960 (block 15). Thus they don't interfere with BASIC's program storage above 2048. We aren't doing any fancy changing of the video block for this program.

And once it's SAVED, you can go ahead and change the sprite shapes in the DATA statements starting at 810. Just remember that every string has to contain 24 characters, one for each bit of the sprite's width, and there must be 21 strings per sprite, one for each row of the sprite shape block.

Movement. With character graphics we were able to move objects around the screen with some good speed,

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using the PRINT command. However, since a character can only be in one 8-by-8 grid or another, each movement had to be at least eight dots at a time. It looks jumpy and is hard to watch.

Sprites can move much more smoothly, since they aren't mapped onto the text screen. They can move one dot at a time, vertically or horizontally, as the program *Basic Sprites* showed. (The program *Pig in a Poke* moves the pig two dots at a time horizontally, to increase the speed; that's about as big a jump as you can take without losing smoothness. It also moves eight dots at a time vertically, so it will always stay in alignment with the character-graphics fences.)

Each sprite has its own horizontal position register and vertical position register. These registers start at 53248. They proceed in order, starting with sprite 0's horizontal position register at 53248, sprite 0's vertical position register at 53249, sprite 1's horizontal register at 53250, sprite 1's vertical register at 53251, and so on.

The registers contain coordinates that correspond with dots on the screen. They always specify the location of the dot in the *upper left-hand corner* of the sprite's shape matrix. This has nothing to do with whether that dot is turned on or not—even if your whole sprite shape is crowded down at the bottom of the shape block, the VIC-2 will still use the position registers to calculate the location of the upper left-hand corner of the sprite shape

block.

A sprite can be half on and half off the display area. Whatever part of the sprite is past the edge of the display area and into the screen border will seem to move "behind" the border—that is, the dots that are off the edge of the display area are simply not displayed.

That's why a sprite with a horizontal or vertical position of 0 is completely off the screen—it's "behind" the border. The leftmost position a sprite can have and still be completely visible on the screen is 24. The highest position is 50. The first position to the right that will have the sprite completely off the screen is 344, and the first position on the bottom that will make the sprite completely disappear is 250. (When the sprite starts to disappear on the right-hand edge or the bottom of the screen depends on whether or not it has been expanded in either direction.)

You'll notice, though, that the horizontal position can go well over 255, which is the highest number that can be POKEd into a single byte of memory. This means that once the sprite reaches horizontal position 255, the horizontal position register can't possibly move it any farther to the right—the number 256 cannot be contained in the register.

The VIC-2 gets around this by putting a sort of International Date Line at position 256. When the sprite reaches that horizontal position, a flag bit is set Somewhere Else, and the horizontal position register starts over at 0. So to move across the International Date Line, you POKE the horizontal register with 253, 254, 255, then set the flag bit, and go on with 0, 1, 2, and so on.

The flag bits for all eight sprites are in a single register at 53264. Sprite 0's flag bit is bit 0, and so on, as with all the other one-byte sprite control registers. If a sprite's flag bit is clear (contains a 0), then the VIC-2 will count the sprite's horizontal position from far left of the screen; if a sprite's flag bit is set (contains a 1), then the VIC-2 will count the sprite's horizontal position from the International Date Line right on the screen.

To handle the horizontal and vertical ranges smoothly, both the *Basic Sprites* example program and the *Pig in a Poke* game use three arrays. The array *VV(n)* contains all the "valid" vertical locations. In *Pig in a Poke*, there are only 20 valid vertical positions, at every eighth row starting with row 53. So in lines 900 and 906, this array is set up to have 20 elements, from 0 to 19, which contain, in order, the vertical position codes 53, 61, 69, 77, 85, 93, 101, 109, 117, and so on to 205. Now the program only has to keep track of which of the twenty valid vertical positions the sprite should be on, using the variable *VP*. Then it sets the vertical positions with *POKE 53248,VV(VP)*.

A similar thing is done with the horizontal position, except that two arrays are used. The first array, *HH(n)*, contains all the valid horizontal position codes for the horizontal position register. The second array, *HB(n)*, contains the flag bits for the register at 53264. Each time the sprite is moved horizontally, *both* numbers are POKEd

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into the control registers.

Why both numbers *every* time? For smoothness. You could use an IF-THEN test to change the flag bit only when the sprite is actually crossing the International Date Line. But in a BASIC program, with its slow POKE statement, that will mean that the sprite hesitates for a moment. By POKEing those values every time, overall movement will be slower, but there's no hesitation. (However, in either case there will be a bit of blinking at that point, because for the moment between POKEing the horizontal register the POKEing the flag-bit register, the sprite will be completely offscreen. This is avoidable only in machine language.)

Another solution, of course, is to keep your sprites from crossing the International Date Line at all. Display something else to the right of the line, and keep the sprites always to the left. No flicker then!

Three Dimensions. The priority register at 53275 controls whether the sprite moves *in front* of objects on the screen or *behind* them. Each bit of the byte at 53275 controls the corresponding sprite. If sprite 0's bit, bit 0, is *set* (equals 1) then the sprite will seem to move *behind* objects on the screen. That is, the sprite will be visible whenever it is in front of the background color of the screen, but every dot that is on the same spot as a dot in a character shape on the screen will be invisible—the character shape will seem to be in front of the sprite. If bit 0 is *clear* (equals 0) then the sprite will move in front of the character shape as well as the background.

This lets you create the illusion of three dimensions on the screen. However, setting and clearing individual bits of the priority register is so cumbersome that in a BASIC program you will probably want to set the priority once and leave it alone. Only in machine language can you fiddle it on and off without slowing down program execution hopelessly.

Collisions. For game programming, one of the most important features of sprites is that the VIC-2 automatically keeps track of whether sprites have bumped into each other or into any character shapes on the screen. Two collision registers keep track of whether each sprite has been involved in a collision since the register was last checked. To see if sprite 4 has bumped into another sprite, examine bit 4 of the sprite/sprite collision register at 53278. To see if sprite 7 has bumped into any of the character shapes (or bit-map designs) on the screen, examine bit 7 of the sprite/foreground collision register at 53279.

When does a collision take place? Only when an "on" dot in the sprite shape occupies the same screen position as an "on" dot in another sprite or an "on" dot in a character shape. If the transparent portion of a sprite's shape matrix passes over another sprite or a character, nothing happens to the collision registers. Only when the dots that are actually displayed come into "contact" is a collision reported.

The collision registers "remember" every collision until your program PEEKs (or LDAs or CMPs, in machine

language) the collision register. This means that you should always clear the collision registers by PEEKing them once at the beginning of the program, before you start checking them in earnest. Also, it means that you can't PEEK the sprite/sprite register to check for a collision for sprite 0 and then check it again for a collision for sprite 1—when you checked it the first time, it was erased! That's why you'll want to put the byte in a variable, like this: `Z=PEEK(53278)`. Then you can check the variable Z to test for as many collisions as you want.

Unfortunately, these registers don't tell you *which* sprite or character shape you bumped into. Of course, if only sprites 0 and 1 in the sprite/sprite collision register report a collision, you can bet they bumped into each other. But if sprites 0, 1, and 2 report a collision, you don't know if both 0 and 1 bumped into 2, but not into each other, or if they all bumped into each other—and it can get even more complex.

To know *which* sprite was bumped, you either have to track the location of every single sprite (in which case a BASIC program will crawl along at the speed of a student driver), or you have to decide that *all* sprite collisions have the same effect, so you don't *care* which sprite bumped which.

That's what *Pig in a Poke* does. Since there's only one sprite onscreen, there can't be any sprite/sprite collisions at all. And *any* collision with character patterns has ex-

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actly the same effect—bouncing the pig toward the top of the screen.

If I had wanted to have characters on the screen that the pig could touch at will, then I would have had to use *sprites* for the fences moving up the screen. In that case, sprite/foreground collisions would have been ignored, and only sprite/sprite collisions would have mattered. Furthermore, it wouldn't have mattered *which* sprite the pig bumped into, because *any* sprite would have the same effect.

Any time it doesn't matter *which* sprite the player's sprite bumped into, collision handling is simple. When it does matter, it becomes complex and generally has to

SPRITE MEMORY MAP

For easy reference, here are the sprite-control registers in the Commodore 64. For explanations, see the text of the article.

Floating Memory Locations

1016-1023 after the start of screen memory (default 2040-2047): The eight **shape location registers**. (If you're using bit-map mode, they can be found at bytes 1016-1023 after the beginning of bit-map color memory.)

0-63: The codes for the possible location of each sprite shape block within the video block. The actual address is found by multiplying this code by 64 and adding the result to the absolute address of the start of the video block. The first 63 bytes of the sprite shape block determine which dots will be "on." Every 1 bit causes a dot to be displayed; a 0 bit allows the playfield display to show through.

Permanent Control Registers

53248, 53250, 53252, 53254, 53256, 53258, 53260, 53262: Horizontal position registers for sprites 0 through 7, in order.

53249, 53251, 53253, 53255, 53257, 53259, 53261, 53263: Vertical position registers for sprites 0 through 7, in order.

53264: Flag-bit register for horizontal position of all eight sprites.

53269: Sprite enable register. (255 enables all sprites; 0 disables all sprites.)

53271: Sprite vertical expansion register. (255 expands all sprites.)

53272: Screen and character memory location register. Where screen memory is located determines where the sprite shape location registers are located. The high four bits are significant for screen memory location:

$screen\ location = (PEEK(53272) \text{ AND } 240) / 16 + \text{video block starting address}$

53275: Sprite priority register. (0 means all sprites appear in front of foreground; 255 means all sprites appear behind foreground.)

53276: Sprite multicolor enable register. (255 makes all sprites display using multicolor option.)

53277: Sprite horizontal expansion register. (255 expands all sprites.)

53278: Sprite/sprite collision register. (0 means no collisions; PEEKing this location clears the register.)

53279: Sprite/foreground collision register. (0 means no collisions; PEEKing this location clears the register.)

53285: Sprite multicolor register 0, controlling the color of 01 bit-pairs.

53286: Sprite multicolor register 1, controlling the color of 11 bit-pairs.

53287, 53288, 53289, 53290, 53291, 53292, 53293, 53294: Sprite color registers for sprites 0-7, in order. Default colors are white, red, cyan, purple, green, blue, yellow, and medium gray. (In multicolor mode, these registers control the color of 10 bit-pairs.)

53276: Video block selection register. Bits 0 and 1 determine which video block the VIC-2 chip will read.

be handled in machine language.

Other Features. Sprites have several other possible features, which I'll discuss in later columns, like multicolor display. These features have their own registers, which are mentioned in the Sprite Memory Map but not explained here.

The sprites' colors are controlled by eight sprite color registers; however, the 64 automatically assigns eight different colors to the sprites when the machine is turned on, and the example programs don't change them. If you want to, however, just POKE into them the number of the color you want, from 0 to 15, just as you do with the background color register at 53281. The sprite color registers are located at 53287 through 53294.

Also, there are advanced techniques like animation (shape-flipping), rotation, and complex sprites, which we'll go through in the next couple of months, including an interrupt-driven machine-language routine that will allow you to speed up sprite movement drastically while still controlling it all from BASIC.

HOW PIG IN A POKE WORKS

In the meantime, though, let's go through *Pig in a Poke* section by section in order to see exactly what's going on.

The Variables. One of the most confusing things in studying somebody else's program is to try to remember what all the variables mean. So here is a list of the major variables used by both *Pig in a Poke* and *Basic Sprites*:

VB	Address of the video block
SB	Address of screen memory
BB	The screen memory page number (used by BASIC)
LT(0-7)	The address of each sprite's shape location register, located starting at byte 1016 after the start of screen memory.
CT(0-7)	The address of each sprite's color register.
HT(0-7)	The address of each sprite's horizontal position register.
VT(0-7)	The address of each sprite's vertical position register.
HR	The address of the flag-bit register for horizontal movement across the "International Date Line."
ES	The address of the sprite enable register.
VE	The address of the vertical expansion register.
HE	The address of the horizontal expansion register.
PR	The address of the priority register.
EM	The address of the multicolor enable register.
MR	The address of the first multicolor color-selection register.
CS	The address of the sprite/sprite collision register.
CF	The address of the sprite/foreground collision register.
BS(0-7)	The bit-set values for each sprite.
BC(0-7)	The bit-clear values for each sprite.
ST(n)	The codes for the location of each sprite shape block; these numbers are POKEd into the sprite location registers at LT(n).
NS	The number of sprite shapes, minus 1.
VV(n)	The vertical position array; these values are POKEd into the vertical position registers at VT(n).
HH(n)	The horizontal position array; these values are POKEd into the horizontal position register at HT(n).
HB(n)	The horizontal flag-bit array; these values are POKEd

Continued on page 75

FISH MATH

for the

VIC 20

By Kevin Dewey

In this educational game for children ages eight through twelve, the player is in control of a group of ten fishes that must be led to the top of the stream safely and with the right amount of food in their tummies.

The player figures out how much food each fish requires by working out a simple multiplication problem at the bottom of the screen. He then leads the fish up the stream, gobbling up food as he goes, and avoiding the shark known as Gums. Contact with Gums makes you into shark-bait.

CONTROLLING THE FISHIES

Controlling the fishies is a very complex process to learn, but very easy once you get the hang of it. There are only two keys—for right and left. The CRSR keys are used, CRSR UP/DOWN moving the fishy left and CRSR right/left moving the fishy right. Doesn't sound too complex, does it? But your fishy is always moving up, almost automatically, except when you are pushing down a CRSR key. So if you have a lot of food to eat, you'd better not go too long without moving right or left, or before you know it, you'll be on the top of the screen, with far less food than the fish requires. This problem can be solved, however, by scrolling off the side of the screen and moving down. You only move down on the right side. If you scroll off the left side, you move up. So if you're too close to the top of the stream with not enough food, you can head back down if you keep going right.

Another key that comes in handy is SHIFT/LOCK. This pauses the game, allowing the player to think over the multiplication problem presented, or the best way to avoid Gums, whichever is most pressing at the moment. Play is resumed by depressing the key.

SCORING

For every fish brought to the top safe and well-nourished, a point is added to your score. For every fish either overfed or underfed, a point is taken away. If Gums gets a fish, the game ends.

A FEW WORDS ON EDUCATION

The educational emphasis in this game is on teaching basic multiplication facts. I had originally chosen to make it an addition game, but chose not to when I realized the arcade element of the game might become frustrating for the younger set of children.

Instead, I chose multiplication because older children can appreciate the challenges of an arcade game while learning, instead of becoming frustrated by it. The game really is quite hard to master, and though children may not realize it, they are being drilled in multiplication skills as they play. ☐ **SEE PROGRAM LISTING ON PAGE 110**

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AHOY! DOCK

A Mini Database Manager for the C-64

By Glenn Lumpkins

How many times has this scene been played? Your latest issue of *Ahoy!* arrives with the mail. You flip through the pages thinking: boy-these-are-great-programs, the ads, all-those-helpful-hints, and the many other inspiring articles. I'll read this issue and type in the programs when I have time to really concentrate. For now, I'll make some mental notes about this issue. You now add this issue to the month's stack of magazines which sit on top of last month's stack, which sit on top of the previous month's stack, and so on.

When was the last time you went to that stack of material needing a routine, a helpful hint, an item, or an article on a specific subject? Pulling issues out of the stack and scanning their indexes, you think to yourself:

"One of these days I've just got to get this stack organized. But the issues keep piling up higher and there seems to be no end to it. There must be a magnetic quality to the computer desk, as everything seems to gather there. Maybe tomorrow I'll get started."

HELP IS ON THE WAY!

I wrote *Ahoy! Dock* because I receive and save several computer publications each month. More than once I have tried to catalog and file these issues, all to no avail.

Now with *Ahoy! Dock* and a 1541 disk drive, I have an index of every article in my issues that I might ever want to use or read. *Ahoy! Dock* allows me to add to my file at any time, search for a program or articles, delete old items, modify the file, print or list the files, and sort the file on multiple fields. It now takes minutes instead of hours to find the information I need and my desk is much neater, thereby allowing me more computer time.

Ahoy! Dock is simply a mini-database manager designed for use with an auxiliary storage device and a floppy disk. It will allow you to index information according to 14 categories, with each category containing 500 independent records. With its simple menu operations, the program is as easy to use as pressing the function keys.

When you run *Ahoy! Dock*, you'll see a main menu. Step-by-step instructions are asked for by each of the menus, with every attempt made to prevent an incorrect entry. If all else fails, at any point of entry a "/" will allow you to escape back to the main menu.

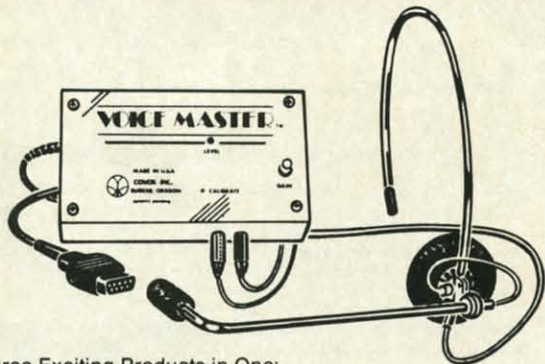
When you select an option from the menu, a submenu of categories will be read to the screen for you to choose from. When you select the ADD option and a category, the program will direct the computer to read the error channel from the disk drive to see if that category exists. If the category doesn't exist, you are asked to create the file or return. Choosing the create option will initialize that file.

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Ahoy! Dock was written for computer magazines. You can easily alter it for any type of publication by changing the data subject categories and the program lines. □

SEE PROGRAM LISTING ON PAGE 103

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32 **AHOY!**

FLOTSAM

Because upon starting the Commodore, RND(1) always produces the same series of random numbers, and because RND(0) is rather suspect, I use one of the following lines in programs that use random numbers:

```
100 R = RND(1): GET A$: IF
  A$="" THEN 100
```

OR

```
100 R = RND(1): IF (PEEK(5
  6320)AND15)=15 THEN 100
```

Depending upon the length of the pause, line 100 will generate a varying number of random numbers, which changes the starting point for the series of random numbers used in the program. The more often the program can zero line 100, the better.

—Jacqueline L. Callaway
Orange Beach, AL

I would like to address an article in the May issue of your fine magazine: *Disk Spinners, Part II* by Morton Kevelson. I have used all three of the referenced devices. I purchased the 1541 Flash after reading the article and cannot offer enough praise for this fine product.

I have the updated model with the switch on the disk drives (2). I have been using the Flash for about a month and have found only two games that will not work with the Flash installed.

I use word processors and PFS (*File & Report*). I have found that with the Flash installed it is a pleasure not waiting between searches during file update and printing.

On the Commodore I have, the Kernal ROM was soldered in and did require the tricky removal of the old Kernal to install the socket furnished with the kit; after this was done the rest of the modification went without any problems.

I would like to thank Mr. Kevelson for his article and Skyles Elec-

tric Works for their product.

—David J. Farrell Sr.
Enfield, CT

I recently purchased the *Fast Load* cartridge from Epyx. One of the first programs that I tried *Fast Load* on was Microsoft's *Multiplan* for the C-64. *Multiplan* is a superb spreadsheet, but frustratingly slow. When I attempted to save some changes to my data disk, *Fast Load* restructured my files so that I could not retrieve them.

I called Epyx to find out what happened. The gentleman I talked to said the problem was relative files. His belated advice was "don't use *Fast Load* on any program containing relative files."

In all the reviews that I have read in your magazine and others, nowhere is this problem mentioned. And nowhere are there any warnings about potential problems like this.

Please address this problem for my benefit and the benefit of all your readers.

—Edward S. Champa
Indianapolis, IN

Scuttlebutt would be even better if it incorporated, though in abridged form, the same thoughtful judgment that's found in your *Reviews* section. Any chance of that?

—Mel Getty
Orono, ME

Not if we want to keep Scuttlebutt the most current—as well as complete—Commodore news section on the stands. We announce new products as soon as we learn of their existence. Waiting for review samples would make our news section yesterday's papers.

We incorrectly listed the address and phone number of Navarone Industries, Inc. on the back cover of our August issue. Correct address and phone number are:

Navarone Industries, Inc.
19968 El Ray Lane
Sonoma, CA 95370
Phone: 209-533-8349

Revised January June 86 NVG

FASTNEW

A 20-Second Formatter for the 1541

By Don Lewis

Fastnew is a fast disk formatting program. The 1541 has a built-in command for formatting, i.e. NO:(diskname,id). So why a special program? Because *Fastnew* improves on the 1541 resident formatter in three important areas:

a. Speed. The normal format takes about 90 seconds. *Fastnew* formats a disk in 20 seconds.

b. Reliability. The normal format routine includes a verify. Unfortunately, this verify has a bug in it which allows some format errors to go undetected. *Fastnew* has a correct verify, insuring error-free formatting.

c. NO Head Bang. The normal format kills 1541's. Every time you use the normal format, the read/write head is BANGED against a hard stop in the drive. Eventually this will throw the disk out of alignment, and cost you an expensive repair. *Fastnew* never bangs the read/write head when formatting.

Fastnew consists of three sections, a BASIC portion and two machine language (ML) routines. The BASIC code handles screen output and user input. One ML routine is a fast memory mover used to transfer code from the 64 to the 1541. The other ML section is the formatter proper. It is transferred to the 1541, then executed using an M-E command. This code relies heavily on sub-routines in the 1541 ROM's to perform the formatting.

When typing in *Fastnew*, be sure to double (and triple) check the data statements at lines 4000-4999 and 5000-5999. Make sure you save a copy to disk before running the program. Until you get a completely working *Fastnew*, be prepared to quickly turn your disk drive off. Typos in the data statements can cause the 1541 to really go wild.

Source code for the 1541 resident code is available for \$8.00 postpaid from the author (see address below). Careful study of the source code will suggest all sorts of possibilities for custom formatting, such as varying data or header block lengths, extra tracks or sectors, and recording density shifts. Custom formatting has been where most copy protection schemes originate.

Fastnew is faster because it avoids a lot of the work the normal format does, without compromising integrity. When formatting a disk the 1541 normally does quite a bit of work. First it writes 10250 \$55 bytes (non-synch marks) to the disk. Then it writes an alternating pattern of \$55 and \$FF (synch marks) bytes to the disk. It then reads the track and counts how many synch and non-

synch marks were actually written on the track. From these counts, it calculates the optimal inter-sector gap length. The goal is to divide the track into evenly spaced sectors. The actual number of bytes written out as the inter-sector gap depends on the length of the track (track 35 is shorter than track 1), the number of sectors on the tracks, and the speed of the disk drive, which may vary from day to day. After calculating the inter-sector gap, the actual formatting is done. The header block and a dummy data block are written out for each sector on the disk. The Read/Write head is then stepped to the next track and the process repeated.

In practice all this work isn't necessary. There is no reason to try to get an even sector distribution around the track, provided there is enough space for all the sectors. It is important, however, to have some gap between the end of one sector and the start of another. If a gap did not exist, you'd run the risk of having a data block write into the header block of the next sector, causing a disk error number 20. This could happen if the speed of the disk drive varies from day to day.

Rather than go through all the calculations described above, *Fastnew* assumes that a gap of 8 bytes between sectors is sufficient. This is based on an examination of the inter-sector gaps on a number of normally formatted disks.

Head bang occurs when the R/W head is pulled back to track 1 by the normal format routine. The normal format assumes that the head is as far away as possible and steps the head back 45 tracks—BANG!! However, provided that the disk drive has accessed at least one properly formatted disk, the current position of the R/W head can always be found at memory location \$22. *Fastnew* reads this location and calculates the necessary steps to pull the head to track 1 with NO bang.

As I said, *Fastnew* makes one assumption, that the disk drive has previously accessed a properly formatted disk. (A small price to pay for extending the life of your 1541 disk drive.)

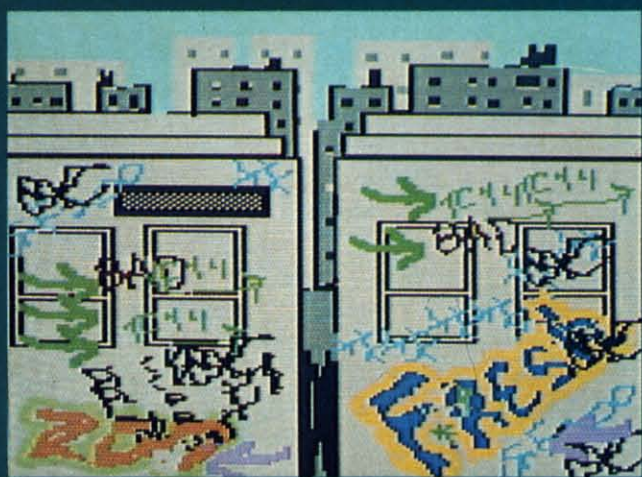
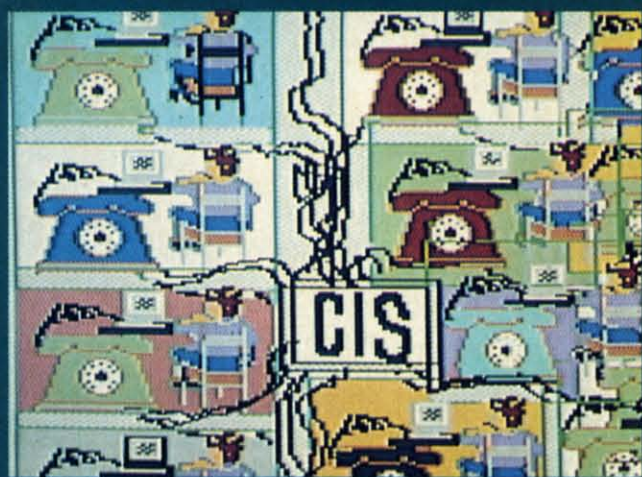
I hope that you will find *Fastnew* a useful utility. I would like to extend my appreciation to my colleagues at R. J. Brachman Assoc., Inc. for their assistance in developing this program. I welcome correspondence from readers. Write to Don Lewis, P.O. Box 521, Folsom, PA 19033. Please include a stamped and self-addressed envelope if you desire a reply. □

SEE PROGRAM LISTING ON PAGE III

ART GALLERY



All of Michael Montauk's (Brooklyn, NY) images were created with the Koala Pad and Koala Painter software: his representations of CIS (the Compu-Serve Information System) and Graffiti (bottom), and the swinging cats at Ahoy! (bottom right, page 35).





Contributors to *Ahoy!*'s Art Gallery will receive royalties based on the sale of disks containing the best computer graphics received, both published and unpublished. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.

Responding to our initial request for starving computer artists, John Matthews Jr. (San Antonio, TX) indicates that he is starving, but only for attention. Hence his choice of attention-getting celebrities for his images, all created on the Koala Pad. *Betty Boop* (right) and charter Gremlin *Gizmo* (below) were drawn freehand, pixel by pixel, using Koala zoom mode. *Yosemite Sam* (left) was drawn freehand, based on a grid designed to proportion the screen pixels to match the proportions of the Okimate 10 color printer. (The proportions actually look better on the printout than on the screen shot shown.) John digitized his image of *Jane Russell* (above) with Computereyes (see review, p. 66) and added finishing details by hand.



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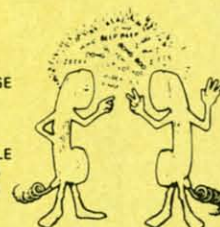
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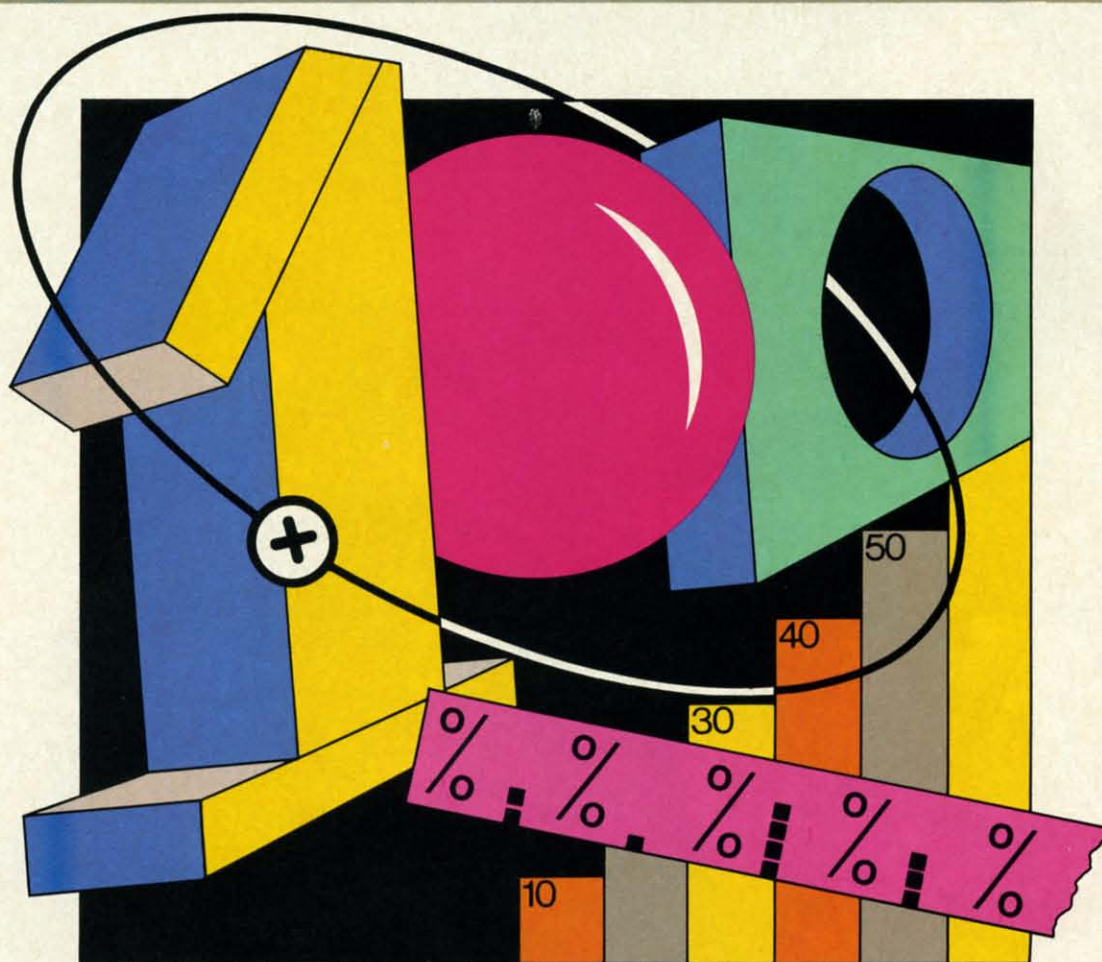
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JAVIER ROMERO

Tumbling Dice & Data Structures

BY DALE RUPERT

The next roll of the dice may determine your future. Three dice rattle in the cup. The question is this: What is the probability that you will roll an eleven? You confidently reach for your portable computer and quickly load the three-dice simulation program. Within moments it has calculated the answer to this final question on your statistics exam.

This article will not reveal the answer to the question. We will develop some programs to solve it, though. We will also look at a loftier topic than dice rolling, called data structure. The data structures of a program affect its speed, versatility, and debuggability. We will look at some of the tradeoffs of using different data structures.

As we saw last month, there are essentially three ways to determine probabilities: (1) formula evaluation, (2) random simulation, and (3) enumeration. It is very unlikely that any reference book contains the formulas of specific outcomes for the roll of three dice, so Method 1 is no good for solving our problem. This month we will develop procedures for implementing Methods 2 and 3.

Method 2 is sometimes referred to as a Monte Carlo approach. It is often used when the total number of possible outcomes is so large that it is impossible to list them all. Method 3 lists all possible outcomes and is feasible only in cases where that number is small enough and determinable.



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It is easy to calculate all possible outcomes for three dice. These nested FOR-NEXT loops generate every combination:

```
10 FOR A=1 TO 6 : FOR B=1 TO 6 : FOR C=1
   TO 6
20 PRINT A;B;C
30 NEXT C,B,A
```

Instantly the most tedious part of statistics class is eliminated! You might send this output to the printer. Then you could find the sum of each triple and keep track of how many of those totals equal the desired value. The probability of rolling an eleven is the quotient of the number of "successful outcomes" divided by the number of possible outcomes. Here a successful outcome is one in which the sum of the three dice is eleven.

Of course we will let the computer keep track of the sums and any other information about the dice that we desire. But before we proceed with this enumeration process, let's try the random simulation method.

ON TO MONTE CARLO

Very little work is needed to simulate and analyze the rolling of three dice, as the *Dice Simulator* program on page 99 shows. Random values from 1 to 6 are chosen for each of the dice. Their total value is calculated and compared with the desired value. If their sum is eleven, the variable GOOD is incremented. The variable N keeps track of the total number of rolls. The number of "good" rolls divided by the total number of rolls should approach the probability we are looking for. Line 70 displays 100 times this probability, giving us the percent probability.

Supposedly the longer this program runs, the closer the result comes to the theoretical value. Of course it is possible that the first three dice we roll have a sum of eleven, giving a 100% probability. On the other hand, we may roll 100 sets of dice before getting a sum of eleven. Neither result is very accurate. Only after numerous rolls with a good random number generator will the results settle down to a value close to the true value.

We have seen in previous articles that the random number generator in our microcomputers is not truly random. The non-randomness may cause the program to "home in" on an inaccurate value. Using an imperfect random number generator is equivalent to rolling loaded dice. I suggest that you run the *Dice Simulator* program to see if you can determine the actual probability before you evaluate it exactly in our next program.

The disadvantages of using this Monte Carlo method should be clear. It may require a fair amount of time to arrive at a reasonable value. Also, it may be difficult to know how reasonable the value is. If the random number generator is not very good, the answer may not be very good either.

The main advantage of this method is that you don't have to be able to list all possible outcomes or even know how many there are. For simulating radioactive decays

and molecular motion (topics for next month), this is certainly a desirable characteristic.

You can easily modify the *Dice Simulator* program to answer other questions, such as:

- 1) Are you more likely to roll a seven or an eleven with three dice?
- 2) What is the probability of rolling a total value greater than fifteen?
- 3) What is the probability that the value on one die equals the sum of the values on the other two dice?
- 4) Is there a fifty percent probability that all three dice show an even number?

Use your intuition to make a guess on each of these before running your program. Probabilities are not always intuitive.

To help you get started on Problem 1, you might add this line:

```
65 IF TTL=7 THEN G2=G2+1
```

Also change line 70 to print the value of $100 \cdot G2/N$ next to the other probability for a side-by-side comparison.

MORE SOPHISTICATION

The bare-bones *Dice Simulator* program uses the most basic data structure, simple numerical variables. The next program goes to the other extreme. It contains numeri-

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BridgePro is the first program I've seen that provides a challenge for the average-to-excellent bridge player. . . The documentation is excellent and allows a new bridge player to learn the basics.

—Harvey Bernstein, *Antic Magazine*, Feb. 1985

After having tried three other bridge programs, I find that BridgePro is indeed a pro game. . . It is designed for both the beginner and the advanced player. . . I didn't find anything that could be improved upon.

—Helen Garret, *Apple-Dayton Journal*, March 1985

If you like to play bridge and don't have three other players ever-eager to play, this software is a must. For bridge freaks it's good enough to justify buying a computer. . . Whether you are a "master" or a beginner, this is great software.

—Christian Basler, NY
Commodore Users Group
Review, Sept. 1984



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AHOY! 39

cal arrays which are indexed by other numerical arrays.

When three dice are rolled, there are 216 possible outcomes. Each die may have any one of six possible values, and $6 \times 6 \times 6$ is 216. The computer can readily handle this many items. The program *Dice Analyzer* (on page 99) generates all of the 216 outcomes and stores the values of each of the dice in a numeric array. This program analyzes the probabilities of various events by the exact process of enumeration. Once the list of outcomes is determined, the computer may look through the list, identifying "successful" outcomes and calculating the desired probabilities. A successful outcome is one which meets certain criteria, such as the sum of the three dice being eleven.

The value of each die for every one of the 216 possible outcomes is stored in the numeric array $ROLL(N,D)$ where N is the outcome number (1 through 216) and D is the die's identifying number (1 through 3). If $ROLL(7,2)$ equals 4, then the value of the second die is four on the seventh roll of the dice. If the third die had a value of five on the twentieth roll, then $ROLL(20,3)$ equals 5.

In addition to keeping track of each die's value, the program stores the count of each face value for every roll in the numeric array $CT(N,V)$. Again N is the outcome number, and V is the face value (1 through 6). If $CT(9,2)=1$, then only one die had a value of two in the ninth roll. If no dice had a value of two in the 216th roll, then $CT(216,2)=0$.

One other numeric array is filled as the various outcomes are enumerated. The array $TTL(N)$ stores the sum of the three dice on the N th roll. If $TTL(40)=7$, then a total value of seven occurred in the fortieth roll.

Lines 40 through 110 enumerate the outcomes and fill the arrays. This program determines exactly the probabilities that

- 1) Three ones are rolled.
- 2) At least one three and no sixes are rolled.
- 3) No twos are rolled.
- 4) The sum of the three dice is eleven.

This program is actually "overkill" for the sake of illustration. It is certainly not necessary to set up such a complicated set of arrays in order to find these probabilities. We could keep a tally of all successful outcomes as the values are generated in line 60. In fact, the simpler method would run more quickly and use less memory.

Why bother with this more complicated program? With the more sophisticated data structure we gain greater ease of analysis and greater flexibility in displaying the results. To implement Test 2 listed above with the simpler structure, we might have to use line 65 such as:

```
65 IF (A=3 OR B=3 OR C=3) AND (A<>6 AND
B<>6 AND C<>6) THEN T2=T2+1
```

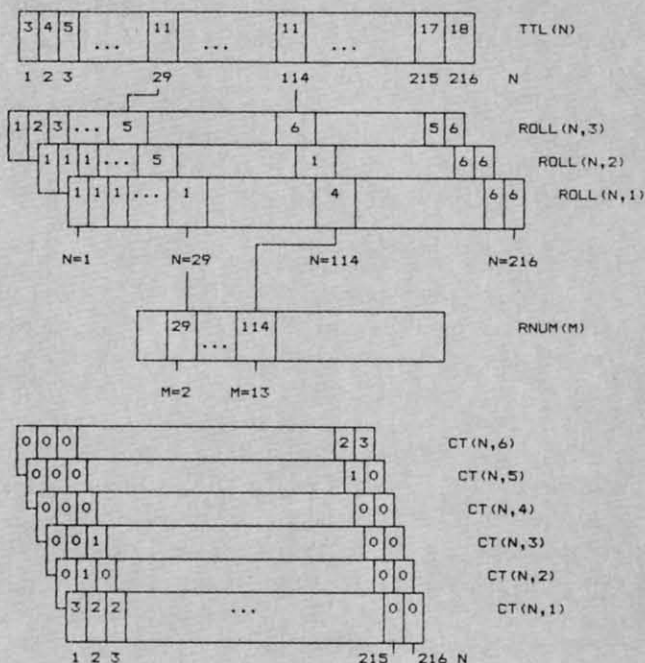
This is somewhat more cumbersome than the corresponding statement in line 150:

```
150 IF CT(N,3)>=1 AND CT(N,6)=0 THEN T2=
T2+1
```

Try to determine the probability that exactly one three and no sixes are rolled. I don't think such a test could be contained in one line with the simpler data structure. (Let me know if I'm wrong!) Line 150 could be easily modified by removing the "<" to perform such a test.

The $ROLL$ array is needed only if selected outcomes are to be listed, as was done for Test 4. $RNUM(M)$ keeps a list of all the roll number indices which satisfy Test 4. For example, if the twentieth roll had a sum of eleven, and if four previous rolls also had sums of eleven, $RNUM(5)$ would equal twenty. $RNUM$ is used as an index into $ROLL$ so that the events satisfying Test 4 can be printed in line 290.

DATA STRUCTURE OF DICE ANALYZER



The diagram shows the relation between $TTL()$, $ROLL()$, and $RNUM()$. On the 29th roll ($N=29$), the dice had values 1, 5, and 5. The sum of their values is eleven so $TTL(29)$ equals 11. This was the second occurrence of a total value of eleven. Consequently $RNUM(2)$ equals 29. Similarly the 114th roll was the thirteenth occurrence of an eleven. The diagram shows that $RNUM(13)$ equals 114, $TTL(114)$ equals 11, and the three dice had values 4, 1, and 6.

We have covered the fundamental concepts of indexing, pointers, and linked lists in the *Dice Analyzer* program. Study the program and the data structure to understand how the variables are defined and related. Better yet, see if you can modify the program to handle more dice. Perhaps you could change the *Dice Analyzer* program to answer the four questions suggested earlier for the *Dice Simulator* program.

Think about the possible data structures as you begin to create any program. A more complicated structure might be harder to implement, but it may pay off with ease of expandability and versatility later. □

SEE PROGRAM LISTINGS ON PAGE 99

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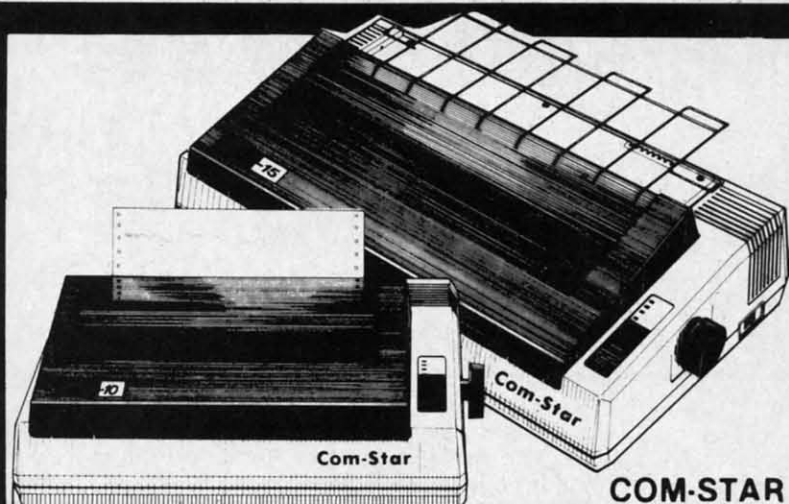
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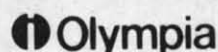
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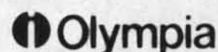


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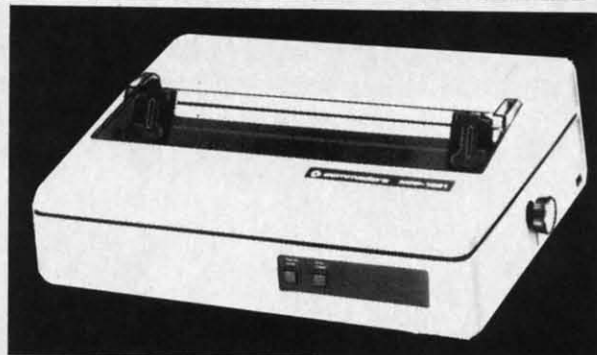
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ERRATA

We omitted two characters from line 620 in *Lucky Lottery* (July '85), causing the program to crap out with a syntax error. Correct line 620 to read as follows:

•620 IF A\$<>"[F1]" OR A\$<>"[F3]" OR A\$<>"[F5]" THEN580

In *Duck Shoot* (June '85), a printer malfunction added extra spaces to lines 10 and 120-160. These spaces should be ignored.

We apologize for any problems caused by the above errors. Remember that corrections to *Ahoy!* programs are posted on our bulletin board (718-383-8909—modem required!) as soon as errors are spotted.

SMALL THINGS CONSIDERED

Ahoy! offers its congratulations to

Kenny Hill
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A Look Around the 1571

Commodore's Disk Drive Companion to the 128

After taking a close look at the capabilities of our 1571 prototype, we have been very favorably impressed. In most areas operating speed has been improved, as much as nine times for a straight LOAD. Even faster performance can be obtained under certain conditions. Commodore also appears to have learned their lessons on the 1541 very well, as careful attention has been given to previously troublesome hardware details.

SPECIFICATIONS

To fulfill its primary purpose of supporting the Commodore 128 computer, the 1571 has two distinct personalities. As a Commodore drive it behaves very much like a double sided 1541 disk drive. Formatting a disk (a 43 second process) results in tracks 1 to 35 being laid down on side 0, the same as on the 1541. The flip side, side 1, contains tracks 36 to 70. Note that side 0, the side which the 1541 uses, is the underside of the disk when it is placed on a surface with the label facing up. As expected, double siding the disk also doubles the overall data storage capability. However, not all of the drive capacities are doubled.

Total disk capacity for a Commodore formatted disk is now up to 349,696 bytes. A look at the directory of a disk freshly formatted on a 1571 shows a total of 1328 blocks free. The maximum size of a sequential file has been increased to a total of 337,312 bytes. A file this size will



*How the 1541 and 1571 drives stack up.
READER SERVICE NO. 101*

By Morton Kevelson

span both sides of the disk. Interestingly enough, the maximum size of a relative file is 167,132 bytes, the same as on the 1541.

Track 18 on side 0 is reserved for the block availability map (BAM) and the disk directory. The BAM tells the disk drive which sectors have been reserved for data storage. Sector zero of this track contains the BAM for both sides of the disk. A separate copy of the BAM for side 1 is maintained in sector 0 of track 53. The capacity of the directory is limited to

144 file entries, as on the 1541, although the remainder of track 53 does not appear to be used for any purpose.

THE DOS

Much work appears to have gone into the built-in disk operating system (DOS), so much so that Commodore has upgraded the DOS version to number 3.0. This is puzzling, as DOS 3.0 is also used in the Commodore D9060 and D9090 hard disk units. The most recent DOS for a Commodore floppy disk unit was version 2.7 on the 8250 dual drive and its SFD 1001 single drive counterpart. The latest revision on the 1541 is DOS 2.6.

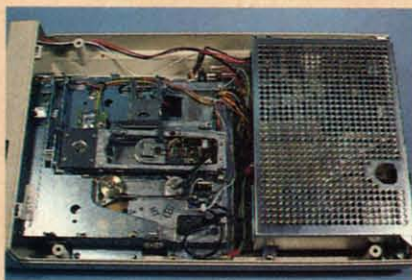
TIMING

With regard to operating speed we have some good news. As mentioned above, formatting time for both sides of the disk is only 43 seconds. Program loading time, when used with a C-128, has been speeded up by a factor of nine as compared to a C-64 with a 1541 disk drive. The following table shows the result of some simple benchmark tests:

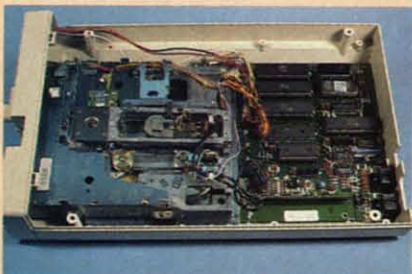
	C-64/1541	C-128/1571
30K LOAD	77 Sec.	8.5 Sec.
30K SAVE	87 Sec.	58 Sec.
40K SEQ File		
Read & Write	230 Sec.	145 Sec.
Read Only	112 Sec.	45 Sec.
Write Only	120 Sec.	100 Sec.
REL File	271 Sec.	280 Sec.

The sequential file tests were conducted by running the following BASIC program:

AHOY! 47



The 1571 drive with its lid removed. The power supply is on the right.



Main circuit board rests below power supply and drive mechanism.

```

10 REM DISK DRIVE TIMING
20 REM SEQUENTIAL FILE BEN
  CHMARK
30 A$="ABCDEFGHIJK"
40 FORI=1TO8
50 B$=B$+A$
60 NEXT
70 OPEN8,8,8,"SEQ FILE TES
  T,S,W"
80 FORI=1TO460
90 PRINT#8,B$
100 NEXTI
110 CLOSE8
120 OPEN8,8,8,"SEQ FILE TE
  ST,S,R"
130 FORI=1TO460
140 INPUT#8,B$
150 NEXTI
160 CLOSE8

```

The relative file test consisted of creating a file with 512 records where each record was 254 bytes. Only the last record was written to.

These timing tests are only part of the story. The 1571 has a "burst" mode which should result in much faster data transfer rates between the disk drive and a C-128. The burst mode is recommended only for non-critical data, such as bit maps, where a data error is not fatal. The

high speeds used by the burst mode leave little time for DOS error checking routines. Commodore 64 users will not be able to take advantage of the faster operating speeds without special software. The C-64 operating system does not have the required routines. Using a 1571 with a C-64 will not give any speed advantage, although the extra disk capacity will still be available.

The discussion until this point has centered about the Group Code Recording (GCR) scheme which is virtually unique to Commodore formatted disks. The 1571's second personality gives it the ability to format disks using modified frequency modulation (MFM) double density recording techniques. This format has been adopted by a large segment of the personal computer community, most notably by many CP/M machines. Even in this case there are variations among machines, most notably in the total capacity of a formatted disk. This can be related directly to the number of bytes in a disk sector.

The 1571 has considerable flexibility with the MFM format. Sector capacity can vary from 128 bytes up to 1024 bytes. The following table shows the possible combinations.

Sector Capacity	# of Sectors per Track	Disk Capacity*
128 Bytes	26	260K
256 Bytes	16	320K
512 Bytes	9	360K
1024 Bytes	5	400K

*Formatted capacity for a double sided disk.

The MFM formats, as well as the high speed burst mode, are accessed via a new direct disk command, U0. The preliminary documentation indicated that mixing of the various MFM and GCR formats was possible on a single disk. Even formatting of single tracks is possible. These prospects are sure to gladden the hearts of many copy protection enthusiasts.

We will report on CP/M on the C-128 with the 1571 in the near future. As of this writing (mid-June) Commodore has not released the CP/M operating system and support



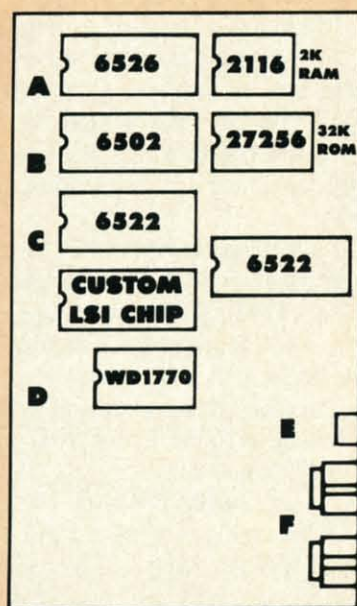
Closeup of the main circuit board. See key at right for chip layout.

utility disks.

COMPATIBILITY

Although the 1571 is a double sided drive, it is still fully capable of reading and writing single sided disks formatted on a 1541 disk drive. When working within C-128 mode, the drive initially assumes that the disk is double sided. If a single sided disk is inserted it takes the drive about 15 seconds to convince itself that the second side is blank. Once done, all subsequent reads and writes are done in single sided mode. Unfortunately this second side checking routine occurs every time disks are swapped. The 15 second delay could become annoying if single sided format disks are frequently mixed with double sided disks.

Double sided disks are filled on side 0 first. If you use a 1541 with a double sided disk you will not be able to access the second side. Flipping the disk will not work as the rotation is reversed. In addition, the track numbers run from 36 to 70. These are illegal as far as the 1541 DOS is concerned. The real difficulty is when a 1571 is added to an existing C-64 system. As the disk fills, files will spill over to the second side. Trying to read one of these on a 1541 will



1571 MAIN CIRCUIT BOARD LAYOUT

- A—CIA CHIP**
B—MICROPROCESSOR
C—VIA CHIP
D—MFM DISK DRIVE CONTROLLER
E—DEVICE NUMBER SELECTION SWITCH
F—SERIAL PORT CONNECTORS

return an illegal track or sector error. The 1541 does not recognize track numbers greater than 35.

When the 1571 is connected to a C-64 it reverts to 1541 mode. Under these conditions the drive will not read the second side of a double sided disk. Even formatting time reverts to 70 seconds for a single side! Compatibility with 1541 software is very good. All the standard DOS commands function as before. Nearly all of the copy protected disks we tried LOADED without any difficulty.

THE ELECTRONICS

The internal works consist of three modules, two for the drive electronics and one for the hardware. The power supply module is completely contained in a perforated metal cage located directly above the main circuit board. This mounting position insures that heat dissipation will be away from the main electronics. The major heat generating components are the twin voltage regulators and

transformer on the left side. These supply the five volt DC and twelve volt DC requirements for the drive. The 120 volt supply line is fully filtered.

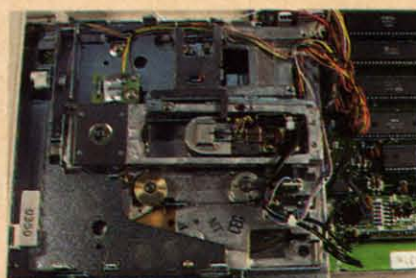
The heart of the drive electronics is a 6502A microprocessor with 32 kilobytes of disk operating system in ROM supported by two kilobytes of RAM. A 6526 CIA chip and a 6522 VIA chip handle the I/O requirements. The Commodore format GCR recording is handled by a custom large scale integrated circuit. The MFM recording for CP/M format disks is taken care of by a Western Digital WD1770 chip.

MECHANICALS

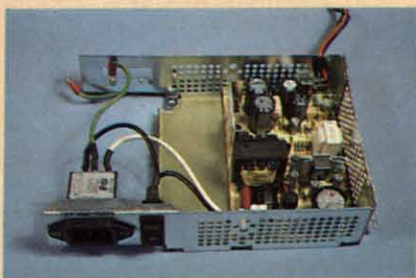
As with all of Commodore's disk drives, the design of the 1571 is revolutionary. For the end user the most significant improvement is the incorporation of an optical sensor for the track one head position. This should virtually eliminate the alignment problems which plagued the 1540/1541 disk drives. The mechanical stops are still present but they are not normally used. The disk operating system arrests head movement at the track one position when formatting a disk or error checking as might be done with some forms of copy protection.

To insure proper seating of the disk, the 1571 spins the drive spindle every time a disk is inserted or removed. This operation is triggered by the write protect sensor. Of course, the same electronics also inform the DOS whenever a disk is swapped.

The 1571 is a double sided drive. Two heads (which in this case are definitely better than one) are provided to accommodate the storage of data on both sides of the floppy surface. These are situated in diametrically opposing positions so as to sandwich the floppy medium between them. These hard, highly polished, precision surfaces must never make contact lest their finish be marred. A mechanical interlock has been incorporated into the latch mechanism for this very purpose. The heads will remain in the open position unless a disk is inserted to trigger the inter-



Closeup of drive mechanism, which incorporates a brushless DC motor.



A closeup and inside view of the 1571 disk drive's power supply.

lock. This is true regardless of the position of the external operating lever.

Head cleaning, for those who shun the costly cleaning kits, requires a minimum of disassembly. Simply remove the top cover to gain access to the heads. As can be seen from the photographs, the power supply and the main electronics board are situated behind and below the drive mechanicals. There is no need to remove any of these components to clean the heads. Do not attempt to force the upper head support arm beyond its mechanical stop. Movement is rather restricted as compared to the design on the 1541. A good-quality clean cotton swab, moistened with isopropyl alcohol (91%), does the job. As with all component disassembly, we caution our readers to use their own good judgment. Opening of the disk drive may void the warranty. If you have any doubts on your ability to handle this work, leave it for a qualified service technician.

The drive mechanism is manufactured by Newtronics/Mitsumi Electric Co. Ltd. It incorporates a brushless direct drive DC motor for spinning the disk. The motor control electronics are on a circuit board which surrounds the armature.

As expected, the back panel includes a pair of serial ports to allow daisy chaining of peripherals, the main power socket, and the on/off switch. A significant new addition is a pair of miniature switches right next to the serial port connectors. These allow the selection of device numbers 8 through 11. Interestingly enough, the preliminary documentation still talks about the cutting of internal jumpers to change device numbers.

In addition to the mandatory disk slot, the front panel sports a twist lock door latch and a pair of colored indicating lights. For some reason Commodore has departed from their previous color scheme. In direct opposition to the 1541 the power on light is red and the drive indicator light is green.

THE MANUAL

Judging from the draft copy of the manual, users will be in for a pleasant surprise. Although it is directed to the reader with some knowledge of BASIC, the manual contains a lot

more information than the early editions of the 1541 book. Carefully written explanations with numerous detailed examples are sprinkled throughout the text. The draft manual is over sixty pages, with two more chapters yet to come.

Numerous tidbits of information have been included. Many of these were apparently gleaned from the pages of the various Commodore publications. Commodore has even officially named the ignominious asterisk file as a "splat" file. Splat files occur when a file is opened and not properly closed by the DOS. They list in the directory with an asterisk next to their file names. As many a user has woefully found out, they can foul up a disk if not properly treated. Details for their cure are now an official part of the 1571 manual.

CONCLUSION

The 1571 disk drive makes an excellent companion to the C-128. The system provides all of the features Commodore users have been looking

for since the introduction of the VIC 20. Much has been done to improve on the marginal performance of the serial bus as implemented on the 1541. (This bus was actually a low cost compromise which allowed the C-64 to appear on the market in a hurry.)

The flexibility of the 1571's operating modes will be put to full use by the CP/M 3.0 Plus operating system. Several popular disk formats will be directly supported or easily accessed by a set of simple keyboard commands. In particular, the supported formats are:

1. Commodore Formats (GCR)
 - The existing CP/M 2.2 disk format, which is used by a Commodore 64 with the CP/M cartridge. Disk capacity is limited to 136 kilobytes in this format.
 - A new Commodore CP/M format which will utilize the full 360 kilobyte capacity of a double-sided 1571 disk.
2. Non-Commodore Formats (MFM)

- Osborne (single sided only)
- Kaypro
- Epson
- IBM CP/M-86 (single- and double-sided disk capacities from 160 kilobytes to 360 kilobytes)



Additional formats are possible but will require special programming of the 1571 disk drive. In all cases data files may be transferred between the Commodore 128 and the respective machines. Of course, you cannot run IBM programs since CP/M 3.0 runs on an eight bit Z-80 microprocessor while CP/M-86 runs on a 16 bit 8088 microprocessor.

The 1571 is only the first step in high quality peripheral support for the C-128. Work is already well under way on the 1572, a dual drive version of the 1571. It also would not surprise us to see a Commodore 3 1/4 inch hard disk with a 10 to 20 megabyte capacity for under \$500 in the near future. This combination of features with low cost is sure to encourage many existing Commodore users into the upgrade path. We also expect to welcome many new users into the Commodore fold. □

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Reader Service No. 125

Touring the Commodore 128 Keyboard

Last month we presented an inside view of the C-128.

Starting this month we will take a closeup look at some of the specific features which make this new machine a significant improvement over its predecessors.

By Morton Kevelson

The ergonomic considerations in the design of the C-128 keyboard are readily apparent. The keyboard's low profile should help reduce fatigue by allowing the user's wrists to rest comfortably on the table. Touch typists will welcome the raised dimples on the F and J home keys, as well as on the 5 key of the numeric keypad. The 2½ inch wide clear space between the keys and the cooling vents is sure to become a haven for all sorts of keyboard overlays. All in all, there are 92 keys to bewilder the novice.

Observant readers will also note that the main part of the keyboard is nearly an exact duplicate of the Commodore 64's. The only notable change is the relocation of the function keys to a horizontal configuration at the right of the top row. Present 64 owners should have very little trouble becoming comfortable with the C-128 layout.

Physical attributes aside, there is a lot more to the C-128 keyboard than meets the eye. Hidden beneath the tactile array, under control of the new operating system, lurks a multitude of functions designed to ease the user's sojourn into the realm of computing with the C-128.

If you have been using a VIC 20 or a C-64, you will already be familiar with a good portion of the keyboard's capabilities. The full screen editor functions in the same way as these machines'. The INST/DEL key



Above the main keyboard of the 128 are (top) Esc, Tab, Alt, Caps Lock, (middle) Help, Line Feed, 40/80, No Scroll, and (bottom) cursor keys.

still eats characters to the left, or when shifted opens spaces to the right. The quote and insert modes still operate in the same fashion which non-Commodorists find so thoroughly befuddling. The CLR/HOME key still moves the cursor to the top left corner of the screen, or when shifted clears the entire screen. As with the

C-64, text can be displayed in 16 colors, as the labels on the 1 to 8 keys indicate. These colors are still accessed by holding down the CONTROL key or the Commodore logo key. Unlike the C-64, the labels on the number keys now indicate both colors which are available for that key. As before, text display can be reversed with a CONTROL/9 and restored with a CONTROL/0.

The real power of the C-128 keyboard is in the new editing and control features which have been incorporated into the BASIC 7.0 operating system. For convenience, we have classified these features into three categories: the function keys, the ESCape key sequences, and the CONTROL key sequences. Let's take a close look at each in turn.

THE FUNCTION KEYS

On power up, eight useful BASIC phrases are preassigned to the C-128 function keys. These phrases can be viewed by executing BASIC 7.0's new KEY command without any parameters. The following list should appear on the display.

```
KEY 1,"GRAPHIC"
KEY 2,"DLOAD"+CHR$(34)
KEY 3,"DIRECTORY"+CHR$(13)
KEY 4,"SCNCLR"+CHR$(13)
KEY 5,"DSAVE"+CHR$(34)
KEY 6,"RUN"+CHR$(13)
KEY 7,"LIST"+CHR$(13)
KEY 8,"MONITOR"+CHR$(13)
```


Getting this list on the screen serves two purposes. First, it reminds you what is programmed into the keys. Secondly, it gives you the opportunity to easily change the contents in any of the eight function keys. For example, if you are not planning to do any graphic programming, you may want to redefine F1. Just cursor up to the "3" in KEY 3 and change it to a "I". Hit RETURN and the directory will now be displayed by F1. Enter

KEY 3, "OPEN 4,4:CMD4"+CHR\$(13)

followed by

KEY 4, "PRINT#4:CLOSE4"+CHR\$(13)

and you will be all set for easy printer listing. Note how the numbers 1 through 8 which immediately follow the KEY statement refer only to the function keys. No other keys are affected by this command.

There is one possible disadvantage to having the function keys preprogrammed. BASIC programs written for the C-64 do not expect to find a lengthy message when examining the function keys. This can be easily remedied by reprogramming all eight keys with the following:

```
FOR I=1 TO 8:KEY I,CHR$(I+132):NEXT
```

This will place the traditional (for VIC 20 and C-64 users) CHR\$ codes into the function keys. You will probably want to do this in every program which uses the function keys to control program operation.

ESCAPE KEY SEQUENCES

The C-128 has the powerful full screen editor that a veteran Commodore user will not feel at home without. This editor has been greatly enhanced with the addition of a series of ESCape key commands. The result is that the C-128 screen editor approaches the capabilities of a full blown text editor. Writing and editing BASIC programs has never been

ESC	72	7	24	RESTORE	-	N	39
TAB	67	8	27	RUN/STOP	63	M	36
ALT	-	9	32	SHIFT LOCK	-	<	47
CAPS LOCK	-	0	35	A	10	>	44
HELP	64	+	40	S	13	?	55
LINE FEED	75	-	43	D	18	SHIFT (RIGHT)	-
40/80	-	£	48	F	21	CRSR UP/DOWN	7
NO SCROLL	87	CLR/HOME	51	G	26	CRSR LEFT/RIGHT	2
CRSR UP	83	INST/DEL	0	H	29	KEYPAD	
CRSR DOWN	84	CTRL	-	J	34	7	70
CRSR LEFT	85	Q	62	K	37	8	65
CRSR RIGHT	86	W	9	L	42	9	78
F1	4	E	14	[	45	+	73
F3	5	R	17	]	50	4	69
F5	6	T	22	=	53	5	66
F7	3	Y	25	RETURN	1	6	77
LEFT ARROW	57	U	30	COMMODORE	-	-	74
1	56	I	33	SHIFT(LEFT)	-	1	71
2	59	O	38	Z	12	2	68
3	8	P	41	X	23	3	79
4	11	@	46	C	20	0	81
5	16	*	49	V	31		82
6	19	UP ARROW	54	B	28	ENTER	76

C-128 KEYBOARD DISTINCTIONS

The C-128 sports a numeric keypad which should greatly speed up data entry in numerically intensive applications, most notably spreadsheets. These keys, as well as the discrete cursor keys, duplicate existing keys on the main keyboard. There are applications where a numeric keypad may be of little or no interest. Instead, various program control functions could be assigned to the new keys.

For such applications it would be desirable to distinguish the keypad from the number keys on the main keyboard. The traditional ASCII code check following a GET will not work, since the same ASCII code will be returned by the corresponding keys. For example, pressing a "I" on the keyboard or keypad returns an ASCII value of 49. Fortunately, there is a simple way for BASIC to distinguish which physical key has been pressed.

Locations 211 and 212 are used by the operating system for this purpose. The values stored here every sixtieth of a second are unique for every key. At address 211 the SHIFT, Commodore logo, and CONTROL keys are identified. These keys will set bits zero, one, and two respectively at this address. If you PRINT PEEK(211) a zero will normally be returned. The SHIFT key changes this to a one. The logo key returns a two and the CONTROL key results in a four. These values are additive, so holding all three keys down gives a seven.

The remainder of the keys, with the ex-

easier.

There are 21 ESCape key sequences implemented on the C-128, almost one for every letter of the alphabet. These sequences are so useful that you will probably want to become familiar with them in a hurry. The best way to become acquainted with them is just to use them while writing a program. Afterwards, if you really want to see how dependent you have become on the new features, just GO 64 and enter the same program. Be forewarned, you may be in for a frus-

trating experience.

ception of the RUN/STOP, RESTORE, ALT, and 40/80 keys, place a unique value in address 212 when pressed. On the C-128 this location contains an 88 when no key is pressed. Press any other valid key and a value between 0 and 87 will appear. The table above shows the values generated in location 212 by the keys on the C-128 keyboard. The following program can be used to reproduce these results:

```
10 DO:GETKEY A$
20 PRINT ASC(A$);PEEK(212)
30 LOOP
```

The same program in BASIC 2.0 on the C-64 or VIC 20 would be:

```
10 GET A$:IFA$=""THEN10
20 PRINT ASC(A$);PEEK(203)
30 GOTO 10
```

Note the change in the PEEKed address. The operating systems on all Commodore machines have many similarities. Addresses 203 and 653 on the VIC 20 and the C-64 are equivalent to 212 and 211 on the C-128. The values in 203 for the C-64 will be the same for the corresponding keys in 212 on the C-128. However, the results on the VIC 20 are quite different. The shift flag values are the same for all three computers. You may want to use the KEY statement on the C-128 to clear the function keys before RUNNING this program, or strange things may result.

trating experience.

Each of the ESCape sequence commands are executed by pressing and releasing the ESC key followed by the appropriate letter key. Do not hold down both keys at once. For example, pressing the ESC key followed by the "A" key places the editor in automatic insert mode. Anything you type will automatically push the remainder of the display ahead of it. This is a tremendous convenience for rearranging text between quotes or for adding temporary com-

The table at left shows the values generated in location 212 by the keys of the C-128 keyboard. (See C-128 Keyboard Distinctions below for explanation.)

mands during program debugging. It is especially useful when you keep in mind that the C-128 permits entry of up to 160 characters (four 40 column lines or two 80 column lines) into a BASIC program line. Note that this is not the same as opening a gap by using the INST/DEL key. All of the keyboard control functions, such as the cursor keys and the CLR/HOME key as well as the INST/DEL key, retain their usual functions. In other words, insert mode does not place the screen editor into quote mode.

The screen parser has been enhanced in other ways as well. It will now link up to a full screen of text at one time. By comparison, the C-64 is limited to only two screen lines and the VIC 20 handles four screen lines. However, trying to enter more than 160 screen characters into a single BASIC program line results in a ?STRING TOO LONG ERROR. By comparison, exceeding the C-64's two line limit simply resets the screen linker to the next two lines. This full screen linking on the C-128 must be kept in mind when using the ESCape functions. The erase to end of line command (ESC Q) will remove all text from the current cursor position to the end of screen text or the next carriage return, whichever comes first. The erase to beginning of line command (ESC J) works analogously but in the opposite direction. The same is true of the move to end of line (ESC K) and move to beginning of line (ESC I). On the other hand, the insert a line (ESC I) command is a screen line function. Use of this command within a BASIC line opens up one screen line while maintaining the line links for BASIC editing.

All of these functions can also be obtained under program control. The following sample program illustrates some of the effects which can be easily obtained by using the ESCape sequences in PRINT statements:

```
10 PRINT CHR$(147):REM CLR
  AR SCREEN
20 CHAR,14,11,"OFF THE TOP
"
30 CHAR,12,12,"DOWN THE BO
TTOM"
```

```
40 CHAR,0,12
50 FOR I=0 TO 12
60 PRINT CHR$(27)"I"CHR$(2
7)"I";:REM INSERT TWO LINE
S
70 PRINT CHR$(27)"V";:REM
  MOVE SCREEN UP ONE LINE
80 NEXT
```

Note that CHR\$(27) is the ESCape key. Several keystrokes can be saved by programming PRINT "<reverse [>X" where the reversed left bracket is obtained by simultaneously pressing CONTROL, SHIFT, and the colon keys while in quote mode. The reverse left bracket between quotes in a BASIC statement will generate a CHR\$(27). This is a useful trick to keep in mind for sending escape codes to a printer with a PRINT# statement. Note that the ESCape key commands only work when sent to the screen. If you want to see how the program works try adding the following lines:

```
65 SLEEP 1
75 SLEEP 1
```

The SLEEP command pauses program execution for the specified number of seconds. Also note the use of the CHAR command to conveniently position the cursor on the screen. The CHAR command is really meant to display text on a graphic screen. In this context it is being used as a PRINT AT command.

One of the more interesting capabilities of BASIC 7.0 is the ability to define windows. Once a window is set, all subsequent screen output is restricted to this area. Try the following program:

```
10 PRINT CHR$(147)
20 CHAR,10,10,CHR$(27)"T"
30 CHAR,10,10,CHR$(27)"B"
40 LIST
```

This will define a screen window whose upper left hand corner is at the tenth row and tenth column position. The lower right hand corner will be at twentieth row and column position. Note the use of the CHAR statement to position the cursor as well as to

set the window coordinates. Also note the coordinates in the CHAR statement of line 30. These are correct as shown. The CHAR statement references its coordinates from the upper left hand corner of the currently active screen window. Since this has been already defined by line 20, we have to take this into consideration for line 30.

To help keep track of the current screen window, BASIC 7.0 includes the RWINDOW function. The following sequence of commands:

```
R=RWINDOW(0)
C=RWINDOW(1)
```

will place the number of rows and columns into the variables R and C.

While entering a BASIC program, the window commands can be used to partition the screen into a message area and a text area. Just write yourself some notes at the top of the screen and set the screen window. Continue to enter BASIC program lines. All screen control functions,

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AHOY! 53

such as clear or home, will not affect the message area. To cancel a window just hit the HOME key twice.

Under program control, a window can be used to eliminate the need to continuously rePRINT a screen layout. The message area in the window can be manipulated as desired without affecting the remainder of the screen. Note that only one window can be active at any time.

A word about the scroll commands. Turning scrolling off, with an ESC M, causes the cursor to wrap from the bottom of the screen to the top of the screen. There is also a NO SCROLL key which according to the preliminary documentation is supposed to perform the same function. This is not so. We found this key to work as a pause as described below.

CONTROL KEY SEQUENCES

Turn on your C-128, hold down the CONTROL key, and press G. Surprise! If you had the volume turned up on your television or monitor, you were rewarded with a pleasant bell

tone. This may not seem like much, but if I had a nickel for every time someone asked me for a simple way to make that noise on a C-64, I would have retired a wealthy man some time ago. Commodore has finally implemented the traditional teletype "bell" in the C-128 console. The same tone can be produced with a PRINT CHR\$(7).

In general the CONTROL functions are not unique to the C-128. Most of them will be familiar to present users of the VIC 20 or the C-64. The C-128 does have some significant changes and additions to this keystroke sequence. Note that unlike the ESCape key sequence you have to hold down the CONTROL key while pressing the second key. Also, CONTROL key commands can be placed into PRINT statements while the screen editor is in quote mode. In contrast, pressing the ESCape key while in quote mode will activate the ESCape key sequence.

As mentioned above, a CONTROL left bracket will send an ESCape character. Try it. If the editor is not in quote mode, this key sequence will initiate the ESCape mode. This little-known key sequence will also generate a CHR\$(27) on the C-64 and the VIC 20. Of course, this has no direct effect on these two machines.

The C-128 has a TAB key on its keyboard right next to the ESCape key. Pressing this key generates a CHR\$(9), which moves the cursor to the next tab stop on the screen. The CONTROL I key combination will have the same effect. On the VIC 20 or the C-64, a CHR\$(9) will enable the character set switch capability. On the C-128 this has been moved to CONTROL K (CHR\$(11)). The disable-character-set-change command has also been changed to CONTROL L (CHR\$(12)), although the old CONTROL H (CHR\$(8)) has no unique C-128 function. Programmers accustomed to these codes on the VIC 20 or C-64 should take note.

Getting back to the tab functions, the CONTROL X (CHR\$(24)) will set or clear a tab at the current cursor position. However, to clear all tabs you have to use the ESCape Z

TABLE OF ESCAPE KEY COMMANDS

@	Erase screen from cursor to end of window
A	Automatic insert mode
B	Set bottom right corner of window at cursor
C	Cancel automatic insert mode
D	Delete current linked line
I	Insert a screen line, preserve line links
J	Move to the beginning of current linked line
K	Move to the end of current linked line
L	Turn on scrolling
M	Turn off scrolling
N	Un-reverse 80 column display
O	Cancel insert, quote, reverse, and flash modes
P	Erase from the beginning of current linked line to the cursor
Q	Erase from cursor to the end of current linked line
R	Reverse 80 column display
T	Set top left corner of window at cursor position
V	Scroll screen up one line
W	Scroll screen down one line
X	Toggle between 40 and 80 column display
Y	Restore default TAB stops at every eighth character position
Z	Clear all TAB stops
ESC	Cancel ESCape mode. (Any nonimplemented character will also cancel ESCape mode.)

sequence. The best way to learn about the tab stops is just to play with them. Note that a TAB command does not wrap the cursor to the following screen line. Tabbing to the end of a line simply leaves the cursor at that position.

Another change is worth noting. The CONTROL J (CHR\$(10)) code generates a linefeed without a carriage return. On the C-64 and VIC 20 both a linefeed and carriage return will be produced.

The remaining unique C-128 CONTROL codes are associated with the 80 column display. CONTROL B (CHR\$(2)) turns underline on. However, there is no corresponding CONTROL sequence to turn it off. You will have to PRINT CHR\$(130) to cancel underline mode. The 80 column characters can be set to flash by using a CONTROL O (CHR\$(15)). As with underline mode, there is no CONTROL sequence to turn flash off. Use PRINT CHR\$(143).

Continued on page 74

C 64

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COMMODORES

PROGRAMMING CHALLENGES

By Dale Rupert

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Problem #21-1: Geometry Fun

This challenge was suggested by Phil MacLean (Columbus, OH). The user inputs three ordered pairs of numbers (x,y values in Cartesian coordinates), and the computer tells whether or not they represent collinear points. The three points are collinear if they lie on the same line. If they are, the computer tells which lies between the other two on the line. Any values of x and y are allowed. Better dust off the geometry books!

Problem #21-2: Logical Fun

Michael P. Marron (Stony Brook, NY) submitted this *Commodore*. Four students were discussing their upcoming report card marks. They made the following statements:

AL: (1) We'll all get different marks.

(2) If I get a 95, then Connie will get a 65.

BETTY: (3) If Connie gets a 75, then Al will get a 65.

(4) Al will get a better grade than Dan.

CONNIE: (5) If Betty doesn't get a 95, then Al will get a 75.

(6) If I get an 85, then Dan won't get a 65.

DAN: (7) If Connie doesn't get a 95, then I'll get an 85.

(8) If Betty doesn't get an 85, then I won't either.

Your task is to write a program which (A) determines the mark for each student assuming the above statements are all true, and (B) finds all possible solutions assum-

ing statement number (1) is false. For extra credit, determine how many of the original eight conditions can be eliminated and still have only one solution.

Problem #21-3: Decimal Columns

E. Harvey Hammett (Houston, TX) asked for a short method of lining up decimal points when numbers are printed in a column. Your routine should print on the screen, but it should also be usable on a printer. That means you are not allowed to use any cursor movement keys. If the user enters 12.5, 134.56, .0026, 23, and 1.234, the computer prints out:

```
12.5
134.56
.0026
23
1.234
```

Problem #21-4: REM Remover

Jim Speers (Niles, MI) has sent a five line subprogram which may be added to the end of another program beginning at line 55000. When the user types GOTO 55000, this subprogram deletes all lines beginning with REM or a colon. Jim uses this subprogram in debugging. Any trace statements to print variables or to STOP the program may be preceded by a colon. They will be executable, but when debugging is done, they may be removed simply by typing GOTO 55000. Can you come up with such a program?

This month we have readers' solutions to the May 1985 *Commodores*. *Problem #17-1: Decimalizing Dates* brought a grand total of three responses. The problem is not really very difficult, and it is a "real world" problem. Business programs typically use a decimal form of a date rather than a "month, day, year" format for internal calculations. The solution from Jim Speers (Niles, MI) is listed below. Jim claims that mid-1985 should be listed as 1984.5 since he considers the first year as 0. Midway into the first year should then be 0.5. We'll leave it up to you to modify the program if you want mid-1985 to be shown as 1985.5.

```
1 REM
```

AHOY! 55


```

2 REM PROBLEM #17-1: DECIMALIZING DATES
3 REM SOLUTION BY JIM SPEERS
4 REM
100 DIMD(12),I$(3):FORI=1TO12:READD(I):N
EXT
110 DATA 0,31,59,90,120,151,181,212,243,2
73,304,334
120 PRINT"[CLEAR][DOWN]ENTER DATA (E.G.
10/5/1985)";:INPUTA$:K=1:FORI=1TOLEN(A$)
130 Z$=MID$(A$,I,1):IFZ$="/"ORZ$="-"THEN
K=K+1:GOTO150
140 I$(K)=I$(K)+Z$
150 NEXT:M=VAL(I$(1)):D=VAL(I$(2)):Y=VAL
(I$(3)):LY=0
160 IFY/4=INT(Y/4)ANDY/400<>INT(Y/400)TH
ENLY=1
170 DT=Y-1+((D(M)+D-LY*(A>2)-.5)/(365+LY
)):DT=INT(DT*10000+.5)/10000
180 PRINT:PRINT"THE DECIMALIZED DATE FOR
"A$" IS":PRINT:PRINTDT

```

Jim's program calculates the decimalized date as of twelve noon, hence the -0.5 in line 70. Each hour is 0.000114 part of a year. Line 160 tests for leap years. The DATA statement stores the number of cumulative days in months prior to the given date. David Alan Wright (New Britain, CT) and James Borden (Carlisle, PA) also

sent solutions. Both Jim's and David's programs allow the user to enter dates in mm/dd/yr or mm-dd-yr format.

Several readers tackled *Problem #17-2: Printer Sentinel*. The solution from Brian J. Wilcox (Coldwater, OH) is listed. Since his program is similar in approach to many others, I concluded that it must work—on some printers at least. It doesn't work on mine. A modified version of Brian's program is also shown, which works on my Epson MX-80 printer with a serial-to-parallel converter.

```

1 REM
2 REM SOLUTION TO COMMODARE #17-2
3 REM     PRINTER SENTINEL
4 REM     SUGGESTED BY BRIAN J WILCOX
5 REM
10 PRINT CHR$(147)
20 GOSUB 100
30 PRINT"THE PRINTER IS ON"
40 END
100 OPEN4,4:PRINT#4:CLOSE4:IF NOT(ST AND
-128) THEN RETURN
110 PRINT"[HOME]PRINTER IS NOT ON LINE"
:GOTO 100

```

```

1 REM
2 REM SOLUTION TO COMMODARE #17-2
3 REM     PRINTER SENTINEL
4 REM     MODIFIED
5 REM
10 PRINT CHR$(147)
20 GOSUB 100
30 PRINT"THE PRINTER IS ON"
40 END
100 PRINT"[HOME]THE PRINTER IS NOT ON":O
PEN4,4:PRINT#4
105 PRINT#4:IF NOT(ST AND -128) THEN
PRINT "[HOME]"":R
ETURN
110 CLOSE 4:PRINT"[HOME]PRINTER IS NOT O
N LINE":GOTO 100

```

Even when my printer is off, the computer can send it one message without the STATUS variable indicating any problem. If the program sends a second message, the computer sits and waits forever at the PRINT# statement. Consequently I couldn't display a "Printer Off" message if the printer was off. Instead I had to display the "Printer Is Not On" message before writing to the printer, and if the printer was on, the message was quickly erased. If the printer is off, the message remains on the screen until the printer is turned on (or online). If neither of these routines works for your printer, you might compare ST with 0 instead of -128 . Refer to the STATUS description in the *Programmer's Reference Manual*.

Other solutions to this problem came from Ron Giedd (Sioux Falls, SD), Clarice A. Baker (Kamloops, BC), Jim Speers (Niles, MI), James E. Borden (Carlisle, PA), and Lonnie Welch (Independence, MO).

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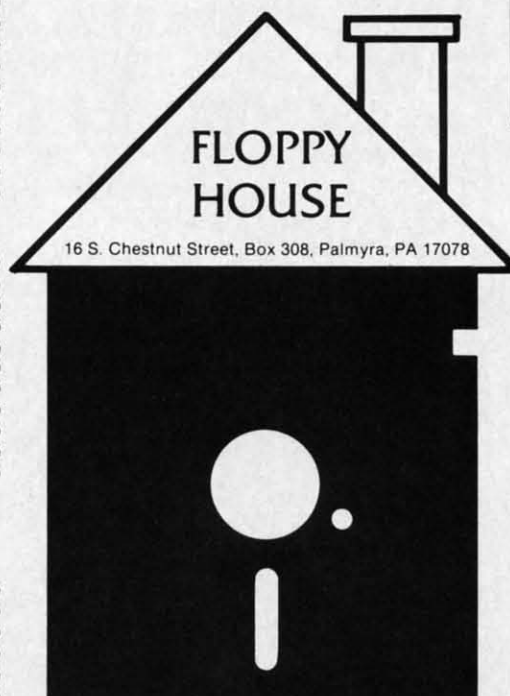
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The most compact solution to *Problem #17-3: MID\$ Statement* came from Ken Karow (Chicago, IL). Ken included some sample strings for testing the routine. The value of N tells how many characters of Y\$ are used to replace characters of X\$ starting at position S of X\$. This can be a very useful routine.

```
1 REM
2 REM SOLUTION TO COMMODORE #17-3
3 REM      MID$ STATEMENT
4 REM      SUBMITTED BY KEN KAROW
5 REM
100 Y$="ABCD":S=4:N=3
110 X$="1234567":GOSUB200:PRINT S,N,
X$:INPUT"START, NUMBER";S,N:GOTO 110
200 IF N=0 OR N>LEN(Y$) THEN N=LEN(Y$)
210 X$=LEFT$(LEFT$(X$,S-1)+LEFT$(Y$,N)+M
ID$(X$,S+N),LEN(X$)):RETURN
```

The most popular *Commodore* was *Problem #17-4: Number Speller*. Solutions ranged from the reasonably short one by Rob Lackey (Albuquerque, NM) listed below to multipage programs.

```
1 REM
2 REM SOLUTION TO COMMODORE #17-4
3 REM      NUMBER SPELLER
4 REM      SUBMITTED BY ROB LACKEY
```

```
5 REM
10 DIM D$(30):FOR I=1 TO 30:READ D$(I):NE
XT
20 INPUT"[CLEAR]ENTER NUMBER (<10000)";N
30 A=LEN(STR$(N))-1:ON A GOTO 90,60,50,4
0
40 N$=D$(INT(N/1000)+1)+" "+D$(30)+" "
50 V=(INT(10*(N/1000-INT(N/1000)))+1):IF
V>1 THEN N$=N$+D$(V)+" "+D$(29)+" "
60 T=N-100*INT(N/100):IF T>19 THEN 80
70 N$=N$+D$(T+1):GOTO 100
80 N$=N$+D$(INT(T/10)+19)+" "
90 N$=N$+D$(N-10*INT(N/10)+1)
100 PRINT N$:END
110 DATA "","ONE,TWO,THREE,FOUR,FIVE,SIX
120 DATA SEVEN,EIGHT,NINE,TEN,ELEVEN
130 DATA TWELVE,THIRTEEN,FOURTEEN
140 DATA FIFTEEN,SIXTEEN,SEVENTEEN
150 DATA EIGHTEEN,NINETEEN,TWENTY
160 DATA THIRTY,FORTY,FIFTY,SIXTY
170 DATA SEVENTY,EIGHTY,NINETY,HUNDRED
180 DATA THOUSAND
```

Rob's program handles numbers up to 9999. Other solutions went up to billions and beyond without much additional coding. Perhaps you can modify Rob's program to handle even larger numbers. This program might be useful for writing checks. I have used this type of program with a speech synthesizer. The speech synthesizer pronounces words which are sent to it in PRINT statements, so multidigit numbers must first be converted into text strings to be spoken properly.

Solutions to these last two problems came from the following readers not mentioned earlier:

Mac Reiter (Mustang, OK)	Steve Werkman (Perrysburg, OH)
M.B. Lanphear (Cheyenne, WY)	William Manganaro (Ctr. Moriches, NY)
Thomson Fung (San Diego, CA)	William Binder (Northville, MI)
Paul DeLuca (Bradford, MA)	Jerry Anderton (Florence, AL)
Ed Taylor (Waukesha, WI)	Tony Herrington (Jeffersonville, IN)
Carlton Burton (Easton, TX)	Sheldon C. Wotring (Palmerton, PA)
R.R. Goings (Washington, IL)	Michael J. Strawn (Warren, MI)
Darin Jett (Paducah, KY)	Paul A. Dobransky (Fombell, PA)
Crile Carvey (Salinas, CA)	Richard Oberle (Columbus, OH)
Clay R. Reed (Edwards, CA)	Nancy Balfour (Honolulu, HI)

Special thanks to Ricardo Chan from the Republic of Panama and to Daniel R. Propst from Caracas, Venezuela for their letters and programs. It is exciting to see how far-reaching Commodore computers and *Ahoy!* magazine are.

One final note. Lonnie Welch (Independence, MO) gave one example of a mandatory space in BASIC. This statement using the logical OR of variables F and Q results in a Syntax Error. Do you see why?

```
10 F=0:Q=1:PRINTFORQ
```

Have you come across any other situations where BASIC requires a space? If so, let us know. This month's problems should keep you busy for a while. See you next month. □



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AUTO-GEN

Automated Generation of DATA Statements on the C-64

BY DAVID A. JONES

Incorporating machine language routines into BASIC programs is often used to increase program execution speed. Sometimes the machine language is a separate program called and loaded by the main BASIC program. This requires two or more programs always to be on the disk, and making duplicates can become a chore. A common alternative is to store the machine language program as a series of DATA statements. This is a tedious task if these statements are typed in by hand. While the routine is under development, or should the need to modify it later arise, one simple change could necessitate retyping the entire sequence of DATA statements. Some form of automation is in order here, and the *Auto-Gen* utility program is my solution.

WHAT IT DOES

Once a machine language program is in memory, usually from the output of an assembler, just load and run *Auto-Gen* and the DATA statements will be automatically generated and written to disk for you. The program prompts you for the addresses of the first and last memory locations to be saved. These may be entered in decimal or, if preceded with a \$ (dollar sign), in hexadecimal. Next you are asked for the starting BASIC line number. (Be sure not to use the same line numbers that are used by the main portion of the program under development.) You are then asked for the number of data items desired per line, and finally the name of the output file you want to create.

While the program is running, it displays the line number being generated to inform you of its progress.

HOW IT WORKS

A quick review of how a line of a BASIC program is stored in the computer will help us understand the task to be accomplished. The normal starting location for the C-64 is 2049 (\$0801). The byte here plus the following one make up a link or pointer to the beginning of the next line of the program. This link is the "low byte first, high byte second" format typical of 6502 machine language. This address can be converted to decimal by multiplying the second, or high byte, by 256 and then adding the first, or low byte, to the product. Conversely, if we have the decimal value we can obtain the two bytes by dividing by 256. The integer quotient is the high byte, and the remainder is the low byte. Our formula will be $HB=INT(NL/256)$; $LB=NL-(INT(NL/256)*256)$, where HB is the high byte, LB is the low byte, and NL is the address of the start of the next line.

The next two locations hold the number of the current program line. Again, the number is stored in low byte-high byte format and the same formula is used to convert to and from decimal.

The rest of the line contains the BASIC program statements. Each BASIC keyword is stored as a token, i.e., reduced to a one byte symbol. This has a twofold purpose. One is to reduce memory requirements and the second is to simplify interpretation during program execution. For our needs, the token for "DATA" is 131 in decimal (\$83 in hex). Spaces, commas, and literals (numbers or letters representing their own value as opposed to variables) are stored in their ASCII form. The numbers 0 through 9 are 48 through 57 respectively. A comma is 44 and a space is 32. The end of the line is indicated with a zero byte, and the last line of the program is terminated with three consecutive zero bytes.

With this limited knowledge we can construct our own BASIC "DATA" statements. Since one numeric data item can have a maximum value of 255, we will allocate one memory location for each digit or three locations per item. Each item must be separated by a comma, so add one per item except for the last one on a line.

Include in our tally 2 for the link to the next line, 2 for the line number, 1 for the DATA token, and 1 for the terminator, and we have the following formula. $2+2+1+4*ND+1$ = the number of memory locations required to store one program line. ND is equal to the number of data items desired on each line. Add this number to the address of the beginning of the current line and we have the address of the start of the following line. NL will be the variable in our program that holds this address.

If we want to increment the line number by 10 we simply add 10 to the previous line number. LN is the variable here. When we reach the end of the program add two zero bytes to the one that terminates the last line and our work is almost done.

A program stored on disk or tape has as its first two bytes an address indicating where the program should be loaded. This is low byte-high byte format again and for our purposes the address is a constant. The C-64 uses 2049 (\$0801) and the VIC 20 1025 (\$0401).

That's about all we need to know to create a file of DATA statements directly on disk.

We assemble and load our machine language file into memory, note the first and last memory locations used, and we're ready to begin.

A loop that starts with the first data location and increments by the number of data items per line until the

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60 AHoy!

last location is reached will be the main loop of our utility. This loop keeps track of the start locations of each line and the line numbers themselves. It writes the first part of each line to disk up to and including the token for DATA and additionally writes the line number to the screen to show the user the progress of the program.

Inside the main loop a smaller loop, incrementing by one up to the number of items per line, creates each item for the DATA statements. Internal to this loop is a third loop to step through the conversion of data items into ASCII characters and write them to disk.

Last is a counter to determine where to insert commas. We don't want a comma after the last item on a line.

Prior to entering the main loop of the program, the disk file is opened and the program load address is written. Each iteration through the loop writes a program line and at the end of the loop the program terminator is written and the file is closed.

Two subroutines are used. One does the error checking on the disk file and the second is to allow hexadecimal inputs for the first and last memory locations to be saved. Since the main function of this program will be saving machine language routines, a hexadecimal input will probably be the norm. Hexadecimal input numbers must be preceded with a dollar sign to distinguish them from decimal.

Once the file is on disk it can be edited just like any other, or appended to an existing file.

Existing programs that have an unequal number of data items per line or that for some other reason need to be reformatted can also benefit from this program. Simply load the old program and let it POKE in the data. Then load *Auto-Gen* and let it do its work. Finally reload the original program, delete the old DATA statements, and append the new. The result is a neatly formatted program with an equal number of DATA items on each line.

VARIATIONS

I like my program listings to be neatly formatted and easy to read. Consequently, I have no reservations about including spaces and blank lines to achieve this end. Lines 1560, 1580, and 1470 in the program would be the ones to change if you absolutely must have files without leading spaces on data items less than three digits.

The choice of the number of data items on each line is arbitrary, but a few points should be considered. 10 is a nice round number and helps us count items easily. 16 is a good choice when working with machine language as it allows quick conversion to hexadecimal. 17 fits the maximum number of a C-64 program line and 19 does the same for a VIC 20.

Incidentally, the sample output of this program is the first part of the DOS Wedge 5.1. It was created by saving from 52224 to 52273. To store the complete wedge use 53081 as the end address. Don't be surprised at the length of the resulting program, though. Using DATA statements to store machine language programs is most inefficient. ☐ SEE PROGRAM LISTING ON PAGE 89

DRAGON TYPE

For the C-64

By Bob Spirko

Computer programming offers the frustrating paradox of not lending to one's typing skills. After months or even years of programming, many of us still cannot type with any speed. This is especially apparent in telecommunications, where each party takes turns plodding letters on the screen. And when it comes to word processing, we suffer the same inertia.

Fed up with my own keyboard struggles, I went and bought a typing-drill program. This was a neat setup where you shot down a flying saucer by correctly typing in words. After each session, your speed, accuracy, and score were given. This, along with color and sound, helped to assuage the drudgery of practice. And the drills worked. In a few weeks I was typing faster and more accurately. But in time, I became bored with typing the same words. Besides, wouldn't it be better to type a variety of words? Unfortunately, I could not change the words, since the program was copy-protected.

Keeping this in mind I wrote my own typing-drill program. It includes the best features of the other, but it allows you to change the words. This provides you with an unlimited number of skill levels. If you find the words that I chose too difficult or too easy to type, or you simply become weary of them, replace them with your own. With *Dragon Type* you can also practice typing symbols: it accepts ASCII codes 32 to 90.

Nor did I stop there, I replaced the flying saucer and laser gun with a dragon. Using the magic of machine language, I brought the little beast to life so that it could run across the screen and eat words. How well he's fed, though, is up to you, for he can only eat those letters that have been correctly typed.

Dragon Type consists of two programs: the first is in machine language and the second in BASIC. Type in and SAVE both programs. Now RUN the first program. After the machine language is LOADED into memory, the second program is automatically LOADED and RUN. Then the fun begins.

First, the dragon does a quick warm-up; then you're asked to choose a level. There are three animation speeds. While a novice can use the fast level, he may feel intimidated by a frantically paced sprite. On the other hand, a good typist might find that a slow sprite cannot keep up with his speed. Once your choice is selected, words fill the screen.

Now enters the dragon. He emerges from the left side

of the screen, races to the first word, and stops. Poised over the first letter, he snaps his jaws wide open and awaits your command. Tap in that letter, and the dragon gulps it down and moves on to the next letter. Continue typing and the letters disappear as the voracious creature munches them (he eats spaces, too). Press the wrong key and a beep is sounded, signaling an incorrect entry. (You can abort the meal by pressing f7.) At the end of each line, he speeds off the screen only to reappear on the next line, ready for another course. Once your dragon consumes all the words, the screen displays your speed and the number of typing errors. Also shown is your score and your highest score; these reflect both your speed and accuracy. To go another round, just press the space bar. Pressing RETURN ends the program. □

SEE PROGRAM LISTING ON PAGE 88

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AHOY! 61

FILE LOCK

T-12

Scratchproofing for Your C-64 Programs

BY DON LEWIS

How many times have you scratched a file, and then immediately regretted it? If you're like me, I'll bet a lot of times. Lately there have been several UNSCRATCH utilities published, but that's a pound of cure. What's really needed is an ounce of prevention and that's where *File Lock* comes in.

File Lock provides a scratchproof feature for the 1541. Built into the DOS, but kept secret by Commodore, the 1541 has the ability to lock out the scratch command on a file by file basis. This LOCK/UNLOCK is not supported by any built-in commands in the 1541, but is available through a utility like *File Lock*.

File Lock has a very convenient user interface. When

you run *File Lock*, the program prompts you to insert a disk. It then reads the directory of file names from the disk. Two large boxes appear on the screen with the file names in them. Below the boxes is the command line:

The command line has the following commands available:

SCRATCH	— scratch files
LOCK	— scratchproof files
UNLOCK	— remove lock
PAGE	— advance to next screen of files
BOOT	— restart program
QUIT	— exit to BASIC (READY)

Choose the command you want by typing the first letter of the command word, for example, L for LOCK. After you have made your choice, a small arrow appears on the screen next to the first file name. Files are selected by moving this arrow around the screen with the cursor keys, HOME key, and RETURN key. Files selected are highlighted in reverse video. Hitting the left arrow key will cancel all the files selected and return you to the beginning of the program.

After selecting the files, operation is started by hitting the first letter of the desired operation: S for scratch, L for lock, U for unlock.

File Lock works by modifying a bit in the file type byte in the directory entry for that file. (See page 67 of the 1541 manual.) As an example, a PRG file has a file type of \$82(1000 0010) if it is not locked. When locked, bit 6 is set, yielding \$C2(1100 0010).

Locked files are marked in the directory listing by a < symbol next to the file name. Once a file has been locked, the 1541 will send the error message 'FILE NOT FOUND' if an attempt is made to scratch the file.

File Lock tends to be a bit sluggish in its operation since it is a BASIC program. However, when it is compiled with a BASIC compiler such as *Blitz!*, its performance is greatly improved. If you like *File Lock*, I would recommend that you *Blitz!* it for the best performance.

As with my other program in this issue (*Fastnew*, p. 33), I wish to acknowledge the assistance of my colleagues at R. J. Brachman Associates, Inc. (Havertown, PA) in developing this program. Please address any correspondence to D. Lewis, P.O. Box 521, Folsom, PA 19033. Include a SASE if you wish a reply. □

SEE PROGRAM LISTING ON PAGE 93

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REVIEWS

MANY WAYS TO SAY I LOVE YOU

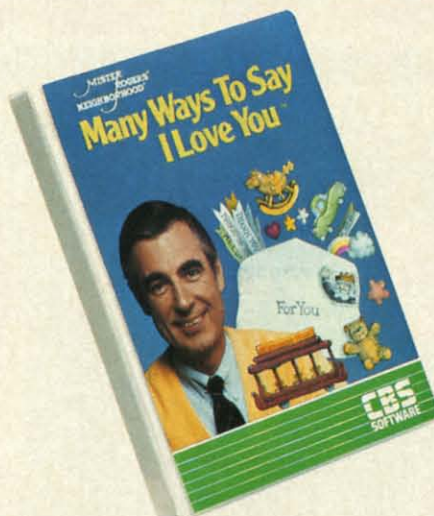
CBS Software
Commodore 64
Disk; \$29.95

Fred Rogers has used music and conversation to teach children to value themselves and their families for almost 18 years on *Mister Rogers' Neighborhood*, the longest running program on public television. In an effort to expand the relationship between parents and children, *Many Ways to Say I Love You* gives children an electronic forum to creatively display their affections.

All the songs in the program are easily recognized, either popular folk tunes or regulars from the show. My two year old had no problem singing along with *Won't You Be My Neighbor* and *It's Such a Good Feeling*. Before long she had picked up *Twinkle, Twinkle, Little Star* and *Frère Jacques*.

Ah! But what are the songs for, you ask? *Many Ways to Say I Love You* helps a child design and deliver an electronic greeting card, complete with moving pictures and music. The child can pick a message like "I think you're special" to appear at the top of the card type in text on the bottom. In this way, each card can be personalized.

The graphics are great. Choice of "stickers" includes animals, trees, flowers, moon, stars, houses, a castle, and residents of *Mister Rogers' Neighborhood* (including the trolley, Mr. McFeeley, and several characters



Lets tykes design and personalize (but not print) electronic greeting cards.

from the land of make-believe). All the stickers will perform some action while the card is being "delivered." Before choosing pictures to illustrate the card, a background and a border design can be chosen.

There are two levels of difficulty: a full frills card or a simplified one with just background, stickers, and music. The simplified version is good for youngsters who have not yet learned to read.

The program does have an option to save cards to disk. Up to 24 cards can be saved on your master disk; however, I wouldn't take the chance. CBS takes pains to explain the buyer's rights in the program, and these rights include making a backup.

While I'm skeptical as to whether this well-designed program will open any heartfelt chats between parents or children, it does offer a chance for closer interaction. Any parent who buys it should be prepared to spend time listening to cards. There is no printout option, so you won't be able to send greetings to friends and family around the country.

If nothing else, my daughter has learned to sing two new songs. And the youngster I borrowed from downstairs showed her mom that computers can be used for something be-

sides shooting aliens and learning to add and subtract.

CBS Software, One Fawcett Place, Greenwich, CT 06836 (phone: 203-622-2500).
—Cheryl Peterson

ON-FIELD FOOTBALL

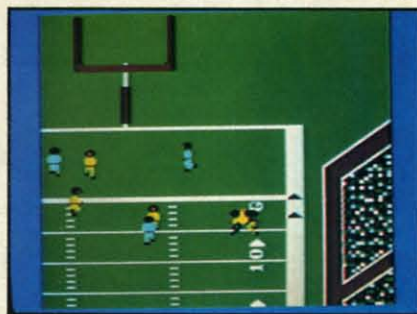
Gamestar
Commodore 64
Disk; \$29.95

The popularity of football has leveled off on television, but there's a real boom underway in home computing. *On-Field Football* is only one of three pigskin programs scheduled for release in time for a fall kickoff, and at least one more is due early in 1986.

Unlike the other newcomers, which stress authenticity, *On-Field* emphasizes freewheeling fun. The media hype of the Super Bowl is light-years away from this brand of football.

The inspiration for designers John Fitzpatrick and Scott Orr is not the National Football League, but rather the sandlot and pickup football games which fill youngsters' fall and winter afternoons. This is four-against-four, not big-time football.

Don't expect to be able to mimic all the latest wrinkles in pro and college football. The coaches in this one- or two-player contest can choose from a variety of offensive and defensive moves, but the true simulations like *Super Bowl Sunday* (Avalon Hill Game Company) and *The World's Greatest Football Game*



Players have individualized strengths.
READER SERVICE NO. 103

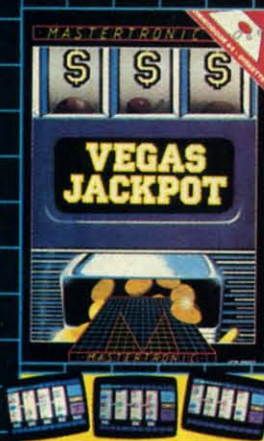


Child picks background, border, more.
READER SERVICE NO. 102

MASTERTRONIC

ARCADE-STRATEGY-ACTION

Sure Chart Winners



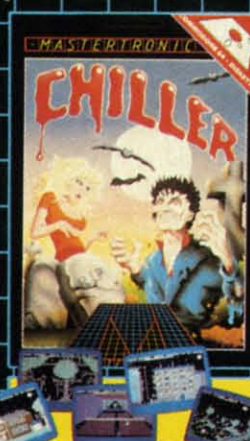
One of the most faithful computer simulations ever produced of a fruit machine. It incorporates the hold, nudge, gamble and shuffle features found in the real thing.



A satellite retrieval game that includes 16 levels of "low pressure" death awaiting the unskilled astronaut.



A sure chart winner. You will need skill and fast reflexes to beat this one! You can ride on 5 different courses, each course ranges from 6 to 25 different scrolling screens.



Opened to Five Star Reviews in Europe recently this is surely one of the most challenging and unusual games available for the C64. Written by Commodore Programmers of the Year Richard and David Darling. The game has five different spectacular screens with hidden twists - if you get this far you have to replace your steps through another five of increasing difficulty.



Another unusual arcade - strategy game in which the players strive by weird and wonderful techniques to achieve a state of miniaturisation and hence enter Zycal's brain and the game continues in another dimension.



An absorbing scrolling game that not only fast reads memory recall.



An imaginative three screen multi level arcade adventure that uses very high resolution graphics and will test the abilities of the most experienced games players.



A scrolling multi screen game that takes Commodore graphics to a 'new state' of the art level previously seen only in a handful of other games. Playability is a keyword on this five star game!



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An absorbing multi level, multi screen game that uses excellent scrolling screen graphics. It requires not only fast reactions but good memory recall.



Britain's zany Monty Python team immortalised in a classic adventure game that is rude irreverent, and often very funny. The challenge could drive you bananas!



An amazing two program adventure using over 100K of memory that will challenge the most experienced adventure games players. Myriad locations graphically illustrated with thousands of alternative moves will probe the limits of your mind.

EDUCATIONAL

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A two program disc aimed at 4-7 year old children that introduces the basics of counting, and simple addition and subtraction. At the same time the child is both amused and entertained by the fun aspects of the programs.



These two testing programs were written by college principal Gordon Askew and help to sharpen observational skills and visual memory. Each of the two programs contains three games and are aimed at 4-7 year olds and then from 7 years upwards. The screen graphics and entertainment value guarantee a child's interest and pleasure.



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graphic
ave.

'Star Wars' 1983 style with a very fast moving five screen arcade action game with multi skill levels.



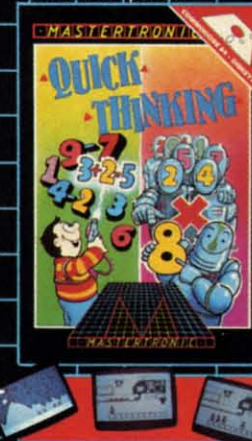
A six programme adventure in the Third Continent magical fantasy series using over 180K memory could absorb and expand your imagination for months.



Truly 'State of Art' programming in this latest Third Continent adventure. Launched to rave reviews in England. This is a 120K adventure in three programs that comes with a beautifully illustrated 156 page descriptive 'book of shadows' set not to be missed by serious games players.



A very user friendly music creation program which allows The Budding Musician to write 'On-Screen' using either keyboard or joystick extensive musical scores with up to 30 notes per page and seven pages in total. After composing your music you then choose to play it back complete on either trumpet, piano, guitar, recorder or trombone or delete and amend.



Double pleasure from two programs that will introduce early learners into the intricacies of multiplication. Age levels range from 6-12 years on game one and from eight upwards on the second game. Several levels of difficulty and choices of speed will sustain interest on the programs for a long time.

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The publisher cannot assume responsibility for errors in the above listing.

(Epyx) boast significantly heftier playbooks.

Joystick control makes *On-Field Football* exceptionally easy to learn and play. The coaches create each play by following a series of onscreen prompts. On offense, the gamer pushes the joystick forward, back, left, or right to select one of five possible formations: "T" right (run), "T" left, split left (pass), slot right (pass), and kick. Then the offensive coach individually programs the video athletes who are going to run with the ball or catch it. Finally, the computerist can revise the play at the line of scrimmage by calling an audible. Pressing the action button when prompted to do so changes the instructions for the halfback or the wide receiver, depending on whether it is, respectively, a running or passing play.

Coaches issue orders to the defense in the same way. The display prompts the gamer to choose separate options for the rush and secondary. The defense can call an audible to change the pass coverage at the last second.

Once both teams complete play-selection, the action button snaps the ball to start the action phase. The offensive coach controls the passer with the joystick and employs a simple system to hand off the ball on running plays or choose between the two eligible receivers when putting the pigskin into the air. The defensive coach guides the free safety with the stick and can even try to blitz the quarterback for a big loss.

The players are more than just animated cursors in *On-Field Football*. As in the same publisher's *On-Court Tennis*, the coaches pick individual players from a roster of possibilities prior to the opening whistle. For instance, there's a choice between the slick-passing "Pinpoint" Pepper and the more mobile "Scrambles" Smith. The teams can bring in replacements for tired players between the third and fourth quarters. It's too bad that the same concept wasn't extended to include members of the defense, who remain anonymous. This makes the game much less involving when the other team has the ball.

The playfield is oriented so that the

team with the ball always moves up the screen against defenders protecting the goal line at the top. When possession changes, the teams swap places.

Gamers traditionally favor football programs in which the action moves side-to-side, but this attempt is more successful than most previous tries. The traditional complaint against vertical gridirons is that they don't provide enough room for passers, runners, and receivers to maneuver. The designers of *On-Field Football* have made the players as small (relative to the size of the field) as practical to minimize this. Most computerists will still prefer horizontal football fields, but the overall effect isn't bad.

The most useful of a batch of special features lets players choose between regular 15-minute quarters and shorter 5-minute ones. The program also allows each coach to call three time-outs during the game. It is also possible to "pause" play entirely when the phone rings or nature calls.

Like other Gamestar titles, *On-Field Football* takes practice to master. (Not, however, quite as much as *Starbowl Football*, also by Gamestar.) Computer sports fans who want an action-oriented football contest, rather than one which relies on pure strategy, are the most likely to enjoy this clever game.

Gamestar, Inc., 1302 State Street, Santa Barbara, CA 93101 (phone: 805-963-3487). —**Arnie Katz**

COMPUTEREYES

Digital Vision Inc.

Commodore 64

Hardware, disk; \$129.95

There is an old saying that a word is worth a millipicture. Nothing brings this truth home more clearly



than working with digitized images. On the Commodore 64 a word is actually worth even less, at most an

eighth of a millipicture. If color is considered, the fraction can be as small as one tenth. Of course, the words we are talking about are eight bits or one byte each. Nevertheless, the veracity of the adage is brought home with a vengeance.

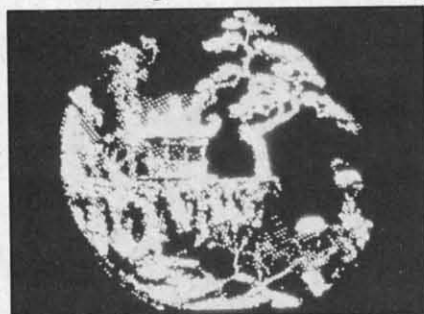
The Computereyes Video Acquisition system adds vision, without foresight, to the ever-growing list of possible applications for the C-64. The system will allow you to capture those fleeting images and translate them into the 8-10,000 bytes needed to describe a bit mapped image.

The physical appearance of the package belies its impressive performance. Computereyes is an excellent example of what a clever design with good programming can accomplish when coupled with the capabilities of the 64.

In keeping with this introduction we have included several screen shots which illustrate the capabilities of the system. The Chinese plates show how Wayne Schmidt used the information contained in a digitized *DOODLE!* image. The color and fine detailing were all added afterwards. We should all be familiar with the original on which the Washington head on page 68 is based. The young lady below it is the cover model from another of this company's publications.

THE HARDWARE

The Computereyes module is a small black box that plugs into the user port. It serves as an interface between any standard video signal and the computer. Suitable sources are video cameras, VCR's, video disc players, or TV's with video outputs. The video signal is fed to a standard



Color and fine detail were added (left) to a digitized DOODLE! image.
READER SERVICE NO. 105

RCA type jack on the back of the module. One of the two controls allows for the fine tuning or synchronization to the video source. The adjustment is non-critical and easily accomplished with the supporting software. You will most likely find that the setting will not change for a particular video source.

The other control compensates for the relative strength or brightness of the signal. The brightness control has a direct effect on the appearance of the acquired image. We found the setting of this control to be critical but manageable. Small adjustments of the brightness control have a significant impact on the final image.

THE VIDEO SIGNAL

The images displayed on a TV are redrawn 30 times a second. Each individual image consists of 512 horizontal lines. These are sequentially drawn from top to bottom of the picture tube. Creating an image in this manner is called scanning. Each image or screen is built up from two passes of 256 lines each. The first pass fills the entire screen; the second fills in the gaps between the lines of the first scan. This arrangement is called interleaving. It follows that the ideal TV picture would be able to resolve 512 discrete verticle points. However, in practice this is not so.

The capabilities of most TV's are about half of the theoretical maximum. The newer "monitor" receivers are somewhat better, on the order of 350 lines. The Commodore 1701 and 1702 monitors fall into this class. Home VCR's are able to resolve about 260 lines at this time, although better equipment is in the works. Laserdisc players generally exceed the resolving capabilities of the best TV sets.

SELECTING A VIDEO SOURCE

Since the Computereyes module merely acts as an interface, you will have to provide it with a standard video signal. If you already have a home video system, with a color camera, then you're all set. In comparison to the overall cost of a complete video system, the \$130 price of this package is almost too good to pass up. If

you do not have a home video system, a black and white video camera is your best bet. These are available as no frills units for use with closed circuit television security systems. The Ikegami model ITC-40 Surveillance camera is a high quality unit of this type. It is available as an option from Digital Vision. The package price of camera and module is \$350. Bear in mind that surveillance cameras are truly no frills devices, lacking any type of viewfinder or sound pickup.

A home VCR is a less than ideal video source for this application. The process of acquiring a detailed image takes quite a few seconds and several tries as the brightness is fine tuned. A stationary image must be provided for these several minutes. The freeze frame mode of a VCR provides less resolution than normal operation. Also, the VCR will automatically start running after five minutes or so to prevent the wearing of a hole through the tape. A laserdisc player should make a very good source. These devices provide a very high quality single frame image for unlimited intervals.

A color video camera will work well. You may want to use its associated VCR as an intermediary device to avoid the cost of an additional cable and adapter. We did all of our tests with the Ikegami camera.

A BIT OF A PICTURE

The Commodore 64 has the ability to create a graphic image composed of 320 horizontal dots by 200 vertical dots. This is a bit-mapped image, which means that each one of these 64,000 dots or pixels corresponds to a single bit of computer memory. This is where we get the 8,000 bytes or words mentioned above. A total of 16 colors may also be displayed. The color information requires another 1,000 bytes of memory.

An alternate display mode permits the display of only 160 horizontal dots with the same number of vertical dots. The tradeoff for this multicolor mode is increased flexibility in the display of color. The memory requirements of the bit map for this mode are the same as above. The increased color capabilities call for 2,000 bytes of

storage. (For additional discussion of Commodore 64 bit mapped graphics, see the October and November 1984 issues of *Ahoy!*)

As we can see, a C-64 bit map would seem to contain as much information as a TV picture. The reason it cannot create a televisionlike image is that the 64 is limited to a total of 16 possible shades or colors. A television image is capable of thousands of brightness and color combinations. Nevertheless, impressive results can be obtained, some examples of which can be found in our *Art Gallery* (see pages 34 and 35).

A number of software packages allow the user to draw or create graphic images on the 64, including *Flexidraw* from Inkwell Systems, *DOODLE!* from City Software, and *Koala Painter* from Koala Technologies. Detailed reviews of these and a number of other packages were presented with the discussions on bit mapped graphics previously mentioned. These packages are supported by the Computereyes software.

GETTING THE PICTURE

The Computereyes software allows you to capture a video image as a Commodore bit map. Three different bit map formats are directly supported. The optional software for use with the above graphics packages adds seven more formats. We will go into these in some detail.

The first step is to set the synchronization control. A built-in routine

George digitized with Koala support software, in low contrast format. With multicolor packages like Koala, compatible image modes are limited to low and high contrast capture, with up to four gray levels in each character cell.



simplifies the process to just a few seconds. Once set, the sync control is left alone. The second step is to set the brightness control. A special display mode performs a continuously visible image scan every six seconds. We found that by setting the brightness control so that only the brightest highlights showed resulted in the best starting setting for subsequent operations. The operation of the package was very sensitive to the setting of the brightness control. Although the adjustment was manageable, some sort of fine tuning would have been welcome. The controls also lacked pointers or markings, a minor inconvenience. It would be a good idea to mark the position of the controls after the initial setup. This would eliminate the need for these preliminary adjustments for each subsequent use.

The package is menu-driven, with

built-in help screens. It is a complete image capture utility which allows for the LOADING, SAVEing, and viewing of the captured images. The disk directory may be viewed without exiting the program; however, disk commands, such as for formatting a disk, cannot be issued. The programs are written in BASIC with the digitizer parts in machine language. Since no copy protection is used, it should be fairly easy to add whatever frills you may want. The starter package makes full use of the high resolution bit map.

The quickest way to digitize an image is to use "Normal Capture." This produces a high contrast black and white image. The original picture is scanned once with all parts above a certain brightness level assigned to white. Maximum resolution is obtained at the expense of any tonal gradation. This mode is relatively fast, completing a scan in less than seven seconds.

Somewhat slower but generally more pleasing is the "4-Level Capture." The original image is scanned four times at different exposure levels. Each level is assigned to a shade of gray by turning on different numbers of pixels. The tradeoff is loss of resolution, as four pixels are required for each part of the image. A 4-Level scan requires about 26 seconds.

The "8-Level Capture" is similar to the above. Eight synthesized grey levels are formed with a corresponding reduction in image resolution. Capture time is a bit over 50 seconds.

OPTIONAL SOFTWARE

The basic software generates a pure



Model from magazine cover digitized with DOODLE! high contrast capture, resulting in a bit map image with three intensity levels—white, gray, and black—with maximum resolution of 320 X 200 pixels and two levels possible in each character cell.

8K bit map without any color information. If you have the *Flexidraw* graphics package, any of the above formats can be loaded in and worked on. Good results will also be obtained with the *Flexidraw* print utility, since these are pure bit map images. For use with other packages, Digital Vision offers Compatibility System Software in support of *Koala*, *DOODLE!*, *Flexidraw*, and *The Print Shop*. Each disk tailors the captured image to the specific package.

For the hi-res packages, namely *Flexidraw* and *DOODLE!*, the above-mentioned capture modes are supported. Two additional modes are also provided. The "Low Contrast Capture" makes use of the C-64 color capabilities to generate a true five level gray scale composed of the three grays, black, and white. In this mode the full bit map resolution is preserved while still allowing for image shading. Since the high resolution bit map is used, only two gray levels will appear in any 8 x 8 pixel character cell. The "High Contrast Capture" is similar to the above, except every other gray level is used.

Since *Koala* is a multicolor package, the compatible image modes are limited to the Low Contrast and High Contrast captures. The difference is that finer gray scale resolution is obtained, since multicolor mode allows up to four colors in each character cell. As a result the *Koala* images are apt to be the most pleasing for many subjects, even with the reduced resolution of the multicolor bit map.

The latest addition is the *Print Shop* support package (see the review of the *Print Shop* in the July '85 issue). This will create images for both the *Kaleidoscope* and the *Graphics Editor* utilities. The support for the latter is very well done. A large portion of a full image is marked by a movable mask. Simply use the cursor keys to select the portion you want. The software then blocks the image into the reduced detail for the graphics editor. When selecting a source image for conversion, keep in mind the 88 by 52 dot resolution of the Graphics Editor (44 by 45 dots for 1525 printers). Images with large solid areas will work the best.


The *Print Shop* support package can be used to convert any 8K hi-res bit map image. The ones generated by *Flexidraw*, without color, are perfectly suitable. Image files created by the *DOODLE!* package will have to be stripped of their leading kilobyte of color data. To do this you simply LOAD "DDPICTURE",8,1; where "DDPICTURE" is the file you want to convert. Next POKE 45,0:POKE 46,96. Finally SAVE "PICTURE",8; where "PICTURE" is the name of the file you want to create. The resulting 33 block disk file will be a pure bit map, without the color information, ready for processing by the Computereyes *Print Shop* support package.

PRINTING THE PICTURE

The built-in print utilities of both *DOODLE!* and *Flexidraw* will do a fine job with the first three image formats. Strange results are likely if you try to print either the Low or High Contrast images. These images depend on the color information to pro-

duce the different shades of gray. The *Koala* screen dump utility will do a good job with either of the *Koala* formats. The Graphic Printer package by Michael Keryan takes into account the color information of a high-resolution bit mapped image. It is designed to work with the high density print modes of the Star Micronics Gemini series of printers or the Epson graphics-capable printers. Contact the Computerist, Inc., P.O. Box 6502, Chelmsford, MA 01824 (phone: 617-256-3649) for information about this package.

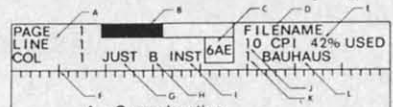
For a real personal touch, try transferring a digitized image to a T-shirt by using the Underware Ribbon. This ribbon for the Epson, Gemini, and Okidata printers contains thermal transfer ink for iron-on images. Just remember to do a left to right flip with the *DOODLE!* software before printing. The ribbons are available for \$19.95 from Diversions Inc., 1550 Winding Way, Belmont, CA 94002 (phone: 415-591-0660) (see the May '85 *Scuttlebutt*).



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On Screen Status Display





- A - Cursor location
- B - Scroll Indicator
- C - Print features currently being used
- D - Filename of text
- E - Percentage of RAM (memory) used
- F - Ruler (also message line)
- G - Word wrap/justification flag
- H - 'Block marked' flag
- I - Insert mode flag
- J - Characters per inch
- K - Number of the current font
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SOME OPERATING TIPS

The techniques used for black and white photography can be applied to imaging with the Computereyes system. As such, good photography practices apply. Pay careful attention to lighting and background. If you are using a black and white camera, photographic colored filters for contrast enhancement can be quite useful.

Want to get close up? A low power magnifying lens placed directly in front of the camera lens will allow you to focus much closer than otherwise possible. The cost is minimal and image quality will be virtually unaffected.

Being able to directly view the video image greatly simplifies the setup procedure. If you are using a monitor with your computer, a simple RCA type "y" adapter and a two position video switch are all you need. Just intercept the camera signal with the "y" adapter and send it to both the Computereyes module and the video switch. The computer video output

goes to the other side of the switch to complete the hookup. The Commodore 1701 and 1702 monitors are ideally suited for this purpose. Simply send the camera output to the video jack on the front of the monitor. The computer should go to the back connectors. The switch on the back panel will let you select between the two sources.

The camera video signal cannot be fed directly to the antenna terminals of a TV set. It will have to be converted to the radio frequency broadcast format. An RF Modulator, available from Radio Shack as catalog number 15-1273 for \$24.95, will do the job. If you can do some of your own tinkering, then the basic RF modulator, sans power supply, is available for \$9.95 as catalog number 277-221. Simply feed both the computer and the modulated video signals to the set's antenna terminals via a game selector switch. Or set one to channel 3 and the other to channel 4 and use the set's tuner.

CONCLUSIONS

Computereyes is an easy to use image digitizing system for the 64. The resulting images are remarkably detailed for such a low cost system. With care, directly usable images can be readily generated. The optional supporting software allows the images to be saved for subsequent editing by some of the more popular graphics packages. The resulting images provide a wealth of detail for manipulation in this environment.

Digital Vision Inc., 14 Oak Street—Suite 2, Needham, MA 02192 (phone: 617-444-9040).

AUTHOR'S NOTE

While working with Computereyes for this review I rapidly accumulated several disks full of images on a variety of subjects. In fact the process became rather addictive. If you would like to have these for your own use I would be glad to provide a diskful for \$12 to cover copying and distribution. Just specify which format you would like. An SASE will get you a listing of available disks and their contents. Send payment to Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229.

BLAZING PADDLES

Baudville

Commodore 64

Disk; \$34.95

Billed as a graphics package that will work with most of the input devices available for the Commodore, I found that *Blazing Saddles* worked well with both a joystick and the Koala Pad. Although it worked with a Tech Sketch Light Pen, it was extremely erratic. While supposed to work with track balls, paddles, light pens, joysticks, or graphics tablets, it can only be used with one device each time it is booted up. If you wish to change devices during a session, you must reboot the program—a three-minute process. Quick loaders like *FastLoad* and *Mach 5* have no effect on *Blazing Paddles*.

One annoying deficiency can be found as soon as you decide to boot the program. The documentation warns not to plug or unplug devices while the program is running, but doesn't bother to tell you which input devices use which ports. Despite the warning, when the joystick failed to move the cursor I switched it to the other port. Fortunately, nothing blew up. From my experience the Koala Pad and light pen used port 1, the joystick used port 2.

The program is designed well, with most of the features we've come to know and love: sketch, fill, zoom, and draw dots, lines, frames and boxes, ovals and circles. Especially nice is the undo command. Hitting a single key cancels your last update. A spray paint mode lets you brush in color a little at a time. Subsequent strokes darken the shading.

The cut and paste window can be used to duplicate things on the screen without having to redraw them. A window's contents can be saved and reloaded using a separate filename, as well.

The screen can be cleared to any of the 16 colors. Since this is a two-step process requiring some precision, it is very difficult to accidentally wipe out your work. In fact, about the only way to really mess up is to change the background color to the same color you're using to draw

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REVIEWS

with and then return to the main menu. This is entirely possible, since you can change the background color at any point during your work by using fl.

A text mode allows you to put messages or labels in your drawings. The characters look strange, both on the screen and in the printouts. One of the companion disks, *Shapes and Fonts*, has a number of other type styles that you can use for writing messages and labels.

The \$20 companion disks (*Shapes and Fonts*, *Science*, *Kid Stuff*) are probably the best recommendation for this program. These have pre-drawn figures that cover a variety of subjects. I used the electronic symbols from the science disk to create a circuit drawing. The resolution of printouts leaves something to be desired: high resolution. The print quality is about the same as the *Koala Painter* in low resolution mode.

The *Blazing Paddles* disk includes a few stick figures to show you how to take images out of the picture libraries and put them into your drawings. This is one area where this program shines. The sprite sized figures can be manipulated before you put them into your picture. You can flip them over, rotate them around 90 degrees, or change their color. The extra disks have some useful shapes on them (especially if you're a kid trying to impress your science teacher).

One other disadvantage that I found was not being able to exchange colors. Although switching the background colors is easy, if you want to change the color of lines you've already drawn it's a difficult task. I've only seen one graphics program with this feature, so I can't be too hard on *Blazing Paddles* for not having it. I originally chose a dark background with light lines for my circuit diagram because it was much easier on the eyes. When I got it finished, though, I realized it would look much better reversed. It took another two hours to redo the drawing. If I could have changed the background using fl and then changed the lines to another color, it would have taken only a few seconds. Using fill on thin lines is al-



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most impossible, especially if they're diagonals.

Except for the one flaw mentioned at the beginning, the documentation is very good. Besides the manual, there is an onscreen help menu. Although it's a nice idea, by the time the help file loads you could have looked it up in the manual. Keyed to the input device you are using, it gives brief instructions on how to enter commands.

For instance, the joystick will draw on the canvas as long as the fire button is held down. To go back to the main menu, you must press f5 to take the cursor off the screen and then hit the fire button. For some reason, when using the joystick the cursor won't go over into the border.

The joystick is very slow to respond, by the way. The light pen button wouldn't work, so I had to use the control key instead. Also, the calibration on the light pen was off by about half an inch. In addition, whenever

I tried to change the brush color, the background color of my drawing would change, too. Although the fl key could be used to change it back, it was a pain in the neck. Of all the input devices used, I enjoyed the Kola Pad most. It responded quickly, and didn't give me any trouble.

This is a nice graphics package, although the input device you use will ultimately determine how satisfied you are with it. I would rate it about equal to other packages in its price range. Unless you are specifically looking for a package to use with several input devices, you would probably do just as well to buy any of the devices that comes with its own software and leave it at that. If you want to spend the extra money for the shapes disks, then *Blazing Paddles* becomes a good value.

Baudville, 1001 Medical Park Drive S.E., Grand Rapids, MI 49506 (phone: 800-824-8873).

—Cheryl Peterson

Dreams CAN come true!

Back in June of 1983, Kelvin Lacy had a dream. He dreamed of creating one integrated program that would include a spreadsheet, business graphics and a database. A program with the power of Lotus 1-2-3. On the Commodore 64. People laughed! He had just finished OmniWriter, to be marketed by HESWARE. Ignoring the skeptical, he started on VIZASTAR.

Now, after 15 months, his dream has come true. VIZASTAR has a full-featured spreadsheet, as good as Multiplan. But much faster—faster than many spreadsheets on the IBM PC! It is written 100% in 6502 machine language code and is ALWAYS in memory. It is menu-driven, using the latest techniques in user-friendliness. It is compatible with virtually all printers and word processors. Up to 9 windows can be open simultaneously, anywhere. Remarkably, 10K of memory is available for spreadsheet use.

The database is equally impressive. Create file layouts by simply painting a picture of the layout on up to 9 screens, showing where a field starts and ends; VIZASTAR does the rest.

Imagine the power of a spreadsheet integrated with a database. Now add graphics — bar, line, and multi-color pie and 3-D "skyscraper" graphs. You could access a customer's profile in the database, transfer the data to the worksheet, and let it calculate discounts, sales tax etc. and then transfer the updated data back to the database. Open up a window anywhere and display a graph of your data, instantly. This integration is the key to VIZASTAR's power—the **first and only** program of this kind on the C-64. All commands can be automated, so you can "program" your own applications and run them with one keystroke.

Trademarks: Lotus 1-2-3/Lotus Development. Commodore 64/Commodore Electronics Ltd. Multiplan/Microsoft.

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Format, Calc, Protect, Width, Skipto
Display, Tone

A	B	C	D
Names	1980	1981	1982
1			
2	Tuesday	200.00	122.67
3	Molly	312.40	212.98
4			
5		512.40	335.65
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GO-LISTER

A Programming Aid for the C-64

By John K. Lunde

Go-Lister is a machine language utility that produces a printout showing which BASIC program lines are called by GOTO, GOSUB, THEN, and ON statements in other program lines.

Anyone who has ever tried to modify a program written by someone else, or who has simply lost track of where the GOTOs get to in his own program, knows the frustration of changing a line in some apparently innocuous way only to have the program begin to act strangely because the line is accessed by a transfer statement somewhere else.

This utility provides a warning when a particular line is used by several other lines in common, and shows when

it is safe to 'crunch' one or more lines together.

It is also useful in analyzing programs, since knowing which lines are called by others gives you a good idea of the program's structure.

Go-Lister must be typed in using our *Flankspeed* machine language entry program. Follow the instructions on page 86 for typing and saving *Flankspeed*. Then run *Flankspeed*, and type in and save *Go-Lister*.

To use *Go-Lister*, type LOAD "GO-LISTER",8,1 and load your target program, then type SYS 49152 to run *Go-Lister*. The only restrictions are that the target program must start at the usual start-of-BASIC location (2049) and that the printer must be device #4. □

SEE PROGRAM LISTING ON PAGE 109

MOXEY'S PORCH

For the C-64

By Bob Blackmer

Moxey's Porch is an arcade-style game played on a three dimensional multistep porch.

After entering and running the game you will be asked if you want instructions. Then enter the level (1-9) that you wish to start at (level 9 is easiest).

You control Enzo as he jumps on his pogo stick. His neighbor, Moxey, a likeable fellow, has just put the finishing touches on his newly painted porch.

Using the joystick in port #2, maneuver Enzo around the porch marking up the steps. Don't let Moxey catch you as he runs around his porch trying to stop you, or the game is over.

After you mark up all the steps, you reach the next level where Moxey gets a little faster. See how long you can keep going once you reach level 1.

Moxey's Porch is a good example of the game screens made possible by using multicolor custom character sets and multicolor sprites. □

SEE PROGRAM LISTING ON PAGE 91

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AHOY! 73

TOURING THE COMMODORE 128 KEYBOARD

Continued from page 54

THE REST OF THE KEYS

The top row of the keyboard has a total of 16 keys in groups of four. The four function keys on the right have been described above. The left-most grouping includes the ESCape and the TAB keys as well as an ALT key and a CAPS LOCK key. The ALT key is intended for use with alternate character sets under program control. This will be a topic for future discussion. The CAPS LOCK key acts as a SHIFT key only on the letter keys. As with the SHIFT LOCK key, the CAPS LOCK key includes a mechanical latch to hold it down.

The next group starts with a HELP key. If this key is pressed immediately after a BASIC program error, the offending BASIC line will be dis-

played. Starting with the point in the line at which the error occurred, the remainder of the line will be displayed in reverse on the 40 column display and underlined on the 80 column display.

The LINE FEED key moves the cursor down without a carriage return. This is the same as the CONTROL J (CHR\$(10)) described above. The 40/80 DISPLAY key is another mechanically latched button. It determines the display mode on power up or when the reset button is depressed. Latching it down defaults to the 80 column display. It has no effect once the computer is up and running. The NO SCROLL key acts as a pause button. It comes in handy for freezing a program or directory listing in its tracks. Hitting a key a second time restarts the listing. In a similar fashion, it also pauses program execution.

The next group consists of four independent cursor keys. These duplicate the operation of the cursor keys at the bottom of the keyboard. The notable exception is that it is not necessary to SHIFT for a cursor up or a cursor right. I found that I have grown so accustomed to the old cursor keys that I almost never used the new ones. Perhaps the need to reach to the top of the keyboard discourages their use.

Finally, a 14-key numeric keypad duplicates the function of the number, plus, minus, period/decimal point, and RETURN/ENTER keys. The numeric keypad and the four independent cursor keys are electrically different from the number keys and

the cursor keys on the Commodore 64 subset of the keyboard. Although they return the same CHR\$ code with a GET statement, it is possible to distinguish them by PEEKing an appropriate location. (See sidebar on page 52 for details.)

This hardware separation of the keypad from the rest of the keyboard is a minor disappointment to C-64 upgraders. If the keypad had been kept electrically identical to the number keys on the keyboard it would have been usable in C-64 mode as well. This would have allowed the use of all existing Commodore 64 programs with the numeric keypad. Keeping the keypad compatible could have been easily accomplished by simply paralleling the existing contacts. Actually, this would have been cheaper to implement than the scheme used. Apparently, Commodore felt the extra flexibility offered by the electrical separation was worth the extra effort.

LAST BUT NOT LEAST

Tucked away on the right side of the C-128, next to the on/off switch, is a small square push button. It is mounted flush with the surface, making accidental activation unlikely. This is a true hardware reset button. Pressed on its own, it will bring the C-128 back to its initial power up state in the current mode. In conjunction with the Commodore logo key, it will force a reset to C-64 mode. If the RUN/STOP key is held down, the C-128 will come up in the machine language monitor with the current BASIC program in memory intact! □

TABLE OF CONTROL KEY FUNCTIONS

CONTROL B	CHR\$(2)	Turn underline on in 80 column display
CONTROL G	CHR\$(7)	Produce bell tone
CONTROL H	CHR\$(8)	No effect
CONTROL I	CHR\$(9)	Move cursor to next tab stop
CONTROL J	CHR\$(10)	Send a linefeed without a carriage return
CONTROL K	CHR\$(11)	Enable character set change
CONTROL L	CHR\$(12)	Disable character set change
CONTROL O	CHR\$(15)	Turn flash on in 80 column display
CONTROL X	CHR\$(24)	Tab set or clear
CONTROL [CHR\$(27)	Send an ESCape character
	CHR\$(130)	Cancel 80 column underline
	CHR\$(143)	Cancel 80 column flash

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Rockets, Boats, and Pigs in Pokes

Continued from page 28

VZ	into the flag-bit register at HR.
VZ	The lowest vertical position allowable on the screen, minus 1.
HZ	The rightmost horizontal position allowable on the screen, minus 1.
VP	The current vertical position (a number from 0 to VZ).
HP	The current horizontal position (a number from 0 to HZ).

In addition, *Pig in a Poke* uses several game-control variables:

WSS	This string contains all the fence units; segments are randomly selected to make each new fence moving up the screen.
WL(n)	This array determines the starting points for each difficulty level in selecting a segment of the fence to display.
RC	Row count—how many blank lines have been inserted between fences.
RT	The total number of fences added to the screen so far.
DT	The delay variable—how many seconds should pass before the fences are scrolled upward.
DL	The difficulty level, or gap-width variable—how far into the string WSS the next fence should come from. Since gaps are narrower and fences wider the farther you go into WSS, the higher this number, the more difficult to get through the fence.
DS	The spacing between fences. It begins with five

EG

K, K(n), KP(n)

KP

blank lines between fences, then progresses to only one blank line before the program ends. End-of-game flag. Several ending conditions set this flag, which causes the program to jump to the ending routines.

In the main loop, these variables are used to interpret keypress data.

The current direction of movement. This is used with LT(n) and ST(n) to determine whether to display the shape of a left-facing pig or the shape of a right-facing pig.

At the beginning of *Pig in a Poke*, line 5 moves the top of BASIC memory below the video block at 32768. Then lines 10 through 13 send the program to four set-up routines.

Video Memory Set-Up. Lines 600-604 tell the VIC-2 to find the video block at 32768, and where within that block the VIC-2 and BASIC can find screen memory.

Lines 610-634 assign the addresses of various registers to the variables listed above. Lines 636-637 set up the set-bit and clear-bit arrays.

Lines 640-654 set the initial values of most registers. If you want to experiment, change these at will and see how they affect the game.

Lines 690-696 disable the SHIFT/COMMODORE and RUN-STOP/RESTORE interrupts. This is because SHIFT and COMMODORE are used for left and right movement in the game, and we don't want the character set shifting back and forth; and because video memory has been relocated, a RUN-STOP/RESTORE would cause the machine to become virtually unusable.

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Background Preparation. Lines 700 to 730 set up the wall string WSS and the variable WL(n), which controls the starting points for random wall segments at different difficulty levels. Line 740 sets the initial difficulty levels. DL should start at 0. DT is the number of seconds the program waits before inserting rows. A value of 0 is too fast to play. DS is the number of spaces between rows at the beginning. You have to make sure the game ends before the program drops the value of DS below 0 —this will cause a program-crashing error.

Sprite Shape. Lines 800-808 read the strings of sprite data, and interpret them so that they can be POKEd into sprite shape blocks in the correct order. If you change the shapes, make sure that each string has 24 characters and there are as many rows as are called for by the variable TS *plus* 1. If TS=9, then there must be ten strings of sprite information per shape. There must also be as many shapes as are called for by NS *plus* 1, so that if NS=1, there must be 2 whole sprite shapes.

Sprite Positioning. Line 900 sets the number of vertical and horizontal positions that will be allowed, and DIMensions the applicable arrays.

Lines 902-904 set the horizontal position values, starting with the leftmost position, 24, and increasing each position by 2. Line 906 sets the vertical positions, starting at 53 and increasing each position by 8.

Lines 920-922 set up the variables used in interpreting keypresses. KP(n) is indexed by the raw keypress at location 653. Values that mean nothing are set to 2; a keypress calling for left movement is set to 0, for right movements, to 1. The keypress that calls for the end of the game (SHIFT/COMMODORE/CTRL) is set to 3. These will be interpreted in the main loop.

K(n) has only two possible values: K(0)=-1 and K(1)=1. When indexed by KP(n), these values will be added to or subtracted from the current horizontal position (HP) of the sprite.

Lines 930-931 set the initial sprite position and POKE it into the proper registers. Line 940 POKes the current shape block code into the sprite location register.

Lines 950-960 set up the initial playfield screen. Line 960 is especially important, because if it were not done, the screen would scroll *two* lines at a time each time a

fence was moved off the top of the screen.

Lines 970-990 clear the collision registers and set the timer back to 0.

Main Loop. After the set-up subroutines are executed, the program jumps to the main loop. Line 100 reads the keyboard for SHIFT, COMMODORE, and CTRL keypresses. If the end of the game is called for, the program jumps to the End-of-game routine at 300.

Line 105 checks for meaningless keypresses and ignores them. Line 110-115 change the horizontal position, depending on the keypress, and cause the pig to "wrap around" if he goes off the edge of the screen.

Line 120 checks to see if the pig has changed direction. If he has, the sprite shape location register is changed accordingly. Line 125 POKes the new horizontal position into the two registers affected.

Line 130 checks the timer to see if it's time to scroll the screen. Line 135 checks to see if the player has moved the pig so it bumps into a fence.

Ending Routines. Lines 300-315 display the end of game messages, indicating the score, which gives points for the number of fences displayed before the end and how low the pig was on the screen at the end. Then they move the pig down to the middle of the screen. Line 320 checks for a keypress; if Q is pressed, the program jumps to 370, the end-of-game routine.

Lines 325-330 cause the pig to move along the screen continuously while the program waits for the player to input a choice. Line 345 keeps the program looping through the pig's movement unless the player has pressed P to play again, in which case line 350 resets the initial variables and goes back to line 100 for the next game.

Lines 370-390 put video memory back to normal and reenable all the key combinations that were disabled before; then the program ENDS.

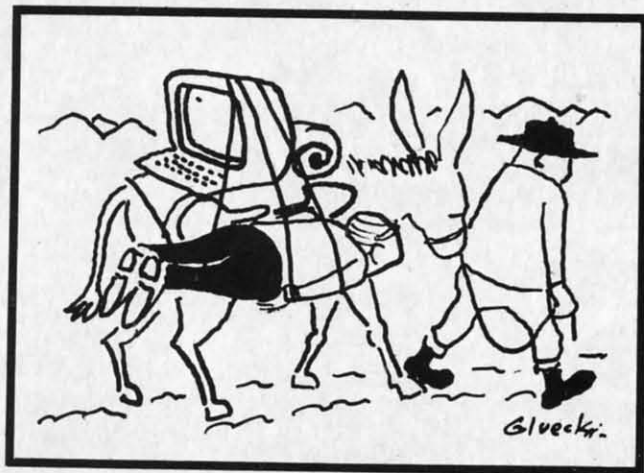
Collision Handling. This routine is only executed if a collision has already taken place. It bounces the pig up to the next valid vertical position. Then it clears the collision registers and checks again to see if the pig is still touching a fence, in which case it starts over again, bouncing the pig up still one more row. If the vertical position, VP, is ever higher than the top of the screen, EG is set to 1, which will end the game when the main loop is executed again.

Scrolling Routines. If we're between fences (RC < DS), then line 502 PRINTs enough cursor-down characters to cause the screen to scroll up one line. The fence-adding routine is skipped.

Lines 506-508 select a new fence segment, PRINT it, and then advance all the counters, changing the difficulty level if necessary. Line 510 checks to see if the maximum number of rows has been added. Right now the game is set up to PRINT 50 new rows on the screen before it ends.

Line 520 checks for collisions. Line 580 clears the screen line link table so the screen will only scroll one line at a time. Then the timer is reset. □

SEE PROGRAM LISTINGS ON PAGE 95



COMMODORE ROOTS

ADDRESSING THE COMMODORE, PART II

The Second of Two Columns on Assembly Language Addressing

By Mark Andrews

Looking for a byte of data in a computer is something like looking for a street address in a large city. If you don't know the city and don't have a map, the task is virtually impossible. If you can find a map, it helps. And with or without a map, the job gets easier as you learn your way around.

Last month, we saw how a set of programming tools called *addressing modes* can be used to retrieve data from memory (and store data in memory) in Commodore 64/Commodore 128 assembly language. In case you missed that column, here's a brief review:

There are 13 addressing modes in C-64/C-128 assembly language. Of these, one of the simplest (and most commonly used) is *absolute addressing*. Using the absolute addressing mode is like going straight to a street address that someone has given you, and immediately finding what you're looking for.

This is the format used for writing a statement using absolute addressing in C-64/C-128 assembly language:

```
LDA $1234
```

The above statement means, "Load the accumulator with the content of memory address \$1234." If this statement were encountered in an assembly language program, the contents of the Memory Address \$1234 would be loaded into the 6510/8502 *accumulator*, the main internal register in the main microprocessor of a C-64 or a C-128. (As you may recall from previous columns, loading a value into the 6510/8502 accumulator is the initial step in many different kinds of assembly language operations. As you may also remember, the "\$" sign in front of the number 1234 means that it's a hexadecimal number.)

INDEXED ADDRESSING

A slightly more complex addressing mode is called *indexed addressing*. Using it is like using a street address to find an apartment building, and then using an apartment number to find an apartment in that building. In a statement written using indexed addressing, the instruction specifies both an address and an *index register*

(either the X register or the Y register, if you're programming in C-64/C-128 assembly language). The value of the index register is then added to the specified address, and the sum of this addition operation is the final address of the instruction.

Indexed addressing is often used in loops that are designed to retrieve bytes of data in succession from data tables. Since the X and Y registers are often used as counters in such loops, they have been provided with a special set of instructions that enable them to be incremented and decremented very easily. There are also instructions that can be used to compare the values of the X and Y registers with other values. These comparison instructions are often quite useful in determining the boundaries of data tables.

In C-64/C-128 assembly language, this is the format for writing a statement using indexed addressing:

```
LDA $1234,X
```

A PROGRAM ILLUSTRATING INDEXED ADDRESSING

The Quest, found on page 100 of the program listings section, illustrates the technique of indexed addressing. The program was written using the *Commodore 64 Macro Assembler*, but can be easily modified to work with other assemblers.

One feature of *The Quest* we have not encountered until now is a *directive*, or *pseudo-op*, in Lines 110 to 130. This directive is written "BYTE" in programs created with the *Commodore 64 Assembler*. If you own a *Merlin 64*, use the *Merlin* equivalent of this directive, which is DFB. If you own a *Panther C-64* the equivalent is DFC.

The .BYTE/DFB/DFC directive is sometimes called a *pseudo-operation code*, or *pseudo-op*, because it appears in the op-code column of assembly language source code listing but is not actually a part of the 6510/8502 assembly language instruction set. Instead, it's a specialized directive that varies in format from assembler to assembler. Many other pseudo-ops have formats that differ from one assembler to another, because there are no generally accepted standards for writing pseudo-op directives.

When the "BYTE" directive (or one of its equiv-

alents) is used in a program, the bytes that follow are assembled into consecutive locations in RAM. In *The Quest*, the bytes that follow the label TEXT are ASCII codes for a series of text characters—as you will see when you type and run the program.

In *The Quest*, the X register is used as an index register. In Line 150, the X register is loaded with a zero. Then in Line 170, indirect addressing is used to load the accumulator with the first byte of the data segment labeled TEXT, plus the value of the X register. Since the value of the X register starts out as zero, the first value that will be loaded into the accumulator is the first byte of the line labeled TEXT, which is the number 87—or the ASCII code for the letter “W”. So, in Line 180, the routine CHROUT (a screen-printing subroutine built into the C-64/C-128 operating system, or *Kernal*), will print a “W” on the screen.

Next, in Line 190, the instruction INX (“increment the X register”) is used to increment the value of the X register. Then in Line 200, the value of the X register is compared with the number 23—the length, in bytes, of the text string being printed on the screen. If 23 characters have not yet been printed, the program cycles back to Line 170, labeled LOOP, and the next character is printed. Finally, when all 23 characters have been printed, the program ends.

INDIRECT ADDRESSING

Indirect addressing is a form of indexed addressing slightly more complex than the simple, no-frills indexed addressing used in *The Quest*. When indirect addressing is used in an assembly language program, the *contents* of a pair of memory addresses—rather than the addresses themselves—are added to the value of an index register. The sum is then used as the final address of an instruction.

Indirect addressing could be compared to a situation in which several persons need to get to a meeting each week, but are never sure where the meeting is being held because its location changes from time to time. One solution would be to direct everyone to the same address every week, and let them know in advance where to look when they arrived—under the doormat, for example—for a note containing the address of that week’s meeting.

In 6510/8502 assembly language, indirect addressing is often used when rapid changes must be made in data being accessed by a program. If indirect addressing did not exist, huge blocks of data would often have to be moved into and out of programs in real time, resulting in tremendous delays in processing. Fortunately, the existence of indirect addressing can usually eliminate this problem. In a program that uses indirect addressing, it is not usually necessary to incorporate large blocks of data into the body of a program, and to move them around in memory when one block of data must be exchanged with another. Instead, the *address* of a block of data can be used in a program. Then, when it is time to replace that block of data with another block, all a programmer has to do is substitute the *address* of the new block of data for the address of the old one. In this way, by changing only a few bytes of memory during the execution of a program, an assembly language programmer can juggle blocks of data that are hundreds, or even thousands, of bytes long in a tiny fraction of the time it would take to move one whole block of data out of a section of memory and then move another block of data in.

Actually, there are two indirect-addressing modes in 6510/8502 assembly language: *indexed indirect addressing* and *indirect indexed addressing*. As mentioned last month, one way to keep these two confusing terms straight is to remember that the word “indexed,” which contains an “X,” is the first word in the term “indexed indirect addressing”—the form that uses the X register. And the other mode—indirect indexed addressing—is the mode that makes use of the Y register.

Both indexed indirect addressing and indirect indexed addressing have one unfortunate limitation: they can be used only with zero-page addresses, that is, with memory locations that have addresses ranging from \$00 to \$FF (or from 0 to 255 in decimal notation). Much more will be said about zero-page addresses in later columns, but this is all we need to know about them right now: since there are only 256 such addresses in the memory space of a Commodore computer—and since most of those are used by the Commodore’s BASIC interpreter and operating system—the zero-page memory requirements of

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indirect addressing place rather severe restrictions on the use of indirect addressing in user-written programs. These restrictions are especially severe in the case of *indexed indirect* addressing, because indexed indirect addressing can be used only with address tables that are located in their entirety on Page Zero. Because of this limitation, indexed indirect addressing is not often employed in user-written programs. It is a good idea to know how it works, however, since it is sometimes encountered in ROM routines, and can even come in handy now and then in user-written programs, provided that the necessary space on Page Zero can be found.

INDEXED INDIRECT ADDRESSING

When indexed indirect addressing is used in a program, the format is:

LDA (\$FB,X)

If the above statement appeared in an assembly language program, the value of the X register would be added to the value of \$FB. The resulting sum would then be interpreted as another address. However, the accumulator would not be loaded with the value of that address. Instead, the *content* of that address, and the content of the *following* address, would be interpreted as still *another*

address. In other words, the indexed address would be used as a *pointer* to still another address. And that would be the final address of the instruction LDA.

As an illustration of this concept, let us assume that the X register contained the value 2 when the statement "LDA (\$FB,X)" was encountered in a program. First, the number \$02—the value of X register—would be added to the value \$FB. The sum of this calculation would, of course, be \$FD. And the *content* of that address—plus the content of the following address, \$FE—would point to the final address to be accessed by the mnemonic LDA.

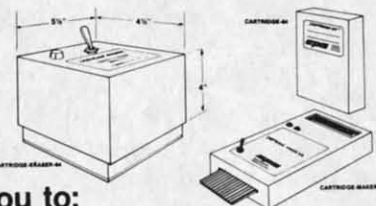
Now let us suppose the 16-bit value of \$1234 were stored in the zero-page pointers \$FD and \$FE. Since the low byte of a 16-bit value always comes first in 6510/8502 assembly language, the contents of page-zero pointers \$FD and \$FE would thus be as follows:

ADDRESS	CONTENT
\$FD	\$34
\$FE	\$12

Now let us suppose that the value \$C000 were stored in memory address \$1234. If the value of \$1234 were stored in page-zero pointers \$FD and \$FE, as illustrated above, the 16-bit value contained in \$FD and \$FE would contain, or *point to*, the address \$1234. So the final ef-

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fect of the statement "LDA (\$FB,X)" would be to load the accumulator with the value \$C000.

INDIRECT INDEXED ADDRESSING

Indirect indexed addressing is more versatile—and therefore more useful—than is indexed indirect addressing. When indirect indexed addressing is used to retrieve a value from a table or a block of data, only two bytes of valuable zero-page address space are needed. (In contrast, in the indexed indirect addressing mode, a whole table of address pointers must reside on Page Zero.) Therefore, indirect indexed addressing is used much more often in user-written programs than is indexed addressing.

The format of a statement that uses indirect indexed addressing is:

LDA (\$FB),Y

In the above statement, it is worthwhile to note that while parentheses enclose the address \$FB, the "Y" which represents the Y register lies outside the parentheses. This is important to remember, since it means that in indirect indexed addressing, the value of the Y register is used not to index the address \$FB, but rather to index the *content* of the address \$FB.

Now let us return to the statement "LDA (\$FB),Y". If this statement were encountered in an assembly language program, the *content* of memory address \$FB, plus the *content* of the following memory address—that is, \$FC—would be interpreted as a memory address. Next, the value of the Y register would be added to that address. And finally, the accumulator would be loaded with the *content* of that final address. In other words, the 16-bit value stored in the addresses \$FB and \$FC would be used as a *pointer* to indicate the final address of the instruction LDA.

To more clearly illustrate how indirect indexed addressing works, let us assume that memory addresses \$FB and \$FC held the address \$1234 when the statement "LDA (\$FB),Y" was encountered. Since the low byte of a 16-bit value always comes first in 6510/8502 assembly language, the contents of memory addresses \$FB and \$FC would thus be as follows:

ADDRESS	CONTENT
\$FB	\$34
\$FC	\$12

Now let us suppose that the Y register contained a 2 when the statement "LDA (\$FB),Y" appeared. In this event, the number \$02—the value of the Y register—would be added to the 16-bit address \$1234. The sum of this calculation would, of course, be \$1236. So the content of memory address \$1236 would be interpreted as the final address to be accessed by the mnemonic LDA.

Finally, let us suppose that the value \$F0AC were stored

in memory address \$1236. If this were the case, the final effect of the statement "LDA (\$FB),Y" would be to load the accumulator with the value \$F0AC.

IMPROVING THE QUEST

Before I sign off this month, I'd like to direct your attention to another program, *Response*, which appears after *The Quest* in the program listings section of this issue (see page 100). *Response* works somewhat like *The Quest*, but demonstrates a few more programming techniques—and, in addition, provides an answer to the riddle presented in *The Quest*.

In Line 130, instead of using ASCII codes to represent typed characters, *Response* uses a pair of delimiters to enclose a real string of typed characters—a feature provided in one form or another by most assemblers, including the *Commodore 64 Assembler*, the *Merlin 64*, and the *Panther C-64*.

At the end of this text string, however, there is one ASCII code: the number 13, which equates to an end-of-line (or "EOL") character. (An ASCII code had to be used here, since typing an actual return character would cause the assembler to move on to another line.)

In Lines 150 through 210 of *Response*, a text buffer (created in Line 510) is filled, or "stuffed," with blank characters, or spaces. Next, in Lines 250 through 320, an X loop is used to place the text string in Line 130 in the now-empty text buffer. Then, in Lines 360 through 460, the message in the buffer is printed on the screen.

The loop that prints the message works somewhat differently than the printing loop used in *The Quest*; instead of counting the number of characters in the text string which is being used, this loop keeps checking the accumulator for the presence of an end-of-line character. If no EOL character is detected, the program loops back to Line 370, and prints the next letter on the screen. When the EOL character that ends the text string is finally found, the program ends.

WHAT'S AHEAD

Next month's column will include the most advanced type-and-run program that has been presented in this space so far. Called *The Name Game*, it is an interactive game that will demonstrate the use of indirect indexed addressing, and do a bit more, too. *The Name Game*, which I have used for years to demonstrate certain programming principles, is a simple interactive game in which the player converses with the computer. It will not only print messages on the screen, it will also accept typed-in text, and print that on the screen, too. It will then compare the data that is typed in with a string of data stored in a buffer—and will use this comparison to determine the outcome of the game. So—see you in next month's column. □

SEE PROGRAM LISTINGS ON PAGE 100

All the programs in Ahoy! are available on disk or tape. See page 23.

CAIDET'S COLUMN

FOR BEGINNING USERS OF THE COMMODORE COMPUTERS — By Cheryl Peterson

Commodore's sales figures for Christmas 1984 showed twice as many disk drive sales as Commodore 64 sales. So it's a safe bet that most of you have already upgraded your systems to include this much-needed peripheral. That's great, because most of this month's column is going to concern the disk drive. For those of you who don't have drives, read this installment to find out some of the reasons for getting one. With the prices being dropped (I've seen them as low as \$159), now may be the time to buy.

Despite complaints about the 1541's speed, it's a vast improvement over tape. Having used a disk drive from the very beginning, I can't even contemplate waiting for a tape program to load. Only twice have I been in a situation desperate enough to warrant using the cassette drive, and both times I was elated to go back to my disk.

DISK BASICS

Although they may seem obvious to experienced disk users, there are some basic facts about using a disk based system that you should know. And don't think just because you've been around, you know everything.

Case in point: a professional musician who uses an electronic synthesizer calls my husband (who repairs electronic equipment). Since it's fairly late in the evening, my husband is reluctant to run across town. The problem is eventually traced to the disk drive in the synthesizer. In a brilliant flash of insight my husband asks, "Do you have the drive sitting on a speaker cabinet?" He did! Although moving the drive did not entirely solve the problem, the incident does demonstrate that even experienced users sometimes forget the basics.

Disks (and to a much lesser extent, drives) are susceptible to magnetic fields. A computer diskette is nothing more than a round recording tape; a piece of plastic with an iron oxide coating melded to it. Data is stored on the disk by polarizing the magnetic fields of the iron ions. If you take a disk and place it in an area where there is a high magnetic field (for instance, around speakers connected to stereo systems), it is entirely possible that you will erase the disk or scramble the data.

The plastic on which the iron is mounted is similar to that used in record albums. Heat can warp the plastic and cold can make it brittle. At sufficiently low temperatures, the iron oxide loses its bond to the plastic and there goes your data.

Disk sleeves were made to be used. Please don't throw them away. The keeper of our user group library never could see any reason to take up extra space in files by leaving the jackets on the disks. After about six months of rubbing together, the oxide started falling off, and the

entire library (some 120 disks worth) had to be recopied onto new disks. Besides the expense of buying more disks, it took days to make the new copies.

What I'm trying to point out is that disks are fragile. Even the best disks will wear out eventually. But if you treat them right, they can last for several years. Disks that see heavy use may only last a year, but that's why you always keep backup disks, right?!

A good rule of thumb is to make a backup copy of the file in which you are working at least once every half hour. This way you never lose more than 30 minutes of work. Frequently, the backup copy is on the same disk as the original. Most word processors and other heavy use software have a save and continue working feature that will quickly create a duplicate of the file so far and then let you continue where you left off. This is your first backup.

At day's end, it's a good practice to use a copy program to make a duplicate of each disk modified that day. (These copies should be made on disks that will be stored separately from those you use each day.) If you are doing anything more important than writing letters to goldfish, a safety is a necessity. I hope to compare a few of the commercial copy programs in a future column. *Fast Load* has such a program built into it.

ORGANIZATION

Most beginners don't have any idea how fast the disks collect. With a typical family, before you know it, you'll have disks with programs written in BASIC, COMAL, PASCAL, machine language, or any combination thereof. You'll have databases, letters created with different word processors, songs written with music processors, sprites made with sprite generators, pictures created with a variety of graphics packages, and data disks that track your progress with the very latest in adventure games.

And all of them will have cryptic labels that list about three files! If you're lucky, there might even be a semi-meaningful diskname. Something like WN!DD1.01 (*Write Now! Data Disk 1.01*) And if you've been making safeties like you should, whew!

Now for the good news! You, as beginners, are in the perfect position to nip this problem in the bud. Start out with some plan for labeling disks. Everyone who uses the computer should help come up with a logical system for organizing disks. I recommend using disknames that key the data to whatever disk was used to create it and then a general category type.

For instance:

WN!Personal Let.JA

WN!Personal Let.FB

WN!Business Let.01

BSWTom Creative.WR
 BSWSusan Book R.01
 BSWSusan Book R.02
 Ahoy! PRG Files.01
 CompuServe Down.01
 Cher PRG Games.01

With a little imagination, these disknames can identify the disk's information; WN!=Write Now!, Let=Letters, JA=January, FB=February, BSW=Bank Street Writer, WR=Writing, R=Reports, PRG=program files, Down=Downloaded files. Tom, Susan, and Cher are family members who regularly use the disk.

It took me three days to organize the mess that six months of haphazard disk and file naming had created. Oh, how I wished someone had warned me to be organized from the beginning.

Even with organization, it can still be tough to find a particular file that you haven't looked at for months. A good disk catalog program will really help here. I've seen one that costs about \$30 and includes an option to print labels.

MACH 5's DISK CATALOG PROGRAM

For my money, I'd get Access Software's *Mach 5* cartridge instead. Although it doesn't print labels, its features are almost indispensable. Besides speeding up disk access, *Mach 5* enables a catalog program that comes on disk.

Another option lets you view or print a listing of the disks in a catalog (see figure 2). This is especially useful at the beginning of your catalog, since it lists how much free space each disk has. Ever wonder which of your disks has enough room for a 20 block file and spend half an hour swapping disks in and out to find one? With this program, you never will.

To update a listing, you delete modified disks by entering their disknames. It isn't necessary to delete each file name; the program automatically finds each one associated with a deleted diskname and removes it. Then you use the "Add a disk function" to update the files.

There's even an option to change a diskname without having to reformat the whole disk (something I've seen no other program do). Even if you're a few months along in "haphazard" mode, it isn't too late to start getting organized with *Mach 5*.

One big hassle facing new drive users is learning the new, save, load, format, initialize, and validate commands. A disk provided with the drives contains a DOS (Disk Operating System) wedge that is supposed to make using these features easier. The wedge must be loaded before using it, however. *Mach 5* has a built in DOS wedge, accessible from BASIC. Because it is on cartridge, though, *Mach 5*'s DOS doesn't have to be loaded from BASIC. The command structure looks much like that of the Commodore DOS wedge, so the commands aren't confusing to more experienced users.

Beginners may not be aware that before you can use

Page 1						
File Name	File Type	File Size	Disk Name	Starting Track	Starting Sector	Entry Order
,	SEQ	1	fourth	24	3	4
....	PRG	1	fifth	11	0	5
2lift	SEQ	3	fifth	19	2	5
=	PRG	1	write now!	20	7	6
@	PRG	1	first	23	18	2
ahoy!.bak	SEQ	1	mj data	20	18	11
ahoy!.rev	SEQ	1	mj data	20	17	11
alphaloop.o	PRG	1	assembly	16	4	9
alphaloop.s	PRG	1	assembly	16	3	9

FIGURE 1 (top): a *Mach 5*-generated disk directory.

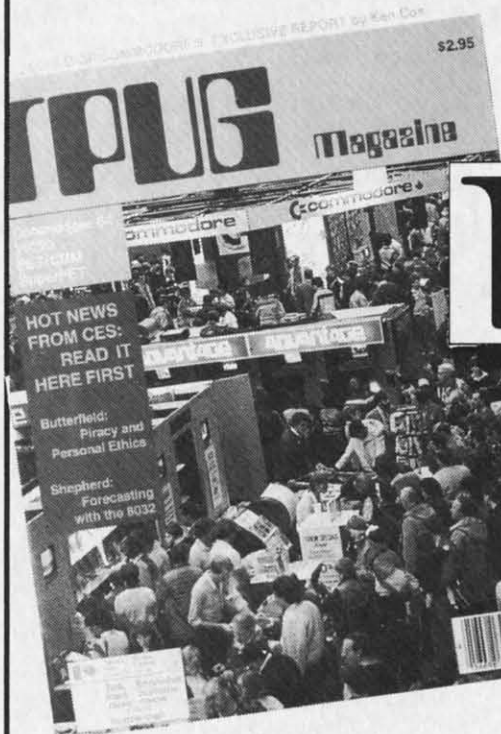
FIGURE 2 (right): list of disks in *Mach 5* catalog.

And is it a dandy! After creating a data disk for your catalog to reside on, you just swap in a disk whose directory you want added to the catalog. Take that disk out and put the catalog data disk back in. That's about it.

Each disk that you want added is swapped in. When you get them all entered, a sort routine in the program will alphabetize them. The printout looks great! (see figure 1). Not only do you know where to find the file you're looking for, you can see how big it is. I usually keep a printout of the catalog in a binder, next to my disk files.

List of Directories		
1	ledger data file	Free Sectors = 645
2	first	Free Sectors = 423
3	second	Free Sectors = 574
4	fourth	Free Sectors = 333
5	fifth	Free Sectors = 197
6	write now!	Free Sectors = 517
7	ok8	Free Sectors = 635
8	ok7	Free Sectors = 632
9	assembly	Free Sectors = 604
10	data	Free Sectors = 641
11	mj data	Free Sectors = 508

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a disk with the Commodore drive, it must be formatted. This two-minute process requires typing the command line (in BASIC):

```
PRINT#15,"NEW():NAME,ID"
```

where "name,id" is the diskname and identification code. If the DOS wedge is loaded or the *Mach 5* cartridge is in, you can type @ instead of PRINT#15.

Even without its quick loading features, *Mach 5* is an excellent package. And at \$34.95, it's a bargain, too.

TIPS ON BUYING SOFTWARE

Although I don't buy software often, there are a few tricks I've picked up along the way that I'll pass on to you. (Don't be surprised if they don't agree with anything you've heard elsewhere.)

Before deciding to buy any "productivity" type software, check back issues of magazines for buyer's guides and indepth reviews. Make a list of the features you definitely need and those you'd like to have if the price isn't too high. Be careful not to pay exorbitant prices for "bells and whistles" you don't need or want.

Read as many current Commodore magazines as you can get your hands on. Don't be an indiscriminate reader; look for useful buying information. Read magazines with a pen in your hand and a pile of note cards sitting next to you. If the family's decided to buy a word processing program in the next couple of weeks, make notes on all the pertinent advertisements: software name and manufacturer, what features are offered, asking price, page and magazine of advertisement. If you see a package that interests you, look for the discounted price being offered by mail order firms.

Mind you, I didn't recommend buying it from a mail order company. Find a local dealer who doesn't mind letting you hang around the store. Hang around. Try out the software you're interested in. Try it on a system similar to yours. Be sure the package will work with your hardware combinations. What kind of printer, interface, modem, or input devices do you need? Does that software need a high resolution or low resolution light pen?

While you're in the store, check the prices of disks. Even if you don't find the software you want, you can always use a few more disks and the store owner may be running a sale. You'd be surprised at the number of times I've walked out of a store empty-handed only to discover two days later that I had only one clean disk left.

Before buying, compare prices *realistically*.

Most mail order places now add a three to four per cent surcharge to credit card orders or a three to five dollar charge for COD. On top of that, there's a three dollar to five per cent shipping and handling charge. By the time you add it all up, you may only be saving a couple of dollars.

Then there's the waiting. If you buy software at a local store, it's yours when you walk out. You run right home and use it. Not so with mail order. If you pay by

check, there's a two week wait while it clears. Discounters advertise some products that are not in stock, since magazine ads must be placed two to three months in advance. A particularly popular package may be temporarily sold out, as well. Even if it is in stock, UPS generally takes 5 to 8 days to deliver.

Though mail order companies must ship your order within 30 days or inform you of the delay and offer to refund your money, they are not required to pay you interest on your money while they hold it. If there's a chance the software will come in a future shipment, they'll usually advise you to wait another couple of weeks before requesting a refund. After all, it takes the accounting department a couple of weeks to issue a refund check.

For your two dollar savings, you've given away the opportunity to take the software back to the store for a credit if it doesn't work. Since most local dealers want to keep your business, they'll try very hard to make you happy. Usually all you need do is bring the software back and show that it doesn't work on their computers, either.

This may lead to finding you actually have a hardware problem, or it could get you another copy of the software. At the very least, if the software won't load, most stores will give you a credit against any other merchandise you want to buy. Refunds are almost unheard of, no matter where you buy.

If you bought from a discount house, you can be almost guaranteed hassles. Don't hold your breath while waiting for most mail order houses to issue a return authorization number. Did I mention that you'll have to call on their user support line, so you get to pay long distance charges? 800 numbers are for orders only. When you do get permission to send it back, you go stand in line at the post office to send the package "Return receipt requested." This way you get back a post card that confirms that software company "XYZ" got the software.

And wait, and wait, and wait.

After several weeks, you may get a package with another copy of the software. If not, you call the company and hassle it out.

With certain software manufacturers, this isn't necessary. They offer a warranty! You ship the faulty disks to their main office and they send you new ones that should work. Usually, it'll only cost you another five dollars more plus shipping. Don't forget "Return receipt requested." And should the problem be hardware related, the new disks won't work, either.

So don't be so sure mail order is really cheaper. It may save a couple of dollars initially, but you'll probably pay for it in waiting time later.


Buying software can be a harrowing exercise. The best protection against disappointment is research. Magazines are a good starting point, but personal recommendations from friends or members of the local user group can lead to bargains. Try before you buy is still the best guarantee of satisfaction, though.

Next month, a few words about fans, furniture, and other fun stuff. □

PROGRAM LISTINGS

Attention new Ahoy! readers! You must read the following information very carefully prior to typing in programs listed in Ahoy! Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets []. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J],

and SHIFT J by [s J].
































Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSor left commands in a row, [5 "[s EP]"] would be 5 SHIFTEd English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. ☐

Call Ahoy! at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See	When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME		[BLACK]	Black	CNTRL 1	
[HOME]	Home	CLR/HOME		[WHITE]	White	CNTRL 2	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓		[RED]	Red	CNTRL 3	
[DOWN]	Cursor Down	↑ CRSR ↓		[CYAN]	Cyan	CNTRL 4	
[LEFT]	Cursor Left	SHIFT ← CRSR →		[PURPLE]	Purple	CNTRL 5	
[RIGHT]	Cursor Right	← CRSR →		[GREEN]	Green	CNTRL 6	
[SS]	Shifted Space	SHIFT Space		[BLUE]	Blue	CNTRL 7	
[INSERT]	Insert	SHIFT INST/DEL		[YELLOW]	Yellow	CNTRL 8	
[DEL]	Delete	INST/DEL		[F1]	Function 1	F1	
[RVSON]	Reverse On	CNTRL 9		[F2]	Function 2	SHIFT F1	
[RVSOFF]	Reverse Off	CNTRL 0		[F3]	Function 3	F3	
[UPARROW]	Up Arrow	↑		[F4]	Function 4	SHIFT F3	
[BACKARROW]	Back Arrow	←		[F5]	Function 5	F5	
[PI]	PI	π		[F6]	Function 6	SHIFT F5	
[EP]	English Pound	£		[F7]	Function 7	F7	
				[F8]	Function 8	SHIFT F7	

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This and the preceding explain these codes and provide other essential information on entering **Ahoy!** programs. Read these pages **before** entering programs.

BUG REPELLENT

This program will let you debug any **Ahoy!** program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the **Bug Repellent** program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working **Bug Repellent**, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the **VIC Bug Repellent** will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the **Repellent**.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter **Bug Repellent**, save it, and type RUN:NEW[RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4.4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```

•63000 FORX=828T01023:READY:POKEX,Y:NEXT:END AC
•63001 DATA169,0,133,63,133,64,165,43,133,251 JL
•63002 DATA165,44,133,252,160,0,132,254,32,228 DF
•63003 DATA3,234,177,251,208,3,76,208,3,230 OE
•63004 DATA251,208,2,230,252,169,244,160,3,32 OH
•63005 DATA30,203,160,0,177,251,170,230,251,208 KO
•63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
•63007 DATA32,210,255,169,0,133,253,230,254,32 OK
•63008 DATA228,3,234,165,253,160,0,170,177,251 LG
•63009 DATA201,32,240,6,138,113,251,69,254,170 BP
•63010 DATA138,133,253,177,251,208,226,165,253,41 DD
•63011 DATA240,74,74,74,74,24,105,65,32,210 EK
•63012 DATA255,165,253,41,15,24,105,65,32,210 FO
•63013 DATA255,169,13,32,210,255,173,141,2,41 PK
•63014 DATA1,208,249,230,63,208,2,230,64,230 CB
•63015 DATA251,208,2,230,252,76,74,3,169,236 KH
•63016 DATA160,3,32,30,203,166,63,165,64,32 DP
•63017 DATA205,221,169,13,32,210,255,96,230,251 EL
•63018 DATA208,2,230,252,96,0,76,73,78,69 OI
•63019 DATA83,58,32,0,76,73,78,69,32,35 FG
•63020 DATA32,0,0,0,0,0,0,0,0,0 LE
  
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the **Bug Repellent**. Type NEW, then type in or LOAD the **Ahoy!** program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152[RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where

contradictions occur. LIST each line, spot the errors, and correct them.

```

•5000 FORX=49152T049488:READY:POKEX,Y:NEXT:END GJ
•5001 DATA32,161,192,165,43,133,251,165,44,133 DL
•5002 DATA252,160,0,132,254,32,37,193,234,177 DB
•5003 DATA251,208,3,76,138,192,230,251,208,2 OF
•5004 DATA230,252,76,43,192,76,73,78,69,32 KN
•5005 DATA35,32,0,169,35,160,192,32,30,171 CA
•5006 DATA160,0,177,251,170,230,251,208,2,230 CE
•5007 DATA252,177,251,32,205,189,169,58,32,210 JE
•5008 DATA255,169,0,133,253,230,254,32,37,193 CL
•5009 DATA234,165,253,160,0,76,13,193,133,253 NB
•5010 DATA177,251,208,237,165,253,41,240,74,74 MB
•5011 DATA74,74,24,105,65,32,210,255,165,253 EP
•5012 DATA41,15,24,105,65,32,210,255,169,13 GH
•5013 DATA32,220,192,230,63,208,2,230,64,230 AN
•5014 DATA251,208,2,230,252,76,11,192,169,153 NG
•5015 DATA160,192,32,30,171,166,63,165,64,76 BF
•5016 DATA231,192,96,76,73,78,69,83,58,32 EP
•5017 DATA0,169,247,160,192,32,30,171,169,3 PJ
•5018 DATA133,254,32,228,255,201,83,240,6,201 FK
•5019 DATA80,208,245,230,254,32,210,255,169,4 FL
•5020 DATA166,254,160,255,32,186,255,169,0,133 CL
•5021 DATA63,133,64,133,2,32,189,255,32,192 GC
•5022 DATA255,166,254,32,201,255,76,73,193,96 NN
•5023 DATA32,210,255,173,141,2,41,1,208,249 NH
•5024 DATA96,32,205,189,169,13,32,210,255,32 IM
•5025 DATA204,255,169,4,76,195,255,147,83,67 KC
•5026 DATA82,69,69,78,32,79,82,32,80,82 DC
•5027 DATA73,78,84,69,82,32,63,32,0,76 ML
•5028 DATA44,193,234,177,251,201,32,240,6,138 GN
•5029 DATA113,251,69,254,170,138,76,88,192,0 JK
•5030 DATA0,0,0,230,251,208,2,230,252,96 NA
•5031 DATA170,177,251,201,34,208,6,165,2,73 DM
•5032 DATA255,133,2,165,2,208,218,177,251,201 JA
•5033 DATA32,208,212,198,254,76,29,193,0,169 FM
•5034 DATA13,76,210,255,0,0,0,0,0,0 PA
  
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language **Ahoy!** programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with **Flankspeed** there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with **Flankspeed** use LOAD "name".1.1 for tape, or LOAD "name".8.1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 - SAVES what you have entered so far.

f3 - LOADs in a program worked on previously.

f5 - To continue on a line you stopped on after LOADing in the previously saved work.

f7 - Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

•5 POKES3280,12:POKE53281,11 .

•6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]"

•10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P ROGRAM[6" "]"

•15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"

•20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA

LL

ED

MC

DM

33	DL 75	DATA169,251,166,253,164,254,32,216,255,96	DH	1060	PRINT"?ERROR IN SAVE":GOTO1100	EI
37	DB 76	DATA169,0,166,251,164,252,32,213,255,96	IM	1070	PRINT"?ERROR IN LOAD":GOTO1100	GL
2	OF 80	B\$="STARTING ADDRESS IN HEX":GOSUB2010:AD=	•	1080	PRINT:PRINT:PRINT"END OF ML AREA":PRINT	PG
KN	B:SR=B		NH	1100	POKE54276,17:POKE54276,16:RETURN	BH
CA	85	GOSUB2520:IFB=0THEN80	KO	1200	OPEN15,8,15:INPUT#15,A,A\$:CLOSE15:PRINTA	IM
CE	86	POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16	HJ		\$:RETURN	PC
JE	90	B\$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B	JB	2000	REM GET FOUR DIGIT HEX	GM
CL	95	GOSUB2510:IFB=0THEN80	HC	2010	PRINT:PRINTB\$;:INPUTT\$	II
NE	96	POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16	FO	2020	IFLEN(T\$)<>4THENGOSUB1020:GOTO2010	AD
ME	97	IFB>255THENB=B-255:POKE254,PEEK(254)+1	KE	2040	FORA=1TO4:A\$=MID\$(T\$,A,1):GOSUB2060:IFT(	GF
EF	98	POKE253,B:PRINT	IF	2050	NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+	EH
GH	100	REM GET HEX LINE	FP		T(4):RETURN	KP
AN	110	GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8	MN	2060	IFA\$>"@"ANDAS\$<"G"THENT(A)=ASC(A\$)-55:RET	NP
NG	120	FORB=0TO1:GOTO210	GE	URN		LI
BE	125	NEXTB	HN	2070	IFA\$>"/"ANDAS\$<":THENT(A)=ASC(A\$)-48:RET	MI
EF	130	A\$(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310	IL	URN		MG
PJ	135	PRINT" [c P][LEFT]";	FG	2080	T(A)=16:RETURN	MI
FK	140	NEXTA:T=AD-(INT(AD/256)*256):PRINT" "	MD	2500	REM ADDRESS CHECK	IM
FL	150	FORA=0TO7:T=T+A\$(A):IFT>255THENT=T-255	ME	2510	IFAD>ENTHEN1030	EB
CL	160	NEXT	LH	2515	IFB<SRORB>ENTHEN1040	HG
GC	170	IFA\$(8)<>TTHENGOSUB1010:GOTO1100	IK	2520	IFB<256OR(B>40960ANDB<49152)ORB>53247THE	CE
NN	180	FORA=0TO7:POKEAD+A,A\$(A):NEXT:AD=AD+8:GOT	PD	N1050		PN
NF	0110		LK	2530	RETURN	MJ
IN	200	REM GET HEX INPUT	IA	3000	REM ADDRESS TO HEX	IM
KC	210	GETA\$:IFA\$=""THEN210	FK	3010	AC=AD:A=4096:GOSUB3070	CJ
DC	211	IFA\$=CHR\$(20)THEN270	•	3020	A=256:GOSUB3070	JP
ML	212	IFA\$=CHR\$(133)THEN4000	MN	3030	A=16:GOSUB3070	AC
GN	213	IFA\$=CHR\$(134)THEN4100	AB	3040	A=1:GOSUB3070	AI
JK	214	IFA\$=CHR\$(135)THENPRINT" ":GOTO4500	HO	3060	RETURN	LH
NA	215	IFA\$=CHR\$(136)THENPRINT" ":GOTO4700	GC	3070	T=INT(AC/A):IFT>9THENA\$=CHR\$(T+55):GOTO3	EO
DN	220	IFA\$>"@"ANDAS\$<"G"THENT(B)=ASC(A\$)-55:GOTO	MD	090		FJ
JA	250		KF	3080	A\$=CHR\$(T+48)	FF
FM	230	IFA\$>"/"ANDAS\$<":THENT(B)=ASC(A\$)-48:GOTO	GE	3090	PRINTA\$;:AC=AC-A*T:RETURN	AB
PA	250		BJ	4000	A\$="**SAVE**":GOSUB4200	MF
•	240	GOSUB1100:GOTO210	•	4050	OPEN1,T,1,A\$:SYS680:CLOSE1	JH
•	250	PRINTA\$"[c P][LEFT]";	GM	4060	IFST=0THENEND	CM
•	260	GOTO125	LE	4070	GOSUB1060:IFT=8THENGOSUB1200	FO
•	270	IFA>0THEN280	LL	4080	GOTO4000	FG
•	272	A=-1:IFB=1THEN290	OA	4100	A\$="**LOAD**":GOSUB4200	OM
•	274	GOTO140	CG	4150	OPEN1,T,0,A\$:SYS690:CLOSE1	GF
•	280	IFB=0THENPRINTCHR\$(20);CHR\$(20);:A=A-1	OP	4160	IFST=64THEN110	DF
•	285	A=A-1	OB	4170	GOSUB1070:IFT=8THENGOSUB1200	IG
•	290	PRINTCHR\$(20);:GOTO140	CJ	4180	GOTO4100	FN
•	300	REM LAST LINE	HG	4200	PRINT" ":PRINTTAB(14)A\$	IM
•	310	PRINT" ":T=AD-(INT(AD/256)*256)	BE	4210	PRINT:A\$=""INPUT"FILENAME";A\$	DK
•	320	FORB=0TOA-1:T=T+A\$(B):IFT>255THENT=T-255	•	4215	IFA\$=""THEN4210	MA
•	330	NEXT	KH	4220	PRINT:PRINT"TAPE OR DISK?":PRINT	OI
•	340	IFA\$(A)<>TTHENGOSUB1010:GOTO1100	AD	4230	GETB\$:T=1:IFB\$="D"THENT=8:A\$="@0:"+A\$:RE	
•	350	FORB=0TOA-1:POKEAD+B,A\$(B):NEXT	GJ	TURN		
•	360	PRINT:PRINT"YOU ARE FINISHED!":GOTO4000	PL	4240	IFB\$<>"T"THEN4230	
•	1000	REM BELL AND ERROR MESSAGES	IA	4250	RETURN	
•	1010	PRINT:PRINT"LINE ENTERED INCORRECTLY":PR	KF	4500	B\$="CONTINUE FROM ADDRESS":GOSUB2010:AD=	
INT:	GOTO1100		HN	B		
LI	1020	PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":	ON	4510	GOSUB2515:IFB=0THEN4500	
GOTO	1100		FL	4520	PRINT:GOTO1100	
EL	1030	PRINT:PRINT"ENDING IS LESS THAN STARTING	DH	4700	B\$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=	
!"	B=0:GOTO1100		JA	4705	GOSUB2515:IFB=0THEN4700	
MG	1040	PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED	HD	4706	PRINT:GOTO4740	
RANGE!"	B=0:GOTO1100		AG	4710	FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B	
DN	1050	PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G	AG	4715	PRINT" ";:NEXTB	
OTO	1100		KN	4720	PRINT:AD=AD+8	
				4730	GETB\$:IFB\$=CHR\$(136)THEN110	
				4740	GOSUB3010:PRINT" ";:GOTO4710	

DRAGON TYPE

FROM PAGE 61

PROGRAM 1

```

•10 REM PROGRAM 1
•20 PRINT"[CLEAR][DOWN][DOWN] LOADING MAC
HINE LANGUAGE"
•30 FORI=49152TO49946:READA:POKEI,A:NEXT:
REM CHECKSUM=98881
•40 PRINT"[DOWN] LOADING DRAGON TYPE2"
•50 LOAD"DRAGON TYPE2",8
•100 DATA32,110,193,169,205,133,128,169
•101 DATA4,133,129,169,11,141,39,208
•102 DATA141,40,208,141,41,208,169,1
•103 DATA141,21,208,169,0,141,25,195
•104 DATA141,0,208,141,16,208,141,26
•105 DATA195,169,85,141,203,194,173,23
•106 DATA195,141,206,194,169,11,141,207
•107 DATA194,32,38,193,169,15,141,248
•108 DATA7,169,0,141,209,194,32,154
•109 DATA192,201,136,240,69,32,38,193
•110 DATA169,0,141,16,208,141,0,208
•111 DATA24,173,203,194,105,16,201,220
•112 DATA176,9,141,203,194,32,132,193
•113 DATA76,57,192,169,14,141,248,7
•114 DATA169,0,141,16,208,169,164,141
•115 DATA0,208,169,70,141,1,208,169
•116 DATA0,141,39,208,169,5,141,33
•117 DATA208,169,13,141,32,208,32,121
•118 DATA193,96,169,1,141,26,195,76
•119 DATA107,192,32,228,255,201,136,240
•120 DATA55,201,32,144,245,141,208,194
•121 DATA32,217,192,224,1,240,235,201
•122 DATA91,176,231,169,14,141,248,7
•123 DATA32,3,193,32,153,193,174,24
•124 DATA195,32,103,193,169,15,141,248
•125 DATA7,32,3,193,173,16,208,240
•126 DATA201,173,0,208,201,28,144,194
•127 DATA96,172,209,194,177,128,201,32
•128 DATA144,27,56,237,208,194,240,11
•129 DATA238,25,195,32,197,193,162,1
•130 DATA76,252,192,169,32,145,128,238
•131 DATA209,194,162,0,96,24,105,64
•132 DATA76,226,192,169,4,141,204,194
•133 DATA238,0,208,173,0,208,141,0
•134 DATA208,208,5,169,1,141,16,208
•135 DATA162,2,32,103,193,206,204,194
•136 DATA173,204,194,208,227,96,173,203
•137 DATA194,141,1,208,173,207,194,141
•138 DATA205,194,169,4,141,204,194,238
•139 DATA0,208,174,206,194,32,103,193
•140 DATA206,204,194,173,204,194,208,239
•141 DATA173,248,7,201,13,208,6,238
•142 DATA248,7,238,248,7,206,248,7
•143 DATA206,205,194,173,205,194,208,210
•144 DATA96,160,255,136,208,253,96,32

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•145 DATA97,193,202,208,250,96,165,128
•146 DATA141,211,194,165,129,141,210,194
•147 DATA96,173,211,194,133,128,173,210
•148 DATA194,133,129,96,24,177,128,32
•149 DATA210,255,105,64,165,128,105,80
•150 DATA133,128,165,129,105,0,133,129
•151 DATA96,169,15,141,0,212,169,85
•152 DATA141,24,212,169,18,141,1,212
•153 DATA169,65,141,6,212,169,28,141
•154 DATA5,212,169,129,141,4,212,162
•155 DATA22,32,97,193,202,208,250,169
•156 DATA128,141,4,212,96,169,0,141
•157 DATA0,212,169,2,141,32,208,169
•158 DATA85,141,24,212,169,38,141,1
•159 DATA212,169,65,141,6,212,169,45
•160 DATA141,5,212,169,33,141,4,212
•161 DATA162,45,32,97,193,202,208,250
•162 DATA169,32,141,4,212,169,5,141
•163 DATA32,208,96,160,255,169,3,141
•164 DATA33,208,169,14,141,32,208,200
•165 DATA185,212,194,32,210,255,201,0
•166 DATA208,245,169,163,160,40,32,210
•167 DATA255,136,208,250,32,110,193,162
•168 DATA200,32,103,193,169,157,133,128
•169 DATA169,5,133,129,169,0,141,16
•170 DATA208,169,3,141,0,208,169,11
•171 DATA141,39,208,141,40,208,141,41
•172 DATA208,169,8,141,25,195,169,125
•173 DATA141,203,194,169,26,141,207,194
•174 DATA169,25,141,206,194,169,0,141
•175 DATA209,194,162,255,32,103,193,206
•176 DATA25,195,173,25,195,208,243,169
•177 DATA1,141,21,208,32,38,193,169
•178 DATA15,141,248,7,162,180,32,103
•179 DATA193,169,14,141,248,7,32,153
•180 DATA193,172,209,194,32,243,192,32
•181 DATA3,193,162,55,32,103,193,169
•182 DATA15,141,248,7,32,3,193,162
•183 DATA80,32,103,193,173,209,194,201
•184 DATA13,208,214,169,13,141,248,7
•185 DATA162,100,32,103,193,169,8,141
•186 DATA206,194,169,11,141,207,194,32
•187 DATA38,193,169,1,141,16,208,169
•188 DATA27,141,207,194,32,38,193,32
•189 DATA121,193,96,125,0,0,8,27
•190 DATA0,13,32,201,147,28,29,29
•191 DATA29,29,29,29,29,29,29,29
•192 DATA29,29,29,29,17,17,17,17
•193 DATA17,17,17,17,68,82,65,71
•194 DATA79,78,32,84,89,80,69,13
•195 DATA13,29,29,29,29,29,29,29
•196 DATA29,29,29,29,29,29,66,89
•197 DATA32,66,79,66,32,83,80,73
•198 DATA82,75,79,31,13,13,0,1
•199 DATA10,0,0

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JD
 ND
 NE
 AA
 JF
 GC
 OB
 KG
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 IG
 FA
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 BF
 LM
 KB
 LA
 PL
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 •1007

PROGRAM 2

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JD 10 REM PROGRAM 2
ND 20 PRINT"[DOWN] RUN"
NE 30 N=99:DIMW$(N):SC=53280
AA 100 FORJ=832TO1022:READB:POKEJ,B:NEXT
JF 130 POKE2040,13:POKE2041,14:POKE2042,15
GC 150 POKE792,193:SYS49659
OB 155 FORI=0TON:READW$(I):NEXT
KG 160 PRINT"[HOME][15][DOWN]"] [BLACK]"TAB(
IE 10)"CHOOSE TYPING SPEED[DOWN]"
GA 170 PRINTTAB(15)"[BLUE]1. FAST[DOWN]":PR
AA INTTAB(15)"2. MEDIUM[DOWN]":PRINTTAB(15)
EN "3. SLOW"
IG 190 GETA$:IFA$=""THEN190
FA 200 A=VAL(A$):IFA<10RA>3THEN190
MK 210 POKE49943,A:POKE49944,A*30
BF 500 PRINT"[CLEAR][4][DOWN]"] [BLUE]":POKE
LM SC,5:POKESC+1,15
KB 510 FORJ=1TO9:A$="[4" " ]":FORI=0TO6:R=IN
LA T(RND(I)*N)
PL 520 A$=A$+" "+W$(R):NEXT
PN 530 PRINTLEFT$(A$,35):PRINT:NEXT:POKE198
LL ,0:T0=TI:SYS49152
MK 540 T=(TI-T0)/3600:E=PEEK(49945):POKESC,
FH 5:POKESC+1,13:S=INT(47/T+.5)
JN 545 IFPEEK(49946)THENS=0:E=0
EN 550 SR=S*90-20*E:IFSR>HSTHENHS=SR
LG 560 S$=RIGHT$(STR$(S),2):E$=RIGHT$(STR$(
EP E),2)
JC 565 SR$=RIGHT$(STR$(SR),4):HS$=RIGHT$(ST
OO R$(HS),4)
LO 570 PRINT"[CLEAR][BLUE][12][DOWN]"] "TAB(
EP 11)"SPEED [10"." ]"$S
KF 580 PRINTTAB(11)"[DOWN]ERRORS[10"." ]"$E$
JI 590 PRINTTAB(11)"[DOWN]SCORE[9"." ]"$SR$
OH 600 PRINTTAB(11)"[DOWN]HIGH SCORE[4"." ]"$
LI HS$
DH 610 PRINTTAB(8)"[4][DOWN]"] [RED][9"[c P]
GG "]"SPC(7)"[8"[c P]" ]"
NO 620 PRINTTAB(8)"[RVSON] SPACE "SPC(7)"
GK RETURN "
IB 630 PRINTTAB(8)"[DOWN][BLACK]CONTINUE"SP
FN C(10)"END"
EA 700 POKE198,0
FO 710 GETA$:IFA$=""THEN710
CH 720 IFA$<>CHR$(13)ANDA$<>CHR$(32)THEN710
PB 725 POKE53269,0
NO 730 IFA$=CHR$(32)THEN500
KC 740 POKE792,71:END
EF 1000 DATA0,127,128,1,249,192,3,248
PK 1001 DATA224,3,255,231,3,255,253,35
FH 1002 DATA255,255,33,255,192,64,243,254
PH 1003 DATA64,112,0,32,120,0,33,252
JD 1004 DATA0,71,252,0,79,254,0,111
AC 1005 DATA246,0,111,243,128,63,224,64
JF 1006 DATA31,192,0,7,224,0,30,96
1007 DATA0,48,48,0,60,30,0,21

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NH 1008 DATA1,255,0,3,243,128,7,241
PC 1009 DATA192,7,255,206,7,255,250,7
DJ 1010 DATA255,254,99,255,128,17,243,252
KH 1011 DATA16,112,0,32,120,0,65,248
ND 1012 DATA0,135,248,0,143,252,0,79
CK 1013 DATA252,0,111,246,0,63,226,0
CN 1014 DATA31,194,0,7,192,0,3,128
JJ 1015 DATA0,7,0,0,15,224,0,21
1016 DATA0,127,0,1,249,199,3,248
1017 DATA253,3,255,255,3,255,240,3
1018 DATA255,224,17,255,192,16,247,128
1019 DATA32,115,128,32,113,128,65,248
1020 DATA192,71,248,96,79,252,0,111
1021 DATA246,0,111,243,128,63,224,64
1022 DATA31,192,0,7,224,0,30,96
1023 DATA0,48,048,0,60,30,0
2000 DATAKNIGHT,MAIDEN,KING,QUEEN,PRINCE
,SWORD,ZEBRA,WISE,PEASANT,KNAVE
2005 DATALANCE,BUCKET,QUILT,FLAGON,WIZAR
D,BIRD,HUT,BRIDGE,PIKE,MAN
2010 DATAHEX,CHILD,RIVER,CHEST,GOLD,SILV
ER,COIN,CASTLE,TUNIC,SPEAR
2015 DATAPATH,MAIL,JOKER,HELMET,FLASK,BE
AST,ANIMAL,MAZE,BAY,LORD
2020 DATATORCH,TABLE,CHAIR,STABLE,HORSE,
BISHOP,JESTER,CROWN,GAME,BOOK
2025 DATAYEOMAN,XEBEC,GORGE,PIT,SHIELD,A
RMOUR,THIEF,YAM,COOK,SHOE
2030 DATALIVER,MALLET,CART,TAX,RAVINE,QU
AIL,BOW,ARROW,HEN,FIRE
2035 DATABABY,WINE,JEWEL,DUNGEON,KNIFE,S
ERF,CROSS,DAMSEL,QUIVER,HAZE
2040 DATAVIPER,LION,DOG,CANDLE,WOLF,SHIP
,LOG,GRATE,NUT,CANNON
2045 DATAQUARRY,IBEX,KEY,KID,BAZAAR,CLOA
K,GEM,LANTERN,STAG,SCARF

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PM
FB
IB
FD
MB
EO
PJ
PG
HM
MM
PA
CO
KL
HI
GL
NH
LA
AJ
OP
OC
BG
FD
IA
CP
DN
NH

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AUTO-GEN FROM PAGE 59

```

1000 PRINTSPC(15)"AUTO-GEN"
1010 PRINTSPC(13)"SEP[3" " ]1, 1984"
1020 PRINTSPC(13)"DAVID A JONES"
1030 REM CREATES DISK FILE OF DATA STATE
MENTS CONTAINING IMAGE OF MEMORY
1040 :
1050 FL=0 : REM FIRST MEMORY LOCA
TION TO BE SAVED
1060 LL=0 : REM LAST MEMORY LOCAT
ION TO BE SAVED
1070 LN=1000 : REM OUTPUT PROGRAM LI
NE NUMBER
1080 LB=0 : REM LOW BYTE OF 16 BI
T NUMBER
1090 HB=0 : REM HIGH BYTE OF 16 B
IT NUMBER
1100 HH=0 : REM TEMP STORE FOR HE

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EN
NE
JF
BM
DI
GG
BC
MB
BH
BO

```


IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

XIDECIAML CONVERSION	PD	•1500 LB=LN-256*(INT(LN/256)): HB=INT(LN/256)	OP
•1110 MM=0 : REM DECIMAL VALUE OF NUMBER CONVERTED FROM STRING	MA	•1510 PRINT#8,CHR\$(LB);CHR\$(HB);: REM NEXT LINE NUMBER	DE
•1120 ND=10 : REM NUMBER OF DATA ITEMS PER LINE	HC	•1520 PRINT LN;: REM SHOW USER WHAT'S HAPPENING	FL
•1130 NL=2049 : REM POINTER TO START OF NEXT BASIC LINE	NG	•1530 PRINT#8,D\$;: REM DATA TOKEN	BL
•1140 X=0 : REM OUTER LOOP COUNTER	EE	•1540 :	DI
•1150 Y=0 : REM INNER LOOP COUNTER	JE	•1550 FOR Y=X TO X+ND-1: REM 0 TO 9 = 10 ITEMS	MB
•1160 Z=0 : REM DATA ITEM COUNTER	MB	•1560 X\$=RIGHT\$("[4" "]+STR\$(PEEK(Y)),3)	NM
•1170 C\$=", " : REM COMMA	LH	•1570 :	DI
•1180 D\$=CHR\$(131): REM BASIC TOKEN FOR "DATA"	MG	•1580 FOR I=1 TO 3	IM
•1190 S\$=" " : REM SPACE	ML	•1590 PRINT#8,CHR\$(ASC(MID\$(X\$,I,1)));	OE
•1200 FI\$="" : REM OUTPUT FILE NAME	KI	•1600 NEXT I	MN
•1210 NN\$="" : REM NUMBER STRING INPUT	MP	•1610 :	DI
•1220 X\$="" : REM 4 CHARACTER STRING REPRESENTING 1 MEMORY LOCATION	AO	•1620 Z=Z+1	EB
•1230 :	DI	•1630 IF Z<ND THEN PRINT#8,C\$;	IA
•1240 : REM MAIN PROGRAM	AK	•1640 NEXT Y	NN
•1250 :	DI	•1650 :	DI
•1260 PRINT:INPUT"FIRST MEMORY LOCATION";NN\$	CH	•1660 PRINT#8,CHR\$(0);: REM END OF LINE TERMINATOR	AP
•1270 MM=VAL(NN\$)	CC	•1670 LN=LN+10	OK
•1280 IF LEFT\$(NN\$,1)="\$" THEN GOSUB 1830	AI	•1680 Z=0	EH
•1290 FL=MM	NM	•1690 GOSUB 1920	GF
•1300 PRINT:INPUT"LAST MEMORY LOCATION";NN\$	IN	•1700 NEXT X	NK
•1310 MM=VAL(NN\$)	CC	•1710 :	DI
•1320 IF LEFT\$(NN\$,1)="\$" THEN GOSUB 1830	AI	•1720 : REM ADD END OF PROGRAM TERMINATOR	JM
•1330 LL=MM	OO	•1730 :	DI
•1340 PRINT:INPUT"STARTING LINE NUMBER";LN	AH	•1740 PRINT#8,CHR\$(0);CHR\$(0);	DK
•1350 PRINT:INPUT"NUMBER OF DATA ITEMS PER LINE";ND	EN	•1750 CLOSE 8	NI
•1360 PRINT:INPUT"OUTPUT FILENAME";FI\$	CM	•1760 GOSUB 1920	GF
•1370 :	DI	•1770 CLOSE 15	AB
•1380 OPEN 15,8,15	AM	•1780 PRINT:PRINT"COMPLETE"	BJ
•1390 OPEN 8,8,8,"0:"+FI\$+",P,W"	NJ	•1790 END	IC
•1400 GOSUB 1920	GF	•1800 :	DI
•1410 :	DI	•1810 : REM HEX TO DECIMAL	EM
•1420 PRINT#8,CHR\$(1);CHR\$(8);: REM PROGRAM LOAD LOCATION	AD	•1820 :	DI
•1430 :	DI	•1830 MM=0: HH=0	DM
•1440 : REM MAIN LOOP	BI	•1840 FOR X=2 TO LEN(NN\$)	CI
•1450 :	DI	•1850 HH=ASC(MID\$(NN\$,X,1))-48	IP
•1460 FOR X=FL TO LL STEP ND	KL	•1860 MM=16*MM+HH+7*(HH>9)	JO
•1470 NL=NL+2+2+1+4*ND+1	JA	•1870 NEXT	IA
•1480 LB=NL-256*(INT(NL/256)): HB=INT(NL/256)	KL	•1880 RETURN	IM
•1490 PRINT#8,CHR\$(LB);CHR\$(HB);: REM NEXT BASIC LINE	KG	•1890 :	DI
		•1900 : REM DISK I/O ERROR	DG
		•1910 :	DI
		•1920 INPUT#15,EN\$,EM\$,ET\$,ES\$: EN=VAL(EN\$)	IM
		•1930 IF EN=0 THEN 1970	IO
		•1940 PRINT"DISK I/O ERROR ";	OM
		•1950 PRINT EN\$,EM\$,ET\$,ES\$	PG
		•1960 CLOSE 8: CLOSE 15: STOP	NN
		•1970 RETURN	IM

MOXEY'S PORCH

FROM PAGE 73

•10 POKE52,48:POKE56,48:CLR	HJ	•350 LV=VAL(LV\$)+1	CI
•20 REM * MOXEYS PORCH * BY BOB BLACKMER	NK	•360 PRINT"[CLEAR]":POKE53272,(PEEK(53272)AND240)+14	HB
•30 DIMMV(136):HS=0:A=2:B=39:C=41:MP\$="MOKEYS PORCH":PS=53270	PO	•370 POKE53282,2:POKE53283,7:POKE53270,PEEK(53270)OR16	HM
•40 V=53248:S=54272:M=56320:POKEV+21,65:POKE53280,6:POKE53281,11:U=1401	MN	•380 X2=203:Y2=166:X1=157:Y1=102:U=1401	JD
•50 FORL=STOS+24:POKEL,0:NEXTL	HA	•390 IFLV-1<1THENLV=2	CP
•60 POKES+5,21:POKES+1,20:POKES+6,240:POKES+4,17:GOSUB1110	AJ	•400 LV=LV-1	MF
•70 PRINT"[CLEAR][HOME][DOWN][DOWN][RVSON][YELLOW]DO YOU WANT INSTRUCTIONS? (Y/N)"	DH	•410 PRINT"[HOME]"TAB(12)"[3"[DOWN]]"[CYAN]"MP\$	AA
•80 GETI\$:IFI\$=""THEN80	HD	•420 GOTO450	CN
•90 IFI\$="N"THEN300	IH	•430 JV=PEEK(M):FR=JVAND16	ON
•100 IFI\$<>"Y"THEN80	AD	•440 JV=15-(JVAND15):RETURN	CG
•110 PRINT"[CLEAR][HOME]"TAB(11)"[c 6]"MP\$"[DOWN][DOWN]"	KN	•450 PRINT"[HOME][7"[DOWN]]"[c 6]"	AH
•120 PRINT"[DOWN][CYAN]ENZO[7" "]JUST GOT A POGO STICK AND"	GH	•460 PRINTTAB(17)"#\$"	GM
•130 PRINTTAB(11)"JUMPED OVER TO HIS NEIGHBORS"	KP	•470 PRINTTAB(16)"#%&\$"	KL
•140 PRINTTAB(11)"MULTI-STEP FRONT PORCH.[3"[DOWN]]"	AI	•480 PRINTTAB(15)"#%&&\$"	OO
•150 PRINT"[YELLOW]MOXIE[6" "]DOESN'T LIKE THE MARKS"	KA	•490 PRINTTAB(14)"#%&&&\$"	DJ
•160 PRINTTAB(11)"ENZO'S POGO STICK IS MAKING"	JL	•500 PRINTTAB(13)"#%&&&&\$"	HI
•170 PRINTTAB(11)"ON HIS PORCH.[3"[DOWN]]"	FN	•510 PRINTTAB(12)"#%&&&&&\$"	BH
•180 PRINTTAB(3)"[c 8]TO PLAY USE JOYSTICK #2 AND MARK UP[5" "]ALL THE STEPS ON";	IE	•520 PRINTTAB(11)"#%&&&&&&\$"	FC
•190 PRINT" MOXIE'S PORCH,":PRINTTAB(3)"WHILE TRYING TO AVOID MOXIE'S PURSUIT"	CG	•530 PRINTTAB(10)"#%&&&&&&&\$"	GN
•200 PRINTTAB(3)"[UP]IF SUCCESSFUL YOU ARE REWARDED WITH"	BM	•540 PRINTTAB(9)"#%&&&&&&&&\$"	HK
•210 PRINTTAB(3)"ANOTHER PORCH AND A FASTER MOXIE.[DOWN][DOWN]"	KJ	•550 PRINTTAB(8)"#%&&&&&&&&&\$"	HJ
•220 POKEV+23,65:POKEV+29,65:POKE2040,P:P	CL	•560 PRINTTAB(8)"'('('('('('('('('('('":POKES+24,15	BM
•230 POKEV,60:POKEV+1,70	BG	•570 FORL=1TO136 STEP2	MJ
•240 POKEV+12,60:POKEV+13,110	FP	•580 POKES+4,17:POKES+1,55:POKES+4,16	LJ
•250 PRINTTAB(10)"[RVSON][c 6]HIT ANY KEY TO BEGIN":FORK=1TO99:NEXTK	ND	•590 X2=X2+MV(L):Y2=Y2+MV(L+1)	NB
•260 GETS\$:IFS\$=""THEN280	HF	•600 FORG=LVTO1STEP-1	HE
•270 IFS\$<>"N"THEN290	OP	•610 K=1:GOSUB430	JF
•280 PRINTTAB(10)"[UP]HIT ANY KEY TO BEGIN[UP]":FORK=1TO99:NEXTK:GOTO250	EG	•620 POKE2040,P:IFK<>LVTHENK=K+1:GOTO620	BI
•290 POKEV+23,0:POKEV+29,0	CH	•630 POKE2046,Q	ON
•300 SL=0	IA	•640 REM ***NOTE*** LINES 650-660 MUST BE ENTERED USING ABBREVIATIONS	NG
•310 PRINT"[CLEAR][HOME][3"[DOWN]]"TAB(7)"LEVEL (1-9)"	GH	•650 POKEV,X1:POKEV+1,Y1:IFPEEK(U)=37THEN POKEU,C:POKEU+1,C+1:SC=SC+1:POKES+4,129:	OM
•320 PRINT"[DOWN]"TAB(7)"1 IS THE HARDEST"	EK	•660 POKEV,X1:POKEV+1,Y1:IFPEEK(U)=39THEN POKEU,43:POKEU+1,44:SC=SC+1:POKES+4,129:	HG
•330 GETLV\$:IFLV\$=""THEN330	DO	•670 POKEV+12,X2:POKEV+13,Y2	KG
•340 IFLV\$<"1"ORLV\$>"9"THEN330	FD	•680 P=P+1:IFP>15THENP=13	IL
		•690 Q=Q+1:IFQ>199THENQ=198	OP
		•700 IFP=14THENPOKES+4,129:POKES+4,128	JD
		•710 IFJV=4THENX1=X1-16:U=U-A:IFPEEK(U)=32THENU=U+A:X1=X1+16	PO
		•720 IFJV=8THENX1=X1+16:U=U+A:IFPEEK(U)=32ORPEEK(U)=36THENU=U-A:X1=X1-16	BP
		•730 IFJV=5THENX1=X1-8:Y1=Y1-8:U=U-C:IFPEEK(U)=32THENU=U+C:X1=X1+8:Y1=Y1+8	EN
		•740 IFJV=6THENX1=X1-8:Y1=Y1+8:U=U+B:IFPEEK(U)=32THENU=U-B:X1=X1+8:Y1=Y1-8	JO
		•750 REM ***NOTE*** LINES 760-770 MUST BE ENTERED USING ABBREVIATIONS	DO
		•760 IFJV=9THENX1=X1+8:Y1=Y1-8:U=U-B:IFPEEK(U)=32ORPEEK(U)=36THENU=U+B:X1=X1-8:Y1=Y1+8	PM


```

•770 IF JV=10 THEN X1=X1+8:Y1=Y1+8:U=U+C:IFP
EEK(U)=40 OR PEEK(U)=32 THEN U=U-C:X1=X1-8:Y
1=Y1-8 OC
•780 IF SC=55 THEN 970 JM
•790 IF Y1=Y2 AND X1-2=X2 THEN 810 AN
•800 NEXT G:NEXT L:GOTO 570 CA
•810 POKE V+23,64:POKE V+29,64:POKE S+4,17:P
OKES+6,240:X2=180:Y2=166:POKE 2046,199 MJ
•820 FOR L=1 TO 99 STEP 2 KJ
•830 X2=X2+MV(L):Y2=Y2+MV(L+1) NB
•840 POKE V+12,X2:POKE V+13,Y2 KG
•850 POKES+1,L+20 EL
•860 FOR K=1 TO 40:NEXT K MC
•870 NEXT L MO
•880 POKES+24,0:POKE V+23,0:POKE V+29,0:PRI
NT "[CLEAR]":POKE PS+2,21:POKE PS,PEEK(PS)A
ND 239 BD
•890 SL=SL+SC*10:SC=0:PRINT SPC(12)"[YELLO
W][RVSON]"MP$:PRINT TAB(11)"[DOWN][c 6]YO
UR SCORE:[YELLOW]":SL JI
•900 IF SL>HSTHEN HS=SL BI
•910 PRINT TAB(11)"[DOWN][c 8]HIGH SCORE:"
;HS JM
•920 PRINT "[YELLOW][RVSON][DOWN][DOWN][RI
GHT][RIGHT]WOULD YOU LIKE TO PLAY AGAIN?
(Y/N)" GD
•930 GET F$:IF F$="" THEN 930 JF
•940 IF F$="N" THEN POKE V+21,0:POKE S+24,0:PR
INT "[CLEAR]":END FC
•950 IF F$<>"Y" THEN 930 CC
•960 GOTO 300 BP
•970 POKE V+23,1:POKE V+29,1:POKE S+4,17:POK
ES+6,240:X1=170:Y1=166 OI
•980 FOR L=1 TO 99 STEP 2 KJ
•990 X1=X1+MV(L):Y1=Y1+MV(L+1) HF
•1000 POKE V,X1:POKE V+1,Y1 GE
•1010 POKES+1,L+20 EL
•1020 FOR K=1 TO 40:NEXT K MC
•1030 NEXT L MO
•1040 SL=SL+SC*10 FM
•1050 POKES+24,0:POKE V+23,0:POKE V+29,0:PR
INT "[CLEAR]":POKE PS+2,21:POKE PS,PEEK(PS)
AND 239 BD
•1060 PRINT TAB(12)"[DOWN][DOWN][CYAN][RVS
ON]"MP$:PRINT TAB(13)"[DOWN][YELLOW]SCORE
:":SL:SC=0 BE
•1070 IF LV-1<1 THEN LV=2 CP
•1080 PRINT TAB(10)"[YELLOW][DOWN][DOWN]YO
U HAVE REACHED":PRINT TAB(14)"[DOWN]LEVEL
:[c 6]":LV-1 CG
•1090 FOR K=1 TO 150:NEXT K AP
•1100 POKES,PEEK(PS)OR 16:POKE PS+2,(PEEK(
PS+2)AND 240)+14:GOTO 360 LH
•1110 PRINT "[CLEAR][HOME][5][DOWN]":[YELL
OW]I'M WORKING[4"."]PLEASE BE PATIENT" MO
•1120 POKE 56334,PEEK(56334)AND 254:POKE 1,P
EEK(1)AND 251 BE
•1130 FOR I=0 TO 57 MF

```

```

•1140 FOR J=0 TO 7 IC
•1150 POKE 14336+I*8+J,PEEK(V+I*8+J) PM
•1160 NEXT J:NEXT I NB
•1170 POKE 1,PEEK(1)OR 4:POKE 56334,PEEK(563
34)OR 1 IE
•1180 CK=0:FOR CH=35 TO 45 PB
•1190 FOR BY=0 TO 7 NE
•1200 READ NU:CK=CK+NU IC
•1210 POKE 14336+(8*CH)+BY,NU JH
•1220 NEXT BY:NEXT CH GL
•1230 IF CK<>10450 THEN PRINT "ERROR IN DATA-
LINES 1300-1400":END DP
•1240 CK=0:FOR S1=832 TO 894:READ Q1:CK=CK+Q1
:POKE S1,Q1:NEXT NF
•1250 FOR S2=896 TO 958:READ Q2:CK=CK+Q2:POKE
S2,Q2:NEXT HB
•1260 FOR S3=960 TO 1022:READ Q3:CK=CK+Q3:POK
ES3,Q3:NEXT JN
•1270 FOR S4=12672 TO 12734:READ Q4:CK=CK+Q4:
POKE S4,Q4:NEXT LJ
•1280 FOR S5=12736 TO 12798:READ Q5:CK=CK+Q5:
POKE S5,Q5:NEXT P=13:Q=198 OP
•1290 IF CK<>8699 THEN PRINT "ERROR IN DATA-L
INES 1410-1800":END MK
•1300 CK=0:FOR W=1 TO 136 STEP 2:READ Q6,Q7:MV(
W)=Q6:MV(W+1)=Q7:CK=CK+Q6+Q7:NEXT W DA
•1310 IF CK<>0 THEN PRINT "ERROR IN DATA LINE
S 1810-1870":END OG
•1320 POKE V+28,65:POKE V+37,6:POKE V+38,5:P
OKE V+45,0:POKE V+39,15:RETURN PE
•1330 DATA 0,0,0,0,2,10,42,170 CJ
•1340 DATA 0,0,0,0,128,160,168,170 MH
•1350 DATA 106,90,86,85,85,149,165,169 KO
•1360 DATA 171,175,191,255,255,254,250,234 PI
•1370 DATA 106,90,86,85,85,21,5,1 KL
•1380 DATA 171,175,191,255,255,252,240,192 DA
•1390 DATA 104,90,86,85,85,149,165,169 PE
•1400 DATA 43,175,191,255,255,254,250,234 HM
•1410 DATA 104,90,86,85,85,21,5,1 FB
•1420 DATA 43,175,191,255,255,252,240,192 AO
•1430 DATA 0,0,0,0,0,0,0,0 FG
•1440 DATA 0,0,0,0,0,0,0,0 FG
•1450 DATA 0,0,0,0,0,112,0,0 JP
•1460 DATA 136,0,1,4,0,0,112,0 ND
•1470 DATA 1,84,0,4,81,0,4,169 EA
•1480 DATA 0,1,36,0,0,32,0,1 KP
•1490 DATA 36,0,1,36,0,1,36,0 NN
•1500 DATA 1,36,0,1,36,0,0,168 HF
•1510 DATA 0,0,32,0,0,32,0,0 EK
•1520 DATA 0,0,0,0,0,0,0,0 FG
•1530 DATA 0,0,0,0,0,0,0,0 FG
•1540 DATA 0,0,0,112,0,0,136,0 GI
•1550 DATA 1,4,0,0,112,0,1,84 PO
•1560 DATA 0,4,81,0,4,169,0,1 NK
•1570 DATA 36,0,0,32,0,1,36,0 NC
•1580 DATA 1,36,0,1,36,0,1,36 CK
•1590 DATA 0,1,36,0,0,168,0 IA
•1600 DATA 0,0,0,0,0,0,0,112 JP

```


IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

IC
PM
NB

IE
PB
NE
IC
JH
GL

DP

NF

HB

JN

LJ

OP

MK

DA

OG

PE
CJ
MH
KO
PI
KL
DA
PE
HM
FB
AO
FG
FG
JP
ND
EA
KP
NN
HF
EK
FG
FG
GI
PO
NK
NC
CK
IA
JP

```

•161 DATA 0,0,136,0,1,4,0,0
•162 DATA 112,0,1,84,0,4,81,0
•163 DATA 4,169,0,1,36,0,0,32
•164 DATA 0,1,36,0,1,36,0,1
•165 DATA 36,0,1,36,0,1,36,0
•166 DATA 0,168,0,0,32,0,0,32
•167 DATA 0,0,0,0,0,0,0,0
•168 DATA 0,0,0,0,0,0,0,0
•169 DATA 0,0,0,0,0,0,0,0
•170 DATA 0,0,0,0,0,0,0,0
•171 DATA 0,0,0,0,42,0,0,170
•172 DATA 128,2,235,160,2,170,160,2
•173 DATA 255,224,2,170,160,0,170,128
•174 DATA 0,42,0,0,34,0,2,162
•175 DATA 160,0,0,0,0,0,0,0
•176 DATA 0,0,0,0,0,0,0,0
•177 DATA 0,0,0,0,0,0,0,0
•178 DATA 0,0,0,0,0,0,0,0
•179 DATA 0,0,0,0,0,0,0,0
•180 DATA 0,0,42,0,0,170,128,2
•181 DATA 235,160,2,170,160,2,255,224
•182 DATA 2,191,160,0,170,128,0,42
•183 DATA 0,0,34,0,2,162,160
•184 DATA -16,0,-16,0,-16,0,-16,0,-16,0,8
      , -8,8,-8,8,-8,8,-8,8,-8,8
•185 DATA -8,-8,8,-8,8,-8,8,8,8,8,8,8,8,8,8,8
      , -8,8,-8,8,-16,0
•186 DATA -16,0,-16,0,-8,8,16,0,16,0,-8,-
      8,-8,-8,8,-8,8,-8,8,-8,8
•187 DATA 8,8,8,8,8,8,8,8,-8,8,-8,8,-8,8,
      16,0,16,0,16,0
•188 DATA 16,0,-8,-8,-8,-8,-16,0,8,8,-8,8
      ,-16,0,-16,0
•189 DATA -16,0,8,-8,8,-8,-8,-8,8,-8,-16,
      0,-16,0,-16,0,-8,8
•190 DATA -8,8,-8,8,-8,8,16,0,16,0,16,0,1
      6,0,8,-8,16,0,16,0,16,0

```

FILE LOCK FROM PAGE 62

T-12

```

•5 REM FILE LOCK V0222/85
•10 GOTO 100000
•50 POKE 198,0
•52 GET A$:IF A$="" THEN GOTO 52
•55 RETURN
•70 REM WAIT FOR RETURN
•80 POKE 198,0:POKE 204,0
•85 GET A$:POKE 207,0:IF A$<>CHR$(13) THEN
  GOTO 85
•90 POKE 204,1:PRINT " "CHR$(157);:RETURN
•100 REM WAIT FOR KEY
•105 POKE 198,0:POKE 204,0
•110 GET A$:POKE 207,0:IF A$="" THEN GOTO
  110

```

```

OK •115 POKE 204,1:PRINT " "CHR$(157);:RETUR
GC N
FF •150 REM BOX ROUTINE
JG •152 GOSUB 190
NN •155 PRINT CHR$(117);:FOR I=0 TO W-2:PRIN
AH T CHR$(99);:NEXT I:PRINT CHR$(105);
PD •158 FOR J=0 TO H-2:RW=RW+1:GOSUB 190
FG •160 PRINT CHR$(103);:FOR I=0 TO W-2:PRIN
FG T " ";:NEXT I:PRINT CHR$(104);
FG •161 NEXT J
LO •162 RW=RW+1:GOSUB 190
PG •165 PRINT CHR$(106);:FOR I=0 TO W-2:PRIN
HC T CHR$(99);:NEXT I:PRINT CHR$(107);
BC •170 PRINT BL$;:RETURN
GB •190 REM SET CURSOR LOCATION
FG •195 POKE 214,RW:POKE 211,CL:SYS 58640:RE
FG TURN
FG •200 REM READ DIRECTORY
FG •210 OPEN 15,8,15,"IO":OPEN 2,8,2,"#"
AC •220 TK=18:SC=1:NF=0
JA •230 PRINT#15,"U1";2;0;TK;SC
CK •240 GET#2,A$:A$=A$+CHR$(0):T=ASC(A$)
LJ •250 GET#2,A$:A$=A$+CHR$(0):S=ASC(A$)
GK •260 FOR F=0 TO 7:REM 8 ENTRIES/SEC
      •270 PRINT#15,"B-P";2;F*32+2
      •275 GET#2,A$:IF A$="" THEN A$=CHR$(0)
      •280 A=ASC(A$):IF ASC(A$)=0 THEN GOTO 325
      •285 L$=">":IF (A AND 64) =0 THEN L$="[SS
      J"
      •290 GET#2,A$:GET#2,A$
      •300 F$=L$+""
      •305 FOR I=0 TO 15:GET#2,A$:IF A$="" THEN
        N A$=CHR$(0)
      •310 IF ASC(A$)=160 THEN GOTO 320
      •315 F$=F$+A$
      •320 NEXT I
      •322 FL$(NF)=F$:S(NF)=SC:EN(NF)=F:NF=NF+1
      •325 NEXT F
      •330 IF T<>0 THEN TK=T:SC=S:GOTO 230
      •335 CLOSE2:CLOSE15
      •340 NF=NF-1:RETURN
      •400 REM PRINT FORMATTED SCREEN
      •405 PRINT CHR$(147);:PRINT HD$:PRINT
      •410 RW=2:CL=0:H=20:W=19:GOSUB 150:
      •415 RW=2:CL=20:H=20:W=19:GOSUB 150
      •450 REM FILL SCREEN WITH FILES
      •455 RW=3:CL=1:GOSUB 190:ZN=0
      •460 FOR J=0 TO 18:I=PG*38+ZN*19+J
      •462 IF SF(I)=0 THEN PRINT FL$(I);:GOTO 4
        64
      •463 IF SF(I)=1 THEN PRINT RV$FL$(I)RO$;
      •464 RW=RW+1:GOSUB 190:NEXT J
      •465 RW=3:CL=21:GOSUB 190:ZN=1
      •470 FOR J=0 TO 18:I=PG*38+ZN*19+J
      •472 IF SF(I)=0 THEN PRINT FL$(I);:GOTO 4
        74
      CM

```

KP
JJ
CO

MC
LI

FG
MM
EF

PE
EF
OH

AF
HI
EI
DO
LN
NL
AG
LM
NK
LB
BK

OA
GE
ID

CD
BM
IO
MN
IP
MI
CJ
BI
IA
KA
KD
BM
GC
EC
GE
CM

OG
FM
HF
MD
CM

PD

AHOY! 93


```

.473 IF SF(I)=1 THEN PRINT RV$FL$(I)RO$;
.474 RW=RW+1:GOSUB 190:NEXT J
.475 ZN=0:RETURN
.500 REM SCRATCH
.510 NC$="SCRATCH FILES "
.515 GOSUB 800
.519 OPEN 15,8,15
.520 FOR I=0 TO NF:IF SF(I)=0 THEN GOTO 540
.525 F$=FL$(I):IF LEFT$(F$,1)=">" THEN GO TO 540
.530 F$=RIGHT$(F$,LEN(F$)-1)
.535 PRINT#15,"S0:"F$:GOSUB 900
.540 NEXT I
.550 CLOSE 15
.599 RETURN
.600 REM LOCK
.610 NC$="[3" "]"LOCK FILES "
.615 GOSUB 800
.619 OPEN 15,8,15:OPEN 2,8,2,"#"
.620 FOR I=0 TO NF:IF SF(I)=0 THEN GOTO 660
.630 GOSUB 690
.635 GET#2,A$:IF A$="" THEN A$=CHR$(0)
.640 FT=ASC(A$):FT=(FT OR 64)
.650 GOSUB 680
.655 GOSUB 900
.660 NEXT I
.670 CLOSE 2:CLOSE15:RETURN
.680 GOSUB 695:PRINT#2,CHR$(FT);
.684 PRINT#15,"B-P";2;0
.685 PRINT#15,"U2";2;0;18;S(I):RETURN
.690 PRINT#15,"U1";2;0;18;S(I)
.695 PRINT#15,"B-P";2;EN(I)*32+2:RETURN
.699 RETURN
.700 REM UNLOCK
.705 RW=1:CL=12:GOSUB 190

```

```

FM .710 NC$=" UNLOCK FILES "
HF .715 GOSUB 800
EO .719 OPEN 15,8,15:OPEN 2,8,2,"#"
KM .720 FOR I=0 TO NF:IF SF(I)=0 THEN GOTO 660
KJ 60
CI .730 GOSUB 690
AM .735 GET#2,A$:IF A$="" THEN A$=CHR$(0)
JB .740 FT=ASC(A$):FT=(FT AND 191)
.750 GOSUB 680:GOSUB 900
.760 NEXT I
KP .770 CLOSE 2:CLOSE15:RETURN
BL .800 REM SELECT FILES
NM .805 RW=1:CL=12:GOSUB 190:PRINT YL$NC$;
MN .806 RW=24:CL=0:GOSUB 190:PRINT CD$;
AB .807 RW=3:CL=18:GOSUB 190:PRINT AR$;:J=0
IM .810 GOSUB 50
MA .811 IF A$=CM$ THEN RETURN
EB .812 IF A$=CHR$(13) THEN GOSUB 820:GOTO 810
CI 810
EI .813 IF A$=AR$ THEN GOTO 10000:REM EXIT A ND START OVER
JL .814 IF A$=CHR$(19) THEN GOSUB 190:PRINT " ";:GOSUB 10000:GOTO 805
CP " ";:GOSUB 10000:GOTO 805
LB .815 IF A$=CHR$(157) THEN GOSUB 890:GOTO 810
GK 810
CO .816 IF A$=CHR$(17) THEN GOSUB 840:GOTO 810
DB 810
MN .817 IF A$=CHR$(145) THEN GOSUB 860:GOTO 810
ON 810
DO .818 IF A$=CHR$(29) THEN GOSUB 880:GOTO 810
AF 810
IJ .819 GOTO 810
LP .820 TP=CL:CL=CL-17:I=PG*38+ZN*19+J
NM .821 IFSF(I)=1THENGOSUB190:PRINTCHR$(146) FL$(CF+I);:SF(I)=0:GOTO 824
IM FL$(CF+I);:SF(I)=0:GOTO 824
GE .823 IF SF(I)=0 THEN GOSUB 190:PRINT CHR$(18)FL$(CF+I)CHR$(146);:SF(I)=1
PA (18)FL$(CF+I)CHR$(146);:SF(I)=1
.824 CL=TP:RETURN
.840 I=PG*38+ZN*19+J:IF I=NF THEN RETURN
.841 J=J+1:IF J>19 THEN J=19
.844 GOSUB 190:PRINT " ";
.845 RW=RW+1:IF RW>21 THEN RW=21:J=J-1
.850 GOSUB 190:PRINT AR$;:RETURN
.860 J=J-1:IF J<0 THEN J=0
.861 GOSUB 190:PRINT " ";
.865 RW=RW-1:IF RW<3 THEN RW=3
.870 GOSUB 190:PRINT AR$;:RETURN
.880 IF NF<PG*38+19 THEN RETURN
.885 GOSUB 190:PRINT " ";:RW=3:CL=38:J=0: ZN=1:GOSUB 190:PRINT AR$;:RETURN
.890 REM
.895 GOSUB 190:PRINT " ";:RW=3:CL=18:J=0: ZN=0:GOSUB 190:PRINT AR$;:RETURN
.900 INPUT#15,A$,B$,C$,D$
.905 RW=23:CL=0:GOSUB 190:PRINT "[38" "]" ;
.910 RW=23:CL=0:GOSUB 190:PRINT A$"[SS]"B $"[SS]"C$"[SS]"D$;:ER=1:RETURN

```

KA
CI
EI
JI
CP
LB
JA
KD
MN
ON
LL
HI
KM
CE
PP
IL
EF
KN
MO
GF
DL
GF
GM
CN
MP
EA
OO
LM
KD
KJ
JI
EK
KL
PD
JI
EF
KL
LF
FK
JD
KJ
CN
MO
MK

PROGRAMMERS!

Ahoy! wishes to continue publishing the best Commodore-compatible programs available in magazines today. We're looking for games, utilities, educational, music, and graphics programs, and programs that completely defy description. If you have an original C-64, C-128, or VIC 20 program, in BASIC or machine language, we'd like to see it. Payment will be made upon acceptance, at competitive industry rates. You will also receive royalties based on the sale of our program disks.

Send a copy of your program on disk or tape, accompanied by a printout and documentation, to Ahoy!, 45 West 34th Street— Suite 407, New York, NY 10001. Include a self-addressed mailer with sufficient return postage affixed. (Program printouts not accompanied by a disk or tape will be returned unread; programs not accompanied by sufficient return postage will not be returned.)

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

•920 ER=0:RETURN
•1000 IF NF<38 THEN RETURN
•1005 PG=PG+1:IF PG*38>NF THEN PG=0
•1010 GOSUB 400:RETURN
•10000 CLR:DIM FL$(76),S(76),EN(76),SF(76)
•10005 BL$=CHR$(154):YL$=CHR$(158):RV$=CHR$(18):RO$=CHR$(146):AR$=CHR$(95)
•10010 POKE 53280,11:POKE 53281,0:PRINT CHR$(147)BL$;
•10012 CD$=BL$+" <CRSR> <HOME>"+YL$+" MOVES "+BL$+" <RTRN>"+YL$+" SELECTS [SS]"+BL$
•10015 HD$=CHR$(18)+"[10 " " ]FILE LOCK V0[3"2"]/85[12 " " ]+CHR$(146)
•10020 PRINT HD$;
•10030 PRINT:PRINT "INSERT DISK AND HIT "YL$"<RETURN>"BL$;
•10035 GOSUB 70:PRINT:PRINT "READING DIRECTORY":
•10040 GOSUB 200:PG=0:ZN=0:GOSUB 400
•10050 RW=24:CL=0:GOSUB 190
•10055 PRINTYL$ "SCRATCH LOCK UNLOCK PAGE BOOT QUIT ? "BL$CHR$(157);
•10056 GOSUB 100
•10060 IF A$="Q" THEN END
•10065 IF A$="S" THEN PRINT A$;:CM$=A$:GOSUB 500:GOTO 10000
•10070 IF A$="L" THEN PRINT A$;:CM$=A$:GOSUB 600:GOTO 10000
•10075 IF A$="U" THEN PRINT A$;:CM$=A$:GOSUB 700:GOTO 10000
•10080 IF A$="B" THEN PRINT A$;:GOTO 10000
•10085 IF A$="P" THEN PRINT A$;:GOSUB 100
•10090 GOTO 10050
•60000 CLOSE 15:OPEN 15,8,15,"IO:":CLOSE 15
•60001 SAVE "@0:FILE LOCK V0[3"2"]",8
•61000 OPEN 15,8,15:INPUT#15,A$,B$,C$,D$
•61001 PRINT:PRINT A$"[SS]"B$"[SS]"C$"[SS]"D$:CLOSE15:STOP

```

```

EN OKE 644,127
IJ •9 REM *** SET-UP SUBROUTINES ***
MF •10 GOSUB 600:REM (VIDEO MEMORY)
OJ •11 GOSUB 700:REM (BACKGROUND STRING)
EP •12 GOSUB 800:REM (SPRITE SHAPES)
BE •13 GOSUB 900:REM (SPRITE POSITIONS)
ED •15 GOTO 100
•98 REM *** ACTION LOOP ***
•100 K=KP(PEEK(653)):IF K>2 OR EG=1 THEN 300
•105 IF K>1 THEN 130
•110 HP=HP+K(K):IF HP<0 THEN HP=HZ
•115 IF HP>HZ THEN HP=0
•120 IF K<>XK THEN XK=K:POKE LT(0),ST(XK)
•125 POKE HT(0),HH(HP):POKE HR,HB(HP)
•130 IF VAL(TI$)>=DT THEN GOSUB 500
•135 IF PEEK(CF)>0 THEN GOSUB 400
•196 GOTO 100
•198 REM *** WAIT FOR RESPONSE ***
•296 RETURN
•298 REM *** ENDING ROUTINES ***
•300 PRINT "[CLEAR]FINAL SCORE: "RT*100+VP*10:PRINT:PRINT:VP=15:POKE VT(0),VV(VP)
•310 PRINT "TO PLAY AGAIN, PRESS P":PRINT "TO QUIT, PRESS Q":HP=79
•315 HP=79:POKE HR,HB(HP):POKE HT(0),HH(HP):XP=1:POKE LT(0),ST(XP)
•320 Z=PEEK(203):IF Z=62 THEN 370
•325 POKE HT(0),HH(HP):POKE HR,HB(HP)
•330 HP=HP+1:IF HP>HZ THEN HP=0
•345 IF Z<>41 THEN 320
•350 EG=0:DL=0:DT=1:DS=5:RT=0:RC=0:GOSUB 930:GOTO 100
•369 REM ** PUT VIDEO MEMORY BACK TO FIRST BLOCK, AND SCREEN MEMORY TO 1024
•370 POKE 56578,PEEK(56578)OR3:POKE 56576,(PEEK(56576)AND 252)OR 3
•371 POKE 53272,20:POKE 648,4
•379 REM ** REENABLE SHIFT/COMMODORE AND RUN-STOP/RESTORE
•380 POKE 657,0:POKE 792,71:POKE 808,237
•390 END
•398 REM *** COLLISION HANDLER ***
•399 REM ** END GAME?
•400 VP=VP-1:IF VP<0 THEN EG=1:RETURN
•401 REM ** MOVE UP
•402 POKE VT(0),VV(VP)
•403 REM ** CLEAR COLLISION REGISTER
•404 Z=PEEK(CS):Z=PEEK(CF)
•405 REM ** NEW COLLISION?
•406 IF PEEK(CF)>0 THEN 400
•496 RETURN
•498 REM *** SCROLL ROUTINE ***
•499 REM ** NEW ROW OR SIMPLE JUMP?
•500 IF RC=DS THEN 506

```

KG
OF
II
BM
PB
IE
CF
KJ
NO
AG
HE
KM
KN
AO
EB
NA
CF
HO
IM
NL
NM
JE
JM
EA
AO
FJ
PE
AK
EG
MB
OM
FB
PK
IC
IG
CE
PN
NJ
MD
BF
KI
ON
FC
IM
JF
PJ
NB

ROCKETS, BOATS & PIGS IN POKES

FROM PAGE 18 PIG IN A POKE

```

•1 REM *** PIG IN A POKE ***
•2 REM AN EXAMPLE OF GAME PROGRAMMING WITH A SPRITE
•4 REM ** MOVE TOP OF MEMORY TO MAKE ROOM FOR VIDEO BLOCK AT 32768
•5 POKE 55,255:POKE 56,127:POKE 643,255:P

```



```

•501 REM ** SIMPLE JUMP
•502 PRINT "[HOME][25"[DOWN]]"[HOME]";
•503 RC=RC+1:GOTO 520
•505 REM ** PUT NEW ROW ON SCREEN
•506 PRINT "[HOME][24"[DOWN]]"MID$(WS$,W
L(DL)+INT(19*RND(9)),40)"[HOME]";
•508 RC=0:RT=RT+1:DL=DL+1:IF DL>8 THEN DL
=0:DS=DS-1
•509 REM ** END OF GAME?
•510 IF RT>49 THEN EG=1
•520 IF PEEK(CF)>0 THEN GOSUB 400:REM **
COLLISION
•580 POKE 217,L1:POKE 218,L2
•589 REM ** RESET TIMER
•590 TI$="[6"0"]"
•596 RETURN
•598 REM *** ARRANGE MEMORY ***
•599 REM USE THIRD VIDEO BLOCK (32768 TO
49151), SO ROM CHARACTER SET IS USABLE.
•600 VB=32768:POKE 56578,PEEK(56578)OR3:P
OKE 56576,(PEEK(56576)AND 252)OR 1
•601 REM ** TELL VIC-2 WHERE SCREEN IS WI
THOUT CHANGING CHARACTER SET LOCATION
•602 SB=0:POKE 53272,(SB*16)+4:SB=VB+1024
*SB
•603 REM ** TELL BASIC WHERE SCREEN IS
•604 BB=SB/256:POKE 648,BB
•608 REM *** REGISTER ADDRESSES ***
•609 REM ** SPRITE SHAPE LOCATION TABLE
•610 LT(0)=SB+1016:FOR I=1 TO 7:LT(I)=LT(
I-1)+1:NEXT
•611 REM ** SPRITE COLOR TABLE
•612 CT(0)=53287:FOR I=1 TO 7:CT(I)=CT(I-
1)+1:NEXT
•613 REM ** SPRITE HORIZONTAL POSITION TA
BLE (LOW BYTES)
•614 HT(0)=53248:FOR I=1 TO 7:HT(I)=HT(I-
1)+2:NEXT
•615 REM ** SPRITE VERTICAL POSITION TABL
E
•616 VT(0)=53249:FOR I=1 TO 7:VT(I)=VT(I-
1)+2:NEXT
•617 REM ** SPRITE HORIZONTAL HIGH-BIT RE
GISTER
•618 HR=53264
•619 REM ** SPRITE ENABLE REGISTER
•620 ES=53269
•621 REM ** VERTICAL EXPANSION REGISTER (
1=DOUBLE HEIGHT)
•622 VE=53271
•623 REM ** HORIZONTAL EXPANSION REGISTER
(1=DOUBLE WIDTH)
•624 HE=53277
•625 REM ** SPRITE PRIORITY REGISTER (1=S
PRITE IS IN FRONT OF FOREGROUND)
•626 PR=53275
•627 REM ** MULTICOLOR ENABLE REGISTER (1
=MULTI-COLOR ENABLED)

```

```

NJ •628 EM=53276
OJ •629 REM ** SPRITE MULTICOLOR COLOR REGIS
CK TERS
BG •630 MR=53285:REM ('01' REGISTER: ADD 1 T
O MR FOR '11' REGISTER)
PL •631 REM ** SPRITE-SPRITE COLLISION REGIS
TER
AJ •632 CS=53278
LE •633 REM ** SPRITE-FOREGROUND COLLISION R
GG EGISTER
KN •634 CF=53279
PJ •635 REM ** SET-BIT AND CLEAR-BIT VALUES
NP :NEXT
NI •636 BS(0)=1:FOR I=1 TO 7:BS(I)=2*BS(I-1)
IM •637 FOR I=0 TO 7:BC(I)=255-BS(I):NEXT
KB •638 REM *** INITIALIZE VALUES ***
AL •639 REM ** FOREGROUND COLOR
CN •640 POKE 53281,9:PRINT "[CLEAR][c 2]";R
EM (BROWN)
GA •641 REM ** BACKGROUND COLOR
MO •642 POKE 53281,5 :REM (GREEN)
GB •643 REM ** BORDER COLOR
AK •644 POKE 53280,9:REM (BROWN)
EJ •645 REM ** SPRITE COLORS (DEFAULTS: WHI,
RED,L-GRN,PUR,GRN,BLU,YEL,M-GRAY)
IF •646 POKE CT(0),1:REM (THE PIG IS WHITE)
AF •647 REM ** SET PRIORITY
LA •648 POKE PR,0:REM (ALL IN FRONT)
AN •649 REM ** SET HORIZONTAL SIZES
CH •650 POKE HE,0:REM (ALL NORMAL WIDTH)
KC •651 REM ** SET VERTICAL SIZES
IJ •652 POKE VE,0:REM (ALL NORMAL HEIGHT)
AJ •653 REM ** ENABLE SPRITES
IG •654 POKE ES,BS(0):REM (SPRITE 0 ONLY)
FB •689 REM *** SAFETY PROCEDURES ***
AF •690 POKE 657,128:REM DISABLE SHIFT/COMMO
FE DORE CHARACTER SET SWITCH
IB •691 POKE 808,234:POKE 792,193:REM DISABL
GC E STOP AND STOP/RESTORE
PL •696 RETURN
FC •698 REM *** BACKGROUND STRING ***
GM •700 WC$="[s v]":BC$=" "
FJ •709 REM SET UP WALL STRING
IM •710 FOR I=1 TO 12
•714 REM EACH WALL UNIT IS WIDER, EACH GA
P NARROWER
•715 FOR J=1 TO 5+I:WS$=WS$+WC$:NEXT
•720 FOR J=1 TO 15-I:WS$=WS$+BC$:NEXT
•725 NEXT
•729 REM SET WALL STARTING POINTS
•730 WL(0)=1:FOR I=1 TO 9:WL(I)=WL(I-1)+2
0:NEXT
•739 REM SET DIFFICULTY LEVELS (DL=SPACIN
G; DT=TIMING; DS=VERTICAL SPACING)
•740 DL=0:DT=1:DS=5
•796 RETURN
•798 REM *** SPRITE SHAPES ***
•799 REM ** NUMBER OF SPRITE SHAPES (-1);

```

EK
OH
LJ
OF
GA
MD
FK
BI
NE
LB
DK
FL
BC
DK
GM
BE
LM
IE
FI
EF
OD
BJ
AL
CC
PK
OD
KB
CM
OA
JJ
IM
FD
IH
GA
MP
CD
EA
GK
IA
JM
PD
PI
OJ
IM
CD

NUM
•800
•801
•802
+1:
•803
•804
:FO
•805
S (J,
•806
M,1
•807
•808
•809
SH
•810
•811
•812
•813
•814
•815
•816
•817
•818
•819
•820
•821
•822
•823
•824
•825
•826
•827
•828
•829
•830
•896
•898
•899
•900
)
•901
•902
=B
•903
•904
•905
•906
T
•919
•920
•921
(2)=
•922
•929
•930

EK	NUMBER OF LINES PER SPRITE SHAPE (-1)	CE	.931 POKE VT(0),VV(VP):POKE HT(0),HH(HP):	AC
OH	.800 NS=1:TS=9	GK	POKE HR,HB(HP)	
LJ	.801 REM ** LOCATE SPRITE SHAPE MEMORY	OM	.939 REM ** TELL VIC-2 WHERE TO FIND SPRITE SHAPE	HK
OF	.802 ST(0)=16:FOR I=1 TO NS:ST(I)=ST(I-1)+1:NEXT	HM	.940 POKE LT(0),ST(XK)	HF
GA	.803 REM ** LOOPS	HL	.949 REM ** CREATE SCREEN DISPLAY	ED
MD	.804 FOR I=0 TO NS:FOR J=0 TO TS:READ SS\$:FOR K=0 TO 2:X=0:Y=VB+ST(I)*64+J*3+K	IB	.950 PRINT "[CLEAR]";:FOR I=0 TO 5:FOR J=0 TO DS:PRINT "[DOWN]";:NEXT	IF
FK	.805 REM ** CONVERT STRINGS TO SHAPE BYTE S (USE BS(0-7) TO SET BITS)	LA	.955 PRINT MID\$(WS\$,1+INT(19*RND(9)),40);:NEXT:PRINT "[HOME]";	OK
BI	.806 FOR L=1 TO 8:M=L+8*K:M=ASC(MID\$(SS\$,M,1)):IF M=42 THEN X=X OR BS(8-L)	KC	.959 REM ** CLEAR SCREEN LINE LINK TABLE	KP
NE	.807 NEXT:POKE Y,X:NEXT:PRINT SS\$:NEXT	GO	.960 L1=PEEK(217)OR 128:L2=PEEK(218)OR 128:POKE 217,L1:POKE 218,L2	DN
LB	.808 Z=64-(TS*3+2):FOR J=Y+1 TO Y+Z:POKE J,0:NEXT:NEXT	PF	.969 REM ** CLEAR COLLISION REGISTERS	GC
DK	.809 REM SPRITE SHAPE DATA, 21 LINES PER SHAPE: *='ON' .='OFF'	MJ	.970 Z=PEEK(CF):Z=PEEK(CS)	IA
FL	.810 DATA "[5"."]*[14"."]**.."	HG	.989 REM ** SET CLOCK	EI
BC	.811 DATA "[5"."]**[4"."][6""]*[5"."]*."	GO	.990 TI\$="[6""]]"	NI
DK	.812 DATA "[4"."][16""]*.~"	IG	.996 RETURN	IM
GM	.813 DATA "[3"."]*.[16""]*[3"."]"	MG		
BE	.814 DATA "[22""].."	LK	.1 REM *** BASIC SPRITES ***	GC
LM	.815 DATA "[22""].."	LK	.2 REM A SHIP AND A ROCKET DEMONSTRATE SPRITE CREATION AND MOVEMENT	MN
IE	.816 DATA "[4"."][17""]*[3"."]"	HO	.9 REM *** SET-UP SUBROUTINES ***	OF
FI	.817 DATA "[6"."][14""]*[4"."]"	HC	.10 GOSUB 600:REM (VIDEO MEMORY)	II
EF	.818 DATA "[6"."]**.*[5"."]*.*[5"."]"	AC	.11 GOSUB 700:REM (BACKGROUND)	AA
OD	.819 DATA "[5"."]**.*[3"."]**.*[5"."]"	DC	.12 GOSUB 800:REM (SPRITE SHAPES)	PB
BJ	.820 REM ** 2ND SHAPE	CL	.13 GOSUB 900:REM (SPRITE POSITIONS)	IE
AL	.821 DATA ".*[14"."]*[6"."]"	JG	.15 GOTO 100	CF
CC	.822 DATA ".*[5"."][6""]*[4"."]**[6"."]"	FO	.98 REM *** ACTION LOOP ***	KJ
PK	.823 DATA ".*[16""]*[5"."]"	MG	.100 VP=VP+1:IF VP>VZ THEN VP=0	BH
OD	.824 DATA ".*[16""]*.~[4"."]"	IG	.110 HP=HP-1:IF HP<0 THEN HP=HZ	GG
KB	.825 DATA ".*[22""].."	BK	.120 POKE VT(1),VV(VP)	LO
CM	.826 DATA ".*[22""].."	BK	.130 POKE HT(0),HH(HP):POKE HR,HB(HP):POKE HT(1),HH(HP)	LP
OA	.827 DATA ".*[17""]*[5"."]"	HO	.140 WV=WV-1:IF WV<1 THEN WV=8	EG
BL	.828 DATA "[3"."][14""]*[7"."]"	KC	.150 PRINT DD\$MID\$(ST\$,WV,40)"[HOME]";	CI
JJ	.829 DATA "[4"."]**.*[5"."]*.*[7"."]"	MC	.196 GOTO 100	CF
IM	.830 DATA "[4"."]**.*[3"."]**.*[6"."]"	OC	.198 REM *** WAIT FOR RESPONSE ***	HO
FD	.896 RETURN	IM	.296 RETURN	IM
IH	.898 REM *** SPRITE POSITIONS ***	KA	.298 REM *** ENDING ROUTINES ***	NL
GA	.899 REM ** POSSIBLE POSITIONS DIM'ED	MK	.300 PRINT "[CLEAR]FINAL SCORE: "RT*100+VP*10:PRINT:PRINT:VP=15:POKE VT(0),VV(VP)	NM
MP	.900 VZ=19:HZ=147:DIM HH(HZ),VV(VZ),HB(HZ)	EJ	.310 PRINT "TO PLAY AGAIN, PRESS P":PRINT "TO QUIT, PRESS Q":HP=79	JE
CD	.901 REM ** ASSIGN HORIZONTAL VALUES	ML	.315 HP=79:POKE HR,HB(HP):POKE HT(0),HH(HP):XP=1:POKE LT(0),ST(XP)	JM
EA	.902 X=24:B=0:FOR I=0 TO HZ:HH(I)=X:HB(I)=B	DP	.320 Z=PEEK(203):IF Z=62 THEN 370	EA
GK	.903 X=X+2:IF X>255 THEN X=X-256:B=1	IA	.325 POKE HT(0),HH(HP):POKE HR,HB(HP)	AO
IA	.904 NEXT	LF	.330 HP=HP+1:IF HP>HZ THEN HP=0	FJ
JM	.905 REM ** ASSIGN VERTICAL VALUES	JN	.345 IF Z<>41 THEN 320	PE
PD	.906 X=53:FOR I=0 TO VZ:VV(I)=X:X=X+8:NEXT	EO	.350 EG=0:DL=0:DT=1:DS=5:RT=0:RC=0:GOSUB 930:GOTO 100	AK
IN	.919 REM ** KEYPRESS MATRIX	JA	.369 REM ** PUT VIDEO MEMORY BACK TO FIRST BLOCK, AND SCREEN MEMORY TO 1024	EG
PI	.920 DIM KP(7),K(2)	ML	.370 POKE 56578,PEEK(56578)OR 3:POKE 56576,(PEEK(56576)AND 252)OR 3	MB
OJ	.921 FOR I=0 TO 7:KP(I)=2:NEXT:KP(1)=1:KP(2)=0:KP(7)=3	BK		
IM	.922 K(0)=-1:K(1)=1:K(2)=0	IO		
CD	.929 REM ** INITIAL SPRITE POSITIONING	MH		
	.930 HP=79:VP=VZ:XX=1			

BASIC SPRITES

•371 POKE 53272,20:POKE 648,4	OM	•639 REM ** FOREGROUND COLOR	FL
•379 REM ** REENABLE SHIFT/COMMODORE AND	FB	•640 POKE 53281,6:PRINT "[CLEAR][BLUE]";:	CC
RUN-STOP/RESTORE	PK	REM (BLUE)	DK
•380 POKE 657,0:POKE 792,71:POKE 808,237	IC	•641 REM ** BACKGROUND COLOR	AH
•390 END	KB	•642 POKE 53281,14:REM (LIGHT BLUE)	BE
•598 REM *** ARRANGE MEMORY ***	ME	•643 REM ** BORDER COLOR	II
•599 REM USE FIRST VIDEO BLOCK (0 TO 1638	HP	•644 POKE 53280,0:REM (BLACK)	IE
3) SO NOTHING FANCY HAS TO BE DONE.	LK	•645 REM ** SPRITE COLORS (DEFAULTS: WHI,	IG
•600 VB=0	EJ	RED,L-GRN,PUR,GRN,BLU,YEL,M-GRAY)	EF
•601 REM ** SCREEN MEMORY STAYS WHERE IT	IF	•646 POKE CT(0),0:POKE CT(1),2:REM (THE S	JD
IS	HP	HIP IS BLACK, THE ROCKET RED)	BJ
•608 REM *** REGISTER ADDRESSES ***	LA	•647 REM ** SET PRIORITY	PP
•609 REM ** SPRITE SHAPE LOCATION TABLE	AN	•648 POKE PR,255:REM (ALL BEHIND)	CC
•610 LT(0)=2040:FOR I=1 TO 7:LT(I)=LT(I-1)	CH	•649 REM ** SET HORIZONTAL SIZES	NG
+1:NEXT	KC	•650 POKE HE,1:REM (SHIP IS DOUBLE WIDTH,	OD
•611 REM ** SPRITE COLOR TABLE	IJ	ROCKET IS NORMAL WIDTH)	LP
•612 CT(0)=53287:FOR I=1 TO 7:CT(I)=CT(I-1)	AJ	•651 REM ** SET VERTICAL SIZES	IM
+1:NEXT	IG	•652 POKE VE,2:REM (ROCKET IS DOUBLE HEIG	JG
•613 REM ** SPRITE HORIZONTAL POSITION TA	FB	HT)	BJ
BLE (LOW BYTES)	AF	•653 REM ** ENABLE SPRITES	HJ
•614 HT(0)=53248:FOR I=1 TO 7:HT(I)=HT(I-1)	FE	•654 POKE ES,BS(0) OR BS(1):REM (SPRITES	BF
+2:NEXT	IB	0 AND 1)	BI
•615 REM ** SPRITE VERTICAL POSITION TABL	GC	•696 RETURN	LC
E	PL	•698 REM *** SET UP OCEAN ***	EL
•616 VT(0)=53249:FOR I=1 TO 7:VT(I)=VT(I-1)	FC	•700 R\$=CHR\$(18):RX\$=CHR\$(146):B\$=" "	JO
+2:NEXT	GM	•701 FD\$=CHR\$(162)+CHR\$(185)+CHR\$(175)+CH	EM
•617 REM ** SPRITE HORIZONTAL HIGH-BIT RE	FJ	R\$(228)	BH
GISTER	IM	•703 FU\$=B\$+CHR\$(228)+CHR\$(175)+CHR\$(185)	IM
•618 HR=53264	EK	•705 S\$=R\$:FOR I=1 TO 40:S\$=S\$+B\$:NEXT:S\$	CD
•619 REM ** SPRITE ENABLE REGISTER	OH	=S\$+RX\$	CE
•620 ES=53269	LJ	•706 ST\$=FU\$+FD\$+FU\$+FD\$+FU\$+FD\$:ST\$=ST\$+	ID
•621 REM ** VERTICAL EXPANSION REGISTER (	OF	ST\$	OM
1=DOUBLE HEIGHT)	GA	•707 DD\$="[HOME][20][DOWN]"	OI
•622 VE=53271	MD	•708 WV=8	HL
•623 REM ** HORIZONTAL EXPANSION REGISTER	FK	•710 PRINT "[CLEAR]"DD\$MID\$(ST\$,WV,40)S\$\$	AG
(1=DOUBLE WIDTH)	BI	\$S\$LEFT\$(S\$,40)"[HOME]"RX\$;	AG
•624 HE=53277	NE	•711 POKE 2023,160	AG
•625 REM ** SPRITE PRIORITY REGISTER (1=S	DK	•796 RETURN	AG
PRITE IS IN FRONT OF FOREGROUND)		•798 REM *** SPRITE SHAPES ***	
•626 PR=53275		•799 REM ** NUMBER OF SPRITE SHAPES (-1);	
•627 REM ** MULTICOLOR ENABLE REGISTER (1		NUMBER OF LINES PER SPRITE SHAPE (-1)	
=MULTI-COLOR ENABLED)		•800 NS=1	
•628 EM=53276		•801 REM ** LOCATE SPRITE SHAPE MEMORY	
•629 REM ** SPRITE MULTICOLOR COLOR REGIS		•802 ST(0)=13:ST(1)=14	
TERS		•803 REM ** LOOPS	
•630 MR=53285:REM ('01' REGISTER: ADD 1 T		•804 FOR I=0 TO NS:FOR J=0 TO 20:READ SS\$	
O MR FOR '11' REGISTER)		:FOR K=0 TO 2:X=0:Y=VB+ST(I)*64+J*3+K	
•631 REM ** SPRITE-SPRITE COLLISION REGIS		•805 REM ** CONVERT STRINGS TO SHAPE BYTE	
TER		S (USE BS(0-7) TO SET BITS)	
•632 CS=53278		•806 FOR L=1 TO 8:M=L+8*K:M=ASC(MID\$(SS\$,	
•633 REM ** SPRITE-FOREGROUND COLLISION R		M,1)):IF M=42 THEN X=X OR BS(8-L)	
EGISTER		•807 NEXT:POKE Y,X:NEXT:NEXT:NEXT	
•634 CF=53279		•809 REM SPRITE SHAPE DATA, 21 LINES PER	
•635 REM ** SET-BIT AND CLEAR-BIT VALUES		SHAPE: *='ON' .='OFF'	
•636 BS(0)=1:FOR I=1 TO 7:BS(I)=2*BS(I-1)		•810 DATA "[9"."]*[14"."]"	
:NEXT		•811 DATA "[9"."]*[14"."]"	
•637 FOR I=0 TO 7:BC(I)=255-BS(I):NEXT		•812 DATA "[9"."]*..*[10"."]"	
•638 REM *** INITIALIZE VALUES ***		•813 DATA "[9"."]*..*[10"."]"	

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

.814 DATA "[8"."]**..**[10"."]"
.815 DATA "[8"."]**..[3**][10"."]"
.816 DATA "[9"."][5**][10"."]"
.817 DATA "[7"."][9**][8"."]"
.818 DATA "[24**]"
.819 DATA "[24**]"
.820 DATA "..[20**].."
.821 DATA "[3"."][18**][3"."]"
.822 DATA "[3"."][18**][3"."]"
.823 DATA "[3"."][19**].."
.824 DATA "[4"."][18**].."
.825 DATA "[5"."][17**].."
.826 DATA "[24"."]"
.827 DATA "[24"."]"
.828 DATA "[24"."]"
.829 DATA "[24"."]"
.830 DATA "[24"."]"
.831 REM ** 2ND SPRITE SHAPE
.832 DATA "[21"."]*.."
.833 DATA "[21"."]*.."
.834 DATA "[20"."][3**].."
.835 DATA "[20"."][3**].."
.836 DATA "[20"."][3**].."
.837 DATA "[20"."][3**].."
.838 DATA "[20"."][3**].."
.839 DATA "[20"."][3**].."
.840 DATA "[20"."]*.*"
.841 DATA "[20"."]*.*"
.842 DATA "[24"."]"
.843 DATA "[24"."]"
.844 DATA "[24"."]"
.845 DATA "[24"."]"
.846 DATA "[24"."]"
.847 DATA "[24"."]"
.848 DATA "[24"."]"
.849 DATA "[24"."]"
.850 DATA "[24"."]"
.851 DATA "[24"."]"
.852 DATA "[24"."]"
.853 DATA "[24"."]"
.896 RETURN
.898 REM *** SPRITE POSITIONS ***
.899 REM ** POSSIBLE POSITIONS DIM'ED
900 VZ=32:HZ=362:DIM HH(HZ),VV(VZ),HB(HZ)
901 REM ** ASSIGN HORIZONTAL VALUES
902 X=0:B=0:FOR I=0 TO HZ:HH(I)=X:HB(I)=B
903 X=X+1:IF X>255 THEN X=X-256:B=3
904 NEXT
905 REM ** ASSIGN VERTICAL VALUES
906 X=202:FOR I=0 TO 9:VV(I)=X:X=X-1:NEXT
907 :FOR I=10 TO 14:VV(I)=X:X=X-2:NEXT
908 :FOR I=15 TO 18:VV(I)=X:X=X-3:NEXT
909 :FOR I=19 TO 21:VV(I)=X:X=X-6:NEXT
910 FOR I=22 TO VZ:VV(I)=X:X=X-12:NEXT

```

```

IK .929 REM ** INITIAL SPRITE POSITIONING IO
LO .930 HP=160:VP=0 LG
AG .931 POKE VT(0),VV(VP):POKE HT(0),HH(HP): AC
FG POKE HR,HB(HP) CB
LC .932 POKE VT(1),VV(VP):POKE HT(1),HH(HP) CB
LC .939 REM ** TELL VIC-2 WHERE TO FIND SPRI KK
HC TE SHAPES FK
MC .940 POKE LT(0),ST(0):POKE LT(1),ST(1) IM
MC .996 RETURN
NG
HC
EG
PC
PC
PC
PC
PC

```

TUMBLING DICE & DATA STRUCTURES* FROM PAGE 37

DICE SIMULATOR

```

AB .1 REM JD
AG .2 REM -- DICE SIMULATOR -- BA
AG .3 REM RUPERT REPORT #21 OI
LG .4 REM JD
LG .5 REM RANDOMLY SIMULATE THE EL
LG .6 REM OUTCOMES FOR ROLLING THREE DICE JE
LG .7 REM JD
LG .8 REM >>DETERMINE THE PROBABILITY THAT CD
LG .9 REM THE SUM IS ELEVEN MD
PC .10 N=1 : R$=CHR$(18) :REM RVS ON ME
PC .20 PRINT CHR$(147); JL
PC .30 PRINT TAB(15)R$;"<< # ROLLS " DO
PC .40 PRINT TAB(15)R$;"<< # SUCCESS " AG
PC .50 PRINT TAB(15)R$;"<< % PROBABILITY " BO
PC .60 A=INT(RND(0)*6)+1 PI
PC .70 B=INT(RND(0)*6)+1 AL
PC .80 C=INT(RND(0)*6)+1 AO
PC .90 TTL=A+B+C LK
PC .100 IF TTL=11 THEN SXCS=SXCS+1 KO
PC .110 PRINT CHR$(19);N : PRINT SXCS JM
PC .120 PROB=100*SXCS/N : PRINT PROB JG
PC .130 N=N+1 CJ
PC .140 GOTO 60 PG
IM

```

DICE ANALYZER

```

KA .1 REM JD
MK .2 REM -- DICE ANALYZER -- OE
OD .3 REM RUPERT REPORT #21 OI
IA .4 REM JD
IJ .5 REM ENUMERATE ALL POSSIBLE FL
HC .6 REM OUTCOMES FOR ROLLING THREE DICE JE
IA .7 REM JD
LF .8 REM >>CALCULATE THE PROBABILITY THAT NA
LA .10 REM 1) 3 ONES ARE ROLLED NP
LA .11 REM 2) AT LEAST 1 THREE AND 1 SIX HM
CN .12 REM 3) NO TWOS ARE ROLLED HF
FA .13 REM 4) THE SUM IS ELEVEN DN
.14 REM JD

```

*Bug Repellent line codes at right of program lines are for C-64 only! See VIC codes on next page.

AHOY! 99

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

•15 REM >ON THE NTH ROLL (N = 1 TO 216):
•16 REM ROLL(N,Y) = DIE Y'S VALUE
•17 REM CT(N,Z) = # DICE WITH VALUE Z
•18 REM TTL(N) = SUM OF DICE VALUES
•19 REM
•20 DIM ROLL(216,3),CT(216,6),TTL(216),RNUM(216)
•30 N=1 : M=1 : PRINT CHR$(147)
•40 FOR A=1 TO 6 : FOR B=1 TO 6
•50 FOR C=1 TO 6
•60 PRINT A;B;C
•70 ROLL(N,1)=A:ROLL(N,2)=B:ROLL(N,3)=C
•80 CT(N,A)=CT(N,A)+1 :CT(N,B)=CT(N,B)+1
•90 CT(N,C)=CT(N,C)+1
•100 TTL(N)=A+B+C
•110 N=N+1 : NEXT C : NEXT B : NEXT A
•120 PRINT"CALCULATING [3"."]"
•130 FOR N=1 TO 216
•140 :IF CT(N,1)=3 THEN T1=T1+1
•150 :IF CT(N,3)>=1 AND CT(N,6)>=1 THEN T2=T2+1
•160 :IF CT(N,2)=0 THEN T3=T3+1
•170 :IF TTL(N)=11 THEN T4=T4+1:RNUM(M)=N:M=M+1
•180 NEXT N
•190 PRINT
•200 PRINT,"# SUCCESS","% PROBABILITY"
•210 PRINT "TEST 1",T1,T1*100/216
•220 PRINT "TEST 2",T2,T2*100/216
•230 PRINT "TEST 3",T3,T3*100/216
•240 PRINT "TEST 4",T4,T4*100/216
•250 PRINT
•260 PRINT"SUCCESSFUL ROLLS FOR TEST 4:"
•270 FOR M=1 TO T4
•280 RM=RNUM(M)
•290 PRINT ROLL(RM,1);ROLL(RM,2);ROLL(RM,3),
•300 NEXT M

```

```

# 80: EA # 140: IL # 200: GN # 260: MG
# 90: NP # 150: JO # 210: NK # 270: OM
# 100: IA # 160: IB # 220: KH # 280: CB
# 110: AJ # 170: FF # 230: BA # 290: NG
# 120: EL # 180: NG # 240: KN # 300: NH
# 130: ON # 190: JJ # 250: JJ

```

ADDRESSING THE COMMODORE, PART II FROM PAGE 77

(See article for instructions on entering!)

THE QUEST

```

10 ;
20 ;THE QUEST
30 ;
40 *=8000 ;OR 'ORG EQU $8000' (OR $2000)
50 ;
60 BUFLN=23
70 CHROUT=$FFD2
80 ;
90 JMP BEGIN
100 ;
110 TEXT .BYTE 87,72,69,82,69,32,73,83
120 .BYTE 32,84,72,69,32,67,79,77
130 .BYTE 77,79,68,79,82,69,63
140 ;
150 BEGIN LDX #0
160 ;
170 LOOP LDA TEXT,X
180 JSR CHROUT
190 INX
200 CPX #BUFLN
210 BNE LOOP
220 RTS

```

RESPONSE

```

10 ;
20 ; RESPONSE
30 ;
40 *=$8000 ;OR 'ORG EQU $8000' (OR $2000)
50 ;
60 EOL=13 ;END-OF-LINE CHARACTER
70 BUFLN=40 ;LENGTH OF TEXT BUFFER
80 FILLCH=$20 ;ASCII CODE FOR A SPACE
90 CHROUT=$FFD2
100 ;
110 JMP START
120 ;
130 TEXT .BYTE 'YOU CAN FIND HIM IN 64K'
140 ;
150 ;CLEAR TEXT BUFFER
160 ;
170 START LDA #FILLCH

```

VIC 20 BUG REPELLENT LINE CODES FOR TUMBLING DICE & DATA STRUCTURES

DICE SIMULATOR

```

# 1: JD # 7: JD # 40: LK # 100: GC
# 2: PB # 8: KJ # 50: ME # 110: NO
# 3: OE # 9: LG # 60: PI # 120: CM
# 4: JD # 10: MI # 70: AL # 130: CJ
# 5: KL # 20: JH # 80: AO # 140: PD
# 6: MK # 30: FO # 90: LK

```

DICE ANALYZER (16K EXPANSION REQUIRED!)

```

# 1: JD # 7: JD # 14: JD # 20: EG
# 2: IK # 8: JI # 15: IC # 30: HA
# 3: OE # 10: OI # 16: IH # 40: EP
# 4: JD # 11: MM # 17: IE # 50: HK
# 5: EF # 12: FC # 18: PO # 60: OF
# 6: MK # 13: GD # 19: JD # 70: OL

```

100 AHoy!


```

180 LDX #BUFLEN
190 STUFF DEX
200 STA TXTBUF,X
210 BNE STUFF
220 ;
230 ;STORE MESSAGE IN BUFFER
240 ;
250 LDX #0
260 LOOP1 LDA TEXT,X
270 STA TXTBUF,X
280 CMP #EOL
290 BEQ PRINT
300 INX
310 CPX #BUFLEN
320 BCC LOOP1
330 ;
340 ;PRINT MESSAGE
350 ;
360 PRINT LDX #0
370 LOOP2 LDA TXTBUF,X
380 PHA
390 JSR CHROUT
400 PLA
410 CMP #EOL
420 BNE NEXT
430 JMP FINI
440 NEXT INX
450 CPX #BUFLEN
460 BCC LOOP2
470 ;
480 FINI
490 RTS
500 ;
510 TXTBUF=*
520 *=*+BUFLEN
530 ;
540 .END

```

SUPERHERO FROM PAGE 17

```

.10 REM SUPERHERO FG
.20 REM BY J.C.HILTY LE
.30 REM 1036 BARNESLEY DR. JK
.40 REM LIBRARY,PA.,15129 KF
.100 PRINT"[CLEAR]" HH
.102 SR=0:ALT=000 OP
.103 Q=192:L=1141:C=28:CM=54272:M=0 FO
.105 V=53248:O=54272 HC
.108 POKE 52,48:POKE 56,48 IC
.110 POKE 53281,6:POKE 53280,2 DD
.120 PRINT"[DOWN][DOWN]"TAB(5)"[RVSON][RED]
D][7" "][c *]" CH
.130 PRINT TAB(5)"[RVSON][8" "][c *]" NL
.140 PRINT TAB(5)"[RVSON][BLACK] [RED] [Y
ELLOW][7" "][RED] [c *][RVSOFF] [RVSON][
BLACK] [RED] [c *][BLACK] [RED] [c *][B
LACK] [RED] [c *][BLACK] [RED] [c *]" CE

```

```

.150 PRINT TAB(5)"[RVSON][BLACK] [YELLOW
][7" "][BLACK] [RED] [c *][BLACK] [RED]
[BLACK] [RED] [3" "][BLACK] [RED] [3" "
][BLACK] [RED] [c *]" DP
.160 PRINT TAB(5)"[RVSON][BLACK] [YELLOW
][5" "][BLACK] [3" "][YELLOW] [BLACK] [
YELLOW] [BLACK] [YELLOW] [3" "][BLACK] [
YELLOW] [3" "][BLACK] [YELLOW] [3" "]" JG
.170 PRINT TAB(5)"[BLACK] [c *][RVSON] [YE
LLOW] [7" "][BLACK] [YELLOW] [BLACK] [Y
ELLOW] [BLACK] [YELLOW] [BLACK] [YELLOW
] [BLACK] [YELLOW] [BLACK] [YELLOW] [B
LACK] [YELLOW] " IA
.180 PRINT TAB(6)"[BLACK] [c *][RVSON] [YEL
LOW] [7" "][BLACK] [YELLOW] [BLACK] [YE
LLOW] [BLACK] [YELLOW] [3" "][BLACK] [YE
LLOW] [RVSOFF] [RVSON] [BLACK] [YELLOW] [
3" "][BLACK] [c *]" IB
.190 PRINT TAB(10)"[RVSON] [BLACK] [YELLO
W] [BLACK] [YELLOW] [BLACK] [YELLOW] [
BLACK] [YELLOW] [RVSOFF] [BLACK] [c *][
RVSON] [YELLOW] [3" "][RVSOFF] [BLACK] [c *
][RVSON] [YELLOW] [RVSOFF] [BLACK] [c *][R
VSON] [YELLOW] " GP
.200 PRINT TAB(5)"[RVSON] [BLACK] [RED] [4"
"] [BLACK] [YELLOW] [BLACK] [YELLOW] [6
"] [RVSOFF] [BLACK] [c *][RVSON] [YELLOW]
" FG
.210 PRINT TAB(5)"[RVSON] [BLACK] [RED] [4
"] [BLACK] [YELLOW] [RVSOFF] [BLACK] [c
*][RVSON] [YELLOW] [6" "]" EG
.220 PRINT TAB(5)"[BLACK] [c *][RVSON] [YE
LLOW] [7" "]" AI
.230 PRINT TAB(6)"[BLACK] [c *][RVSON] [YEL
LOW] [7" "][RVSOFF] [RVSON] [BLACK] [RED] [
c *][BLACK] [RED] [c *][RVSOFF] [RVSON] [B
LACK] [RED] [3" "][c *][RVSOFF] [RVSON] [B
LACK] [RED] [c *][RVSOFF] [RVSON] [BLAC
K] [RED] [c *]" CL
.240 PRINT TAB(15)"[RVSON] [BLACK] [YELLOW
] [BLACK] [YELLOW] [RVSOFF] [RVSON] [BLAC
K] [YELLOW] [4" "][RVSOFF] [RVSON] [BLACK]
[YELLOW] [3" "][RVSOFF] [RVSON] [BLACK]
[YELLOW] [3" "]" FA
.250 PRINT TAB(15)"[RVSON] [BLACK] [YELLOW
] [BLACK] [YELLOW] [RVSOFF] [RVSON] [BLAC
K] [YELLOW] [BLACK] [c *][RVSOFF] [RVSO
N] [YELLOW] [BLACK] [YELLOW] [RVSOFF] [
RVSON] [BLACK] [YELLOW] [BLACK] [YELLOW]
" LE
.260 PRINT TAB(15)"[RVSON] [BLACK] [YELLOW
] [3" "][RVSOFF] [RVSON] [BLACK] [YELLOW] [
3" "][RVSOFF] [RVSON] [BLACK] [YELLOW] [3
"] [RVSOFF] [RVSON] [BLACK] [YELLOW] [B
LACK] [YELLOW] " CI
.270 PRINT TAB(15)"[RVSON] [BLACK] [YELLOW
] [BLACK] [YELLOW] [RVSOFF] [RVSON] [BLAC
K] [YELLOW] [BLACK] [c *][RVSOFF] [RVSO

```


N)[BLACK] [YELLOW] [BLACK][RVSOFF][c *][RVSON][YELLOW] [RVSOFF] [RVSON][BLACK] [YELLOW] [BLACK] [YELLOW] "	HA	•750 PRINT"[RVSON][15" "][RVSOFF][7" "][RVSON][17" "]"	PM
•280 PRINT TAB(15)"[BLACK][c *][RVSON][YELLOW] [RVSOFF][BLACK][c *][RVSON][YELLOW] [RVSOFF] [BLACK][c *][RVSON][YELLOW][4" "][RVSOFF] [BLACK][c *][RVSON][YELLOW] [RVSOFF] [BLACK][c *][RVSON][YELLOW] [RVSOFF] [BLACK][c *][RVSON][YELLOW][3" "]	NN	•760 NEXT I	MN
•290 PRINT	JJ	•770 POKEA,4	DL
•300 PRINT TAB(9)"SAVE THE SPACE SHUTTLE"	LL	•780 J=INT(RND(1)*4):X=J	MO
•310 PRINT TAB(16)"PRESS ANY KEY"	KL	•790 B=A+A(J):IF PEEK(B)=WLTHENPOKEB,J:POKEA+A(J)/2,HL:A=B:GOTO 780	BP
•320 GET A\$:IF A\$="" THEN 320	HI	•800 J=(J+1)*-(J<3):IF J<>XTHEN790	FD
•330 PRINT"[HOME]":PRINT"[21"[DOWN]]" TAB(15)"PLEASE WAIT[3""]"	TI	•810 J=PEEK(A):POKE A,HL:IFJ<4THENA=A-A(J):GOTO 780	HB
•340 PRINT TAB(15)"READING DATA"	JH	•820 PRINT"[HOME]":PRINT"[15"[DOWN]]"TAB(16)"[CYAN]SCORE"	DN
•370 FOR X=12288 TO 12350	GB	•830 PRINT TAB(17);SR	LI
•380 READ A:POKE X,A:NEXT	BA	•831 PRINT"[4"[DOWN]]"TAB(16)"ALT":PRINT TAB(16);ALT	MF
•390 FOR X=12352 TO 12414	DG	•832 POKE 2040,192	DH
•400 READ A:POKE X,A:NEXT	BA	•833 POKE V+0,150:POKE V+1,60:POKE V+2,150:POKE V+3,190	OK
•410 FOR X=12416 TO 12478	FD	•834 POKE V+21,3	FC
•420 READ A:POKE X,A:NEXT	BA	•840 POKE 1113,81:POKE 1113+CM,7	PJ
•430 FOR X=12480 TO 12542	DC	•842 POKE 1835,81:POKE 1835+CM,7	JF
•440 READ A:POKE X,A:NEXT	BA	•844 POKE 1825,81:POKE 1825+CM,7	AH
•464 FOR X=828 TO 973	KC	•846 POKE 1509,81:POKE 1509+CM,7	EP
•466 READ A:POKE X,A:NEXT	BA	•848 POKE 1599,81:POKE 1599+CM,7	EF
•470 PRINT"[CLEAR]"	HH	•850 POKE 1605,81:POKE 1605+CM,7	PL
•480 POKE 53280,0:POKE 53281,0	BH	•852 POKE 1137,81:POKE 1137+CM,7	AF
•490 POKE 2040,194:POKE 2041,195	IP	•854 POKE 1131,81:POKE 1131+CM,7	GJ
•500 POKE V+39,6:POKE V+40,1	DA	•856 POKE 1857,81:POKE 1857+CM,7	JF
•510 POKE V+0,70:POKE V+1,80:POKE V+2,70:POKE V+3,140	FI	•858 POKE 1851,81:POKE 1851+CM,7	GJ
•530 POKE V+29,3:POKE V+23,3	MB	•860 POKE 1141,28:POKE 1141+CM,3	FE
•540 POKE V+28,1:POKE V+37,10:POKE V+38,2	OD	•865 POKE A,42:J=2	OC
•550 PRINT"[HOME]":PRINT"[DOWN][CYAN]"TAB(12)"GRAPHICS[3" "]CHART"	AF	•870 Q=Q+1:IF Q=195 THEN Q=192	AK
•560 POKE V+21,3	FC	•871 POKE 2040,Q	OH
•570 PRINT"[5"[DOWN]]"TAB(12)"[EP][6" "]SUPERHERO"	JH	•872 ALT=ALT+1	FP
•580 PRINT"[6"[DOWN]]"TAB(18)"SPACESHUTTLE"	CA	•873 IF ALT=800THEN3500	DP
•590 PRINT"[4"[DOWN]]"TAB(12)"[GREEN]*[CYAN][5" "]ZYPONITE METEOR"	CH	•875 PRINT"[HOME]":PRINT"[22"[DOWN]]"[CYAN]"TAB(16);ALT	AJ
•600 PRINT"[DOWN]"TAB(14)"PRESS ANY KEY"	FF	•876 B=A+A(J)/2	JM
•610 GET A\$:IF A\$="" THEN 610	IC	•877 IF PEEK(B)=32THENPOKEB,42:POKEA,32:A=B:J=(J+2)+4*(J>1)	LG
•620 PRINT"[CLEAR]":POKE V+21,0	AH	•878 IF PEEK(B)=81 THEN POKE B,42:POKE A,81:POKE A+CM,7:A=B:J=(J+2)+4*(J>1)	KJ
•630 POKE 53280,2:POKE 53281,0	EF	•879 IF PEEK(B)=28 THEN 3000	IG
•700 DIMA(3)	EJ	•880 J=(J-1)-4*(J=0)	HI
•710 A(0)=2:A(1)=-80:A(2)=-2:A(3)=80	LN	•881 SYS(828):R=PEEK(254)-PEEK(253)	ML
•720 WL=160:HL=32:SC=1024:A=SC+81	AJ	•890 IF R=0 THEN 870	AO
•740 FOR I=1 TO 6	JB	•900 W=PEEK(L+R)	GN
•741 PRINT "[RVSON][GREEN][15" "][RVSOFF][7" "][RVSON][17" "]"	FF	•910 IF W=81 THEN 1500	HI
•742 NEXT I	MN	•920 IF W<>32 THEN 870	PH
•744 FOR I=1 TO 9	JC	•930 L=L+R:POKE L-R,32:POKE(L-R)+CM,5	BN
•745 PRINT "[RVSON][39" "]"	GO	•940 POKE L,C:POKE L+CM,3	BB
•746 NEXT I	MN	•950 GOTO 870	CP
•748 FOR I=1 TO 8	JD	•1500 M=M+1:IF M=10 THEN 2500	LH
		•1505 L=L+R:POKE L-R,32	BD
		•1510 POKEL,C:POKEL+CM,3	BB
		•1520 GOSUB 2000	FL
		•1530 PRINT"[HOME]":SR=SR+10:PRINT"[16"[DOWN]]"[CYAN]"TAB(17);SR	HG
		•1540 GOTO 870	CP

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

PM
MN
DL
MO

BP
FD

HB

DN
LI

MF
DH

OK
FC
PJ
JF
AH
EP
EF
PL
AF
GJ
JF
GJ
FE
OC
AK
OH
FP
DP

AJ
JM

LG

KJ
IG
HI
ML
AO
GN
HI
PH
BN
BB
CP
LH
BD
BB
FL
D
HG
CP

```

•2000 FOR X=0 TO 0+24:POKE X,0:NEXT
•2010 POKE 0,150:POKE0+1,200:POKE0+5,8:PO
KE0+6,248
•2020 POKE0+24,15:POKE0+4,17
•2030 FOR T=0TO50:NEXT
•2040 POKE0+4,16
•2050 FOR T=0TO50:NEXT
•2060 POKE0+24,0
•2070 RETURN
•2100 FOR X=0 TO 0+24:POKEX,0:NEXT
•2110 POKE0+24,15:POKE0+12,160:POKE0+13,2
52
•2120 POKE0+8,80:POKE0+7,40:POKE 0+11,129
•2130 FOR T=0TO100:NEXT
•2140 POKE0+11,128:RETURN
•2500 PRINT"[CLEAR]"
•2502 PRINT"[CYAN][15"[DOWN]]"TAB(6)"CON
GRATULATIONS"
•2503 PRINT"[DOWN][6" "]PLAY ON!"
•2504 FOR T=0 TO 3000:NEXT
•2510 M=0
•2520 SR=SR+100:ALT=ALT -200
•2525 L=1141
•2528 PRINT"[CLEAR]"
•2530 GOTO 710
•3000 PRINT"[CLEAR]"
•3005 FOR T=1 TO 30
•3010 POKE V+39,2:POKE V+39,1:POKE V+39,6
•3020 NEXT
•3030 GOSUB 2100
•3040 PRINT"[14"[DOWN]]"SORRY,A ZYPTONITE
METEOR CRUSHED YOU."
•3050 FOR T=0 TO 3000:NEXT
•3060 GOTO 4000
•3500 PRINT "[CLEAR]"
•3510 FOR T=1 TO 20
•3520 POKE V+40,2:POKE V+40,6:POKE V+40,1
•3530 NEXT
•3540 GOSUB 2100
•3550 PRINT"[12"[DOWN]]"[CYAN]THE SHUTTLE
IS 800 MILES UP—TOO LATE."
•3560 FOR T=0 TO 3000:NEXT
•3570 GOTO 4000
•4000 PRINT"[CLEAR]"
•4005 POKE V+21,0
•4010 PRINT"[12"[DOWN]]"[RED]S C O R E "
;SR
•4020 PRINT"[DOWN][DOWN]PLAY AGAIN[3"—"Y
OR N "
•4030 GET JUNK$:IF JUNK$<>""THEN 4030
•4040 GET A$:IF A$=""THEN 4040
•4050 IF A$="Y" THEN 4060
•4055 END
•4060 PRINT"[CLEAR]"
•4070 M=0
•4080 L=1141
•4090 ALT=000

```

```

CE •4100 SR=0 IO
•4110 GOTO 710 CA
NL •6240 REM MULTICOLOR SUPERHERO X3 OF
GB •6250 DATA 0,160,0,0,144,0,0,144,0,0,192, IG
IM 0,3,160,0,12,160,0
GC •6260 DATA 48,160,0,48,160,0,48,160,0,48, MJ
IM 128,0,192,128,0,192,192,0
GH •6270 DATA 192,192,0,192,128,0,192,128,0, AN
IM 0,128,0,0,128,0,0,192,0
CH •6280 DATA 0,192,0,0,192,0,0,240,0 FI
JO •6290 DATA 0,160,0,0,144,0,0,144,0,0,192, EI
FB 0,3,160,0,14,160,0,50,170,64,50,170,64
LC •6300 DATA 50,160,0,56,128,0,204,128,0,19 KF
6,192,0,192,192,0,194,32,0
HA •6310 DATA 194,32,0,8,8,0,8,8,0,48,12,0,4 IN
8,12,0,12,12,0,0,15,0
HH •6320 DATA 0,160,0,0,144,0,0,144,0,0,192, HN
0,3,160,0,14,160,64,48,171,0,48,162,0
GK •6330 DATA 48,164,0,48,136,0,192,128,0,19 KF
2,192,0,192,192,0,194,32,0
PL •6340 DATA 194,32,0,2,32,0,2,32,0,2,32,0, GA
3,48,0,3,48,0,3,252,0
NI •6350 REM SPACESHUTTLE EA
LN •6360 DATA 0,0,0,0,0,0,32,0,0,32,0,0,48,0 OJ
HH ,0,56,0,0
CA •6370 DATA 63,255,192,63,255,224,61,85,48 OJ
HH ,63,255,56
NI •6380 DATA 63,255,252,12,62,0,8,60,0,8,56 GG
LL ,0,0,48,0
IA •6390 DATA 0,32,0,0,0,0,0,0,0,0,0,0,0,0,0 CG
FE ,0,0,0
NE •6450 REM ML JOYSTICK ROUTINE PM
PL •6460 DATA 173,1,220,74,176,40,74,74,176, FB
FF 11,169,0
HH •6470 DATA 133,254,169,41,133,253,76,182, NM
3,74,176,11,169,0,133,254,169,39
MF •6480 DATA 133,253,76,182,3,169,0,133,254 CA
FD ,169,40,133,253,76,182,3,74,176
IA •6490 DATA 39,74,176,11,169,39,133,254,16 KH
FE 9,0,133,253,76,182,3,74,176,11
KF •6500 DATA 169,41,133,254,169,0,133,253,7 NF
PL 6,182,3,169,40,133,254,169,0
FF •6510 DATA 133,253,76,182,3,74,176,11,169 LG
HH ,0,133,254,169,1,133,253,76,182,3
FF •6520 DATA 74,176,11,169,1,133,254,169,0, CH
133,253,76,182,3,169,0,133,254
OM •6530 DATA 133,253,173,1,220,74,74,74,74, LJ
74,176,7,169,1,133,80,76,203,3
DK •6540 DATA 169,0,133,80,96,234,234 EM
FG
LO
MF
IC
HH •0 PRINT"[CLEAR]" HH
DG •1 DIMSU$(500),TA$(500),AN$(500),MN$(500) IB
LN ,ID$(500),CM$(500):P$="," :OPEN15,8,15
CK •2 GOTO100 CF

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AHOY! DOCK FROM PAGE 30


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10 PRINT"[CLEAR]":PRINTTAB(12);"ONE MOMEN
NT READING":PRINT:PRINTTAB(20-LEN(Z$)/2)
;Z$
15 OPEN5,8,5,"0:"+Z$+",S,R":INPUT#15,AX,
BX$,CX,DX$:IFAX<>0THENGOSUB9000:RETURN
18 FORI=1TO500:C=I
20 INPUT#5,SU$(I),TA$(I),AN$(I),MN$(I),I
D$(I),CM$(I)
30 IFSU$(I)="EOF"THENCLOSE5:C=C-1:RETURN
40 NEXT
50 PRINT:PRINT"40 CHARACTERS MAXIMUM":FO
RI=1TO4000:NEXT:PRINT"[CLEAR]":RETURN
60 PRINT:PRINT"80 CHARACTER MAXIMUM":FOR
I=1TO4000:NEXT:PRINT"[CLEAR]":RETURN
80 OPEN5,8,5,"0:"+Z$+",S,W":FORI=1TOC
82 PRINT#5,SU$(I):PRINT#5,TA$(I):PRINT#5
,AN$(I):PRINT#5,MN$(I):PRINT#5,ID$(I)
83 PRINT#5,CM$(I):NEXT:I=C+1
84 SU$(I)="EOF":TA$(I)="TITLE":AN$(I)="A
UTHOR":MN$(I)="MAG":ID$(I)="ISSUE"
86 CM$(I)="COMMENT":PRINT#5,SU$(I):PRINT
#5,TA$(I):PRINT#5,AN$(I):PRINT#5,MN$(I)
87 PRINT#5,ID$(I):PRINT#5,CM$(I)
88 CLOSE5:RETURN
100 PRINT"[CLEAR]":POKE53280,6:POKE53281
,0:FORI=1TO40:PRINT"[RED][S S][WHITE][S
S]";:NEXT:PRINT"[RED][S S][WHITE][S S]";
110 PRINT"[RVSON][C A][32"[S C]"]"[C S][
RVSOFF] ";
120 PRINT "[RED][S S][WHITE][S S]";:PRIN
T"[RED][S S][WHITE][S S] [RVSON][S B][RV
SOFF][32"="[RVSON][S B][RVSOFF] [RED][S
S][WHITE][S S]";
130 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON] [3""]AHoy DO
CK FILE[3""] [RVSOFF][5"="[RVSON][S B]
[RVSOFF] [RED][S S][WHITE][S S]";
140 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][22""] [RVSOFF
][5"="[RVSON][S B][RVSOFF] [RED][S S][W
HITE][S S]";
150 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]ADD[4""]
]-/- RECORD [RVSOFF][5"="[RVSON][S B][
RVSOFF] [RED][S S][WHITE][S S]";
160 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]SEARCH -
/- RECORD [RVSOFF][5"="[RVSON][S B][RV
SOFF] [RED][S S][WHITE][S S]";
170 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]DELETE -
/- RECORD [RVSOFF][5"="[RVSON][S B][RV
SOFF] [RED][S S][WHITE][S S]";
180 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]MODIFY -
/- RECORD [RVSOFF][5"="[RVSON][S B][RV
SOFF] [RED][S S][WHITE][S S]";
190 PRINT"[RED][S S][WHITE][S S] [RVSON]

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FI
KB
FN
DM
EM
IA
OJ
NB
HN
NF
FM
JO
JP
IK
JK
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[S B][RVSOFF][5"="[RVSON][3""]SORT[3"
"]-/- RECORD [RVSOFF][5"="[RVSON][S B]
[RVSOFF] [RED][S S][WHITE][S S]";
200 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]LIST[3"
"]-/- RECORD [RVSOFF][5"="[RVSON][S B]
[RVSOFF] [RED][S S][WHITE][S S]";
210 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][3""]PRINT -
/- RECORD [RVSOFF][5"="[RVSON][S B][RV
SOFF] [RED][S S][WHITE][S S]";
215 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][5"="[RVSON][22""] [RVSOFF
][5"="[RVSON][S B][RVSOFF] [RED][S S][W
HITE][S S]";
220 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF][32"="[RVSON][S B][RVSOFF]
[RED][S S][WHITE][S S]";
230 PRINT"[RED][S S][WHITE][S S] [RVSON]
[C Q][32"[S C]"] [C W][RVSOFF] [RED][S S]
[WHITE][S S]";
240 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF]";:PRINTCHR$(159);:PRINT"[R
VSON] F1[3""]ADD[4""]";:PRINTCHR$(5);
250 PRINT"[6"=""]";:PRINTCHR$(159);:PRINT
"[RVSON] F2[3""]SEARCH ";:PRINTCHR$(31)
;:
260 PRINT"[WHITE][RVSON][S B][RVSOFF] [R
ED][S S][WHITE][S S]";:PRINT"[RED][S S][
WHITE][S S] [RVSON][S B][RVSOFF]";:PRINT
CHR$(159);:PRINT"[RVSON] F3[3""]DELETE
";
270 PRINTCHR$(5);:PRINT"[6"=""]";:PRINTCH
R$(159);:PRINT"[RVSON] F4[3""]MODIFY ";
280 PRINTCHR$(31);:PRINT"[WHITE][RVSON][
S B][RVSOFF] [RED][S S][WHITE][S S]";:PR
INT"[RED][S S][WHITE][S S] [RVSON][S B][
RVSOFF]";:PRINTCHR$(159);
290 PRINT"[RVSON] F5[3""]SORT[3""]";:P
RINTCHR$(5);:PRINT"[6"=""]";:
300 PRINTCHR$(159);:PRINT"[RVSON] F6[3"
"]LIST[3""]";:PRINTCHR$(31);:PRINT"[WHI
TE][RVSON][S B][RVSOFF] [RED][S S][WHITE
][S S][WHITE]";
310 PRINT"[RED][S S][WHITE][S S] [RVSON]
[S B][RVSOFF]";:PRINTCHR$(159);:PRINT"[R
VSON] F7[3""]PRINT ";:PRINTCHR$(5);:
320 PRINT"[6"=""]";:PRINTCHR$(159);:PRINT
"[RVSON] F8[3""]END[4""]";:PRINTCHR$(3
1);:
330 PRINT"[WHITE][RVSON][S B][RVSOFF] [R
ED][S S][WHITE][S S]";:PRINT"[RED][S S][
WHITE][S S] [RVSON][C Z][32"[S C]"] [C X]
[RVSOFF]";
340 PRINT"[RED][S S][WHITE][S S]";:FORI
=1TO40:PRINT"[RED][S S]";:PRINT"[WHITE][
S S]";:NEXT
350 GETRE$:IFRE$=""THEN350

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MM
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DF
IF
PG
MP
BM
BJ
EO
IL
LJ
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CL
GJ
EG
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OE	•360 IFRE\$=CHR\$(140)THEN680	PL	ARTICLE :[RVSOFF]":PRINT"[BLUE]";:INPUTS	
	•400 FORI=133TO140:IFRE\$=CHR\$(I)THEN520	GK	U\$(C)	AC
	•410 NEXT	IA	•1025 IFSU\$(C)="/"THENRETURN	DD
MO	•420 PRINT"[CLEAR]":POKE53281,0:POKE53280		•1030 IFLEN(SU\$(C))>79THENGOSUB60:PRINT:	PF
	,0:PRINT"[WHITE]":PRINTTAB(12);"INVALID	OL	•1040 PRINT"[BLACK]":PRINTTAB(8);"[RVSON]	
	RESPONSE"		: TITLE[4" "]OF ARTICLE :[RVSOFF]":PRIN	FA
	•430 PRINT:PRINTTAB(7);"PLEASE PRESS FUNC	FD	T"[BLUE]";:INPUTTA\$(C)	GG
	TION KEY":RE\$="":FORI=1TO4000:NEXT	CF	•1045 IFTA\$(C)="/"THEN1020	
	•440 GOTO100		•1050 IFLEN(TA\$(C))>39THENGOSUB50:PRINT:G	LH
MM	•450 DATA+++++++,+...SELE	BN	OTO1040	
	CTION MENU....+,+ +		•1060 PRINT"[BLACK]":PRINTTAB(8);"[RVSON]	
	•460 DATA + 1--BUSINESS +,+ 2--DI	AM	: AUTHOR'S[8" "]NAME :[RVSOFF]":PRINT"[B	IJ
	SK OPERATION +,+ 3--EDUCATIONAL +		LUE]";:INPUTAN\$(C)	GC
ND	•470 DATA + 4--FUN AND GAMES +,+ 5--GR	BM	•1065 IFAN\$(C)="/"THEN1040	
	APHICS +,+ 6--HARDWARE +		•1070 IFLEN(AN\$(C))>39THENGOSUB50:PRINT:	MO
	•480 DATA + 7--HOME USE +,+ 8--LA	IL	GOTO1060	
	NGUAGES-MLX +,+ 9--MISCELLANEOUS +	EI	•1080 PRINT"[BLACK]":PRINTTAB(8);"[RVSON]	
DF	•490 DATA + 10-MUSICAL +,+ 11-SI		: [SS]NAME[5" "]OF MAGAZINE :[RVSOFF]":PR	MM
	MULATIONS +,+ 12-SOFTWARE +	BJ	INT"[BLUE]";:INPUTMN\$(C)	JM
IF	•500 DATA + 13-TUTORIAL +,+ 14-UT		•1085 IFMN\$(C)="/"THEN1060	
	ILITIES +,+ +	PN	•1090 IFLEN(MN\$(C))>39THENGOSUB50:PRINT:G	AN
	•510 DATA+...PLEASE SELECT....+,++++++		OTO1080	
PG	+++++++	DE	•1100 PRINT"[BLACK]":PRINTTAB(8);"[RVSON]	AO
	•520 PRINT"[CLEAR]":PRINT:POKE53280,7:POK	KG	: ISSUE # / PAGE / DATE :[RVSOFF]":PRINT"	HI
MP	E53281,1:PRINT"[BLACK]":FORI=1TO20:READM	ME	[BLUE]";:INPUTID\$(C)	
	\$	LO	•1105 IFID\$(C)="/"THEN1080	GH
	•530 PRINTTAB(9);M\$:NEXT:RESTORE:INPUT"[9	AP	•1110 IFLEN(ID\$(C))>39THENGOSUB50:PRINT:	
	"[RIGHT]"]";SE\$:SE=VAL(SE\$)	EC	GOTO1100	IP
BM	•532 IFSE\$="/"THEN440	IG	•1120 PRINT"[BLACK]":PRINTTAB(8);"[RVSON]	CO
	•535 IFSE<1ORSE>14THEN520	FA	: COMMENTS OR[3" "]NOTES :[RVSOFF]":PRI	HI
BJ	•540 IFSE\$="1"THENZ\$="BUSINESS"	OE	NT"[BLUE]";:INPUTCM\$(C)	
	•550 IFSE\$="2"THENZ\$="DISK OPERATION"	LC	•1130 IFLEN(CM\$(C))>79 THENGOSUB60:PRINT:	EG
	•560 IFSE\$="3"THENZ\$="EDUCATIONAL"	KE	GOTO1120	BO
	•570 IFSE\$="4"THENZ\$="FUN & GAMES"	GC	•1135 IFCM\$(C)="/"THEN1100	
EO	•580 IFSE\$="5"THENZ\$="GRAPHICS"	AI	•1140 PRINT"[BLACK]":PRINTTAB(5);"->PRESS	BG
	•590 IFSE\$="6"THENZ\$="HARDWARE"	PJ	ANY KEY TO CONTINUE<-"	OF
IL	•600 IFSE\$="7"THENZ\$="HOME USE"	CK	•1150 GETDE\$:IFDE\$=""THEN1150	CD
	•610 IFSE\$="8"THENZ\$="LANGUAGES-MLX"	BP	•1160 PRINT"[CLEAR]":PRINTTAB(20-LEN(Z\$)/	IO
	•620 IFSE\$="9"THENZ\$="MISCELLANEOUS"	FJ	2);Z\$:PRINT	DO
LJ	•630 IFSE\$="10"THENZ\$="MUSICAL"	EI	•1170 PRINTTAB(5);"[RVSON][C][RVSOFF]ONTI	BL
	•640 IFSE\$="11"THENZ\$="SIMULATIONS"	DH	NUE OR [RVSON][W][RVSOFF]RITE TO DISK"	ED
	•650 IFSE\$="12"THENZ\$="SOFTWARE"	EM	•1180 GETDE\$:IFDE\$=""THEN1180	MF
	•660 IFSE\$="13"THENZ\$="TUTORIAL"		•1185 IFDE\$="/"THENRETURN	DN
CE	•670 IFSE\$="14"THENZ\$="UTILITIES"		•1190 IFDE\$<>"C"ANDDE\$<>"W"THEN1180	PH
	•680 RE=ASC(RE\$):ON(RE-132)GOSUB1000,2000	EO	•1200 IFDE\$="C"THENPRINT"[CLEAR]":C=C+1:G	GE
	,3000,4000,5000,6000,7000,8000	LF	OTO1020	BO
	•690 Z\$="XX":DE\$="":DE=.:K1=.:GOTO100	KD	•1205 PRINT:PRINTTAB(15);"WRITING TO":PRI	MF
	•700 REM*****		NT:PRINTTAB(20-LEN(Z\$)/2);Z\$	DN
CL	*		•1210 GOSUB80:RETURN	PH
	•710 REM* WRITTEN BY GLENN LUMPKINS	EO	•1999 REM====DELETE ROUTINE=====	
	•720 REM* FEB. 1985	OC	•2000 PRINT"[CLEAR]":PRINT:PRINT:PRINT	GE
	•730 REM*****	HO	•2005 PRINT" DELETE [RVSON][E][RVSOFF]NT	BO
GJ	*	GN	IRE FILE OR [RVSON][O][RVSOFF]NE RECORD"	IO
	•999 REM====ADD ROUTINE=====		•2010 GETDE\$:IFDE\$=""THEN2010	FI
	•1000 PRINT"[CLEAR]":GOSUB10:PRINT"[CLEAR		•2015 IFDE\$="/"THENRETURN	EP
	]":C=C+1		•2020 IFDE\$<>"E"ANDDE\$<>"O"THEN2000	
EG	•1010 IFK=1THENK=0:RETURN		•2030 IFDE\$="E"THENGOSUB920:RETURN	
AE	•1020 PRINTTAB(8);"[RVSON]: SUBJECT OF			

•2040 FL=1:GOSUB7000:FL=.:RETURN	JD	O R":PRINT#3:PRINT#3,AN\$(I):PRINT#3	ME
•2999 REM=====SORT PART1=====	PK	•4280 PRINT#3,XX\$:PRINT#3,TAB(2);"M A G A	
•3000 GOSUB10:PRINT"[CLEAR]":FORI=1TO5:PR	JE	Z I N E":PRINT#3:PRINT#3,MN\$(I)	EO
INT:NEXT:PRINTTAB(15);"SORT BY":PRINT	OF	•4290 PRINT#3:PRINT#3,XX\$:PRINT#3,TAB(5);	
•3010 F1=1:GOSUB5010:IFDE\$="/"THENRETURN	ED	"I S S U E":PRINT#3:PRINT#3,ID\$(I)	BP
•3020 IFDE\$="S"THENK1=1:GOSUB9300:GOTO307	ED	•4300 PRINT#3:PRINT#3,XX\$:PRINT#3,TAB(3);	
0		"C O M M E N T":PRINT#3:PRINT#3,CM\$(I)	MI
•3030 IFDE\$="T"THENK1=2:GOSUB9300:GOTO307		•4310 PRINT#3:NEXT:CLOSE3:RETURN	GC
0		•4999 REM=====SEARCH ROUTINE=====	AA
•3040 IFDE\$="A"THENK1=3:GOSUB9300:GOTO307	GP	•5000 PRINT"[CLEAR]":FORI=1TO5:PRINT:NEXT	HN
0		:PRINTTAB(15);"SEARCH BY":PRINT	
•3050 IFDE\$="M"THENK1=4:GOSUB9300:GOTO307	LK	•5010 PRINT:PRINTTAB(15);"[RVSON][S][RVSO	
0		FF]BJECT":PRINT:PRINTTAB(15);"[RVSON][T	CG
•3060 IFDE\$="I"THENK1=5:GOSUB9300:GOTO307	IF	][RVSOFF]ITLE":PRINT	
0		•5020 PRINTTAB(15);"[RVSON][A][RVSOFF]UTH	
•3070 K1=.:PRINT"[CLEAR]":PRINTTAB(8);"ON	OO	OR":PRINT:PRINTTAB(15);"[RVSON][M][RVSO	OK
E MOMENT WRITING SORTED":PRINT	KL	F]AGAZINE":PRINT	
•3080 PRINTTAB(20-LEN(Z\$)/2);Z\$	MF	•5030 PRINTTAB(15);"[RVSON][I][RVSOFF]SSU	BL
•3090 GOSUB80:RETURN	LP	E	EC
•3999 REM=====PRINT RECORD/FILE=====		•5040 GETDE\$:IFDE\$="""THEN5040	IO
•4000 PRINT"[CLEAR]":PRINTTAB(8);"[RVSON]	LD	•5045 IFDE\$="/"THENRETURN	
[E][RVSOFF]NTIRE OR [RVSON][O][RVSOFF]NE	BM	•5050 IFDE\$<"S"ANDDE\$<"T"ANDDE\$<"A"AND	IC
RECORD"	IO	DE\$<"M"ANDDE\$<"I"THEN5000	KC
•4010 GETDE\$:IFDE\$="""THEN4010	GB	•5055 IFF1=1THENF1=.:RETURN	
•4020 IFDE\$="/"THENRETURN	NI	•5060 IFDE\$="S"THENPRINT"[CLEAR]":FORI=1T	PL
•4030 IFDE\$<"E"ANDDE\$<"O"THEN4010	JH	04:PRINT:NEXT:GOTO5090	AH
•4040 IFDE\$="O"THENK2=1:GOSUB7000:IFK2=.T	ML	•5070 IFDE\$="T"THENPRINT"[CLEAR]":FORI=1T	OM
HENRETURN	FH	04:PRINT:NEXT:GOTO5110	GC
•4050 IFDE\$="E"THENGOSUB10:GOTO4200	HD	•5075 IFDE\$="A"THENPRINT"[CLEAR]":FORI=1T	FA
•4060 OPEN3,4:XX\$="[s T][17"="[s Y]":PRI	JC	04:PRINT:NEXT:GOTO5130	
NT#3,Z\$;" RECORD NUMBER";I:PRINT#3	PG	•5080 IFDE\$="M"THENPRINT"[CLEAR]":FORI=1T	GG
•4070 PRINT#3:PRINT#3,XX\$:PRINT#3,TAB(3);	NH	04:PRINT:NEXT:GOTO5150	LH
"S U B J E C T":PRINT#3	BJ	•5085 IFDE\$="I"THENPRINT"[CLEAR]":FORI=1T	FN
•4080 PRINT#3,SU\$(I):PRINT#3:PRINT#3,XX\$:	FL	04:PRINT:NEXT:GOTO5170	NE
PRINT#3,TAB(5);"T I T L E":PRINT#3	GL	•5090 PRINT"[CLEAR]":PRINTTAB(13);"ENTER	LO
•4090 PRINT#3,TA\$(I):PRINT#3:PRINT#3,XX\$:	OJ	";:PRINT"[BLUE]";:PRINT"[SUBJECT]":PRINT	JB
PRINT#3,TAB(4);"A U T H O R":PRINT#3	AH	"[BLACK]"	AL
•4100 PRINT#3,AN\$(I):PRINT#3:PRINT#3,XX\$:	GH	•5100 INPUTS\$:GOSUB10:GOTO5300	NF
PRINT#3,TAB(2);"M A G A Z I N E"	AA	•5110 PRINT"[CLEAR]":PRINTTAB(13);"ENTER	
•4110 PRINT#3:PRINT#3,MN\$(I):PRINT#3:PRIN	PD	";:PRINT"[BLUE]";:PRINT"[TITLE]":PRINT"[
T#3,XX\$:PRINT#3,TAB(5);"I S S U E"	PE	BLACK]"	
•4120 PRINT#3:PRINT#3,ID\$(I):PRINT#3:PRIN		•5120 INPUTM\$:GOSUB10:GOTO5300	
T#3,XX\$:PRINT#3,TAB(3);"C O M M E N T"		•5130 PRINT"[CLEAR]":PRINTTAB(13);"ENTER	
•4130 PRINT#3:PRINT#3,CM\$(I):CLOSE3:RETUR		";:PRINT"[BLUE]";:PRINT"[AUTHOR]":PRINT"	
N		[BLACK]"	
•4199 REM=====PRINT ENTIRE RECORD=====		•5140 INPUTA\$:GOSUB10:GOTO5300	
•4200 PRINT"[CLEAR]":PRINTTAB(14);"NOW PR		•5150 PRINT"[CLEAR]":PRINTTAB(12);"ENTER	
INTING":PRINT:PRINTTAB(20-LEN(Z\$)/2);Z\$		";:PRINT"[BLUE]";:PRINT"[MAGAZINE]":PRIN	
•4210 XX\$="[s T][17"="[s Y]":OPEN3,4:PRI		T"[BLACK]"	
NT:PRINT"RECORD NUMBER"		•5160 INPUTM\$:GOSUB10:GOTO5300	
•4230 PRINT#3,Z\$;" FILE":PRINT#3		•5170 PRINT"[CLEAR]":PRINTTAB(13);"ENTER	
•4240 FORI=1TOC:PRINTI:PRINT#3:PRINT#3,"=		";:PRINT"[BLUE]";:PRINT"[ISSUE]":PRINT"[
=>RECORD NUMBER";I;" <=":PRINT#3		BLACK]"	
•4250 PRINT#3,XX\$:PRINT#3,TAB(3);"S U B J		•5180 INPUTI\$:GOSUB10:GOTO5300	
E C T":PRINT#3:PRINT#3,SU\$(I):PRINT#3		•5300 PRINT"[CLEAR]":PRINT" #";TAB(10);"O	
•4260 PRINT#3,XX\$:PRINT#3,TAB(5);"T I T L		NE MOMENT SEARCHING":PRINTTAB(20-LEN(Z\$)	
E":PRINT#3:PRINT#3,TA\$(I):PRINT#3		/2);Z\$	
•4270 PRINT#3,XX\$:PRINT#3,TAB(4);"A U T H		•5310 FORI=1TOC	

ME	•5320 IFDE\$="S"ANDLEFT\$(S\$,LEN(S\$))=LEFT\$(SU\$(I),LEN(S\$))THENPRINTI;SU\$(I):K=K+1	JB	•6100 DE=VAL(DE\$):IFDE\$="/"THENRETURN	NL
EO	•5330 IFDE\$="T"ANDLEFT\$(T\$,LEN(T\$))=LEFT\$(TA\$(I),LEN(T\$))THENPRINTI;TA\$(I):K=K+1	LF	•6110 IFDE<1ORDE>7THEN6090	LO
BP	•5340 IFDE\$="I"ANDLEFT\$(I\$,LEN(I\$))=LEFT\$(ID\$(I),LEN(I\$))THENPRINTI;ID\$(I):K=K+1	FF	•6120 IFDE=7THENGOSUB80:RETURN	HO
MI	•5350 IFDE\$="M"ANDLEFT\$(M\$,LEN(M\$))=LEFT\$(MN\$(I),LEN(M\$))THENPRINTI;MN\$(I):K=K+1	BB	•6130 IFDE=1THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: SUBJECT OF ARTICLE :[RVSOFF]":PRINT:PRINT"[BLUE]";	II
GC	•5360 IFDE\$="A"ANDLEFT\$(A\$,LEN(A\$))=LEFT\$(AN\$(I),LEN(A\$))THENPRINTI;AN\$(I):K=K+1	KB	•6140 IFDE=1THENPRINTSU\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTSU\$(I)	NH
AA	•5370 IFK=15THENK=0:PRINT:PRINTTAB(4);"CORRECT RECORD FOUND [RVSON][Y][RVSOFF] OR [RVSON][N][RVSOFF]":Y=1	GG	•6150 IFLEN(SU\$(I))>79THENGOSUB60:PRINT:GOTO6130	GM
HN	•5380 IFY=1THENGETRE\$:IFRE\$=""THEN5380	NN	•6155 IFSU\$(I)="/"THENRETURN	GN
CG	•5385 IFRE\$="/"THENRETURN	LM	•6160 IFDE=2THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: TITLE OF ARTICLE :[RVSOFF]":PRINT:PRINT"[BLUE]";	JG
H	•5390 IFY=1ANDRE\$<>"N"ANDRE\$<>"Y"THEN5380	DK	•6170 IFDE=2THENPRINTTA\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTTA\$(I)	MC
FK	•5400 IFRE\$="N"THENPRINT"[CLEAR]":Y=.:RE\$="" :NEXT:GOTO5440	KI	•6180 IFLEN(TA\$(I))>39THENGOSUB50:PRINT:GOTO6160	DN
U	•5410 IFRE\$="Y"THENY=.:GOTO5500	NI	•6185 IFTA\$(I)="/"THENRETURN	GO
BL	•5415 IFC=IANDK=>1THENK=15:GOTO5370	AE	•6190 IFDE=3THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: AUTHOR'S NAME :[RVSOFF]":PRINT:PRINT"[BLUE]";	HE
EC	•5420 NEXT:PRINT	FO	•6200 IFDE=3THENPRINTAN\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTAN\$(I)	FL
IO	•5430 PRINTTAB(11);"RECORD NOT FOUND":PRINT	PA	•6210 IFLEN(AN\$(I))>39THENGOSUB50:PRINT:GOTO6190	OI
IC	•5440 PRINTTAB(10)"[RVSON][A][RVSOFF]BORT OR [RVSON][R][RVSOFF]ETRY	GN	•6215 IFAN\$(I)="/"THENRETURN	DA
KC	•5450 GETDE\$:IFDE\$=""THEN5450	BN	•6220 IFDE=4THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: NAME OF MAGAZINE :[RVSOFF]":PRINT:PRINT"[BLUE]";	EE
PL	•5460 IFDE\$="/"ORDE\$="A"THENRETURN	EK	•6230 IFDE=4THENPRINTMN\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTMN\$(I)	KG
T	•5470 IFDE\$="R"THENDE\$="" :GOTO5000	FO	•6240 IFLEN(MN\$(I))>39THENGOSUB50:PRINT:GOTO6220	GM
AH	•5480 IFDE\$<>"A"ANDDE\$<>"R"THEN5450	PF	•6245 IFMN\$(I)="/"THENRETURN	EE
OM	•5500 PRINT:PRINTTAB(13);"SELECT RECORD":PRINT"[BLUE]";:INPUTRN:IFRN>CTHEN5500	KB	•6250 IFDE=5THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: ISSUE / PAGE / DATE :[RVSOFF]":PRINT:PRINT"[BLUE]";	IA
GC	•5510 PRINT"[BLACK]":PRINT"[CLEAR]":I=RN:FA=1:GOTO7010	DD	•6260 IFDE=5THENPRINTID\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTID\$(I)	JB
FA	•5999 REM====MODIFY RECORD=====	LN	•6270 IFLEN(ID\$(I))>39THENGOSUB50:PRINT:GOTO6250	DP
T	•6000 F4=1:GOSUB7000	PP	•6275 IFID\$(I)="/"THENRETURN	DG
GG	•6010 PRINTTAB(7);"[BLACK]";"[RVSON][1. SUBJECT OF ARTICLE][RVSOFF]":PRINT"[BLUE]";SU\$(I):PRINT	CN	•6280 IFDE=6THENPRINT"[CLEAR]":PRINTTAB(5);"[RVSON]: COMMENTS OR NOTES :":PRINT:PRINT"[BLUE]";	BL
LH	•6020 PRINTTAB(7);"[BLACK]";"[RVSON][2. TITLE OF ARTICLE[3" "]]][RVSOFF]":PRINT"[BLUE]";TA\$(I):PRINT	AB	•6290 IFDE=6THENPRINTCM\$(I):PRINT:PRINT"ENTER NEW VALUE":PRINT:INPUTCM\$(I)	AO
FN	•6030 PRINTTAB(7);"[BLACK]";"[RVSON][3. AUTHOR'S NAME[6" "]]][RVSOFF]":PRINT"[BLUE]";AN\$(I):PRINT	AN	•6300 IFLEN(CM\$(I))>70THENGOSUB60:PRINT:GOTO6280	DP
NE	•6040 PRINTTAB(7);"[BLACK]";"[RVSON][4. NAME OF MAGAZINE[3" "]]][RVSOFF]":PRINT"[BLUE]";MN\$(I):PRINT	PM	•6305 IFCM\$(I)="/"THENRETURN	CF
R	•6050 PRINTTAB(7);"[BLACK]";"[RVSON][5. ISSUE #/PAGE/DATE][RVSOFF]":PRINT"[BLUE]";ID\$(I):PRINT	DO	•6310 PRINT"[CLEAR]":GOTO6010	PO
AL	•6060 PRINTTAB(7);"[BLACK]";"[RVSON][6. COMMENT OR NOTE[4" "]]][RVSOFF]":PRINT"[BLUE]";CM\$(I):PRINT	BG	•6999 REM====LIST + DELETE ROUTINE =====	CE
NF	•6070 PRINTTAB(7);"[BLACK]";"[RVSON][7. WRITE TO DISK[6" "]]][RVSOFF]":PRINT	OC	•7000 PRINT"[CLEAR]":GOSUB10:PRINT"[CLEAR]":FORI=1TOC:PRINT:PRINT	OB
JM	•6080 PRINTTAB(7);"[3""]>CHANGE WHICH LINE<=""	BO	•7010 PRINTTAB(9);"[RVSON][:SUBJECT OF ARTICLE:][RVSOFF]":PRINT"[BLUE]";SU\$(I):PRINT	
MJ	•6090 GETDE\$:IFDE\$=""THEN6090	EK		

INT	BM	•8010 FORI=1TO15:POKE53281,I+1:FOR X=1TO2	AA
•7020 PRINTTAB(9);"[BLACK][RVSON][:TITLE		00:NEXTX:NEXTI:POKE53281,6	FO
OF ARTICLE :][RVSOFF]":PRINT"[BLUE]";TA	MJ	•8020 PRINT"[CLEAR]":PRINT"[HOME]":END	PG
\$(I):PRINT		•8999 REM===== INITIALIZE FILE=====	
•7030 PRINTTAB(9);"[BLACK][RVSON][:AUTHOR	MI	•9000 PRINT"[CLEAR]":PRINTTAB(5);"THIS FI	PL
'S NAME[5" "]:][RVSOFF]":PRINT"[BLUE]";A		LE "";Z\$;" HAS NOT BEEN INITIALIZED ":C	
N\$(I):PRINT	PI	LOSE5	PL
•7040 PRINTTAB(9);"[BLACK][RVSON][:NAME O		•9010 PRINT"OR YOU DO NOT HAVE THE CORREC	PL
F MAGAZINE :][RVSOFF]":PRINT"[BLUE]";MN	BD	T DISK IN THE DRIVE !"	
\$(I):PRINT		•9020 PRINT:PRINTTAB(8);"[RVSON][C][RVSO	OE
•7050 PRINTTAB(9);"[BLACK][RVSON][:ISSUE		F]ONTINUE -/- [RVSON][R][RVSOFF]ETURN"	GH
#/PAGE/DATE :][RVSOFF]":PRINT"[BLUE]";ID		•9030 GETDE\$:IFDE\$=""THEN9030	PM
\$(I):PRINT		•9035 IFDE\$="/"THENK=1:RETURN	EF
•7060 PRINTTAB(9);"[BLACK][RVSON][:COMMEN	OC	•9040 IFDE\$="R"THENK=1:RETURN	PN
T OR NOTES :][RVSOFF]":PRINT"[BLUE]";CM		•9050 IFDE\$<>"R"ANDDE\$<>"C"THEN9030	PE
\$(I):PRINT	AH	•9060 OPEN5,8,5,"0:"+Z\$+",S,W":PRINT"[CLE	GB
•7065 IFFA=1THENPRINT:PRINT"[BLACK]";TAB(	BK	AR]":PRINTTAB(14);"INITIALIZING"	BG
8);"PRESS ANY KEY TO CONTINUE"	IO	•9070 PRINT:PRINTTAB(20-LEN(Z\$)/2);Z\$	DC
•7070 IFFA=1THENGETDE\$:IFDE\$=""THEN7070	MC	•9080 SU\$(1)="EOF":TA\$(1)="TITLE":AN\$(1)=	PG
•7075 IFDE\$="/"THENRETURN		"AUTHOR":MN\$(1)="MAG":ID\$(1)="ISSUE"	JA
•7080 IFFA=1THENFA=. :RETURN	HM	•9090 CM\$(1)="COMMENT"	JM
•7090 IFFL=1THENPRINT"[BLACK]";TAB(5);"DE	DI	•9100 PRINT#5,SU\$(1)P\$TA\$(1)P\$AN\$(1)P\$MN\$	KK
LETE THIS RECORD [RVSON][Y][RVSOFF] OR [	ML	(1)P\$ID\$(1)P\$CM\$(1):CLOSE5:RETURN	GC
RVSON][N][RVSOFF]"		•9199 REM=====DELETE THE ENTIRE FILE =====	IO
•7100 IFFL=1THENGETDE\$:IFDE\$=""THEN7100	AF	=	PC
•7110 IFFL=1ANDDE\$="Y"THEN7180	EB	•9200 PRINT"[CLEAR]":FORI=1TO10:PRINT:NEX	LD
•7120 IFFL=1THENPRINT"[CLEAR]":NEXTI:RETU	IO	T:PRINTTAB(11);"!! ARE YOU SURE !!"	DO
RN	CF	•9210 PRINT:PRINTTAB(15);"[RVSON][Y][RVSO	BJ
•7125 IFF4=1THENPRINT"[BLACK]";TAB(5);"MO		FF] OR [RVSON][N][RVSOFF]"	KP
DIFY THIS RECORD [RVSON][Y][RVSOFF] OR [	EB	•9220 GETDE\$:IFDE\$=""THEN9220	EC
RVSON][N][RVSOFF]":GOTO7140	LD	•9225 IFDE\$="/"THENRETURN	KL
•7130 PRINT"[BLACK]";TAB(7);"CONTINUE PAG	EC	•9230 IFDE\$<>"Y"ANDDE\$<>"N"THEN9220	EO
ING [RVSON][Y][RVSOFF] OR [RVSON][N][RVS	KJ	•9240 IFDE\$="N"THENRETURN	MI
OFF]"	OF	•9250 PRINT:PRINTTAB(10);"ONE MOMENT DELE	PO
•7140 GETDE\$:IFDE\$=""THEN7140	CP	TING":PRINT:PRINTTAB(20-LEN(Z\$)/2);Z\$	II
•7145 IFDE\$="/"THENRETURN	BI	•9260 OPEN5,8,5,"@0:"+Z\$+",S,W":GOSUB9080	ND
•7150 IFDE\$<>"Y"ANDDE\$<>"N"THEN7140	KH	:RETURN	IM
•7155 IFF4=1ANDDE\$="N"THENPRINT"[CLEAR]":	EH	•9299 REM=====SORT PART2=====	MI
NEXT:RETURN	OA	•9300 PRINT"[CLEAR]":PRINTTAB(9);"ONE MOM	NA
•7160 IFDE\$="N"THENRETURN		ENT NOW SORTING":PRINT	II
•7165 IFF4=1ANDDE\$="Y"THENF4=. :PRINT"[CLE	HB	•9310 PRINTTAB(20-LEN(Z\$)/2);Z\$	NN
AR]":RETURN	CC	•9320 ONK1GOTO9350,9400,9450,9500,9550	IM
•7170 PRINT"[CLEAR]":NEXT:K2=. :RETURN	CO	•9350 F=. :FORJ=1TOC-1	OJ
•7180 SU\$(I)="DELETE":OPEN5,8,5,"@0:"+Z\$+		•9360 IFSU\$(J)<=SU\$(J+1)THEN9380	II
"S,W":PRINT"[CLEAR]"		•9370 GOSUB10000	NE
•7190 PRINTTAB(4);"ONE MOMENT DELETING RE		•9380 NEXT:IFF=1THEN9350	MI
CORD #";I:FORI=1TOC		•9390 RETURN	MI
•7200 IFSU\$(I)="DELETE"THENC=C-1:NEXT		•9400 F=. :FORJ=1TOC-1	OJ
•7210 PRINT#5,SU\$(I)P\$TA\$(I)P\$AN\$(I)P\$MN\$		•9410 IFTA\$(J)<=TA\$(J+1)THEN9430	II
(I)P\$ID\$(I)P\$CM\$(I)		•9420 GOSUB10000	NE
•7220 NEXT:I=C+1:SU\$(I)="EOF":TA\$(I)="TIT		•9430 NEXT:IFF=1THEN9400	MI
LE":AN\$(I)="AUTHOR":MN\$(I)="MAG"		•9440 RETURN	OJ
•7230 ID\$(I)="ISSUE":CM\$(I)="COMMENT"		•9450 F=. :FORJ=1TOC-1	II
•7240 PRINT#5,SU\$(I)P\$TA\$(I)P\$AN\$(I)P\$MN\$		•9460 IFAN\$(J)<=AN\$(J+1)THEN9480	NE
(I)P\$ID\$(I)P\$CM\$(I):CLOSE5:FL=. :RETURN		•9470 GOSUB10000	MI
•7999 REM=====END=====		•9480 NEXT:IFF=1THEN9450	
•8000 PRINT"[CLEAR]":FORX=1TO12:PRINT:NEX		•9490 RETURN	
T:PRINTTAB(9);"IT'S BEEN A PLEASURE"		•9500 F=. :FORJ=1TOC-1	

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

•9510 IFMN$(J)<=MN$(J+1)THEN9540
•9520 GOSUB10000
•9530 NEXT:IFF=1THEN9500
•9540 RETURN
•9550 F=.:FORI=1TOC-1
•9560 IFID$(J)<=ID$(J+1)THEN9580
•9570 GOSUB10000
•9580 NEXT:IFF=1THEN9550
•9590 RETURN
•10000 S1$=SU$(J):T1$=TA$(J):A1$=AN$(J):M
1$=MN$(J):I1$=ID$(J):C1$=CM$(J)
•10010 SU$(J)=SU$(J+1):SU$(J+1)=S1$:TA$(J
)=TA$(J+1):TA$(J+1)=T1$:F=1
•10020 AN$(J)=AN$(J+1):AN$(J+1)=A1$:MN$(J
)=MN$(J+1):MN$(J+1)=M1$
•10030 ID$(J)=ID$(J+1):ID$(J+1)=I1$:CM$(J
)=CM$(J+1):CM$(J+1)=C1$:RETURN

```

```

NC C110: 90 02 E6 15 C8 B1 FB 4C 61
PP C118: E4 C0 20 53 C0 A5 3D C5 9A
NK C120: 14 D0 13 A5 3E C5 15 D0 A7
IM C128: 0D A9 20 20 D2 FF A5 FD 95
MH C130: AA A5 FE 20 CD BD A0 00 CB
NK C138: B1 FB C9 2C F0 91 4C 23 CD
II C140: C0 01
NF
IM
PB
OJ
MO
KA

```

START & END FILE ADDRESS FROM PAGE 17

```

•2 PRINT"[CLEAR][DOWN][7" "][RVSON]START
& END FILE ADDRESS":REM BY DAVE SMART DM
•4 FORI=828TO904:READA:POKEI,A:NEXT KH
•6 OPEN15,8,15,"I0" OO
•8 INPUT"[3"[DOWN]" ] FILE TO CHECK ";F$:P
RINT DE
•10 "PMSD-3" SEQ OG
•12 POKE251,P-S*256:POKE252,S CI
•14 PRINT" ";F$ KC
•16 OPEN1,8,2,"0:""+F$ GO
•18 GET#1,A$,B$ AK
•20 D=ASC(A$+CHR$(0))+256*ASC(B$+CHR$(0)) IL
•22 INPUT#15,E,E$,E1,E2 ED
•24 IFE>0THENPRINT:PRINT,E$:CLOSE1:CLOSE1
5:END KL
•30 PRINTTAB(15)"START ADDR.(DEC)"D JH
•32 W=D:GOSUB54 HC
•34 PRINTTAB(26)"(HEX) "H$ NJ
•36 PRINT"[DOWN]PLEASE WAIT[3".""] IJ
•38 SYS831 DN
•40 F=P:P=PEEK(251)+PEEK(252)*256:T=P CN
•42 Z$=RIGHT$("[3" " ]"+STR$(T-F),5) DH
•44 PRINT"[UP][18" " ]"Z$;" BYTES OF MEM.[
DOWN]" JP
•46 Z=VAL(Z$) KH
•48 PRINTTAB(17)"END ADDR.(DEC)"Z+W:D=W+Z
:GOSUB54 AN
•50 PRINTTAB(26)"(HEX) "H$ NJ
•52 GOTO60 PG
•54 H$="":M=4096:N=3:IFD<256THENM=16:N=1 AL
•56 FORH=0TON:C=INT(D/M):D=D-C*M:M=M/16:C
=C+48:IFC>57THENC=C+7 DA
•58 H$=H$+CHR$(C):NEXT:RETURN BL
•60 CLOSE1:CLOSE15 BB
•62 PRINT"[DOWN][DOWN]DO YOU WISH TO CHEC
K ANOTHER FILE (Y/N)" NH
•64 GETA$:IFA$=""THEN64 GB
•66 IFA$<>"Y"THENEND DI
•68 IFA$="Y"THEN6 DG
•70 DATA 76,96,3,162,1,32,198,255,32 NH
•72 DATA 228,255,160,0,145,251,230 OB
•74 DATA 251,208,8,230,252,165,252 HA
•76 DATA 201,208,240,6,165,144,41,64 KD

```

GO-LISTER* FROM PAGE 73

First byte: C000 Last byte: C140 SYS to start: 49152

```

C000: A9 01 A2 04 A0 FF 20 BA CC
C008: FF A9 00 20 BD FF 20 C0 70
C010: FF A2 01 20 C9 FF A0 08 46
C018: 84 46 A0 01 84 45 4C 87 22
C020: C0 A0 00 B1 FB C9 00 F0 E9
C028: 41 C9 22 D0 06 A9 01 45 1C
C030: 43 85 43 A5 43 C9 01 F0 E0
C038: 12 B1 FB C9 89 F0 28 C9 2E
C040: 8D F0 24 C9 A7 F0 20 C9 2F
C048: CB F0 1C A0 01 20 53 C0 F6
C050: 4C 23 C0 C0 00 F0 0F A9 EA
C058: 01 18 65 FB 90 02 E6 FC 49
C060: 85 FB 88 4C 53 C0 60 4C 77
C068: CF C0 A0 02 B1 FB C9 00 13
C070: F0 14 A0 03 B1 FB 85 FD 4A
C078: C8 B1 FB 85 FE C8 20 53 AF
C080: C0 84 43 4C 23 C0 88 B1 73
C088: 45 C9 00 F0 34 C8 B1 45 7C
C090: 85 3D C8 B1 45 85 3E A0 77
C098: 00 B1 45 AA C8 B1 45 85 7F
C0A0: 46 8A 85 45 A9 00 85 FB 67
C0A8: A9 08 85 FC A9 0D 20 D2 86
C0B0: FF A5 3D AA A5 3E 20 CD 10
C0B8: BD A9 3A 20 D2 FF 4C 72 0C
C0C0: C0 A9 0D 20 D2 FF 20 CC 18
C0C8: FF A9 01 20 C3 FF 60 A0 58
C0D0: 00 84 14 84 15 C8 B1 FB 79
C0D8: C9 20 F0 F9 C9 A0 F0 F5 FE
C0E0: C9 A4 F0 F1 C9 30 30 32 8E
C0E8: C9 3A 10 2E E9 2F 85 07 D0
C0F0: A5 15 85 22 A5 14 0A 26 3D
C0F8: 22 0A 26 22 65 14 85 14 80
C100: A5 22 65 15 85 15 06 14 F6
C108: 26 15 A5 14 65 07 85 14 03

```

*To enter Go-Lister, you must use *Flankspeed* (see page 86).

AHOY! 109

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

•78 DATA 240,231,76,204,255,162,1,32
 •80 DATA 201,255,162,54,134,1,160,0
 •82 DATA 177,251,32,210,255,230,251
 •84 DATA 208,2,230,252,165,251,197,253
 •86 DATA 208,239,165,252,197,254,208
 •88 DATA 233,162,55,134,1,76,204,255

KC •38 IFF=23ANDA<8163THENA=A+1:G=1 FL
 DB •39 IFPEEK(A)=5THEN14 OI
 MK •40 POKEA+B,2:POKEA,G:POKEC,32:POKEC+1,32 IA
 DM :C=C+1:IFPEEK(C+1)=5THENC=C+22 KK
 FL •41 IFA<HTHEN8 PG
 EF •42 GOTO33 GD

FISH MATH FROM PAGE 29

•0 GOT090
 •2 D=INT(RND(1)*9)+1
 •3 E=INT(RND(1)*9)+1:I=D*E:PRINT"[HOME][2
 2"[DOWN]]"[7"[RIGHT]]";D;"[RVSON][s V]"
 ;E;
 •4 X=2:Q=0:F0RT=1T07:POKEU,241:F0RTT=1T03
 00:NEXT:POKEU,0:F0RTT=1T050:NEXT:NEXT:GO
 T034
 •8 IFQ=ITHEN18
 •9 IFQ<>ITHEN70
 •14 POKEA,G:POKEA+B,2:Q=Q+1:F0RT=170T0135
 STEP-1:POKEU+1,T:NEXT:POKEU+1,0:POKEA,32
 :GOTO40
 •18 K=K+1:PRINT"[CLEAR][BLACK][RVSON]GREA
 T[3"!"]":PRINT"[DOWN][DOWN][RED][RVSON]C
 ORRECT ANSWER!":PRINT"[DOWN][DOWN]";D;"[
 RVSON][s V]";E;"=";I
 •19 PRINT"[DOWN][PURPLE][RVSON]YOUR SCORE
 IS NOW";K:F0RT=135T0241:POKEU,T:NEXT
 •20 POKEU,0:F0RT=1T02:POKEU,241:F0RTT=1T0
 200:NEXT:POKEU,0:F0RTT=1T050:NEXT:NEXT
 •21 PRINT"[4"[DOWN]]"[BLACK][RVSON]HIT SP
 ACE"
 •22 IFPEEK(197)<>32THEN22
 •23 PP=PP+1:IFPP<10THEN29
 •24 POKE36869,240:PRINT"[CLEAR][7" "]GAME
 OVER":PRINT"[3"[DOWN]]FINAL SCORE:";K
 •25 PRINT"[4"[DOWN]]YOU HAVE COMPLETED T
 EN PROBLEMS WITHOUT GUMS GETTING YOU!"
 •26 PRINT"[3"[DOWN]]HIT [RVSON]F1[RVSOFF
] TO PLAY[10" "]AGAIN."
 •27 IFPEEK(197)<>39THEN27
 •28 RUN95
 •29 PRINT"[CLEAR]":POKE36869,255
 •30 A=8131:B=30720:C=7680:V=36878:POKEV,1
 5:U=36876:POKEV+1,238:X=1
 •31 F0RT=1T0125:S=INT(RND(1)*396)+7702:PO
 KES,5:POKES+B,0:NEXT:H=7679
 •33 IFX=1THEN2
 •34 POKEC+B,0:POKEC+1+B,0:POKEC,3:POKEC+1
 ,4:IFA=CORA=C+1THEN55
 •35 WAIT653,1,1:IFC>8160THENPOKEC,32:POKE
 C+1,32:C=7680
 •36 POKEA,32:F=PEEK(197):IFF<>23ANDF<>31T
 HENA=A-22:G=0
 •37 IFF=31THENA=A-1:G=2

PP •55 L=15
 OB •56 F0RT=200T0135STEP-1:POKEU+1,T:NEXT:PO
 KEU+1,135:F0RT=1T050:NEXT:POKEU+1,0 CL
 •57 L=L-1:POKEV,L:IFL>5THEN56 KA
 •58 F0RT=1T01500:NEXT:POKEU-2,135:F0RT=1T
 01000:NEXT:POKEU-2,0 AL
 •60 POKE36869,240:PRINT"[CLEAR]GUMS GOT Y
 A!":PRINT"[4"[DOWN]]BUT DON'T WORRY, YOU
 [3" "]WERE DELICIOUS!! BI
 •61 PRINT"[4"[DOWN]]HIT[RIGHT][RVSON]F1[
 RVSOFF] TO PLAY AGAIN" EO
 •62 IFPEEK(197)<>39THEN62 BC
 •63 RUN29 PO
 •70 POKE36869,240:IFQ>ITHENPRINT"[CLEAR]Y
 OU ATE TOO MUCH!" ID
 •71 IFQ<ITHENPRINT"[CLEAR]YOU DIDN'T EAT
 ENOUGH!" ED
 •72 F0RT=241T0135STEP-1:POKEU,T:NEXT:POKE
 U,0:F0RTT=1T0100:NEXT:POKEU,140:F0RT=1T0
 1000 JJ
 •73 NEXT:POKEU,0:PRINT"[DOWN][DOWN]";D;"[
 s V]";E;"=";I::PRINT"[DOWN][DOWN]YOU ATE
 ";Q AH
 •74 K=K-1:PRINT"[DOWN][DOWN]YOUR SCORE IS
 NOW";K:GOTO21 OF
 •90 POKE52,28:POKE56,28:CLR:F0RI=7168T076
 79:POKEI,PEEK(I+25600):NEXT NL
 •91 RESTORE:F0RT=1T020:READF:NEXT:F0RG=71
 68T07221:READF:POKEG,F:NEXT AO
 •92 DATA135,145,155,145,155,165,155,165,1
 75,185,185,195,165,165,165,195,195,165,1
 65,215 MK
 •93 DATA24,40,122,114,60,24,24,60,0,12,15
 8,253,247,144,12,0,0,48,121,191,239,9,48
 ,0 EH
 •94 DATA14,7,143,223,255,255,223,143,0,0,
 192,160,240,184,128,240,0,0,0,0,4,28,60,
 28,0,0,0 II
 •95 DATA0,0,0 HD
 •100 POKE36879,8:PRINT"[CLEAR][CYAN][3"[c
 +]]"[SS][3"[c +]]"[SS][3"[c +]]"[SS][c
 +]]"[SS][c +]":PRINT"[c +][4"[SS]]"[c +][S
 S][SS][c +][3"[SS]]"[c +][SS][c +]":PRIN
 T"[c +][c +][3"[SS]]"[c +][SS][SS][3"[c
 +]]"[SS][3"[c +]]" CG
 •101 PRINT"[c +][4"[SS]]"[c +][4"[SS]]"[c
 +][SS][c +][SS][c +]":PRINT"[c +][3"[SS
]"[3"[c +]]"[SS][3"[c +]]"[SS][c +][SS]
 [c +]":PRINT:PRINT"[3" "][c +][3"[SS]]"
 c +][SS][3"[c +]]"[SS][3"[c +]]"[SS][c +]


```

]]SS][c +]"
.102 PRINT"[3" "[c +][c +][SS][c +][c +]
[SS][c +][SS][c +][SS][SS][c +][SS][SS][
c +][SS][c +]":PRINT"[3"[SS]"[c +][SS][
c +][SS][c +][SS][3"[c +]"[SS][SS][c +]
[SS][SS][3"[c +]"[SS][SS][c +][3"
[SS]"[c +][SS][c +][SS][c +][SS][SS][c
+][SS][SS][c +]
[c +]"
.103 PRINT"[3" "[c +][3"[SS]"[c +][SS][
c +][SS][c +][SS][SS][c +][SS][SS][c +][
SS][c +]":PRINT"[DOWN][DOWN][YELLOW][3"
"]BY KEVIN DEWEY."
.104 PRINT"[DOWN][DOWN][5" "]"HIT ANY KEY"
;:POKE198,0
.105 PRINT"[BLACK]":POKE36878,15
.106 RESTORE:FORT=1TO20:READU:POKE36876,U
:FORTT=1TO100:NEXT:POKE36876,0
.107 GETA$:IFA$<>""THEN29
.108 NEXT
.109 GOTO106

```

FASTNEW

FROM PAGE 33 T-12

```

.10 REM -----
.11 REM FAST NEW
.12 REM DON LEWIS V010585 (REV V123184)
.14 REM -----
.15 GOTO 1000
.16 :
.19 REM DOWNLOAD CODE INTO 1541
.20 RESTORE:PRINT CHR$(151)
.30 FOR I=0 TO 102:READ A:POKE 820+I,A
.35 IF (I/10)-INT(I/10)=0 THEN PRINT "[c
P]";
.40 NEXT I
.50 FOR I=0 TO 511:READ A:POKE I+9472,A
.55 IF (I/18)-INT(I/18)=0 THEN PRINT "[c
P]";
.60 NEXT I:PRINT CHR$(30);:RETURN
.99 :
.100 REM PROMPT AND WAIT FOR RESPONSE
.105 PRINT:PRINT "INSERT DISK AND HIT "RT
$;
.110 GOSUB 200:IF A$<>CHR$(13) THEN GOTO
110
.120 RETURN
.199 :
.200 REM GET CHAR FROM KB, WITH PROMPT
.205 POKE 198,0:POKE 204,0
.210 GET A$:POKE 207,0:IF A$="" THEN GOTO
210
.215 POKE 204,1:PRINT " [LEFT]";:RETURN
.299 :
.400 REM DO A DISK JOB, THANKS "INSIDE CO
MMODORE DOS" BY DICK EMMERS, DATAMOST
.410 TY=0:PRINT#15,"M-W"CHR$(8)CHR$(0)CHR

```

```

GA $(2)CHR$(T)CHR$(S) KH
.420 PRINT#15,"M-W"CHR$(1)CHR$(0)CHR$(1)C
HR$(JB) KH
.430 TY=TY+1 OK
.440 PRINT#15,"M-R"CHR$(1)CHR$(0) OD
.450 GET#15,E$:IF E$="" THEN E$=CHR$(0) AH
.460 E=ASC(E$) GE
.470 IF TY=500 THEN GOTO 495 GI
BO .480 IF E>127 THEN GOTO 430 AL
.485 IF E<>1 THEN GOTO 495 CN
.490 RETURN IM
.495 PRINT:PRINT"FATAL ERROR TRY AGAIN":S
PI TOP NN
.499 : DI
BH .1000 REM ***** MAIN CODE HERE ***** IC
AE .1003 Q$=CHR$(5)+"Q"+CHR$(30) CK
NI .1005 POKE 53280,11:POKE 53281,0:PRINT "[
PE 0) PG
IA .1006 TP$=CHR$(31)+"[s U][19"[s C]"[s I]
CL "+CHR$(30) DF
.1007 PN$=CHR$(31)+"[s B]" +CHR$(30)+" FAS
T NEW V010585 "+CHR$(31)+"[s B]" +CHR$(3
0) EO
.1008 TB$=CHR$(31)+"[s J][19"[s C]"[s K]
"+CHR$(30) CO
.1010 PRINT CHR$(147)CHR$(13)"[10" "]"TP$ GE
.1011 PRINT "[10" "]"PN$ OC
.1012 PRINT "[10" "]"TB$:PRINT KI
FC .1015 IF FG=1 THEN GOTO 1035 AF
DI .1020 PRINT "PLEASE WAIT.."; JI
BJ .1030 GOSUB 200:PRINT:FG=1 HG
PO .1035 SYS 820:DN$="NAME ME" AA
JP .1040 POKE 198,0:INPUT "DISK NAME";DN$ EN
.1050 POKE 198,0:INPUT "DISK ID";DI$ GL
LM .1060 DI$=LEFT$(DI$+"ZZ",2) CL
MN .1070 I1=ASC(LEFT$(DI$,1)):I2=ASC(RIGHT$(
PE DI$,1)) JM
.1080 OPEN 15,8,15:PRINT#15,"M-W"CHR$(18)
CHR$(0)CHR$(2)CHR$(I1)CHR$(I2);:CLOSE15 KH
MM .1090 GOSUB 100 CJ
DI .2000 OPEN 15,8,15:PRINT#15,"M-E"CHR$(0)C
HJ HR$(5);:CLOSE15:OPEN 15,8,15 DI
NN .2010 T=18:S=0:JB=176:GOSUB 400:REM SEEK EA
.2020 JB=128:GOSUB 400:REM READ DL
BC .2030 PRINT#15,"M-W"CHR$(0)CHR$(4)CHR$(3)
CHR$(18)CHR$(1)CHR$(65) HG
IM .2040 JB=144:GOSUB 400:REM WRITE IK
DI .2050 S=1:JB=128:REM READ BN
HG .2060 PRINT#15,"M-W"CHR$(0)CHR$(4)CHR$(2)
CHR$(0)CHR$(255) LC
HG .2070 JB=144:GOSUB 400:REM WRITE IK
CJ .2080 CLOSE 15 AB
JF .2090 OPEN 15,8,15:PRINT#15,"N0:"DN$ DN
DI .2100 CLOSE 15 AB
JH .3000 PRINT:PRINT:PRINT"FORMAT COMPLETE,
REMOVE DISK" DM
.3010 PRINT:PRINT"HIT "RT$" TO FORMAT ANO

```

AHOY! III

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 85 and 86 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

THER DISK,"
.3015 PRINT Q$" TO QUIT";:GOSUB 200
.3020 IF A$=CHR$(13) THEN GOTO 1000
.3030 END
.4000 DATA 169,16,133,255,169,0,133,251
.4010 DATA 169,37,133,252,169,0,133,253
.4020 DATA 169,5,133,254,165,186,32,177
.4030 DATA 255,169,111,32,147,255,165,251
.4040 DATA 164,252,141,152,3,140,153,3
.4050 DATA 160,0,185,149,3,32,168,255
.4060 DATA 200,192,6,208,245,160,0,177
.4070 DATA 251,32,168,255,200,192,32,144
.4080 DATA 246,165,251,105,31,133,251,165
.4090 DATA 252,105,0,133,252,165,253,105
.4100 DATA 32,133,253,165,254,105,0,133
.4110 DATA 254,32,174,255,198,255,208,180
.4120 DATA 96,77,45,87,0,0,32
.4999 REM CODE DOWNLOADED INTO 1541 RAM
.5000 DATA 120,173,0,28,9,12,141,0
.5010 DATA 28,169,45,133,74,32,210,6
.5020 DATA 198,74,208,249,162,0,32,217
.5030 DATA 6,169,1,133,34,165,34,201
.5040 DATA 36,240,12,32,70,5,48,7
.5050 DATA 230,34,32,200,6,240,238,173
.5060 DATA 0,28,41,243,141,0,28,169
.5070 DATA 236,141,12,28,165,75,240,5
.5080 DATA 41,127,76,200,193,96,32,75
.5090 DATA 242,133,67,138,10,10,10,10
.5100 DATA 10,133,68,173,0,28,41,159
.5110 DATA 5,68,141,0,28,169,238,141
.5120 DATA 12,28,160,0,132,77,165,57
.5130 DATA 153,0,3,200,200,165,77,153
.5140 DATA 0,3,200,165,34,153,0,3
.5150 DATA 200,165,19,153,0,3,200,165
.5160 DATA 18,153,0,3,200,169,15,153
.5170 DATA 0,3,200,153,0,3,200,185
.5180 DATA 250,2,89,251,2,89,252,2
.5190 DATA 89,253,2,153,249,2,230,77
.5200 DATA 165,77,197,67,144,192,152,72
.5210 DATA 169,3,133,49,32,48,254,104
.5220 DATA 168,136,32,229,253,32,245,253
.5230 DATA 169,1,162,0,157,0,4,232
.5240 DATA 208,250,169,4,133,49,32,233
.5250 DATA 245,133,58,32,143,247,169,206
.5260 DATA 141,12,28,169,255,141,1,28
.5270 DATA 141,3,28,32,243,6,169,0
.5280 DATA 133,50,169,255,141,1,28,162
.5290 DATA 5,80,254,184,202,208,250,162
.5300 DATA 10,164,50,80,254,184,185,0
.5310 DATA 3,141,1,28,200,202,208,243
.5320 DATA 162,9,80,254,184,169,85,141
.5330 DATA 1,28,202,208,245,162,5,169
.5340 DATA 255,80,254,184,141,1,28,202
.5350 DATA 208,247,162,187,80,254,184,189
.5360 DATA 0,1,141,1,28,232,208,244
.5370 DATA 160,0,80,254,184,177,48,141

```

```

LM .5380 DATA 1,28,200,208,245,169,85,162 HI
PD .5390 DATA 8,80,254,184,141,1,28,202 JK
BO .5400 DATA 208,247,165,50,24,105,10,133 NP
IC .5410 DATA 50,198,77,208,149,80,254,184 IE
CK .5420 DATA 80,254,184,32,0,254,169,0 PB
PE .5430 DATA 133,48,169,3,133,49,165,67 LJ
EL .5440 DATA 133,77,32,176,6,162,10,80 ML
EM .5450 DATA 254,184,173,1,28,209,48,208 DB
HC .5460 DATA 14,200,202,208,242,24,165,48 II
HM .5470 DATA 105,10,133,48,76,132,6,169 BF
PF .5480 DATA 244,133,75,96,32,176,6,160 OA
BF .5490 DATA 187,80,254,184,173,1,28,217 JI
EH .5500 DATA 0,1,208,235,200,208,242,162 AE
AG .5510 DATA 252,80,254,184,173,1,28,217 CD
HH .5520 DATA 0,4,208,219,200,202,208,241 ML
EP .5530 DATA 198,77,208,182,169,0,240,209 ML
PK .5540 DATA 169,208,141,5,24,169,161,44 MN
HI .5550 DATA 5,24,16,197,44,0,28,48 FL
GO .5560 DATA 246,173,1,28,184,160,0,96 HK
FM .5570 DATA 32,203,6,174,0,28,232,76 LH
PM .5580 DATA 217,6,32,213,6,174,0,28 EL
GG .5590 DATA 202,138,41,3,133,68,173,0 BP
MM .5600 DATA 28,41,252,5,68,141,0,28 EL
HN .5610 DATA 160,8,162,0,202,208,253,136 OI
ED .5620 DATA 208,250,96,169,85,141,1,28 CK
LB .5630 DATA 160,32,208,240,234,234,234,234 PK
IF .60000 CLOSE15:OPEN 15,8,15:INPUT#15,A$,B
PO $,C$,D$ LK
EO .60001 PRINT A$"[SS]"B$"[SS]"C$"[SS]"D$:C LM
GN LOSE15:STOP
GJ .61000 CLOSE15:OPEN 15,8,15,"I0":SAVE "@
OD 0:FASTNEW.BAS",8:CLOSE 15:STOP KL
EM .62000 CLOSE 15:OPEN 15,8,15:PRINT#15,"M-
FG R"CHR$(18)CHR$(0):GET#15,I1$ DP
GP .62001 PRINT#15,"M-R"CHR$(19)CHR$(0):GET#
ID 15,I2$ EO
EO .62002 PRINT I1$I2$ NF
KN .62004 CLOSE 15:STOP NG

```

INVECTIVE FROM PAGE 15

```

10 REM PROGRAM: INVECTIVE JC
20 REM GEORGE TREPAL BM
30 REM 2650 ALTURAS RD PO
40 REM BARTOW, FL 33830 AG
50 : DI
100 GOSUB 1150 FK
110 POKE53280,12:POKE53281,12:PRINT"[CLE
AR]"; KE
120 REM SET UP SCREEN AL
130 G$(1)="[BLACK][c B] [YELLOW][6"[s Z
]"[3" "][6"[s Z]"[4" "][6"[s Z]"[3" "
][6"[s Z]" [BLACK][c B] KN
140 G$(2)="[BLACK][c B] [BLUE][c +][4"
]"[c +][3" "][c +][4" "][c +][4" "][c +]

```


[4" "][c +][3" "][c +][4" "][c +] [BLAC		•560 REM WIPE OUT PLAYER POSITION	NI
K][c B]"	LC	•570 PRINT DN\$; SPC(SP)" ";	LL
•150 G\$(3)="[BLACK][40"[c B]""]	IB	•580 :	DI
•160 G\$(4)="[BLACK][c B][4" "][YELLOW][s		•590 REM PRINT NEW PLAYER POSITION	OD
Z][8" "][s Z][10" "][s Z][8" "][s Z][4"		•600 P=T	FB
"][BLACK][c B]"	LE	•610 IF J(JV)=1 THEN SP=SP+1	MB
•170 PRINT G\$(3); G\$(4); G\$(2); G\$(2); G\$		•620 IF J(JV)=-1 THEN SP=SP-1	FB
(1); G\$(2); G\$(2); G\$(4);	BF	•630 IF J(JV)=40 THEN DN\$=DN\$ + "[DOWN]"	AK
•180 PRINT G\$(4); G\$(4); G\$(2); G\$(2); G\$		•640 IF J(JV)=-40 THEN DN\$=LEFT\$(DN\$,LEN(
(1); G\$(2); G\$(2); G\$(4);	DC	DN\$)-1)	LE
•190 PRINT G\$(4); G\$(4); G\$(2); G\$(2); G\$		•650 PRINT DN\$; SPC(SP)"[s Q]";: RETURN	ID
(1); G\$(4); G\$(4); G\$(3);	CF	•660 :	DI
•200 :	DI	•670 REM SCRAMBLE JOYSTICK	LB
•210 REM POKE GREEN POINTS	EG	•680 IF VT>130 THEN 1050	ED
•220 CM=54272: REM CM=COLOR MEMORY	KB	•690 FOR J=1 TO 4: RN=INT(RND(1)*4)+1	GG
•230 FOR J=1 TO 50	DM	•700 T=SA(J): SA(J)=SA(RN): SA(RN)=T: NEX	
•240 RN = INT(RND(1)*920)+1024	PB	T	GH
•250 IF PEEK(RN)<>32 THEN 240	LB	•710 J(SA(1))=1: J(SA(2))=-1: J(SA(3))=40	
•260 POKE RN,105: POKE RN+CM,13	KG	: J(SA(4))=-40	FF
•270 NEXT	IA	•720 GOSUB 900	EB
•280 :	DI	•730 :	DI
•290 REM SET JOYSTICK VALUES J() AND SCRA		•740 REM POSITION HINTS	LH
MBLE ARRAY VALUES SA()	FK	•750 PRINT BM\$;SPC(13)"[c 2]";	AJ
•300 J(1)=-40: J(2)=40: J(4)=-1: J(8)=1	CO	•760 FOR J=1 TO 8	AL
•310 SA(1)=1: SA(2)=2: SA(3)=4: SA(4)=8	CA	•770 IF J=1 THEN PRINT "UP ";	LN
•320 :	DI	•780 IF J=2 THEN PRINT "DN ";	JD
•330 REM SET UP PLAYER SP=SPACES OVER D		•790 IF J=4 THEN PRINT "LT ";	LL
N\$=HOW FAR DOWN P=POSITION	CI	•800 IF J=8 THEN PRINT "RT ";	KF
•340 REM BM\$=BOTTOM OF SCREEN TI\$=TIMER	NF	•810 IF J(J)=1 THEN PRINT "> ";	PG
•350 PRINT"[HOME][DOWN][WHITE][RIGHT][s Q	PL	•820 IF J(J)=-1 THEN PRINT "< ";	FN
]"		•830 IF J(J)=40 THEN PRINT "v[3" "];	DP
•360 SP=1: DN\$="[WHITE][HOME][DOWN]": P=1	IL	•840 IF J(J)=-40 THEN PRINT "[UPARROW] "	
065: TI\$="[5"0"]1"		;	PF
•370 BM\$="[HOME][24"[DOWN]]": GOSUB 750:	MM	•850 NEXT	IA
GOSUB 1000	DI	•860 POKE 53280,2: POKE 53281,2: FOR DL=	
•380 :	PA	1 TO 80: NEXT	EG
•390 REM READ PORT 2 JOYSTICK	GA	•870 POKE 53280,12: POKE 53281,12	NO
•400 JV=PEEK(56320)	GH	•880 :	DI
•410 JV=15-(JVAND15)	EL	•890 REM SCRAMBLE SOUND	KE
•420 PRINTBM\$;"[WHITE]SCORE ";SC;	IO	•900 POKE 54296,15: POKE 54276,17: POKE 5	
•430 VT=VAL(TI\$): IF VT/15=INT(VT/15)THEN	LA	4277,15: POKE 54273,60	HP
GOSUB 680	DI	•910 FOR DL=1 TO 25:NEXT	BG
•440 IF JV=0 THEN 400	MB	•920 POKE 54296,0: POKE 54276,0: RETURN	EB
•450 :	ED	•930 :	DI
•460 REM FIND CHARACTER MOVED TO	AB	•940 REM YELLOW HIT	KD
•470 T=P+J(JV)	CF	•950 POKE 54296,15: POKE 54276,33: POKE 5	
•480 CH=(PEEK(T))	JH	4277,15: POKE 54273,40	KL
•490 IF CH=32 THEN GOSUB 570: GOTO 400:	PM	•960 FOR DL=1 TO 25:NEXT	BG
REM BLANK SPACE	EL	•970 POKE 54296,0: POKE 54276,0: RETURN	EB
•500 IF CH=105 THEN SC=SC+10: GOSUB 570:	DP	•980 :	DI
GOSUB 1000: GOTO 400: REM GREEN SCORE	CA	•990 REM GREEN SOUND	LN
•510 REM BLUE JOYSTICK SCRAMBLE	DI	•1000 POKE 54296,15: POKE 54276,17: POKE	
•520 IF CH=102 THEN GOSUB 570: GOSUB 680:		54277,15: POKE 54273,30	KA
SC=SC-20: GOTO400		•1010 FOR DL=1 TO 25:NEXT	BG
•530 IF CH=90 THEN SC=SC-50: GOSUB 570: G		•1020 POKE 54296,0: POKE 54276,0: RETURN	EB
OSUB 950: GOTO 400: REM YELLOW SCORE		•1030 :	DI
•540 GOTO400		•1040 REM END GAME	OE
•550 :		•1050 PRINT"[CLEAR][8"[DOWN]]";SPC(15);"	

SCORE ";SC	OF	•1190 PRINTSPC(10)"[DOWN][YELLOW]YELLOW =	
•1060 FOR J=1 TO 4: GOSUB 900: GOSUB 950:	PI	-50 POINTS"	IP
GOSUB 900	DI	•1200 PRINTSPC(2)"[DOWN][c 7]BLUE = -20 P	JP
•1070 GOSUB 1000:NEXT	DI	OINTS AND SCRAMBLES THE"	IA
•1080 PRINT"[4"[DOWN]] PRESS JOYSTICK B	BF	•1210 PRINTSPC(16)"JOYSTICK[DOWN]"	NN
UTTON TO PLAY AGAIN"	GA	•1220 PRINTSPC(2)"[CYAN]THE JOYSTICK IS S	CD
•1090 JV=PEEK(56320)	AN	CRAMBLED EVERY 15"	IB
•1100 FR=JVAND16	ED	•1230 PRINTSPC(2)"SECONDS WHETHER YOU HIT	AC
•1110 IF FR = 16 THEN 1090	DM	BLUE OR NOT"	EJ
•1120 GOTO 110	DI	•1240 PRINTSPC(5)"[DOWN]THE JOYSTICK GOES	GA
•1130 :	DH	IN PORT #2"	AN
•1140 REM INTRO	CA	•1250 PRINTSPC(7)"[DOWN]THE GAME LASTS 90	IM
•1150 PRINT"[CYAN][CLEAR][DOWN]":POKE 532	NI	SECONDS"	
80,0: POKE 53281,0:	DA	•1260 PRINTSPC(5)"[DOWN]PRESS THE FIRE BU	
•1160 PRINTSPC(16)"INVECTIVE[DOWN]"	PH	TTON TO PLAY"	
•1170 PRINTSPC(12)"BY GEORGE TREPAL[DOWN]		•1270 JV=PEEK(56320)	
[DOWN]"		•1280 FR=JVAND16	
•1180 PRINTSPC(11)"[c 6]GREEN = 10 POINTS		•1290 IF FR = 16 THEN 1270	
"		•1300 RETURN	



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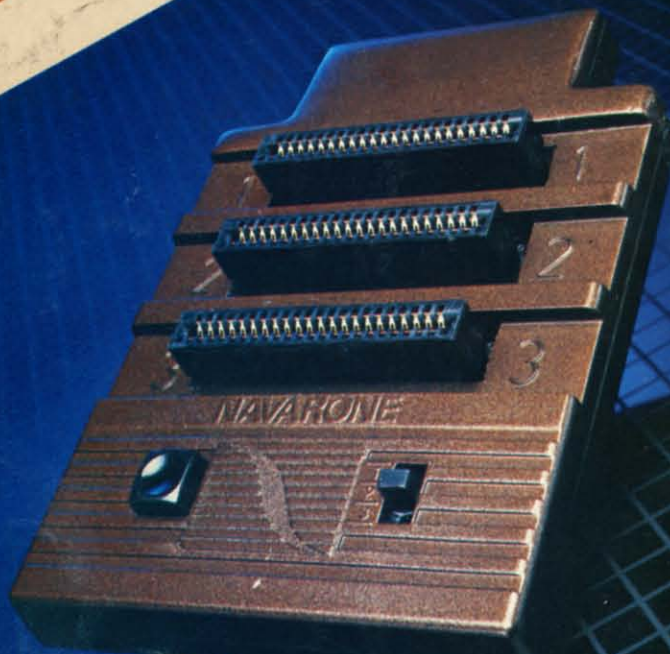
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