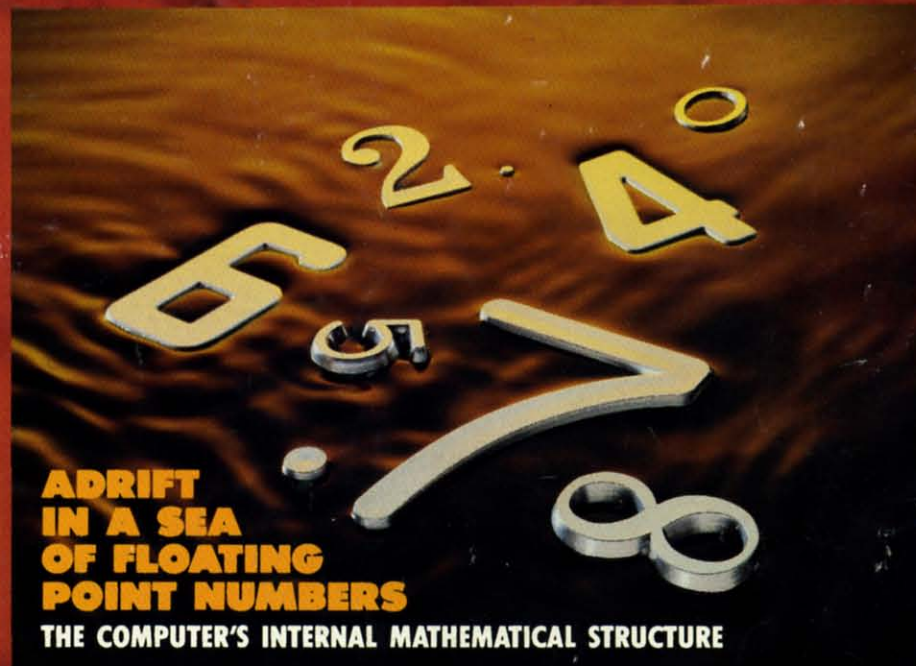


# Ahoy!

\$2.95/ CAN. \$3.75  
DECEMBER 1988

..NUMBER 1 WITH COMMODORE OWNERS!..





## Arcade adventure at its finest...

Fast-paced, exciting combat demands the use of all your wits and endurance to best a world teeming with assassins, wizards and monsters. Experience captivating graphics of an unprecedented calibre. Relentless opponents will hone your combat skills to a razor's edge. A simple yet powerful menu and icon interface provides effortless interaction with the world and its people, while the incredibly smooth

animation presents a continuous panorama of action and adventure.



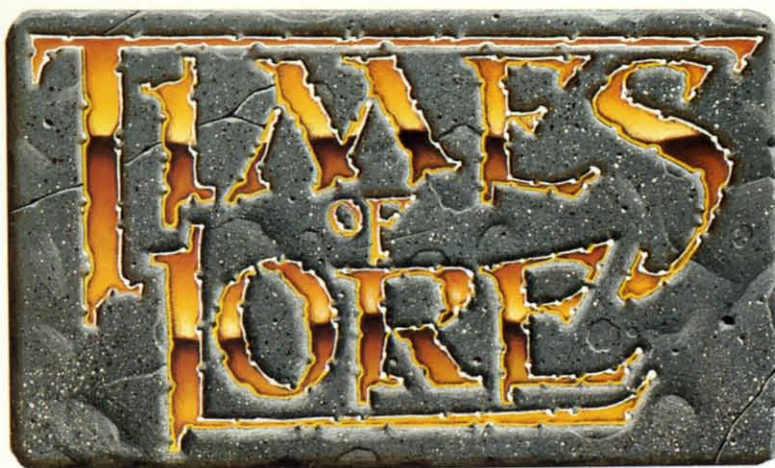
To get your copy of Times of Lore, either  
1) visit your local retailer,

2) call 1-800-999-4939 8am to 5pm EST to order by VISA/MC, or

3) mail check (U.S. \$) or VISA/MC#, cardholder name and expiration date to Origin. All versions \$39.95 plus \$2.50 shipping/handling. Allow 1-2 weeks for delivery

Try it! A demo disk of Times of Lore is now available for the Commodore 64/128K. Send \$2.50 to Origin for yours and credit it towards a direct order purchase.

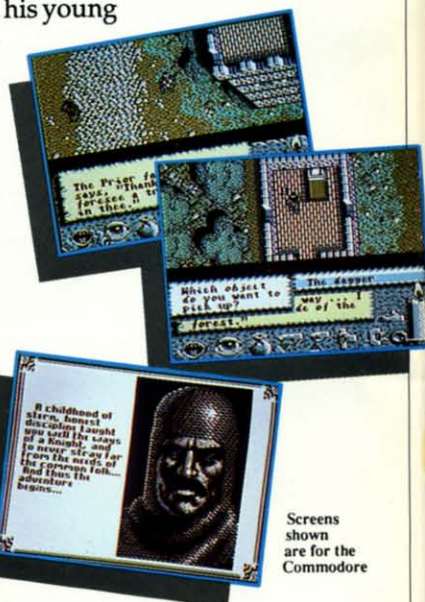
Also available for the IBM and Apple II series.



## Fantasy role- playing at its best!

Astonishing realism is yours through scores of unique characters and sophisticated conversations. Immerse yourself in the sights and sounds

of an ancient world embroiled in turmoil—the disappearance of the king and his young child—the struggle for control of the realm. The stakes are high; your role as the hero-for-hire requires all the courage and savvy you can muster. Your quest for truth will teach you much of the distinction between appearances and reality. Magic and intrigue combined with finely crafted game-play bring you the best of fantasy in...



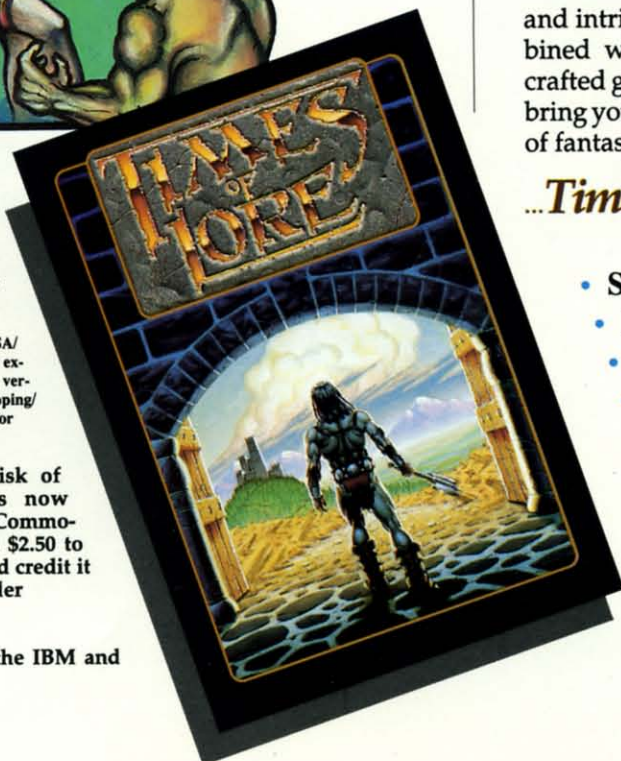
Screens shown are for the Commodore

## ...Times of Lore

- Stunning graphics and animation
- Fast-paced combat action
- Dynamic conversations
- Compelling plot



Origin Systems, Inc.  
136 Harvey Road, Building B., Londonderry, NH, 03053  
Times of Lore is a trademark of Origin Systems, Inc.





THE  
COMMODORE USERS



# clipper

## OUR HOLIDAY SALES ARE SET!

The *Clipper* offers members of the *Ahoy! Access* Club discounts and other special deals on products and services advertised in *Ahoy!* and *Ahoy!'s AmigaUser*. Your membership is free for the duration of any subscription paid for prior to December 31, 1988.

Some of the offers are cross-referenced to ads in the December *Ahoy!* or *Ahoy!'s AmigaUser*. If you subscribe to only one of the two magazines and require information that appears in the other, contact the manufacturer directly.

To take advantage of any of this month's offers, follow the instructions on the front and back of the coupon. Fill in all necessary information. And use the original coupon only—facsimiles are not acceptable. For more information, call 212-239-6089 (if busy or no answer after three rings, call 212-239-0855).

## Pacific Peripherals

Pacific Peripherals' line of Amiga hardware (advertised on page 28 of this month's *Ahoy!'s AmigaUser*) includes the OverDrive hard disk controller for the 2000 (with or without hard disk drive) and the SubSystem expansion chassis for the 500. For *Ahoy! Access* Club members who order from them direct, Pacific will **waive the normal credit card surcharge**, and provide **free shipping**. (OverDrive and disk drives go by UPS 2nd Day Air; the SubSystem by UPS Ground.) (Offer expires December 31.)

**NO SURCHARGE:  
FREE SHIPPING**



The fact that DigiTek markets so many programs for the Amiga and C-64 (see their ad on page 5 of this month's *Ahoy!'s AmigaUser*) makes their offer for *Ahoy! Access* Club members especially attractive. Buy any of DigiTek's programs directly from them for full price, and **take a second program for half price**; or, buy any two programs for full price and **take a third program free**! This offer is good on all DigiTek programs, including *Drum Studio*, *Skyblaster*, *Final Mission*, and *Amegas* (available for the Amiga only), and *Vampire's Empire* and *Hollywood Poker* (available for both the Amiga and 64). (Offer expires December 31.)

**2ND DISK 50%  
OFF—OR 3RD FREE**



Even before its most recent update, the *Super Snapshot* utility cartridge had far too many features to list. Instead of trying to describe the new V4, we'll refer you to Software Support's ad on page 6 of this month's *Ahoy!* Also offered in that ad is the *Super Snapshot Slideshow Creator*, which allows you to combine *Snapshot*ed screens into presentations with professional video effects. *Slideshow* retails for \$14.95; but when you buy *Snapshot V4* at the advertised price of \$64.95, you can **buy Slideshow for just \$9.95**. The shipping and handling charges outlined in the ad on page 6 apply. If you prefer to order by phone, call the number listed in the ad and mention that you saw this offer in the *Clipper*. (Offer expires December 31.)

**\$5.00 OFF**

## BRIWALL

Briwall, whose ad appears on page 34 of this month's *Ahoy!*, has Christmas gifts for both 64/128 and Amiga users. With every order of \$75 or more, you can take a **free copy of Free Spirit's Christmas Classics** for the C-64 (list price \$9.95). Or, with every order of \$100 or more, take a **free copy of Free Spirit's Christmas Classics** for the Amiga (list price \$14.95). Call Briwall toll free for more information: 800-638-5757. (Offer expires December 31.)

**FREE DISKS**



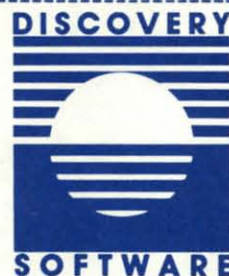
Digitronics' ad on page 57 of this month's *Ahoy!'s AmigaUser* offers the fully assembled and tested RC4 Ramcard for \$225. The card is configurable with 1/2 to 4 megs of RAM, and can be used with the Amiga 2000 or with the 500 via Digitronics' adapter box. *Ahoy! Access* Club members get to take **10% off** the list price, and pay only \$202.50. You must add \$4.05 for shipping via UPS ground service; if you want your unit shipped some other way, call Digitronics at 215-459-4493. (Offer expires December 31.)

**10% OFF**

## DUNE SYSTEMS

Dune Systems' Chip Checker hardware for the C-64/128 or PC (see page 45 of this month's *Ahoy!*) can help you save on the cost of computer diagnosis and repair. And the *Ahoy! Access* Club can help you save on the cost of the Chip Checker! Dune Systems is offering our members **\$10 off** the \$159 price of the 64/128 version—you pay \$149. For the PC version, regularly priced at \$259, you pay \$244—**\$15 off**. You must add \$4.00 per unit for shipping. (Offer expires December 31.)

**\$10—\$15 OFF**



Like their biologic namesakes, computer viruses are almost impossible to cure. But you can prevent them from infesting your Amiga with Discovery Software's *Virus Infection Protection (V.I.P.)*. Purchase two or more Discovery Software products (see their ad on page 47 of this month's *Ahoy!'s AmigaUser*) before the end of December, either from your local retailer or direct from Discovery. Send in proof of purchase, with the date of purchase clearly indicated. In return, you'll receive a **free copy of V.I.P.**—a \$49.95 retail value! (Offer expires December 31.)

**FREE V.I.P.**



## THE AHoy! ACCESS CLUB BBS

☐ Enclosed is my check or money order for \$206.55 (\$202.50 plus \$4.05 shipping). Send me the RC4 Ram-card, a \$225 retail value.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Digitronics

Ahoy! Access Club Clipper Offer

P.O. Box 206

Villanova, PA 19085

The Ahoy! Access Club BBS is up and running, for the exclusive use of Club members. To receive validation, call 212-239-6089 (if busy or no answer after three rings, call 212-239-0855). Have a recent subscription label handy, as you'll need to read that to us to be validated. At that time, we'll give you the phone number.

Don't share the number with your friends. Remember that every non-member to whom you give the number will give it to five others, and so on, and so on. While these non-validated callers will be unable to log on, their repeated attempts to do so will tie up the phone lines and make it more difficult for you to get through.

On the board you'll find advance, up to the minute information about future issues of *Ahoy!* and *Ahoy!'s AmigaUser*; just-announced products; forthcoming *Clipper* offers; and places to use your *Ahoy!* Access Club Card. Also, you'll be able to download public domain software, exchange electronic mail with other members, and do a whole lot more. Log on today and see!

☐ Enclosed is \$153 (\$149 plus \$4.00 shipping) for the 64/128 Chip Checker—\$10 off the advertised price.

☐ Enclosed is \$248 (\$244 plus \$4.00 shipping) for the PC Chip Checker—\$15 off the advertised price.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Dune Systems

Ahoy! Access Club Clipper Offer

2603 Willa Drive

St. Joseph, MI 49085

☐ Enclosed is my payment for *Super Snapshot* (\$64.95 plus the tax and shipping charges outlined in the ad on page 6 of the December *Ahoy!*). This entitles me to buy the *Super Snapshot Slideshow Creator* for \$9.95 plus tax and shipping (payment enclosed).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Software Support International

Ahoy! Access Club Clipper Offer

2700 N.E. Andresen Road #D13

Vancouver, WA 98661

☐ Enclosed is my order for the Over-Drive hard disk controller or the Sub-System expansion chassis, with free shipping included. If ordering by credit card, I understand that the surcharge will be waived. If not ordering by credit card, my check or money order is enclosed.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Pacific Peripherals

Ahoy! Access Club Clipper Offer

P.O. Box 14575

Fremont, CA 94539

☐ Enclosed is my proof of purchase, with date of purchase indicated, for any two Discovery Software products. Send me a free copy of *Virus Infection Protection* for the Amiga.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Discovery Software

Ahoy! Access Club Clipper Offer

163 Conduit Street

Annapolis, MD 21401

☐ Enclosed is my order for \$75 or more. Send me a free copy of Free Spirit's C-64 *Christmas Classics*.

☐ Enclosed is my order for \$100 or more. Send me a free copy of Free Spirit's Amiga *Christmas Classics*.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

Briwall

Ahoy! Access Club Clipper Offer

P.O. Box 129, 56 Noble Street

Kutztown, PA 19530

Send me the program(s) indicated:

*Vampire's Empire* *Hollywood Poker*

☐ C-64 (\$29.95) ☐ C-64 (\$29.95)

☐ Amiga (\$44.95) ☐ Amiga (\$34.95)

Amiga, \$29.95: Amiga, \$34.95:

☐ Drum Studio ☐ Skyblaster

☐ Final Mission ☐ Amegas

☐ Enclosed is my payment for one program, plus payment of 50% off the listed price for the following program:

☐ Enclosed is payment for two programs. Send the following program free:

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:

DigiTek Software

Ahoy! Access Club Clipper Offer

104 West Seneca, Suite 4

Tampa, FL 33612





SunRize Industries' *Color Splitter* allows *Digi-View* and *Perfect Vision* users to digitize color pictures

from VCRs or color cameras without using color filters. As you can see in SunRize's ad on the inside back cover of this month's *Ahoy!*'s *AmigaUser*, it retails at \$99.95. But *Ahoy!* Access Club members who order direct from SunRize **save 25%**—they pay only \$75.00! For more information on the *Color Splitter*, or such other SunRize products as *Perfect Sound*, *Studio Magic*, or *Desktop Artist*, call 409-846-1311. (Offer expires December 31.)

**SAVE 25%**

## Central Coast

Once again, Central Coast Software invites *Ahoy!* Access Club members who own the *Quarterback* hard disk backup utility to upgrade to version 2.0. (At press time, this upgrade offer was still **available exclusively through the Clipper.**) Send your original QB disk, along with this coupon and a check or money order for \$15.00 (MC and VISA also accepted). For more information on *Quarterback* and other Central Coast products, see their ad on page 7 of this month's *Ahoy!*'s *AmigaUser*. (Offer good indefinitely.)

**UPGRADE**

## Computer Repeats

Computer Repeats continues to offer a **20% higher trade-in allowance** to *Ahoy!* Access Club members. Non-members must buy hardware from Computer Repeats at the prices listed in the ad on page 55 of the December *Ahoy!* But *your* prices are:

Amiga 500: \$199 with trade-in of your C-128 computer, 1571 drive, and 1902 monitor; or, \$355 with your C-64 computer, 1541 drive, and 1702.

Commodore 128D: \$209 with trade-in of your C-128 and 1571, or 64C computer, 1541 and 1702.

Amiga 2000: \$1189 with trade-in of your Amiga 500.

Call 303-939-8144 for a price quote for your particular system. Mention your membership in the *Ahoy!* Access Club. Then, when you ship your equipment for trade-in, include this coupon. (Offer expires December 31.)

**20% HIGHER  
TRADE-IN**



P.A.V.Y. is repeating the offer made in October's *Clipper* on *Landmark, The Computer Reference Bible*. (See their ad on page 44 of this month's *Ahoy!*) Their special fall price on the \$164.95 package is \$129.95. But for *Ahoy!* Access Club members they're going **\$10 lower**—to just \$119.95 (plus \$4.00 postage and handling). And that price, available to our members only, is the **lowest advertised anywhere**. (Offer expires December 31.)

**\$10 OFF**



SOGWAP's *Big Blue Reader* programs allow you to transfer C-64/128 files to MS-DOS format, and vice versa. For full details, see SOGWAP's ad on page 29 of the December *Ahoy!* (or our review in the June '87 *Ahoy!*). *Ahoy!* Access Club members receive a **20% discount** on the price of both the 128 and 64 versions. The retail price of *Big Blue Reader 128* is \$44.95; you pay \$35.95. And while the rank and file pay \$29.95 for *Big Blue Reader 64*, you pay \$23.95. (Offer expires December 31.)

**20% OFF**

## Creative Computers

Again this month, Creative Computers (see pages 10 and 11 of the December *Ahoy!*'s *AmigaUser*) is offering a discount on their entire line of Amiga products. With every order of \$50 or more placed by an *Ahoy!* Access Club member, Creative Computers will extend a **5% discount**, and provide **free shipping** to anywhere in the Continental US. This offer is good on mail orders only; you must include this coupon; only one order per coupon is allowed; and you may not combine this offer with any other Creative Computers discount offer. For more information, call 213-370-2009. (Offer expires December 31.)

**5% OFF;  
FREE SHIPPING**

**Use Original  
Coupon Only**

Facsimiles will not be accepted



## CHIP LEVEL DESIGNS

The *RapiDOS* and *RapiDOS Professional* hardware modification kits let you turn your C-64 and 1541 into a high speed parallel disk operating system. If you've been plodding along at serial speed these many months (we *did* tell you about these products back in our April *Reviews* section), you can't make up for lost time. But if you buy *RapiDOS* or *RapiDOS Professional* now, Chip Level will throw in a **free Parallel Utilities disk**—a regular \$24.95 value! The disk is essentially the same as Chip Level's *Mass Duplicator 1541* disk (see their ad on page 9 of this month's *Ahoy!*), with the addition of individual file copiers for use with *RapiDOS*. Include \$3.00 for shipping with your payment of \$49.95 for *RapiDOS* or \$99.95 for *RapiDOS Professional*. (Offer expires December 31.)

**FREE \$25 DISK**

## Lyc0 Computer

The FSD-2 Excelerator Plus disk drive is fully compatible with the C-64 or 64C, but offers a number of advantages over Commodore's 1541 and 1541C. The FSD-2 is a half-height drive, smaller and slimmer than the 1541/41C. It features a separate power supply, which allows it to remain cool. It is faster, quieter, and more reliable, and comes with a full one-year warranty. A guide light is available as an option. The price of the drive in Lyc0's ad on pages 4 and 5 of the December *Ahoy!* is \$149.95. But when *Ahoy!* Access Club members prepay (via check, money order, or credit card), they receive **free shipping!** (Offer expires December 31.)

**FREE SHIPPING**

## SPOC

SPOC's ad on page 39 of this month's *Ahoy!*'s *AmigaUser* offers their disk of 35 family-oriented game and educational programs, plus a bonus disk containing samples from their library of public domain programs (reworked to run bug-free and without use of the CLI). The SPOCPD collection normally sells for \$20.00; but *Ahoy!* Access Club members can obtain the entire collection for only \$15.00. (Offer expires December 31.)

**\$5.00 OFF**



☐ Enclosed is my payment of \$52.95 (\$49.95 plus \$3.00 shipping) for *Ra-piDOS*, or \$102.95 (\$99.95 plus \$3.00 shipping) for *RapiDOS Professional*. Send me your *Parallel Utilities* disk (a \$25 retail value) free.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
Chip Level Designs  
Ahoy! Access Club Clipper Offer  
P.O. Box 603  
Astoria, OR 97103-0603

☐ Send me *Landmark, The Computer Reference Bible*. Enclosed is my check or money order for \$123.95 (\$119.95 plus \$4.00 postage and handling).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
P.A.V.Y. Software  
Ahoy! Access Club Clipper Offer  
P.O. Box 1584  
Ballwin, MO 63022

☐ Send me the *Color Splitter* at 25% off the advertised price of \$99.95. Enclosed is my payment of \$75.00.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
SunRize Industries  
Ahoy! Access Club Clipper Offer  
3801 Old College Road  
Bryan, TX 77801

Enclosed is my payment of:

☐ \$35.95 for *Big Blue Reader 128* (\$20% off the advertised price of \$44.95).

☐ \$23.95 for *Big Blue Reader 64* (\$20% off the advertised price of \$29.95).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
SOGWAP Software  
Ahoy! Access Club Clipper Offer  
115 Bellmont Road  
Decatur, IN 46733

☐ Enclosed is my original *Quarterback* disk, plus my check, money order, or VISA or MC payment for \$15.00. Send me the upgraded *Quarterback V. 2.0*.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
Central Coast Software  
Ahoy! Access Club Clipper Offer  
268 Bowie Drive  
Los Osos, CA 93402

☐ Enclosed is my prepayment of \$149.95 (via check, money order, or credit card) for the FSD-2 Excelsator Plus disk drive, which entitles me to free shipping.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
Lycu Computer  
Ahoy! Access Club Clipper Offer  
P.O. Box 5088  
Jersey Shore, PA 17740

☐ Enclosed is my order totaling \$50 or more. I'm taking 5% off the total amount. I understand that I'm also entitled to free shipping to anywhere in the Continental US.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
Creative Computers  
Ahoy! Access Club Clipper Offer  
4453 Redondo Beach Blvd.  
Lawndale, CA 90260

☐ This coupon entitles me to the higher trade-in allowances guaranteed to Ahoy! Access Club members.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
Computer Repeats Inc.  
Ahoy! Access Club Clipper Offer  
2017 13th Street, #A  
Boulder, CO 80302-5201

☐ Enclosed is \$15.00. Send me the complete SPOCPD collection (normally sold at \$20.00).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send coupon to:  
SPOC  
Ahoy! Access Club Clipper Offer  
Box 299  
Kiowa, OK 74553

Look for more bargains in the next edition of the *Clipper*, bound into subscriber copies of the January Ahoy! and Ahoy!'s AmigaUser.



# Ahoy!

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Exploring the computer's internal mathematical structure.

\*Includes program: *Floating Point Converter* (for the C-64)

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Cover art by James Regan; photography by Christopher Gould and Michael R. Davila

Commodore owners—save on computer software, hardware, and accessories with the *Ahoy!* Access Club! See page 13 for details.

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Suite 200  
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# Lyc Computer

## Marketing & Consultants

Since 1981

Air orders processed within 24 hours.

### Lyc Means Total Service.



Mark "Mac" Bowser, Sales Manager

I would personally like to thank all of our past customers for helping to make Lyc Computer one of the largest mail order companies and a leader in the industry. Also, I would like to extend my personal invitation to all computer enthusiasts who have not experienced the services that we provide. Please call our trained sales staff at our toll-free number to inquire about our diverse product line and weekly specials.

First and foremost our philosophy is to keep abreast of the changing market so that we can provide you with not only factory-fresh merchandise but also the newest models offered by the manufacturers at the Absolute best possible prices. We offer the widest selection of computer hardware, software and accessories.

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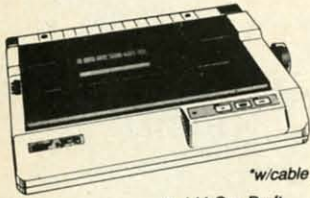
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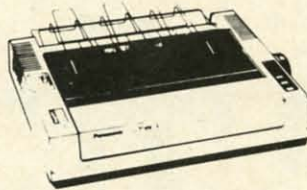
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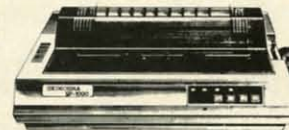
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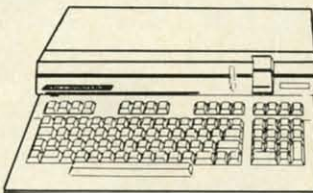
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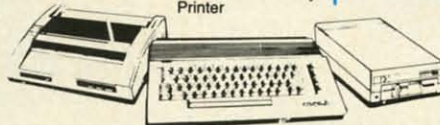
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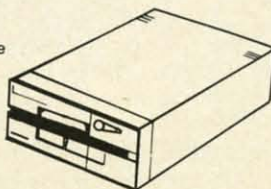
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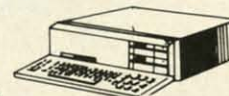
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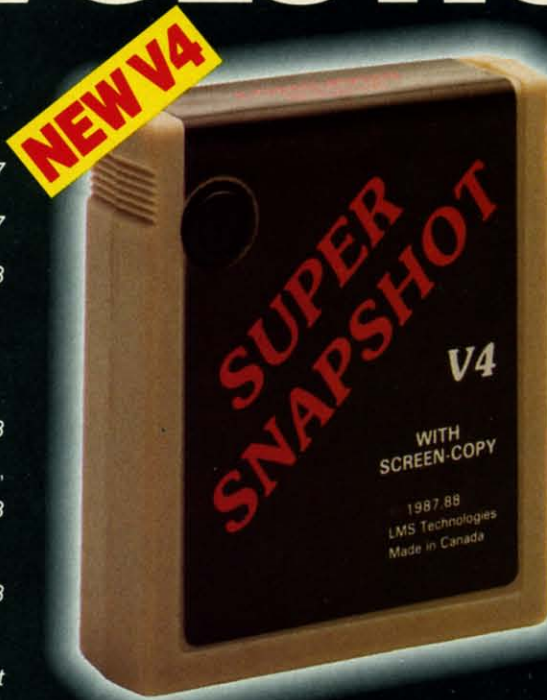
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# VIEW FROM THE BRIDGE

**T**his month it begins—the most exhaustive game software coverage you'll find in any 64/128 magazine, at any price! Entertainment Editor Arnie Katz and his staff have profiled no fewer than eight new entertainment packages for this issue—and just in time for Christmas shopping, too!

As we stressed last month, our expanded entertainment coverage is only a reflection of the scarcity of non-entertainment software on the market—not a sign of the “teching down” of *Ahoy!* We'll continue to tailor the magazine for the intermediate to advanced users who have always made up the bulk of our readership.

But the proof of the pudding is in the reading—of the December issue of *Ahoy!*:

- The odds are at least 1.70141183E+38 to 1 that you're annoyed by those strange numerical representations your computer resorts to when figures become too unwieldy to list. This month Dale Rupert explains why these types of numbers have a place in BASIC, along with offering a great deal more information. Once you've finished this issue's *Rupert Report*, you'll never again feel like you're *Adrift in a Sea of Floating Point Numbers*. (Turn to page 32.)

- For fans of Bob Blackmer's games, Christmas comes twice this month: both on the regularly scheduled date (December 7, isn't it?), and on receipt of this issue of *Ahoy!*, containing two Blackmer blockbusters. *Tri Words* is an electronic jumble contest for the C-128 which, the aforementioned author assures us, uses every three-letter word in his dictionary, excluding abbreviations and slang. (Turn to page 18.) *Tubular!* poses the problem of scaling a network of high pressure tubing to reach the top of a pyramid, scooping up 14 bells along the way. Bob himself has been unable to complete the 16th and highest level of the game. If anyone out there does (and we're sure someone out there will), let us hear from you—Bob is dying to know what happens! (Turn to page 18.)

- Just like us, you've probably wondered—how did Peter M.L. Lottrup come by those middle initials? Did he tack them on after he became a programmer? Did his parents make a lucky guess as to his future occupation? Or do they simply stand for something like Melvin Louis, rather than what we all feel they must? Unfortunately, we've had no opportunity to find out, since Peter sends his programs in from Buenos Aires, Argentina. One day, though, we'll spring for the long distance call to find out. In the meantime,

there's no mystery about his *Screen Pocus 64* in this issue—its ability to fade text screens in and out is clearly of great value to programmers. (Turn to page 52.)

- Richard Curcio's innovative utilities have appeared in most of the leading Commodore periodicals. But now that he's joined our staff as Senior Editor, you can expect all his best work to appear in these pages. This month Rich offers a variation on one of his best. *Screensaver* provides C-64 users with pseudo-window capabilities approximating the real window capabilities of *TextSave* for the C-128 (January '88 *Ahoy!*). (Turn to page 55.)

- Members of the *Ahoy!* Access Club (consisting of subscribers to *Ahoy!* and *Ahoy!'s AmigaUser*) can take advantage of money saving offers from companies like Software Support, Lyco, Chip Level, SOGWAP, P.A.V.Y., Dune, and many others in this month's edition of the *Clipper*. The special monthly supplement is bound into subscription copies only. So if you haven't yet taken advantage of our discount subscription rates (see page 25), you now get to kick yourself harder than ever before!

We hope this issue of *Ahoy!* gives you nothing to kick about. If it does, we're only a letter or a phone call away.

—David Allikas

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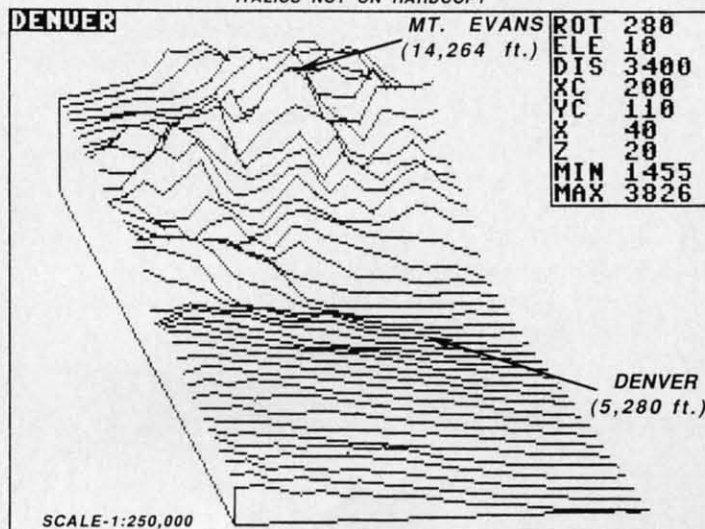
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LLM Press, 212-766-3785 (see address list, page 14).

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## FORTAN TRAINING

With support for more than 45 statements and functions, *Fortran 64* (\$39.95) offers an economical way to

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Abacus Software, 616-698-0330 (see address list, page 14).

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- Uses 8k RAM track buffering and hardware GCR conversion!
- Provides 40 track extension (749 blocks free!)
- Adds 20 new disk commands (i.e., lock files, change disk name).

**. . . and if you want the ultimate, get RapiDOS Professional!**

### Here's what people are saying about RapiDOS:

Mike J. Henry (Basement Boys Software) - "It's amazing how incredibly fast it is, I'm impressed!"

Mitch S. (Eaglesoft Inc.) - "Very fast, very reliable, and very compatible. I love it!"

J.F. Jones (ADP) - "Superbases' speed is increased greatly, and it's now a dream to use!"

Function	Normal DOS	RapiDOS	RapiDOS Pro	Your System
Load 202 blocks	128 sec.	15 sec.	3 sec.	
Save 202 blocks	196 sec.	98 sec.	8 sec.	
Format 35 tracks	90 sec.	24 sec.	18 sec.	

**Compare these speeds with your current system and see why RapiDOS puts the C-64 into a different league!**

RapiDOS requires a socketed kernal ROM U4, and is available in versions for the 64c, 128 in 64 mode, and 1541c (please specify when ordering). RapiDOS is easily upgradeable to the Professional Version. RapiDOS Professional drive controller is (c) '87 mts data GbR, the creators of the best European parallel systems.

**At these affordable prices no C-64 owner should be without RapiDOS!**

**RapiDOS \$49.95**

**RapiDOS Professional \$99.95**

### MASS DUPLICATOR 1541

- For the C64/128 with a single 1541 disk drive.
- 15 second, 4 pass backup for standard disks!
- 25 second full GCR Super Nibbler, the most powerful yet!
- 9 second disk format!
- Fast loader!
- Quick installation.
- Can be upgraded to RapiDOS

**\$32.95**

### MASS DUPLICATOR MSD

- A must for any MSD SD-2 owner.
- 15 second standard disk backup!
- 18 second full GCR Quick Nibbler!
- 9 second disk format!

**\$25.95**

### MSD AUTO COPY ROM

- Adds new Fast Backup commands!
- Turns the MSD SD-2 into a dedicated copying drive (no computer needed).

**\$29.95**

### C-64 BURST-ROM

- Gives the 64 'Burst Mode' when used with a 1571 or 1581 disk drive!
- Loads 100 blocks in 6 seconds on a 1571, 4 seconds on a 1581!
- Fast directory, SEQ, and REL file access!
- Built in DOS wedge!
- Simple installation. (Kernal ROM U4 must be socketed)

**\$39.95**

### C-128 BURST-ROM

- Lets the 128 run at 'Burst' speed when in 64 mode!
- Provides the same features as the C-64 Burst-ROM!

**\$49.95**

### STILL TO COME

- MSD SD-1 Fast Copier!
- 1571 Mass Duplicator!
- 1581 Utility Pack!

### TURBO 64

- Speed-up cartridge for the C-64, just plug it in!
- Adjust the clock rate from 100 khz (1/10 normal) to 4 mhz (4x normal)!
- Uses 8/16 bit 65816 microprocessor (same as the Apple ][gs... but twice as fast)!
- Spread sheets, BASIC, flight sims, graphics, and now GEOS... all are accelerated!

**\$199.95**



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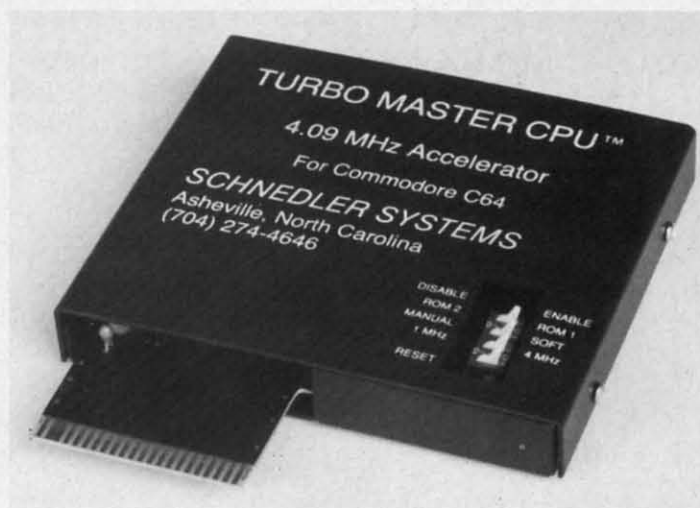
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**The Turbo Master CPU Processor Accelerator increases the C-64's processing speed by four times. Also included are Turbo disk routines in ROM.**

online scratch pad for computations, and test-taking strategies. An online calculator "locks out" during the two tests. Bar graphs display improvement charts and projected scores. A "random start" feature allows the second-time test taker to skip over the basics and brush up on more difficult areas of study (trigonometry, reading comprehension, etc.). A review of high school grammar is included for the Test of Standard Written English.

Simon & Schuster Software, 212-373-8882 (see address list, page 14).  
Circle #201 on Reader Service Card

## GRATIS GRAPHICS

While supplies last, Broderbund is including a *Special Edition Graphics Library* disk with specially marked packages of *The Print Shop*. The disk, not available as a stand-alone product, includes over 100 graphics, borders, and full panel designs that can be used to supplement those included in the main program.

Broderbund Software, 415-492-3200 (see address list, page 14).

Circle #205 on Reader Service Card

## TRADE-IN EXTENSION

Commodore has extended until December 31 the trade-in program that allows owners of any Commodore computer to receive a \$100 credit toward the purchase of an Amiga 500 or 2000. Further information can be obtained at any Commodore dealer, or direct from Commodore.

Commodore Business Machines, 800-343-3000 or 215-431-9100 (see address list, page 14).

Circle #206 on Reader Service Card

## MUSIC WRITER

*The MAESTRO!*, a menu-driven composition program, lets users select notes by placing the cursor at the proper position on the musical staff, and duration by moving the cursor up and down a column offering durations from 32nd notes upward, including triplets, dotted notes, double dotted notes, grace notes, tied notes, and non-standard durations. The SID chip's entire eight octaves are supported, and up to 1023 notes are permitted for each of its voices. Other capabilities include changing the ASDR envelope, making keyboard and programmed changes in tempo and volume, silencing one or more voices so the user can learn an individual vocal part, transposing to other keys, and cut and paste. Due to memory restrictions, the program does not include fancy graphics, printout capability, or support for SID filters, resonance, and Ring Modulation. Price is \$24.95 plus \$3.00 shipping (CA residents add sales tax).

Zwetzig Associates, 415-339-9396 (see address list, page 14).

Circle #184 on Reader Service Card

## REPLACEMENT CPU

The Turbo Master CPU Processor Accelerator, an onboard replacement microprocessor, plugs into the C-64's expansion port to provide the computer with four times faster processing speed. Also included are turbo disk routines in ROM for five times faster disk load and save, and a DOS wedge in ROM. Unlike other products which speed up only the disk drive, Turbo Master accelerates screen graphics,

word processor functions (scroll, search and replace, insert), number crunching, and spreadsheet recalculation. The \$179 price includes shipping to US addresses, and a 10-day money back guarantee.

Schnedler Systems, 704-274-4646 (see address list, page 14).

Circle #185 on Reader Service Card

## VIRUS RX

*Computer Viruses—A High-Tech Disease* explains viruses (to which auto-booting computers like the C-128 are particularly susceptible), their history, how they work, and what can be done to protect against them. Several rudimentary programs demonstrate some of the ways viruses can infect your computer. 288 pages; \$18.95.

Abacus, 616-698-0330 (see address list, page 14).

Circle #189 on Reader Service Card

## GRAPHICS SHOW

The 5th Annual Computer Graphics New York Show, to be held January 17-19 in the Jacob K. Javits Convention Center, will showcase graphics hardware, software, and services. Sessions will address desktop publishing, corporate video/animation, business and corporate graphics, and CAD. Admission is free to those who preregister.

Exhibition Marketing & Management Co. Inc., 703-893-4545 (see address list, page 14).

Circle #190 on Reader Service Card

## 25¢ SAVED

Commodore has saved 25¢ by neglecting to inform us at *Ahoy!* that production of the original Commodore 128 model has ceased. It was dropped in favor of the 128D (with detachable keyboard and built-in disk drive). We had to learn of the change from the September issue of Commodore's own magazine, just as some of you may have. We mention it here primarily so that you'll know why we didn't tell you sooner.

We'd be interested in knowing what Commodore will do with the 25¢ they saved. What did they determine to be a better value for their money than the good media relations a timely press release could have fostered? We don't know of any use they could find for 25¢ that would be worth nearly as much as that. About the only thing we could think of that even comes close would

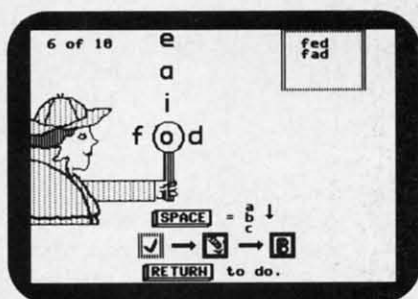


be a letter to our readers, apologizing for their negligence. But it's unlikely that the money will be invested that way, since we've received no such letter on the many occasions in the past when the same sort of thing happened.

Perhaps Commodore is going to hold on to the 25¢, just in case their fourth quarter turns out to be less profitable than expected. That way, if dividends are disappointing, they can divide the 25¢ among their stockholders. If you're in that category, check your year-end statement for your share of those two bits.

Commodore International, 215-431-9100 (see address list, page 14).

Circle #188 on Reader Service Card



Basic phonics skills for youngsters.

## PHONICS TUTOR

*Clue In on Phonics* uses a Sherlock Holmes theme to reinforce basic phonics skills, including identifying single consonant sounds and short vowel sounds and making word families. Kindergarten to fourth graders use a magnifying glass to identify blends and digraphs in words, or add blends and digraphs to various letter patterns to make words. In the lesson on vowels, students compare and match the sounds of vowel digraphs and diphthongs. They also identify words which become new words when the silent E is added.

Teachers can set the number of questions in a lesson, turn the sound on or off, decide what percent must be scored to play the reward game, and turn the reward on or off. Names and scores for up to 200 students can be stored alphabetically on disk. Available on the C-64 on either 5 1/4" or 3 1/2" disk — \$44.95 for one disk, \$54.95 with backup, and \$164.95 for class pack.

Gamco Industries, 800-351-1404 or 915-267-6327 (see address list, page 14).

Circle #183 on Reader Service Card

*Why waste money on acting lessons when your Ticket to Hollywood is waiting? Eight decades of movie history and thousands of facts are covered.*



## STAR 64

Who was born Maurice Micklewhite? What superstar made her escort follow two paces behind her? How many movies did Tracy and Hepburn make? You'll try to solve one of 25 mysteries by answering these and other questions in *Ticket to Hollywood* (\$29.95), Blue Lion's latest C-64 travelogue. You'll cover eight decades of movie history and thousands of facts, from the silent screen to the present, as you explore landmarks and follow the footsteps of the stars with the aid of six 3-D maps.

Blue Lion Software, 617-876-2500 (see address list, page 14).

Circle #186 on Reader Service Card

## SWEEPSTAKES

Epyx is promoting their products with three simultaneous contests:

The Print Magic Sweepstakes offers more than 100 prizes, with a grand prize of two three-night stays at the Hyatt Grand Champions Resort near Palm Springs, CA, plus airfare. Other prizes include CD players, road bikes, sampling keyboards, and memory telephones. You can enter by filling out an entry blank found at any Babbages, Egghead Discount Software, Electronic Boutique, Software Etc., or Warehouse store. Entries must be returned by January 31, 1989.

The Gold Rush Sweepstakes offers a chance at a grand prize of a vacation for four to Los Angeles plus \$1300 for hotel and expenses, a first prize of round-trip tickets for two to LA, and 500 second prizes of U.S. Gold game posters. To enter, fill out the form in-

side packages of *Tower Toppler* and *Technocop* and return it by May 31, 1989.

In the Dive Bomber Sweepstakes, you can win one of 15 Avirex leather WWII type G-1 Navy flight jackets, or one of 80 Avirex silk classic aviator scarves. Fill out and return the card inside specially marked *Dive Bomber* boxes by May 31, 1989.

Epyx, Inc., 415-368-3200 (see address list, page 14).

Circle #187 on Reader Service Card

## 3-D GLASSES

Shades of Elvis, poodle skirts, and Joe McCarthy—when used with specially designed software, Haitex's X-Specs 3D (sic) glasses create the illusion of a 3-D image. The glasses, scheduled for release in a C-64 compatible version at some unspecified point in the future (they've just been released for the Amiga), control what each eye sees independently by closing and opening an optical shutter at 60 frames per second. Price will probably be in the \$99.00 range.

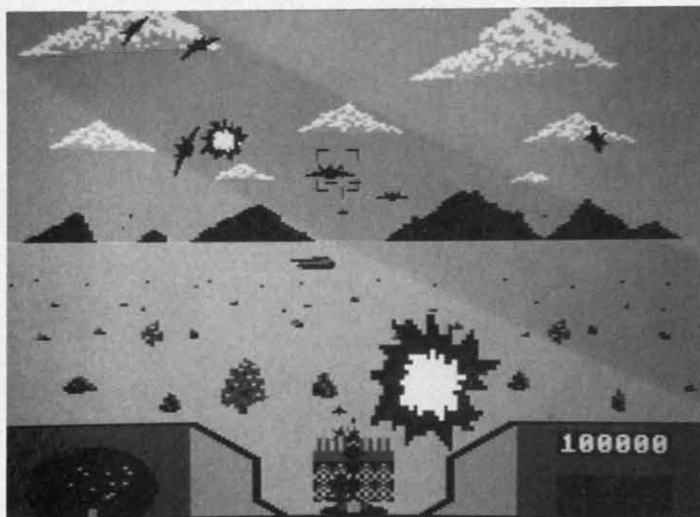
Haitex Resources, 214-241-8030 (see address list, page 14.)

Circle #194 on Reader Service Card

## SUPERBASE SHIFT

Precision Software of London, England has taken over the North American distribution of *Superbase Personal* and *Superbase Professional* from Progressive Peripherals & Software, establishing a US office in Denver to do so. Precision will also take over the servicing and technical support of the products.





Precision Incorporated, 214-929-4888 (see address list, page 14).  
Circle #195 on Reader Service Card

## GAMES

**Heavy Metal—Modern Land Combat Volume I** (\$39.95) combines elements of simulation, arcade action, and strategy as you advance through the ranks of today's army. You start in the war as a Second Lieutenant, devising strategies to overrun enemy positions. Once the strategy is set you move to the front line, commanding one of three modern weapons systems: the M1A1 Abrams (the US Army's newest, most sophisticated battle tank), the Martin Marietta Air Defense Anti Tank System, aka ADATS (located at your forward supply stations to defend against air and ground attack), and the XR311 Fast Attack Vehicle, or FAV (based on the actual US Army vehicle used to attack outlying enemy stations).

Access Software, 801-298-9077 (see address list, page 14).

Circle #191 on Reader Service Card

**Ocean Ranger** (\$34.95) simulates the operation of a next-generation missile ship. Battling in four of the world's military hot spots (the Bering Sea, Southeast Asia, Central America, and the Persian Gulf), you pilot your craft through a non-stop firestorm while destroying primary and secondary targets. Missions entail battling destroyers, planes, submarines, and mines, aboard a missile ship armed with 75mm cannons, Sea Sparrow and Harpoon missiles, depth charges, chaff, and an ECM radar jammer. Players get a 360

**Heavy Metal—Modern Land Combat Volume I** lets you command modern weapons systems—a battle tank, an anti tank system, or a fast attack vehicle.

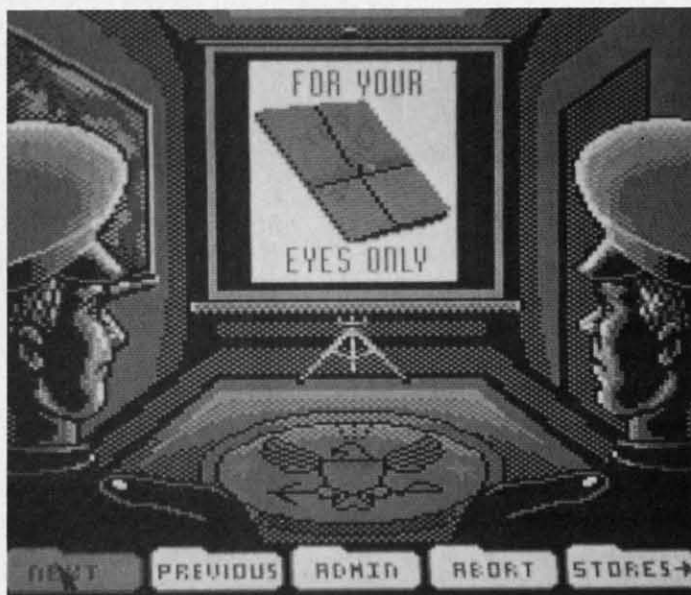
Previously released for the Amiga, the C-64 conversion of **ZOOM!** (\$29.95) lets one or two players guide a character named Zoomer through 50 levels of an outer space Zoomland. Though he's being chased by a gang of enemies, the game's action is strictly non-violent. A 30 day unconditional money back guarantee is offered.

Discovery Software, 301-268-9877 (see address list, page 14).

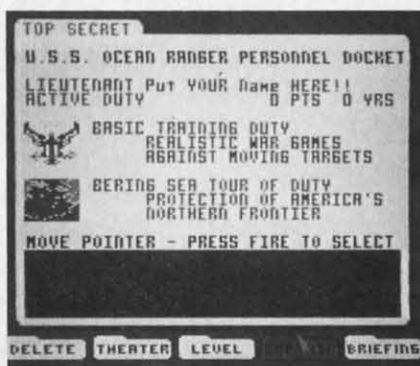
Circle #193 on Reader Service Card

From MicroIllusions:

**Faery Tale Adventure** follows Philip, Julian, and Kevin through the wilderness, as they venture into caves, castles, and even the astral plane in search



**Battling destroyers, planes, subs, and mines while navigating through a non-stop firestorm is all part of the fun of Ocean Ranger. The action takes place in four of the world's top military hotspots.**



degree view around the ship through bow, port, starboard, and stern. Map, damage, briefing, and stores screens can be accessed.

Activision Entertainment, c/o Mediagenic, 415-329-0800 (see address list, page 14).

Circle #203 on Reader Service Card

of the Dream Knight and the stolen Talisman.

The first in the One to One series of arcade games featuring one to one playability with the computer or another human, over a modem or in person, **Firepower** is a continuous action tank battle.

MicroIllusions, 800-522-2041 or 818-360-3715 (see address list, page 14).

Circle #204 on Reader Service Card

Accolade and Jack Nicklaus have signed a three year contract to produce home computer golf simulations. The first, **Jack Nicklaus' Greatest 18 Holes of Major Championship Golf**, is based on the recently released tape from the ABC Sports Video Library. C-64 gamers can play on 18 of Jack's favorite holes, as well as two of his invention.



# GET ACCESS TO REAL BUYING POWER... WITH THE *Ahoy!* ACCESS CLUB!

Subscribing to *Ahoy!* and/or *Ahoy!'s AmigaUser* has always made sense—for you and for us. We get to keep more of your money when we cut out the middlemen (our distributor and your newsdealer), and we kick some of the savings back to you with a discount rate.

And now you can save even more—in fact, you can save the cost of your subscription many times over!

The *Ahoy!* Access Club, launched in January 1986, has been expanded to offer its members even more clout in the Commodore marketplace. And for a limited time, membership will be awarded free to subscribers!

Here are some of the ways the *Ahoy!* Access Club can boost your buying power:

- The *Ahoy!* Access Club *Clipper*, published 12 times a year, contains exclusive discount offers on products advertised in *Ahoy!* and *Ahoy!'s AmigaUser*. Participating vendors offer reductions of 10%, 20%, 30%, or more on selected items, free bonus merchandise, and special close-out and combo offers not advertised elsewhere—all for Club members only!
- The *Ahoy!* Access Club Card is your ticket to discounts at participating computer software, hardware, and book dealers, and reduced admission at Commodore and Amiga conventions and swap meets across North America. (Details are found in each issue of the *Clipper*.)
- The *Ahoy!* Access Club BBS (modem required) offers continuously updated information on new offers available through the Club, as well as late-breaking industry news,

corrections and updates to articles in *Ahoy!* and *Ahoy!'s AmigaUser*, and free electronic mail facilities. Operation is 24 hours a day, 7 days a week—for Club members only!

If you are presently a subscriber to *Ahoy!* or *Ahoy!'s AmigaUser*, your membership has already been activated. You'll receive the *Ahoy!* Access Club *Clipper* bound into each issue.

If you're not a subscriber, fill out and return the postpaid card bound between pages 50 and 51 today!

Let everyone else pay list price. You don't have to...when you have Access!

## LOCK IN YOUR FREE MEMBERSHIP NOW!

*Ahoy!* Access Club membership will be included free with your paid subscription for a limited time only.

You are guaranteed free membership for the duration of any subscription paid for prior to December 31, 1988. After that date, a small additional charge may be levied.

So why not lock in free membership for as many years as you wish by extending your subscription now?

### ANNOUNCING COMPUTER DIRECT—A NEW DIVISION OF PROTECTO...

Protecto Enterprises, one of the leaders in the computer discount mail-order business, proudly announces the launch of *Computer Direct*, a new division dedicated to serving you better. Family-owned and family-managed, the company's management includes four brothers, their sister and spouses. With the family keeping a vigilant eye on all phases of the operation, things continue running smoothly.

Recently, the company has been working on improving services. They've installed a mini-computer and upgraded their phone system, while streamlining operations to serve you better.

You've probably noticed the large number of *Computer Direct* pages in each *Ahoy!* issue. That's because *Computer Direct* will consistently win your business with their exceptional support and unusual guarantees. Their 15 DAY FREE TRIAL policy on products including software is among the best in the industry.

So give Protecto's *Computer Direct* a try. I know you'll be impressed, too!

### FREE WALNUT DISK STORAGE BOX FROM OXXI...

Oxxi, a relatively new company whose name has become synonymous with landmark software for the Amiga, is pleased to announce their new Benchmark Module-2: Software Construction Set for the Amiga.

Oxxi's new language product delivers a highly efficient environment for developing programs, by integrating the primary tools used in software development: an editor, a compiler, and a linker.

The lightning-fast compiler implements the entire Module-2 languages. Completion of densely packed programs takes place at an average speed of 10,000 lines per minute with burst speeds of up to 30,000 lines per minute. Once the program is compiled, the editor automatically positions itself at the site of any errors, and displays an error message. The error can then be fixed, and the editor repositioned at the next error by pressing a key. Once all parts of the program have been compiled successfully, the turbo-speed linker, built into the EMACS-style editor is activated by pressing another single key, while still in the editor. The program is then linked into a stand-alone executable file.

The Benchmark Module-2: Software Construction Set has some terrific features, besides those already mentioned. Amiga hardware/software support libraries, including intuition, ROM Kernel, Amiga DOS, to name but a few. Standard Module-2 libraries, including File System, InOut, Storage, Terminal, Math-

LibO, and more; demonstration programs showing the usage of many of the Amiga functions, such as windows, graphics, multi-tasking, menus, gadgets, and many others (some of the demo programs include a featured paint program and a desktop calculator); and professionally written documentation, consisting of a user's guide and a reference manual.

*Emerald* also has an excellent policy: Your SATISFACTION IS GUARANTEED. Now and for a limited time, when you buy the FSD-2 from *Emerald Computer International*, you may take your pick of the following offers: 1) 10 FREE DISKETTES, 2) 30% OFF the Quickshot II Joystick, regularly selling for \$19.95, but with discount only \$13.33, 3) 30% OFF

The *Ahoy!* Access *Clipper* is published bimonthly by *Ahoy!* magazine and sent free to selected subscribers of *Ahoy!* *Ahoy!* is a monthly publication of *Amiga International Inc.* The cost of a one-year subscription is \$23.00; two years are \$44.00. Inquiries regarding subscriptions to the magazine should be addressed to *Amiga International Inc.*, 45 West 34th Street, New York, New York 10001.

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### SAVE 30% OR GET A FREE BOX OF DISKETTES WITH FSD-2 PURCHASE FROM EMERALD COMPONENT INTERNATIONAL

Mail to: Emerald Component International  
P.O. Box 1441 / Eugene, OR 97401

For faster service, call 1-800-356-5178.

Or in OR, call 1-503-683-1154.

YES, *Emerald*, I want to take my pick of the options

listed below. Enclosed is my order for the FSD-2 at

\$159, plus \$20 for shipping and handling. I have in-

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\$5 for shipping and handling on any of the hardware

offers. Thanks!

☐ I want to SAVE 30% on the Quickshot II. Enclosed

is my additional payment of \$13, plus \$5 for ship-

ping and handling.

☐ I want my FREE BOX OF DISKETTES.

☐ I want to SAVE 30% on your 3000 Baud Modem,

regularly \$30. Enclosed is my additional payment of

\$21, plus \$5 for shipping and handling.

☐ I want to SAVE 30% on your 1200 Baud Modem,

regularly \$129. Enclosed is my additional payment of

\$90.30, plus \$5 for shipping and handling.

☐ I want to SAVE 30% on your *Sinclair Case*, regu-

larly \$29.95. Enclosed is my additional payment of

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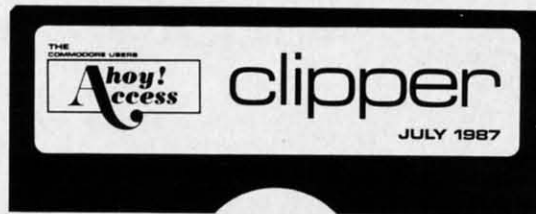
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SAVE MORE THAN 40% ON

COMMODORE PC-16 SYSTEM FROM

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Mail to: Lyco Computer



### GREAT PRICES PLUS A FREE GIFT FROM MONTGOMERY GRANT

When you're in the market for Commodore-compatible peripherals, you'll want to be sure to check out the prices from *Montgomery Grant*. Whether you're looking for a printer, a disk drive, or some other peripheral, *Montgomery Grant* is definitely one of the suppliers you should consider. Their prices are among the lowest in the country. When you're ready to buy from *Montgomery Grant*, be sure to clip the coupon on page 3 of this *Clipper*, because besides having fantastic prices, with every purchase over \$100, *Montgomery Grant* will add a FREE GAME CARTRIDGE. Read their ad in this month's issue of *Ahoy!* for details about ordering. If you wish to place your order by phone, just call 1-800-345-7058, or in New York, call 1-212-594-7400. And don't forget to ask for your FREE GAME CARTRIDGE. This offer expires August 15th, so don't wait. Order TODAY!

### FREE SOFTWARE WITH \$10 PURCHASE FROM S & S...

S & S Wholesalers has very good prices, perhaps the best you'll find anywhere on Commodore and Amiga-compatible hardware and software. They're anxious for you to consider buying from them when you're in the market, so they're making you this exciting offer: When you clip the S & S coupon on page 3 of this *Clipper* and send it along with your order of at least \$10, you'll receive 1 FREE piece of software! If you're in a hurry you may call them at 1-800-233-6345, or in Florida, call 1-305-536-1364. But be sure to mention that you saw this offer in the *Ahoy!* Access *Clipper*, so that you receive your FREE SOFTWARE. This offer expires on August 15, 1987, so mail your order RIGHT AWAY!

### Ahoy! Readers:

Well, here we are again in the heat of the impending summer. My escape from the heat is to clutter myself in my air-conditioned study with my computer. Last summer I created some great programs to help run my friend's business. This summer, who knows!

In this *Clipper*, you'll find some more wonderful offers to tempt you. The newest advertiser featured in this month's *Clipper* is *Montgomery Grant*. Even with their great prices, when you spend \$100 or more you will include a FREE GAME CARTRIDGE. *AICP* is again offering a FREE DISK NOTCHER with the purchase of two boxes of disks. If you don't already own a notcher, be sure to take advantage of this offer. *Lyco Computer* is reducing the price of the *Panasonic 1080* when you also purchase an applicable cable or interface. S & S is holding over their top notch FREE SOFTWARE OFFER, and *Emerald* is also in with a jewel of a dual offer. And there is much more, so be sure to read this *Clipper* carefully.

See you in September with more dynamic offers for your consideration.

Admirably yours,

Joe Ferguson  
Joe Ferguson

Ahoy! Access

### SAVE \$5 ON A KRACKER JAX® PACKAGE FROM COMPUTER MART...

When I was a kid, I loved to buy boxes of *Kracker Jax*, not for the confection, but rather for the surprise. This month *Computer Mart* has a *Kracker Jax* surprise offer for you, too. Their Jim Jandry copy protection program, *Kracker Jax*, was reviewed in the January, 1987 issue of *Ahoy!* We liked it, and so will you. *Kracker Jax* is a powerful parameter copy program which will allow your 1541 or 1571 disk drive to strip all copy protection from your expensive software, thus allowing you to use simple, fast copiers to make backups. You need never again pay for a backup to a program you already own. The cost of *Kracker Jax* is only \$19.95 for each volume. There are five.

But wait, there's more! There's also a

book called *Kracker Jax* which comes with a neat little disk, and 20 parameters. The regular cost of the book is \$5.95. This valuable book contains the secrets of unprotecting software, and includes a tutorial which explains to you a new level of knowledge protection.

*Computer Mart* also has a hifty software worth your so be sure to find their ad in this issue of *Ahoy!* *Computer Mart* is giving you serious consideration to *Kracker Jax* package. If, in 1987, you may take \$5 bination of the book and volume of your choice. *Computer Mart* coupon on page 3, and send it with your order. Your turn state on August don't wait.

### COMMODORE USERS

# Ahoy! Access!

## MEMBERSHIP CARD

Michael Schneider  
President

Michael Schneider





**Jack Nicklaus' Greatest 18 Holes is based on the ABC video release.**

You can compete against Nicklaus, against three human opponents, or

## Keep Your Collection Looking Shipshape with Ahoy! Binders

Don't be caught at sea the next time you need valuable programming information from a back issue of *Ahoy!* Our official binders turn a year's worth of *Ahoy!* into a textbook on Commodore computing! These quality-constructed binders use metal rods to hold each magazine individually, allowing easy reference to any issue without removal. Sporting a navy blue casing with a gold *Ahoy!* logo imprinted on the spine, these binders will be the pride of your computer bookshelf.

To order, send \$12.45 (US funds) for each binder desired to:

**Ahoy! Binders**  
45 West 34th Street—Suite 500  
New York, NY 10001

(Outside Continental US add \$2.50 per binder. Allow 4 to 6 weeks for delivery.)

against a variety of computer-controlled men and women. Features include skins scoring or stroke play, pro, men's, or ladies' tees, wind intensity and direction, and uphill or downhill lies. The game will be available by Christmas shopping season.

Accolade, 408-985-1700 (see address list, page 14).

Circle #192 on Reader Service Card

As the *Global Commander* (\$29.95) of the United Nuclear Nation in the year 2032, you are responsible for the welfare of the 16 aggressive, untrustworthy member nations. This involves managing the earth's economies, détente, resources, food supply, communications—and nuclear missiles. To head off the threat of world destruction you must fulfill all needs, cool hot tempers, mend stressed relations, and maintain military security. Your executive privileges include eavesdropping on radio

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Datasoft, c/o Electronic Arts, 415-571-7171 (see address list below).

Circle #224 on Reader Service Card

Mindscape has adapted three Sega coin-op titles to the 64:

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In *Alien Syndrome* (\$29.95) you must rescue people trapped inside an alien-infested genetic laboratory before the lab's self-destructing mechanism makes the job unnecessary.

Mindscape, 312-480-7667 (see address list below).

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Grand Rapids, MI 49508  
Phone: 616-698-0330

### Access

545 W. 550 South, Ste. 130  
Bountiful, UT 80410  
Phone: 801-298-9077

### Accolade

550 S. Winchester Blvd.  
San Jose, CA 95128  
Phone: 408-985-1700

### Activision

3885 Bohannon Drive  
Menlo Park, CA 94025  
Phone: 415-329-0800

### Blue Lion Software

90 Sherman Street  
Cambridge, MA 02140  
Phone: 617-876-2500

### Broderbund Software

17 Paul Drive  
San Rafael, CA 94903-2101  
Phone: 415-492-3200

### Commodore

1200 Wilson Drive  
West Chester, PA 19380  
Phone: 215-431-9100

### Datasoft

c/o Electronic Arts  
1820 Gateway Drive  
San Mateo, CA 94404  
Phone: 415-571-7171

### Digiscap Software

P.O. Box 113058  
Carrollton, TX 75011-3058  
Phone: 214-241-9891

## Companies Mentioned in Scuttlebutt

Contact companies directly for more information; or save time and money by using the Reader Service Card bound between pages 50 and 51.

### Discovery Software

163 Conduit Street  
Annapolis, MD 21401  
Phone: 301-268-9877

### Epyx

600 Galveston Drive  
P.O. Box 8020  
Redwood, CA 94063  
Phone: 415-368-3200

### Exhibition Marketing

8300 Greensboro Drive  
McLean, VA 22102  
Phone: 703-893-4545

### Gamco Industries, Inc.

Box 1911  
Big Spring, TX 79721  
Phone: 800-351-1404; in TX 915-267-6327

### Haitex Resources

208 Carrollton Park,  
Suite 1207  
Carrollton, TX 75006  
Phone: 214-241-8030

### LLM Press

150 Broadway  
New York, NY 10038  
Phone: 212-766-3785

### MicroIllusions

17408 Chatsworth Street  
Granada Hills, CA 91344  
Phone: 800-522-2041; in CA 818-360-3715

### Mindscape Inc.

3444 Dundee Road  
Northbrook, IL 60062  
Phone: 312-480-7667

### Online Information Network

5707 South 86th Circle  
P.O. Box 27347  
Omaha, NE 68127  
Phone: 402-593-4593

### Precision Incorporated

8404 Sterling St., Suite A  
Irving, TX 75063  
Phone: 214-929-4888

### Schnedler Systems

25 Eastwood Road  
P.O. Box 5964  
Asheville, NC 28813  
Phone: 704-274-4646

### Simon & Schuster Software

One Gulf+Western Plaza  
New York, NY 10023  
Phone: 212-373-8882

### Zwetzig Associates

5932 Bruns Court  
Oakland, CA 94611  
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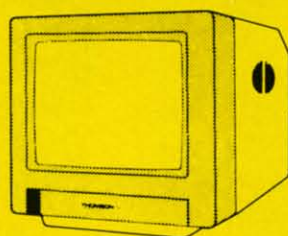
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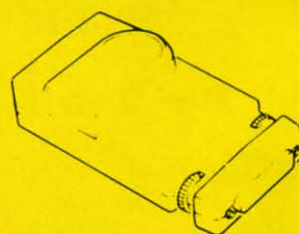
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# TUBULAR!

## For the C-64

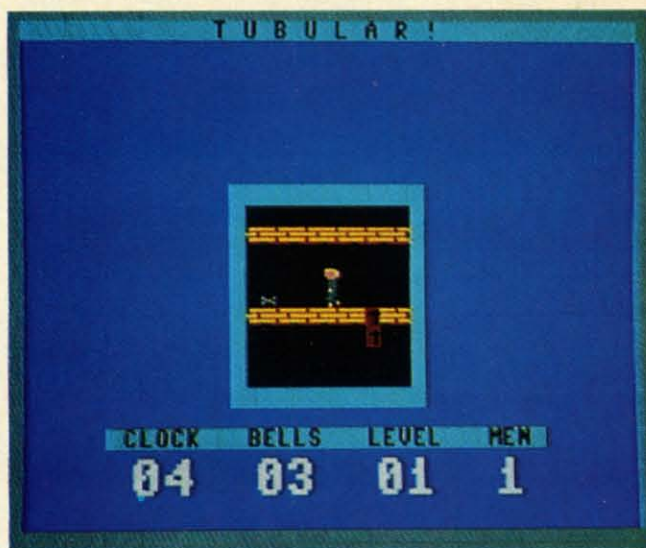
By Bob Blackmer

**T**ubular! is an addictive multilevel arcade game for the C-64. The object is simple: collect the 14 bells and make it to the top of a huge pyramid. I've designed 16 different and challenging levels for your enjoyment.

The only way you get from floor to floor is through the high pressure tubes that turn the pyramid into a giant maze. The up and down tubes are clearly marked and of different colors. Step over a down tube and it activates, rushing you downward. Sometimes the tubes will be stacked, and if you do nothing you will continue through the next tube. Pushing on the joystick left or right when you reach a floor will allow you access to that floor. There will be times when you go up and there is no way down again, which is disastrous if you miss any bells.

The only access to the top floor is an up tube which appears when you have gathered all the bells. Some levels you will find easy to solve, others will give you a hard time. Consider yourself a true puzzle solver if you can master all 16 levels.

You start out in the bottom right hand corner of the pyramid,



amid, and have 90 seconds in which to complete a level. To help you out, you get an extra life with each level completed, up to a maximum of nine. I've also included a kill key which is activated by pressing the RUN STOP key; you'll know when to use it.

I'm sure you will find this program addictive and challenging, which, judging by your letters, is what you want.

*Tubular!* is written entirely in machine language for speed and playability, and must be entered using *Flankspeed* (see page 63). After typing in and saving a copy, reset the machine and LOAD "TUBULAR!";8,1. Then SYS 49152 to start. ☐ SEE PROGRAM LISTING ON PAGE 64

# TRI WORDS

## For the C-128

By Bob Blackmer

**T**ri Words is an entertaining word game for the C-128 that is also useful as an educational tool. You play against the computer, forming three-letter words from a grid of 16 jumbo sized letters which are chosen randomly for each game. The program utilizes its own built-in database to select words and to check your word for validity.

You can set the intelligence level of the computer. The computer will select words according to their usage and familiarity. Simple words like CAT will appear early in the game, while vague words such as OHM will only show up late in the game. I advise linguists who seek a challenge to select the super brain.

Type in the second program, TRI.DAT (page 71), first. When this program is run it will check the data for any typing errors. If your typing is correct, the program prompts you to press a key to write the binary database WORD-FILE to disk. The main program will load this file at the start of each session, so save it on the same disk as the main program.



Using a standard dictionary to establish the word list, I have omitted all slang words and abbreviations. Only legal words are contained in the final list of 489, which will provide a formidable challenge.

The game is designed as you against the computer, but is great played in groups. Everyone can help form words while one person handles the input.

You will be prompted to enter your word. Type in any three letter word and press RETURN. The program will inform you if your word contains double letters (each word must use three different letters—double letter words like

*Continued on page 74*



MICHAEL R. DAVILA



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- Thanks for (your) user support! *A.S., TX*
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Renegade is a synthesis of the best utilities ever created by the best programmers ever assembled on a project of this nature. Not only is Renegade the only archival software a Commodore owner needs, it's so advanced it's now the only archival software we make. This means all our R&D effort goes into making sure that nothing else on the market comes close to Renegade's capabilities.

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The *Art Gallery* offers the opportunity for fame and fortune to aspiring Commodore artists. Send your work on disk to *Art Gallery*, Ion International Inc., 45 West 34th Street—Suite 500, New York, NY 10001. Label each disk with the date of your submission, your name and address, the number of images on the disk, and the graphics or paint program used. Graphics produced on the Amiga are eligible for inclusion in *AmigaUser*; C-64, C-128, and Plus/4 images are eligible for inclusion in *Ahoy!* If your image is published, you will receive a free one-year subscription. Current subscribers will have their subscription extended by one year.

Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the Art Director, based solely on their artistic merit.



For the average person, Christmas or Chanukah means just the usual round of presents, celebrations, and time off from work or school. But *Ahoy!* readers have something really special to look forward to: the annual holiday edition of the *Art Gallery*. Above is *Reindeer* by Jason Anderson (Independence, MO), created on *SuperSketch*. Top right: *Winter Sunset* by John A. Skilba (Lemont, IL), drawn on *The Artist*. Middle right: *Santa's Sack*, also by Jason Anderson. Bottom right: *Winter Hills* by Peter Leontescu (Bronx, NY), on *Koala*. Better start cleaning that chimney!



Send your comments on any aspect of Commodore computing to Flotsam, c/o Ahoy!, 45 West 34th Street—Suite 500, New York, NY 10001. We can print only a few letters, but we individually answer as many as we can—and we read every one.

I have a very strong feeling that I've purchased your magazine for the last time with the July 1988 issue. I've been buying your magazine each month since January 1986, but the issue I refer to left me with a sour taste in my mouth.

In your *Art Gallery* section for that issue, devoted to images related to American Independence Day, you show an illustration of a Canadian post office. You observe: "True, it's a Canadian post office. But where would our neighbors north of the border be without the American Revolution? Still trapping furs, no doubt, and trading them to us for three-cornered hats and powdered wigs."

Perhaps the author meant to be humorous. Well, I see nothing funny in his comments. I am a Canadian, and proud of it, just like the author is an American and proud of it. The author insinuated that we north of the border are living in the past. May I remind you that Commodore started in Toronto, Ontario; *Transactor*, a recognized Commodore publication, is based here; and important industry figures like Steve Punter (developer of the telecommunications protocol that bears his name) and Steven Douglas (author of *PaperClip*) are also Canadian-born.

We, your Canadian neighbors, are not the poor country bumpkins that your author would have your US readers believe. —Wayne D. Anderson  
Greenwood, Nova Scotia, Canada

*We're sorry you were offended by our remark. We certainly didn't mean to imply that Canadians were living in the eighteenth century, and we're at a loss to understand how you managed to make that inference from the passage quoted. Rest assured that we've always thought of our primary audience as North America—never as the United States alone.*

*Continued on page 31*

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# TIPS AH-OY!

Compiled by Michael R. Davila

Send your best programming and hardware hints to *Tips Ahoy!*, c/o Ion International, 45 W. 34th St. - Suite 500, NY, NY 10001. Include a stamped and self-addressed envelope.

## RASTER LINE

This program creates a reverse white line at the top of the screen like the one of many word processors.

If the user doesn't want to scroll the characters in this line, he can change with zero the byte at location \$D011; in this way the line will be clean.

Now to write something in this line the user must POKE the first 40 bytes of the screen memory (\$0400).

—Genco Ludovico  
Mola di Bari, Italy

```
140 FORJ=828T0903:READX:POKEJ,X
150 CS=CS+X:NEXT
160 IFCS<>8431THENPRINT"ERROR!":END
170 PRINT"S":SYS828
200 DATA120,169,91,141,20,3,169,3
210 DATA141,21,3,169,50,141,18,208
220 DATA173,17,208,41,127,141,17,208
230 DATA169,129,141,26,208,88,96,173
240 DATA25,208,141,25,208,48,7,173
250 DATA13,220,88,76,49,234,173,18
260 DATA208,201,58,176,10,169,1,141
270 DATA33,208,169,58,76,130,3,169
280 DATA0,141,33,208,169,50,141,18
290 DATA208,76,188,254
```

## CUP OF BOOLEAN

A Boolean expression, named for the logician George Boole, is often called a logical expression. These expressions only have a value of TRUE or FALSE.

Whether you know it or not, the Commodore computer has a built-in type of Boolean expression. Instead of values TRUE and FALSE, we use a one to represent TRUE and a zero to represent FALSE.

Type in and run the program below. The prompts are self-explanatory. After all questions have been answered, you will be shown whether two variables contain the same thing or not. This is acknowledged by a printed TRUE or FALSE.

Another way to view this program, would be to add the following lines:

```
IF NAMEBOOLEAN THEN PRINT"TRUE":GOTO 19
18 PRINT"FALSE"
20 IF AGEBOOLEAN THEN PRINT"TRUE":END
21 PRINT"FALSE"
```

where NAMEBOOLEAN and AGEBOOLEAN are TRUE only if they contain the value of one. —Michael Jaacks  
Alamogordo, NM

```
0 DIM BOOLEAN$(1):BOOLEAN$(0)="FALSE":BO
LEAN$(1)="TRUE"
1 RV$=CHR$(18):RO$=CHR$(146)
2 PRINTCHR$(147);:INPUT"ENTER YOUR NAME"
;N$:INPUT"ENTER YOUR AGE";A
3 PRINT:INPUT"ENTER ANOTHER NAME";N1$:IN
PUT"ENTER ANOTHER AGE";A1
4 REM
5 REM LINE 9 ASSIGNS A BOOLEAN VALUE
6 REM OF ZERO FOR FALSE OR ONE FOR
7 REM TRUE TO THE VARIABLE NAMEBOOLEAN
8 REM
9 NAMEBOOLEAN=ABS(N$=N1$)
10 REM
11 REM LINE 15 ASIGNS A BOOLEAN VALUE
12 REM OF ZERO FOR FALSE OR ONE FOR
13 REM TRUE TO THE VARIABLE AGEBOOLEAN
14 REM
15 AGEBOOLEAN=ABS(A=A1)
16 PRINT:PRINT"TRUE OR FALSE?":PRINTRV$;
N$;RO$;" IS THE SAME AS ";RV$;N1$
17 PRINT BOOLEAN$(NAMEBOOLEAN)
18 PRINT:PRINT"TRUE OR FALSE?":PRINTRV$;
A;RO$;" IS THE SAME AS ";RV$;A1
19 PRINT BOOLEAN$(AGEBOOLEAN)
```

## DMA REMEDIES

Available for the C-128 are the 1700 128K and 1750 512K RAM Expansion Units (REU). The C-128 comes equipped with the three easy to use statements, STASH, FETCH, and SWAP which operate on the REU. But there are some problems with these commands.

Problem one is that the C-128's 8502 microprocessor must be in SLOW (1 mhz) mode before the DMA command is issued. If the C-128 is in FAST (2 mhz) mode when the DMA command is issued, the system will lock up. This problem can be avoided by using a SLOW command immediately before the DMA command and a FAST command immediately after. However, this is the responsibility of the programmer.

Problem two is that if the 40 column display and FAST mode are being used, then the solution to problem one will cause the 40 column screen to flicker while the DMA takes place.

Problem three is that the next to the last routine involved with these DMA commands, located in ROM, contains a bug. It first gets the memory configuration data for the last used BANK command. If no BANK command has been used, then the bank used is bank 15. This memory configuration data which is correct up to this point is ANDed with \$FE (254) which forces the 4K I/O block to be switched in between \$D000 and \$DFFF (53248 to 57343)



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in all cases. While this is necessary on the C-64 it is *not* necessary on the C-128. Forcing the I/O block in makes it impossible to use a DMA command on this area of RAM in banks 0 and 1. If you wish to move this area of memory to the REU, TOUGH LUCK!

The following machine language routine loaded by a BASIC loader routine solves all of these problems.

```

•1000 DMA=1008: JMP=76: ADR=2816: HI=INT(
  ADR/256):LO=ADR-(HI*256)
•1010 POKE DMA,JMP: POKE DMA+1,LO: POKE D
  MA+2,HI
•1020 BYTES=26: REM NUMBER OF BYTES IN DM
  A REPLACEMENT ROUTINE
•1030 FOR LD=0 TO BYTES-1
•1040 : READ ML: POKE ADR+LD,ML
•1050 NEXT LD
•1060 NEW: REM ERASE LOADER ROUTINE
•1070 REM DATA REPLACEMENT DATA
•1080 DATA 173,48,208,72,169,0,141,48,208
•1090 DATA 174,213,3,32,107,255,174,0,255
•1100 DATA 32,243,3,104,141,48,208,96
  
```

The starting location of the DMA issuer routine located is \$3F0 (1008). The BASIC loader routine replaces the first instruction LDX \$FF00 of the original DMA issuer routine with JMP \$0B00. The replacement routine will be lo-

cated in the cassette buffer. The JMP instruction redirects *any* call to this routine to the replacement routine.

In the replacement routine the A register is loaded from \$D030 (53296) which determines the speed of the 8502. If this byte contains a 1 then the 8502 will operate in FAST mode. If this byte contains a 0 then the 8502 will operate in SLOW mode. The speed of the 8502 is pushed onto the stack, then a 0 byte is stored to \$D030, forcing SLOW mode. Location \$3D5 holds the bank number from the last used BANK command. The X register is loaded from here and a call is made to the kernal routine at \$FF6B which returns the memory configuration data for the chosen bank in the A register. The X register is loaded from \$FF00, the current memory configuration data which will be re-stored later when the DMA transfer is complete. Then the old DMA routine is called at location \$3F3, three bytes past the original starting location. The Y register which remains untouched throughout the execution of the new DMA routine contains the DMA command itself. The Y register is stored to \$DF01 which is the DMA command register in the I/O block. At this point bank 15 is still switched in. The A register which contains the memory configuration data for the DMA transfer is stored to \$FF00 and DMA transfer takes place. Then the X register which contains the memory configuration data from before the DMA command was issued is stored back to \$FF00 and a return is made back to the replacement routine which pulls the processor's speed from the stack and stores it back to D030 and returns control to BASIC.

The replacement routine relieves the programmer of the responsibility of insuring the C-128 is in SLOW mode before the DMA, prevents screen flicker when using FAST mode with the 40 column screen and permits the use of DMA commands on RAM from \$D000 to \$DFFF in banks 0 and 1.

It should be noted that a STASH, FETCH, or SWAP should always be preceded by a BANK 0 or a BANK 1 command to prevent accidentally overwriting the I/O register if this area of memory is involved in the DMA. Otherwise the system will lock up on a FETCH or SWAP on the I/O registers.

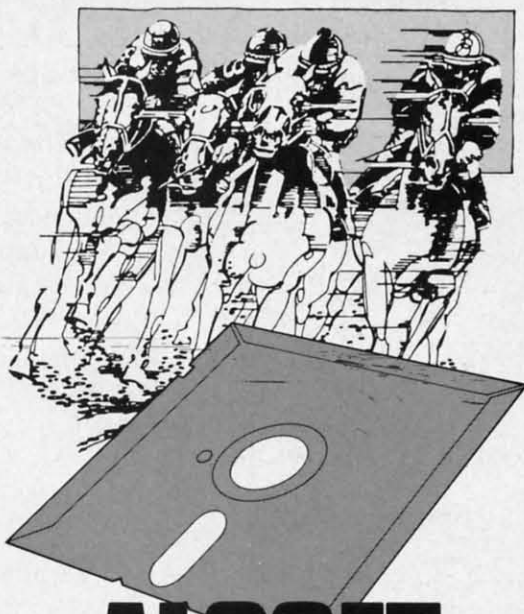
The replacement DMA routine is completely relocatable. If you wish to relocate it, just change the value of ADR to the address in memory where you will be placing the routine. Before I forget, this replacement routine allows the assembly and machine language programmer to freely use the C-128's DMA CALL routine at \$FF50 on the RAM beneath the I/O block with no problems at all.

—Eric Schneider  
Florissant, MO

## COMPUTED GOTO/GOSUB

For the C-128 owner, here's a short ML routine that provides computed GOTO/GOSUB capability. Rather than being limited to actual line numbers, such expressions as GOTO.N, GOTO.1000+A\*X, GOSUB.L(J), and GOSUB.VAL(A\$) are provided. The decimal point is required before the expression, otherwise a SYNTAX ERROR results. It will not be considered part of any math that follows.

*Continued on page 57*



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# COMMODORES

## PROGRAMMING CHALLENGES

By Dale Rupert

**E**ach month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodores*!

### PROBLEM #60-1: EIGHT QUEENS

This classic problem was suggested by Robert Woods (Sherwood, OR). He says it is a tough one. Let your computer find all 92 arrangements of 8 queens on a chess board for which no queen can attack any other. The chess board is 8 by 8. A queen can attack any piece on her own row, column, or diagonal in any direction. Solution #1 is displayed like this:

COLUMN: 1 2 3 4 5 6 7 8  
ROW: 1 5 8 6 3 7 2 4

Rob's solution takes 35 minutes with printouts. Can you do better?

### PROBLEM #60-2: UNSTRING COMMAND

In contrast to the Instring (INSTR) function which locates the first occurrence of a given character within a string, this problem requires you to implement an UNSTRING routine identifies the first position within a string which does *not* contain the given target character.

For example, if the given string is "AAAABAA" and the target character is "A", the UNSTRING routine returns 5, since the 5th character is not an "A". If the target is any other character than "A" in this example, UNSTRING returns 1, indicating that the first character does not match the target. If the given string is "AAA" and the target character is "A", UNSTRING returns 0 since every character in the

given string is the target character.

### PROBLEM #60-3: \$10,000 SERIES

*The New York Times* (8/30/88) described a numerical series for which the famous mathematician John Conway offered a \$10,000 reward for anyone who could determine a particular property of the series. Two weeks after this offer was made, another well-respected mathematician, Colin Mallows, found the answer (with the help of a Cray supercomputer, his wife, and another colleague). Dr. Conway had intended to offer \$1000, but his videotaped lecture revealed that he had in fact offered \$10,000, so that is what he paid. Dr. Mallows agreed to the \$1000 payment, although he kept the \$10,000 check for framing.

Your task is to write a program to generate this otherwise obscure series. It starts out like this:

1, 1, 2, 2, 3, 4, 4, 4, 5, 6, ...

The rules for generating the next term in the series are:

1. Take the last term of the series (6 for the portion of the series shown above) and use it as a counter value CV. Count that many numbers back to the left (counting the last term as #1). That brings us to the 3.

2. Start at the beginning of the series and count forward CV terms (6 terms in our example). That brings us to the first 4.

3. Add the results of steps 1 and 2 and write the sum as the next number in the series. Here 3 plus 4 is 7 which is the next term in the series.

### PROBLEM #60-4: ROMAN-ARABIC II

Richard van Frank (Montclair, NJ) suggested this *Commodore* which we have previously done. Newcomers will enjoy it, and old-timers may find a better way of solving it the second time around. The user enters a Roman numeral from I to MMMCMXCIX and the computer returns the corresponding Arabic value from 1 to 3999.

This month we will discuss the best solutions to *Commodores* from the July 1988 issue of *Ahoy!* Problem #55-1: *Sig Digs* was submitted by Jim Speers (Niles, MI). The overall challenge was to accept any integer from 0 to 65535 and determine the numbers of 1's, significant 0's, and significant DIGits altogether in the integer's binary representation.

Jim challenged the readers to perform this feat in a one-line program. This short program from Robert Clark (Ocean Springs, MS) *almost* does the job:



```

1 REM =====
2 REM   COMMODARES PROBLEM #55-1 :
3 REM   SIG DIGS
4 REM   SOLUTION BY
5 REM   ROBERT CLARK
6 REM =====
7 INPUTN:FORE=15TO0STEP-1:V=2[UPARROW]E:
F=V<=N:N=N+V*F:U=U-F:S=S+(S=0)*F*(E+1):N
EXT:PRINTU,S-U,S

```

In fact many readers took a similar approach, although not as concise as Robert's program. This program works for most integers, but not all. The problem is with the value 2 raised to the 15th power. The number 55201 has the binary representation

1101 0111 1010 0001

for which the program should respond with 9 1's, 7 significant 0's, and 16 significant digits in all. Unfortunately most solutions submitted (including Robert's above) gave 8 1's and 8 significant 0's. Two raised to the 15th power is 32768.0001 in Commodore BASIC, and that extra ten-thousandth causes trouble.

This program from Jan Sorensen (Brockville, ONT) uses the INT function and gives the right answer for all integers:

```

1 REM =====
2 REM   COMMODARES PROBLEM #55-1 :
3 REM   SIG DIGS
4 REM   SOLUTION BY
5 REM   JAN SORENSEN
6 REM ===== C-128 ONLY =====
10 INPUT"INPUT INTEGER";N
20 A=INT(N/2): IF A=N/2 THEN X=X+1: ELSE
Y=Y+1
30 N=A: IF N>0 THEN 20
40 PRINT "1'S ="Y; "0'S ="X, "SIG DIGS ="
X+Y

```

C-64 users may modify this solution to eliminate the ELSE statement. You may change line 20 to this:

```

20 A=INT(N/2): Y=Y+1: IF A=N/2 THEN X=X+
1: Y=Y-1

```

These statements assume that Y (the number of 1's) will be incremented. If X should have been incremented instead, then Y must also be decremented. Notice that Jan's solution does not use the exponentiation function. In general, avoid that function whenever possible. Exponentiation is slow and prone to round off errors that are sometimes significant. Be careful when you use it.

Thanks to Joshua Tempkin (Roanoke, VA) for his analysis of this problem. Joshua's solution below uses exponentiation, but the INT function takes care of its inaccuracy.

```

1 REM =====
2 REM   COMMODARES PROBLEM #55-1 :
3 REM   SIG DIGS
4 REM   SOLUTION BY
5 REM   JOSHUA TEMPKIN
6 REM =====
10 INPUT"ENTER INTEGER FROM 0 - 536870911";NM: IF NM<0 OR NM>536870911 THEN 10
20 X=NM: S=0: N0=0: N1=0: I=29
30 DO UNTIL I=0
40 I=I-1: K=INT(2[UPARROW]I): IF X>=K THEN N1=N1+1: S=1: X=X-K: ELSE N0=N0+1: IF S=0 THEN N0=N0-1
50 LOOP
60 NT=N0+N1: PRINT"NUMBER OF 1'S, SIG 0'S, SIG DIGS:": PRINT N1,N0,NT

```

Notice that Joshua's solution allow integers up to 536,870,911 (2<sup>29</sup>) since numbers that large are stored exactly in the computer.

You may modify this program to display the binary representation of the given number. In line 40 add PRINT "I"; before the ELSE statement and add PRINT "0"; before the second IF. Also add PRINT: at the start of line 60. C-64 users must rewrite the program to eliminate the DO UNTIL, LOOP, and ELSE statements.

Problem #55-2: *Rapid Randomizer* was submitted by Justin Smalley (Boulder, CO). The problem was to add line 30 to a program which rearranges a given 100-element ar-

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ray in random order, as quickly as possible.

This solution from Jim Borden (Carlisle, PA) is almost the fastest.

```

1 REM =====
2 REM   COMMODARES PROBLEM #55-2 :
3 REM   RAPID RANDOMIZER
4 REM   SOLUTION BY
5 REM   JIM BORDEN
6 REM =====
10 N=100: DIM X(N): FOR I=1 TO N: X(I)=I
: NEXT
20 T0=TI
30 FORX=1TON: I=RND(1)*N+1: T=X(X): X(X)=X(
I): X(I)=T: NEXT
40 PRINT TI-T0"JIFFIES"
50 FOR I=1 TO N: PRINT X(I);: NEXT

```

Jim's solution runs in 89 jiffies on my C-128 in FAST mode. Jim's program works by taking the elements of the array one at a time and swapping each one with a randomly selected element. After the 100th element has been swapped, the array should be in reasonably random order.

Looking at Jim's program, you might be hard pressed to make it any faster. In fact Doug Ropp (Phoenix, AZ) used an interesting twist to knock off a few more jiffies. His program listed here runs in 81 jiffies on my machine.

```

1 REM =====
2 REM   COMMODARES PROBLEM #55-2 :
3 REM   RAPID RANDOMIZER
4 REM   SOLUTION BY
5 REM   DOUG ROPP
6 REM =====
10 N=100: DIM X(N): FOR I=1 TO N: X(I)=I
: NEXT
20 T0=TI
30 X(0)=X(N): FOR I=0TON-1: N=RND(N)*I: J=X(
I): X(I)=X(N): X(N)=J: NEXT: N=I: X(N)=X(0)
40 PRINT TI-T0"JIFFIES"
50 FOR I=1 TO N: PRINT X(I);: NEXT

```

Doug (and many other readers) used periods instead of the 0's in line 30. I replaced them with 0's and found no speed difference in this application, so I left them. I really dislike seeing RND(.) instead of RND(0). Yes, I know that Commodore BASIC accepts it, and it does shave fractions of jiffies from certain applications. But in my opinion it is an obscure, non-standard, and just plain *cheap* programming practice.

So what did Doug do to gain the speed? He first moved X(100) to X(0). Now the range of random numbers needed is from 0 to 99 instead of 1 to 100. Consequently Doug's program does not need to add 1 to the calculated random number each time. Once the randomization is done, Doug's program restores N (in case this routine will be used again within another program), and it moves X(0) back up to X(100). Very clever indeed.

Now for *Problem #55-3: Unjumbled Words*, suggested

by Eddie Byrd (Ste. Genevieve, MO). Eddie wanted to see every permutation of the letters of any given 5- or 6-letter word. I hinted that anyone with a good set of back issues of *Ahoy!* should be able to solve this one.

Wallace Leeker (Lemay, MO) dug through his collection and pulled out the April 1986 issue in which we discussed an algorithm used by Allan Flippin (San Jose, CA) to solve *Problem #24-1: Printing Permutations*. Wallace gives credit to Allan in his solution to this problem:

```

1 REM =====
2 REM   COMMODARES PROBLEM #55-3 :
3 REM   UNJUMBLED WORDS
4 REM   SOLUTION BY
5 REM   WALLACE LEEKER
6 REM   (BASED ON A SOLUTION TO
7 REM   PROBLEM #24-1 BY ALLAN FLIPPIN)
8 REM =====
100 INPUT S$: N=LEN(S$): DIM C(N-1)
110 I=N-1: PRINT S$,
120 S$=LEFT$(S$,I-1)+RIGHT$(S$,N-I)+MID$
(S$,I,1)
130 C(I)=C(I)+1: IF C(I)<=N-I GOTO 110
140 C(I)=0: IF I>1 THEN I=I-1: GOTO 120

```

Wallace modified Allan's solution so that it could handle letters instead of the numbers in the original problem. This is a very quick program. It handles words of any length.

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It is much better than the more traditional solutions to this problem which use loops within loops to pick all the permutations.

The program is deceptively simple. You should "play computer" to see just how it steps through the character positions to build every possible string from the given string. Those jumbled word puzzles just won't be the same with this program available. Wallace suggests tying the output of this program into a spell-checker. That way only "real" words would be displayed. (Aren't back issues wonderful?)

The final challenge this month is *Problem #55-4: Polar Graphics* from Thomson Fung (San Diego, CA). You'll love some of the impressive graphics this problem produces. The problem is to write a program which plots a graph of the equation

$$R = 10 * T * \cos(T) * \sin(T)$$

in polar coordinates. R is the distance of each point from the origin (0,0). T is the angle of a line from the origin to the given point.

All the solutions were for the C-128 or for the C-64 with Simons' BASIC or a comparable language with graphics capabilities. The solution requires the value of T to be incremented, the new value of R to be calculated from the formula, and then the Cartesian coordinates X and Y to be determined from R and T. The formulas for X and Y are very simple:

$$X = R * \cos(T)$$

$$Y = R * \sin(T)$$

Wallace Leeker sent four variations on his solution:

```

•1 REM =====
•2 REM   COMMODARES PROBLEM #55-4 :
•3 REM   POLAR GRAPHICS
•4 REM   SOLUTION BY
•5 REM   WALLACE LECKER
•6 REM =====
•10 GRAPHIC 1,1
•20 FOR T=0 TO 25.2 STEP .1
•30 R=10*T*COS(T)*SIN(T)
•40 X=INT(R*COS(T))+160
•50 Y=INT(R*SIN(T))+100
•60 DRAW 1,X,Y:NEXT T

```

This version plots individual dots at each (R,T) or (X,Y) position. The added 160 and 100 in lines 40 and 50 shift the origin to the middle of the screen. The result is a "Spir-

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ograph" type of butterfly pattern.

In one of his variations on this solution, Wallace sent line 60 to

```
60 DRAW 1,X,Y TO 160,100 : NEXT T
```

This generates rays outward from the origin. Another variation used these lines:

```
60 DRAW 1,X,Y TO X2,Y2
70 X2=X: Y2=Y: NEXT T
```

This solution produces smoother, curved lines. You should have fun trying other variations.

This solution from Jim Borden lets you specify the range and step size of T:

```

•1 REM =====
•2 REM   COMMODARES PROBLEM #55-4 :
•3 REM   POLAR GRAPHICS
•4 REM   SOLUTION BY
•5 REM   JIM BORDEN
•6 REM =====
•10 INPUT "START ANGLE, END ANGLE (RADS),
STEP";SA,EA,SP
•20 GRAPHIC 1,1: FOR T=SA TO EA STEP SP:
R=10*T*COS(T)*SIN(T)
•30 X=INT(R*COS(T))+160: Y=INT(R*SIN(T))+100: DRAW 1,X+160,
Y+100
•40 NEXT: GETKEY A$: GRAPHIC CLR: IF A$<>
"Q" GOTO 10

```

Use 0, 25.2, and .1 to get the same results as Wallace's program. Change the formula for R to get other types of patterns. Notice that pressing any key except "Q" will restart Jim's program.

C-64 users must implement a routine to plot the X and Y values given in the DRAW statements of these programs. Once again, back issues may come to your rescue. *Rupert Reports* in the June and July 1985 issues of *Ahoy!* provide usable pixel plotting routines.

That's it for this month. Keep those problems and solutions coming. Have fun with this month's challenges. □

The following readers not already mentioned sent valid solutions this month:

Ed Balow (Calumet City, IL)  
Miguel Borges (St. John's, Newfoundland)  
John Desclin (Brussels, Belgium)  
George Gaudette (Lakeland, FL)  
Keith Kushner (Brooklyn, NY)  
H.G. Langston (Kissimmee, FL)  
E. Lindsey  
William Pfister (Camden, NY)  
Norman Richards (Angleton, TX)  
Larry Shafer (Westphalia, MI)  
David Shobe (Lawrence, KS)  
Richard van Frank (Montclair, NJ)  
Rob Woods (Sherwood, OR)



# FLOTSAM

Continued from page 23

This is being written to you from the other side of the earth. Kangaroo Island is 70 miles south of Adelaide in South Australia. The island is quite large—160 miles long by 60 miles wide, supporting about 4000 people.

I would like to thank you for a fine computer magazine. I have been a regular reader for the past 18 months and find that your programs are good.

I have two C-64s and two 1541s, one fitted with a Flash and one without. I have found the C-64 to be the most economical of all computers (though very slow, except when using the Flash). The C-128D is the most versatile I've used, though its 64 mode does not load the 100% of C-64 programs that we are led to believe. The CP/M mode is its most interesting aspect—it is unique in that it recognizes six other disk formats and shows the disk name and identification on the screen, and I've been able to copy public domain software from these other disks.

Your article in the March 1988 *Ahoy!* (we get our issues about two months late) on surge suppression was most interesting. Surge suppression arrived in South Australia this year in the form of a four-outlet power board which takes care of small surges in the power circuit, whether caused by the power supply or by light electrical equipment. However, major surges (or spikes) caused by refrigerators, air conditioners, pressure pumps, and the like override the power board, causing the computer to reset. The only thing I've found to control this type of surge is my printer (an

Epson GX80 Commodore-compatible); when it's powered up, it absorbs the surge, protecting the computer and the program I'm working on.

—Bill Jordan  
Penneshaw K.I., South Australia

*Here's a good one for Commodores (if not for Ripley's Believe It Or Not): what are the odds against our receiving two letters in two consecutive months from Kangaroo Island, South Australia? That's just what happened—with Murray Hansen's letter printed last month, followed by the above. Any more Kangaroo Islanders out there who'd like to make it three in a row?*

I recently cancelled my subscription to another computer magazine because they stopped publishing type-in programs. I own a C-64 and enjoy typing in your programs. Please keep *Ahoy!* the way it is, except for returning it to a 12 issue per year schedule.

—J. Revis  
Bark River, MD

*No one would like to see Ahoy! return to monthly publication more than we. However, no such change is likely in the near future. Still, you should find some consolation in knowing that publishing fewer issues enables us to publish better issues. With 8 magazines to fill yearly instead of 12, we're able to include only the best of the best of the programs and articles we receive. Also, the extra time allows us to fine-tune each magazine to an extent that would not otherwise be possible.*



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**AHOY! 31**





# Adrift in a Sea of Floating Point Numbers

The Computer's Internal Mathematical Structure



# RUPERT REPORT

**T**he largest value your computer allows is the rather unusual number  $1.70141183E+38$ . The smallest positive number that is distinguishable from 0 in the computer is  $2.93873588E-39$ . How did the designers of the computer come up with these strange values?

We have discussed how integers are stored in the computer, but what about decimal fractions and numbers written in scientific notation? Why does the computer say that the square root of 36 does not equal 6 even though it displays both values as "6" on the screen?

To answer these questions and many more, we will dip into the complicated and confusing world of floating point numbers. When we are done, you will be able to better appreciate one of the most important and complex parts of the BASIC language.

Just to see that there is more to numbers in the computer than meets the eye, type these statements in direct mode:

```
A=6: B=SQR(36): PRINT A,B: IF A<>B THEN  
PRINT "A AND B ARE NOT EQUAL"
```

The computer shows "6" for the values of A and B, but it also concludes that A and B are not equal. If we look into the way that A and B are stored, this is what we see:

```
A: 131 64 0 0 0  
B: 131 64 0 0 1
```

Clearly A and B are different inside the computer. But how do we interpret this strange format where the simple number "6" is stored in five bytes as "131 64 0 0 0"?

## STRANGE FORMAT

All numbers assigned to numeric (non-integer) variables in BASIC are stored in a floating point format which might be described as "4-byte normalized mantissa with two's complement most significant bit and 1-byte excess-128 exponent." If that rather scary-sounding bunch of terminology bothers you, a simplified example of floating point number storage will show that there is nothing to worry about.

Start with a number written in standard scientific notation:  $4 \times 10^3$ . This quantity may be expressed in BASIC as 4E3, 0.4E4, 40E2, or in various other ways, all equivalent to the number 4000. "E" stands for the words "times ten raised to the power." One way to interpreting "E" is to think "move the decimal point over this many places." To evaluate 0.4E4 for example, write 0.4 as 0.40000 (use as many 0s as you want), then move the decimal point four places to the right, giving 4000.0.

The number following the "E" is called the "exponent" and the number preceding the "E" is called the "mantissa." The number 10 is called the "base."

Every real number can be expressed as a *mantissa* times a *base* raised to an *exponent*.

It is convenient to adjust or "normalize" the mantissa to

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be a decimal fraction greater than or equal to 0.1 and less than 1.0. The exponent can then be adjusted to compensate. For example, 4000 written in normalized form is 0.4E4 since the mantissa is between 0.1 and 1. Other forms such as 40E2, 400E1, and 4000E0 all have the same value, but they are unnormalized.

Here are some other values and their normalized floating point representation:

123 = 0.123E3	54.321 = 0.54321E2
0.5 = 0.5E0	6 = 0.6E1
0.05 = 0.5E-1	0.00064 = 0.64E-3

Notice that the last two examples have negative exponents. A negative exponent is interpreted as "move the decimal point to the left by this many places." Thus 0.64E-3 can be written 0.00064E-3 (add as many 0s as desired), and then "E-3" says to move the decimal point 3 places to the left, giving 0.00064.

Now we have seen that there is nothing very mystifying about the concepts of mantissa, base, exponent, and normalization. Is there any number that can't be written in this floating point format? If the exponent can be a number of any size, the answer is "No, any number can be written in floating point format."

Negative numbers are written with a negative mantissa. Don't confuse a negative mantissa (meaning "the number is less than 0") with a negative exponent (meaning "move the decimal point left").

The power of floating point representation is that a very wide range of values can be stored in a limited amount of space. Compare the number 1,000,000,000 with its normalized floating point equivalent of 0.1E6. Square that number to get 1,000,000,000,000 which can be expressed as a compact 0.1E12. Cube that result to get 1 followed by 36 zeros which can be shown tidily as 0.1E36.

For small numbers very close to zero, there is a similar storage advantage. The distance between circuit lines in the microcircuits of some computers is 2 microns (or less). This is 2 millionths of a meter written as 0.000 002 meter. In normalized floating point representation, this is a compact 0.2E-5.

Floating point notation is more powerful than "fixed point" notation. In fixed point notation, only a certain number of digits are allowed to the right of the decimal point. If that number is 2, for example, the quantity 123.2345 is stored as 123.23. Any digits beyond the second decimal digit are rounded off or truncated.

The disadvantage of fixed point storage is that the smallest positive number which can be represented is 0.01 (for 2-place fixed point format). Any smaller number such as 0.0032 becomes just 0.00. Floating point notation might limit the number of decimal digits to 2 also, but it is still able to represent very small values: 0.0032 could be stored as 0.32E-2.

## BINARY REALM

We all know that computers store their information as binary numbers, using only 0s and 1s. Binary is another name for the "base 2" number system. It might be expected

then that floating point storage in the computer uses a base of 2 rather than the base of 10 in the previous examples. In fact, that is true. Numbers are stored in the computer in normalized, base-2 format.

Probably most readers are already familiar with binary integers: 1101 in base 2 (written 1101<sub>2</sub>) equals 13 in base 10, 111111<sub>2</sub> = 255<sub>10</sub>, and so forth. Each digit corresponds to a certain power of 2 in the binary number system just as each digit corresponds to a power of 10 (its "place value") in a decimal number.

Just as we may think of the decimal number as "1 in the 1000's place + 5 in the 100's place + 0 in the 10's place + 4 in the 1's place," the binary number 1101 stands for "1 in the 8's place + 1 in the 4's place + 0 in the 2's place + 1 in the 1's place." Calculating (1\*8 + 1\*4 + 0\*2 + 1\*1) gives the decimal equivalent 13.

So much for whole numbers. What about fractions? How is the decimal fraction 0.5 represented as a binary number? Very simply, 0.5 in decimal = 0.1 in binary. Again it all depends upon place values. The first digit to the right of the decimal point in base ten represents tenths, the second digit represents hundredths, and so forth. In the binary system, the first digit to the right of the "binary point" (or "radix point" — the more general term) represents halves, the next digit is 4ths, the next is 8ths, then 16ths, and so on.

The binary fraction 0.1101 may be interpreted this way:

$$\begin{aligned} 0.1101_2 &= 1*(\frac{1}{2}) + 1*(\frac{1}{4}) + 0*(\frac{1}{8}) + 1*(\frac{1}{16}) \\ &= 0.5 + 0.25 + 0 + 0.0625 \\ &= 0.8125 \text{ in decimal} \end{aligned}$$

There is another way to convert a binary fraction into its decimal equivalent. Just as we might read the decimal fraction 0.058 as "58 thousandths", we could interpret the binary fraction 0.1101 as "13 sixteenths" since 1101<sub>2</sub> is 13 and the furthest digit to the right in 0.1101 is in the 16ths place. If we convert 13/16 into a decimal by dividing, we get the previous result 0.8125.

## TAKE A BYTE

Not only is the computer binary-oriented, it is byte-oriented, where a byte is a group of 8 binary digits. Binary fractions in the computer are most easily handled in byte format. Consider the binary fraction 0.11010001. Again we could convert it to decimal bit by bit:

$$\begin{aligned} 0.11010001_2 &= 1*(\frac{1}{2}) + 1*(\frac{1}{4}) + 0*(\frac{1}{8}) + 1*(\frac{1}{16}) + \\ &0*(\frac{1}{32}) + 0*(\frac{1}{64}) + 0*(\frac{1}{128}) + 1*(\frac{1}{256}) \\ &= 0.81640625 \end{aligned}$$

Using the other method, take the binary integer 11010001 which is 209 in decimal. Divide it by 256 (since the bit furthest to the right in the original binary fraction is in the 256th's place) giving 209/256 or 0.81640625, just as above:

$$0.11010001_2 = 11010001_2 / 256 = 209/256 = 0.81640625$$

209 comes from the fact that the left-most bit in the byte is 128, so 11010001<sub>2</sub> equals 1\*128 + 1\*64 + 0\*32 + 1\*16 + 0\*8 + 0\*4 + 0\*2 + 1\*1 which is 209.



## CONVERTING A FLOATING-POINT NUMBER INTO ITS INTERNALLY STORED FORMAT

Consider 10.234. Here is how to calculate the floating-point representation of this value.

1. Divide by 2 repeatedly until the quotient is between 0.1 and 1:

$$\begin{aligned} 10.234 / 2 &= 5.117 \\ 5.117 / 2 &= 2.5585 \\ 2.5585 / 2 &= 1.27925 \\ 1.27925 / 2 &= 0.639625 \end{aligned}$$

Since this took 4 divisions, our exponent will be 4. Convert the exponent to excess-128 format:

$$\text{Exponent} = 4 + 128 = 132$$

2. Multiply the last quotient by 256:

$$0.639625 * 256 = 163.744$$

Take the integer part of this number (163) as the MSB of the mantissa. But first subtract 128 from it (since it is greater than or equal to 128 and since our original number 10.234 is positive):

$$\text{Mantissa MSB} = 163 - 128 = 35$$

3. Take the fractional part of the previous product (0.744) and multiply by 256:

$$0.744 * 256 = 190.464$$

The next MSB of the mantissa is the integer part of this result:

$$\text{Mantissa byte 2} = 190$$

4. Repeat Step 3 two more times to get the last two bytes of the mantissa:

$$0.464 * 256 = 118.784$$

$$\text{Mantissa byte 3} = 118$$

$$0.784 * 256 = 200.704$$

Round this final value to the nearest integer (201) to get the least significant byte of the mantissa:

$$\text{Mantissa LSB} = 201$$

5. The number 10.234 will be stored in the computer as

$$132 \ 35 \ 190 \ 118 \ 201$$

You can verify this result with the program *Floating Point Converter*.

We need one more example before we see how all of this is related to floating point storage in BASIC. We saw that normalizing a decimal fraction meant moving the decimal point so that it was just to the left of the most significant digit of the mantissa. This movement was compensated by changing the size of the exponent. An analogous process is used to normalize a binary fraction.

Consider the decimal number 209. Here is how it could be represented as a normalized, binary floating point value:

1) Write 209 as a binary number times a power of 2:

$$\begin{aligned} 209 &= 11010001_2 * 2^{\uparrow 8} \text{ (since } 2^{\uparrow 8} \text{ is 1)} \\ &= 11010001.E0 \text{ (now E stands for " * 2^{\uparrow 8} ")} \end{aligned}$$

2) Move the radix point to the left of the left-most non-zero bit (move it 8 places to the left):

$$.11010001$$

3) Compensate for that move by increasing the exponent by 8:

$$.11010001E8$$

To check our results, take the binary fraction 0.11010001 and multiply it by  $2^{\uparrow 8}$ . We saw earlier that 0.11010001 is 0.81640625 and we know that  $2^{\uparrow 8}$  is 256. Sure enough,  $0.81640625 * 256 = 209$ . Alternately 0.11010001 is  $209/256$ , and  $209/256 * 256$  is 209. We lost nothing in translation.

## INTO THE DEPTHS

If you have made it this far, the worst is behind. With an understanding of binary fractions and normalization, we can now look at numbers stored in floating point form in the computer.

We will discuss the program *Floating Point Converter* (see page 64). This program PEEKs at the data stored in a floating point variable so that we can see the computer's internal representation of any number. The program also allows you to put data values directly into memory and see how the computer interprets them as a floating point quantity.

The program looks into the memory location where the first variable defined in the program is stored. That memory location is found from the "start of variables pointer." This pointer is a 2-byte number stored at addresses 47 and 48 in the C-128 and at 45 and 46 in the C-64. Line 70 determines which computer is being used. Line 80 selects the proper value for the starting address of the pointer.

Line 90 converts the 2-byte pointer into a memory address using the standard formula:

$$\text{Address} = (\text{pointer's 1st byte}) + 256 * (\text{pointer's 2nd byte})$$

This address is where the first variable of the program resides. Each variable is allocated 7 bytes of memory. The storage format for floating point variables looks like the chart at the top of the next column.

Each variable may have a 2 character name (only the first 2 characters are significant anyway). These characters are stored in Name1 and Name2. If the variable has a single



character name, that character is stored in Name1 and 0 is stored in Name2.

Byte	Contents	Byte	Contents
1	Name1	5	Mant2
2	Name2	6	Mant3
3	Exponent	7	Mant4
4	Mant1		

The remaining 5 bytes are the exponent and mantissa of the variable's floating point value. Each byte may have a value from 0 to 255. The exponent is stored as an "excess 128" value which means very simply that 128 has been added to the actual value. The smallest exponent which can be represented here is -128 which is stored as the quantity 0. The largest exponent allowed is +127 which is stored as 255. Remember that these exponents are powers of 2.

The mantissa is normalized and stored as four bytes. There is just one more complication, however. Since the mantissa has been normalized (the radix point is shifted so it is just to the left of the left-most, non-zero bit), we know that the left-most bit is always a 1.

Here's where some *incredible* reasoning comes into play. Read carefully. We know that the exponent has been adjusted so that the left-most bit of the mantissa is always a 1, and therefore, (are you ready for this?) we don't actually need to store a 1 there in the left-most bit of the mantissa. In fact, that bit is used to indicate whether the mantissa is positive or negative.

If the mantissa is negative, a 1 is stored in the left-most bit. If the mantissa is positive, a 0 is stored in the left-most bit. Regardless of what is stored in the left-most bit, we know (at least the computer knows) the value of that bit is always a 1. By seeing what is actually stored for that bit, we also know the sign of the mantissa. Pretty neat, eh?

## BACK TO THE PROGRAM

We now know how data is stored in floating point variables. Let's see how the program *Floating Point Converter* reads and displays the data. The exponent and 4 mantissa bytes for the variable X0 are at addresses S1 and S2 through S5. Line 260 PEEKs at those addresses (in BANK 1 for the C-128) to see the values stored there. The 5 bytes are stored in V1 through V5.

The routine at line 1010 prints those 5 bytes and interprets them. The exponent is calculated from V1 by subtracting the "excess 128" in line 1030. The mantissa is calculated from the other 4 bytes in line 1040. V2 stores the left-most byte of the mantissa. Remember that its left-most bit should always be 1. The statement (128 OR V2) sets the bit to 1 regardless of its actual value.

We have already seen that the first mantissa byte may be thought of as a number of 256ths. The second mantissa byte is in the  $(1/256)^2$  position. Similarly the third and fourth mantissa bytes represent the number of  $(1/256)^3$ s and  $(1/256)^4$ s.

Line 1040 shows an efficient way to calculating the actual value of the mantissa. The least significant byte V5 is first divided by 256. The next least significant byte V4 is added, and the quantity is again divided by 256. Now V5

is effectively been divided by  $256^2$ . Next V3 is added and the quantity is divided once more by 256. Finally the corrected most-significant mantissa byte V2 is added and the quantity is divided by 256.

You may do some algebraic tinkering to convince yourself that MN in line 1040 now stores the value:

$$\frac{V2}{256} + \frac{V3}{256^2} + \frac{V4}{256^3} + \frac{V5}{256^4}$$

This is analogous to our earlier example in binary where  $0.1101_2$  was converted to decimal by dividing each digit by its place value:

$$\frac{1}{2} + \frac{1}{4} + \frac{0}{8} + \frac{1}{16} = \frac{1}{2} + \frac{1}{2^2} + \frac{0}{2^3} + \frac{1}{2^4}$$

Line 1050 determines the sign SN of the mantissa by checking the value of the most significant byte (MSB). The MSB of V2 is greater than or equal to 128 only if its most significant bit equals 1. Thus all negative mantissas have a value of V2 greater than or equal to 128, and all positive mantissas have V2 less than 128.

Line 1060 displays the calculated sign, mantissa, and exponent and then shows the actual value of the variable X0. The program does not actually perform the calculation of  $SN * MN * 2^E$  because multiplication and exponentiation round off errors limit the accuracy of the results. You may add the statements to display the results of that calculation

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If you press X at the prompt, the program switches to the value entry mode. In this mode, you may specify the 5 bytes to be stored for the variable X0. The same routine at line 1010 then converts those values to exponent/mantissa format. You will see that slightly changing the 5th byte (V5) may not change the displayed value of X0. Several different internal values are all displayed the same way on the screen.

For example, let's see how SQR(36) differs from 6. Line 20 in the program defines X0 to be the square root of 36. If you just press the RETURN key the first time you run the program, X0 retains that value. The bytes stored for SQR(36) are shown to be:

131 64 0 0 1

Now enter 6 at the prompt and see that the number 6 is stored as:

131 64 0 0 0

A difference of 1 in the least significant byte is not significant for the screen display. When the computer compares 6 with SQR(36), however, the difference is significant.

Now press X to switch modes. Enter values 131, 64, 0, 0, 2. This quantity is displayed on the screen as 6.00000001. Experiment with other values and see how sensitive the displayed value is to changes in the internal values.

To wrap it all up, let's analyze the results of X0 equal to SQR(36) just to make sure you understand what is being shown by this program. Once again, the internal values for SQR(36) are 131, 64, 0, 0, 1. The exponent is 131 minus

128 which is 3. The MSB of the mantissa is 64 which is 0100 0000 in binary. Remember that the left-most bit of this byte is *assumed* to be 1. The fact that it is actually 0 means that we have a positive mantissa.

Change the left-most bit of this byte to 1 giving 1100 0000 which is 192 in decimal. Now calculate the mantissa using the displayed values from right to left:

$$\text{mantissa} = (((1/256 + 0)/256 + 0)/256 + 192)/256$$

or

$$\begin{aligned}\text{mantissa} &= 1/256^4 + 192/256 \\ &= 1/4294967296 + 192/256 \\ &= 0.750\ 000\ 000\ 233\end{aligned}$$

Next multiply this mantissa by 2 raised to the 3rd power:

$$\begin{aligned}\text{result} &= 0.750\ 000\ 000\ 233 * 2^3 \\ &= 6.000\ 000\ 001\ 86 \\ &= 6 \text{ (rounded to 9 significant figures)}\end{aligned}$$

Hopefully by experimenting with other numbers, you will better understand and more fully appreciate the internal mathematical structure of BASIC. Enter these values into the program to see why 1.70141183E38 is the largest allowed value, and 2.93873588E-39 is the smallest. The next time someone tells you that computers never make mistakes, show them our first example and explain why the computer thinks the square root of 36 does not equal 6. Computers can certainly *appear* to make mistakes if we don't recognize their limitations and don't understand their internal operations. □

SEE PROGRAM LISTING ON PAGE 64

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# REVIEWS

## METROCROSS

Epyx

Commodore 64

Disk; \$24.95

This jaunty 1985 Namco design features an imaginative obstacle course beneath an unnamed city. It's a race against time that should challenge even arcade aces.

The joystick or keyboard controls a commuter, depicted in modified side perspective. The animated cartoon figure leaps barriers, slides on the green slime tiles, and vaults over the rolling red cans as seconds tick away on the counter located below the active play-field.

If the commuter reaches the goal-posts at the end of the horizontally scrolling subway tunnel before time



*Metrocross features an imaginative obstacle course under an unnamed city.*

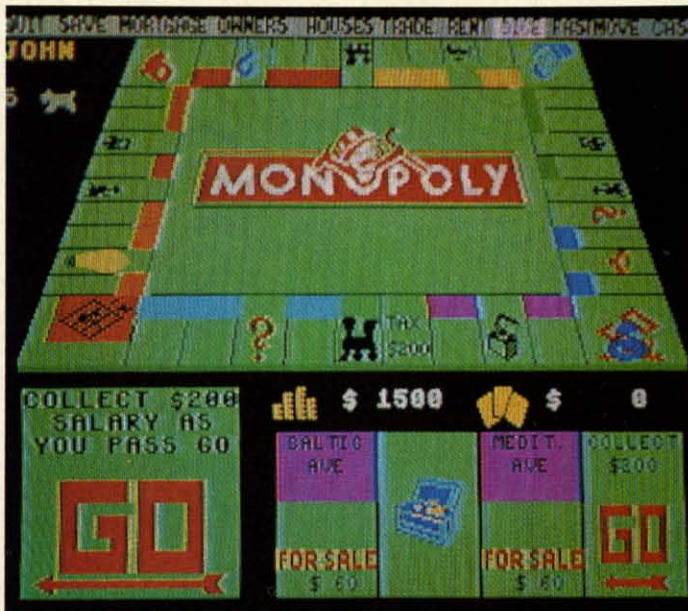
elapses, the player advances to the next one. A cute sequence in which the character huffs and puffs after successfully completing a level also allows the computerist to get ready for the next, even more difficult round.

The commuter gets help from several sources in the frantic footrace against the clock. Skateboards are a superior form of transportation, and the springboards offer the character a quick trip through the air.

Kicking a blue can earn a bonus score, but stomping one is an even better strategy. It temporarily stops the clock and gives the player two precious additional seconds.

Jumping on a green can has the same time-delaying effect, but kicking one increases the commuter's speed for five

*Computer Monopoly is played just like the original, with the advantages of onscreen prompts to guide players through the game, and the computer's help in making money and real estate transactions.*



seconds. Sometimes, faster movement is worth more than the extra seconds.

The logic of the situation is paper thin, but *Metrocross* is so much fun that most joystick jockeys won't care. The documentation doesn't really attempt to provide a rationale for all the cans and skateboards and surplus track and field hurdles. It's just as well. *Metrocross*, the first title in Epyx's new U.S. Gold line, is best enjoyed with a light heart and an empty mind.

The biggest objection, however, concerns the failure to adjust the game for the U.S. market. The only thing more frustrating than a "high score" screen which doesn't retain the computerist's

best performances between sessions is a vanity board which permanently saves only the miscellaneous names and scores which the programmers coded into the product before purchase. I make no promises of good behavior if I run into "Brian" who is credited with a score of 100,000 on my disk.

Fine-tuning the increase in difficulty between levels is another change which would make *Metrocross* better for the home gaming audience. Adults may find it hard to make progress in this demanding action contest.

Those who can cope with the physical requirements are in for a treat. *Metrocross* will give your joystick or key-

*Clubhouse Sports simulates six arcade amusements from the pre-video-game era. The games attempt to reproduce what the gamer would see if he were actually playing these contests.*





board fingers a terrific workout.

Epyx, 600 Galveston Dr., P.O. Box 8020, Redwood City, CA 94063 (phone: 415-366-0606).

—Arnie Katz

Circle #179 on Reader Service Card

## MONOPOLY

**Leisure Genius  
Commodore 64  
Disk; \$29.95**

America's most enduringly popular board game is *Monopoly*. It has literally enthralled the world since Parker Brothers purchased the rights in 1935. The board game is currently published in 29 countries and translated into 22 foreign languages. There's hardly a family that doesn't own a set; there are hardly any of us who don't fondly recall marathon playing sessions around the kitchen table.

Leisure Genius' computer edition of *Monopoly* recalls those family games with the same warmth of heart, then adds its own brand of ruthless gusto that would do everyone's Brother Ed proud. If you think the *Monopoly* players at your family gatherings were tough, just wait until you play against the computer!

Computer *Monopoly* is played exactly like the boardgame; there are no sacrifices or abridgements of the standard rules. Two to eight players can participate, and these can be all human, all computer, or any combination of humans and computer opponents. Regardless of the mix of players, the bank always takes over the money-changing details, including monitoring all property transactions.

Onscreen prompts guide the user through the game. After a handsome title screen and a view of the standard *Monopoly* board, the computerist enters the number and name of each player in the game, whether or not each position is managed by the computer, and then selects the playing tokens. These are the old familiar icons: flat-iron, dog, motor car, thimble, shoe, hat, wheelbarrow, and cowboy.

Next the computerist either chooses to play the standard, full-length game, or sets a time limit for a shortened version.

Gamers control play with joystick, cursor keys, or keyboard. An option bar runs across the top of the screen, and by highlighting these commands,

the gamer can quit, save the game, mortgage property, see what property is owned by each player, buy houses, collect rent, throw the dice, or show how much cash each player has. The final selection is Fastmove; use of this option speeds up each person's playing time.

Play is logical, and semi-automatic. Positions played by the computer are handled very speedily, almost too quickly for a human monitor to keep up. When a human competitor is on deck, action only proceeds when the player hits the RETURN key.

The name of the current player is displayed to the left of the full-sized board with a picture of the applicable token. The player moves the cursor along the option bar at the top of the screen to highlight Dice. This activates two nicely articulated dice, shown tumbling in the lower lefthand corner.

After the dice roll, the player's token scoots the proper number of spaces along the board before coming to rest in its new location. The four pieces of property surrounding the player's position are depicted full sized in the lower right corner, each with a banner across its face indicating if it's still for sale, sold, mortgaged, or has houses or hotels.

An onscreen prompt inquires if the player wants to buy the property, if it's available. If so, the computer automatically makes the sale, and takes care of the money and accounting chores. If the property belongs to one of the others, the onscreen prompt tells how much rent is owed and to whom, then deducts that amount of money from the player's stash. The amount of cash available for use and the property that player owns are also shown onscreen for instant reference.

Before the player surrenders the dice, he or she can offer trades, make loans, or develop property. When the player finishes the turn, highlighting Dice and pressing RETURN starts the next player's turn.

The graphics are extremely attractive, and help protect the old-fashioned feeling of *Monopoly*. The board, depicted in two-thirds perspective, is true to its origins. When each player's token comes to life and slides around the board, the trip is enhanced by pleasant sound effects, like the policeman's

whistle, bells that chime when you pass Go, and locomotive sounds for each of the four railroads.

In fact, the only real flaw with the computer edition of *Monopoly* is that it doesn't come packed with live people, instead of its computer robot players. The computer plays a hard-hearted game, adhering strictly to the rules. Until you play a computerized game, you probably won't realize just how much of the fun of *Monopoly* comes from the family or group of friends. The game loses something if Little Sister isn't there wheedling her way into an overly generous loan from the bank, or if Cousin Earl isn't making an under-the-table arrangement with Uncle Buck to take over the world. Without the family fun, it's a cold game—and also a fairly quick one. If one human plays against several computerized opponents, the game races along at a breakneck speed, going through all of its phases with no human input, so that it's practically impossible to keep up with the action.

*Monopoly* is a wonderful game, and this computerized edition is a true and faithful rendition. No one who loves the game should be without this, since it provides a good way to get up a game, even when the kitchen is empty of family and friends. But, when the house fills up with familiar faces, the game should be moved back to the tabletop, for that's still the place where it's the most fun for everyone.

Leisure Genius/Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171).

—Joyce Worley

Circle #178 on Reader Service Card

## CLUBHOUSE SPORTS

**Mindscape  
Commodore 64  
Disk; \$29.95**

Nobody gives computer game players value for their dollar like Ed Ringler. In 1987, Ed's DesignStar Consultants brought us the groundbreaking *Superstar Indoor Sports*, with its quartet of Air Hockey, Darts, Bowling, and Ping Pong simulations. Any of these smartly executed games might have been released on its own without a murmur of discontent from consumers, but DesignStar and Mindscape nobly opted to package the four into one of the most successful omnibus en-



# Ahoy! DISK

Why type in the listings in this month's *Ahoy!* when we've done it for you? All the programs in this issue are available on the current *Ahoy! Disk* for \$8.95. Isn't your time worth more than that?

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*Like some previous Datasoft titles, Cosmic Relief mixes action with elements from role-playing adventures to form a new kind of entertainment that requires mental as well as physical dexterity.*



*Stocker's overhead view is like a blast from video/computer gaming's past.*

tainment products ever.

This year's model is called *Clubhouse Sports* and includes an amazing six simulations of classic arcade amusements from the pre-videogame era: Pinball, Billiards, Skee-ball, Shooting Gallery, Crazy Pool, and Foosball. Up to four players can compete in any or all of the contests, with top scores stored to memory on each game's vanity board.

As with *Indoor Sports*, the games of *Clubhouse Sports* share a visual orientation that attempts to reproduce what the gamer would see if he were actually playing these contests. Unfortunately, some of these games are not optimized by this viewpoint.

In Pinball the novelty of seeing the table from a true player's perspective does have appeal. It allows the user to realistically integrate tilting into the gameplay, for example. But before long the lack of an overhead view is sorely

missed. This presentation limits the amount of space available for table graphics, resulting in a much too simple board. There are only two bumpers, both at the top of the table, and just one pair of flippers, where a second set was clearly called for.

The visually compelling display is full of compromises. The ball does not in any way suggest a pinball. When seen from the farthest point, at the top of the table, it resembles a ping pong ball. By the time it reaches the flipper area it has swollen to baseball size, giving the entire game an outsized, non-proportional look.

Continuity is a nice thing, and the conceit that we are in a computerized

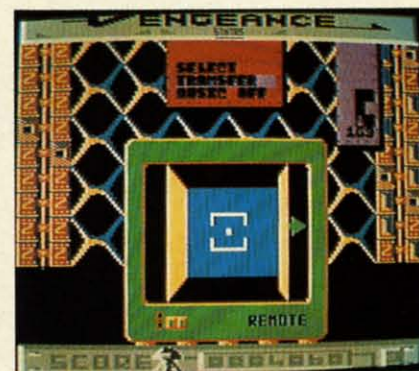
*In Pool of Radiance as in other games, you create characters, form them into a party, and send them into the world to encounter monsters, magic, and treasure, whereby they rise in level and power.*



clubhouse, playing all the games from the same perspective, is very endearing. But it simply does not make sense to hammer a square peg into a round hole. Pinball should have been one of this package's hottest entries. Instead it plays like a clever idea that didn't pan out as a satisfying game.

The player's-eye-view perspective does work on Foosball, however, making this the surprise pick of the litter. Foosball is a form of table soccer in which two gamers manipulate a series of rods containing plastic players to make up six-man teams.

*Clubhouse Sports'* computer version of this neglected classic simplifies the one play element that could cause difficulty: alternating control from rod to rod. The potential problem is nicely sidestepped by having the computer automatically activate the appropriate rod depending on the position of the ball.



*Alien Destruction Set is four action games with a shared sci-fi theme.*



# Pure-stat College Basketball

Authorities say that coaching ability makes the difference in college basketball: Can you coach a team to the final 4, or even the National Tournament? Now you can find out! From the authors of PURE-STAT BASEBALL comes PURE-STAT COLLEGE BASKETBALL.

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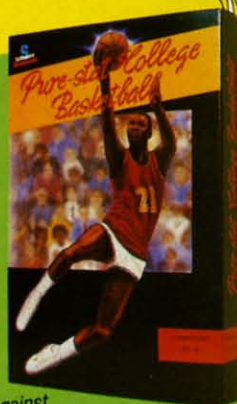
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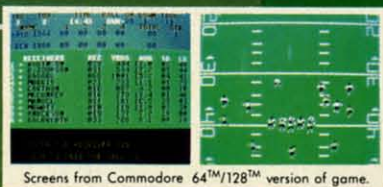
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Screens from Commodore 64™/128™ version of game.



Skee-ball is the next best of the six entries. This venerable variation on bowling lets the player roll a ball down an alley with an upward tilt at its far end. This lip acts as a launch pad for the rolling ball which must attain some loft in order to hit the target: a series of segmented concentric circles with point values that increase toward the center.

The user has full access to a detailed series of player options. In Skee-ball, the user can play solo, contest with a variably skilled computer opponent, play against the clock, or play with a preset number of balls. The ball is aimed with a cursor set to provide automatic resistance to the bullseye (the closer the cursor comes to center screen, the greater the force which pushes it away). This game works just fine, recreating the simplicity and fascination of this arcade favorite.

The shooting gallery, while no eyepopper, is a pleasant diversion. The user targets the pop-up ducks, bunnies, and bullseyes through a joystick-controlled crosshairs cursor and fires by

pressing the action button. There are four levels of depth to this target gallery, ranging from the turtles creeping slowly along the bottom foreground to the flying ducks and drop-targets in the background.

The two pool table games, Billiards and Crazy Pool, are minor disappointments. Again, the viewpoint takes much of the blame. In both games, the table is seen from a two-thirds perspective with the short sides at the top and bottom of the screen. This unyielding viewpoint forces the player to set up every shot from the same position, which is simply *not* the way such games are played. As with Pinball, an overhead view would have made a lot of sense here.

*Clubhouse Sports* is a great value, make no mistake, but this collection is inferior to *Indoor Sports*. Some of the games in this newer package look like leftovers—ideas that didn't make the first cut and so showed up here hoping to find strength in numbers. It is recommended, but don't set your expectations too high.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667).

—Bill Kunkel

Circle #173 on Reader Service Card

## COSMIC RELIEF: PROF. RENEGADE TO THE RESCUE

Datasoft

Commodore 64

Disk; \$24.95

*Cosmic Relief* is an action-adventure with the backdrops and characters from one of those world-spanning Victorian science fiction novels full of improbable inventions and all kinds of eccentric characters.

Although created in England by Teque Software Development Ltd., *Cosmic Relief* represents the logical evolution of the action-adventure format pioneered by Datasoft in games from *Conan the Barbarian* to *The Goonies*. These games mix straight-ahead action with elements from role-playing adventures to form a new kind of entertainment that requires mental as well as physical dexterity. *Cosmic Relief* has that same mix of physical puzzles and arcade-style action, but adds elements of camp comedy and surreal science-fantasy. These additions clearly improve the recipe.

The story goes like this: Forty years before the game begins, Professor K.K. Renegade predicted an asteroid would hurtle toward Earth and eventually destroy our beloved planet. When nothing happened, however, the Prof. was subjected to ridicule and censure. Feeling basically unappreciated, he took off for parts unknown, and no one has seen him since.

Now it's forty years later, and guess what? Yep, here comes that asteroid! And, believe it or not, people actually *remember* the old crackpot who predicted it almost half a century earlier! Totally at a loss as to what to do, the citizenry logically concludes that Prof. Renegade must be found, apologized to, and set to the task of saving us in spite of our shortsighted selves.

This task is in the lap of the user, who must choose one of five soldiers of fortune to represent him on his search for Prof. Renegade. There's the robust Brit, Fortisque Smythe, master of many skills but something of a self-promoter. Big John Caine is a burly, fresh-faced Yankee; Wu Pong, a famed Japanese adventurer; Herr Krusche, a valiant German explorer; and Henri Beaucoup, a world-renowned French daredevil. Though their differences are largely cosmetic, each has a specific object within the game that is his personal key to locating Renegade.

As the player surrogate moves around the multidirectional scrolling playfield, he encounters a series of objects left behind by previous unsuccessful expeditions. These range from the wacky to the whimsical and include a flying vacuum cleaner, a magical flute (especially helpful for mellowing out snakes), and a coat hanger that turns out to be good for more than keeping one's jacket unwrinkled!

The player can carry multiple objects thanks to offscreen native bearers. At any time, the player can access the inventory of either bearer in order to exchange items.

The game also accesses a T (Think) command when the user is stuck. The onscreen player will then think about the item he needs to get past the logjam. This item is visualized in a thought balloon above the hero's head.

If the player gets *really* desperate, there's a map and cheat sheet packed with the game that reveals the purpose



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of every object and the key item for each onscreen surrogate.

The playfield contains the visual display and a data area across the bottom third of the screen. This strip lists current and high scores, the day and time (the player has only 30 days to construct an asteroid deflector), and a visual inventory.

The only real problem is that many of the items are not easily identified due to occasional lapses in the artwork. For example, the basket to which the player must affix a hot air balloon looks disarmingly like a toilet bowl!

*Cosmic Relief: Prof. Renegade to the Rescue* is an amusing and engaging entertainment that piques the intelligence while challenging the motor skills of the user.

Datasoft, 19808 Nordhoff Place, Chatsworth, CA 91311 (phone: 818-886-5922).

—Bill Kunkel

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## POOL OF RADIANCE

Strategic Simulations

Commodore 64

Four double-sided disks; \$39.95

This mammoth fantasy role playing game (RPG) is the first title SSI has published under its license from TSR, creators of the trailblazing "Dungeons & Dragons." It is derived from the campaign module of the same name which TSR produced for the pencil-and-paper "Advanced Dungeons & Dragons," a sophisticated revision of Gygas and Arneson's basic rules.

The usual horde of monsters has overrun the fabled city of Phlan, located in the North of the Forgotten Realms. The computerist creates a band of adventurers which battles the creatures and their mysterious leader. Although the player must repulse the monster army and restore Phlan to its former glory to win, running questing parties with no larger goal in view provides hours of entertainment.

It is difficult to assess this product's originality. Whose fault is it that *Pool of Radiance* precisely simulates the game, "Advanced Dungeons & Dragons," which inspired a dozen earlier role playing disks? It is undeniably similar to *Wizardry*, *The Bard's Tale*, *Might & Magic*, *Alternate Reality*, and all the other programs which "borrowed" experience points, character

level, moral alignment, and much more from "Advanced Dungeons & Dragons." The main difference is that *Pool of Radiance* officially and unambiguously acknowledges the source of its play mechanics and rules structure.

As in other computer RPGs, the player creates characters, forms them into a party, and sends it into the world to gain experience through encounters with monsters, magic, and treasure. As characters accumulate experience, they rise in level and acquire greater power. A party with sufficient power can defeat the monsters and liberate Phlan.

Veteran computer role playing gamers will find the "quick start" card supplied with *Pool of Radiance* enough to get going. For those who require a fuller explanation, SSI provides a lucid rules manual and a separate book of background information about the Forgotten Realms.

Everything works off menus, and there are plenty of onscreen prompts to coach the solitary Commodore owner through the multipart turn. Frequent disk-switching disrupts the smooth flow of events, but it is unavoidable in a game of this scope and complexity.

The main display screen gives the armor class and hit points of each party member and presents a drawing of the current location. The illustrations are colorful and animated, but they are not quite as slick as in *Bard's Tale II* and *III*. A complete report on each character in the party is also available on subsidiary screens.

*Pool of Radiance* does, however, introduce a few novel elements. The biggest change involves non-player characters (NPCs), which electronic RPGs have hitherto ignored. A party can talk to NPCs and ask them to join the group. Of course, it is sometimes difficult to gauge the loyalty of strangers, and seemingly docile creatures may turn traitor if they don't receive proper treatment.

A major innovation is the tactical battle display. During combat, a close-up of the engagement replaces the main screen. This system is much more satisfying than abstract summaries. The computerist actually sees each individual character move, cast spells, deliver sword blows, and take damage from attacks.

*Pool of Radiance* is an impressive

beginning for this series of adventures set in the Forgotten Realms. It is hard to imagine anyone who likes fantasy role playing games who would not enjoy an electronic trip to the beleaguered city of Phlan.

Strategic Simulations, 1046 North Rengstorff Ave., Mountain View, CA 94043 (phone: 415-964-1353).

—Arnie Katz

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## ALIEN DESTRUCTION SET

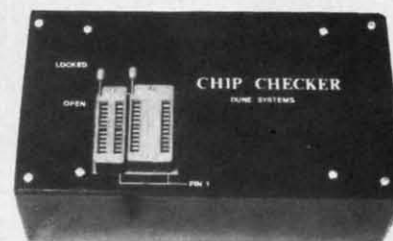
Scorpion

Commodore 64

Disk; \$29.95

Despite first impressions, *Alien Destruction Set* is not a construction kit. It is a collection of four action and action-strategy games which share a science fiction theme. The quartet was designed by CRL, a kind of game design collective. All four feature space combat seen from an overhead perspective and enlivened by impressive music and graphics, but each has its own unique elements. As is the case with most collections of games, the four are not

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equally exciting, but the best of the *Set* is a real winner.

*Thundercross* is a straightforward space combat game with little in the way of innovation to recommend it. The Thundercross is a massive, lumbering craft that seems to function as an asteroid-sweeper in this horizontally scrolling contest. This sweeper can fire in any of eight directions at a variety of nondescript targets and has movement capability in all directions, including backwards. The Thundercross is protected by shields, which are automatically deactivated when the cannons fire.

*Vengeance* is far more polished and professional-looking, without being much more original than *Thundercross*. The player's ship moves up through a vertically scrolling playfield depicting a vast network of alien refineries. The graphics are extraordinarily sharp, as are the explosions and general sound effects. They combine to make this a compelling if slightly old-fashioned arcade experience.

*Death or Glory* is less conventional than either of the above. Instead of firing a standard front-mounted cannon, players in this multidirectional scrolling game drop bombs on a squadron of Deathstar-size alien destroyers. Pressing the action button while pushing forward on the joystick unleashes cataclysmic bombs capable of ripping entire sections from the hulls of any enemy ship unfortunate enough to pass below.

Jon Law's graphics on *Death or Glory* are very nice, but his stars don't move. This undermines any illusion of movement unless an alien ship is on-screen. Also, the panels blow off the hulls in neat, square sections which neither makes sense nor enhances the game's sense of realism. Even so, *Death or Glory* is an entertaining and somewhat offbeat diversion.

The jewel in the Crackerjack box, however, is unquestionably *Discovery*. At first it appears to be a simple multidirectional scrolling shootout, but it soon reveals unexpected depth. While the player's ship must deal with a horde of gnatlike alien fighters, the priority mission is to complete an all-important circuit board by winning a series of mini-games.

These mini-contests are accessed by

positioning the player's ship over the entrance hatch of each of the alien space stations. The player is then transported into one of a series of action, strategy, and action-strategy contests.

The mini-games use pattern-recognition and other classic brain twister elements to create kinetic puzzles with occasional arcade flourishes. For example, one of the action games is a sideways variant of *Centipede*. Some of these puzzles are real stumbers and will take several attempts to solve, but each is worth the effort.

*Alien Destruction Set* is a worthwhile collection from a group of talented up-and-coming game creators. The range within this quartet of entertainments is considerable, and should prove satisfying to most fans of action-oriented science fiction games.

Scorpion, 19 Harbor Dr., Lake Hopatcong, NJ 07849 (phone: 201-663-0202).

—Bill Kunkel

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## STOCKER

Capcom

Commodore 64

Disk; \$29.95

Okay, nostalgia lovers, here's a blast from the past: a stock car racing game with an *overhead* perspective!

With the exception of auto *combat* games, like *Spy Hunter* (Bally/Midway) and *Autoduel* (Origin), the overhead view virtually disappeared from the auto simulation scene for several good reasons. Unfortunately, *Stocker*, a stock car racing game from Capcom, illustrates all of them.

The most obvious reason for the scarcity of bird's-eye-view driving/racing games is that users are now spoiled. First-person perspectives (behind-the-wheel) and pseudo first-person (the car itself appears onscreen in the foreground) found in games like *Pole Position* (Atari), *Speed Buggy* (Data East), and *Test Drive* (Accolade) are simply more exciting.

Players clearly prefer to see the road from a driver's viewpoint because it is realistic. Driving is not an exotic experience, like piloting a spaceship; people ride in cars every day of their lives. Yet *Stocker* is presented from a point of view that only a pigeon could relate to. People don't watch auto races from blimps or hot air balloons, so they're

not likely to resonate to *Stocker's* high-altitude viewpoint which displays the vehicles, buildings, and topography as faraway, insect-sized icons. Though these onscreen objects are rendered in precise detail, the vehicles become indistinguishable when viewed as if from a low-flying plane.

Worse still, the roadway doesn't scroll. Instead, the player's car reappears on a new map-section after driving off the edge of a previous screen. This is extremely disorienting, since the player must scan each new screen to locate the car's position and reorient the steering.

This disorientation is a keystone of overhead driving games. It is almost impossible to keep track of where you've been and where you're headed since there are no street signs or other markings. But then, the user is likely to have enough trouble just staying on the road.

In first-person driving games, all directions are true. Pushing the joystick left turns the car left. If a game takes the driver *outside* his vehicle, however, steering becomes compass-based. Instead of being focused around the user and his vehicle, reality is linked only to the compass headings. Pushing the joystick up (north) will always cause the car to head north, but depending upon the direction the vehicle is going in, that same command could result in the car making a turn in any of three directions.

If the car is traveling north to south and the player moves the joystick to the left (east), the car will head east by making a *right* turn. If the car is heading north and the player makes the same joystick command, the car will head east by making a *left* turn. If the car is heading east, however, the east command will invoke an abrupt U-turn.

The playfield for *Stocker* consists of the screen-sized overview, a score counter, high score, and speedometer. Other motorists include truckers, bikers, and even the Highway Patrol, who intercept speeders and cause them to lose time.

*Stocker* is a quaint game, almost like an antique that's been painfully restored using state-of-the-art techniques. The tiny graphics are remarkably clean-cut, with each vehicle pictured in minute detail. The race itself is accompanied



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by short musical phrases (including the old "See the USA in your Chevrolet!" jingle) that should evoke memories from users.

The problem with *Stocker* is like the problem with all spiffed-up antiques: when all is said and done, it's still an old contest, albeit an attractive one.

Capcom, 1283-C Old Mountain View/Alviso Rd., Sunnyvale, CA 94089 (phone: 408-745-7081).

—Bill Kunkel

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## LANE MASTODON VS. THE BLUBBERMAN

Infocom

Commodore 64

Disk; \$12

We hear a lot about this or that being "a bold new medium." Well, surprise, surprise, InfoComics represents a legitimately new entertainment form, computerized comic books. Created by Infocom and Tom Snyder Productions, InfoComics are *not*, nor do they attempt to be, games.

Until now, software publishers have been hidebound in clinging to games as the computer's dominant entertainment medium (with some forays into art, music, and the occasional non-game simulator). Tom Snyder theorized that there are, or should be, many different forms of interactive entertainment possible on the computer. This insight resulted in InfoComics: animated stories told with a comic book sensibility that use the computer like a VCR. The user can fast-forward, rewind, advance frame-by-frame, and periodically branch off the current storyline to follow an alternative character's point of view.

One of the real plusses for this system is its simplicity. Each InfoComic comes with a warranty, a brief explanation of the system's "branching" technique, and a list of 10 keyboard commands. This includes a Bookmark, Restart, and three running speeds. Those are the only instructions that any user requires.

The InfoComics interface is one of the most brilliant innovations in entertainment software history. The screen is set up to look like an open page of a book or magazine. On the page are two windows, the larger one filling about three-fourths of the screen. This

display area represents the comic book panel, one of the series of frames in which the graphic story is told. All visuals, dialogue, and thought balloons are contained within this window. Captions are broken out into the smaller window at the bottom of the page in deference to the long-standing traditions of illustrated adventure games.

There are some very good and some very bad things about *Lane Mastodon Vs. The Blubberman*. The action is told in a form that owes much more to the cinema than the graphic story. The drawings are minimalist but very stylized. They're extremely well done with a limited but effective use of color. The numerous animated sequences utilize all the trendiest camera angles from films and TV: pans, tracking shots, fades, and transitions that have never been seen on a computer monitor. These are remarkably effective.

Unfortunately, *Lane Mastodon* reads more like a demo of the InfoComics system than an actual story that anyone might care about on its own. The story purports to be a cornball spoof of 1930s soap operas but really hasn't a clue about science fiction, before or after the 30s, and no notion at all of how comics work. Worse, the author(s) seem to have no affection for the material they're creating. They treat it with a condescending scorn that should burn in the guts of comic and SF fans like a bad burrito.

The plot involves the alien Blubbermen and their plan to take over the Earth of 2029 by turning an enlarging ray on small animals and insects. These oversized kitties and cockroaches will presumably overwhelm Earth's defenses and the Blubbermen will waddle in and pick up the pieces.

There is no reason to waste any of our time picking holes in this cheese-cloth of a plot. I must ask, however, if only rhetorically, why enlarge *tiny* critters? Wouldn't it make more sense to make behemoths of creatures who are *already* big? Somehow the idea of a 300 foot rhino or a whale the size of two football fields is more intimidating than a 50 foot earthworm. That aside, the whole story, without recourse to alternate plotlines, runs in less than 10 minutes.

The story is loaded with sophomore inanities that the writers must have

felt would really have those simple-minded comic book fans rolling in the aisles. "Don't pluck your chickens before they hatch!" advises a character in one of the story's more side-splitting moments, and the designers might have listened to their own advice. *Lane Mastodon* also periodically cuts away to a Blubberman and a Thin Man (a slim race that's already been squashed by the avatars of alien avoidupois). The pair perform a Siskel & Ebert routine, complete with the familiar theme music from "At the Movies," and remark on the plot's more inane elements.

The ironic thing about *Lane Mastodon* is how much it reads like a computer adventure without the interaction. During the story's climax, Lane reaches the pivotal enlarging ray, producing an animated sequence about how he has to turn it off. We then see a gigantic switch with ON/OFF buttons and Lane slowly pushes the OFF switch. In the moment's hesitation before Lane acts, gamers everywhere will be frantically scanning the keyboard for the "Turn ray off" command.

The InfoComics format could be the biggest software success in years. But first the creators of this wonderful tale-telling system must work to discover the kind of stories InfoComics can do best and the creators capable of writing them.

Infocom, 125 Cambridge Dr., Cambridge, MA 02140 (phone: 617-492-6000).

Bill Kunkel

## ACTION REPLAY IV

Datel Computers

Commodore 64

Cartridge: \$59.99

I'm always put off by advertising that uses superlatives such as "ultimate." But Datel has some justification for claiming as they do that their Action Replay is "the ultimate backup cartridge." The main use of the product is to create backups of protected software. We will cover that function last, and first describe its other features.

## Overview

The cartridge fits in the 64's expansion slot. It has two pushbuttons, Reset and Freeze. When plugged into a C-128, the computer powers up in C-64

Continued on page 54



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# SOURCE CODE FOR SCREEN POCUS 64

1030	C000	4C 06 C0		JMP ONE	
1040	C003	4C 33 C0		JMP TWO	
1050	C006	A9 00	ONE	LDA #0	
1060	C008	8D 36 03		STA TAB	CLEAR TABLE THAT CONTROLS WHEN ALL FOUR SCREEN SECTIONS HAVE BEEN PROCESSED
1070	C00B	8D 37 03		STA TAB+1	
1080	C00E	8D 38 03		STA TAB+2	
1090	C011	8D 39 03		STA TAB+3	
1100	C014	A9 EA		LDA #234	
1110	C016	8D 28 03		STA 808	DISABLE STOP/RESTORE
1120	C019	A9 F9	RANDOM	LDA #249	
1130	C01B	8D 0E D4		STA \$D40E	
1140	C01E	A9 EE		LDA #238	
1150	C020	8D 0F D4		STA \$D40F	USE SID VOICE 3 TO GENERATE RANDOM NUMBERS
1160	C023	A9 00		LDA #0	
1170	C025	8D 18 D4		STA \$D418	
1180	C028	A9 81		LDA #129	
1190	C02A	8D 12 D4		STA \$D412	
1200	C02D	A9 A0		LDA #160	ALTERNATE TEXT SCREEN @ \$A000
1210	C02F	8D 88 02		STA 648	
1220	C032	60		RTS	
1225					
1230	C033	A2 00	TWO	LDX #0	
1240	C035	A9 04		LDA #4	
1250	C037	85 FC		STA \$FC	
1260	C039	86 FD		STX \$FD	PREPARES ZERO PAGE POINTERS TO REAL AND ALTERNATE SCREENS
1270	C03B	86 FB		STX \$FB	
1280	C03D	A9 A0		LDA #\$A0	
1290	C03F	85 FE		STA \$FE	
1300	C041	A5 01		LDA 1	SWITCH OUT BASIC ROM
1310	C043	29 FE		AND #254	
1320	C045	85 01		STA 1	
1325					
1330	C047	AD 1B D4	NEWONE	LDA \$D41B	
1340	C04A	A8		TAY	
1350	C04B	B1 FB		LDA (\$FB),Y	
1360	C04D	D1 FD		CMP (\$FD),Y	
1370	C04F	F0 36		BEQ OTHER	
1380	C051	B1 FD	SI	LDA (\$FD),Y	
1390	C053	91 FB		STA (\$FB),Y	
1400	C055	A2 00	HERE2	LDX #0	
1410	C057	BD 36 03	CHECK	LDA TAB,X	
1420	C05A	F0 07		BEQ HERE	GET RANDOM NUMBER USE AS INDEX TO TRANSFER REAL SCREEN ALTERNATE
1430	C05C	E8		INX	
1440	C05D	E0 04		CPX #4	
1450	C05F	90 F6		BCC CHECK	
1460	C061	B0 55		BCS DONE	
1470	C063	E6 FE	HERE	INC \$FE	
1480	C065	E6 FC		INC \$FC	
1490	C067	A5 FC		LDA \$FC	
1500	C069	C9 08		CMP #8	
1510	C06B	90 DA		BCC NEWONE	

# SCREEN

## Fade In / Fade Your

By Peter

**T**hrough the years I have seen several fancy ways of displaying or erasing text screens on the Commodore 64. But my favorite effect is achieved by this short and easy to use machine language utility which uses a technique usually seen in hi-res screens. I call it "materializing" a screen or "dematerializing" it. Visually, the screen fades in or out of view, or fades away as a new screen fades in. As text screens are used much more than hi-res screens, I wrote the *Screen Pocus* utility for text screens on the C-64. You will be able to "fade in" or "fade out" text screens at the speed you wish. It's great for flashy screens, or to make new screens appear in multilevel games, or for menus, or wherever you need it. The utility is short, relocatable, and extremely easy to use!

### TYPING IT IN

*Screen Pocus* is an all-ML utility, presented as a BASIC loader that also allows relocation of the routine. Type in the BASIC program and save it. Then type RUN. The ML routine will be POKed to memory. It is currently loaded at address 49152, but change the value of SA to whatever start address you wish.

### USING SCREEN POCUS

The utility has two entry points: one to create the screen which will fade into view, and the other to actually make the screen visible. Let's see how to use them.

SYS SA, where SA is the address at which you located the utility, will start the random number generator, clear some values, and place you at an alternate text screen (placed under



# POCUS 64

## Out Effects on Commodore

**M.L. Lottrup**

BASIC ROM at \$A000-\$A3FF). Whatever you print after this call will not be visible on the standard screen, but will be ready to materialize later. Make sure that this alternate screen you print does not cause a screen-scroll, or the resulting "materializing" screen will be garbage.

SYS SA+3 will start the materializing process, bringing the screen you printed earlier into view, shifting out whatever was currently in display.

Address 2 controls the shift speed, where 1 is the fastest speed and 255 (or 0) is the slowest. POKE the desired speed in memory location 2. A value of 70 is recommended for most uses.

A couple of things to take care of: as pressing RUN STOP or RUN STOP/RESTORE while creating the alternate screen (between the two SYS calls) would leave you in an awkward position (you won't be able to see what you type), the routine disables these keys until the screen has been materialized. This routine should not be used together with sounds or sprites. Also, try using the same colors, as color memory is the same for all screens (test this for best results and see the demo program included).

The routine uses the following addresses to operate:

\$C000 - \$C0C8 (when loaded at 49152)  
2, 251-254, 820-822  
\$A000 - \$A400 (located under BASIC ROM).

The short demo program I have included shows the power of this utility. It is written in BASIC, so just type it in and save it. The demo assumes the *Screen Pocus* utility is loaded in memory at \$C000 (49152). □

SEE PROGRAM LISTINGS ON PAGE 73

The BASIC loader and demo for *Screen Pocus 64* are found on page 73. Source code is listed here for informational purposes.

	1520 C06D A9 04	LDA #4
	1530 C06F 85 FC	STA \$FC
	1540 C071 A9 A0	LDA #\$A0
	1550 C073 85 FE	STA \$FE
	1555	
	1560 C075 A5 02	LDA 2
	1570 C077 8D 34 03	STA TEMP
	1580 C07A A0 19	LDY #25
	1590 C07C 88	DEY
	1600 C07D D0 FD	BNE WA1
	1610 C07F CE 34 03	DEC TEMP
	1620 C082 D0 F6	BNE WA2
	1630 C084 18	CLC
	1640 C085 90 C0	BCC NEWONE
	1650 C087 8C 35 03	STY GUARDA
	1660 C08A AD 1B D4	LDA \$D41B
	1670 C08D C9 80	CMP #128
	1680 C08F 90 05	BCC DECR
	1690 C091 A9 C8	LDA #\$C8
	1700 C093 18	CLC
	1710 C094 90 02	BCC NEST
	1720 C096 A9 88	LDA #\$88
	1730 C098 8D A4 C0	STY POSIT
	1740 C09B AC 35 03	LDY GUARDA
	1750 C09E B1 FB	LDA (\$FB),Y
	1760 C0A0 D1 FD	CMP (\$FD),Y
	1770 C0A2 D0 AD	BNE SI
	1780 C0A4 C8	INY
	1790 C0A5 CC 35 03	CPY GUARDA
	1800 C0A8 D0 F4	BNE WAIT
	1810 C0AA A5 FC	LDA \$FC
	1820 C0AC 38	SEC
	1830 C0AD E9 04	SBC #4
	1840 C0AF A8	TAY
	1850 C0B0 A9 01	LDA #1
	1860 C0B2 99 36 03	STA TAB,Y
	1870 C0B5 18	CLC
	1880 C0B6 90 9D	BCC HERE2
	1885	
RESTORE DEFAULT SCREEN	1890 C0B8 A9 04	LDA #4
	1900 C0BA 8D 88 02	STA 648
ENABLE STOP-RESTORE	1910 C0BD A9 ED	LDA #237
	1920 C0BF 8D 28 03	STA 808
RESTORE ROM	1930 C0C2 A5 01	LDA 1
	1940 C0C4 09 01	ORA #1
	1950 C0C6 85 01	STA 1
BACK TO BASIC	1960 C0C8 60	RTS
	1970 C0C9	TEMP = 820
	1980 C0C9	GUARDA = 821
	1990 C0C9	TAB = 822



Continued from page 50

mode. When powered up or reset, a menu is presented, and the function keys can be used to select "Configure Memory," "Normal Reset," "Utilities," and "Install Fastload." "Configure" is (sometimes) used preparatory to the backup process. The documentation does not explain this configuration process. Normal reset takes you to the familiar light blue on dark blue C-64 opening screen. The Utilities selection presents another menu with a number of very useful disk operations, including file and whole disk copy. These are for use with unprotected disks.

When Fastload is installed, a number of enhancements are made to the C-64's operation. With *Action Replay's* "standard" disk turbo, loads and saves occur at 6-7 times normal speed. Without the cartridge, turbo-saved programs will load slightly faster than normal. The Warp\*25 Turbo, however, will load a previously warp-saved program in 6-7 seconds. These warped programs can only be loaded by Fastload—the cartridge must be plugged in—or by a special loader that the utilities menu allows you to save to the same disk.

A DOS wedge is enabled, permitting shorthand disk commands similar to those of DOS 5.1. Some useful direct mode only BASIC commands are provided, including OLD, DELETE, MERGE, APPEND, and AUTO. Notably absent is RENUMBER, but you can't have everything. A very powerful machine language monitor is also available. In addition to the usual MLM features, this one provides Compare, Transfer, and Number conversion. It can bank switch, accessing the C-64's hidden memory, and, for the adventurous hacker, it can perform its operations on the disk drive! A nice touch is the ability to scroll up and down through a disassembly.

Two negative points: The DOS wedge doesn't seem to allow pattern matching (\*) on a directory, and always lists all names on a disk. When Fastload is enabled, direct mode always sets the character color to white, which causes the cursor to disappear if the screen is white, as it is on a SX-64.

All these features—Fastload, DOS wedge, BASIC enhancements, and the MLM—use no C-64 main memory. Like other "transparent" cartridges,

however, *Action Replay* occupies both I/O blocks 1 and 2, and no other boards can be plugged into the expansion port. The cartridge has the intelligence to lock up the computer if an attempt is made to disassemble certain addresses in I/O 1 or 2.

One feature not tested for this review was the Tape Turbo. According to the instructions, tape I/O is speeded up 5-6 times using Fastload. Tape backups, on the other hand, load independent of the cartridge.

## Backups

Unlike utilities that attempt to defeat the protection on a disk, and thus copy it, *Action Replay* is designed to "freeze" a program once it's in memory and then save a functioning, unprotected copy of the computer's memory. As always, some copy protected programs will be more resistant to copying than others. Extensive experimentation may be necessary to copy a particular program and confirm that the copy operates correctly. At this point we emphasize that a backup should be just that: a copy of a program owned and used by the legal purchaser of said program, as insurance against the loss or damage of the original.

In most cases, the copy process will be as follows: Choose normal reset from the *Action Replay* opening menu. Load the program you want to back up in the usual way. When the program is running, press the cartridge's Freeze button. A menu is presented with "backup" as one of the choices. If this is selected, the screen border changes color for a few seconds, indicating that the program is being compacted and otherwise prepared for saving. When this process is complete, another menu is displayed with various save options. A normal or standard save will save the computer's memory in a form that can be loaded (slowly), without the cartridge being present. Turbo save puts the program into *Action Replay's* fastload format, and Warp\*25 is a super-fast option. Fastload-formatted saves can be loaded without the cartridge, at slightly faster than normal speed. Warp saved programs can only be loaded by the cartridge or by the special loader mentioned earlier. So not only do you get to backup your vulnerable originals, but you get to speed up the load-

ing time as well.

Some variation on this scenario may be required, depending on how well protected the program is. *Action Replay* provides enough flexibility to back up virtually any copy protected program. For an additional charge (\$14.99), a "Parameter Support" disk is available for use on the more resistant programs.

A number of operations can be performed on a "frozen" program. Screens can be saved to tape or disk in *Koala*, *Blazing Paddles*, or several other formats. Hi-res and multicolor screens can be dumped to a printer. Text within a game can be altered or sprite collisions disabled, making the player invincible. (Where's the challenge in that?) Sprites can be saved from one game, then loaded into another. Since the MLM is available, the program can be disassembled and modified. Because of copyright laws, any modified versions of commercial software must be for the amusement and entertainment of the owner of the software. They can be neither sold nor given away. To do so is piracy.

## Finally

Backing up protected software with *Action Replay* is relatively trouble free, less so than with disk-based nibblers and parameter copiers. With all its extras—BASIC enhancement, Fastload, etc.—*Action Replay* is well worth its \$59.99 price tag.

Datel Computers, 3430 E. Tropicana Avenue, Unit #67, Las Vegas, NV 89121 (phone: 702-454-7700).

—Richard Curcio

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# SCREENSAVER64

For the C-64

By Richard Curcio

**A** routine to save and recall the C-64 text screen can be put to a number of uses. Help screens, low-res animation, and pseudo-windows are a few of the possibilities. *ScreenSaver64* will allow you to achieve these effects.

## LOADER AND USAGE

The BASIC loader for *ScreenSaver* POKEs the machine language into RAM at 51200. The ML can be relocated by changing the variable SS in line 110. When the loader is RUN it reports the range of memory occupied and displays several SYS locations. These in effect are a "mini" jump table to perform the following actions:

SYS SS save screen information  
SYS SS +3 recall screen information  
SYS SS +6 clear links

The simplest operations are Save, which obviously saves



the current text screen and color memory, and Recall, which recalls a previously saved screen to the current screen. In addition to the screen characters and colors, the routine stores the current cursor position, the current color, the reverse flag, and the screen line link table. This last item consists of 25 bytes at zero page locations 217-242 (\$D9-\$F2) that hold the high bytes of pointers to the start of each screen

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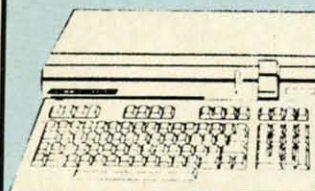
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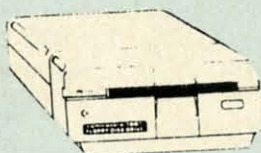
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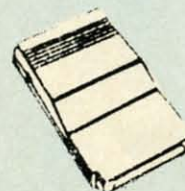
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line. (Ignoring bit 7, these bytes aren't absolute addresses, but are instead off-sets into the 16K video bank. However, when the screen is in the default VIC bank 0, these bytes appear to be the absolute addresses.) Bit 7 of each byte indicates whether that line is linked to the line above it. If bit 7 of a byte is clear (0), the line is said to be linked. This is what happens when PRINTing "wraps" from the right edge of the screen to the left edge of the line below. *ScreenSaver* includes an operation to un-link the screen lines by setting bit 7 of each link byte to "1". This is important when message boxes and such are to be printed over existing text.

*ScreenSaver* stores the screen information in the C-64's "hidden" memory. Location SS +9 holds the high byte of the start of storage. As written, this byte is 208 (\$D0), corresponding to 53248 divided by 256, the start of the very well hidden RAM under I/O and character ROM at \$D000-\$DFFF. Since this area is 4K of RAM, it has enough room for two complete text screens with color memory and link information. By POKEing new values into SS +9, the routine can be made to store many more screens. Each new high byte should be on a 2K boundary, for example 208, 216, 224, 232, etc. Storage doesn't have to be in hidden memory. Care should be taken to ensure that a storage area doesn't conflict with another program's use of that location. *ScreenSaver* uses the contents of location 648 to determine where the active text screen is located, and can access a screen moved from its default location. Recalled screens, however, must be returned to the location they came from. Also, the routine cannot access an active screen in hidden RAM. Because the routine is switching the ROMs and I/O in and out, it should not be utilized with a program that uses Non Maskable Interrupts, such as modem and RS-232 programs.

To use this utility for "help" screens, print your informa-

tion screen, then POKE SS +9, HS where HS is the high byte of the address to store the help screen, then SYS SS. When the need arises in your program to display the help screen, POKE SS +9, CS where CS is the high byte of the address to store the current screen, and save it with SYS SS. Then POKE SS +9, HS and recall the help screen with SYS SS +3. When the help screen is no longer needed, POKE SS +9, CS and recall the original screen with SYS SS +3 and the help screen disappears.

## MESSAGE BOXES AND WINDOWS

Implementing windows like the C-128's on the C-64 is a major undertaking, requiring many pages of machine language. *ScreenSaver*, however, can perform a reasonable impersonation of such a facility. To display a message box, or a "pop-up menu" overlaying the existing text, the screen links must first be cleared. The operating system simply will not let you print over linked lines in the way that you intend. A neatly formatted box comes out very un-neat when linked lines are present.

The demo program contains a subroutine to print boxes based on C. Pickrell's program in the April 1988 *Tips Ahoy!* The program has been slightly enhanced by the use of a *Screen Wizardry* trick (February 1988) to position the cursor. An option to print the box in reverse is also included. When the routine is called, W is the width of the box, H is its height, D is down from the top of the screen, and R is columns right. The variable RV\$ is the reverse flag and is either reverse on (CTRL-9) or reverse off (CTRL-0).

To simulate a window, first SYS SS to save the screen and links, then SYS SS +6 to clear the links. GOSUB to the box routine and print your message, menu, or whatever. To make this pseudo-window disappear, SYS SS +3 and the screen is restored to what it was before the box was displayed. To display a box, with no intention of recalling the text that it overwrites, first SYS SS +6 to un-link the screen lines, then call the box subroutine. Your display will be as neat as you envisioned it.

When using box routines like this, it's up to the user to make sure that the text within the box doesn't extend beyond the borders. LEN, POS, and other string functions will be useful in this regard. See *BASIC Obscurities*, April 1988 *Rupert Report*.

## ROLL YOUR OWN

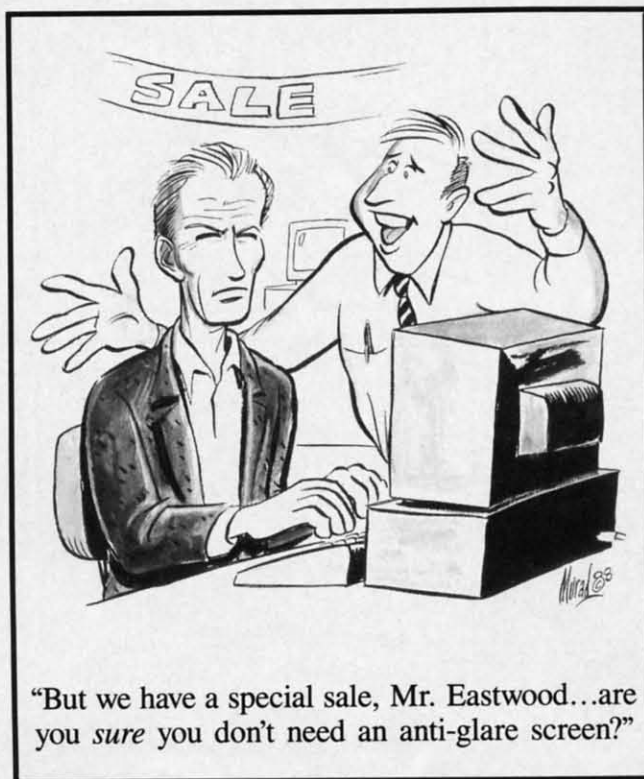
If you have some other memory mover that you prefer to use, it can duplicate *ScreenSaver*'s operation by storing the screen and color memory in some location, and including a call that stashes the 25 link bytes somewhere. All that remains is to clear the link table before PRINTing any boxes. This can be done in BASIC with the statement

```
FOR I = 0 to 24: POKE 217 +I, PEEK (217 +I) OR 128: NEXT
```

This takes 25 jiffies—about half a second. If this is too slow for you, the ML to accomplish the same thing is quite short. POKE the following data into any free 12 bytes of memory:

```
DATA 162, 181, 217, 9, 128, 217, 202, 16, 247, 96
```

SEE PROGRAM LISTING ON PAGE 69





## TIPS AHoy!

Continued from page 26

One might, for example, build an array of line numbers, then use the format GOTO.L(J) as a powerful version of ON-GOTO with destination lines limited only by available memory. When writing a text-based game, this could be a huge time-saver. By using a string array for the words, such as WD\$(n), and a parallel numeric array for line numbers, e.g., LD(n), locating the correct string also gives the correct line. Then just GOTO.WD(n).

Although the default storage area for the ML is 4864, it's fully relocatable and can be put anywhere there are 44 free bytes. Once activated, only a cold reset will stop it. Fair warning: RENUMBER has no effect on this command, even if a valid line number follows it. Lastly, although it's unlikely to happen, if you get an UNDEFINED STATEMENT error, check the math. Some functions, such as exponents, give unexpected results.

—Bob Renaud  
Washington, MA

```

1 INPUT"ML LOAD ADDRESS 4864[6"[LEFT]]"
;X
2 DATA A5,3D,D0,02,C6,3E,C6,3D,20,C9,03
3 DATA C9,89,F0,06,C9,8D,F0,02,D0,13,20
4 DATA 80,03,C9,2E,D0,0C,20,80,03,20,96
5 DATA AF,20,0C,AF,4C,FB,59,6C,12,03,00
6 FORJ=XTOX+43:READK$:K=DEC(K$):T=T+K:PO
KEJ,K:NEXT
7 IFT<>4500THENPRINT"[RVSON]DATA ERROR!"
:END
8 POKE786,PEEK(768):POKE787,PEEK(769)
9 POKE768,XAND255:POKE769,X/256:END

```

## NO DIM WAITS

The vast expanse of variable memory available to C-128 users allows the creation of some truly prodigious data-arrays. When saving the array to disk, it's usually done as a sequential file, value by value. In one of my programs, I used the array DT(53,40,2), which if stored sequentially and starting at DT(0,0,0) would require saving 6642 values, permitting a nap while it's running. Being impatient, I wanted a faster way. Bless BASIC V7.0, there IS one.

First, DIMension all variables at the beginning of the program, and make the array variable the last one. Then, when it's time to save it, use a line similar to this one from my program:

```
BSAVE"DT",B1,P(POINTER(DT(0,0,0)))TO P(P
EEK(51)+256*PEEK(52))
```

This saves the entire array as a binary file (51,52 form the zero-page pointer for the last address for array variables). To load the file, use this format:

```
BLOAD"DT",B1,P(POINTER(DT(0,0,0)))
```

In each case, B1 specifies Bank 1, the variable memory area. Fair warning: *don't omit it*. If multiple arrays are in use, start at the POINTER to the first array, and it will save

them all. Also note that if the zero values in the array aren't used, start the BSAVE and BLOAD using 1's rather than 0's (ex: DT(1,1,1)) which saves times and cuts the file length considerably. I use them, so I can't skip them, but starting at DT(1,1,1) would reduce the file to 4240 values. If possible, using integer arrays would make it far smaller still.

As an indication of reduced waiting time, using a 1571 my 131 block file SAVes in one minute, 12 seconds (including SCRATCH time for the old file) and loads in 8 seconds. If you've had the displeasure of waiting and twiddling thumbs while your sequential file saves or loads, give this technique a shot. The difference is amazing.

—Bob Renaud  
Washington, MA

## SIMPLE SMOOTH SCROLL

This neat program lets you create a smooth sliding message like those used on Wall Street. Simply type in the program, run it, and type in your message when the word MESSAGE appears. SYS 52224 (\$CC00) starts the scroll. For greater effects you can use your own character sets. Using SHIFted characters creates reversed characters. To rewrite the message just run line 500.

—Marcus Linkert  
Glendale, NY

```

10 REM -SYS52224 TO START-
20 REM -SIMPLE SMOOTH SCROLL-
30 REM -BY MARCUS LINKERT-
40 H$="0123456789ABCDEF"
50 HD$=""
60 V=52223
70 READ HD$:V=V+1:PRINTV,HD$
80 IF V=52435 THEN GOTO 500
90 IF LEN(HD$)=0 THEN PRINT"ERROR":END
100 IFLEN(HD$)<>2 THEN PRINT"ERROR":END
110 H=0
120 FORI=1TO16
130 IFLEFT$(HD$,1)=MID$(H$,I,1) THENH=I:I
=16
140 NEXT I
150 IF H=0 THEN POKE V,0:GOTO 70
160 H=H-1
170 L=0
180 FORI=1TO16
190 IF RIGHT$(HD$,1)=MID$(H$,I,1) THENL=I
:I=16
200 NEXTI
210 IF L=0 THEN POKEV,0:GOTO 70
220 L=L-1
230 D=H*16+L
240 POKEV,D
250 GOTO 70
260 DATA 78,A9,3E,8D,14,03,A9,CC,8D
270 DATA 15,03,AD,11,D0,29,7F,8D,11
280 DATA D0,A9,90,8D,12,D0,A9,81,8D
290 DATA 19,D0,8D,1A,D0,AD,0E,DC,29
300 DATA FE,8D,0E,DC,AD,16,D0,29,F7
310 DATA 09,07,8D,16,D0,A9,E0,85,FB

```



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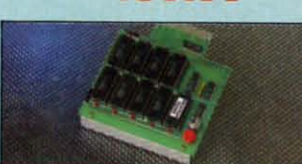
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```

•320 DATA A9,CC,85,FC,C6,FB,58,60,AD
•330 DATA 19,D0,29,01,F0,23,C6,FD,10
•340 DATA 04,A9,07,85,FD,C6,FD,AD,16
•350 DATA D0,29,F0,05,FD,8D,16,D0,A9
•360 DATA 79,8D,14,03,A9,CC,8D,15,03
•370 DATA A9,A4,8D,12,D0,A9,81,8D,19
•380 DATA D0,8D,1A,D0,AD,0D,DC,68,A8
•390 DATA 68,AA,68,40,AD,19,D0,29,01
•400 DATA F0,48,AD,16,D0,09,07,8D,16
•410 DATA D0,A5,FD,D0,2D,A8,C8,B9,08
•420 DATA 06,88,99,08,06,4C,9A,CC,EA
•430 DATA EA,C8,C0,28,D0,EE,A0,00,E6
•440 DATA FB,D0,02,E6,FC,B1,FB,D0,0B
•450 DATA A9,E0,85,FB,A9,CC,85,FC,4C
•460 DATA A7,CC,8D,2F,06,A9,3E,8D,14
•470 DATA 03,A9,CC,8D,15,03,A9,90,8D
•480 DATA 12,D0,A9,81,8D,19,D0,8D,1A
•490 DATA D0,4C,31,EA,00
•500 REM -MESSAGE WRITER-
•510 A=52448:POKE204,0:PRINT"MESSAGE:"
•520 GET A$:IF A$="" THEN 520
•530 IF A$=CHR$(13) THEN POKEA,0:END
•540 IF ASC(A$)<65 THEN PRINTA$;:POKEA,ASC(A$):A=A+1:GOTO 520
•550 PRINTA$;:POKEA,ASC(A$)-64:A=A+1:GOTO 520

```

## C-128 EASY MERGE

While looking at a memory map of the C-128, I discovered a method of merging two programs without using a bunch of PEEKs and POKEs.

First you must create a sequential file of the program you want to merge with the main program. This is done with the following commands:

```

OPEN 8,8,8,"filename.ASC,S,W":CMD8:LIST:
PRINT#8:CLOSE8

```

Then load the main program and type:

```

OPEN 8,8,8,"filename.ASC":BANK15:SYS6547
8,0,8:CLOSE8

```

The SYS is a standard Commodore kernal jump which sets a specified channel for input.

You may get a Syntax error but ignore it. This is a true merge (lines with same numbers will be replaced).

—Steve Stutts  
Loretto, TN

## QUOTE SWITCHER

Quote mode, the strange transformation that comes over your Commodore 64 when you press SHIFT-2, can be very useful for entering certain cursor positioning and control commands that would otherwise only be available through tedious CHR\$ codes. However, it can become extremely frustrating, especially when editing PRINT statements. To avoid getting high blood pressure from using quote mode,

simply run this short BASIC program. It POKEs a short machine language program into memory locations 49152-49189 and enables it. Now, to enter quote mode, just press the f1 key. To get out of quote mode, press f3. If at some point during your programming, you press RUN STOP/RESTORE, you will have to enter SYS 49152 in order to reenable *Quote Switcher*.

—Jeremy Baer  
Mulino, OR

```

•5 T=0:SA=49152
•10 FOR C=SATOSA+37:READD:T=T+D:POKEC,D:NEXT
•15 IF T<>4252THENPRINT"[CLEAR][BLACK]ERROR IN DATA STATEMENTS!":STOP
•20 SYS 49152
•25 PRINT"[CLEAR][CYAN]QUOTE SWITCHER INSTALLED":STOP
•49152 DATA 120,169,13,141,20,3
•49158 DATA 169,192,141,21,3,88
•49164 DATA 96,165,197,201,5,208
•49170 DATA 7,169,0,133,212,76
•49176 DATA 34,192,201,4,208,4
•49182 DATA 169,1,133,212,76,49
•49188 DATA 234,186

```

## AUTO INSERT

What Commodore user hasn't typed a command over screen info without thinking, with a SYNTAX ERROR for the effort? This ML routine (for the C-128 only) all but eliminates this nuisance. After any direct-mode operation, e.g., a program edit, a line-insert leaves the cursor flashing in an empty line, and a bell dings to say that it's ready for more input.

The program asks for a load address. Any RAM area with 28 free bytes can be used. Once loaded, key F8 (or POKE250,1) activates it and key F6 (or POKE250,0) turns it off. Delete line 5 if this will interfere with needed F-key definitions.

Only a cold reset will disable it, whence a SYS call restarts it. The program will tell you what to use.

—Bob Renaud  
Washington, MA

```


•1 INPUT"[CLEAR]ML ADDRESS";A:B=A+27:C=A+11
•2 FORJ=ATOB:READD:V=V+D:POKEJ,D:NEXT
•3 IFV<>2744THENPRINT"[DOWN][RVSON]DATA ERROR!":END
•4 L%=CAND255:H%=C/256:POKEA+1,L%:POKEA+6,H%:SYSA
•5 KEY6,"POKE250,0"+CHR$(13):KEY8,"POKE250,1"+CHR$(13)
•6 PRINT"AFTER RESET, ENTER 'SYS'A"[LEFT]":END
•7 DATA 169,198,141,002,003,169,077
•8 DATA 141,003,003,096,165,250,208
•9 DATA 003,076,198,077,032,129,146
•10 DATA 027,073,007,000,076,198,077

```



# 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 listings guide on this page.**

 In 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; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). 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 C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

**Call Ahoy! at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).**

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	S	[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	π	[F6]	Function 6	SHIFT F5	■
[EP]	English Pound	£	£	[F7]	Function 7	F7	■
				[F8]	Function 8	SHIFT F7	■



# BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent*. You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

## C-64 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3".]":J
=49152
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
50 X=0:J=J+12:IFJ<49456THEN20
60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)":A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3".]":GOTO150
90 POKE49456,1:INPUT"DISK OR TAPE (D/T)":C$:IFC$<>"D"THE
ND=1:D$="TAPE"
100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)":N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME":F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE49458,L:FORJ=1TO L:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)":B$:IFB$<>"Y"THEN6
0
160 POKE770,131:POKE771,164:SYS49152:END
170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
220 DATA32,197,169,32,121,165,173,0,2,240,5,169,1215
230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500

```

## C-128 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3".]":J
=4864
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
50 X=0:J=J+12:IFJ<5213THEN20
60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)":A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3".]":GOTO150
90 POKE5213,1:INPUT"DISK OR TAPE (D/T)":C$:IFC$<>"D"THEN
D=1:D$="TAPE"
100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)":N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME":F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE5215,L:FORJ=1TO L:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)":B$:IFB$<>"Y"THEN6
0
160 POKE770,198:POKE771,77:SYS4864:END
170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339

```



# 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 previous 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. It temporarily freezes the output as well.

•100 POKE53280,12:POKE53281,11	OP	5	IK
•105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";	FP	•390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:	HK
•110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "]	JP	GOTO415	DM
•115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]	FA	•395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415	JK
•120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.	ND	•400 PRINT"?ERROR IN SAVE":GOTO415	IO
[3" "]	AJ	•405 PRINT"?ERROR IN LOAD":GOTO415	JO
•125 FORA=54272TO54296:POKEA,0:NEXT	NP	•410 PRINT:PRINT"END OF ML AREA":PRINT	BF
•130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO	FL	•415 POKE54276,17:POKE54276,16:RETURN	DH
KE54296,15	FF	•420 OPEN15,8,15:INPUT#15,A,A\$:CLOSE15:PRINTA\$:RETURN	IM
•135 FORA=680TO699:READB:POKEA,B:NEXT	EX	•425 REM GET FOUR DIGIT HEX	OL
•140 DATA169,251,166,253,164,254,32,216,255,96	KP	•430 PRINT:PRINTB\$;:INPUT\$	JD
•145 DATA169,0,166,251,164,252,32,213,255,96	OE	•435 IFLEN(T\$)<>4THENGOSUB380:GOTO430	AK
•150 B\$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B	AM	•440 FORA=1TO4:A\$=MID\$(T\$,A,1):GOSUB450:IFT(A)=16THENGOSUB	KB
•155 GOSUB480:IFB=0THEN150	PE	380:GOTO430	GM
•160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16	PG	•445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN	NJ
•165 B\$="ENDING ADDRESS IN HEX":GOSUB430:EN=B	GM	•450 IFA\$>"@ANDAS\$<"G"THENT(A)=ASC(A\$)-55:RETURN	IC
•170 GOSUB470:IFB=0THEN150	HG	•455 IFA\$>"/ANDAS\$<":"THENT(A)=ASC(A\$)-48:RETURN	OL
•175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16	EC	•460 T(A)=16:RETURN	HO
•180 IFB>255THENB=B-255:POKE254,PEEK(254)+1	ED	•465 REM ADDRESS CHECK	LE
•185 POKE253,B:PRINT	KD	•470 IFAD>ENTHEN385	OB
•190 REM GET HEX LINE	IH	•475 IFB<SRORB>ENTHEN390	HE
•195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8	IJ	•480 IFB<256OR(B>4096ANDB<49152)ORB>53247THEN395	PM
•200 FORB=0TO1:GOTO250	FA	•485 RETURN	AP
•205 NEXTB	EG	•490 REM ADDRESS TO HEX	NF
•210 A\$(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340	II	•495 AC=AD:A=4096:GOSUB520	LG
•215 PRINT" [c P][LEFT]";	GL	•500 A=256:GOSUB520	HE
•220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "	GI	•505 A=16:GOSUB520	JD
•225 FORA=0TO7:T=T+A\$(A):IFT>255THENT=T-255	FL	•510 A=1:GOSUB520	OC
•230 NEXT	IM	•515 RETURN	JI
•235 IFA\$(8)<>TTHENGOSUB375:GOTO195	PA	•520 T=INT(AC/A):IFT>9THENA\$=CHR\$(T+55):GOTO530	AA
•240 FORA=0TO7:POKEAD+A,A\$(A):NEXT:AD=AD+8:GOTO195	GA	•525 A\$=CHR\$(T+48)	IC
•245 REM GET HEX INPUT	GO	•530 PRINTA\$;:AC=AC-A*T:RETURN	AB
•250 GETA\$:IFA\$=""THEN250	LM	•535 A\$="**SAVE**":GOSUB585	FB
•255 IFA\$=CHR\$(20)THEN305	IG	•540 OPEN1,T,1,A\$:SYS680:CLOSE1	PM
•260 IFA\$=CHR\$(133)THEN535	HO	•545 IFST=0THENEND	FI
•265 IFA\$=CHR\$(134)THEN560	HE	•550 GOSUB400:IFT=8THENGOSUB420	PE
•270 IFA\$=CHR\$(135)THENPRINT" ":GOTO620	MI	•555 GOTO535	PO
•275 IFA\$=CHR\$(136)THENPRINT" ":GOTO635	DJ	•560 A\$="**LOAD**":GOSUB585	OI
•280 IFA\$>"@ANDAS\$<"G"THENT(B)=ASC(A\$)-55:GOTO295	JA	•565 OPEN1,T,0,A\$:SYS690:CLOSE1	CO
•285 IFA\$>"/ANDAS\$<":"THENT(B)=ASC(A\$)-48:GOTO295	PK	•570 IFST=64THEN195	GN
•290 GOSUB415:GOTO250	FA	•575 GOSUB405:IFT=8THENGOSUB420	KA
•295 PRINTA\$"[c P][LEFT]";	BI	•580 GOTO560	IO
•300 GOTO205	BB	•585 PRINT" ":PRINTTAB(14)A\$	HK
•305 IFA>0THEN320	FA	•590 PRINT:A\$=""INPUT"FILENAME";A\$	HL
•310 A=-1:IFB=1THEN330	BF	•595 IFA\$=""THEN590	NP
•315 GOTO220	FK	•600 PRINT:PRINT"TAPE OR DISK?":PRINT	KO
•320 IFB=0THENPRINTCHR\$(20);CHR\$(20);:A=A-1	PH	•605 GETB\$:T=1:IFB\$="D"THENT=8:A\$="@0:"A\$:RETURN	PH
•325 A=A-1	CP	•610 IFB\$<>"T"THEN605	DD
•330 PRINTCHR\$(20);:GOTO220	KH	•615 RETURN	NK
•335 REM LAST LINE	OD	•620 B\$="CONTINUE FROM ADDRESS":GOSUB430:AD=B	HN
•340 PRINT" ":T=AD-(INT(AD/256)*256)	OB	•625 GOSUB475:IFB=0THEN620	FK
•345 FORB=0TOA-1:T=T+A\$(B):IFT>255THENT=T-255	LH	•630 PRINT:GOTO195	LN
•350 NEXT	BO	•635 B\$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B	HI
•355 IFA\$(A)<>TTHENGOSUB375:GOTO195	MB	•640 GOSUB475:IFB=0THEN635	LM
•360 FORB=0TOA-1:POKEAD+B,A\$(B):NEXT	LM	•645 PRINT:GOTO670	LE
•365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535	JK	•650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G	CD
•370 REM BELL AND ERROR MESSAGES	PG	OSUB410:GOTO195	JD
•375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415		•655 PRINT" ";:NEXTB	KE
•380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415		•660 PRINT:AD=AD+8	
•385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41		•665 GETB\$:IFB\$=CHR\$(136)THEN195	
		•670 GOSUB495:PRINT" ";:GOTO650	



# ADrift IN A SEA OF FLOATING POINT NUMBERS FROM PAGE 32

## FLOATING POINT CONVERTER

```

•1 REM===== NM
•2 REM JD
•3 REM FLOATING POINT CONVERTER PB
•4 REM RUPERT REPORT #60 OF
•5 REM JC
•6 REM===== CL
•10 PRINT"[CLEAR]FLOATING POINT CONVERTER
" IN
•15 PRINT "[24="]" IP
•20 X0=SQR(36) :REM: X0 MUST BE FIRST V
ARIABLE AI
•30 SP$="[39" "]+CHR$(13) OK
•40 DEF FNPTR(M)=PEEK(M)+256*PEEK(M+1) BG
•60 FALSE=0: TRUE=NOT FALSE: C64=FALSE GI
•70 IF FRE(0)=FRE(1) THEN C64=TRUE EH
•80 VP=47: IF C64 THEN VP=45 :REM START
VARIABLES POINTER AD
•90 SV=FNPTR(VP) :REM START VARIABLES FA
•100 S1=SV+2: S2=SV+3: S3=SV+4: S4=SV+5:
S5=SV+6 :REM STORAGE AREA FOR X0 GP
•110 IF NOT C64 THEN BANK 1 DI
•200 REM ===== FP TO STORED VALUES == IF
•210 PRINT "(X TO SWITCH MODES; Q TO QUIT
)" IJ
•220 PRINT "ENTER FLOATING PT. VALUE : " AC
•225 INPUT X$: IF X$="" THEN 260 EE
•230 IF X$="Q" THEN END ED
•240 IF X$="X" THEN PRINT "[3"[UP]]";SP$
;SP$;"[3"[UP]]": GOTO 310 DN
•250 X0=VAL(X$) MF
•260 V1=PEEK(S1): V2=PEEK(S2): V3=PEEK(S3)
): V4=PEEK(S4): V5=PEEK(S5) MK
•270 GOSUB 1010 FK
•280 GOTO 210 DA
•300 REM ===== STORED VALUES TO FP == GG
•310 PRINT: PRINT "(X TO SWITCH MODES; Q
TO QUIT)" HE
•320 PRINT "ENTER 5 STORED VALUES (0 TO
255) : " PL
•330 INPUT "FIRST VALUE";X1$: V1=VAL(X1$) DO
•340 IF X1$="X" THEN PRINT "[3"[UP]]";SP
$;SP$;SP$;"[4"[UP]]": GOTO 210 AC
•350 IF X1$="Q" THEN END PF
•360 INPUT "2ND VALUE";X2$: V2=VAL(X2$) NC
•370 INPUT "3RD VALUE";X3$: V3=VAL(X3$) AM
•380 INPUT "4TH VALUE";X4$: V4=VAL(X4$) PA
•390 INPUT "5TH VALUE";X5$: V5=VAL(X5$) EG

```

```

•400 POKE S1,V1: POKE S2,V2: POKE S3,V3:
POKE S4,V4: POKE S5,V5 KJ
•410 GOSUB 1010 OG
•420 GOTO 310 MF
•1000 REM ===== CONVERSION & OUTPUT ===== AO
•1010 PRINT V1; V2; V3; V4; V5 EG
•1020 REM -- EXPONENT, MANTISSA, SIGN -- KL
•1030 EX=V1-128 EA
•1040 MN=((V5/256+V4)/256+V3)/256 + (128
OR V2))/256 CC
•1050 SN=1: IF V2 >= 128 THEN SN=-1 II
•1060 PRINT "[RVSON]"; SN*MN; "[RVSOFF]*
2[UPARROW][RVSON]"; EX; "[RVSOFF] = [RV
SON]"; X0; "[RVSOFF]": PRINT KD
•1070 RETURN MA

```

## TUBULAR FROM PAGE 18

Starting address in hex: C000

Ending address in hex: CF3F

SYS to start: 49152

Flankspeed required for entry! See page 63.

```

C000: 20 AB C5 A9 00 8D 0B DC B0
C008: 8D 0A DC 8D 09 DC 8D 08 85
C010: DC 20 CA C1 20 61 C4 20 FF
C018: 05 C6 20 F4 C1 20 C2 C0 5E
C020: 20 35 C3 20 9A C2 20 48 1F
C028: C2 20 17 C3 20 E8 C0 20 CF
C030: 78 C1 20 E1 FF D0 03 4C 8C
C038: 5F C0 AD F7 C9 C9 10 D0 72
C040: 19 EE E2 C9 AD E2 C9 C9 19
C048: 10 D0 03 4C 3A C1 20 00 94
C050: C1 20 48 C2 20 C2 C0 4C 2D
C058: 20 C0 AD E4 C9 F0 C1 A9 F1
C060: 81 8D 04 D4 A9 E0 8D F8 59
C068: 07 A0 1E A2 FF 8C 00 D4 32
C070: 20 E8 C0 E8 88 8C 01 D4 0E
C078: A9 00 9D 00 38 9D 1A 38 E7
C080: C0 00 D0 EC A9 80 8D 04 BA
C088: D4 AD FF 07 C9 E6 F0 1A CD
C090: 20 A9 C6 20 61 C4 20 48 CF
C098: C2 CE FF 07 A9 00 8D E4 4D
C0A0: C9 8D E3 C9 20 C2 C0 4C 95
C0A8: 20 C0 A2 00 BD 31 C9 9D 82
C0B0: AF 04 A9 06 9D AF D8 E8 23
C0B8: E0 09 D0 F0 20 C2 C0 4C 54
C0C0: 11 C0 A2 00 BD 26 C9 9D 80
C0C8: FE 04 A9 06 9D FE D8 E8 D9
C0D0: E0 0B D0 F0 AD 00 DC C9 D2
C0D8: 6F D0 F9 A2 00 A9 A0 9D 9D
C0E0: FE 04 E8 E0 0B D0 F8 60 E2
C0E8: EE F5 C9 AD F5 C9 D0 F8 CE
C0F0: EE F6 C9 AD F6 C9 C9 18 F0
C0F8: D0 EE A9 00 8D F6 C9 60 11

```



C100:	AD	AE	C7	8D	6F	C7	AD	F1	88	C2D0:	F0	06	E8	E0	0E	D0	F3	60	C4
C108:	C7	8D	B2	C7	AD	14	C8	8D	EF	C2D8:	AD	F8	C9	DD	C6	C9	F0	B9	62
C110:	F5	C7	18	AD	AE	C7	69	10	83	C2E0:	EE	F8	C9	20	FF	C2	60	AD	83
C118:	8D	AE	C7	18	AD	F1	C7	69	05	C2E8:	F8	07	C9	E2	D0	08	A9	E3	FB
C120:	0C	8D	F1	C7	18	AD	14	C8	16	C2F0:	8D	F8	07	4C	FB	C2	A9	E2	16
C128:	69	0E	8D	14	C8	20	A9	C6	9A	C2F8:	8D	F8	07	CE	FA	C9	60	AD	28
C130:	20	F4	C1	20	61	C4	20	AC	1A	C300:	F8	07	C9	E0	D0	08	A9	E1	0F
C138:	C1	60	A2	00	BD	56	C9	9D	78	C308:	8D	F8	07	4C	13	C3	A9	E0	43
C140:	AF	04	A9	03	9D	AF	D8	E8	AF	C310:	8D	F8	07	EE	FA	C9	60	AC	5E
C148:	E0	09	D0	F0	A2	00	BD	5F	B3	C318:	F2	C9	A2	00	B9	5C	C8	9D	F3
C150:	C9	9D	26	07	E8	E0	1B	D0	9A	C320:	6B	31	C8	E8	E0	05	D0	F4	1A
C158:	F5	A9	17	8D	F7	C1	A9	16	16	C328:	8C	F2	C9	C0	14	D0	05	A0	BC
C160:	8D	2B	C2	20	F4	C1	AD	00	60	C330:	00	8C	F2	C9	60	A9	00	8D	11
C168:	DC	C9	6F	D0	F6	A9	41	8D	BE	C338:	F3	C9	AD	FA	C9	8D	4A	C3	04
C170:	F7	C1	8D	2B	C2	4C	11	C0	C3	C340:	AD	FB	C9	8D	4B	C3	AE	F3	F2
C178:	AD	09	DC	29	0F	C9	00	D0	DE	C348:	C9	AD	00	60	9D	E5	C9	AD	1B
C180:	01	60	8D	7E	C1	CE	FA	07	80	C350:	4A	C3	9D	E9	C9	AD	4B	C3	6C
C188:	AD	FA	07	C9	E4	F0	01	60	39	C358:	9D	ED	C9	18	AD	4A	C3	69	EA
C190:	A9	EE	8D	FA	07	CE	F9	07	88	C360:	80	8D	4A	C3	B0	03	4C	6C	E8
C198:	AD	F9	07	C9	E4	F0	01	60	48	C368:	C3	EE	4B	C3	EE	F3	C9	AD	84
C1A0:	A9	E5	8D	F9	07	8D	FA	07	4E	C370:	F3	C9	C9	04	D0	D0	AD	E5	31
C1A8:	EE	E4	C9	60	AD	FF	07	C9	25	C378:	C9	C9	2A	D0	04	20	BC	C3	AB
C1B0:	EE	F0	03	EE	FF	07	EE	FE	77	C380:	60	AD	E8	C9	C9	29	D0	04	09
C1B8:	07	AD	FE	07	C9	EF	F0	01	1F	C388:	20	F5	C3	60	AD	E7	C9	C9	EB
C1C0:	60	A9	E5	8D	FE	07	EE	FD	31	C390:	2D	D0	28	A9	17	8D	0B	D4	E4
C1C8:	07	60	A9	00	8D	E2	C9	8D	A1	C398:	A9	FF	8D	08	D4	AD	EB	C9	10
C1D0:	6F	C7	8D	B2	C7	8D	F5	C7	5B	C3A0:	8D	AC	C3	AD	EF	C9	8D	AD	41
C1D8:	A9	10	8D	AE	C7	A9	0C	8D	D9	C3A8:	C3	A9	20	8D	00	60	20	37	7B
C1E0:	F1	C7	A9	0E	8D	14	C8	A0	5D	C3B0:	C4	A0	FF	88	D0	FD	A9	16	2D
C1E8:	E5	8C	FD	07	C8	8C	FE	07	BB	C3B8:	8D	0B	D4	60	A9	00	8D	F3	B1
C1F0:	8C	FF	07	60	A0	00	A9	41	70	C3C0:	C9	A9	81	8D	12	D4	A9	03	D6
C1F8:	8D	04	D4	8D	0B	D4	AE	F1	6D	C3C8:	8D	0F	D4	A9	E4	8D	F8	07	56
C200:	C9	BD	98	C9	AA	BD	7A	C9	96	C3D0:	20	E8	C0	CE	F7	C9	20	48	93
C208:	8D	00	D4	BD	89	C9	8D	01	0A	C3D8:	C2	20	2E	C4	EE	F3	C9	AD	09
C210:	D4	AE	F1	C9	BD	A8	C9	AA	2A	C3E0:	F3	C9	C9	04	D0	EA	CE	F8	EF
C218:	BD	7A	C9	8D	07	D4	BD	89	CA	C3E8:	07	CE	FB	C9	CE	FB	C9	A9	C2
C220:	C9	8D	08	D4	20	E8	C0	20	3E	C3F0:	80	8D	12	D4	60	A9	00	8D	7D
C228:	E8	C0	A9	41	8D	04	D4	8D	B0	C3F8:	F3	C9	A9	81	8D	12	D4	A9	FF
C230:	0B	D4	EE	F1	C9	C8	C0	10	54	C400:	02	8D	0F	D4	A9	E4	8D	F8	88
C238:	D0	BC	A9	40	8D	04	D4	8D	A3	C408:	07	20	E8	C0	EE	F7	C9	20	A9
C240:	0B	D4	A9	00	8D	F1	C9	60	73	C410:	48	C2	20	2E	C4	EE	F3	C9	DA
C248:	AD	F8	C9	85	FB	A9	60	85	C9	C418:	AD	F3	C9	C9	04	D0	EA	CE	DB
C250:	FC	AE	F7	C9	E0	00	F0	10	9F	C420:	F8	07	EE	FB	C9	EE	FB	C9	89
C258:	A5	FB	18	69	80	85	FB	A5	23	C428:	A9	80	8D	12	D4	60	A0	C8	90
C260:	FC	69	00	85	FC	CA	D0	F0	D5	C430:	8C	0E	D4	88	D0	FA	60	EE	43
C268:	A9	76	85	02	A9	05	85	03	47	C438:	E3	C9	AD	E3	C9	C9	0E	D0	E9
C270:	A2	08	A0	0A	B1	FB	91	02	07	C440:	03	20	58	C4	EE	FC	07	AD	21
C278:	88	10	F9	18	A5	02	69	28	5C	C448:	FC	07	C9	EF	F0	01	60	A9	02
C280:	85	02	A5	03	69	00	85	03	A2	C450:	E5	8D	FC	07	EE	FB	07	60	1A
C288:	18	A5	FB	69	80	85	FB	A5	53	C458:	A9	2A	8D	BF	6A	8D	3F	6B	1C
C290:	FC	69	00	85	FC	CA	10	DA	2F	C460:	60	A2	00	8A	9D	00	38	9D	61
C298:	60	60	AD	00	DC	C9	7F	F0	1E	C468:	00	39	9D	00	3A	9D	00	3B	52
C2A0:	F8	C9	7B	D0	1F	A2	00	AD	1F	C470:	E8	E0	00	D0	EF	A2	00	A0	3E
C2A8:	F7	C9	DD	B8	C9	F0	06	E8	AA	C478:	00	BD	70	C8	99	00	38	BD	FE
C2B0:	E0	0E	D0	F3	60	AD	F8	C9	35	C480:	7F	C8	99	00	39	C8	C8	C8	F5
C2B8:	DD	D4	C9	F0	DC	CE	F8	C9	94	C488:	E8	E0	0F	D0	EC	A2	00	BD	7F
C2C0:	20	E7	C2	60	C9	77	D0	1E	1C	C490:	8E	C8	9D	43	38	BD	B7	C8	3F
C2C8:	A2	00	AD	F7	C9	DD	B8	C9	3B	C498:	9D	80	38	BD	E0	C8	9D	C3	B7



C4A0:	38	E8	E0	29	D0	E9	A9	00	30	C670:	A9	03	9D	4E	D9	9D	DE	DA	3A
C4A8:	8D	F3	C9	A0	00	A2	00	BD	F4	C678:	E8	E0	0B	D0	F3	A2	00	BD	72
C4B0:	80	31	99	40	39	C8	C8	C8	CF	C680:	09	C9	9D	25	07	A9	03	9D	67
C4B8:	E8	E0	08	D0	F2	18	AD	B3	C7	C688:	25	DB	9D	00	D8	A9	A0	9D	E7
C4C0:	C4	69	40	8D	B3	C4	B0	03	E8	C690:	00	04	E8	E0	1D	D0	E8	A2	D7
C4C8:	4C	CE	C4	EE	B4	C4	18	AD	D6	C698:	00	BD	3A	C9	9D	0C	04	A9	B1
C4D0:	B0	C4	69	08	8D	B0	C4	EE	A9	C6A0:	03	9D	0C	D8	E8	E0	1C	D0	DC
C4D8:	F3	C9	AD	F3	C9	C9	0A	D0	A6	C6A8:	F0	A2	00	A9	23	9D	00	60	07
C4E0:	CA	A9	31	8D	B1	C4	A9	80	B4	C6B0:	E8	A9	24	9D	00	60	E8	E0	2F
C4E8:	8D	B0	C4	A9	39	8D	B4	C4	D5	C6B8:	00	D0	F0	EE	B5	C6	EE	AF	84
C4F0:	A9	40	8D	B3	C4	A9	03	8D	1B	C6C0:	C6	AD	AF	C6	C9	A0	D0	E1	C8
C4F8:	AA	38	A9	C0	8D	01	38	A9	B6	C6C8:	A9	60	8D	AF	C6	8D	B5	C6	E0
C500:	80	8D	04	38	8D	07	38	A9	C0	C6D0:	A9	00	8D	F3	C9	A9	BE	8D	BB
C508:	40	8D	22	38	A9	03	8D	AA	15	C6D8:	19	C8	A9	69	8D	1A	C8	A9	E7
C510:	38	A9	73	8D	FA	C9	A9	83	E4	C6E0:	02	8D	F3	C6	A2	00	A9	25	9C
C518:	8D	FB	C9	A2	00	A9	00	9D	55	C6E8:	20	18	C8	E8	A9	20	20	18	D4
C520:	E3	C9	E8	E0	15	D0	F8	A2	19	C6F0:	C8	E8	E0	02	D0	F6	A9	26	1D
C528:	00	BD	7C	C5	9D	00	D0	E8	7F	C6F8:	20	18	C8	18	AD	19	C8	69	0B
C530:	E0	2F	D0	F5	A9	64	A2	00	B7	C700:	7F	8D	19	C8	B0	03	4C	0C	FA
C538:	BD	63	C5	9D	00	D4	E8	E0	5B	C708:	C7	EE	1A	C8	EE	F3	C6	EE	3A
C540:	19	D0	F5	A9	6E	8D	F8	C9	88	C710:	F3	C6	EE	F3	C9	AD	F3	C9	E2
C548:	A9	44	8D	F7	C9	A9	E2	8D	9F	C718:	C9	37	D0	C8	A9	00	8D	F3	DD
C550:	F8	07	A9	E5	8D	FA	07	8D	FC	C720:	C9	A9	BC	8D	19	C8	A9	6A	D3
C558:	FB	07	8D	FC	07	A9	EE	8D	13	C728:	8D	1A	C8	A9	07	8D	3C	C7	DA
C560:	F9	07	60	00	00	00	08	00	C9	C730:	8D	46	C7	A2	00	A9	27	20	5F
C568:	00	F8	00	00	00	08	00	0A	73	C738:	18	C8	E8	E0	01	F0	0A	A9	88
C570:	09	FF	40	00	00	80	69	69	0D	C740:	28	20	18	C8	E8	E0	01	D0	05
C578:	00	00	00	0F	AE	93	4C	DE	F4	C748:	EC	38	AD	19	C8	E9	04	8D	78
C580:	5C	DE	8C	DE	9C	DE	CC	DE	4E	C750:	19	C8	18	AD	3C	C7	69	08	6D
C588:	DC	DE	0C	DE	80	1B	00	00	CA	C758:	8D	3C	C7	8D	46	C7	EE	1A	8E
C590:	00	FF	D8	FE	1D	00	00	01	86	C760:	C8	EE	1A	C8	EE	F3	C9	AD	55
C598:	01	FE	00	00	0C	00	09	0E	BB	C768:	F3	C9	C9	0E	D0	C5	A9	00	3E
C5A0:	01	0B	07	0A	01	01	01	01	C1	C770:	8D	F3	C9	AE	F3	C9	BD	00	E5
C5A8:	01	01	01	AD	0E	DC	29	FE	6C	C778:	CA	8D	8A	C7	BD	00	CB	8D	3A
C5B0:	8D	0E	DC	A5	01	29	FB	85	7A	C780:	8B	C7	A9	00	8D	F4	C9	A9	73
C5B8:	01	A2	00	BD	00	D0	9D	00	88	C788:	2A	8D	00	60	18	AD	8A	C7	B8
C5C0:	30	E8	E0	00	D0	F5	EE	BD	2E	C790:	69	80	8D	8A	C7	B0	03	4C	5A
C5C8:	C5	EE	C0	C5	AD	C0	C5	C9	02	C798:	9D	C7	EE	8B	C7	EE	F4	C9	ED
C5D0:	37	D0	E6	A9	30	8D	C0	C5	AD	C7A0:	AD	F4	C9	C9	02	D0	E0	EE	79
C5D8:	A9	D0	8D	BD	C5	A5	01	09	14	C7A8:	F3	C9	AD	F3	C9	C9	10	D0	7C
C5E0:	04	85	01	AD	0E	DC	09	01	0E	C7B0:	C2	A9	00	8D	F3	C9	AE	F3	0B
C5E8:	8D	0E	DC	A2	00	BD	1C	C8	A6	C7B8:	C9	BD	00	CC	8D	CD	C7	BD	ED
C5F0:	9D	18	31	E8	E0	40	D0	F5	A8	C7C0:	C0	CC	8D	CE	C7	A9	00	8D	A9
C5F8:	A2	00	A9	00	9D	58	31	E8	55	C7C8:	F4	C9	A9	29	8D	00	60	18	60
C600:	E0	18	D0	F6	60	A9	9A	20	85	C7D0:	AD	CD	C7	69	80	8D	CD	C7	21
C608:	D2	FF	A9	93	20	D2	FF	A2	AD	C7D8:	B0	03	4C	E0	C7	EE	CE	C7	07
C610:	00	A9	A0	9D	00	04	9D	00	99	C7E0:	EE	F4	C9	AD	F4	C9	C9	02	C6
C618:	05	9D	00	06	9D	E8	06	E8	36	C7E8:	D0	E0	EE	F3	C9	AD	F3	C9	B2
C620:	E0	00	D0	ED	A9	9B	20	D2	F7	C7F0:	C9	0C	D0	C2	A9	00	8D	F3	85
C628:	FF	A2	09	A0	0E	18	20	F0	AB	C7F8:	C9	AE	F3	C9	BD	80	CD	8D	C8
C630:	FF	A9	20	20	D2	FF	C8	C0	76	C800:	0B	C8	BD	60	CE	8D	0C	C8	23
C638:	19	D0	F2	E8	E0	12	D0	EB	AD	C808:	A9	2D	8D	00	60	EE	F3	C9	79
C640:	A9	9F	20	D2	FF	A9	12	20	58	C810:	AD	F3	C9	C9	0E	D0	E2	60	67
C648:	D2	FF	A0	0D	A2	08	18	20	AB	C818:	9D	00	60	60	55	7D	7D	55	1C
C650:	F0	FF	A9	20	20	D2	FF	E8	E6	C820:	D7	DF	DF	57	5D	DF	DF	57	83
C658:	E0	13	D0	F2	A0	19	A2	08	74	C828:	D5	F7	F7	D7	7D	FD	F4	F4	2B
C660:	18	20	F0	FF	A9	20	20	D2	46	C830:	D0	D0	40	40	7D	7F	1F	1F	8D
C668:	FF	E8	E0	13	D0	F2	A2	00	AB	C838:	07	07	01	01	55	7F	55	FD	70



C840: 55 7F 55 00 55 FF 55 FF 15  
 C848: 55 FF 05 00 AA A2 A2 A2 35  
 C850: A2 80 A2 AA 55 51 40 51 F8  
 C858: 51 51 51 55 00 41 14 41 38  
 C860: 00 00 82 28 82 00 00 C3 51  
 C868: 3C C3 00 00 82 14 82 00 81  
 C870: 0F 3A 3A 0A 05 05 05 05 12  
 C878: 0D 05 05 01 15 31 03 06 DF  
 C880: 0F 0F 0F 05 05 15 15 15 F6  
 C888: 15 15 11 11 11 33 0F C0 E8  
 C890: 00 3A 80 00 3A 80 00 0A 10  
 C898: 00 00 05 00 00 05 00 00 A2  
 C8A0: 05 00 00 05 00 00 05 C0 70  
 C8A8: 00 05 00 00 05 00 00 10 C2  
 C8B0: 40 00 40 10 00 C0 30 0F 41  
 C8B8: C0 00 0A B0 00 0A B0 00 EE  
 C8C0: 02 80 00 01 40 00 01 40 C5  
 C8C8: 00 01 40 00 01 40 00 03 4E  
 C8D0: 40 00 01 40 00 01 40 00 93  
 C8D8: 05 00 00 01 50 00 01 30 60  
 C8E0: 0F C0 00 0A B0 00 0A B0 26  
 C8E8: 00 02 80 00 01 40 00 01 AD  
 C8F0: 40 00 01 40 00 01 40 00 B3  
 C8F8: 0D 40 00 01 40 00 01 40 C8  
 C900: 00 04 10 00 10 04 00 30 58  
 C908: 0C A0 83 8C 8F 83 8B A0 04  
 C910: A0 A0 82 85 8C 8C 93 A0 A6  
 C918: A0 A0 8C 85 96 85 8C A0 B4  
 C920: A0 A0 8D 85 8E A0 90 92 C6  
 C928: 85 93 93 A0 A0 86 89 92 B8  
 C930: 85 87 81 8D 85 A0 8F 96 98  
 C938: 85 92 94 A0 95 A0 82 A0 DE  
 C940: 95 A0 8C A0 81 A0 92 A0 F8  
 C948: A1 A0 A0 A0 A0 A0 A0 A0 4E  
 C950: A0 A0 A0 A0 A0 A0 A0 81 36  
 C958: 97 85 93 8F 8D 85 A0 A0 EC  
 C960: B1 B6 A0 8E 85 97 A0 8C 42  
 C968: 85 96 85 8C 93 A0 83 8F DD  
 C970: 8D 89 8E 87 A0 93 8F 8F F0  
 C978: 8E A0 00 0C E9 61 68 8F F6  
 C980: 30 8F 18 D2 C3 D1 1F 60 40  
 C988: 1E 00 07 07 08 09 0A 0B DA  
 C990: 0C 0E 0F 10 12 15 16 19 20  
 C998: 05 08 05 08 05 06 05 04 C6  
 C9A0: 06 05 04 03 02 04 02 01 BB  
 C9A8: 05 01 01 01 01 04 04 04 BD  
 C9B0: 04 01 01 01 01 05 05 01 C3  
 C9B8: 44 40 3C 38 34 30 2C 28 6A  
 C9C0: 24 20 1C 18 14 10 6E 6A 36  
 C9C8: 66 62 5E 5A 56 52 4E 4A 8B  
 C9D0: 46 42 3E 3A 06 0A 0E 12 02  
 C9D8: 16 1A 1E 22 26 2A 2E 32 F9  
 C9E0: 36 3A 00 00 00 00 00 00 51  
 C9E8: 00 00 00 00 00 00 00 00 E8  
 C9F0: 00 00 00 00 00 00 00 00 F0  
 C9F8: 00 00 73 83 00 00 00 00 EF  
 CA00: C0 B7 AD B9 A9 BF AF B7 B0  
 CA08: BD B7 C3 C1 C1 C1 C1 0A

CA10: AA DA B5 C2 D0 AC BC D0 19  
 CA18: C7 BA C8 BC C0 C0 C0 C0 23  
 CA20: E1 E1 E1 D5 AB BB AF BF 72  
 CA28: BF C3 C0 BD C5 BB BB BB 23  
 CA30: D1 9D C5 CB BF BF B5 C9 30  
 CA38: B7 CF C9 BF C3 BB BB BB 40  
 CA40: BF BF D5 D5 D5 BF BF C9 8A  
 CA48: C9 BF BF C3 BD BD BD BD 4C  
 CA50: A3 A9 9B A0 BF BF B5 BF CE  
 CA58: B1 B9 BF BF BF BF BF BF 42  
 CA60: B7 B7 B7 B7 C1 BC C9 A9 31  
 CA68: C3 AF B4 BC B4 BF B9 BB 37  
 CA70: CF CD CB C9 A4 C7 A6 C1 78  
 CA78: C5 AA BE B9 B9 B9 B9 BB 4A  
 CA80: C1 C4 C8 CE D6 BF BF BF B4  
 CA88: C7 BF C7 B3 C7 BB BB BB 86  
 CA90: BF BF A9 C3 C7 C3 C3 BF 8C  
 CA98: C7 A9 B5 B5 B5 C8 C4 C1 7A  
 CAA0: BF BF BF BF BF BF BF BF 9E  
 CAA8: BF BF BF BF BF BF BF BF A6  
 CAB0: DB D9 D7 D5 D3 D4 BF BF 3C  
 CAB8: C0 B6 CC C4 C6 C8 BF BF D0  
 CAC0: AD D0 AA D2 A7 D4 C9 C6 C9  
 CAC8: C3 C0 BD B0 BC B3 B6 BB 9E  
 CAD0: C9 C9 AF CD AF B9 E1 AF DC  
 CAD8: DB CB AF BF BB BF BF BF EA  
 CAE0: B7 B7 CF CF C1 CF C1 AF F2  
 CAE8: C1 B0 C1 BD C1 C1 C1 C1 E1  
 CAF0: BD BB DA DA 9E AB AB D4 EA  
 CAF8: CE CE B8 B8 CE C3 C3 BB 1A  
 CB00: 82 80 7E 7C 7A 7A 78 76 E1  
 CB08: 74 72 70 6E 6C 6C 6C 7F  
 CB10: 82 80 7E 7C 7A 78 76 76 ED  
 CB18: 74 72 70 6E 6C 6C 6C 8F  
 CB20: 82 80 7E 7C 7A 7A 78 76 02  
 CB28: 74 72 70 6E 6E 6C 6C 6C A1  
 CB30: 82 80 80 7E 7C 7A 78 76 18  
 CB38: 74 74 72 70 6E 6C 6C 6C B7  
 CB40: 82 80 80 7E 7C 7A 78 76 28  
 CB48: 74 72 70 6E 6C 6C 6C 6C BF  
 CB50: 82 80 7E 7C 7C 7A 78 78 36  
 CB58: 76 74 72 70 6E 6C 6C 6C D9  
 CB60: 82 80 7E 7C 7C 7A 7A 78 48  
 CB68: 78 76 74 72 70 70 6E 6C F9  
 CB70: 82 80 7E 7C 7A 7A 78 78 54  
 CB78: 78 76 76 74 72 70 6E 6C 10  
 CB80: 82 80 7E 7C 7A 78 76 74 5C  
 CB88: 74 72 72 70 6E 6C 6C 6C 06  
 CB90: 82 80 7E 7E 7C 7A 7A 78 7A  
 CB98: 78 76 76 74 72 70 6E 6C 30  
 CBA0: 82 80 7E 7C 7A 78 76 74 7C  
 CBA8: 72 70 6E 6C 6C 6C 6C 6C 18  
 CBB0: 82 80 7E 7C 7A 78 76 74 8C  
 CBB8: 72 70 70 6E 6E 6E 6C 6C 30  
 CBC0: 82 82 80 80 7E 7E 7C 7A BA  
 CBC8: 78 76 74 72 72 70 6E 6C 5C  
 CBD0: 82 80 7E 7E 7C 7C 7C 7A C0  
 CBD8: 7A 78 76 74 72 70 6E 6C 74



CBE0: 82 80 80 7E 7C 7C 7A 78 CE  
 CBE8: 78 76 74 72 70 6E 6C 6C 76  
 CBF0: 82 80 80 7E 7C 7C 7A 7A E0  
 CBF8: 78 76 74 72 72 70 6E 6C 8C  
 CC00: D3 C1 A5 B1 C1 C6 C6 C6 03  
 CC08: C6 C6 C6 C6 9A E8 9F 9C E2  
 CC10: E2 DE C5 CB C3 C3 C3 C3 72  
 CC18: D1 A5 D1 A5 A5 B3 C4 C2 E7  
 CC20: C2 C2 C2 C2 AB D1 A5 C9 18  
 CC28: A9 AB B1 B1 B1 B1 B1 B1 A7  
 CC30: D7 CB D7 AB D7 AB B1 B7 44  
 CC38: CD BB C6 C6 B0 D5 B0 D5 5C  
 CC40: B0 D5 B0 D5 D5 C7 C7 C7 7A  
 CC48: BB BB BF BE BE BE BE BE 39  
 CC50: BE BE BE BE CC CA C8 C6 72  
 CC58: A7 C4 C3 B6 B6 B6 B6 C3 27  
 CC60: DE A5 DE A5 DE A5 DE A5 72  
 CC68: DE A5 A5 A5 B7 CA B9 CA 3F  
 CC70: AD CA B1 CA CA CA CA CA 90  
 CC78: A7 DA A5 AB D6 DC A5 AB 51  
 CC80: D6 DC A8 D9 BF BE CA BF BF  
 CC88: BE CA BF B8 B7 BD C5 C7 8D  
 CC90: C3 A0 DD A1 DC BA BA B5 7C  
 CC98: BA BA BA BA B4 B3 B5 B2 54  
 CCA0: B4 DA CA B0 CB CB CB CB DA  
 CCA8: E5 B5 B9 E5 E5 B1 CC D2 1B  
 CCB0: B1 B1 B1 B1 9C DC EB 98 75  
 CCB8: EB A0 A0 D1 DB DB C1 C1 F2  
 CCC0: 82 7C 7A 7A 7A 72 72 72 86  
 CCC8: 72 72 72 72 82 80 7E 7C 90  
 CCD0: 7C 7A 76 70 6C 6C 6C 6C 60  
 CCD8: 80 7E 7E 7C 7A 7A 74 6E AA  
 CCE0: 6E 6E 6E 6E 80 7E 7A 7A 8E  
 CCE8: 78 76 74 74 74 74 74 74 92  
 CCF0: 82 80 80 7E 7E 7C 7A 78 E0  
 CCF8: 74 70 70 6E 82 82 80 80 C2  
 CD00: 7E 7E 7C 7C 7A 76 74 72 CD  
 CD08: 7E 7C 7C 7A 78 76 74 72 CF  
 CD10: 72 72 72 72 82 80 7E 7C D7  
 CD18: 7A 7A 78 74 72 70 70 76 C3  
 CD20: 82 80 80 7E 7E 7C 7C 7A 14  
 CD28: 7A 78 78 78 7C 7C 7A 7A F9  
 CD30: 78 78 76 76 74 72 70 70 D5  
 CD38: 82 82 80 80 80 80 7E 7E 3C  
 CD40: 7E 7E 7C 7C 82 80 80 7E 38  
 CD48: 7C 7C 7A 76 74 70 6E 6E F3  
 CD50: 82 80 80 7E 7E 7A 78 76 3A  
 CD58: 76 74 72 72 80 7E 7E 7C 22  
 CD60: 7C 7C 7A 72 70 70 70 70 08  
 CD68: 82 80 80 80 7E 7C 7C 7C 60  
 CD70: 7A 78 78 78 82 82 82 80 5C  
 CD78: 80 7E 7C 7C 7A 78 74 72 4A  
 CD80: 47 5D 6B 39 2F 37 3E 2B 99  
 CD88: 2B 35 3B 39 42 40 22 50 52  
 CD90: 61 6A 2A 1E 4D 56 3C 40 C4  
 CD98: 4B 4A 42 41 48 54 5D 54 FF  
 CDA0: 5D 2D 47 2D 3A 41 41 41 9D  
 CDA8: 44 42 57 39 24 4E 5D 3B CA

CDB0: 41 2F 2A 34 4C 43 3D 42 8E  
 CDB8: 3E 40 56 54 56 2D 33 3E D6  
 CDC0: 40 48 4A 3E 40 45 3B 2F C1  
 CDC8: 1C 2F 2F 31 3E 40 37 33 5D  
 CDD0: 3E 33 3E 40 3B 4D 29 36 A8  
 CDD8: 39 3D 48 2A 3D 2A 35 3D 9B  
 CDE0: 35 3A 4B 4E 49 4C 47 4A 11  
 CDE8: 45 48 43 46 42 44 26 40 EC  
 CDF0: 45 5F 49 5F 24 4F 5F 1E 2F  
 CDF8: 57 5F 40 48 40 40 41 2B 25  
 CE00: 41 35 45 39 49 52 23 46 F9  
 CE08: 3D 33 52 40 28 59 28 59 0E  
 CE10: 28 59 40 3E 40 3E 40 3E 0D  
 CE18: 40 3E 40 58 40 40 54 40 44  
 CE20: 40 51 37 37 45 47 4B 46 3E  
 CE28: 29 54 26 55 24 57 4F 4C 38  
 CE30: 49 46 43 2F 34 43 35 47 26  
 CE38: 4B 33 35 34 45 1E 38 5C 18  
 CE40: 30 2D 52 40 36 38 37 4E 24  
 CE48: 50 4E 50 40 25 5A 29 40 60  
 CE50: 37 40 11 6A 2F 55 1E 55 3B  
 CE58: 27 5A 4B 50 2D 4F 34 3F 65  
 CE60: 84 84 84 82 80 7E 7E 7C 6A  
 CE68: 7A 78 76 72 70 6C 84 84 2A  
 CE70: 82 82 80 7E 7E 7C 7A 78 62  
 CE78: 76 72 70 6E 82 82 82 80 48  
 CE80: 80 7C 7C 7A 78 76 74 72 4A  
 CE88: 70 6C 84 82 80 80 80 7C 6A  
 CE90: 7C 7A 78 76 74 72 70 6C 3A  
 CE98: 82 82 80 7E 7E 7C 7A 7A 8C  
 CEA0: 7A 76 76 72 72 6E 84 82 62  
 CEA8: 80 80 7E 7E 7C 7C 7A 78 92  
 CEB0: 78 76 74 6E 84 82 80 80 8A  
 CEB8: 7C 7C 7C 78 78 76 74 72 7C  
 CEC0: 70 6E 82 82 80 80 7E 7E A2  
 CEC8: 7C 7C 7A 7A 78 78 7C 76 9A  
 CED0: 82 82 80 80 7E 7E 7E 7C CE  
 CED8: 7C 7C 78 74 6E 6C 82 80 9C  
 CEE0: 80 7E 7E 7C 7C 7C 7A 7A C8  
 CEE8: 78 74 74 6C 82 82 80 80 BC  
 CEF0: 7E 7E 7A 78 76 74 72 70 AE  
 CEF8: 6E 6C 82 82 80 7E 7E 7C D2  
 CF00: 7A 7A 76 72 70 70 70 6E 9D  
 CF08: 82 82 80 80 7E 7E 7C 7A 02  
 CF10: 78 76 74 72 70 6C 82 82 C7  
 CF18: 82 80 80 7E 7E 7C 7C 7C 0E  
 CF20: 78 74 74 72 82 82 80 7E F7  
 CF28: 7E 7C 7C 7A 78 78 76 76 F7  
 CF30: 6E 6C 84 80 7E 7E 7C 7C 06  
 CF38: 78 78 76 76 74 72 70 6C D9

## **PROBLEMS ENTERING A PROGRAM?**

For assistance, call 212-239-6089 (if busy or no  
 answer after three rings, call 212-239-0855).



# SCREENSAVER64 FROM PAGE 55

## BASIC LOADER

```

•100 REM *** SCREENSAVER 64 ***      IH
•110 SS=51200:REM RELOCATING ***      PI
•120 CK=0                               OL
•130 READD:CK=CK+D:IFD=999THEN150      AG
•140 GOTO130                            KO
•150 IFCK<>20519THENPRINT"[3*"] ERROR IN MB
      DATA [3*"]":END
•160 RESTORE:SA=SS                      GB
•170 READD:IFD=999THEN220              CA
•180 IFD=>0THENPOKESA,D:GOTO210        MN
•190 AD=SS+ABS(D):H=AD/256:L=AD-INT(AD/256)*256 LJ
•200 POKESA,L:SA=SA+1:POKESA,H        CA
•210 SA=SA+1:GOTO170                  OH
•220 PRINT"SCREENSAVER INSTALLED"SS"TO"SA JK
•230 PRINT                             IB
•240 PRINT"TO SAVE SCREEN: SYS"SS     JL
•250 PRINT"RECALL SCREEN : SYS"SS+3   KK
•260 PRINT"CLEAR LINKS[3 "]: SYS"SS+6 AJ
•270 PRINT"MOVE STORAGE : POKE"SS+9"[LEF CM
      T], HIGH-BYTE"
•280 END                               JJ
•290 DATA 184,80,7,184,80,85,184,80  FF
•300 DATA 70,208,173,136,2,32,-160,173 GA
•310 DATA -9,133,196,132,195,32,-194,169 EN
•320 DATA 216,32,-160,32,-191,32,-245,160 AA
•330 DATA 24,185,217,0,32,-220,136,16  FI
•340 DATA 247,160,25,165,199,32,-220,200 EL
•350 DATA 173,134,2,32,-220,56,32,240  OO
•360 DATA 255,138,72,152,160,27,32,-220 BB
•370 DATA 104,200,76,-220,162,24,181,217 NF
•380 DATA 9,128,149,217,202,16,247,96  AI
•390 DATA 173,-9,32,-160,173,136,2,32  LB
•400 DATA -176,24,165,175,105,4,162,208 JB
•410 DATA 134,174,133,175,169,216,32,-176 OO
•420 DATA 160,24,32,-205,153,217,0,136  FH
•430 DATA 16,247,160,25,32,-205,133,199 KB
•440 DATA 200,32,-205,141,134,2,200,32  NA
•450 DATA -205,72,200,32,-205,170,104,168 AN
•460 DATA 24,76,240,255,160,0,133,173  LN
•470 DATA 132,172,24,105,3,133,175,169  ON
•480 DATA 232,133,174,96,132,195,133,196 LM
•490 DATA 32,-205,145,195,32,-237,208,246 BB
•500 DATA 96,32,-245,177,172,32,-220,32 KO
•510 DATA -237,208,246,96,162,52,8,120  EJ
•520 DATA 165,1,134,1,170,177,172,134  HL
•530 DATA 1,40,96,162,52,8,120,72      NE
•540 DATA 165,1,134,1,170,104,145,195  JK
•550 DATA 134,1,40,96,32,219,252,32    BM

```

•560 DATA 209,252,240,6,230,195,208,2 PC  
•570 DATA 230,196,96,999 LB

## DEMO

```

•100 SS=51200                          LB
•110 POKESS+9,53248/256:REM START OF STOR AGE EM
•120 P$="[RVSON]PRESS A KEY[RVSOFF]"   HP
•130 SYS65409:REM DEFAULT SCREEN SET UP CP
•140 D=5:R=0:GOSUB590                  HB
•150 PRINT"WHEN PRINTING MESSAGE BOXES AN D PSEUDO IA
      WINDOWS ON THE C-64 SCREEN,";
•160 PRINT" THINGS DON'TALWAYS WORK OUT A S AB
      PLANNED.":TT=2:GOSUB620
•170 PRINT:PRINT"LINES THAT WRAP CAN DISR KF
      UPT YOUR NICE, NEAT BOX[3"."]:GOSUB620
•180 PRINT"[DOWN]"TAB(10)P$           DF
•190 GOSUB640                          OM
•200 SYS SS:REM SAVE SCREEN            LD
•210 C=1:GOSUB430                      EN
•220 GOSUB640                          AG
•230 SYS SS+3:REM RECALL SCRIN        JP
•240 GOSUB620                          BE
•250 PRINT"[UP]BUT, IF YOU SET BIT 7 OF L DO
      OCATIONS 217 THRU 242,";:GOSUB620
•260 PRINT" WRAPPED LINES ARE UN-LINKED[3 DP
      " "]AND THE BOX COMES OUT AS PLANNED.
•270 GOSUB620:PRINT"[DOWN]"TAB(R)P$:GOSUB II
      640
•280 SYS SS:SYS SS+6:C=3:GOSUB430      JH
•290 GOSUB640:SYS SS+3                JJ
•300 GOSUB620                          FD
•310 PRINT"[UP][GREEN]NOW EXECUTING MULTI FG
      PLE SCREEN SAVES[3"."]"
•320 GOSUB620                          GP
•330 W=16:H=4:D=3:R=5                 OM
•340 FORC=1TO4:SYS SS                 GK
•350 POKESS+9,PEEK(SS+9)+8:REM MOVE STORA HD
      GE
•360 POKE646,C:D=D+2:R=R+2:GOSUB480    BD
•370 NEXT                             PF
•380 GOSUB620:GOSUB590:PRINT"[DOWN][DOWN] HE
      [RIGHT][RIGHT]"P$;:GOSUB640
•390 FORC=1TO4:POKESS+9,PEEK(SS+9)-8  AL
•400 SYSSS+3                          KC
•410 TT=.5:GOSUB620:NEXT              HC
•420 END                              CF
•430 POKE646,C:W=22:H=8:D=4:R=6:RV$="[RVS GH
      ON]":GOSUB490
•440 D=8:R=12:GOSUB590:PRINTRV$"LIKE THIS FL
      "
•450 GOSUB620:PRINT"[YELLOW][3"[DOWN]]"T GO
      AB(R-1)P$;
•460 RETURN                            FL

```



```

.470 REM *** PRINT BOX ***
.480 SYS SS+6:REM CLEAR LINKS
.490 GOSUB590
.500 PRINTRV$"[c A]";
.510 FORI=1TOW-2:PRINT"[s *]";:NEXT:PRINT
"[c S]"
.520 FORI=1TOH:PRINTTAB(R);
.530 PRINTRV$"[s -]";:FORJ=1TOW-2:PRINT"
";:NEXT:PRINT"[s -]":NEXT
.540 PRINTTAB(R)RV$;
.550 PRINT"[c Z]";:FORI=1TOW-2:PRINT"[s *
]";:NEXT
.560 PRINT"[c X]"
.570 RETURN
.580 REM
.590 POKE214,D-1:PRINT:REM VERTICAL POSIT
ION
.600 PRINTTAB(R);:REM HORIZ POS.
.610 RETURN
.620 REM TIME DELAY
.630 FORT=1TO1000*TT:NEXT:RETURN
.640 REM WAIT FOR KEY PRESS
.650 POKE198,0:WAIT198,1:RETURN

```

```

KP [YELLOW]NICE GAME":GOSUB480 BD
MG .190 CHAR1,14,24,"[c 1]PRESS ANY KEY":POK
BF E208,0:WAIT208,1:RESTORE1070:GOSUB610:GO
II TO120 PO
BL .200 REM ***** YOUR TURN ***** IG
MK .210 F$="[WHITE]YOUR TURN":GOSUB470:CHAR
1,18,22:Q=3:GOSUB510:F$="[10" " ]":GOSUB4
70:GOSUB480:IFN$="[3@]" THENQU=1:RETURN CC
EK .220 FORL=1TO3:POKE249+L,ASC(MID$(N$,L,1)
NP )-64:NEXT:SYS3584:IFPEEK(253)THENF$="[PU
AC RPLE]NO DOUBLES":GOSUB490:GOTO210 AG
NF .230 B=0:FORV=1TO3:FORS=1TO16:IFASC(MID$(
MK N$,V,1))-64<>K(S)THEN240:ELSEB=B+1 HN
NH .240 NEXTS,V EO
CA .250 IFB<>3THENF$="[c 3][UPARROW][UPARROW
OI ] LOOK [UPARROW][UPARROW]":GOSUB490:GOTO
PC 210 FL
JD .260 SYS3615:IFPEEK(253)THENF$="[c 6]NOT
FC A WORD":GOSUB490:GOTO210 JH
LG .270 GOSUB430:IFWOTHENF$="[YELLOW]WORD U
ML SED":GOSUB490:GOTO210 CN
.280 CHAR1,X1,Y1,C1$+N$:SUM=SUM+1:W$(SUM)
= N$:Y1=Y1+1:IFY1=22ANDX1=3THENY1=2:X1=7:
ELSEIFY1=22THENY1=2:X1=3 HB
.290 S1=S1+1:IF(S1=40ORS1=120)THENC1$="[Y
ALLOW]":ELSEIF(S1=80ORS1=160)THENC1$="[C
YAN]" AL
.300 CHAR1,0,23:PRINTTAB(7)"[WHITE]";:S1:
PLAY "V104T8HFV204T2IADEFV1QFV2QD":RETUR
N EK
.310 REM ***** 128'S TURN ***** PJ
.320 F$="[WHITE] MY TURN ":GOSUB470 JH
.330 CHAR1,15,22,"[CYAN]THINKING.." DJ
.340 SYS3694:IFPEEK(254)THENW=1:RETURN OE
.350 B=0:FORV=250TO252:FORS=1TO16:IFPEEK(
V)<>K(S)THEN360:ELSEB=B+1 NP
.360 NEXTS,V:IFB<>3THEN340 JE
.370 N$="":FORL=1TO3:N$=N$+CHR$(PEEK(L+24
9)+64):NEXT:GOSUB430:IFWOTHEN340 FE
.380 F$="[10" " ]":GOSUB470:GOSUB480 CG
.390 CHAR1,X2,Y2,C2$+N$:SUM=SUM+1:W$(SUM)
= N$:Y2=Y2+1:IFY2=22ANDX2=30THENY2=2:X2=3
4:ELSEIFY2=22THENY2=2:X2=30 NH
.400 S2=S2+1:IF(S2=40ORS2=120)THENC2$="[Y
ALLOW]":ELSEIF(S2=80ORS2=160)THENC2$="[C
YAN]" ID
.410 CHAR1,0,23:PRINTTAB(34)"[WHITE]";:S2
:PLAY "V102T8QAV203T2QCV1QCV2QDV1QAV2QF"
:RETURN AJ
.420 REM ***** WORD USED ***** AI
.430 WO=0:FORL=1TOSUM:IFW$(L)=N$THENWO=1 BK
.440 NEXTL:RETURN FA
.450 REM ***** PRINT ROUTINES ***** ON
.460 POKELOC,LR:POKELOC+40,LR+1:POKELOC+1
,LR+2:POKELOC+41,LR+3:RETURN OI
.470 CHAR1,15,20,F$:RETURN FG

```

## TRI WORDS FROM PAGE 18

### MAIN PROGRAM

```

.10 REM *****
.20 REM * TRI WORDS *
.30 REM * BOB BLACKMER *
.40 REM * 6118 S. BRIAR BAYOU *
.50 REM * HOUSTON,TX 77072 *
.60 REM *****
.70 RN=RND(-TI)
.80 IFPEEK(4864)<>1THENBLOAD "WORDLIST"
.90 PRINT"[CLEAR] SETTING UP[3"."]1 MINUT
E":POKE54,56:POKE58,56:CLR:DIMNU(15),PO(
16),K(16),W$(400) NL
.100 DEF FNA(X)=NU((CCAND240)/16):DEF FNB
(X)=NU(CCAND15):DEF FNC(X)=PEEK(AA+NL+IL
):DEF FND(X)=BB+2*(NL+IL)+1 JJ
.110 COLOR0,1:COLOR4,12:GOSUB740:GOSUB610 NH
.120 X1=3:Y1=2:X2=30:Y2=2:SUM=0:QU=0:W=0:
S1=0:S2=0:C1$="[CYAN]":C2$="[CYAN]":POKE
3692,0:POKE3693,19 AD
.130 REM ***** MAIN LOOP ***** OD
.140 GOSUB210:IFQUTHENGOSUB320:IFWTHENF$=
"I'M STUMPED":GOSUB470:F$=" WE TIED ":G
OSUB480:GOTO190:ELSEIFQUTHEN180 MK
.150 GOSUB320:IFWTHEN170 BA
.160 GOTO140 LJ
.170 F$="[WHITE]I'M STUMPED":GOSUB470:F$=
"[CYAN]!YOU WIN!":GOSUB480:GOTO190 BK
.180 F$="[WHITE]! I WIN !":GOSUB470:F$="

```

```

LN
IE
BD
BN
EG
NH
NI
JK
NL
JJ
NH
AD
OD
MK
BA
LJ
BK
FG

```



```

•480 CHAR1,15,22,F$:RETURN
•490 CHAR1,15,20,F$:GOSUB590:SLEEP2:RETUR
N
•500 REM ***** INPUT ROUTINE *****
•510 N$="":ZL=LEN(N$):POKE208,0:PRINTCHR$(
(43)CHR$(157);
•520 GETZ$:Z=ASC(Z$):IF(Z=13ORZ=20)THEN53
0:ELSEIF(Z<64ORZ>90)THEN520
•530 ZL=LEN(N$):IFZL=QTHEN550
•540 IFZ>20THENN$=N$+Z$:PRINTZ$CHR$(43)CH
R$(157);:GOTO520
•550 IFZ=13ANDZL=QTHENRETURN
•560 IFZ=20ANDZLTHENN$=LEFT$(N$,ZL-1):PRI
NTCHR$(32)CHR$(157)CHR$(157)CHR$(43)CHR$(
157);
•570 GOTO520
•580 REM ***** BUZZER *****
•590 SOUND3,1200,20,0,0,0,1:RETURN
•600 REM ***** DRAW SCREEN *****
•610 PRINT"[CYAN][CLEAR][5"[DOWN]]"TAB(9
)"[YELLOW]N[RED]ORMAL OR [YELLOW]S[RED]U
PER BRAIN"
•620 GETLV$:IFLV$<>"N"ANDLV$<>"S"THEN620
•630 IFLV$="N"THENPOKE3737,24:ELSEPOKE373
7,25
•640 PRINT"[RED][CLEAR]":READLOC:FORL=1TO
3:READLR:GOSUB460:LOC=LOC+2:NEXT:READLOC
:FORL=1TO5:READLR:GOSUB460:LOC=LOC+2:NEX
T
•650 A$=CHR$(40):B$=CHR$(41):TP$="[BLUE]$
[7""]%":BT$="[BLUE]&[7""]'":BX$="[c 2]
$**%[DOWN][4"[LEFT]]"([YELLOW] [c 2])[D
OWN][4"[LEFT]]"([YELLOW] [c 2])[DOWN][4
"[LEFT]]"&**'":SC$="[GREEN]WORDS[WHITE]:
[3" "]
•660 PRINTTAB(2)TP$TAB(29)TP$:FORL=2TO21:
CHAR1,2,L,A$:CHAR1,10,L,B$:CHAR1,29,L,A$
:CHAR1,37,L,B$:NEXT:PRINT:PRINTTAB(2)BT$
TAB(29)BT$
•670 FORA=12TO24STEP4:FORB=3TO15STEP4:CHA
R1,A,B,BX$:NEXT:NEXT:CHAR1,0,23:PRINTTAB
(2)SC$TAB(29)SC$
•680 REM ***** PICK 16 LETTERS *****
•690 FORL=1TO16
•700 RN=INT(RND(1)*26)+1
•710 FORE=1TOL:IFK(E)=RNTHEN700:ELSEIFK(E
)>>RNTHENNEXT E
•720 K(L)=RN:IFK(L)=0THEN700:ELSENEXTL:FO
RL=1TO16:LOC=PO(L):LR=(K(L)*4)+64:GOSUB4
60:NEXT:RETURN
•730 REM ***** INITIALIZE *****
•740 BANK14:FORI=0TO2047:POKEI+14336,PEEK
(I+53248):NEXT:BANK15
•750 FORL=1TO15:READNU(L):NEXT
•760 FOROL=8TO208STEP8:AA=14336+OL:BB=148
48+4*OL:FORIL=0TO4STEP4:FORNL=0TO3:CC=FN
C(0):DD=FND(0):XX=FNA(0):YY=FNB(0)
•770 POKEDD,XX:POKEDD+1,XX:POKEDD+16,YY:P

```

KC  
PE  
MF  
KP  
BF  
ML  
BG  
NP  
EN  
FL  
DF  
EM  
HP  
OB  
PE  
BN  
LH  
PH  
II  
DN  
LP  
GO  
EN  
PO  
KN  
NH  
HJ  
GI  
JP

```

OKEDD+17,YY:NEXT NL,IL,OL
•780 FORL=14624TO14687:READA:POKEL,A:NEXT
:FORL=1TO16:READPO(L):NEXT
•790 CK=0:FORL=3584TO3742:READA:CK=CK+A:P
OKEL,A:NEXT:IFCK<>19489THENPRINT"ERROR I
N LINES 870-1060"
•800 POKE2604,(PEEK(2604)AND240)+14:RETUR
N
•810 REM ***** CHAR AND LOC DATA *****
•820 DATA 3,12,15,48,51,60,63,192,195,204
,207,240,243,252,255
•830 DATA 0,0,0,31,31,28,28,28,0,0,0,248,
248,56,56,56,28,28,28,31,31,0,0,0,56,56,
56,248,248,0,0,0
•840 DATA 28,28,28,28,28,28,28,28,56,56,5
6,56,56,56,56,56,0,0,0,255,255,0,0,0,0,0
,0,0,0,0,0,255
•850 DATA 1197,1201,1205,1209,1357,1361,1
365,1369,1517,1521,1525,1529,1677,1681,1
685,1689
•860 REM ***** ML ROUTINE DATA *****
•870 DATA 169,0,133,253,165,250,197,251
•880 DATA 240,15,197,252,240,11,165,251
•890 DATA 197,252,240,5,169,0,133,253
•900 DATA 96,230,253,96,0,0,19,169
•910 DATA 0,141,29,14,169,19,141,30
•920 DATA 14,173,30,14,141,57,14,160
•930 DATA 0,140,28,14,174,29,14,189
•940 DATA 0,19,217,250,0,208,3,238
•950 DATA 28,14,232,200,192,3,208,239
•960 DATA 142,29,14,173,28,14,201,3
•970 DATA 240,21,224,255,208,211,232,142
•980 DATA 29,14,238,30,14,173,30,14
•990 DATA 201,25,208,197,230,253,96,169
•1000 DATA 0,133,253,96,0,19,173,109
•1010 DATA 14,141,125,14,160,0,132,254
•1020 DATA 174,108,14,189,0,19,153,250
•1030 DATA 0,232,200,192,3,208,244,142
•1040 DATA 108,14,224,255,208,16,232,142
•1050 DATA 108,14,238,109,14,173,109,14
•1060 DATA 201,25,208,2,230,254,96
•1070 DATA 1035,144,136,100,1043,156,124,
136,80,140

```

AP  
ED  
JE  
OL  
DL  
KO  
EJ  
CM  
EM  
FE  
BJ  
CA  
AL  
FD  
JL  
MN  
PO  
IL  
GA  
IJ  
OG  
PK  
JF  
NJ  
CP  
BP  
OP  
DA  
AP  
GJ  
LI

# TRI.DATA

```

•10 CK=0:FORL=4864TO6399:READA:CK=CK+A:PO
KEL,A:NEXT:IFCK<>17381THENPRINT"ERROR IN
DATA":STOP
•20 PRINT"[CLEAR][5"[DOWN]]"READY TO WRI
TE WORD FILE":PRINT" PRESS ANY KEY WHEN
READY"
•30 POKE208,0:WAIT208,1:BSAVE"WORDLIST",B
0,P4864 TO P6400
•40 DATA 1,3,5,1,3,20,4,21
•50 DATA 2,4,21,5,4,21,7,7
•60 DATA 1,19,7,1,25,7,5,13
•70 DATA 2,15,23,2,15,24,6,15

```

GN  
KF  
EG  
KH  
PE  
NI  
OI



•80 DATA 7,6,15,5,2,21,14,12  
 •90 DATA 5,20,12,5,7,12,1,23  
 •100 DATA 13,15,16,13,21,4,13,15  
 •110 DATA 23,20,15,5,20,9,16,16  
 •120 DATA 1,4,16,1,14,19,11,25  
 •130 DATA 19,11,9,19,5,23,19,5  
 •140 DATA 20,13,1,25,13,5,14,22  
 •150 DATA 1,14,22,1,20,18,9,2  
 •160 DATA 23,15,14,2,21,4,2,21  
 •170 DATA 7,1,14,25,1,16,5,3  
 •180 DATA 1,14,2,1,20,7,9,14  
 •190 DATA 7,5,20,9,14,11,1,18  
 •200 DATA 20,6,21,14,8,1,25,8  
 •210 DATA 5,25,12,9,16,12,9,20  
 •220 DATA 8,15,20,8,15,7,8,15  
 •230 DATA 16,5,14,4,3,15,23,3  
 •240 DATA 21,16,10,1,13,13,1,14  
 •250 DATA 14,5,23,20,1,14,18,21  
 •260 DATA 14,16,21,20,14,1,16,14  
 •270 DATA 15,23,20,1,18,23,8,25  
 •280 DATA 23,8,15,20,15,25,20,18  
 •290 DATA 25,19,9,20,18,1,14,13  
 •300 DATA 9,24,19,9,16,23,1,18  
 •310 DATA 1,7,5,1,18,5,4,9  
 •320 DATA 13,4,9,7,7,21,14,8  
 •330 DATA 9,20,8,9,13,8,9,19  
 •340 DATA 12,9,4,12,15,7,1,20  
 •350 DATA 5,4,15,20,4,18,25,0  
 •360 DATA 25,5,19,15,12,4,15,9  
 •370 DATA 12,15,1,11,20,5,1,19  
 •380 DATA 21,14,15,14,5,21,19,5  
 •390 DATA 18,5,4,14,15,20,19,8  
 •400 DATA 5,23,9,14,18,9,16,18  
 •410 DATA 15,2,20,15,16,20,1,7  
 •420 DATA 20,8,5,15,21,18,15,21  
 •430 DATA 20,18,21,2,16,9,14,1  
 •440 DATA 14,4,1,14,20,2,9,7  
 •450 DATA 2,9,14,8,15,23,11,9  
 •460 DATA 20,10,21,7,10,15,25,8  
 •470 DATA 9,16,4,5,14,4,1,25  
 •480 DATA 8,1,13,8,1,4,7,15  
 •490 DATA 20,10,1,23,9,3,5,12  
 •500 DATA 1,16,12,5,4,8,21,7  
 •510 DATA 2,21,20,2,21,19,3,1  
 •520 DATA 20,3,1,18,4,15,7,8  
 •530 DATA 5,14,6,12,25,13,1,20  
 •540 DATA 16,15,20,18,1,25,19,15  
 •550 DATA 14,20,15,14,20,9,5,19  
 •560 DATA 9,14,25,15,21,23,1,24  
 •570 DATA 18,1,7,14,21,20,18,21  
 •580 DATA 7,19,21,13,1,19,11,1  
 •590 DATA 18,13,6,1,14,10,5,20  
 •600 DATA 6,9,14,6,15,18,10,15  
 •610 DATA 2,12,1,25,12,15,23,2  
 •620 DATA 9,4,2,5,4,1,9,18  
 •630 DATA 8,1,19,12,9,5,8,9  
 •640 DATA 4,4,9,5,11,9,4,3  
 •650 DATA 21,20,13,1,16,20,9,14

OB •660 DATA 20,5,14,19,9,24,15,1  
 LB •670 DATA 20,14,5,20,16,9,7,0  
 JO •680 DATA 18,21,20,20,1,2,18,9  
 OM •690 DATA 7,16,5,14,16,5,1,14  
 KI •700 DATA 9,16,12,1,4,6,9,24  
 PN •710 DATA 7,21,13,2,21,13,2,1  
 BP •720 DATA 4,12,15,20,3,18,25,1  
 MF •730 DATA 9,4,6,1,18,10,1,18  
 HP •740 DATA 11,5,25,16,1,20,3,21  
 MI •750 DATA 2,8,1,20,6,9,20,3  
 IA •760 DATA 1,16,2,1,25,6,18,25  
 HI •770 DATA 13,1,4,18,1,20,19,1  
 FG •780 DATA 20,16,5,20,23,5,2,25  
 FE •790 DATA 5,20,16,9,20,19,1,4  
 OD •800 DATA 23,9,7,15,23,12,14,15  
 EK •810 DATA 4,18,15,20,20,21,2,23  
 HB •820 DATA 1,7,16,1,25,2,15,25  
 II •830 DATA 6,15,24,3,15,20,3,1  
 FM •840 DATA 2,5,1,18,6,1,20,10  
 DF •850 DATA 1,2,3,15,2,18,21,13  
 IC •860 DATA 13,15,2,18,9,13,18,15  
 DD •870 DATA 23,23,9,20,14,1,7,20  
 PE •880 DATA 15,23,23,5,4,19,1,25  
 OP •890 DATA 16,21,14,18,1,23,19,1  
 MG •900 DATA 16,16,9,5,1,9,13,19  
 EE •910 DATA 9,18,20,1,24,4,9,16  
 BE •920 DATA 2,9,20,2,1,18,7,1  
 MO •930 DATA 16,8,21,20,6,1,4,2  
 FC •940 DATA 1,7,2,5,7,5,12,13  
 IC •950 DATA 8,15,5,1,19,8,4,15  
 EC •960 DATA 5,8,21,2,10,9,7,12  
 MD •970 DATA 21,7,4,1,2,2,5,20  
 CI •980 DATA 16,15,4,13,21,7,14,1  
 FF •990 DATA 2,15,1,18,19,1,7,0  
 BO •1000 DATA 20,21,7,20,1,16,19,5  
 BI •1010 DATA 1,19,1,23,16,1,23,15  
 KG •1020 DATA 18,5,23,5,20,19,12,25  
 BH •1030 DATA 19,16,25,3,21,5,2,1  
 IN •1040 DATA 14,3,15,14,11,5,7,10  
 JL •1050 DATA 1,7,6,21,18,7,1,2  
 KL •1060 DATA 10,15,7,3,15,4,1,9  
 EE •1070 DATA 12,4,1,13,4,5,23,7  
 CP •1080 DATA 21,20,7,15,4,12,1,7  
 GH •1090 DATA 6,9,7,2,21,25,2,25  
 NK •1100 DATA 5,10,15,20,5,1,20,6  
 PG •1110 DATA 9,2,5,12,11,15,23,5  
 IC •1120 DATA 19,15,2,18,15,4,18,1  
 DP •1130 DATA 16,19,8,25,16,1,18,19  
 DF •1140 DATA 15,4,16,18,25,15,1,6  
 PI •1150 DATA 10,1,25,8,21,5,8,1  
 OJ •1160 DATA 7,11,9,14,3,1,13,5  
 FI •1170 DATA 12,6,23,1,25,9,3,25  
 LP •1180 DATA 9,22,25,8,5,13,1,18  
 BA •1190 DATA 11,6,9,18,1,23,5,7  
 OC •1200 DATA 21,25,6,5,23,23,1,4  
 GC •1210 DATA 12,1,24,13,1,18,16,18  
 NH •1220 DATA 15,19,16,1,19,15,25,25  
 JA •1230 DATA 1,16,15,4,5,18,1,13

PJ  
 JH  
 BG  
 HG  
 HJ  
 IK  
 GO  
 AM  
 IF  
 OM  
 GE  
 BH  
 DN  
 FP  
 GA  
 FP  
 IF  
 FI  
 EA  
 MJ  
 LB  
 PE  
 HJ  
 GB  
 DN  
 IA  
 IN  
 FE  
 FI  
 IB  
 HN  
 KM  
 LP  
 LP  
 NF  
 KI  
 BI  
 GC  
 NH  
 AN  
 LP  
 PL  
 HB  
 PH  
 DC  
 ML  
 JI  
 BM  
 OH  
 KG  
 IC  
 FP  
 CJ  
 OI  
 LO  
 HL  
 PK  
 MN



**IMPORTANT!** Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 61 and 62 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

•1240 DATA 22,5,20,22,15,23,19,21  
 •1250 DATA 5,16,5,7,13,5,20,20  
 •1260 DATA 23,15,20,1,4,19,20,25  
 •1270 DATA 9,13,16,18,25,5,19,21  
 •1280 DATA 2,18,9,4,2,15,7,16  
 •1290 DATA 21,2,16,15,24,16,5,23  
 •1300 DATA 10,21,20,12,25,5,1,24  
 •1310 DATA 5,1,12,5,3,15,7,0  
 •1320 DATA 5,18,1,12,15,2,8,5  
 •1330 DATA 24,9,18,5,4,9,14,1  
 •1340 DATA 7,15,3,1,4,3,15,25  
 •1350 DATA 3,21,4,4,25,5,7,15  
 •1360 DATA 2,9,18,11,22,5,24,25  
 •1370 DATA 1,13,26,9,16,20,15,7  
 •1380 DATA 20,1,13,14,1,25,14,15  
 •1390 DATA 18,19,15,24,16,12,25,16  
 •1400 DATA 5,18,15,23,14,16,21,7  
 •1410 DATA 23,15,5,8,21,13,12,1  
 •1420 DATA 13,12,15,24,5,15,14,5  
 •1430 DATA 7,15,4,15,14,1,23,12  
 •1440 DATA 7,1,4,1,6,20,1,19  
 •1450 DATA 16,6,12,21,7,5,12,12  
 •1460 DATA 15,16,14,21,2,18,21,5  
 •1470 DATA 19,5,24,19,15,16,20,8  
 •1480 DATA 25,25,1,11,13,9,4,16  
 •1490 DATA 21,19,14,9,12,19,21,16  
 •1500 DATA 23,18,25,15,18,2,18,1  
 •1510 DATA 8,20,15,13,25,5,1,21  
 •1520 DATA 18,14,1,4,15,1,25,5  
 •1530 DATA 4,21,15,3,21,18,9,15  
 •1540 DATA 14,6,18,15,2,15,1,22  
 •1550 DATA 9,5,7,14,21,19,15,23  
 •1560 DATA 13,15,4,15,16,20,15,8  
 •1570 DATA 13,18,15,5,1,16,20,1  
 •1580 DATA 18,3,2,1,8,4,21,14  
 •1590 DATA 8,5,18,10,9,2,21,7  
 •1600 DATA 8,20,21,24,19,15,20,16  
 •1610 DATA 1,12,23,1,19,14,9,20  
 •1620 DATA 8,9,5,9,12,11,21,13  
 •1630 DATA 16,6,5,4,22,9,13,0  
 •1640 DATA 1,12,16,1,21,11,2,15  
 •1650 DATA 16,2,21,18,3,1,23,3  
 •1660 DATA 1,25,3,15,19,3,15,24  
 •1670 DATA 3,21,13,4,1,14,5,6  
 •1680 DATA 20,5,13,21,5,18,7,6  
 •1690 DATA 1,7,19,1,3,6,5,14  
 •1700 DATA 6,5,25,6,5,26,6,9  
 •1710 DATA 5,6,15,2,6,15,16,7  
 •1720 DATA 1,18,8,1,23,8,5,23  
 •1730 DATA 8,15,2,8,15,4,13,1  
 •1740 DATA 23,13,5,23,13,8,15,13  
 •1750 DATA 15,20,14,5,2,14,9,2  
 •1760 DATA 15,2,9,15,12,5,15,22  
 •1770 DATA 1,18,5,22,16,1,19,16  
 •1780 DATA 15,9,16,25,24,18,5,13  
 •1790 DATA 18,5,16,19,9,3,19,15

EJ •1800 DATA 12,12,5,9,20,1,23,20  
 EF •1810 DATA 9,3,20,15,18,20,21,14  
 LM •1820 DATA 22,9,1,1,12,2,23,1  
 HN •1830 DATA 14,13,9,12,23,5,14,23  
 LL •1840 DATA 15,11,25,1,8,25,1,23  
 KB •1850 DATA 25,5,14,25,5,23,25,9  
 EE •1860 DATA 16,2,18,1,15,6,20,21  
 PI •1870 DATA 13,16,2,5,25,12,5,1  
 LO •1880 DATA 0,0,0,0,0,0,0,0  
 BH •1890 DATA 0,0,0,0,0,0,0,0  
 FC •1900 DATA 0,0,0,0,0,0,0,0  
 NK •1910 DATA 0,0,0,0,0,0,0,0  
 DO •1920 DATA 0,0,0,0,0,0,0,0  
 DC •1930 DATA 0,0,0,0,0,0,0,0  
 FF •1940 DATA 0,0,0,0,0,0,0,0  
 NO •1950 DATA 0,0,0,0,0,0,0,0

BC  
PF  
NJ  
LB  
GJ  
HC  
II  
DB  
KH  
KN  
JL  
MB  
MP  
LF  
OD  
OJ

## SCREEN POCUS 64 FROM PAGE 52

### BASIC LOADER

•10 SA=49152 FG  
 •20 FORI=SATOSA+200:READA:POKEI,A:CK=CK+A  
 :NEXT LC  
 •30 IFCK<>26102THENPRINT"ERROR IN DATA":S  
 TOP FL  
 •50 A=SA+6:B=INT(A/256):C=A-B\*256:POKESA+  
 1,C:POKESA+2,B AJ  
 •60 A=SA+51:B=INT(A/256):C=A-B\*256:POKESA  
 +5,B:POKESA+4,C MB  
 •70 A=SA+164:B=INT(A/256):C=A-B\*256:POKES  
 A+154,B:POKESA+153,C EH  
 •100 DATA76,6,192,76,51,192 DO  
 •110 DATA169,0,141,54,3,141 GA  
 •120 DATA55,3,141,56,3,141 FG  
 •130 DATA57,3,169,234,141,40 IG  
 •140 DATA3,169,249,141,14,212 JL  
 •150 DATA169,238,141,15,212,169 EK  
 •160 DATA0,141,24,212,169,129 LI  
 •170 DATA141,18,212,169,160,141 DF  
 •180 DATA136,2,96,162,0,169 IE  
 •190 DATA4,133,252,134,253,134 KL  
 •200 DATA251,169,160,133,254,165 DF  
 •210 DATA1,41,254,133,1,173 LM  
 •220 DATA27,212,168,177,251,209 PL  
 •230 DATA253,240,54,177,253,145 LI  
 •240 DATA251,162,0,189,54,3 OB  
 •250 DATA240,7,232,224,4,144 AJ  
 •260 DATA246,176,85,230,254,230 HL  
 •270 DATA252,165,252,201,8,144 AA  
 •280 DATA218,169,4,133,252,169 BH  
 •290 DATA160,133,254,165,2,141 FF  
 •300 DATA52,3,160,25,136,208 ED  
 •310 DATA253,206,52,3,208,246 JC  
 •320 DATA24,144,192,140,53,3 FK



•330 DATA173,27,212,201,128,144  
 •340 DATA5,169,200,24,144,2  
 •350 DATA169,136,141,164,192,172  
 •360 DATA53,3,177,251,209,253  
 •370 DATA208,173,200,204,53,3  
 •380 DATA208,244,165,252,56,233  
 •390 DATA4,168,169,1,153,54  
 •400 DATA3,24,144,157,169,4  
 •410 DATA141,136,2,169,237,141  
 •420 DATA40,3,165,1,9,1  
 •430 DATA133,1,96

JN  
BP  
FK  
JN  
KG  
IJ  
HF  
MO  
NM  
PH  
LL

•70 SYS49155 PM  
 •90 GETA\$:IFA\$=""THEN90 JE  
 •100 POKE2,1:SYS49152:PRINT"[CLEAR]"; BK  
 •120 SYS49155:SYS49152 AB  
 •130 PRINT"[CLEAR][YELLOW]"V\$(7)TAB(6)"FA  
 DE SPEED MAY BE CONTROLLED!" JD  
 •140 PRINTV\$(10)TAB(6)"SCREENS MAY FADE O  
 UT/IN" DM  
 •150 PRINTV\$(11)TAB(6)"SIMULTANEOUSLY!" HG  
 •160 PRINTV\$(14)TAB(6)"ALL FOR [RVSON] NE  
 AT [RVSOFF] PRESENTATIONS!" EO  
 •170 POKE53280,6:POKE53281,6:SYS49155 JO  
 •181 PRINTV\$(23)TAB(12)"PRESS ANY KEY[3".  
 "]" KN  
 •182 GETA\$:IFA\$=""THEN182 CO  
 •190 X=1:FORJ=1TO101STEP50:POKE2,J:PRINT"  
 [CLEAR]":SYS49152:PRINT"[CLEAR]"; HG  
 •200 FORI=1TO120:PRINT" SCREEN ";:NEXT LP  
 •220 GOSUB300:SYS49155:SYS49152:PRINT"[CL  
 EAR]"; OB  
 •230 FORI=1TO120:PRINT" POCUS ";:NEXT KN  
 •250 GOSUB300:SYS49155:SYS49152:PRINT"[CL  
 EAR]"; NL  
 •260 FORI=1TO120:PRINT" MAGIC! ";:NEXT MG  
 •270 GOSUB300:SYS49155:X=X+1:FORDY=1TO500  
 :NEXTDY,J CL  
 •280 POKE2,70:SYS49152:PRINT"[CLEAR]";:FO  
 RI=1TO23:PRINTB\$:NEXT KF  
 •290 PRINTV\$(10)TAB(7)"[RVSON]PRESS ANY K  
 EY TO RESTART" IL  
 •292 SYS49155:SYS49152:PRINT"[CLEAR]" EG  
 •295 GETA\$:IFA\$=""THEN295 IF  
 •296 POKE53280,0:POKE53281,0:SYS49155:RUN OM  
 •300 PRINTV\$(12)TAB(16)"[RVSON]SPEED="MID  
 \$(STR\$(J),2):RETURN KA

## DEMO

•10 POKE53280,0:POKE53281,0:PRINT"[CLEAR]  
 [c 7]";:POKE2,100 ID  
 •14 DIMV\$(24):V\$(0)=""[HOME]" OJ  
 •15 FORI=1TO24:V\$(I)=V\$(I-1)+"[DOWN]":NEX  
 T JO  
 •16 B\$=""":FORI=1TO39:B\$=B\$+" ":NEXT:B\$="[  
 RVSON]"+B\$ NM  
 •20 FORI=1TO71:PRINT"SCREEN POCUS! ";:NEX  
 T:SYS49152 DK  
 •52 PRINT"[CLEAR]"V\$(8); MI  
 •53 PRINTTAB(14)"[RVSON][14" "]" EP  
 •55 PRINTTAB(14)"[RVSON][4" "]"SCREEN[4" "  
 "]" DH  
 •56 PRINTTAB(14)"[RVSON][4" "]"POCUS![4" "  
 "]" AD  
 •57 PRINTTAB(14)"[RVSON][14" "]" BD  
 •58 PRINTTAB(14)"[RVSON][4" "]"\*DEMO\*[4" "  
 "]" KL  
 •59 PRINTTAB(14)"[RVSON][14" "]" AF  
 •60 PRINTV\$(23)TAB(13)"PRESS ANY KEY[3".  
 "]" NL  
 •65 FORI=1TO700:NEXT OD

## TRI WORDS

*Continued from page 18*

ADD are not allowed), if the letters are in the current grid, if the word has already been used, or if the word is a word at all. After passing all the tests, the word will be printed on your board on the left side of the list.

If you feel all possible words have been selected, or if you wish to quit, enter three "at" signs (@@@) to challenge the computer. The computer will try to guess one

more word. If it succeeds, the computer wins. If it fails, the game ends in a tie. Of course, the computer can also inform you that it is stumped and will declare you the winner. The length of a game will vary depending on the 16 letters chosen, as well as the level you have selected.

The game is challenging and can help you expand your vocabulary while providing hours of entertainment. If the computer selects a word you are not familiar with, use the opportunity to learn a new word by looking it up in the dictionary. ☐ SEE PROGRAM LISTINGS ON PAGE 70

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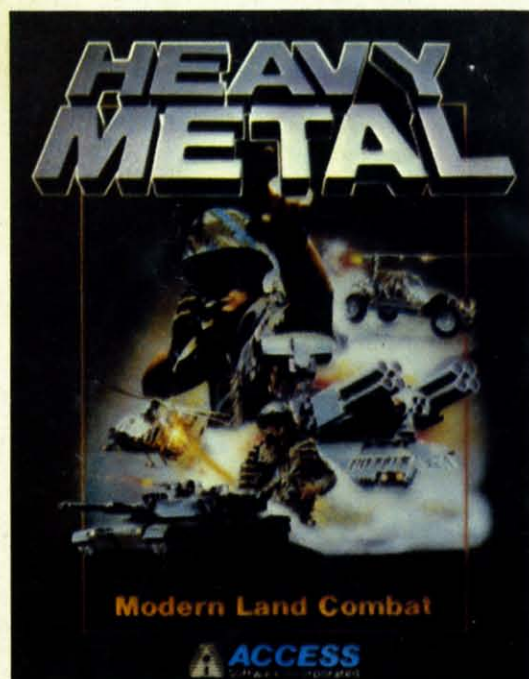
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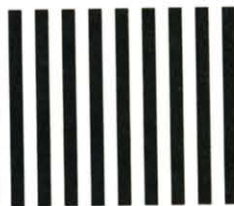
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