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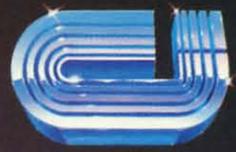
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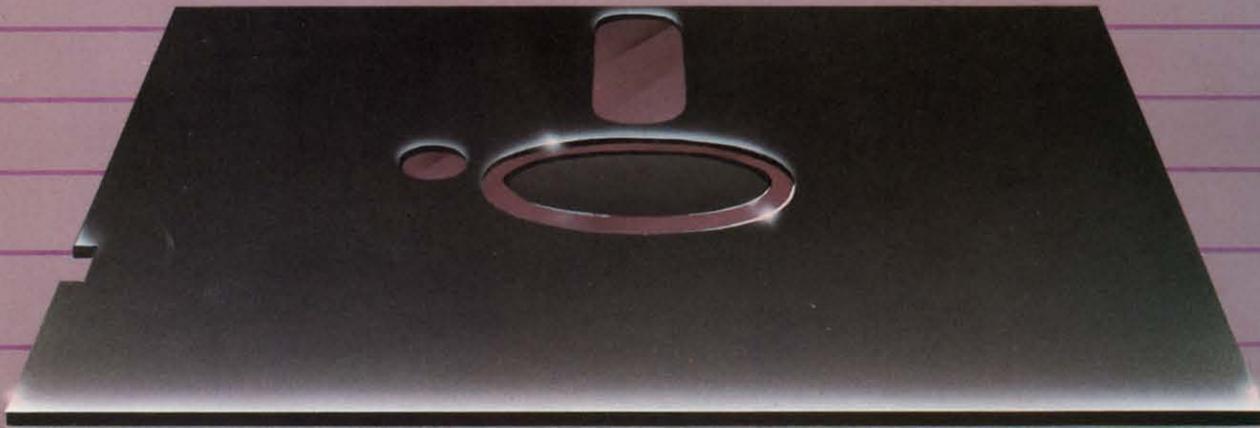




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Clipper

Dear Ahoy! Access Club Member,

Welcome back! This Clipper is the second of our bimonthly issues, brought to you by the publishers of Ahoy!

Those of you receiving your Clipper for the first time should also be receiving your Ahoy! Access Club Membership Card. If you didn't get your card, just drop me a note to Dept. AAM, Ion International Inc., 45 West 34th Street, Suite 407, New York, New York 10001. When you read this Clipper, you'll note that you won't need your card right away, but in the future, there will be offers for which you will need your card, so make sure you keep yours in a safe place.

One of our members, Steve Sheeter from Delphos, Ohio took the time and effort to drop me a note with a good suggestion I thought I'd pass along: Once you have signed your membership card, you can protect it by having it laminated, like some people do with licenses. It makes the card less pliable and costs only about 50 cents. Thanks, Steve, for your good suggestion!

Well, that's about all for now. In this month's Clipper, you'll find some fabulous specials. Buy 1, get 1 free, great discounts on all sorts of products and super offers you won't want to miss.

Admirally yours,

Joe Ferguson

Joe Ferguson
Director
Ahoy! Access Club

BUY 1...GET 1
FREE...Cardco is a
name we have all come to
respect and trust. That's

why I was so pleased and surprised when they told me that they would offer you, as a member of the Ahoy! Access Club, this fantastic deal: Buy one of the powerful programs from their new Personal Productivity Series—Personal Accountant, Personal Inventory or

Personal Time Manager, mail in the coupon on page 3 of this Clipper, together with your warranty card, and you'll receive the additional program of your choice, ABSOLUTELY FREE! (This offer may not be handled over the phone; you must *mail* in the warranty card with your Cardco coupon.) Please don't forget to indicate which of their valuable programs you'd like to receive. More information about this excellent CP/M Series may be found in

the Cardco ad on the inside cover of this month's issue of Ahoy!, the page just opposite this one. But please don't wait, we don't want you to be disappointed, and this offer expires on June 1, 1986. You can find Cardco's Personal Productivity Software at the following stores: Fedco/Gemco, Toy's "R" Us, B. Dalton/Software Etc., Electronics Boutique.

TIME FOR SALE... **YOURS!** Wouldn't it be terrific if you could start your programs with the touch of a single key? Or put a number of programs on a single cartridge? We know you've been wanting to start programming your own ROMs and so does **CSM Software**. And they've just made it 10% easier to afford! For a limited time only, **CSM** is offering everything you need to get into EPROM programming as a package deal: Jason-Ranheim's super product, Promenade™ Model C1, along with **CSM's** helpful reference guide, *EPROM Programmer's Handbook*, all for \$119.60. That's a full 10% off the regular price of the package (\$99.95 + \$32.95 = \$132.90). Ranheim's Promenade™ C1 provides you with 4 programming voltages, 2 EPROM supply voltages, 3 intelligent programming algorithms and 15 bit chip addressing (EPROMs and cartridge PC boards are not included). **CSM's** Handbook is the ideal reference to help you through the maze of learning EPROM Programming, covering beginning to advanced topics, AND it comes with a disk of ready-to-use routines and helpful utilities. You'll discover the remarkable power of programming your own EPROMs, while you learn to create your own cartridges and customize your computer and disk drive. Please add \$5 for shipping and handling within the United States. Foreign orders are extra. See **CSM's** ad on page 15 for more details. If you choose to mail your payment with your order, use the handy coupon on page 3 of this *Clipper*, or **CSM** will happily take your Visa or MasterCard order over the phone. Don't forget to mention your membership in *The Ahoy! Access Club*, otherwise you won't get your 10% discount. Mail or phone in your order TODAY, because this offer lasts only until June 1, 1986.

I GOT SO EXCITED... when I heard about this product because, I thought, here at last is an easy and fun way to get my 10-year-old out of the "game loop." With this product, I reasoned, he will learn programming AND enjoy it. Boy, was I right! Since I brought home Voice Master from **COVOX**, he can't wait to finish his homework and start programming. Thank you, **COVOX!** So what is this wonder of technology called Voice Master? Simply stated, it's a self-contained hardware and software system for the 64 or 128, which for the amazingly low price of \$89.95 offers a speech synthesizer, a voice recognition system, and an incredible music machine which lets you compose music, even if you don't know a treble clef from a bass note. For more details on the versatile Voice Master, check out the **COVOX** ad on page 87. (The system that we're offering here will work on the 64 or the 128, but watch for the 128-specific version coming soon.) But wait, the best is yet to come! It won't cost you \$89.95 to buy this quality product, because as a member of the *Ahoy! Access Club*, you qualify for a 10% discount on the purchase of one unit. Or, buy two or more units and you'll get a whopping 25% discount. **BONUS:** With your order of Voice Master, you'll receive their handy 48-page booklet called *Learning BASIC with Voice Master*, an indispensable guide to teaching yourself programming with speech. You do need to add \$4 for shipping and handling on each unit, and an extra \$2 for 2nd Day Air Service. If you order by phone with your Visa or MasterCard by calling 1-800-523-9230 don't forget to mention your membership in the *Club*. If you're ordering by mail, just clip the handy coupon on page 3 of this *Clipper*. But don't delay, because this offer sinks out of sight on the 3rd of June.

MUSIC TO YOUR EARS... Now you can use your 64 or 128 as a sequencer for your MIDI-equipped keyboard! All you need is the wonderful MIDI Magic Interface from **Micro W**. They offer prerecorded disks or play-along disks for learning music. With over 100 six-song diskettes, including the Q-R-S Player Piano Library, you'll have a wide selection of disks to choose from once you get hooked, as I have. From classics by George Gershwin, Scott Joplin and Fats Waller to more contemporary musicians like Liberace and Peter Nero, you're sure to find your favorite music available. Your special offer this month from **Micro W** is \$10 off the regular price of \$49.95. So for just \$39.95, you'll get the super MIDI Magic and a six-song sample disk. Other Prerecorded Digital Music Disks are only \$19.95 each. Buy 5, get 1 FREE. Their FREE CATALOG will give you a complete rundown of their extensive selection. Just send your payment to Micro W. Distributing, 1342 B, Route 23, Butler, NJ 07405, or for faster service call (201) 838-9027 or 9127 with your Visa or MasterCard in hand, please. Please don't delay, though, because this offer expires June 1, 1986.

SPEED UP YOUR LIFE... If you're like me, you have a very low threshold of boredom, and perhaps, also a limited amount of patience. That's why I was so thrilled when I tried Blitz from **Skyles Electric Works**. These guys have been selling electronics for years, and their experience is reflected in their products. With Blitz, an excellent compiler for the 64 or 128, there is no time for the usual "blitzing out" while I wait for my computer to respond. It runs my BASIC programs 5 to 20 times faster than they ran before, and believe me, that's fast for my 64. For more of the low-down on Blitz, see **Skyles'** ad on page 93. And after you've decided that you want to speed up your life, too, use the handy coupon on page 3 of this *Clipper* to order your very own copy of Blitz at a generous 20% discount (off the already-low "Sale Prices" of \$49.95 for the 64 version, and \$99.95 for the 128 version). You will need to add \$4.50 for shipping within the U.S. or Canada and California residents do need to add sales tax. So an order for the 64 version delivered within the U.S. or Canada (outside of California) is a mere \$44.45. What a bargain, considering that the regular prices (not including shipping) are \$99 and \$129, respectively. But act quickly, 'cause this offer fades into the sunset on June 1, 1986.

COMMODORE CALENDAR OF EVENTS

June 1-4 (Trade Only)	'86 Summer International Consumer Electronics Show McCormick Place	Consumer Electronics Group Electronic Industries Association Chicago Illinois	Dennis Corcoran (202) 457-8700
August 9-10	Third Annual M.A.R.C.A. Commodore Show Harrisburg, PA	M.A.R.C.A. P.O. Box 76 Mt. Holly Springs, PA 17065	Phone number to be announced.

CLEANER HEADS...FREE! When was the last time you cleaned your disk drive or your printer? If your excuse is that you don't have the proper materials, **American International Computer Products** wants to remedy that situation! For a limited time only, when you buy one box of 10 AICP disks at \$7.95 and one Disk Drive Cleaning Kit, also for \$7.95, you'll receive a Printer Head Cleaning Kit, valued at \$7.95, ABSOLUTELY FREE! The disks are 1st quality, guaranteed to be 100% error free. It's AICP's way of introducing you to their quality products. Please add \$3.50 for shipping in the continental U.S. Check out AICP's ad on page 61 of this issue of *Ahoy!* for details. With the coupon on page 3, you can order your FREE Printer Head Cleaning Kit or you may call 1-800-634-AICP, or in New York, 1-718-351-1864. But don't wait too long, 'cause this offer runs out of steam on June 1, 1986.

CONTINUE TO COUNT YOUR SAVINGS... Boy, are we lucky! **Abacus Software** (see their ads on pages 6 and 22), the guys who brought you those great \$5 and \$10 coupons in our last *Clipper*, have generously decided to extend their offer through May 31, 1986. How lucky can we get? You must use the new coupons in this *Clipper*, because by now, the others have probably expired, anyway. The \$5 coupon entitles you to \$5 credit towards the purchase of any book, purchased directly from **Abacus**, and you'll note, it's not valid with the Optional Diskettes for Books. The \$10 coupon is valid for \$10 credit towards the purchase of any software package, purchased directly from the company, but is also not good with Optional Diskettes for Books. You'll find the coupons on page 3 of this *Clipper*. Start clipping your **Abacus** coupons TODAY!

LET YOUR FINGERS DO THE WALKING, NOT RUNNING... How many times have you thought, "If only I didn't have to type in all those programs!" Well, I have good news... now, you don't. Simply subscribe to the *Ahoy!* Disk Program and you'll avoid those hours of typing. Usually, the *Ahoy!* monthly disks cost \$79.95 for a year of all of the programs printed in the magazine, but for you as a Club Member, for a limited time, the cost is only \$69.95. Use the coupon on the opposite page of this *Clipper* to save time. But don't wait too long, because this offer expires June 1, 1986, and may never be repeated.

SERVICE WITH A SMILE...even over the phone. I was really surprised to learn that

there was a Commodore-specific mail order operation that was also a Commodore-Authorized Service Center. And when I saw that the same company shipped software orders over \$100 by Federal Express, at the regular shipping cost, I was really impressed. But when I noticed that the same company had a telephone number for tech assistance and questions, I was convinced that this was a company I should get to know! The exceptional company that provides all of this additional service, and still has VERY competitive prices, is **Tussey Computer Products** in State College, Pennsylvania. They want you to experience first hand their great service, so they're making you this great offer: 50 cents off the already-discounted price of each box of Bonus Disks (limit 3 boxes, please!). Whether you choose single-sided, double density at \$7.95 per box or double-sided, double density at \$8.95, you're sure to be pleased with these 1st quality disks. Please add \$2.50 per order for shipping and handling within the United States. See their ad on page 34 for more information. The coupon on this page will assist you in ordering, or you may call 1-800-468-9044, but you must mention your *Ahoy!* Access membership in order to qualify for the discount. Don't delay. This offer expires June 1, 1986.

HELP IS ON THE WAY!

How many times have you wished you could have instant, online

help screens for the 69 BASIC Commodore 64 commands? Well, for just \$15.95, you can have the guidance of **HELP MASTER 64** at your fingertips. It requires no BASIC RAM and provides no interference with loading, saving, editing or running BASIC programs. Help information may remain onscreen while you program or you can remove it with a single keystroke. **HELP MASTER 64** is an invaluable aid to programming. It's compatible with DOS WEDGE and is available on disk or tape. Be sure to specify which you want. The regular price of **HELP MASTER 64** is \$19.95. See the Master Software ad on page 12. But you as a member of the *Ahoy!* Access Club get an additional \$4 off this already low price and this price even includes surface shipping within the U.S. and Canada. Maryland residents, please add sales tax. **BONUS:** This great offer also comes with complete information about Master Software's Money-Making Market Master Plan at no extra charge. Send your **HELP MASTER 64** coupon on this page, together with your payment, to the address indicated on the coupon. Or, if you wish, you may use your Visa or MasterCard and call 1-301-922-2962. This offer expires on June 1, 1986, so don't delay!



The Ahoy! Access Clipper is published bimonthly by Ahoy! magazine and sent free to selected subscribers of Ahoy! Ahoy! is a monthly publication of Ion International Inc.

The cost of a one-year subscription is \$19.95; two years are \$37.95. Inquiries regarding subscriptions to the magazine should be addressed to Ion International Inc., 45 West 34th Street, Suite 407, New York, New York 10001.

\$10 OFF ABACUS SOFTWARE

Mail to: Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

Yes, Abacus, I want to save \$10 on your terrific software. I understand that this coupon is not good for Optional Diskettes with Books, and may only be redeemed directly from you.

FREE KEYS OFFER

Mail to: MegaSoft Ltd., P.O. Box 1080, Battle Ground, WA 98604. For faster service, call 1-800-541-1541, or in WA, 1-206-687-7176.

Yes, MegaSoft, I want my own set of 25 Keymaster Update Keys FREE. My payment of \$29.95 to cover the cost of your Keymaster Program is enclosed. Thanks for the \$10 gift!

\$10 OFF GRAPHICS LIBRARIES

Mail to: Disk-of-the-Month Club, Unlimited Software, Dept. Y, P.O. Box 116, Fair Lawn, NJ 07410. For faster service, call 1-201-794-3220.

Yes, Disk-of-the-Month Club, I want to expand my design and graphics capabilities with your new programs, Printer's Devil and Printer's Patriot. The program(s) I want are indicated and I have enclosed \$16 for each program to be delivered within the 48 continental United States. Thanks, guys! Printer's Devil Printer's Patriot

MODEM + DATABASE MEMBERSHIP OFFER

Mail to: Protecto Enterprises, 22292 N. Pepper Road, Barrington, IL 60010. For faster service, call 1-312-382-5244.

Yes, Protecto, I'm ready to communicate with the universe of BBS's and receive a FREE 1 month membership to QuantumLink. My payment of \$24.95 for the 300 baud modem is enclosed.

MIDI MAGIC OFFER

Mail to: Micro W. Distributing, 1342B Route 23, Butler, NJ 07405. For faster service, call 1-201-838-9027.

Yes, Micro W., I want to add music to my life. My payment of \$39.95 for the MIDI Magic Interface and six-song sample disk. I understand you'll also send me your FREE CATALOG of Pre-recorded Digital Music Disks, and if I buy 5, I'll get 1 FREE!

BONUS DISK OFFER

Mail to: Tussey Computer Products, P.O. Box 1006, State College, PA 16804. For faster service, call 1-800-468-9044, or in PA, 1-814-234-2236.

Yes, Tussey, I want to experience your service with a smile AND save 50 cents on each box of Bonus Disks I purchase from you (limit 3 boxes). I have enclosed \$7.95 for each box of single-sided, double density or \$8.95 for each box of double-sided, double-density, plus \$2.50 for shipping and handling within the United States. My payment of \$_____ is enclosed.

VOICE MASTER OFFER

Mail to: COVOX, Inc., 675-D Conger Street, Eugene, OR 97402. For faster service on credit card orders only, call 1-800-523-9230.

Yes, COVOX, I want to get excited, too! I understand that as a member of the Club, I'll receive a 10% discount on the cost of Voice Master at \$89.95, and if I buy two or more, I qualify for a whopping 25% discount. I will also add \$4 for shipping and handling on each unit, so the cost of 1 unit delivered will be \$84.95. Thanks, COVOX!

\$5 OFF ABACUS BOOKS

Mail to: Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

Yes, Abacus, I want to save \$5 on your helpful books. I understand this coupon is not valid for Optional Diskettes with Books and may only be redeemed directly by you.

\$4 OFF HELP MASTER 64

Mail to: Master Software, 6 Hillery Court, Randallstown, MD 21133.

Yes, Master Software, I'm ready for HELP MASTER 64. Thanks for the terrific discount (over 20%!). My payment of \$15.95 is enclosed. I have indicated my preference for disk or tape: Disk Tape.

20% OFF BLITZ

Mail to: Skyles Electric Works, 231E South Whisman Road, Mountain View, CA 94041. For faster service, call 1-800-227-9998, or in CA, 1-415-965-1735.

Yes, Skyles, I want to speed up my life and save 20% while I'm doing it! Please rush me the 64/128 version (please specify) of Blitz at \$44.45/\$84.45. I understand this payment includes \$4.50 for delivery in the U.S. and Canada. Thanks, Skyles!

BUY 1, GET 1 FREE

Mail to: Cardco, Inc., 300 S. Topeka, Wichita, KS 67202. No phone orders!

Yes, Cardco, I want to take advantage of your fantastic offer on the new Personal Productivity Software for the 128. My warranty card is also enclosed. I have indicated my choice for a FREE PROGRAM: Personal Accountant Personal Inventory Personal Time Manager.

SPECIAL OFFER ON EPROM PROGRAMMING PACKAGE

Mail to: CSM Software, Inc., P.O. Box 563, Crown Point, IN 46307. For faster service, call 1-219-663-4335.

Yes, CSM, I'm ready to get into EPROM Programming and thanks for helping me save 10% while I'm doing it. Enclosed is my payment of \$119.60 to cover the cost of Jason-Ranheim's Promenade™ Model C1 and your helpful reference guide, *The EPROM Programmer's Handbook*.

FREE PRINTER HEAD CLEANING KIT

Mail to: American International Computer Products, P.O. Box 1758, Staten Island, NY 10314. For faster service, call 1-800-634-AICP, or in NY, 1-718-351-1864.

Yes, AICP, I want to have cleaner heads! Enclosed is my payment of \$19.40 to cover 1 box of AICP disks at \$7.95, 1 Disk Drive Cleaning Kit at \$7.95 and \$3.50 for shipping and handling in the continental U.S. I understand you'll also be sending me my FREE Printer Head Cleaning Kit, a \$7.95 value, mine FREE with my order.

\$10 OFF AHOY! DISK SUBSCRIPTION

Mail to: Ion International Inc., 45 West 34th Street, Suite 407, New York, NY 10001.

Yes, Ahoy!, I want to let my fingers to the walking, not the running, and save hours of typing time. I really appreciate saving \$10 on my Ahoy! Disk Subscription. My payment of \$69.95 is enclosed. Thanks!

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THE KEYS TO THE KINGDOM—FREE with Purchase...MegaSoft

sells superior hard and software, including their terrific disk back-up program; Keymaster. Keymaster, which sells for \$29.95, is a quick and easy-to-use program to help you duplicate archival software. With just one 1541 Disk Drive and Keymaster, you can copy files up to 5 times faster, format disks in a mere 10 seconds and even copy protected disks with the helpful Disk Unlocking Kit. For more information on the powerful Keymaster, see MegaSoft's ad on page 20 of this issue of *Ahoy!* But just for you, as a member of the *Ahoy! Access Club*, when you order Keymaster, you'll get their 25 Keys on update disks normally selling for \$10, ABSOLUTELY FREE. If you place your call by telephone to 1-800-541-1541, please mention your membership in the *Ahoy! Access Club*, or if you mail in your order, use the Keymaster coupon on page 3. But don't delay because this offer walks the plank on June 1, 1986, and you certainly don't want to miss out on this great opportunity to SAVE OVER 30%.

COMMUNICATE WITH THE UNIVERSE...There's an enormous universe of

BBS's out there. Can you communicate with them? Well, the nice guys at **Protecto** want to help! They're offering you, as a member of the *Ahoy! Access Club*, their terrific 300 baud modem with autodial, auto answer and up- and down-load capabilities for only \$24.95! Normally listing for \$99, this modem comes with a Complete Telecommunications Package, plus a FREE one-month membership in QuantumLink (a database service similar to Viewtron), a \$9.95 value, yours ABSOLUTELY FREE. You will need to add \$3 for handling, shipping and insurance, and Illinois residents need to add 6% tax. They will ship to some places outside of the US, but consult their ad on page 24 for details. If you call their telephone number 1-312-382-5244, please make sure to mention your membership in the *Ahoy! Access Club*, so that you receive your discount. If you use the mails, be sure to clip the coupon on page 3 of this *Clipper*. Please note that **Protecto** does have a generous company policy of providing a 15-day FREE TRIAL, so place your order TODAY. This offer dematerializes on July 1, 1986.

EXPAND YOUR PRINT SHOP! Disk-of-the-Month Club

wants to help you expand your design and graphics capabilities. If you have Print Shop, and who doesn't these days, you can now get RTR's excellent graphics library programs, Printer's Devil and Printer's Patriot at a helpful \$2 off. Usually selling at \$18 each, delivered, these newly released libraries are completely new and distinct from any previously-available from Broderbund, or anyone else, for that matter. Although this special offer is \$16 throughout the continental United States, elsewhere the price must remain \$18, due to increased costs for shipping. If you have a Visa or MasterCard, you can place your order by calling 1-201-794-3220 and mentioning your *Ahoy! Access Club* membership. Or mail in your order with the handy coupon on page 3. But don't put off ordering, because you'll be put off, if you try to order after June 1, 1986.

Ahoy!

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**Includes programs: *Hi-Res Bit Map Draw, Save, and Load; Multicolor Draw, Save, and Load; and Koala to C-128 Converter* (for the C-128)

***Includes program: *Alchemist's Apprentice* (for the 64, 128, Plus/4)

****Includes program: *SPRITE* (for the C-64)

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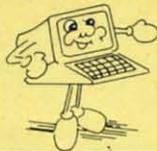
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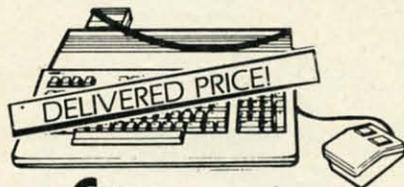


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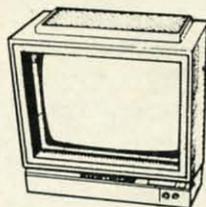
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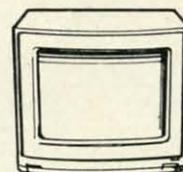
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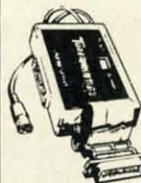
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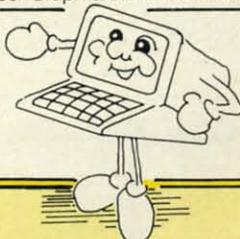
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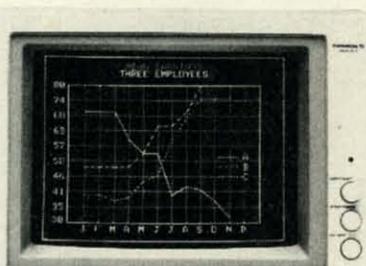
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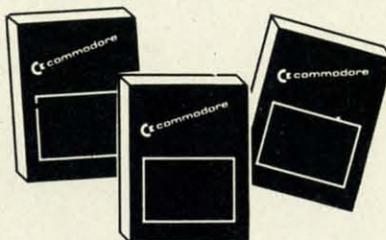
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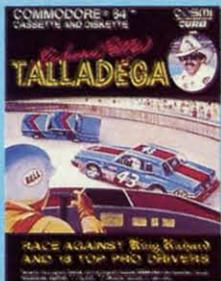
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VIEW FROM THE BRIDGE

The folk maxim that births and deaths come in pairs has never been better illustrated than by this issue of *Ahoy!* Our *VIC 20 Bug Repellent* has surrendered the space it's held for two years to a new C-128 version, providing a representation in microcosm of the direction *Ahoy!* is moving in.

While the VIC 20 will not totally disappear from these pages, the trend *Ahoy!* has been following these past months toward more for the 64 and 128 and less for the VIC will continue. This will anger the devout VIC users in our reading audience, but with a near total lack of new VIC products to announce and review and an ever decreasing trickle of original VIC program submissions, we couldn't continue to satisfy that small segment of our readership even if we tried. But we'll promise you VIC users this: send us a VIC program or article that's so useful, so innovative that we *must* publish it, and publish it we will!

As mentioned, *Ahoy!*'s C-128 coverage will continue to grow, as is witnessed by this month's lineup of 128-related features:

- Programming-wise, you're sure to become more powerful than the locomotive on this issue's cover once you learn the Escape sequence-accessed C-128 commands explained in this month's *Rupert Report* on *The Great Escape*. (Turn to page 18.)

- Some people love to talk movies. Some baseball. With Morton Kevelson, though, it's graphic bit-mapping. So it was only a matter of time before he turned his attention to *The C-128 Graphic Bit Map*. In addition to examining BASIC 7.0's graphic commands, Morton the K and Doug Bannon provide some multicolor and hi-res images and programs for manipulating them. (Turn to page 37.)

As for the other programs and features in this issue, some of which are 64-specific and some general:

- Last issue's *Commodore Roots* included *BIGCHRS*, a program for enlarging letters on the C-64 screen. Paul Montognese's *Bigprint* goes several magnifications beyond that routine, providing a full-featured environment for creating and utilizing large screen characters. (Turn to page 49.)

- *English Darts* recreates the famed pub pastime without the necessity of a flight to London. (Turn to page 60.)

- *Star Search* has drama, excitement, machine language

speed, stellar graphics...everything but Ed McMahon. (Turn to page 54.)

- At first, *Dead Man's Slope* may seem all downhill. But as *Ski Folly* progresses, so does the steepness of the slope...and the speed at which you fly down it. (Turn to page 67.)

- Buck Childress, fast becoming one of *Ahoy!*'s most prolific contributors, provides *Free RAM Check*, which will investigate the areas of memory where many ML programs and subroutines reside. (Turn to page 35.)

- But the Buck doesn't stop there! You'll never want to program without *Failsafe*, a utility to automatically save your BASIC program every 15 minutes. (Turn to page 56.)

- In addition to providing a comparative review of four popular boxing simulations and a strategy guide to Epyx's Olympic Series, this month's *Entertainment Software Section* includes reviews of *Zorro*, *Ultima IV*, *Heart of Africa*, and other new releases. (Turn to page 41.)

Cheryl Peterson illustrates some programming fundamentals with the aid of *Alchemist's Apprentice*, a children's game for the C-64, C-128, or Plus/4 included with this month's *Cadet's Column* on *More BASIC Programming*. (Turn to page 79.)

The SPRITE program presented this month as part of *Commodore Roots* has nothing to do with the column's theme: *The Musical Commodore*. But Mark Andrews promised it last issue, and he's a man who keeps his promises. (Turn to page 85.)

As usual, there's more inside than we have room to mention on this page. We're sure that's the way you want it. One final note: the *Ahoy!*/PlayNET subscription offer has been repeated due to popular demand. But act soon! Details are on page 75.

—David Allikas

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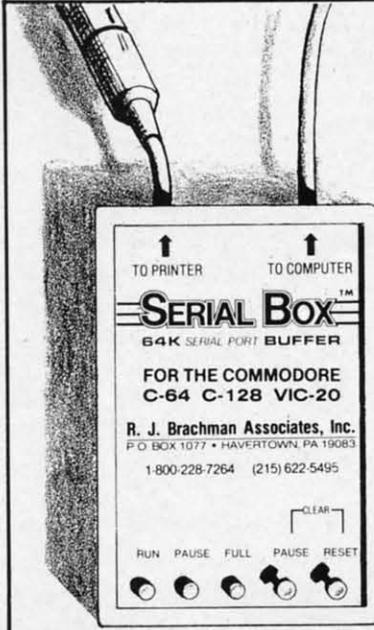
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Cardco, Inc., 316-267-6525 (see address list, page 122).

COMPUTEREYES/NEWSROOM

Digital Vision's *Newsroom Compatibility System Software* will enable users of their Computereyes video acquisition system (see review in September '85 *Aho!*) to convert captured images to a format usable by Springboard's *Newsroom* program, making it possible to incorporate photos into *Newsroom*-rendered newsletters and announcements. The new software will also convert standard hi-res images from other programs to the proper format.

This latest release joins the other software enhancements available for use with Computereyes, each available on disk with user's manual for \$15.00. They include the *Print Shop Compatibility System Software* and programs supporting the graphics modes and image formats of *DOODLE!*, *Koala Pad*, and *Flexidraw Pen*

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MasterSoft, 503-388-7654 (see address list, page 122).

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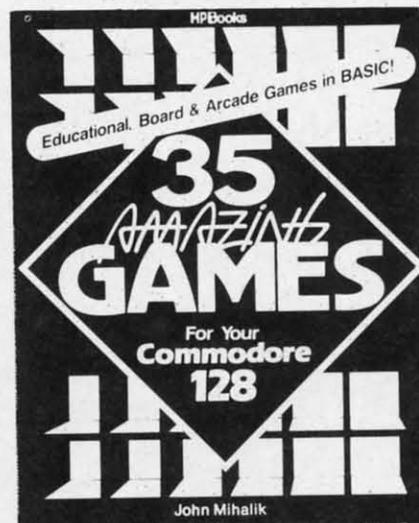
Omnitek Software, 414-694-4400 (see address list, page 122).

BOOK OF 128 GAMES

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Commodore International, 215-431-9100 (see address list, page 122).

C-64/128 MICE

Winner, the maker of a line of arcade style joysticks, has added a pair of mice to its product line. *Mighty Mouse* will work with the C-64 or C-128, and is compatible with most programs. *Magic Mouse*, compatible with the C-64 and most of its programs, is designed for creating hi-res graphics, sprites, and icons. Each mouse carries a one year warranty.

Winner, c/o Contriver Enterprise Co., Ltd., 604-251-9925 (see address list, page 122).

AMIGA UTILITIES

Now available are six packages for Amiga programmers previously announced by Lattice, Incorporated:

Lattice Text Utilities, a set of eight programs providing a language-independent set of tools for examining and editing text files.

Lattice Make Utility, allowing us-



Lotsa Lattice utilities for Amiga.
READER SERVICE NO. 226

ers to rebuild complex systems with a single command.

Lattice Screen Editor, providing a multiwindow environment with standard editor functions as well as special features like an error tracking mode, three assembly language input modes, and pattern searches.

Lattice dBC III Library, containing more than 70 C language functions for creating, accessing, and updating dBASE III-compatible files.

Panel, a screen design/management tool permitting programmers to use custom data entry validation and pop-up help messages and menus.

Lattice MacLibrary, supplying over 60 C language functions that aid in implementing screens, windows, and gadgets.

Also available is *Unicalc* (\$79.95), a spreadsheet providing a 256 column by 1024 row processing area, context-sensitive help screens, and dual window capabilities, plus floating dollar signs, negative balance indicators, integrated functions, and punctuated numbers.

Lattice, Incorporated, 312-858-7950 (see address list, page 122).

C-128 CABINET

The C-128 Command Center is a cabinet providing protection for one or two disk drives, the CPU, and all necessary cables, and matching the C-128 in color, texture, and style. A built-in power strip protects the equipment from line surges and voltage spikes; a built-in fan keeps the drives and CPU cool. Price is \$159.95 plus \$3.50 for shipping and handling.

ICCCI, 319-338-7123 (see address list, page 122).

BASIC HANDBOOK

The third edition of *The BASIC Handbook* (\$24.95), in print since 1978, has been released. The 862-page volume functions as a dictionary of over 800 words, an encyclopedia, a thesaurus (for alternates when BASIC will not allow a specific word), and a translation guide for converting programs from one BASIC dialect to another. Examples and demo/test programs illustrate us-

age and results.

CompuSoft Publishing, 619-588-0996 (see address list, page 122).

SPACE PEN

Watch for a dramatic drop in the price of the Space Pen input device announced in the September '85 *Scuttlebutt*. The light pen which detects a "Z" axis, permitting operation in a six foot area in front of the computer screen, had been selling for \$150 (C-64/VIC 20 version) and \$175 (Amiga version). But by integrating the electronics on a chip, the manufacturer tells us, he will be able to begin wholesaling the package within the next six months for around \$10.00. What your final cost will be remains to be seen, but there's a good chance that you won't even have to buy the pen—that it will be offered "free" along with third party software developed for it.

Soniture, Incorporated, 408-866-4616 (see address list, page 122).

GAME RELEASES

Five new C-64 releases from Strategic Simulations:

Nam (\$39.95) allows you to lead a unit of U.S. Marines in one of six action scenarios: in the air, underground, against a defended position, in ambush, with armor, and building to building. Tactical elements available include civil police units, South Vietnamese and Korean infantry, paratroopers, rangers, and air cavalry, along with their attendant vehicles and support weapons. The computer directs the enemy on one of three difficulty levels, forcing you to deal with such military concepts as concentration of force, cover fire, and flanking and selective maneuver.

BattleGroup (\$59.95), the sequel to *Kampfgruppe*, follows allied armies fighting Hitler's forces through every major engagement from North Africa in 1943 through the war's climax in Germany, posing you as the leader of American or British regiment- or brigade-sized forces opposed by like numbers of Nazis. Four historic scenarios are included; in addition, the player can create an infinite number of original ones. You can play against

a human opponent or the computer, or let the computer play itself in one of the four historical modes.

Wargame-type strategies are combined with fantasy game elements in *Wizard's Crown* (\$39.95), in which you lead a band of adventurers to recapture said headpiece from behind spell-woven walls in the once-splendid city of Arghan. You create individual characters by selecting from among personality traits, attributes, skills, and a nearly infinite variety of semi-randomly created magical items. With your companions, you fight battles against more than 20 kinds of monsters, in single or party combat, forming lines, advancing, and retreating.

Once you've bagged the crown, you can start looking for the missing *Rings of Zilfin* (\$39.95), and fighting the forces of Lord Dragos, The Dark One, to save the people of Batinig. You must make your way through dozens of villages and towns, utilizing spells, magic plants, assorted swords, bows, and armor, along with sundry mundane and mysterious objects. While you search and fight, clues are revealed that must be dealt with in cause and effect relationships.

Phantasie II (\$39.95) takes you to the Isle of Ferronrah, beset by evil power emanating from the enchanted Orb of Nikademus, the Dark Lord. You and your companions must invade difficult terrain, escape dungeons, and defeat monsters (chosen from over 80 types) to rid the land of both orb and lord. Additional features include new terrain elements such as dangerous molten lava, near-impenetrable mists, and haunted dark voids.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 122).

Tales of the Unknown: The Bard's Tale (\$39.95) combines color animation with 16 levels of mazes, combat, magic, and puzzle-solving. You must vanquish Mangar, the evil wizard (can you stand one more?) who has cast an eternal winter spell on the town of Skara Brae. To this end, you assemble up to six alter ego characters, outfit them with armor, weapons, and magic items, and lead them

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AHOY! 11

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MODEM MASTER PLUS 4-foot user port extender with reset	\$29.95
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C128 80 col monochrome cable for non-RGB monitor	\$ 9.00
Surge Protector 6 outlet power strip 6-foot cord	\$21.00
Disk Notcher — lets you use both sides of disk	\$ 8.00

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Reader Service No. 227

through increasingly complex and challenging mazes. Four types of magic are employed: conjuring (for creating objects and healing adventures), magic (for bestowing special effects on common items), sorcery (for creating illusions and heightening awareness), and wizardry (for summoning and controlling supernatural creatures). The two-disk game for the C-64 will retail for \$39.95.

Electronic Arts, 415-571-7171 (see address list, page 122).

Championship Golf at Pebble Beach (\$24.95 prepaid; \$27.95 C.O.D.) lets golfers tee up on the Pebble Beach Golf Links, graphically recreated with bird's-eye views of tees, fairways, greens, sand traps, trees, and the Pacific Ocean. A joystick or the keyboard is used to produce a variety of different shots including hooks, slices, and chips. Features include variable tee placements and pin positions, scorecard printout, and choice of 14 clubs. Closeup views of each green are provided during putting. Data disks from courses such as Augusta National and the Tournament Players Club can also be purchased.

Sportsware, 415-960-6674 (see address list, page 122).

Farm Life simulates an ultramodern farm, where you must buy and sell cattle, crops, and machinery. One to four players compete against one another or the bank. Price of the C-64 program is \$12.00, including shipping.

Tidal Bore Software, 902-895-4563 (see address list, page 122).

Three new C-64 offerings from Cygnus include **Star Fleet I** (\$49.95), a translation of the two-year-old IBM PC game; **Quizam!** (\$39.95), a trivia contest; and **Stinger!** (\$19.95), a space arcade game for younger players. An Amiga version of **Star Fleet I** is planned for this summer (along with **Balakon Raider** and **Spinout** for the C-64), and **Star Fleet II** for the C-64. Cygnus Software, 713-486-4163 (see address list, page 122).

AMIGA GRAPHICS SOFTWARE

The following from Aegis Development, intended to exploit the Amiga's

graphics capabilities:

The **Aegis Images** paint program allows the use of 32 colors at once and features spread and wash options, color blending, adjustable airbrush, customizable paint brushes, and tile drawing.

Aegis Animator allows the use of any **Images** picture as a backdrop for an animated sequence, plus path plotting, storyboarding of up to nine separate animations, clone and destroy, movement on X and Y axes for a 3D effect, full rotation, and proportional sizing.

Images is priced at \$79.95; **Images** and **Animator** together at \$139.95. Both programs are for use with 512K.

Impact allows the business or scientific professional to display numeric data in bar, line, or pie chart format. Bar charts can be either horizontal or vertical, and 3D. Line graphs include both single and multiple plots in regular, area, and scatter formats. Pie charts can have exploded segments, with a 3D option. Slide show capabilities control the type of transformation used between slides (fade in/out, spiral, curtain up, etc.).

At press time, it appeared that **Aegis Draw** (under \$200) would not be ready in time for inclusion in Morton Kvelson's comparative review of CAD (Computer Aided Design) programs scheduled for next issue. Which is unfortunate, because pre-publicity for the package (see ad last issue) indicates that the program actually does what the C-64 and C-128 CAD packages are trying to approximate. In fact, already in the works is **Aegis Draw Professional**, to which users will be able to upgrade and utilize features not found on other microcomputer CAD systems.

Aegis Development, Inc., 213-306-0735 (see address list, page 122).

LABEL MAKER

Disk Label Maker (\$12.99) allows the user to read and print labels from the disk directory, and to modify any entry (including the header) before printing. Expanded and condensed print modes are supported, and names up to 54 characters long can

be used. C-64 and C-128 versions are on the same disk.

Mavenware, 907-789-1783 (see address list, page 122).

CP/M SOFTWARE

Out-Think (\$49.95) lets C-128 owners running CP/M Plus classify text into an outline structure, then alter and access the text based on that structure. Levels of the outline can be collapsed off the screen, hidden from view, and then expanded back into view for editing. Complete copy and move operations are provided. Outlines can be printed with over 20 different formatting parameters, including headers and footers and an automatic table of contents.

Current owners of Kamasoft's *Kamas* outline processor can obtain *Out-Think* by sending in their *Kamas* master disk and \$25.

Kamasoft, Inc., 503-649-3765 (see address list, page 122).

Disks of public domain CP/M software are available for \$15.25 each from Poseidon Electronics. To receive a catalog send a stamped (\$0.39) and self-addressed envelope and \$1.00 to Poseidon (see address list, page 122).

TELECOM NEWS

The good news is that Commodore

is giving away a free 1660 modem (retail \$49.95) and QuantumLink software (see review last issue) with the purchase of a C-128. The bad news is that it may already be too late for you to take advantage of this offer, which ends March 31.

Commodore International, 215-431-9100 (see address list, page 122).

The aforementioned QuantumLink has enhanced its Commodore Information Network to include a Commodore Hotline, permitting the user to send questions to Commodore or browse a database of frequently asked questions on the 64, 128, and Amiga; a User Group Center, listing authorized groups and providing a forum for user group officers and members, along with special bulletin boards set up by more than 50 user groups; Meet the Press, enabling users to exchange messages with leading experts; and SYSOP Corner, providing weekly columns by each of Q-Link's SYSOPs.

Quantum Computer Services Inc., 703-448-8700 (see address list, page 122).

Microsearch, a database devoted exclusively to microcomputer products, is now available on CompuServe. Updated biweekly, the database contains over 28,000 product summaries and computer magazine

reviews of more than 12,000 products. Users can search by keyword, publication, title, author, date, computer, operating system, or manufacturer. A directory of 5,000 manufacturers' names is provided.

Microsearch Information, Inc., 202-833-1174 (see address list, page 122).

PIRATE TO WALK PLANK

Be forewarned, those of you who think the FBI is too busy tracking master criminals to concern itself with folks who merely dupe software for fun and profit. That esteemed government agency has informed us of the arrest of Raymond Paul Johnson for copyright infringement in violation of Title 17, United States Code, Section 506A. The possible penalty for the accused software pirate's piddling crime? A fine of up to \$250,000 or imprisonment for up to two years. His is one of many arrests to be made in months to come. Please don't get your name in *Ahoy!* that way.

AMIGA ANSWERING MACHINE

The Amiga 1100 AnswerMate, a programmable answering machine, hooks up to the Amiga's RS-232 port and is put in series with the telephone. The unit contains a computer-controlled audio cassette mechan-

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ism for recording voice messages from the telephone line, or voice messages generated by the Amiga's built-in text to speech capability. A touch tone decoder is provided for beeperless remote control; Hayes-compatible Bell 212A modem is available at extra cost.

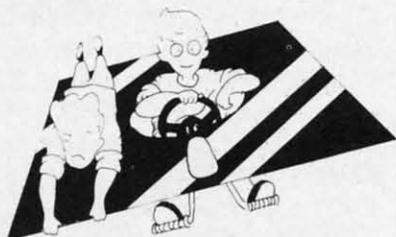
Commodore-Amiga Inc., 215-431-9100 (see address list, page 122).

DISK CARE BOOKLET

The Floppy Disk Story, a free 32-page booklet, introduces children to the use and care of diskettes through the illustrated adventures of Ralph and his buddy, P.C. Poindexter. A free copy (one per household) can be obtained by writing to the Fuji Film Promotion Department (see address list, page 122).

MICRO TOOLKIT

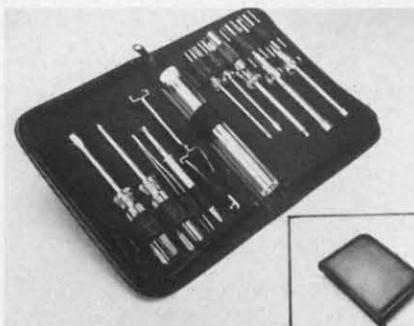
As most adventurous Commodore users discover after their first misadventure, opening your hardware and attempting a repair is an activity best



Free Fuji booklet teaches disk care.
READER SERVICE NO. 220

left to qualified personnel. But if you're in that category, as a large percentage of *Ahoy!*'s readers are, the PC Tool Kit provides II implements commonly used in do-it-yourself repairs, some designed especially for use with microcomputers, packaged together in a zippered case. Price is \$29.95.

MicroComputer Accessories, Inc., 213-641-1800 (see address list, page 122).



II implements for computer repair.
READER SERVICE NO. 221

ANCIENT SPARTAN

We reported on it for the first time in our February '84 issue, at which time we assumed that the Mimic Systems AP Modular Pak would soon see release. It was the most exciting new product to be announced in some months: a hardware addition that would allow all Apple II-compatible software to run on a Commodore 64. In the more than two years that followed, the project changed ownership, the device was rechristened the Spartan, and hundreds of thousands of dollars worth of full-page ads appeared in major computer publications (ours included). But between our February 1984 issue and last month, not another word about Mimic Systems' Spartan had appeared in *Scuttlebutt*—because it still had not

been released.

In the home computer market, we are of course used to products being announced and/or advertised months before they actually come available. But the Spartan has in its two and a half year non-life transcended the classification of "vaporware" into an industry joke. Still, the great gobs of money Mimic Systems continued to spend on advertising left no doubt in our minds that they meant business. After more than a year of fine tuning, Mimic invited *Ahoy!*'s editors to their suite at the January '85 Consumer Electronics Show, where a working model was on display. Shipments would begin, we were told, very shortly. Twice during the following year, the company's PR agency called to tell us that an evaluation unit would be sent in a matter of weeks. You guessed it—nothing.

Until last month's West Coast Commodore Show in San Francisco, where boxed Spartans were on display and Mimic's Peter Ho informed us that shipments had at long last begun (as of early February). While neither you nor we may ever know the true cause of the product's record book delay, we can provide you with the Spartan's current technical specifications.

The system is Apple II+ software- and hardware-compatible. The manufacturer does not claim full compatibility; in fact, on the press release we



Spartan: II+ emulation, II+ year wait.
READER SERVICE NO. 222

received, "100%" is crossed out in both cases.

Included are eight Apple II+ compatible decoded peripheral slots and four software selectable C-64 cartridge slots, one non-dedicated 8-bit parallel port with flag registers and command word, and one standard

Continued on page 122

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See the review in the Oct. 1984 *Compute!'s Gazette*. Also reviewed in *Ahoy and Run*.

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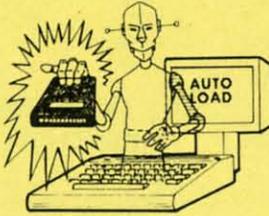
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Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about \$1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

These are just some of programs included.

TOP SECRET STUFF I

- The Dock (view/repair disk contents)
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- 1/2 Track Reader
- Electronic Arts Backup
- Drive Mon (disk drive m/f monitor)
- Diskette File Log (start-end address)
- Repair A Track (recover data)
- 1/2 Track Formatter

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TOP SECRET STUFF II

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This is the first book available of its kind. Complete cross-references used to convert 64 programs over to the 128 computer. Book is formatted on the left side with the location and label name, and then on the right with the equivalent 128 location. The entire range of memory is covered starting at 0-Page going thru BASIC and then thru the Operating System. A must for the serious 128 user.

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- Up and down file transfers with a choice of access levels.
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- Print out boards activity to include what files accessed and by who.
- Faster performance and more storage using the 1571 drives.
- Supports the use of over 500 users!
- Both boards will support and work on any type of disk drive including the big 1 meg. SFD's.

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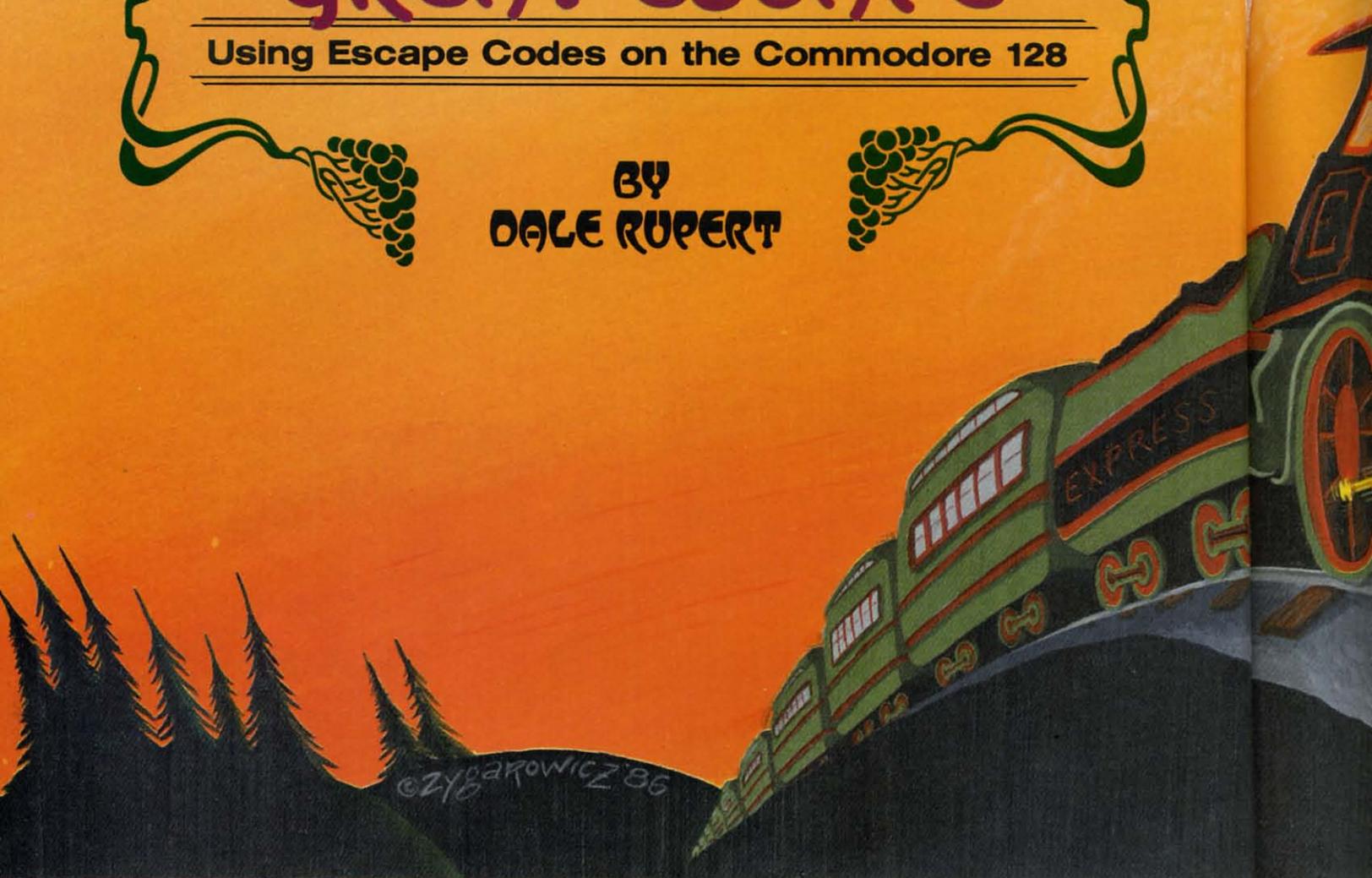
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THE GREAT ESCAPE

Using Escape Codes on the Commodore 128

BY
DALE RUPERT



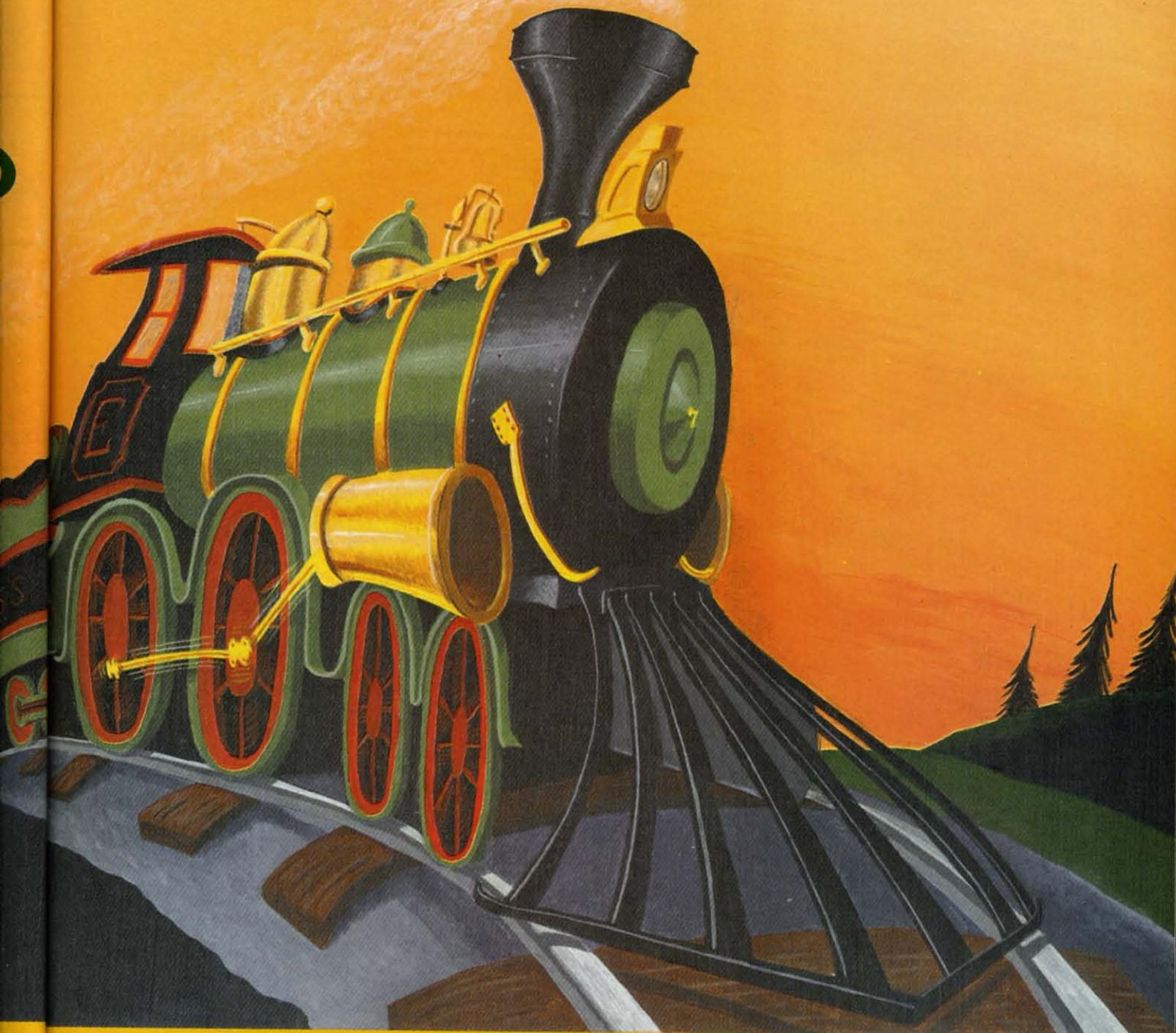
The Commodore 128 provides a very nice environment for creating and editing programs. The disk commands are built into BASIC 7.0, so there is no longer a need to type horrendous sequences of keystrokes to look at a directory. The function keys are programmable “on the fly.” The 80-column format allows just the right amount of information to be present on the screen at one time. The No Scroll key is worth many times its weight in gold.

All Commodore computers since the VIC 20 have provided a screen editor. The ability to move around at will on the screen, inserting and deleting as necessary, is an incredibly powerful feature. (Probably only those who have used a line editor can fully appreciate the significance of a screen editor.)

The Commodore 128 adds some useful and powerful commands to facilitate programming and editing. Those commands are accessed by means of Escape sequences. This month we will investigate the Escape sequences and see how useful they are.

The concept of an Escape sequence may not be new to you if your printer accepts this type of special control code. The Escape character has an ASCII value of 27. Many printers are programmed to interpret a character 27 as the first of a two-byte instruction, rather than as text to be printed.

For example, if an Epson printer receives a character 27 (Escape) followed by a character 69 (E), it does not print the letter “E”. Instead it treats the sequence “Escape-E” as a command to enter the “emphasized print mode.”



T.J. ZYGAROWICZ

The Escape sequences on the C-128 are similar in concept to those on a printer. Pressing the ESC key does not display a symbol on the screen. The key pressed after the ESC key determines what action is to be taken. The symbol normally associated with that second key is not displayed on the screen either.

In direct mode, Escape sequences are generated by first pressing then releasing the ESC key, followed by pressing then releasing a second key. The second key may be the "@" key or any of the letter keys "A" through "Z". Thus there are 27 Escape sequences available in the C-128.

COMMAND CATEGORIES

The Escape sequences or commands may be separated into three general categories. There are commands to (1)

change the quote and insert modes, (2) affect the appearance and function of the screen, and (3) help with the task of editing.

The table on page 23 lists the commands in these categories. The Escape sequences are listed alphabetically on page 88 of the *C-128 System Guide*, and they are grouped in Appendix I. Note that in both places the descriptions of Escape-C and Escape-D are incorrect and should be swapped.

We will discuss each command in the order presented in the table below. Many are self-explanatory. A few have some side effects which we will describe.

DESCRIPTIONS

How often have you needed to insert text into the mid-



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KEY MASTER

One of the easiest-to-use, most powerful disk backup program ever written for the 64. Working with the 1541 or the 1571 KEYMASTER is like getting two copy programs for the price of one. Its main feature comes with 50 keys that unlocks protected disks by ELIMINATING the protection scheme originally written on the disk.

Once one of the KEYMASTER'S KEYS has unlocked a disk, the program can generally be **FILE COPIED** onto another disk (also making the program compatible with non-1541 drives.)

In addition to the UNLOCKING KIT it contains a powerful yet easy to use general purpose copier for the programs not listed as a key.

With One 1541:

- **FAST FILE COPIER** - up to 5 times faster!
- **FAST full protected** - disk GCR nibble copier works in only 75 seconds!
- **FAST full unprotected** - disk copier.
- **FAST 10 second disk formatter.**

With Two 1541:

- **FAST file copier** - up to 6 times faster!
- **FAST full protected** - disk GCR nibble copier works in only 37 seconds!
- **FAST full unprotected** - disk copier.
- **50 KEYS** for popular programs will be provided on the first KEYMASTER disk. Frequent updates of 25 to 50 additional KEYS will be available periodically. (No original disk return required for updates!)

ALL OF THIS AT THE RIGHT PRICE! ONLY —

\$29.95 for KEYMASTER

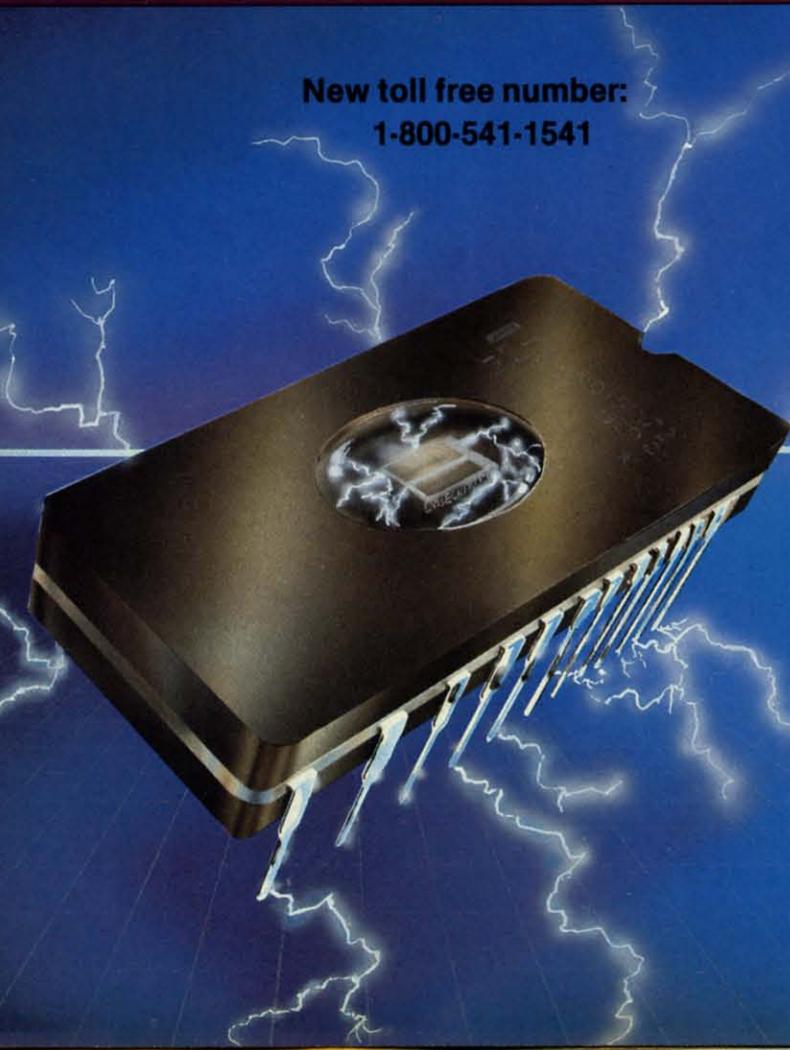
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KEYMASTER created by Jim Drew.

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- A high-speed loader, high-speed verify, disk drive no-head-rattle routine (1541 drive) and a BASIC UNNEW ROUTINE (MSD drive) have replaced the Datasette tape routines.
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- Unlike the older, cartridge-style fast loaders, no ports are tied up at the rear of your computer, the screen is not blanked during loading and there is no wear-and-tear on the game port.
- For maximum convenience and performance, MAGNUM LOAD is installed DIRECTLY in the circuit board. Generally, a socket has already been provided to make the operation easy, but occasionally some soldering may be required.
- Now you can give your 1541 disk drive "1571 speed."

The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pitstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec**	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = Failed to load at all.

FIVE VERSIONS OF MAGNUM LOAD ARE AVAILABLE TO FIT ANY NEED.

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A	C64 computer and one 1541 drive	\$24.95
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D	C128 computer and one 1541 drive***	\$24.95
E	C128 and one MSD drive (single or dual)***	\$24.95

*** = Fully compatible with 128 & CP/M modes. Cartridge versions MUST be UNPLUGGED to access 128 & CP/M modes!

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MAGNUM LOAD created by Jim Drew

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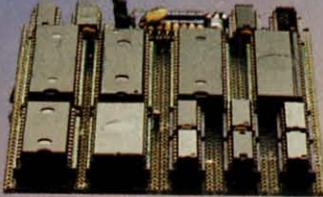
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Being the best utility available today, it will even copy the other copy programs.

Because of the Shadow's unique abilities, we feel DOS protection is a thing of the past.



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Shadow a disk while it loads, then read an exact list of:

- Track, sector, ID, check sum, drive status
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 - Command recorder shows commands that were sent to 1541 while program was loading
 - RAM recorder records custom DOS
- Shadow-scan any disk, then read exact list of:
- Valid tracks, half tracks, partial tracks and segments
 - Sync mark link, header block links and data block links
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Exclusive snap shot recorder will give you an exact copy of the 1541 RAM and can be viewed, saved or printed. Plus many more features included.

*Requires Shadow

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Highly sophisticated and integrated piece of hardware that turns you 1541 into something you've always wanted.

- Track and sector display
- Drive reset switch
- Device number change
- Half track indicator
- Abnormal bit density indicator
- Shadow on-off indicator

The Shadow display will give you an accurate display of precisely what track you are accessing during a normal load even if the program does a read past track 35.

*Requires Shadow



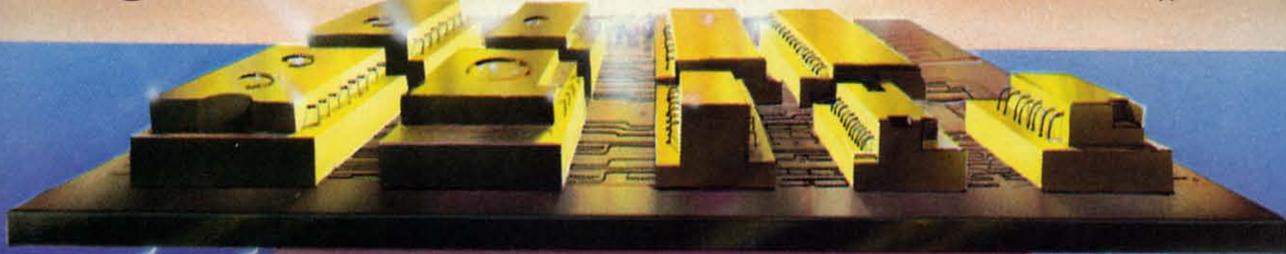
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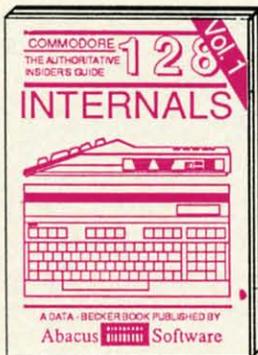


1541

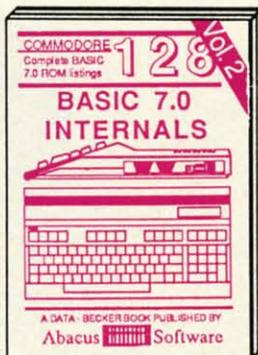
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C-128™ and C-64™

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Detailed guide presents the 128's operating system, explains graphic chips, Memory Management Unit, 80 column graphics and commented ROM listings. **500pp \$19.95**



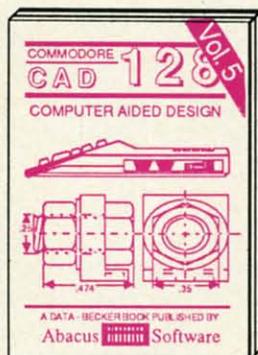
Get all the inside information on BASIC 7.0. This exhaustive handbook is complete with commented BASIC 7.0 ROM listings. Coming Summer '86. **\$19.95**



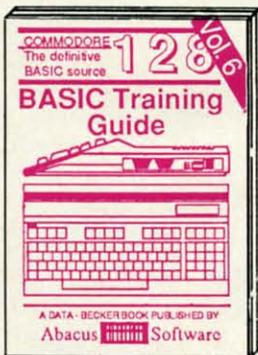
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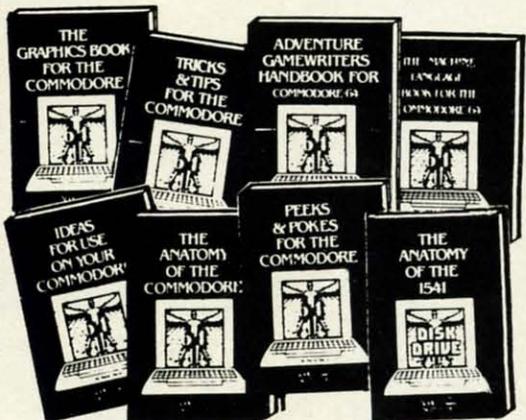
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Modes

- A—Enable auto-insert mode
- C—Disable auto-insert mode
- O—Cancel quote and insert mode
- X—Toggle between 40 and 80 column mode

Screen

- L—Enable scroll
- M—Disable scroll
- F—Enable cursor flash
- E—Disable cursor flash
- T—Define top of window at cursor
- B—Define bottom of window at cursor

(The next four are for 80 column mode only)

- U—Create underline cursor
- S—Create block (solid) cursor
- R—Display screen in reverse video
- N—Display normal screen image

Editing

- J—Move to start of line
- K—Move to end of line
- P—Erase to start of line
- Q—Erase to end of line
- @—Erase to end of screen
- D—Delete entire line
- I—Insert blank line
- V—Scroll screen up
- W—Scroll screen down
- Y—Set default tabs
- Z—Clear tabs
- G—Enable bell (Control-G)
- H—Disable bell

dle of a program line? Without Escape codes, you must press the INST key the proper number of times to clear the space for the added characters. With ESC A, the computer enters an "auto insert" mode. Now as you type, the text to the right of the cursor is pushed ahead as the new characters are entered. You no longer have to count or guess the number of characters to be inserted.

There is one side effect to the auto-insert mode. Listings are displayed very slowly in that mode. If you type LIST and see your program printed almost character-by-character on the screen, chances are that the computer is in auto-insert mode. Use ESC C to disable auto-insert mode. You may now type over any characters on the line.

ESC O provides the ability to escape from the quote and insert modes. If you have just typed the first quotation mark or pressed the INST key, you are in the quote and insert modes. The cursor keys no longer move the cursor as before. In the insert mode, the DEL key no longer deletes the character to the left of the cursor. Instead these keystrokes appear as strange symbols. Pressing ESC O is handy for returning to normal editing mode without pressing RETURN and leaving the current line.

ESC X toggles the active screen from the 80-column monitor to the 40-column monitor. If the cursor is no longer visible on the screen, and your program is not running, perhaps it is blinking on the other display. Press the ESC key followed by the X key to see what the other screen looks like. If you are using the 1902 monitor, you must also press the 40/80 column switch on it.

On power up, or if you press the RUN-STOP and RESTORE keys together, the active screen is determined by the 40/80 DISPLAY key. ESC X allows you to use the other screen mode regardless of the 40/80 DISPLAY switch.

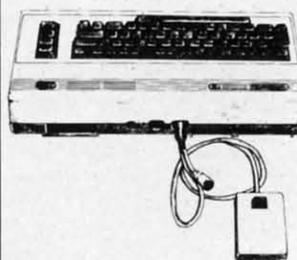
ESC M disables the normal scrolling of the screen. Usually when text is printed on the last line of the screen, the whole screen image scrolls upward, clearing the bottom line for more text to be printed. If scrolling is disabled, the cursor jumps to the top of the screen (or active window) after it prints the bottom line. Text on the screen is overwritten rather than moved out of the way. ESC L enables the normal scrolling mode.

Lines near the bottom of the screen do scroll off the screen even when scrolling is disabled if text is inserted into upper lines on the screen. For an unusual effect, press ESC A then ESC M and then list a program several times.

ESC E is just the thing if you find the blinking of the cursor to be annoying. The cursor may be harder to find,

Continued on page 95

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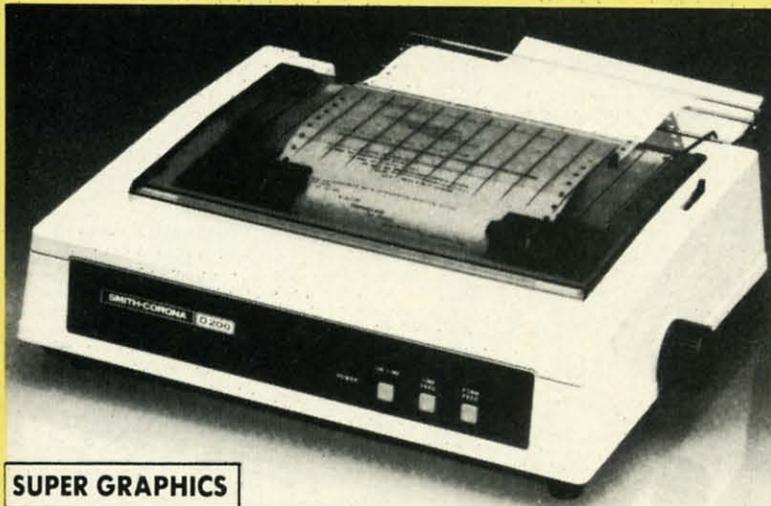
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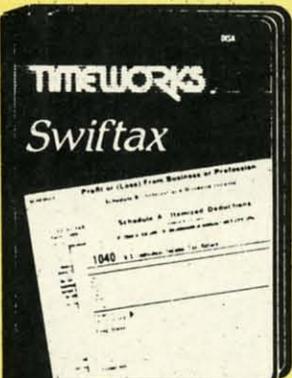
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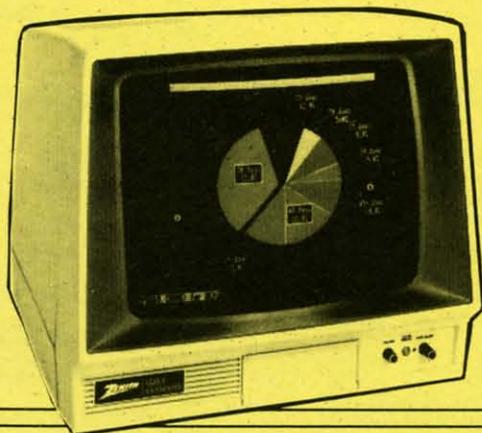
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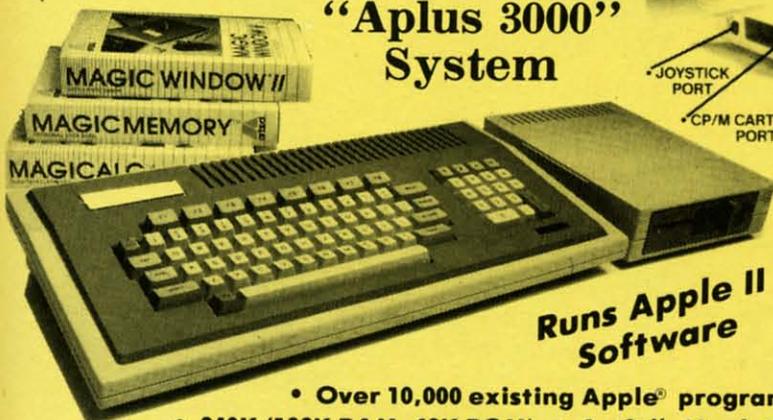
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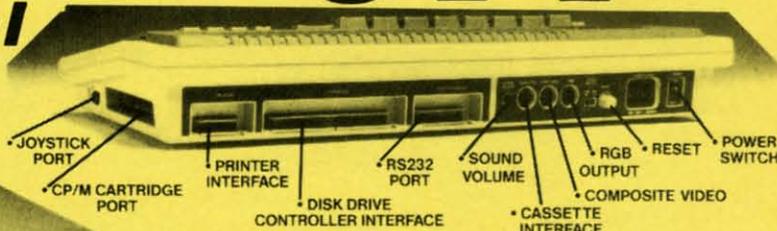
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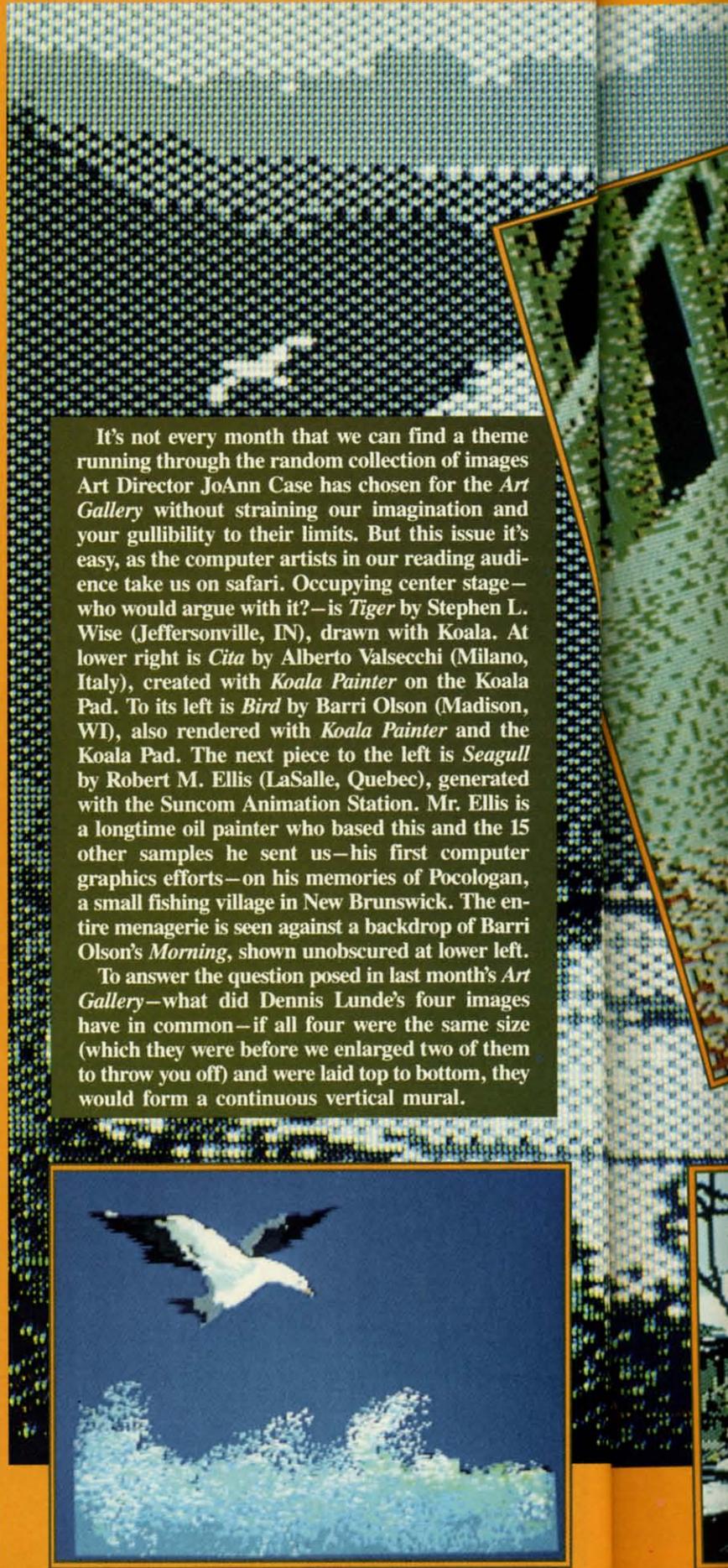
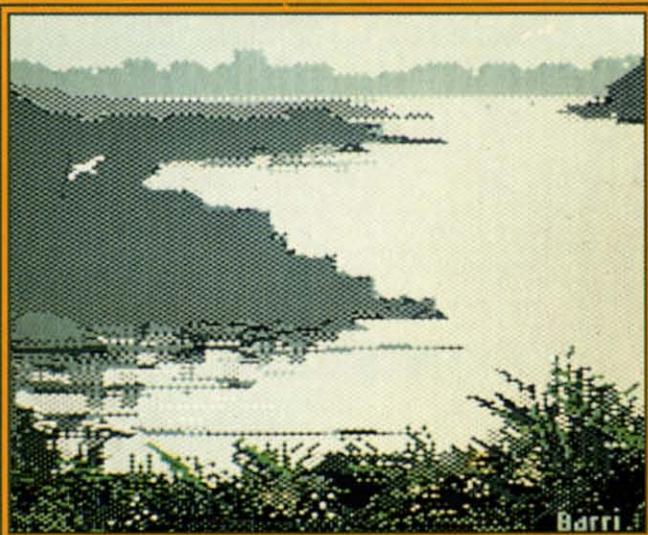
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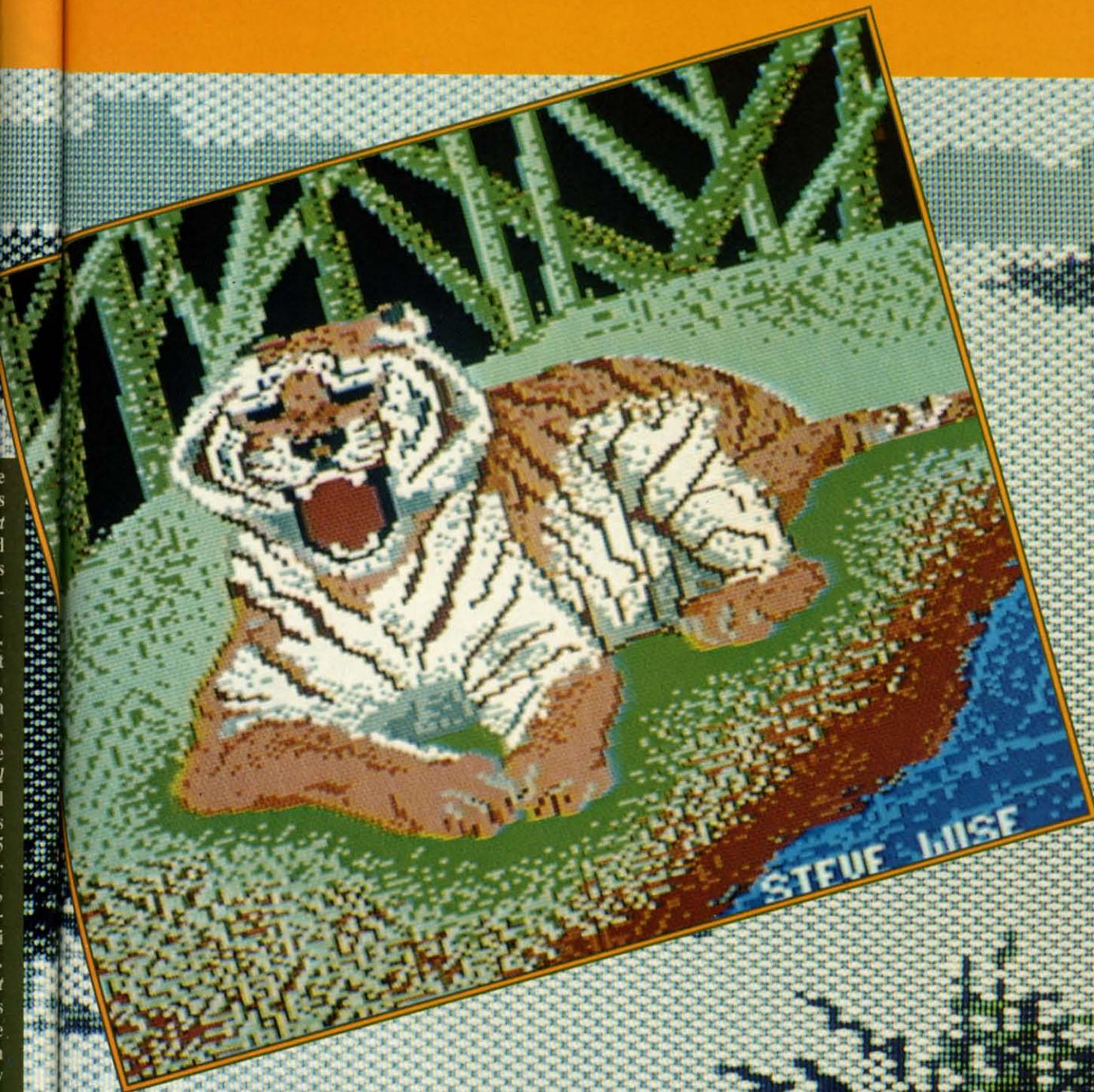
Art Gallery images are available on disk. High resolution bit-mapped images are available in *DOODLE!* format. Multicolor bit-mapped images are available in *Koala* format. Each disk includes a slide show program for easy viewing. *DOODLE!* disks include a bit map screen dump utility for the 1525 or properly interfaced dot matrix printer. *Koala* disks include a set of custom routines for bidirectional conversion to other multicolor formats. The conversion routines were expressly developed for the *Art Gallery* by Michael Beutjer of K.T. Software, author of the *Koala Printer* program and *Quad Print* (June '85 *Ahoy!*). Formats presently supported are *Cadpic*, *Peripheral Vision*, *Paint Magic*, and *Flying Colors*. Disks are available for \$15 from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229. Send a stamped and self-addressed envelope for a complete listing (or send \$10 and receive a sample disk of *DOODLE!* and *Koala* images with slide shows).



It's not every month that we can find a theme running through the random collection of images Art Director JoAnn Case has chosen for the *Art Gallery* without straining our imagination and your gullibility to their limits. But this issue it's easy, as the computer artists in our reading audience take us on safari. Occupying center stage—who would argue with it?—is *Tiger* by Stephen L. Wise (Jeffersonville, IN), drawn with *Koala*. At lower right is *Cita* by Alberto Valsecchi (Milano, Italy), created with *Koala Painter* on the *Koala Pad*. To its left is *Bird* by Barri Olson (Madison, WI), also rendered with *Koala Painter* and the *Koala Pad*. The next piece to the left is *Seagull* by Robert M. Ellis (LaSalle, Quebec), generated with the *Suncom Animation Station*. Mr. Ellis is a longtime oil painter who based this and the 15 other samples he sent us—his first computer graphics efforts—on his memories of Pocologan, a small fishing village in New Brunswick. The entire menagerie is seen against a backdrop of Barri Olson's *Morning*, shown unobscured at lower left.

To answer the question posed in last month's *Art Gallery*—what did Dennis Lunde's four images have in common—if all four were the same size (which they were before we enlarged two of them to throw you off) and were laid top to bottom, they would form a continuous vertical mural.







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FREE RAM CHECK

For the C-64

By Buck Childress

I hope you used *Memory Check* (January '86 *Ahoy!*) to test your BASIC RAM, and that your good Ol' 64 checked out fine, like mine did. If so, I guess we'll have to stop blaming Old Reliable when our works of wonder launch themselves into oblivion. Or will we? The 64 has some areas of free RAM that BASIC doesn't use. Maybe we can blame one of them!

Free RAM Check will test the three remaining areas of 64 RAM. They are 679-767, 828-1023, and 49152-53247. These areas of free RAM are where many machine language programs and subroutines reside. In addition, locations 828-1019 make up the cassette buffer. This is where data is temporarily held when you use your datasette. If this area were on the blink, using a datasette could be difficult, if not impossible.

Free RAM Check works by attempting to store all values from 0 through 255 in each memory location. If successful, it moves to the next location. The RAM area currently being checked is displayed and, if all locations in that area check out fine, *Free RAM Check* will print "OK". Should a bad spot be encountered, "ERROR" will be printed. *Free RAM Check* then moves to the next area of free RAM. When all three areas have been checked, the test is over. The whole process only takes about 30 seconds.

While *Free RAM Check* is running, you'll see what appears to be a shimmering object. This is a video display of the values being stored in each memory location. It appears to be shimmering because of the great speed of machine language.

After you've entered and saved a copy of *Free RAM Check*, switch your computer off, then back on. This will clear the memory and reset everything to normal. (This is just in case you've been running any programs that alter memory pointers.) Now load *Free RAM Check* and run it. The loader will POKE the data into memory and check for errors. If one is found, the corresponding line number will be given. If all is well, type SYS 40000 and press RETURN. *Free RAM Check* will do its thing. If for some reason you want to stop *Free RAM Check* before it's completed the task, RUN STOP/RESTORE will bring it to a halt.

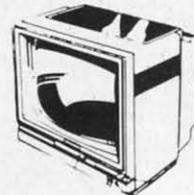
As with my BASIC RAM, all of my free RAM checked out fine. So, the next time one of my masterpieces takes a dive, I guess I'll have to admit it was me after all... well, maybe a power surge?! □

SEE PROGRAM LISTING ON PAGE III

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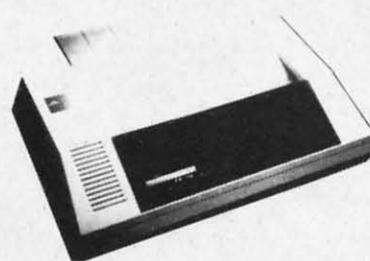
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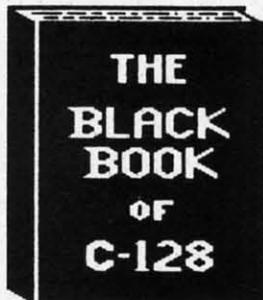
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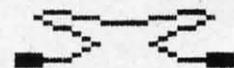
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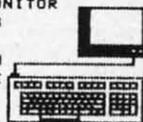
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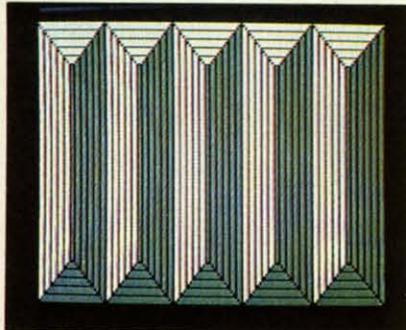
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The VIC chip's capabilities can be easily accessed on the C-128. Its built-in BASIC 7.0 comes with a rich set of graphic commands for manipulating the high resolution video display. As with the C-64, the C-128 has two bit-mapped modes—high resolution and multicolor. In fact, the hardware behind the C-128's 40-column display and the C-64's display is identical. We will shortly show how to import graphic images created with the C-64 into the C-128.



Pyrbar, a product of the C-128's multicolor bit-mapped graphic mode.

The BASIC 7.0 command for turning on the high resolution bit map display is

GRAPHIC 1,1

where the first 1 specifies the high resolution display mode and the second 1 clears the graphic screen. If you have just entered this command, your screen will have cleared and text entered from the keyboard will no longer appear on the screen. Don't panic! Just hit RUN STOP/RESTORE and you will be back to normal. Better yet, press function key 1, type a 0, and hit RETURN. The original text screen should reappear with all text intact. That is, if you had not previously redefined the contents of fl. You should also notice at this point that the text screen was updated, although it was not visible while the graphic screen was active.

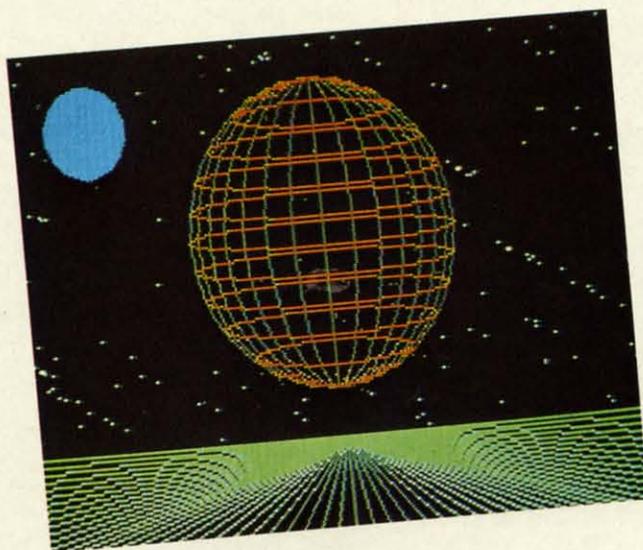
Several things happen when the GRAPHIC command is executed. Nine kilobytes of RAM in bank 0 are immediately reserved for the bit map display. This reserved memory is located right at the start of BASIC's pro-

THE C-128 GRAPHIC BIT MAP

What Goes on Behind the Screens with BASIC 7.0's Graphic Commands

BY MORTON KEVELSON

Including BASIC 7.0 Graphics Drawing Programs by Doug Bannon and C-128 Bit Map Save and Load Routines by Morton Kevelson



The high-resolution Planets, like the other Commodore 128 graphics appearing on this and the following page, was rendered by Doug Bannon.

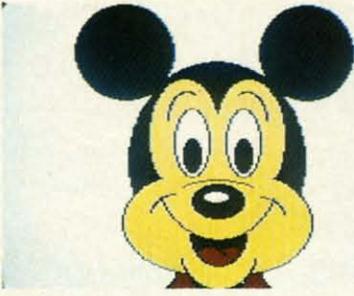
gram space. Any programs already in this space are safely relocated right above the graphic RAM. Executing a FRE(0) command will show that program space has been reduced by the proper amount. This memory can be reclaimed for BASIC programs with the GRAPHIC CLR command.

On page 40 is a map of the affected part of the C-128's RAM space. Note that this map only represents bank 0 RAM. The first kilobyte is used by the operating system and BASIC. The next 1024 bytes (\$0400-\$07FF) are the text display RAM. Note that this is the same area which is used for this pur-

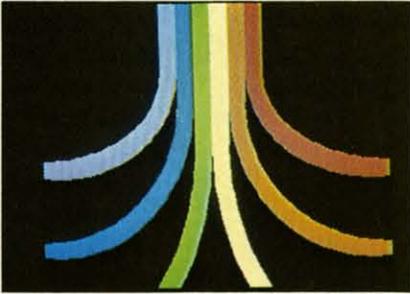
pose in the C-64. The next five kilobytes are reserved for BASIC and the operating system. Beyond that (starting at \$1C00) is where BASIC 7.0 programs are normally stored. If a graphic mode is active, the start of BASIC is moved up nine kilobytes to \$4000.

HI-RES GRAPHICS

The nine kilobyte graphic RAM is divided into two parts. The first 1,000 bytes, or video matrix, contains the high resolution color information. Each byte can store two colors. The lower nybble (first four bits) contains the background color. This corre-



The Multicolor Bit Map programs on page III will generate Mickey.



The multicolor Colari resembles the logo of a Commodore arch-rival.

sponds to COLOR 0 in GRAPHIC 1 mode. The upper nybble is the foreground color corresponding to COLOR 1. This 1,000 bytes, which we will refer to as video RAM, extends from 7168 to 8167. The remaining 24 bytes of this kilobyte are not used.

The actual bit map data is stored in the 8,000 bytes starting at 8192. The design of the video display chip makes it convenient to break up these 8,000 bytes into 1,000 eight byte blocks. Each group of eight consecutive bytes, or character cell, can display 64 individual dots or pixels. The display colors for each character cell are determined by the information stored in one byte of the video matrix. Bits which are set to zero, or off, display the background color. Bits set to one, or on, display the foreground color.

The arrangement of the 1,000 character cells follows that of the text screen. The result is a high resolution bit map display which is 320 pixels wide by 200 pixels high.

SAVING THE HI-RES DISPLAY

Whenever BASIC 7.0 draws a picture it is placed into this nine kilobyte block of RAM in bank 0. The BSAVE command makes it easy to SAVE this information to disk.

SAVED images can be redisplayed by turning on the appropriate graphic mode and BLOADing them into RAM. If you are using a 1571 disk drive the procedure may be quicker than redrawing the image.

At this point you may wish to set up an image for saving to disk. You can use one of your own graphics programs or the *Hi-Res Bit Map Draw & Save* program on page 110. Before saving the image you may want to make note of the border color. This is readily done by:

```
BANK 15:PEEK(DEC("D020")) A
ND 15
BANK 0:POKE 8168,A
```

The bit map image may now be saved with

```
BSAVE "PLANETS.BMP",B0,P71
68 TO P16191
```

Restoration of the display is equally straightforward. First set the graphic mode:

```
GRAPHIC 1
```

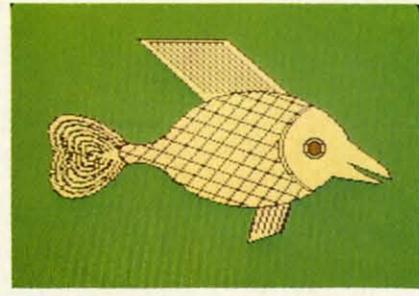
Then load in the bit map:

```
BLOAD "PLANETS.BMP",B0,P71
68
```

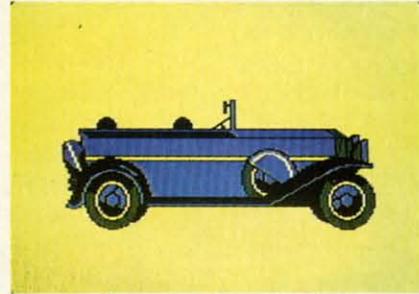
Finally restore the border color with

```
BANK0:A=(PEEK(8168))+1
COLOR 4,A
```

If you have some high resolution bit map images from the C-64, the same procedure can be used to display them, if they are in the proper format. In fact, images created by the *DOODLE!* drawing package from City Software are already in the proper format. The only thing not saved is the border color. Just load the *DOODLE!* image using its proper filename. Once an image is loaded into the C-128's graphic RAM it may be modified, or drawn upon, with any of BASIC 7.0's graphic commands (refer to the appropriate section of the *Commodore 128 Personal Computer System Guide*).



Scaled-down version of a multicolor Fish, with twice the color of hi-res.



Auto, also a product of C-128 multicolor mode (160 horizontal pixels).

MULTICOLOR GRAPHICS

The C-128 has a second bit map display mode. The multicolor bit mapped graphics mode can display up to twice as much color in a character cell as the high resolution mode. The tradeoff is a reduction in the horizontal resolution to 160 pixels. Note that the size of the image is still the same as each horizontal pixel is twice as wide. The basic screen arrangement is the same as before with each character cell composed of eight bytes. The difference is that it takes two bits to display a single pixel. Thus a character cell is four pixels wide and eight pixels high.

Two bits may represent four possible values: 00, 01, 10, and 11. As you might expect, these are pointers to the four possible display colors. The 00 value selects the screen background color found in the lower nybble of 53281 (\$D021). This color is common to the entire display. A value of 01 takes its color value from the upper nybble of the corresponding byte in the video matrix. A pixel value of 10 looks at the lower nybble of the same byte. A value of 11 finds its color information in a second 1,000 nybble block which we will refer to as color memory. Thus we find that the multicolor mode character cell is

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composed of 32 pixels displaying up to four colors at once. Three of these colors are independent of all the other character cells and one is a common background color for the entire screen.

Color memory is a separate block of 1,000 nybbles starting at \$D800. Notice we said nybbles and not bytes. This section of RAM is only four bits wide. This RAM is not part of the C-128's BASIC RAM. It is found in the I/O block located in bank 15. Actually, there are two banks of color memory for a total of 2 kilonybbles. One of these banks is the color memory which is used for the text screen. The other is used for the bit map display. This allows the C-128 to maintain and update the text display while maintaining a separate multicolor graphic screen.

SAVING THE MULTI-COLOR DISPLAY

At first glance, completing the multicolor image requires no more than saving the 1,000 nybbles of RAM starting at \$D800 in bank 15. Unfortunately, things are not that simple. A BSAVE of this block would only preserve the color information for the current text screen, not the multicolor bit map screen. In fact, it is the cleverness of BASIC 7.0 which works against us. The constant maintenance of both the text and graphics screens is handled automatically, by BASIC, regardless which screen is currently displayed. In fact, the split screen mode displays parts of both screens at once. The microprocessor normally sees the color memory associated with the text screen except when a graphic update activity is taking place. The VIC chip will see either bank depending on what is currently displayed. In the split screen modes (GRAPHIC 2 or GRAPHIC 4) the VIC chip's attention is redirected from one screen to the other in mid-display.

The microprocessor's I/O port at address 1 controls which bank of color RAM is seen by each device. Bit 0 of this port controls the bank seen by the microprocessor. Bit 1 directs the attention of the VIC chip. We cannot simply POKE a value into this

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C-128 BANK 0 MEMORY MAP

Address	Description
\$FFFF (65535)	System vectors, Kernal jump table, memory management unit (256 bytes)
\$FFF0 (65280) (End of BASIC program storage area)	58112 bytes of BASIC program storage area (48896 when graphics are on)
\$4000 (16384) (Start of BASIC program storage area when graphics are on)	Graphics bit map (8192 bytes)
\$2000 (8192)	Video matrix (graphics) (1024 bytes)
\$1C00 (7168) (Start of BASIC program storage area when graphics are off)	System RAM (5120 bytes)
\$0800 (2048)	Video matrix (text) (1024 bytes)
\$0400 (1024)	System RAM (1024 bytes)
\$0000(0)	

register. BASIC 7.0 acts to frustrate us in this regard. The contents of this register are automatically updated 60 times per second. This update is triggered by the Raster Compare IRQ (Interrupt ReQuest) generated by the VIC chip itself. In order for our POKE to take effect we have to first turn off this interrupt. First we select the bank

BANK 15

Then we turn off bit 0 of 53266 (\$D012):

```
POKE(DEC("D01A")),PEEK(DEC("D01A")) AND 254
```

Next we turn off bit 0 of location 1, which directs the microprocessor to graphic color memory:

```
POKE 1,PEEK(1) AND 254
```

Now we can save it:

```
BSAVE"COLOR MEM",B15,P55296,P56395
```

Finally we carefully clean up with a pair of POKES:

```
POKE 1,PEEK(1) OR 1
```

```
POKE(DEC("D01A")),PEEK(DEC("D01A")) OR 1
```

Note the order of the last two POKES. Reversing this sequence may mess up your graphics display.

Of course, the bit map and video matrix have to be saved as well. The procedure is similar to that used for saving the high resolution bit map. Before you save the bit map you should make note of the multicolor screen common background color. This can be easily done by

```
BANK 15:B=PEEK(DEC("D021")) AND 15
BANK 0:POKE 8169,B
```

Loading and displaying the image is similar to displaying the high resolution screen. Just remember to restore the background color with

```
BANK 0:B=(PEEK(8169))+1
COLOR 0,B
```

Saving and restoring the border color is the same as for the high resolution screen.

See the sample programs on page 110-111 for a complete listing. The routines for creating sample images are by Doug Bannon; the save and load routines are by this writer.

KOALA AND THE C-128

We have shown how a C-64 *DOODLE!* image may be easily displayed on the C-128. Graphics created with the Koala software may also be displayed in a similar fashion, but it will take a little more work. The multi-color graphic mode Koala image file will have to be slightly rearranged. We will illustrate the technique using the C-128's built-in machine language monitor.

Enter the monitor by hitting function key f8 or entering MONITOR from the keyboard. LOAD the Koala image into bank 1 at \$6000 with

```
L "?PIC A NAME*",8,16000
```

Note the use of the ? and the * wild card characters to avoid problems with the Koala image file names.

Move the video matrix to \$5C00:

```
T 17F40 18327 15C00
```

Copy the background color:

```
T 18710 18710 15FEA
```

Save the video matrix and bit map:

```
S"PIC A BMP",8,15C00,17F40
```

Save color memory:

```
S"PIC A CMM",8,18328,18710
```

The resulting files can now be handled as described above. Just remember to pick your border color with a COLOR 4,X command. The *Koala to C-128 Converter* program on page 111 performs the same series of tasks using BASIC. □

SEE PROGRAM LISTINGS ON PAGE 110

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FEATURED THIS MONTH:

Going for the Gold! (Below)

Computer Boxing (Page 43)

Reviews of Heart of Africa, Fighter Command, Silent Service, Ultima IV, Zorro (Pages 45-48)

GOING FOR THE GOLD!

A Strategy Guide to Epyx's Olympic Series

By Bill Kunkel

Before *Summer Games* (Epyx) came along, track and field simulations were remarkable mainly for the number of mutilated joysticks and strained arms they produced. Unlike previous titles, which required the gamer to jiggle the joystick to simulate running, *Summer Games* introduced much more elaborate control schemes which raised the strategy stakes. Even lightning reflexes won't automatically set records and win medals. That characteristic has made the trio of entertainment classics attain cult status among competition-minded computerists.

Summer Games and its sequels *Summer Games II* and *Winter Games* break down the movements of the on-screen athletes into a sequence of commands, which the computerist must execute with perfect timing. Expect to perform at the superstar level only after minute analysis and plenty of practice.

The good news is that there are some basic tactics and approaches which users have already proven effective. They won't turn you into an electronic Jesse Owens overnight, but they can improve the learning curve.

The Pole Vault, for instance, can be broken down into four separate



Winter Games (top) features bobsledding, skiing, and skating competitions. READER SERVICE NO. 153

Summer Games II (left) boasts graphics superior to its famed precursor's. READER SERVICE NO. 154

Summer Games (bottom) introduced sophisticated control schemes. READER SERVICE NO. 155

movements/sequence commands. After running up to the crossbar, the onscreen athlete must plant his foot and rise off it with as much momentum as possible. Next, the pole must be driven downward just before reaching the disqualification line. The most crucial moment in the vault comes when the athlete kicks up and over the crossbar.



AHOY! 41

The first thing to get down absolutely pat is timing the approach. Learn to drive the pole at the same point in the run every time. Use the vault's position relative to details in the background to make sure you always start from the same point. Begin the kick when the pole attains a 40-degree angle. Finally, release the pole when it points straight up to sail blissfully over the bar.

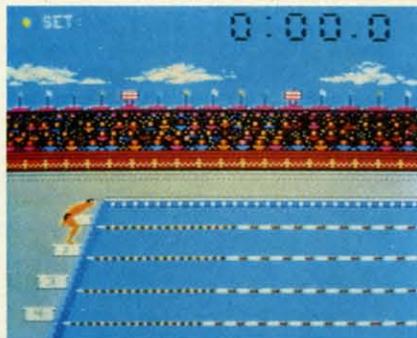


Parrying with a circular motion will aid the Summer Games II fencer.

Diving is a form-oriented event. No matter how many midair gyrations the onscreen competitor performs, the score will be low unless he cleaves the water in a vertical line. The acrobatics on the way down certainly add to the score, but you can always add flourishes after mastering the splashdown.

The key to good form is watching the diver's head and shoulders. Once he is 75% of the way down, wait for his head and shoulders to arrive perpendicular to the water and push the joystick forward.

The one straight-ahead joystick jigger is the 100m Dash. The best hint: squeeze a rubber ball to develop hand strength and endurance.



Key to Summer Games swimming is timing strokes for smooth rhythm.

The 100m Relay, however, requires much more strategy. The key here is learning when to turn on the afterburners in order to reach the next relay-runner at top speed. Fortunately, the program itself provides an impossible-to-miss visual cue—the letters “U-S-A” appear in the stands. When this message is flashed, go for the gusto and don't stop until you've passed the baton. Note that the last runner actually has a bit more stamina than his fellows and can launch his finishing sprint a tad earlier.

The gymnastic competition is very challenging, so get off on the best possible foot. Attempt to hit the springboard at the far edge and perform a complete 180 degree body twist. When the gymnast is perpendicular to the horse, press the button for a strong pushoff. Once the athlete is in the air, moving the stick up or down controls the speed of the rotation.

The key is a quick and accurate analysis of the initial leap. This determines how many somersaults the video Olympian can safely perform. When the gymnast's feet are nearest to the mat, move the joystick down, then correct any imbalance in the dismount by steering the stick left or right. If the gymnast is veering to the left, move the stick to the right, and vice versa.

The three swimming events—free-style, relay, and 100m race—boil down to timing the strokes to generate a smooth, continuous rhythm. Push the button as the arcing hand touches the surface and hold it down an instant longer as the hand pushes beneath the water. Then release the button and repeat the cycle.

Skeet shooting becomes a lot easier once the user memorizes the launch pattern of the targets, but beyond that, this event is a rigid test of hand-eye coordination. Remember to correct for the downward tug of gravity when sighting targets.

The events in *Summer Games II*, while more ambitious graphically, rely on many of the same strategic techniques. The most difficult, however, is clearly the triple jump.

Think of the onscreen performer in this event as a stone skipping over

the surface of a lake and time the jumps in a smooth sequence. Only practice will enable users to avoid this event's greatest pitfall, the foul line.

The javelin toss is the first “throwing” contest in this Olympic series. Speed is secondary to timing and setting the correct angle to maximize the distance of the toss. With the javeliner moving to the line at a brisk, steady pace, point the joystick shaft to the desired trajectory and let it fly. Try to keep the angle close to 45 degrees. A shallower arc runs the risk of plowing up the field, while a cloud-kisser won't pick up good distance.

Some of the tactics mastered in *Summer Games* can be adapted to events in *Summer Games II*. The high jump is much like the pole vault, minus the pole, of course. Similarly, the rhythm-oriented strategy discussed for swimming works quite well on the rowing and cycling contests.

The equestrian event requires the user to learn some new command-sequences. As the horse approaches a jump, the player moves the stick to the right (the direction of all jumps), then quickly left, before returning to the canter and trot. Also, don't jump the horse too near the obstacle. Computerized steeds can be just as adamant in refusing a jump as real hay-burners.

Fencing requires a tremendous amount of practice, but there are a couple of moves which will win more than one match. Execute a parry with a circular motion, and only strike while moving forward.

The season is different in *Winter Games*, but the game is essentially the same. Once again, track and field experience applies directly to mastering the contests.

The Hot Dog is actually quite similar to diving. The athlete performs a series of stunts while falling downward, each inaugurated by a single joystick movement. And like diving, the difference between a good score and a bad one is learning when to cut the gyrations and prepare for landing.

In the ski jump, a good takeoff is largely a matter of proper timing. The user must hit the joystick button, instigating the jump, just before the tips of the skis touch the end of the run-

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SOFTWARE SECTION

way. While in the air, push the skier far forward to make him as aerodynamic as possible and instantly correct any flaws in his form.

Remember, landing on your feet isn't enough. Failure to maintain form all the way down costs precious style points.

The other skiing event is the biathlon, certainly one of the most peculiar contests in the Olympics. The athlete must ski, cross-country style, over rugged terrain for great distances, pausing only to fire his rifle at the targets.

Movement on skis is similar to the swimming command-sequence in that consistent rhythm is all-important. When the skier slows down or comes to a steep incline, however, the user has no recourse but to flip the joystick shaft back and forth, left-to-right, as quickly as possible. To ski downhill, pull the joystick down when the skier's arms move out in front of his body.

During the shooting sequence, the targets rotate like slot machine wheels,

a sure indication that a marksman requires timing as well as aim. Even when ejecting the spent shell after each shot, try to keep the sight level, so that it can swivel smoothly from target to target.

There are three types of skating: figure, freestyle, and speed. The figure and freestyle competitions use identical movements, all invoked with a series of single commands, but in the speed event, the user has more flexibility in move selection.

Never forget that it is impossible to land while skating forward. Always emerge from spins in good form or you'll spend a few penalty seconds sweeping the ice with your skater's posterior.

In freestyle, perform as many of the high-rated movements as possible three times each. No sense going overboard, since additional repetitions don't count. Blend them with the music. Certain moments suggest a camel spin while others seem to demand a forward triple. This event rewards the gamer's artistic sensibilities.

COMPUTER BOXING

Punch Programs Make Computerists into Lords of the Ring

By Arnie Katz

The Kid looks bad, you think, as he staggers back to the corner. While the seconds perform their rituals and the cut man works his healing magic, you whisper, "You can take him, Kid," with a confidence you don't entirely feel. "Keep going for the body," you add as the bell rings.

Boxing scenes like this, with minor variations, have become familiar, even to those who don't follow the actual sport, through movies like the "Rocky" series, "Body and Soul," and "Raging Bull." The manly art of self-defense has persisted despite millennia of criticism from medicos and moralists. Even outright bans couldn't

stamp out pugilism.

The elements which attract fans, like the interplay of strategy and the sharply drawn lines of confrontation between the two fighters, have made simulations of fisticuffs incredibly popular among home computerists. There are currently four major boxing games on the market for the Commodore 64/128, and even the worst of them is excellent.

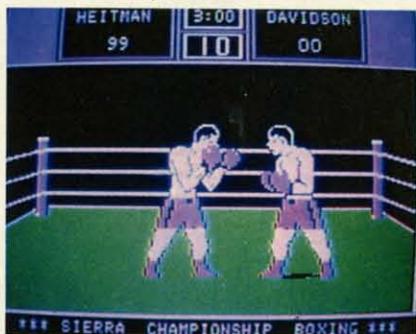
Ringside Seat (Strategic Simulations), by Carl and Anthony Saricini, is a statistically based game which uses an action-strategy format to explore the tactics of boxing. The program comes with a roster of famous



The best overall boxing simulation.
READER SERVICE NO. 156



Star Rank Boxing pits you against 19 increasingly fearsome foes.



Championship Boxing: versatile.
READER SERVICE NO. 157

fighters of the past and present, representing all weight classes from Bantam to Heavyweight.

Roster disks, initialized using a routine included on the *Ringside Seat* disk, can store collections of up to 75 names. The documentation provides a step-by-step system for producing simulacra of any real or fictional fighter who ever stepped through the ropes. Of course, the accuracy of the model depends on the computerist's skill at quantifying an individual's broad range of abilities. Homemade boxers may not have the fine accuracy of those created by the Saricinis, but small misjudgments won't ruin the fun.

The gamer's viewpoint is clearly that of the manager. Prior to the start of each round, the player types a number on the keyboard which corresponds to one of seven possible strategies: fight flat-footed, cover up, charge in, stick & move, stay away, go for the knockout, and protect cuts. The fighter will pursue this course of action relentlessly during the following stanza. The only possible deviation is that a manager can order his or her charge to cover up to avoid a K.O. while combat is underway.

To avoid a technical knockout, a manager must closely monitor the cut status. When a body part is printed in red on a white background, it means a cut is bleeding. If the background shifts to blue, the cut has worsened. Should between-rounds ministrations prove successful, the closed cut is printed in black. The same section of the display also keeps a running tally of how many times each man gets knocked down in the round and the fight as a whole.

The representations of the boxers are small and lack detail, but they are fairly well animated. The figures resemble those utilized in *Lode Runner* and *Choplifter!* more than those found in the three competing titles. It's sometimes hard to tell who is connecting as the wraithlike fighters dance around the ring, but this one- or two-player contest gets a good ranking overall.

Championship Boxing (Sierra) is the most versatile of the games. It

BOXING GAMES AT A GLANCE

(Programs are rated from 1(poor) to 5(outstanding))

	Ringside Seat	Championship Boxing	Fight Night	Star Rank Boxing
Graphics	2	2	5	4
Animation	3	3	5	4
Realism	4	4	3	5
Mental Challenge	4	4	3	5
Physical Challenge	1	5	3	4
Excitement	3	3	4	4
Documentation	4	5	5	5
Replayability	4	4	4	4
Overall Rating	3	3	3	4

gives a choice among autplay simulation, strategy, and arcade modes. The disk includes a selection of 57 prerated heavyweights, and a boxer generation setup that takes less than five minutes to complete.

The Murry Brothers previously authored editions for the Macintosh and IBM PC. It would be unrealistic to expect the graphics on the C-64 to equal those of the Macintosh version, but the art here is poor by C-64 standards. The fighters are large, but they are not gracefully drawn or well-animated.

In the action version, one or two players hit appropriate keys to make the boxer throw four different types of punches, cover up the head or body for defense, and move left or right. This play-mechanic causes crowding at the keyboard in head-to-head contests between human opponents, but works well solitaire.

The simulation is more a demonstra-



Fight Night lets the player build his boxers one body part at a time.
READER SERVICE NO. 158

tion than a true game. The user selects any two fighters, and the program guides both men through the bout. It's fun to see great "what if?" combinations like Rocky Marciano and Muhammed Ali, but it is an essentially non-interactive entertainment.

The strategy mode again casts the computerist as a manager. Prior to the start of each round, the players pick a tactic from an onscreen menu. The choice of selection varies according to the round and the course of the bout to that point. The gamer can "shout" to his or her fighter during the round by tapping either of two keys. One causes the pugilist to cover up, while the other exhorts him to go for the knockout.

Fight Night (Accolade) is a joystick-actuated game which refuses to take boxing too seriously. A simple command control system lets the player fake or throw two types of



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punches, block head or body shots, and move around the squared circle.

The program has five modules: "Boxing," "Construction," "Train," "Spar," and "Tournament." The first matches a constructed boxer against five successfully tougher foes. "Construction" offers a system for designing a boxer, including the details of his physical appearance. "Train" gives a chance to develop mastery over the control system. "Spar" allows two constructed boxers to fight. "Tournament" allows two managers to turn promoter and formulate a whole series of bouts.

Learning to precisely control a fighter takes training in the gym and a few practice bouts, but the system is really quite simple. In fact, the lack of complication is probably this program's most significant drawback. With only two punches, jab and body blow, ring movement becomes overly important. Too often, the victory in the game's three-round bouts goes to the fighter who does the best job of shoving his opponent into the ropes.

Calling the graphics "charming" would be an understatement. The comically drawn contenders in the "Boxing" module breathe life into the design. Dip Stick, also known as "old banjo eyes," is especially well-ren-

dered. He looks like the proverbial 97-lb. weakling, but watch out for his below-the-belt sucker punch!

Since boxers are constructed one body part at a time, there can be considerable variation in the way they look in the ring. Attaching spindly legs and a bearded face to a powerhouse torso creates a very different look than if you blend a cigar-chomping head, pipestem arms, and tree-trunk legs into the same figure.

If watching Burgess Meredith guide Sylvester Stallone to the title in "Rocky" sets your pulse racing, *Star Rank Boxing* (Gamestar) is a "must have" disk. It simulates the totality of boxing better than any other home computer product, yet it is also exciting and highly playable.

The computerist first constructs a boxer and then matches him against a field of 19 increasingly fearsome antagonists. A new boxer starts at the bottom of the ladder and must score a victory in an 8-, 10-, or 12-round bout to usurp the foe's ranking.

A training period precedes each bout. The manager apportions the remaining time until the actual fight among five activities, each of which boosts one or more of the fighter's ratings. The light bag, for example, is the best way to build up punching speed.

HEART OF AFRICA

Electronic Arts

Commodore 64/128

Disk; \$32.95

Today brave men and women tease death by vaulting into the heavens in primitive spacecraft. During the last half of the 19th century, those who wanted to court death frequently did so by venturing into the interior of the Dark Continent.

Although the continent's coastal regions were thoroughly colonized and explored much earlier, the jungles, climatic extremes, and often-hostile natives kept most Europeans from penetrating the mysteries of this mammoth land mass.

Heart of Africa, Ozark Softscape's sequel to the classic *Seven Cities of Gold*, presents the computerist with the opportunity to experience the danger and excitement of the un-

known as an intrepid African explorer. As the game-scenario begins, a law firm has contacted the player and revealed that he is the heir apparent to the fabulous fortune of globetrotter Hiram Perkins Primm. No one has seen the enigmatic Mr. Primm since his last expedition set out two years earlier.

Before you can inherit the fortune Primm amassed in the casket business, you must prove to the executors of the will that you are committed to carrying on his life's work, "shedding light upon the dark continent." In practical terms, this means you must lead an expedition into the heart of Africa and locate the rumored Lost Tomb of Pharaoh Ahnk Ahnk.

The play-mechanic of this action-strategy game closely resembles the one employed in *Seven Cities of Gold*.

The joystick controls the boxer during a bout. Holding the action button down produces a choice of several "inside" blows, while moving the stick without pressing the button produces longer-range punches.

The most unusual aspect of the control system is that the program controls the boxers' ring movement. The type of footwork each pugilist employs depends, in a general way, on what ring style the computerist chose for him during the boxer generation phase. This arrangement allows the manager to concentrate on punch selection, though watching your man slug toe-to-toe when you'd like him to retreat can be heart-breaking.

The disk has space to save a roster of boxers. This allows more than one person to have a continuing character or for a solitaire player to assemble a stable of contenders.

Star Rank Boxing, like most Gamestar titles, cannot be mastered in a day or even a week. This keeps it fresh long after games which provide quick success have grown stale.

Most boxing connoisseurs believe that the sport's "Golden Age" ended more than 30 years ago. Perhaps so. But the "Golden Age" of computer boxing is here today. □

The player moves the expedition around the strategic map with the joystick. When the explorers encounter a native village, a more detailed view replaces the topographical view. The player can then determine the party's behavior toward the Africans by selecting one of the options from the onscreen menu.

While the expedition has considerable latitude in dealing with the villagers, including the possibility of armed combat, it's often better to make friends with the inhabitants by trading with them. Villagers know where the valuables are located, and they provide clues to visitors.

As with any Ozark Softscape creation, *Heart of Africa* benefits from meticulous attention to detail. Your character can even become delirious and wander uncontrollably through the dangerous countryside. And fail-

ure to act in a civilized manner carries a significant penalty, just as similar heavy-handedness does in *Seven Cities of Gold*.

The program's glaring flaw is that bludgeoning works as well as subtle detective work. An expedition can stomp back and forth across Africa and find the Lost Tomb by sheer luck.

A harder-to-define problem is that *Heart of Africa* comes across as flat and not very exciting. It's a well-designed game, and the documentation tries hard to set the proper mood, but it never quite comes alive. Perhaps computerists who already have a strong interest in this period of history will find it compelling and enchanting, but this title does not have overpowering appeal to the typical gamer. It's a good try, but not a rousing success.

Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (phone: 415-571-7171).
—Arnie Katz

FIGHTER COMMAND

Strategic Simulations

Commodore 64/128

Disk; \$59.95

Air cadets often get cocky after they earn their wings, so just because you graduate with flying colors from programs like *Flight Simulator II*, *Skyfox*, or *F-15 Strike Eagle*, don't think that this program will be a piece of cake.

Fighter Command shows that there's a lot more to military flying than hopping into a plane and finding someone who wants to dogfight. It is a thorough simulation of the "Big Picture." This program casts the computerist as what a true aviator would call a pencil pusher, the guy who allocates forces for various types of air missions. All that rides on these decisions is the fate of your country and the course of history.

SSI's own rating system judges *Fighter Command* "intermediate" in difficulty, and that might be a little low on the scale. This is certainly no computer wargame for a beginner. Charles Merrow and Jack Avery's most recent SSI title, *Wings of War*, is indicative of this title's overall complexity.

While *Wings of War* could recre-

ate almost any individual air battle between World War II planes, *Fighter Command* focuses on the Battle of Britain. The solitaire competitor takes command of the beleaguered British forces as they try to repel the bombing raids of the Luftwaffe.

Keeping your forces ready is vital, but the defender must also anticipate where and when the Germans plan to strike next. And once the raids begin, *Fighter Commanders* must react with the forces in the air of ready to fly on the ground.

A series of menu-based commands makes it fairly simple to implement a wide range of strategies. To help the player monitor the location and status of the multitude of squadrons, SSI has provided a game board to give an overview.

This should tug at the heart strings of any wargamer who cut his teeth on board games. Each squadron has a marker to indicate where it's located, and whether it's on patrol, refueling, or merely in a state of readiness.

The five states of readiness are runway alert, cockpit alert, hut alert, 30-minute alert, and two-hour call. The readiness ranking tells how long it will take a certain squadron to react to your call. Too much readiness for too long a period adversely affects the morale and performance of that squadron.

There are five possible scenarios, three of which cover specific time periods of the 34-day battle. The campaign game encompasses the entire tussle for air supremacy. Eagle Day is the introductory-level choice and covers only the first day of fighting.

The Germans have six different types of planes in the arsenal and the British possess five. Each is rated with historical accuracy as to speed, climb rate, ceiling, endurance, and bomb load.

The documentation is well-written, although somewhat sloppily arranged. It is a good idea to read the directions thoroughly before even booting the game for the first time. Even those who ordinarily take a seat-of-the-pants approach should expect to put in some study time. Some of the information you need early in the game isn't revealed until the final pag-

es of the manual. The explanations are detailed and complete and the playing aids are far more than window dressing. It is virtually impossible to avoid a decisive German victory game after game against the computer without understanding the rules thoroughly.

The computer-directed Germans can play at several different skill settings. The game gets tougher as the human commander grows more capable. This keeps the program fresh even for those who primarily play solo.

Many games have treated the Battle of Britain, but *Fighter Command* deserves its place on the shelf with the best of them. So after you've enjoyed your Snoopy versus the Red Baron fantasy, find out what it's like to be the brains behind the brave in *Fighter Command*.

Strategic Simulations Inc., 883 Stierlin Road, Building A-200, Mountain View, CA 94043 (phone: 415-964-1353). —Rick Teverbaugh

SILENT SERVICE

MicroProse Simulation Software

Commodore 64

Disk; \$39.95

During the frightening days after Japan attacked Pearl Harbor, repeated hammer blows sent the Allies running for cover and conjured lurid images of imminent attacks on Los Angeles and San Francisco.

The invasion of the West Coast never took place, of course. One reason was the work of the American submarine corps. The so-called silent service relentlessly harried the Japanese navy in its home waters and wreaked havoc upon the enemy's merchant marine fleet.

Sid Meier, justly famous for his outstanding air simulations, exchanges wings for a periscope to produce this solitaire recreation of undersea action. The same surehanded design sense which makes *F-15 Strike Eagle* both authentic and a positive pleasure to play are much in evidence in *Silent Service*. Although there's a lot happening, and five complete battle stations to oversee, the play-mechanic is so user-friendly that most armchair admirals will be ter-

rorizing the shipping lanes like veteran submariners within a couple of gaming sessions.

A joystick-actuated menu screen allows the user to customize the program to a considerable degree. There are four basic skill levels, and a menu of "reality factors" which further adjust the difficulty. A flick of the stick can introduce visibility limitations, allow the target ships to make evasive course corrections, or saddle the sub with the handicap of occasional dud torpedoes. The impact of these factors on the overall difficulty of the game is summarized at the bottom of the screen, which prevents the unwary from loading the game with difficulty-boosting extra elements.

Three types of scenarios are offered. Gunnery practice allows the novice to learn to control the ship and its weaponry, and Convoy scenarios are historically accurate recreations of actual World War II submarine engagements. Finally, the Patrol mini-games dispatch your sub pack on a two-month mission to seek and destroy the adversary's shipping and naval vessels.

The conning tower, a beautiful full-screen drawing, is the submarine captain's primary station. The gamer moves the captain to the other battle stations with the joystick and hits the action button to switch screens. These other screens include the periscope, instruments and gauges, maps and charts, damage control, and the bridge. The player switches among these locations, using the joystick and keyboard commands to steer the sub, make it dive and surface, monitor combat damage, and aim and fire the torpedoes.

The target ships aren't minutely detailed, but players should have no trouble telling one type of ship from another. In fact, the Patrol scenarios require the gamer to pass a silhouette identification test before turning them loose in the Pacific. After all, we wouldn't want our submarines sending American craft to the bottom!

Don't mistake this for a boot-and-blast epic. Meier includes quick-start rules, but *Silent Service* is truly at its exciting best when the computerist understands the full depth of the



Silent Service offers a choice of gunnery, convoy, and patrol scenarios. From the conning tower you move the captain to other screens including instruments and gauges, periscope, and the bridge.

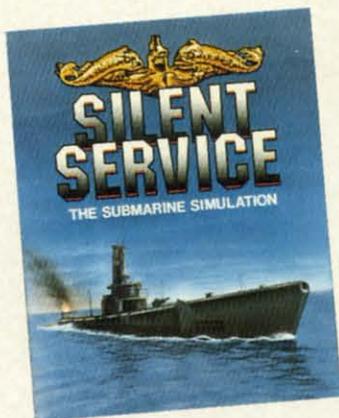
simulation.

On the other hand, this is not just for double-domed heavy thinkers. *Silent Service* is surprisingly simple to learn and play, thanks to excellent documentation and a logical rules structure.

Like Meier's *F-15 Strike Eagle*, *Silent Service* packs broad appeal for home computergamers while it challenges the wits of even master strategists. Score another direct hit for MicroProse!

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

—Arnie Katz



Fight the Jap in his home waters.
READER SERVICE NO. 159

ULTIMA IV
Origin Software
Commodore 64
Disk; \$59.95

Trust Lord British, the eccentric but brilliant designer, to provide a new dimension in fantasy games, just when some prematurely called the

genre old hat. The goal here is nothing less than complete self-perfection on a personal level.

The opening sequence resembles an illustrated adventure, with large pictures and a small text bar along the bottom. The main difference: you can't actually do anything besides press "Return" until the program deposits you at the door of a gypsy fortune teller, where the game really starts.

The woman deals eight cards, two at a time, and poses questions to the player with each new pair. Each question has two possible "right" answers. For example, she might ask a player whether he or she would be honest in a given situation. The answers directly influence the gamer's starting point and type of character (fighter, wizard, bard, etc.).

As in previous *Ultimas*, players give orders with single keystrokes. A menu-driven system would be an improvement.

The player starts alone, but can build up a party by inviting people in towns to join. The ideal group has eight characters, each a different class.

Talking and listening to everyone in town is the key to success. Each townspeople can hold a complete conversation. If a character hasn't asked your hero a question, you haven't heard everything that person has to say!

Ultima IV has a series of mini-quests which blend to form a larger whole. Eight large towns contain information leading to Runes and mantras, which are necessary to enter the shrines dedicated to various virtues,

including compassion, valor, humility, and sacrifice. Make sure you pay more than lip service to the virtues, though, because the program punishes "sinners" by making them work even harder to achieve goals. For example, snubbing too many beggars results in the player having to give even more gold just to "break even."

The proper Rune is needed to enter each shrine. Once inside, the player picks a virtue on which to meditate. The program actually forces you to stare at the screen for a few seconds each cycle, then asks for the mantra. Type in the correct word and you might be rewarded with a valuable insight—or even with partial avatarhood, meaning that you've attained perfection in that virtue.

The graphics, animation, and sound are all markedly improved over those in *Ultima III*. This is most obvious in the dungeons, where players can see fountains, chests, and, most important, monsters far down hallways. Entering a room often yields a bird's-eye view of the area, including treasures, monsters, traps, and secret doors. There are even a few tricks dropped in for good measure, like bridges that disappear unless the hero occupies the right spot, or secret passages that only open when someone picks up a particular chest.

Only Avatars—perfect people—can enter the Abyss, a danger-filled island where the Codex (the final goal) is rumored to lie. A few extra items are required to pass safely through the Abyss.

Magic is more complicated in *Ultima IV* than in past titles. Players can't just cast a spell, but must first assemble and mix the proper reagents, such as sulphurous ash, black pearl, and the exotic mandrake root.

Ultima IV is the most complicated *Ultima* yet, a must-have for those who want a true challenge. If you've never played through an *Ultima* scenario before, though, this is not a recommended starting point. Work up through the ranks from *Ultima II* and *Ultima III* first, since they're both easier to learn. But if you're already an Ultimaniac, dig out your notebook, settle into your most comfortable chair, and get ready for the ul-



Ultima IV: most complicated yet.
READER SERVICE NO. 160

timeate *Ultima*.

Origin Systems, 340 Harvey Rd., Manchester, NY 03103 (phone: 603-644-3360). —*Tracie Foreman Hines*

ZORRO

Datasoft
Commodore 64
Disk; \$29.95

Look out Sergeant Garcia and all the other oppressors of old California, the masked avenger with the lightning sword is coming! The latest entry in Datasoft's excellent series of action strategy contests, which already includes *Bruce Lee*, *Conan*, and *The Goonies*, casts the user as the foppish Don Diego de la Vega, better known as Zorro.

As the curtain rises in the game, "The Fox" watches helplessly as one of Sgt. Garcia's flunkies carries off his lady love to a drawbridge-fortified castle several playscreens to the right. To rescue her, Zorro must duel, climb, and explore a wide variety of playfields above and below ground level. There are vines and trees to climb, chandeliers on which to swing, and bumbling soldiers on whom the masked title character can carve his signature "Z."

There are also keys and other such objects, some possessing magical properties, which the gamer uses to solve puzzles and gain access to fortified areas. It is, in fact, these adventure game trappings that make this game so much fun.

Each screen presents several challenges, some of which are real headbusters. There are levers and counterbalances, trampolines and trapdoors, and, of course, plenty of dueling op-

ponents to keep things moving. Although none of the bumbling swordswingers chasing Zorro is fit to cross blades with the master, they can divert you from accomplishing more important business.

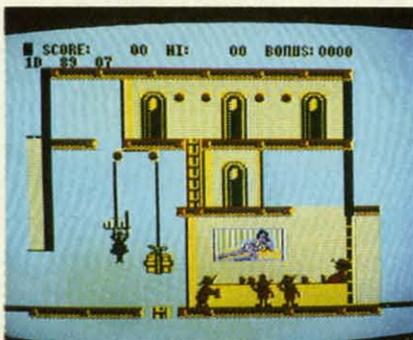
The graphics are good enough to satisfy most gamers, but there is no question that they are not up to previous entries in this series. Compare the underground screens, for example, with the beautifully elaborate tableaux from *Bruce Lee*. It's hard not to be at least a little dissatisfied with the current offerings.

There are some very nice visual touches, however. Zorro himself seems to be walking on tiptoes, but his movement is otherwise well-articulated. The soldiers look great, and after they've been vanquished by the masked man's rapier, they disappear—leaving only a ragged "Z" where they once stood!

The only other complaint lies with the meager documentation. Such a complex design requires more than two and a half pages of loading instructions and joystick commands. The few hints which the folder provides are helpful, but little is done to explain Zorro's many play nuances.

Zorro is nonetheless a tremendously enjoyable play-experience. The gamer quickly develops a real sense of being an adventurer, of scrambling over hacienda rooftops and swinging from flagpoles. The dueling sequences are great stuff, and the plethora of game-screens will keep computerists coming back session after session.

Software Creations, 19808 Nord-



Zorro: some headbusting challenges.
READER SERVICE NO. 161

hoff Place, Chatsworth, CA 91311 (phone: 818-886-5922). —*Bill Kunkel*



Enlarged Characters for the C-64

By Paul Montognese

Bigprint is a machine language subroutine that prints characters in an enlarged mode four times the normal character size. Each enlarged character occupies 4 screen positions across and 4 down, a total of 16 bytes.

Bigprint is invoked by way of a SYS call like the following:

```
SYS ml,S,V,H,B,E
```

The first parameter, ml, is the entry point of *Bigprint*: 49152.

S is the string of characters to be printed. It can be a literal value like "ABC", a variable like A\$, or any other string expression that is normally acceptable to BASIC.

V is the vertical line number on which printing is to start and can range from 0 to 21. H is the horizontal start position with valid range of 0 to 36. Any BASIC numeric expression is allowed for specifying the horizontal and vertical starting positions. Further, either or both start positions may be specified using an asterisk, in which case the current cursor position is used to determine the vertical starting position, the horizontal starting position, or both.

B stands for blanks and specifies the number of spaces that will appear between enlarged characters. Values of 0 to 32 are allowed.

E stands for escape character and gives you the capability to specify some optional special effects. Escape

can be specified as a string value or a numeric value. In either case you are indicating a single byte ASC character value that will be used to determine the escape code. More on this later.

SPECIAL SYNTAX PROVISIONS

Any of the numeric parameters may be omitted by simply keying the delimiting comma, in which case the value will default to zero. You can cause any remaining parameters to default to zero by simply terminating the statement. By way of illustration, each of the examples below will cause the word "HELLO" to appear in large characters starting in line 10, print position zero.

```
SYS ml,"HELLO",10,,0,0
```

```
SYS ml,"HELLO",10,0
```

```
SYS ml,"HELLO",10
```

A semicolon is used in place of SYS ml as a means of invoking *Bigprint* multiple times in succession without having to return to BASIC. The two examples below will print "HELLO" and "THERE" starting respectively on lines 6 and 11.

```
SYS ml,"HELLO",6,10;SYS ml,"THERE",11,10
```

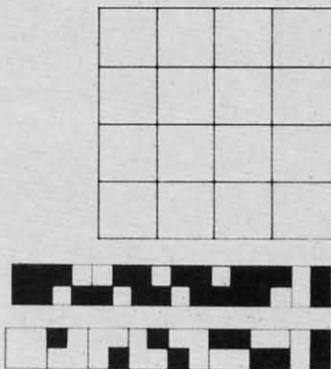
```
SYS ml,"HELLO",6,10;"THERE",11,10
```

Both achieve the same net result, but the second method is faster.

**FIGURE 1:
ILLUSTRATION OF
OVERLAY MODE**

**One enlarged
character—each
grid square is
one byte.**

**Each grid square
is formed by one
of 16 block
characters.**



COLORS AND CHARACTER SETS

The large characters will initially be printed in the cursor color from location 646 (\$286). You can change this by simply embedding color control characters in the string to be printed, the same as with a BASIC PRINT statement.

The same goes for the character images, upper case/graphics, or upper and lower case. The large character images will be formed from the character set operative at the time of the SYS call. This can be changed by embedding the character set controls in the string, also in the same manner as you would with the BASIC PRINT statement.

Once changed in this manner, the color and/or character set specified will be in effect until changed to some other value. This holds true for the duration of one *Bigprint* call. Each new invocation, including the multiple invocations by the way of the semicolon, causes the values to be reset to the active cursor color and character set in use.

OTHER PRINT CONTROL CHARACTERS

The large characters will initially be printed in standard mode. To print them in reverse image simply include CTRL/RVS ON in the string at the point you want to start printing in reverse image and change back to standard image with CTRL/RVS OFF.

The four cursor controls (UP-DOWN-LEFT-RIGHT) are also recognized in much the same manner as BASIC PRINT. Simply include them in the string to be printed and they will cause their specified actions to occur.

Note that all of these manipulation controls are used on a strictly local basis by *Bigprint* for its purposes only. Upon return to your BASIC program, the current cursor position, color, and reverse on/off status are the same as they were before the call to *Bigprint*.

SPECIAL EFFECTS

A number of character manipulations are possible for use in achieving special effects. The last parameter of the SYS call is the escape character and works much like quote mode does when you're editing BASIC lines. When the escape character is encountered in the string to be printed, certain characters will be used to activate and deactivate special effect. Every other escape character encountered will turn off this capability, just as every other quote character turns off quote mode.

The escape character that you select in a given call to *Bigprint* is thus used exclusively to toggle control mode on and off and cannot itself be printed.

If control mode is active, an upper case U causes characters to be printed upside down while a lower case u reverts back to the normal rightside up mode.

An upper case "I" activates inversion while a lower case "i" turns off inversion. Inversion gives the effect of flipping a character image over from left to right. The left arrow character printed with inversion active will result in an arrow that points right.

An upper case L causes subsequent characters to be printed rotated to the left. An upper case R activates rotate right.

CONTROL CODE SUMMARY

The tables below are for quick reference purposes and list all the control codes that are processed by *Bigprint*.

Control Codes Always Recognized

Reverse On (18)	.....Sets Reverse Mode On
Reverse Off (146)	.....Sets Reverse Mode Off
Lower Case (14)	.....Upper/Lower Case Characters
Upper Case (142)	.....Upper/Graphics Characters
Cursor Up (145)	.....Up One Vertical Line
Cursor Down (17)	.....Down One Vertical Line
Cursor Left (157)	.....Back One Position
Cursor Right (29)	.....Forward One Position
Color Controls	.....Changes Character Color

Controls Recognized Only In Control Mode

Capital A (193)	.....The two color codes that follow will be used for every other large character
Capital U (213)	.....Upside Down Mode On
Lower Case u (85)	.....Upside Down Mode Off
Capital I (201)	.....Inversion Mode On
Lower Case i (73)	.....Inversion Mode Off
Capital L (204)	.....Rotate Left On
Capital R (210)	.....Rotate Right On
Capital O (207)	.....Overlay Mode On
Lower Case o (79)	.....Overlay Mode Off
Capital C (195)	.....Clears special effects and resets to print characters rightside up with no overlay—also terminates escape mode

Upper case O and lower case o activate and deactivate overlay mode. Normally the 16 individual characters comprising one enlarged character are simply placed on the screen. Overlay causes a special set of logic to be employed before each individual character is placed in screen memory.

To understand overlay mode you must first understand that each large character is formed by a 4 x 4 matrix of individual characters, 16 all together. In turn, each of the 16 individual characters is divided into a 2 x 2 grid, giving us a total of 4 blocks, each of which can be filled in or left empty. Figure 1 should help in visualizing this.

The ch
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a prog
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a LOA
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POKE
SYS 5
SYS 6
A FI
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The character that matches this grid pattern, 16 possible, is POKEd into screen memory and the process continues until all 16 screen memory locations have been filled and the large character is formed.

Back to overlay mode. If the character already in screen memory is one of the block characters used to construct one large character, then an OR'ing effect takes place. This results in a new character being stored which represents a combination of the old and new screen codes.

If the character in screen memory is not a block character, it and the associated color memory byte are left unaltered.

This is a powerful capability that takes a little thinking to understand. It can be used to create a number of interesting special effects.

Alternating colors are created by the use of an upper case A followed by the two color codes to be alternated. For example, if the escape code is a slash, then "/A (GREEN) (RED) /ABCD" will result in a green A, a red B, a green C, and a red D. Any color code turns off alternating color mode and causes all subsequent characters to be printed in that color.

One final control character is a capital C, which stands for clear. Clear cancels any unusual character manipulations that may be in effect and results in subsequent characters being printed rightside up with no overlay and no inversion. C also turns off control mode just as though a terminating escape character were encountered.

ABOUT THE PROGRAM

The program on page 103 provides three different processing options. The demonstration is a sampling of some of the ways that *Bigprint* can be put to good use.

The view characters option allows you to key a character and then see how it appears enlarged, with a simultaneous display that includes both character sets, standard display, and reverse image. Press the space bar to cycle through the various display options. The CTRL key changes the color of the four enlarged characters appearing on the screen at any one time. Note that the coding for this uses a period as the escape character, meaning that the display will not change if you key a period.

The save option will write *Bigprint* to disk or tape with a program file name of your choosing. After this you can LOAD BIGPRINT from BASIC with the usual LOAD sequence, in which you account for the fact that BASIC reenters the program at the first line after doing a LOAD. Or you may avoid disrupting program flow by loading the saved subroutine in the following fashion:

```
POKE 147,0
SYS 57812 "name",8,1
SYS 62631
```

A FEW CONCLUDING NOTES

Bigprint stores directly into screen and color memory, bypassing the KERNAL PRINT routines. This is for lightning fast execution, as well as preservation of the BASIC

pointers. *Bigprint* maintains its own internal pointers for this purpose but does not check for cursor controls or an excess of characters in a string that could cause storing of characters before or after screen and color memory.

The protection you do have is that the parameters on the SYS statement are validated at entry to *Bigprint*. An ILLEGAL QUANTITY error results if the starting line and position specifies an address that is lower than the start of screen/color memory, or such that the creation of one large character would go beyond normal screen/color memory.

The Kernal clear line routine entered at 59903 is sometimes useful for creating special effects with this subroutine. Simply POKe 781 with the line number (0-24) that you want to clear and then SYS 59903.

Most BASIC compilers will not properly handle SYS calls with this type of syntax. Therefore, if you intend to compile BASIC that uses this subroutine, you'll have to use the pass through mode of your compiler. With *BLITZ!* this means simply preceding the statement with two colons, as in ::SYS ml,"ABC",10,5. Check the instructions for your compiler to be sure.

The demonstration will show you some general ways in which *Bigprint* can be used, but the most creative applications will be those that you write yourself. View the demonstration to get some ideas and then have fun using this routine in your own programs. □

SEE PROGRAM LISTING ON PAGE 103

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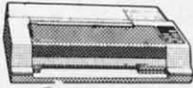
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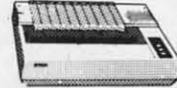
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STAR SEARCH

For the C-64

By Jim Sanders



Well, the IASA (International Aeronautics and Space Administration) has finally done it. For centuries they have made regular deposits of space garbage in the remote galaxy of Remus. The deposits have consisted of various types of used satellites, space labs, SIS's (Synthetic Intelligence Stations), spent retros and boosters, and sundry other space paraphernalia. And for centuries an interesting paradox has been gradually taking shape.

IASA and the world at large have depleted the supply of oress (the source of power for the 23rd century—the last source known to man) to dangerous levels. And tests have indicated a startling rise of oress units in the Remus galaxy.

A space exploration team was dispatched to investigate Remus and report to IASA the possibilities of retrieving the precious oress. The last report from the exploration craft brought the entire world to the point of despair. It was reported that the oress and the synthetic devices had combined in some sort of strange metamorphosis and produced oress-laden, intelligent stars which could perhaps present an even greater and more imminent threat to the future of the world.

As a last effort to save the known world Mission: Star Search was commissioned and dispatched to Remus with orders to both destroy the "smart stars" and recover the oress. You may be the most important person on the mission craft. You have the responsibility of operating the gamma-gun, the only weapon capable of destroying this threat to the human race.

As you approach Remus you see them: some moving from one place to another as if conducting some sort of business, some flickering as if conversing with one another. Some appear and suddenly are gone. The task seems overwhelming. Then suddenly your craft is hit by some strange force emitted by a star. Your mission is to destroy as many stars as possible and to retrieve at least 300 units of oress if your world is to survive.

As you gaze out your gamma-gun window your concentration grows to an intense level. You bring the power of your gamma to bear on the dangerous looking en-

ties. You must be quick-handed as well as perceptive for this challenge. Your eyes are pulled in three directions—your craft damage indicator to the left of the window, your ammo monitor below, and your gamma-gun position for your attack on the smart-stars. The greatest hazard you face is the star force attack on your own craft. The damage indicator changes color to show the degree of damage. After several hits it will turn blue, and as you experience more abuse it will change to yellow, then red. Red indicates that complete destruction of you and your craft (and the world) is imminent. You can reverse some of the damage if you are a good shot. If you are able to destroy three stars in a row (that is, without a miss), you will nullify some of the damage to your craft.

Another potential hazard is the depletion of your gamma ammo. This can be replenished in the same way: by destroying three stars without a miss. Are you up to the task? I hope so, the world is depending on you. Good luck!

ABOUT THE PROGRAM

The program on page 113 is in two parts. *Star Search Boot* contains the ML portion, as well as a loader which loads *Star Search* (the main program). I suggest that you type *Boot* first and save it to disk or tape. If you are using tape, change the device number in line 60 of the loader program to a "1". Then type in *Star Search* and save it to disk or in sequence on the tape after the loader program. You *must* save it under the name "Star Search".

When you load and run *Star Search Boot* the ML will be POKEd into memory. If all is well with your typing, *Star Search* will automatically be loaded and run.

FINAL NOTES

As you view your screen and peer out the star craft window, strange sensations take place in your head. With a little imagination you find yourself really looking out the side window of your craft watching the stars and other "space garbage" stream by. So if your stomach feels a little queasy or you feel a bit lightheaded, just turn your head away from the window for a moment.

If you would like to alter the "playability" of *Star Search*, you could change the following items:

1. The number of oress units for victory in the conditional statement in line 1860.
2. The level of damage to your craft before destruction in lines 380 to 410.
3. Memory location 49633 is part of a timer in the sprite movement ML routine. The smaller the contents of this location the greater the speed of the star sprites (and your craft). This value is normally 20.

I hope you enjoy *Star Search*. It was fun and interesting to design. I realize the program is fairly long but I believe you will find it worth the effort to type it in. Or if you are basically lazy like me you may order *Ahoy!*'s disk. Good luck.

PS: To insure the proper loading, be sure to save the second program under the name "Star Search."

SEE PROGRAM LISTING ON PAGE 113

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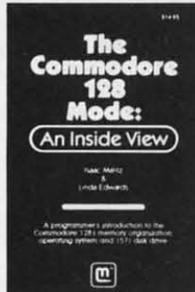
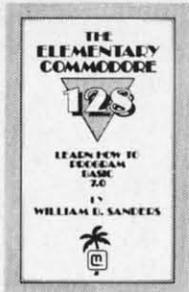
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FAILSAFE

Automatic Save Routine for the C-64

By Buck Childress

I couldn't believe it! A few nights ago the power went out. Oh, that part I could believe, especially considering it was a stormy winter night in the Pacific Northwest. What I had trouble swallowing was the fact that both my datasette and disk drive were ready to protect the program I was working on, and I hadn't made a safety save in over five hours! I got a lump in my throat about the size of 38911 empty bytes. The program, five hours of work, and a few more gray hairs went to that Great Microchip in the Sky.

I kept telling myself it was just one of those things and that, after all, I'm only human. But, as I glumly remembered what my trusty datasette and disk drive are for, I couldn't help feeling like the proverbial south end of a north bound horse. With that thought firmly implanted in my shattered mind, and with all the bravado I could muster, I vowed that it would never happen again. So, out of the gloom of that cold January night, *Failsafe* was born.

Failsafe automatically saves your BASIC program to disk or tape every 15 minutes. It works all by itself so you don't have to concern yourself with it at all. Just enjoy your programming and presto...every 15 minutes your latest version is saved. No more marathon sessions hurled into oblivion (no more hair falling from the head!).

Failsafe is a machine language program that uses an area of RAM from 49152 to 49632. Since this area is separate from BASIC RAM, you can load, save, and run programs (provided they don't put data in *Failsafe's* territory) with no interference.

After saving a copy of *Failsafe*, run it. The loader will POKE the data into memory and check for errors. Should any be encountered, the corresponding line number will be given. If all is well, away you go.

Type SYS 49152, then press RETURN. The screen will clear and you'll be asked whether you're saving to disk (D) or tape (T). After pressing the appropriate letter, the rest of the word will appear, verifying your choice. Then you pick a starting number, from 00 through 99. If you choose a number that's less than 10, you still need to enter two digits. As an example, if you want to start at one, enter 01. Now press RETURN. Next, you're asked to enter the name, which can be up to 14 letters long. (*Failsafe* only accepts letters for the name.) After you enter a name, press RETURN. If you don't want to use a name, just press RETURN before entering anything. If you make a mistake entering any of this information, press the INST/DEL key. *Failsafe* will take you back to the beginning. Remember, you don't have to press RE-

ACCESS

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Mach 128 (R)
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People (D)
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Mindshadow
Space Shuttle
ACCOLADE
Dambusters
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TURN after entering D or T (for disk or tape), but you do have to press it after entering the starting number and name. (This gives you a chance to press INST/DEL if you goof.)

When everything has been entered, *Failsafe* activates itself. Should you want to make a change once *Failsafe* is active, you'll need to deactivate it first. Type SYS 49152, then press RETURN. A message will appear telling you it's off. Now SYS 49152 to start over. As you can see, SYS 49152 turns *Failsafe* both on and off. (I figured my hair was falling out fast enough without having to remember a bunch of different SYS locations.)

That's all there is to it. After 15 minutes have elapsed, *Failsafe* will wait for the RETURN key to be pressed. It won't make a save while you're in the middle of programming a line. Once the RETURN key has been pressed, the screen border will turn medium gray (color 12) for about three seconds. During this time you can press the RUN STOP key if you want to cancel the save. (Perhaps you haven't added anything new to your program since the last save, or maybe you want to tempt fate one more time.) If the RUN STOP key isn't pressed, the save will take place. After saving, or cancelling, the screen border returns to its original color (*Failsafe* initially sets it as light blue—color 14) and the timer resets for 15 minutes.

When a save is made, the version number will be tacked on before it (e.g.: 44PROGRAM). Then the number is incremented by one. The next save (using our example name and number) would appear as 45PROGRAM. Should the number exceed 99, *Failsafe* automatically resets to 00.

If you're using a disk drive, all you have to do is leave it on. With the datasette, you'll see the message "PRESS RECORD & PLAY ON TAPE". After you've done so, and the save is completed, leave the buttons down (the datasette won't run until the next save). All future saves will be completely automatic.

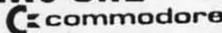
You can make a save before 15 minutes are up by typing SYS 49325, then pressing RETURN. Providing *Failsafe* is on (if it's not you'll just get the READY. message), the latest version of your masterpiece will be saved, the version number incremented, and the timer reset. If for some reason you want to save something in the conventional manner (e.g.: SAVE"PROGRAM",8 for disk, or SAVE"PROGRAM" for tape), it's perfectly okay with *Failsafe*. Remember, though, if you use a conventional save, the number won't be incremented and the timer won't be reset.

Failsafe won't try to make a save when you're listing, loading, saving (in the conventional manner), or verifying programs. If you happen to be using an ML monitor, *Failsafe* won't save while you're working with it. In other words, it never gets in your way. It only saves when it's supposed to. If you plan to run your programs, you should deactivate *Failsafe* first.

Give *Failsafe* a try. It'll keep those "WHY DIDN'T I SAVE IT?!" blues away! □

SEE PROGRAM LISTING ON PAGE 112

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Reader Service No. 196

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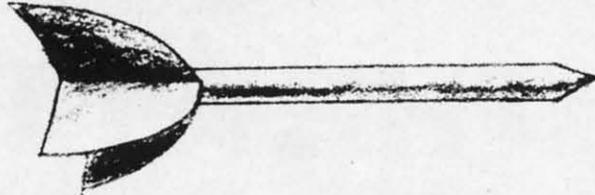
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60 **AHOY!**

ENGLISH DARTS For the C-64



By **Michael E. Townsend**

With the popularity of the new electronic dart games in pubs today, you can brush up on your aim before taking on the pros on your evening out with a home version of English darts.

This program allows you to choose between the standard '30!' game or the extended '50!'. Up to seven players may participate at one time, making it an ideal home party game. Rules are the same as with ordinary board darts, with the advantage being that you don't scar up your walls with your overthrows! There are three throws per player per round: to win, an exact score must be made or you will 'break' and return to your previous score.

Type in the program on page 117 and save it to disk or tape. Type 'RUN' and the billboard will appear following the loading of data. Choose the game you wish to play and the number of players. The game will automatically prompt you as to which player is up.

The screen will clear and the program title along with six informational boxes will appear at the top of the screen, plus a listing of each player's current score in the lower right hand corner. The dartboard will appear, as well as a dart moving up and down on the left hand side of the screen. To throw a dart, simply press any key.

Scoring is from the center of the board (a bull's eye for 50 points) to the outer edges of the board (from 20 down to 1 point as you advance to the edge). You may also score double and triple points as in the real board game: the computer will evaluate your throw randomly.

Following each round, a 'box score' is presented with the current standing of each player.

When a person has won, you will be prompted as to whether you wish to see the final scores, as well as asked if you wish to play again.

When typing in the program, you may delete all 'REM' statements and numbers immediately preceding and following them.

SEE PROGRAM LISTING ON PAGE 117

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Cadpak 128
Chartpak 64 or 128
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Little Computer People
Master of the Lamp
Mindshadows
On Track Racing
Slot Car Construction
Space Shuttle

Acro Jet
Crusade in Europe
Decision in the Desert
F-15 Strike Eagle
Gunship
Kennedy Approach
Silent Service

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Stunt Flyer
Ultima II
Wiztype

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1571 OR 1541?

Many times a C-128 programmer needs to know what kind of disk drive a user has. Here's a simple way to do it:

```
10 DISK=1541:POKE2588,0:DOPEN#2,"*":CLOS  
E2  
20 IF PEEK(2588) THEN DISK=1571
```

The programmer may wish his program to use fewer disk operations if the user has a slower disk drive.

—Bruce Jaeger
St. Paul, MN

EASY DIRECTORY READER

This short and sweet subroutine will read up to 70 entries from the directory and store them in the variables A\$ (program names) and C\$ (file types). It can be used as a directory reader or as a subroutine which can LOAD programs off the disk (they auto run if so loaded) or as a utility to, for example, erase all sequential files.

—David Rostcheck
Mendon, MA

```
•10 DIMA$(70),C$(70):OPEN1,8,0,"$0"  
•20 GET#1,B$:IFSTTHEN70  
•30 IFB$<>CHR$(34)THEN20  
•40 GET#1,B$:IFB$<>CHR$(34)THENA$(X)=A$(X  
) + B$:GOTO40  
•50 FORY=1TO(17-(LEN(A$(X)))):GET#1,B$:NE  
XT:FORY=1TO3:GET#1,B$:C$(X)=C$(X)+B$  
•60 NEXT:X=X+1:IFST=0THEN20  
•70 CLOSE1  
•80 FORC=1TO70:PRINTA$(C)TAB(20)C$(C):NEX  
T:PRINTX
```

PAUSE 64

Here's a handy utility that will cause your C-64 to pause whenever the CTRL and P keys are pressed simultaneously. This is most useful for halting a program listing, but it will also halt a running BASIC program as well. Some machine language programs can be halted too, if the ML has not dismantled the pause utility. The program below will install *Pause 64* in memory at 50176 to 50264 (\$C400-C458). If you wish, it will also save the utility to disk (for cassette, change the 8 in line 220 to 1). After this you don't need the BASIC loader; just enter LOAD "PAUSE 64",8,1 and then NEW. To LOAD the utility without NEWing an existing program in memory enter POKE 147,0:SYS57812"PAUSE 64",8,1:SYS 62631 and then hit RETURN. This will load *Pause 64* without upsetting BASIC pointers. After the utility is in memory, connect it with SYS50176. Thereafter CTRL-P will cause your C-64 to pause whatever it is doing (e.g., scrolling a listing). CTRL-C or C will allow the computer to continue. Use SYS 50213 or STOP/RESTORE to disconnect the utility.

Pause 64 is an IRQ wedge routine that, when it detects CTRL-P, sets up an infinite loop that JSR's to the Kernal SCNKEY routine. Each time around it checks for C. When it detects C it exits the loop and returns control to the program that was interrupted.

—James C. Dunavant
Gainesville, FL

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A 73,X,96:REM X=EOR VALUE
•30 POKE AC,VAL:SYS ML:VAL=PEEK(AC):REM V
AL IS NOW EOR'ED WITH X

Actually, this is more like machine language than BASIC; the first value in the DATA statements (73) is the 6510's OP code for EOR. The variable AC is the storage location for the accumulator, so what we're really doing is this:

```
LDA #VAL ;BASIC's POKE AC,VAL
EOR #X ;SYS ML/VAL=PEEK(AC)
```

To see a quick example of what this can do, enter lines 10 and 20 and RUN them. Then enter this line in direct mode:

```
FORI=1TO5:FORJ=0TO39:POKEAC,PEEK(1024+J)
:SYS ML:POKE1024+J,PEEK(AC):NEXT:NEXT
```

This is also quite useful when working with sound or sprite registers where "bit flipping" is a common occurrence.

—Matthew R. Strange
Mansfield, PA

EPYX DRIVE SWITCH

If you're using the Epyx *Fast Load* cartridge with two disk drives, there is a location in memory that you can change to allow the cartridge to know which drive you wish to use. Just POKE location 186 with the device number of the drive that you want activated. Location 186 holds the current device number. POKEing this location with the device number of your extra drive allows you to switch between drives. The default for this location is 8.

—Larry Mudge
Winnipeg, Manitoba

WINDOW INPUT

You can use the WINDOW command on the C-128 to put a limit on the length of keyboard INPUT. So long as the combined length of prompt and response doesn't exceed one screen line, this little routine works beautifully.

In the following example, the limit is 16 characters. If the user tries to enter a 17th character, the line clears and the cursor is returned, forcing him to start his INPUT over. To use this in your own programs, simply change the variables in line 1000 to suit your needs.

—R. Harold Droid
Seattle, WA

```
•1000 PR$="FILENAME: ":LE=16:REM TEXT OF
INPUT PROMPT AND MAXIMUM INPUT LENGTH
•1010 LN=PEEK(235):OPEN3,0:PRINTPR$;:WIND
OWLEN(PR$).LN,LLEN(PR$)+LE,LN:INPUT#3,A$
•1020 CLOSE3:PRINTCHR$(19)CHR$(19):LN=LN+
1:IFLN>24THENLN=24
•1030 POKE235, LN
```

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3

SKI FOLLY

For the C-64
By Kevin Brown

After what seemed like an eternity, you were finally rewarded with that well-deserved vacation. You fully expected to spend a restful week at the Mt. Kendall Ski Lodge; skiing and romantic evenings by a fireplace were all that were on your mind. When you slipped into your ski jacket, the thought that you'd soon be desperately attempting to save your life never occurred to you. *Ski Folly* is a magnificent simulation of the deadly situation you find yourself in. You've accidentally gotten on "Dead Man's Slope!"

This arcade-style action game starts out with an attractive title screen followed by another equally attractive instruction screen that completely explains the game. After pressing the fire button of the joystick in port 1, the game screen appears and the action begins. The object of the game is to survive the journey to the end of the slope, a difficult task by itself; however, to score well, you must do this in the shortest amount of time possible. The rate of speed at which you fly down the slope is not controlled by you. The slope steepens as you progress towards the end, and the speed increases as this occurs. The only control you have is which direction you head in (left or right) and a semi-efficient system of slowing yourself down; but this has some adverse effects on your score. When the brakes are used, the distance to the end of the slope remains the same, but the timer continues; heavy use of slowing down can ruin

your chances of a serious score. Also, if you don't have a joystick or would prefer to use the keyboard, just use the ConTRoL key for left, the 2 key for right, and the space bar to slow down. (Remember that last one!)

Most C-64 owners would glance at the program, notice that it was in BASIC, and give up on any hope that it might be worth typing. I agree; if it were entirely in BASIC, it *wouldn't* be worth typing. You see, this game requires the fast moving action of many sprites, which would jerk in BASIC. So short ML routines are read into memory to take care of this, thus shortening the program length besides speeding it up. An interrupt routine in machine language moves your man without the aid of endless BASIC program lines. You can observe this for yourself; when the program prompts you to press the fire button on the instruction screen, just hit RUN/STOP and then move the joystick around. As you can see, the routine moves the skier no matter what else the program may be doing. Another routine scrolls the sprites during the game; attempt to press RUN/STOP while the trees you're supposed to avoid are scrolling down the screen. In effect, with these routines the program can do two things at once.

The fast action, challenging object, fine graphics and sound effects, and endless other gameplayer's luxuries of *Ski Folly* make it one that any computerist should have in his program library. □

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AHOY! 67



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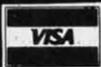
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PROGRAMMERS' BASIC TOOLKIT

Epyx, Inc.

Commodore 64

Disk; \$34.95-\$44.95

Epyx has taken some of the most commonly desired commands and functions omitted from Microsoft's BASIC 2.0 and incorporated them into a package that also adds a sprite animator/generator and a background/font editor. Designing sprites and alternate character sets is simplified tremendously. Laying out a background for sprites to move on is as easy as picking characters from a menu and laying them down on a blank screen.

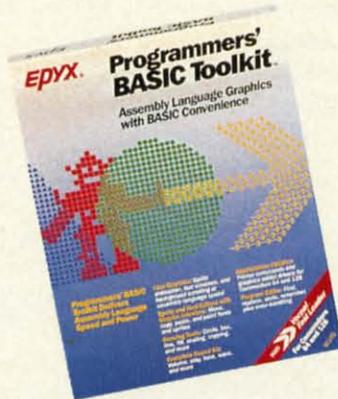
The Macintosh-type user interface with pull-down menus and joystick pointer are easy to use, though the resolution isn't nearly as fine. When choosing the options from the pull-down menus, it's easy to overshoot the bottom of the menu, causing it to go back up. But because this doesn't take long to get used to, the menus are an asset.

The documentation would have been improved by inclusion of a sample programming session. The reference summary with its command listing and descriptions helps considerably. Sample programs on the disk adequately demonstrate how completed programs look, but offer few hints as to how they were created. A command summary card acts as a handy reference guide. Help files are included on the disk.

Programs created with the *Toolkit* are not self-sufficient. They must be run from a specially created "auto-boot" disk or after the *Toolkit* has been loaded. These disks load fairly quickly considering the amount of material being loaded. With the Vorpel Fast Loader, included on the disk, the *Toolkit* itself loads in quickly, too.

So exactly what did they add?

First, direct commands like automatic line-numbering, renumbering, a disk directory, LPRINT, and LLIST. The last two list the program or line to a printer instead of the



Wrench more power from BASIC 2.0.
READER SERVICE NO. 162

screen; no OPEN, CLOSE, or CMD commands needed. A find and replace command called CHANGE will find all occurrences of a word and change them to whatever you designate. A FIND command will list all lines containing a user-chosen string (great for checking all your GOSUB and GOTO lines). Function keys are easily reprogrammed using a KEY command. And just in case you really mess it up, there's an UNNEW command.

They added programming commands such as PRINT AT, an ELSE statement to accompany IF/THEN clauses, DO <procedure>, JOY (checks joystick position), and a WINDOW statement. The DO and PROCEDURE commands are similar to those used in PASCAL programming. Drawing commands like LINE, CIRCLE, BOX, DOT, and FILL make it easier to create graphics on the screen. The VOICE and SPRITE related commands give complete control of sprites and sound.

Though these commands add flexibility to the way programs are written, *Toolkit* goes even further. A sprite editor/animator and a background and font editor help the programmer illustrate his works. Sprites created and saved with the *Toolkit* can be called into programs with a simple SPRITE LOAD command. A variety of sprite commands help you locate, activate, move, and deactivate sprites.

For the old-fashioned types (or those who like to use machine-coded sprites), the sprite creation display includes all the numbers needed to identify and use your sprite. If you know the right places to poke the data, you can bypass all the *Toolkit's* sprite commands, while still using the sprite generator to simplify the process.

Sprites can be high resolution two color or multimode four color creations. Multiple sprites can be tested in the animator to decide the best paths for them to take. Sprite movement is controlled using AT, MOVE, FREEZE, ON, OFF, ON BACKGROUND, and UNDER BACKGROUND commands. Special sprite collision commands can detect when sprites hit each other or the background. After detection, the collision detector is easily reset to register the next collision with a simple command. A sprite copy command can be used to create and manipulate sprites directly from BASIC.

The background and font editor allow easy text handling. Though called a background editor, this section does not allow the drawing flexibility of a program like *DOODLE!* or *Koala Paint*. You actually create the background using the C-64's graphics characters or those you've created. A translator provided on the *Toolkit* disk allows the use of *Koala Paint* files with the *Toolkit*, however. Three character fonts are included on the disk computer, Old English, and cursive. These (or the Commodore's built-in character set) may be modified and used at will. Commands to swap out the native character set for another make changing letters easy.

A printer dump is included, so sprites, text, and background and other illustrations can be seen in hard copy.

The windowing feature is also a nice addition. With it and its companion commands ROLL and SCROLL, text and graphics can be placed on the screen in layers. Graphics larger than the screen can be viewed in pic-

es in the window.

The sound and voice commands make it easy to incorporate sound effects and music. All three of the Commodore's voices are easily accessed. A sound clear function simplifies discontinuing ringing tones (one of the more difficult tasks on the C-64).

Suspecting that the *Toolkit* might bring Commodore 64 programs up to C-128 level, I made a feature-by-feature comparison and found almost no compatibility. The few commands shared by both versions don't generally perform the same functions.

The package is aptly named. A beginning user wouldn't know enough about programming to appreciate some of the features. An intermediate level programmer using this package would greatly speed up the creation process. An experienced programmer probably already has such tools available, though it is nice to have them all in one package. With the graphics and music aspects, this is a great package for game programmers.

Despite the package's claim of working with both the 64 and 128, like many similarly advertised programs it works only in the 128's C-64 mode.

Epyx, Inc., 1043 Kiel Court, Sun-

nyvale, CA 94089 (phone: 408-745-0700).
—Cheryl Peterson

HELP MASTER 64

Master Software

Commodore 64

Disk; \$19.95 (see below)

Help Master 64 is a memory-resident programming aid for BASIC. The meaning, use, and syntax of each Commodore BASIC command will appear on your screen when you type one special key followed by the BASIC command. Or, just type the special key and you get a list of all the commands.

Written in pure machine language, *Help Master 64* resides in portions of your C-64's memory that are not used by BASIC. It loads below the BASIC ROM into RAM from 40960 to 49151 and uses most of the 4K from 49152 to 52223. Using these locations, it is compatible with the DOS wedge, which sits in RAM from 52224 to 53247. *Help Master 64* should run with any pure BASIC program, but it will conflict with any machine language program that tries to use the same memory locations.

Help Master 64 uses this unrequired memory space so that it can

be totally transparent to you. Once it is loaded and you have read its five introductory screens, which you can bypass when you are familiar with the program, nothing about the operation of your computer or the appearance of the screen will hint that *Help Master 64* is even there.

That is, until you need it. When you have forgotten the abbreviation of a BASIC command, cannot remember its exact syntax, or want more information on the command, *Help Master 64* instantly comes to your rescue. Just type a quote followed by the BASIC command and RETURN. *Help Master 64* will display, on the top 13 lines of your screen, the information you need. The program lines you are working on will still show on the lower half of the screen.

Before we see exactly what is displayed, what happens to that top half of your screen? The program you were writing, or at least 13 lines of it, was there. True to its name, *Help Master 64* restores your screen to its original appearance after you have the help you need. No muss, no fuss, the *Help Master 64* overlay just disappears.

Now what exactly does *Help Master 64* tell you? Within those thirteen lines are five lines used just for spacing, one to tell you this is a *Help Master 64* display, and one to tell you how to exit. That leaves six lines of real information, so do not expect a sample program showing you how to use the command.

The first line of information lists the BASIC command and its Commodore abbreviation. The second gives proper syntax for the command with optional parameters in [brackets]. Up to three more lines describe the command, give options, and list system defaults. The last line of information gives page numbers of reference books where you will find more information. Those references include the *C-64 User's Guide* (both old and new versions), the *C-64 Programmer's Reference Guide*, and the *Handbook of BASIC for the C-64*.

Of the 69 commands on which *Help Master 64* can provide information, 4 span two screens and 38 are linked to companion commands so

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If yo program can still saving A speci can loa fore it r mands: The fir second you un

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you can get more information just by touching a function key. ON, for instance, can take you to GOTO, then to GOSUB and RETURN.

An example of the information provided is:

POKE Abbrev P Shift O

Syntax **POKE** M,V

Store the value V in memory location M.

M must be in range 0 thru 65535.

V must be in range 0 thru 255.

Guide 123/177:PRG-REF 69: Handbook 167

If you have already begun your programming effort for the day, you can still load *Help Master 64* without saving and reloading your program. A special version of *Help Master 64* can load around your program. Before it runs, you must type three commands: NEW, SYS51250, and CLR. The first wipes out your program, the second restores it, and the third gets you under way again.

The SYS51250 command is always available in *Help Master 64*. It will restore a NEWed program, one that has been zapped by a warm start (SYS64738), or one wiped out with a hardware reset switch.

Help Master 64 by itself costs \$19.95. With a BASIC handbook it costs \$24.95. Buy the package. The *Handbook of BASIC for the Commodore 64* from Brady Co. (read that Prentice-Hall) is softbound and spans 359 pages.

The *Handbook* includes 9 pages of introductory material on programming, 238 pages of alphabetized BASIC commands, statements, and functions, 25 pages on sprites, and 12 on music synthesis. It concludes with 19 useful appendices on character sets, colors, disk commands, data files, memory allocation, printer codes, RS-232, graphics, sound, etc.

For each BASIC command you get a description, an example, comments (how to use the command), and applications (when to use it). This book is full of demonstration programs — as far as I am concerned, the only way to understand BASIC commands. For POKE, the two examples show

how to change screen background and border colors and how the music synthesis chip can be used as a warning beeper.

This program has an unusual rebate offer. Each of your friends who buys the program and mentions your serial number earns you a \$2 credit. For each \$2 credit that friend earns, you get a \$1 credit. Each year, anyone with \$10 or more on the books gets a check for the full amount.

Help Master 64 will be a wonderful aid for beginning and intermediate BASIC programmers. Somewhere in the intermediate stage, I suspect that some of you will pick up one of the several good BASIC extensions on the market. These extensions give you many more BASIC commands to improve and ease your control of graphics, sound, and data files. By the time you are ready for these, you may have outgrown *Help Master 64*, and it will not help you with the new commands anyway.

Help Master 64 will help you write your own programs and make sense of programs you type from *Ahoy!* (Even when you do not understand everything you type, this is a great way to become familiar with good BASIC programming technique.) Do I recommend *Help Master 64*? Yes. If you outgrow it quickly, it will have done its job of helping you learn.

Master Software, 6 Hillery Court, Randallstown, MD 21133 (phone: 301-922-2962). —Richard Herring

BASIC 128

Abacus Software

Commodore 128

Disk; \$59.95

BASIC 128 is Abacus Software's *BASIC 64* compiler redesigned and improved for the 128. Like the earlier version, it's an import from Europe. Since Europe usually gets new Commodore machines first, they get a head start on programs like compilers and other programming tools, which Abacus has been importing for several years. Like those before it, *BASIC 128* is an attractive product at a good price.

BASIC 128 will compile programs to either pseudo-opcode or machine code.

Missing Letter Puzzle

- 1) Insert your COMAL disk in drive*.
- 2) Type LOAD "C64 COMAL*",8
- 3) Type RUN (starts COMAL)
- 4) Type AUTO (turn on auto line#'s)
- 5) Enter the program lines shown below (COMAL indents lines for you)
- 6) Hit RETURN key twice when done
- 7) Type RUN
Pr-gr-mm-r's P-r-d-s- P-ck-g-
Programmer's Par?

```
0010 dim text$ of 39, disk$ of 2
0020 open file 2,"missing.dat",read
0030 disk$:=status$; count:=0
0040 if disk$="00" then
0050   count'text
0060 else
0070   close // no data file found
0080   create'text
0090 endif
0100 play'game
0110 //
0120 proc count'text
0130   while not eof(2) do
0140     read file 2: text$
0150     count:+1
0160   endwhile
0170   close
0180 endproc count'text
0190 //
0200 proc create'text
0210   open file 2,"missing.dat",write
0220   print "input text (or blank):"
0230   repeat
0240     input text$
0250     if text$>"" then
0260       write file 2: text$
0270       count:+1
0280     endif
0290   until text$=""
0300   close
0310 endproc create'text
0320 //
0330 proc play'game
0340   open file 2,"missing.dat",read
0350   for x:=1 to rnd(1,count) do
0360     read file 2: text$
0370   endfor x
0380   close
0390   for letter:=1 to len(text$) do
0400     if text$(letter) in "aeiou" then
0410       print "- ",
0420     else
0430       print text$(letter),
0440     endif
0450   endfor letter
0460   print
0470   for letter:=1 to len(text$) do
0480     while key$<>text$(letter) do
0490       print "?"+chr$(157), //left
0500     endwhile
0510     print text$(letter),
0520   endfor letter
0530 endproc play'game
```

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AHOY! 71

The pseudo-opcode runs faster than normal BASIC, but occupies more disk space. The machine code runs a bit faster than the pseudo-opcode.

The documentation is unimpressive at first glance, but further study reveals that it is a gold mine of hints and tips for speeding up your programs. There are a couple of sample programs to demonstrate the advantages of compiling. They are careful to point out that compiling generally doesn't speed up programs that contain few mathematical procedures. Sorts and manipulations of numbers are quickened; screen intensive activities are barely changed.

A whole chapter is devoted to optimizing your code for maximum speed. In addition, *BASIC 128* has a few optimizers built in. One is an alternative way to handle the "garbage collection" function. According to Abacus, it limits even the worst collection to under a second's time.

One section even outlines some undocumented features of BASIC 7.0, such as using relative coordinates with some of the graphics commands. Unfortunately, the compiler doesn't

take advantage of these directives. It seems that BASIC 7.0 isn't entirely compatible with its documentation.

Should there be any problems while compiling, coded error messages are displayed. These are all explained in one section, so they're easy to find. Errors that occur during the running of the compiled program are identified just as they would be if an uncompiled program were running, but instead of giving line numbers for the errors, *BASIC 128* programs return memory locations. This would make it very difficult to debug a program, but *BASIC 128* will print a list of locations and the line numbers to which they correspond.

Errors that occur during compilation don't usually stop the process. In this way, you can get a list of all the errors that need attention in one pass. Disk errors are the exception. If a disk error occurs, the program stops compiling and delivers the error message.

If used with the 128 in 80-column mode, *BASIC 128* boots up in FAST mode. This does greatly improve the speed over compiling using 40 columns. Long programs can take

"hours" to compile (or so it seems).

Another advantage is its simplicity. While it is complicated enough for programmers who use overlays and assembly language sections, it is also simple enough for a novice who wants to compile a simple magazine program. For a simple compile, the whole process requires only six steps once you've got the BASIC program debugged.

The BASIC program to be compiled must be saved as a file on disk. *BASIC 128* must be loaded in from its disk. The disk with the source program on it must be swapped into the drive. The RETURN key is pressed to choose the "Compile to P-code" option. The name of the program to be compiled must be entered. When it's finished, you type "N" to quit the compiler.

Two extra steps are required to compile to machine code: choosing option 3 from the opening menu, and pressing the "A" key and RETURN. This activates the machine code compile option.

BASIC 128 is a two-pass compiler. The first pass interprets and optimizes the code and then creates the P-code. The second pass reprocesses and completes the compiling, adding the run-time module and data lines. As it does its work, it keeps you updated on its progress via screen messages. When it finishes the compiling, it gives the memory locations of data word, object code, strings, and extensions. If there were any errors, these too will appear on the screen.

A few of the 128's commands cause a little trouble and require special compiler directives inserted into the program before compiling, most notably the COLLISION command and commands that use variables for line numbers. Some others that cause difficulty are compiler directives.

Some of the Pascallike functions can also cause trouble if used incorrectly. IF...THEN...ELSE can BEGIN...BEND have to be handled carefully. A good programmer won't be thrown by this at all.

While being easy enough for a novice, *BASIC 128* still has features that will please the more experienced programmer. From allowing the use of

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- Grid dump to printer
- Character can be printed while editing (font creator only)

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Debby Z Thom, Do you know the name of
The User Group in Kansas
City?
Ray Al Great to hear it, Thomas!
Deb, you can find some User
Group listings in the
Bulletin Boards.
Gerald Y Hello everyone :)
Ray Al Hello Gerald! I just got your
Electronic Mail message about
the Chess tournament!
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some BASIC extenders to handling overlays, it has some powerful features. If you need a compiler and have some idea of why you need one, this one will probably do the job. At \$59.95, it is certainly not overpriced.

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—Cheryl Peterson

ORTHO'S COMPUTERIZED GARDENING

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One frequent complaint made about software packages is that they assume you know what you're doing before you start to operate the program. The documentation that results when a software publisher makes this assumption is frequently minimal, and the user finds himself falling in holes because he doesn't understand fundamental concepts that the documentation fails to explain. While gardening deals with many holes, there are none in Ortho's documentation.

In fact, their idea of documentation is a complete course in gardening supplemented by a user's manual for the software. A 192-page book explains most of the major considerations that go into creating a garden. From analyzing soil content to starting seedlings to dealing with pests, this book covers it all. Similar books on gardening run between \$15 and \$25 at a bookstore.

The included planting guide illustrates the planting zones in the US and tells when vegetables should be planted for each zone. A landscape planner is included to help you lay out the gardens you'll want to plant. There's a small guide to growing flowers that briefly touches on choosing the kinds of flowers to plant. This is where the software comes in. The Ortho Personalized Plant Selector makes it easy for you to choose plants that will thrive in your geographic area. When you enter your zip code, the program searches its database and tags the files of plants that will do well for you.

The program is so well designed it barely needs documentation. Com-

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pletely menu-driven, it is almost too easy to use. With help files available on the disk, it's almost impossible to go wrong.

The database can be searched for a number of parameters, making it very convenient to plan out your flower beds and landscaping (see figure 1). Using the blooming season option, you could for example create a list of plants that bloom in the summer for a bed along the driveway.

Using the "MAKE A PERSONALIZED PLANT LIST" option, you can search the database using any or all of the criteria simultaneously. If you are planning a colorful display and want to use annual flowers of varying heights less than a foot, you could search through setting the TYPE option for annuals and the HEIGHT option at 12 inches or less. By not specifying a color, all colors are displayed. The listing that is returned is easily printed out.

This list then becomes a directory to the database. By highlighting a

Figure 1: Main Menu

Ortho's Personalized Plant Selector
Main Menu

- 1 List by BOTANICAL Name
- 2 List by COMMON Name
- 3 List by TYPE
- 4 List by HEIGHT
- 5 List by FLOWER COLOR
- 6 List by BLOOMING SEASON
- 7 List by LIGHT REQUIREMENTS
- 8 List by WATER REQUIREMENTS
- 9 Make a PERSONALIZED PLANT LIST
- 0 PRINT a plant list
- ? HELP
- Exit Program

Enter a number or a botanical name

>

name and pressing the RETURN key, all the information on that plant is displayed (see figure 2). Noting the heights of the flowers, you could choose one of each color and be sure each is a different height. Because it's easy to print the information, you can be printing a listing of flowers that meet your requirements as you go along (see figure 3).

While the database makes it easy to find plants to suit your needs, the

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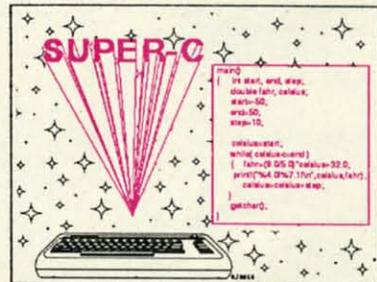


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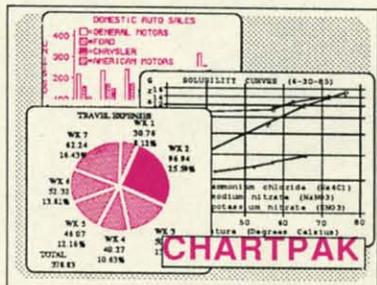
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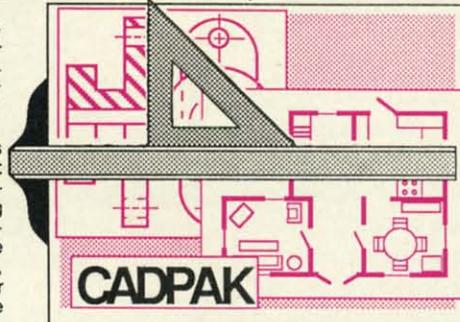
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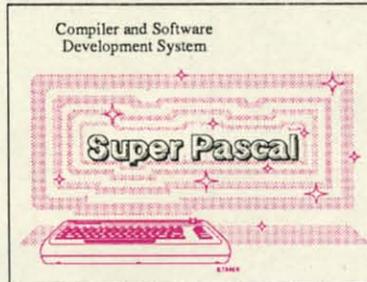
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package also helps you track steps in landscaping projects. The calendar option lets you enter notes on tasks that need to be performed on specific days. On a separate data disk (which the program will format for you), calendar entries are stored by month, day, and year. This section is amazingly simple to use; much like writing

Figure 2: Personalized Plant List

Select from list

Gardenia jasminoides prostrata
Hedera canariensis
Hedera helix
Juniperus conferta—g'cover
Juniperus procumbus
Lantana montevidensis
Liriope muscari
Liriope spicata
Ophiopogon japonicus
Trachelospermum asiaticum
Trachelospermum jasminoides
Vinca major

Point to name and select or type name here >

a reminder on a calendar.

A separate notepad function lets you write notes for special plant care, shopping lists, unscheduled tasks; just about anything you like. These too are easily printed. Using the menu provided, you can even edit your calendar entries without leaving the notepad.

If that's not enough, a calculator is

Figure 3: Plant Information

Pelargonium Domesticum

Botanical Name:
Pelargonium Domesticum

Common Name:
Pelargonium
Martha Washing'n Geranium

PLANT TYPE: Tender Perennial
height: 1½ to 3 ft.
soil: Good drainage
light: Full Sun to light shade
water: Medium water
feeding: Light feeder
blooming time: Spring to Summer
flower colors: Lavendar, Pink
Purple, Red, White

Comments: In warm weather, water deeply once a week.

built in. Though it only provides simple math functions, it can come in handy for figuring out square footage of sod needed or approximate costs for shopping trips. Nice addition!

Last and not least, the program doesn't seem to be copy protected. Using the simple copier provided with *Fast Load* gave me working copies of the disks' two sides. Since data must be written to the disk to personalize it for your zip code area, this is an important factor.

Definitely developed for the "home market," a lot of thought went into making this a worthwhile package. It is certainly worth a look by anyone who is serious about improving their botanical surroundings. A small landscaping firm could probably use it to help plan projects, so a home owner should certainly find its features useful.

Ortho Information Services, P.O. Box 7144, San Francisco, CA 94120-7144 (phone: 415-894-0277).

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- 4) Type AUTO
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- 5) Enter the program lines shown below
(COMAL indents lines for you)
- 6) Hit RETURN key twice when done
- 7) Type RUN
Watch an animated sprite hobble across the screen. Change the (99) in line 450 for really fast walking

```
0010 setup
0020 repeat
0030 walking
0040 until key$="q" //Q to Quit
0050 //
0060 proc setup
0070 blue:=14; pink:=10
0080 white:=1; black:=0
0090 define'images
0100 repeat
0110 input "speed (1-10): ": speed
0120 until speed>=1 and speed<=10
0130 background black
0140 setgraphic 0
0150 spriteback blue,pink
0160 spritecolor 1,white
0170 spritesize 1,false,false
0180 plottext 1,1,"press q to quit"
0190 endproc setup
0200 //
0210 proc define'images closed
0220 dim shape$ of 64, c$ of 1
0230 shape$(1:64):=""
0240 shape$(64):=chr$(1)//multicolor
0250 c$:=chr$(0)
0260 for x=22 to 63 do shape$(x):=c$
0270 c$:=chr$(170)
0280 for x=1 to 21 do shape$(x):=c$
0290 define 0,shape$
0300 c$:=chr$(20)
0310 for x=22 to 42 do shape$(x):=c$
0320 define 1,shape$
0330 define 3,shape$
0340 c$:=chr$(60)
0350 for x=43 to 63 do shape$(x):=c$
0360 define 2,shape$
0370 endproc define'images
0380 //
0390 proc walking
0400 for walk:=1 to 319 div speed do
0410 x:=walk*speed
0420 y:=100+walk mod 4
0430 spritepos 1,x,y
0440 identify 1,walk mod 4
0450 pause(99)
0460 endfor walk
0470 endproc walking
0480 //
0490 proc pause(delay) closed
0500 for wait:=1 to delay do null
0510 endproc pause
```

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MORE BASIC PROGRAMMING



J. CASE

Including *Alchemist's Apprentice*, A Program for the C-64, C-128, and Plus/4

By Cheryl Peterson

This month we have a little exercise in BASIC programming to show how to structure a program using the ON-GOSUB command. We'll put together a program called *Alchemist's Apprentice* and see how it works. We'll use a randomizing function to make our game unpredictable. We'll use a timing routine to keep track of how much longer our players can continue. We'll use both GET and INPUT statements to take keyboard input. Though I'll be explaining the main parts of the program, there are several subroutines that I will leave you to figure out.

Since I've always preferred to communicate using words instead of pictures, *Alchemist's Apprentice* doesn't use fancy graphics or sprites. If you'd like to, you could write some graphics routines to illustrate the program.

There are lots of books available on BASIC programming that explain the use of different commands, and I'll have a list of some of them at the end of this month's column. But what the beginning programmer needs to know is how to organize a program. The actual technique

of writing a program involves much more than knowing which commands to use. Let's take a look at one person's approach to programming: mine.

To write *Alchemist's Apprentice*, I first thought about what I wanted it to do. With notepad in hand, I sat down and started writing the basic plot.

The alchemist has gone away to a convention. As his apprentice, the player is just learning how to change stones into gold. The alchemist has demonstrated most of the process, but keeps the key ingredient secret. The player must figure out what the ingredient is. The object of the game is to change as many stones into gold as possible before the alchemist returns from the convention. Unless the gold is hidden out of sight before the alchemist returns, he'll take the player's gold away. The alchemist also expects the shop to be cleaned up before he returns.

Some of my options at this point in the program's development were more complicated than I wanted to get. I didn't want to write a parser to figure out exactly what ingredients the player was using. I didn't want to bother

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with comparison tables to figure out whether the right ingredients had been chosen, either. And I didn't want to turn what was meant to be a simple children's program into a major adventure game. Basically, I decided to give the player two choices: quit while you're ahead and take what you've got *or* keep going and risk getting "zonked." (After all, it worked for "Let's Make a Deal!")

This made the player input easy to handle, though there were still a couple of options. Yes, I know that a simple "Yes/No" question seems like a pretty black and white programming situation. But it's not. Part of "user friendly" programming is using defaults and making the default answer as easy as possible to enter. Here's a short routine to accept keyboard input and analyze it.

```
10 INPUT"(Y)es or (N)o";X$
20 IF X$="Y" THEN GOTO 40
30 END
40 PRINT"You have chosen to continue."
```

At first glance, this little routine appears to check for a "Y" and continue if a "Y" is entered. And some programmers would be satisfied with that. But it also means that a typographical error will end the program. In fact, typing "Yes" would also end the program. Any input other than the single character "Y" will end the program. That's not very nice.

A better way to do it would be:

```
10 INPUT"(Y)es or (N)o";X$
20 IF X$="Y" THEN GOTO 60
30 IF X$="N" THEN GOTO 100
40 PRINT"PLEASE TYPE EITHER Y OR N.":GOT
O 10
60 PRINT"YOU HAVE CHOSEN TO CONTINUE."
100 END
```

This routine analyzes for a Y or an N and reacts accordingly, but it also automatically gives another chance to re-enter your response after prompting for the correct format. The subroutine at 10010 does this in yet another way.

Since I expect that most players will want to continue playing, the only way to end the game is to answer "Y" to the question "Do you want to start cleaning up?" Any other response will continue the game. This actually makes it easier to continue the game, since all that need be entered is a RETURN.

The routine at 10100 uses a GET statement in place of an INPUT command. Since the INPUT statement always places a "?" on the screen, some programmers prefer to use the GET. GET, however, retrieves only one character at a time. So it is more difficult to use in some applications. For a routine where you only want one key anyway, it's ideal.

To use it, though, requires a small extra step. The GET command takes one byte (from the keyboard buffer), representing whatever key is being pressed at the exact moment that line of the program comes up. The player would

have to be awfully fast to hit the key before the GET routine scans the keyboard. What you have to do is keep checking the keyboard until a key is pressed. To do this, you have the program compare the input to nothing and repeat the same line of the program if there's no input:

```
10 GET Q$
20 IF Q$="" THEN GOTO 10
```

or to do it in one line:

```
10 GET Q$: IF Q$="" THEN GOTO 10
```

That's basically how the routine at 10100 works, except that it became a little more complicated. I originally added the 10100 subroutine to facilitate paging in the instructions for playing the game. Since the instructions are a little long, they would scroll off the top of the screen. By using a GOSUB to 10100, the screen display stops and the reader is prompted to "PRESS A KEY TO CONTINUE." This is the way I originally wrote the routine:

```
10100 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
10200 GET Q$
10300 IF Q$="" THEN 10200
10400 IF Q$<>"" THEN RETURN
```

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Later, as the program was developing, I found other instances when this routine would be beneficial. At those times, though, I wanted the program to prompt "PRESS A KEY TO TRY SOMETHING ELSE." Rather than add four more lines by duplicating the routine and calling it with a different GOSUB routine, I changed the routine to:

```
10100 IF I=1 THEN GOTO 10110
10105 PRINT"PRESS A KEY TO TRY SOMETHING
ELSE"
10110 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
10200 GET Q$
10300 IF Q$="" THEN 10200
10400 IF Q$<>""THEN PRINT"[CLR]"
10500 RETURN
```

I then added a command at the beginning of the instructions that set I to 1. After the instructions, I is set back to 0. This causes the "PRESS A KEY TO CONTINUE" prompt to display only during the instructions.

CREATING THE FRAMEWORK

The program starts out with the routine to give the instructions. From there, we need to dimension our variables and reset them (just in case this is not the first pass through the game). Since the program offers the option

to play again, we have to set the variables back to zero before the start of any additional games. It won't hurt to reset the variables for the first game either.

Before I could actually design the various subroutines, I had to decide what I wanted to happen to the player. Obviously one subroutine had to be reserved for being successful. One routine needed to handle the early return of the alchemist. But a program that only gives two results is pretty boring. There could be many ways for the player to fail, however, so using 3 x 5" note cards, I sat down and mapped out what I wanted to happen to the player in each subroutine.

First I thought of the MONSTER SUBROUTINE, and then I thought of adding the COUNTERSPELL SUBROUTINE to go with it.

I decided that having the player turn himself into various animals might be fun. And using the text, I indicated that the counterspell couldn't be used, since animals can't talk.

Then I thought of putting in the WASTE TIME SUBROUTINE. Originally these each had separate cards, but since the process is parallel they all ended up in the same section of the program.

Then I thought "Gee, what difference does it make if you waste time unless a clock is running?" So the CLOCK SUBROUTINE was written on a card. I didn't want to make the alchemist's return limit the number of turns in

ALCHEMIST'S APPRENTICE—FRAMEWORK

```
•900 PRINT "[CLEAR]"
•910 PRINT "[10" "]"ALCHEMIST'S APPRENTICE
"
•920 PRINT "[17" "]"COPYRIGHT"
•930 PRINT "[12" "]"CHERYL COX PETERSON"
•940 PRINT "[19" "]"1986"
•950 PRINT:PRINT:PRINT:PRINT
•960 INPUT"DO YOU NEED INSTRUCTIONS";X$
•970 IF X$="N" THEN GOTO 1500
•980 PRINT"[CLEAR]"
•1500 REM SETUP
•1550 PRINT"[CLEAR]"
•1560 DIM A(17), M1(17), M2(9), WT(9), R(
11), RC(10)
•1570 I=0:CS=0:SB=0:Y=0:TL=0:G=0
•2000 REM MAIN ROUTINE
•2005 T=INT(RND(1)*3+1)
•2006 IF T=2 THEN TL=1
•2010 R=INT(RND(1)*10+1)
•2015 IF TL>0 THEN TL=TL+1
•2050 ON R GOSUB 4000,4500,5000,6000,7000
,7500,8000,8500,9000,9500,20500
•3000 REM CLOCK ROUTINE
•3001 PRINT"CLOCK"
•3002 PRINT TL:PRINT T
•3005 IF T<>1 THEN GOTO 2000
•3010 IF TL=120 THEN GOTO 3500
•3020 IF TL<>90 THEN 3030
•3025 GOTO 20000
```

```
•3030 GOTO 20000
•3500 REM GAME OVER
•3501 PRINT"GAME OVER"
•4000 REM FOUND IT SUBROUTINE
•4001 PRINT"FOUND"
•4499 RETURN
•4500 REM PARTLY SUCCESSFUL SUBROUTINE
•4501 PRINT"PARTLY"
•4999 RETURN
•5000 REM EARLY SUBROUTINE
•5001 PRINT"EARLY"
•6000 REM COUNTERSPELL ROUTINE
•6001 PRINT"COUNTER"
•6999 RETURN
•7000 REM WASTED TIME SUBROUTINE
•7001 PRINT"WASTE"
•7999 RETURN
•8000 REM MONSTER SUBROUTINE
•8001 PRINT"MONSTER"
•8999 RETURN
•9000 REM ANIMAL SUBROUTINE
•9001 PRINT"ANIMAL"
•9998 RETURN
•9999 END
•10010 PRINT"DO YOU WANT TO START CLEANIN
G UP?"
•10020 PRINT"THE ALCHEMIST COULD RETURN E
ARLY."
•10050 IF X$<>"Y"THEN 10090
```

a game to 60. (After all, this is a *very* random game.) Also, the game's plot provides for the alchemist to call, maybe. Of course, I then realized that once the alchemist calls, the clock has to be incremented each turn. So although originally conceived as a subroutine, the clock (out of necessity) became part of the main program.

I then organized the cards, putting subroutine line numbers at the top of each. I tried to figure out what commands were needed by each subroutine and planned out the variables needed for each card. Then I set out to put it all together.

To illustrate the organization process, the preliminary draft of the program is shown here. This is the program without all the subroutines filled in. (The listing for the complete, working game is on page 107.) By looking at the bare bones structure you'll get a better idea of how it all fits together. I also used this to test how well my random numbers were functioning. By running the program, you get a screen printout of the name of each routine as it is accessed. Once positive that everything was working at that point, entering the other subroutines was a fairly simple matter. A good point in favor of working this way is that when something does go wrong, you can be sure it isn't in the main routine. This makes it much easier to track down the inevitable "bugs" that creep in when you back is turned.

The main program uses a randomly generated number

(See page 107 for type-in listing)

```
•10060 PRINT"CONGRATULATIONS, YOU'VE GOT
";G;" GOLD PIECES."
•10070 PRINT"WOULD YOU LIKE TO TRY AGAIN?
"
•10080 INPUT"[025] OR [014]";D$
•10085 IF D$="Y"THEN 1500
•10089 END
•10090 PRINT"OK, LET'S TRY SOMETHING ELSE
":RETURN
•10100 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
•10200 GET Q$
•10300 IF Q$="" THEN 10200
•10400 IF Q$<>"" THEN RETURN
•20000 REM ALCHEMIST RETURNS
•20001 PRINT"HE'S BACK"
•20010 PRINT"TOO BAD. THE ALCHEMIST IS BA
CK"
•20020 GOTO 20520
•20500 REM ALCHEMIST RETURNS EARLY
•20501 PRINT"HE'S EARLY"
•20510 PRINT"TOO BAD. THE ALCHEMIST RETUR
NED EARLY"
•20520 PRINT"AND YOU LOSE ALL YOUR GOLD."
•20530 PRINT"BETTER LUCK NEXT TIME."
•20540 INPUT"CARE TO TRY AGAIN";D$
•20550 IF D$="Y" THEN GOTO 1570
•20560 IF D$="N" THEN 9999
•20570 GOTO 20540
```

to route the program to one of the subroutines. Line 2005 gives a random number between 1 and 11. The ON-GO-SUB in line 2050 uses the randomly generated number R to pick the appropriate subroutine from the list. If R=1 then it goes to 4000, If R=2 then it goes to 4500, etc.

Line 2010 also gives a random number between 1 and 11. This variable is used to determine whether or not the clock starts running. This means that there is a one in eleven chance that the one-hour clock will start running.

Line 3005 checks to see if random number T has come up 1. If T is equal to 1, the program continues execution at the next line. If not, it returns to line 2000 and does the main routine again. When it continues past line 3005, the program increments the variable TL (for time left). The next line tests TL to see if it is equal to 60. If TL is equal to 60 the game is over and the program shunts off to the end game routine. The next six lines are just timekeepers to tell the player how much longer he has left.

Of course, the random function in line 3010 could still send the program off to the EARLY SUBROUTINE at 5000. So, the clock running is no guarantee that the alchemist won't return early. (Aren't I devious?)

That's the main program. It just keeps looping through until the player is unlucky enough to stumble into one of the subroutines that ends the game. I'm not going to explain all the subroutines. You'll get more out of them if you analyze them yourselves. If you're really stumped drop me a note care of *Ahoy!* and I'll fill in the details. I will say that most of the subroutines use another randomly generated number to decide what happens within them. And some also use the ON-GOSUB command again to give a variety of responses. This is used in the ANIMAL SUBROUTINE in an interesting way.

One nice thing that this program illustrates is how creative you can get with a minimum of commands available. If you look at this program, you will find there are *no* advanced commands used. I stuck with the very basics in designing this program. No complicated math schemes; no complicated variable arrays; no disk read schemes. Nothing but simple input and output commands and some very simple comparisons. In fact, the only math used in the program is the incrementing of the variable TL in line 2015, the simple multiplication and addition in the randomizing lines, the addition of the time wasted to TL, and the addition used for keeping track of the player's gold count.

FURTHER READING

There are a number of good books available on BASIC programming and I'd like to recommend a few. I'm including a short list with this column.

One, *The Adventure Gamewriter's Handbook for Commodore* (Abacus Software), is designed much like this column. But it goes into a lot more detail. (Magazine columns afford limited space.) The book includes several programs, both games you can key in and utilities to help you create your own adventure games. It takes you through the creation of each routine used by the pro-

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grams and explains how each works. A very good book for learning programming, since you have tangible results when you have finished it.

The C-64 Starter Book uses an easy-to-read textbook format to teach programming. It covers BASIC using good samples for illustration. It emphasizes flow charting and structuring, rather than slapdash layout.

C-64 Color Graphics: A Beginner's Guide teaches how to use high resolution graphics. Using good instructions and samples, it presents a complicated subject in a manner that will be useful to beginning programmers.

C-64 Subroutine Cookbook has over 60 useful BASIC subroutines. Though most of them are written for intermediate level programmers, some of the routines would be useful for beginners. Of course, if you keep following this column, you'll soon be up to intermediate level BASIC programming.

Another intermediate level book is *At Home with BASIC: Programming the C-64*. While this one has some heavy duty math routines that may not interest beginners, it also contains a good section on debugging procedures.

As mentioned in past columns, if you'd like to reach me in the quickest way possible, Viewtron is it. I am online live in the CB section on Saturday nights from 9 to 11 EST. Messages left on the For Starters bulletin board will probably be answered immediately, especially if you mention that you're an *Ahoy!* reader. My user ID number is 266399CCP. My handle in CB is Cherp!

By the way, the editor of *Ahoy!* turned down my idea for a column devoted to using Viewtron. He thinks that there aren't enough beginning Commodore users who have modems to justify devoting that much space to telecommunications. Anyone want to organize a letter writing campaign to convince *Ahoy!* that telecommunications deserves all the space it can get? Of course, those of you who don't want to hear about modems and stuff should write and support the editor's decision.

SEE PROGRAM LISTING ON PAGE 107

BOOKS FOR FURTHER READING

Adventure Gamewriter's Handbook

J. Walkowiak
Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510

*At Home with BASIC:
Programming the C-64*
Henry Mullish and Doug
Kruger

Simon and Schuster Books
1230 Avenue of the Americas
New York, NY 10020

C-64 Subroutine Cookbook
David D. Busch

Robert J. Brady Co.
Bowie, MD 20715

*C-64 Color Graphics: A
Beginner's Guide*
Shaffer and Shaffer Applied
Research and Development
Reston Publishing Co.
11480 Sunset Hills Road
Reston, VA 22090

The C-64 Starter Book
Christopher Titus, David
Larsen and Jonathan Titus
Howard Sams and Co.
4300 West 62nd St.
Indianapolis, IN 46268

THE MUSICAL COMMODORE

How to Make SID Sing

By Mark Andrews

This month's column features both words and music. A type-and-run program on page 100 contains some pretty fancy graphics—including an alternate character set, a giant-sized screen message, and an animated sprite routine. A detailed explanation of how that program works was presented in last month's column, so I won't repeat it now. Instead, in the text that follows, we'll start exploring a brand-new topic: Commodore graphics and sound.

Despite its modest appearance and rock-bottom price, the C-64 has sound-and music-generating capabilities that rival those of synthesizers used by professional musicians. In this column, we'll look at some techniques that you can use to turn your Commodore's typewriter keyboard into a keyboard for reproducing an almost limitless variety of sounds.

You can use either BASIC or assembly language to program sound on your Commodore. But assembly language is much better than BASIC for writing music and sound routines. Here are some of the reasons:

- Sound is programmed on the Commodore 64 by manipulating specific bits in specific memory registers—a job that is slow and clumsy in BASIC, but fast and easy in assembly language.
- Timing is often critical in sound-and-music programming, so the speed of assembly language is especially important in programs that deal with music and sound.
- The length of a note cannot be determined very precisely in BASIC, but musical timing can be controlled with pinpoint precision in assembly language. In fact, by using a programming tool called an **interrupt**, you can make the lengths of musical notes, rests, and phrases completely independent of everything else in an assembly language program. By using interrupts, you can add music and sound to an assembly language program with perfect synchronization—and you can be certain that your soundtrack will always run at the same speed, no matter how many other features are then added to the program.

To understand how the Commodore 64/128 music synthesizer works, it helps to know a few fundamental principles of sound reproduction. I'll outline some of the principles now. Then we'll be ready to put your Commodore through its paces as a music synthesizer.

FOUR CHARACTERISTICS OF SOUND

When you hear a sound being played on a musical in-

strument, there are really four characteristics which are combined to create the sound that you perceive:

- (1) **Volume**, or loudness.
- (2) **Frequency**, or pitch.
- (3) **Timbre**, or sound quality.
- (4) **Dynamic range**, or the difference in level between the loudest sound that can be heard and the softest sound that can be heard during a given period of time. This period of time can range between the time it takes to play a single note and the length of a much longer listening experience, such as a musical performance or a complete musical recording.

The Commodore 64/128 contains a special microprocessor that can be programmed to control the volume, frequency, timbre, and dynamic range of sounds. It is this processor—called the 6581 SID (Sound Interface Device)—which gives the Commodore 64/128 its incredible sound-synthesizing capabilities.

THE THREE VOICES OF SID

The SID chip has three separate voices, and each of these can be independently programmed. This means that your Commodore can play music in three-part harmony, or you can use one voice for melody, one for percussion, and one for bass. You can use the SID chip to generate noises instead of music, and program each of SID's three voices to produce a different sound. SID can even be taught to synthesize sounds that are recognizable as speech—but that takes some pretty fancy programming.

In a moment, we'll look at how the SID chip can be used to program three voices: that is, how it can control the **volume**, **frequency**, and **timbre** of three independent sources of sound. But first let's see where the SID chip is situated in your computer's memory, and how it is designed to be programmed.

HOW TO FIND SID

In the C-64, Memory Registers \$D400 through \$D7FF (54272 to 55295 in decimal notation) are used to address the SID chip. These 1024 memory registers can be divided as shown in the chart on page 86.

Registers \$D400 through \$D418 are the only SID registers ordinarily used in BASIC to intermediate level SID programming. The largest block of memory in the table—the section that extends from \$D400 through \$D414—can be broken down further into three subsections: one for Voice 1, one for Voice 2, and one for Voice 3. Let's take

a look now at how the SID chip's registers are used to program the volume, frequency, timbre, and dynamic range of the three voices of the C-64.

CONTROLLING SID'S VOLUME

For some reason known only to the Commodore 64's designers, it is not possible to control the volume of the SID chip's three voices individually; instead, the loudness of the overall sound produced by the SID register is determined by the value that is placed in the lower four bits (bits 0 through 3) of Memory Register \$D418 (sometimes known as the SIGVOL register).

To control the volume of all sounds produced by the SID chip, all you have to do is place a number ranging from \$0 to \$F in the lower nybble of the SIGVOL register. The larger the value of this nybble is, the louder is the sound which the SID chip produces. If the value of the nybble is \$0, no sound will be generated. In most applications, the volume nybble of the SIGVOL register is kept at \$F, its maximum setting.

Bits 4 through 6 of the SIGVOL register are used to control three sound filters that are built into the SID chip: a low-pass filter, a bandpass filter, and a high-pass filter. The uses of these filters will be explained later in this column.

Bit 7 of the SIGVOL register can be used to disconnect the output of Voice 3 of the SID chip. Voice 3 is discon-

MEMORY BLOCKS USED BY SID

\$D400 through \$D406	— Registers for Voice 1
\$D407 through \$D40D	— Registers for Voice 2
\$D40E through \$D414	— Registers for Voice 3
\$D415 through \$D418	— Sound filter and volume controls
\$D419 through \$D41A	— Game paddle registers (not used for sound)
\$D41B through \$D41C	— Read-only sound registers (used in advanced synthesis operations)
\$D41D through \$D41F	— Not connected
\$D420 through \$D7FF	— Images of other registers; not used

SID'S SOUND REGISTERS

Address	Label	Function
\$D400	FRELO1	Voice 1 Frequency Control (low byte)
\$D401	FREHI1	Voice 1 Frequency Control (high byte)
\$D402	PWLO1	Voice 1 Pulse Waveform Width (low byte)
\$D403	PWHI1	Voice 1 Pulse Waveform Width (high nybble)
\$D404	VCREG1	Voice 1 Control Register
\$D405	ATDCY1	Voice 1 Attack/Decay Register
\$D406	SUREL1	Voice 1 Sustain/Release Control Register
\$D407	FRELO2	Voice 2 Frequency Control (low byte)
\$D408	FREHI2	Voice 2 Frequency Control (high byte)
\$D409	PWLO2	Voice 2 Pulse Waveform Width (low byte)
\$D40A	PWHI2	Voice 2 Pulse Waveform Width (high nybble)
\$D40B	VCREG2	Voice 2 Control Register
\$D40C	ATDCY2	Voice 2 Attack/Decay Register
\$D40D	SUREL2	Voice 2 Sustain/Release Control Register
\$D40E	FRELO3	Voice 3 Frequency Control (low byte)
\$D40F	FREHI3	Voice 3 Frequency Control (high byte)
\$D410	PWLO3	Voice 3 Pulse Waveform Width (low byte)
\$D411	PWHI3	Voice 3 Pulse Waveform Width (high nybble)
\$D412	VCREG3	Voice 3 Control Register
\$D413	ATDCY3	Voice 3 Attack/Decay Register
\$D414	SUREL3	Voice 3 Sustain/Release Control Register
\$D415	CUTLO	Filter Cutoff Frequency (low nybble)
\$D416	CUTHI	Filter Cutoff Frequency (high byte)
\$D417	RESON	Filter Resonance Control Register
\$D418	SIGVOL	Volume and Filter Select Register

ected by setting this bit to 1. When Voice 3 is disconnected, an oscillator with which Voice 3 is equipped can be used for modulating the sound of the other two voices. Or the Voice 3 oscillator can be used for other purposes—such as generating random numbers—without affecting the output of sound.

When the filters controlled by Register \$D418 are not being used, and when there is no need to disconnect Voice 3, the SID chip's volume can be controlled by simply storing a value from \$0 to \$F (or from 0 to 15 in decimal notation) in the SIGVOL register. But when Bits 5 through 7 of the SIGVOL register are in use, masking operations must be used in order to implement a desired volume setting without affecting the register's other functions. Here is a routine that could be used to implement a volume setting of 15 (\$F in hexadecimal notation) without disturbing the high-order nybble of the SIGVOL register:

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- 2 AND #\$F0
- 3 ORA #\$0F
- 4 STA SIGVOL

CONTROLLING FREQUENCY

The pitch of a musical note is determined by its **frequency**, usually measured in Hertz, or cycles per second. The frequencies that can be produced by the 64's SID chip range from 0 Hz (very low) to 4000 Hz (quite high).

The SID chip synthesizes the frequencies of sounds by carrying out a rather complex mathematical operation. First, it reads a pair of 8-bit values (one "low" value and one "high" value) that have been placed in a specific pair of **frequency control registers** (the SID chip has six such registers—two for each voice—and the addresses of all of them are listed in the table on the facing page).

When a pair of frequency-control registers has been loaded with two 8-bit values, it combines them into a 16-bit value. It then divides that 16-bit value by a number that is derived from a certain frequency: specifically, the frequency of a **system clock** built into the Commodore 64. Finally, when all of these operations have been carried out, the SID chip is able to generate a note of the desired frequency.

Fortunately, you don't have to worry about all those technicalities to produce a note of a given frequency on the Commodore 64. All you have to do is place the proper values in the proper memory registers, and then set a certain bit in another register. All the values you need to play eight octaves of notes on the C-64 are listed on pages 384-386 of the *Programmer's Reference Guide*. In that table, you find two values (as "low" value and a "high" value) that must be placed in the SID chip's frequency control registers in order to produce each note that the 64 is capable of generating. But remember that the values listed in this table are not actual frequencies; they are numbers that the SID chip uses to *calculate* frequencies that are to be generated.

CONTROLLING TIMBRE

Timbre, or note quality, can be illustrated with the help of a structure called a **waveform**. The SID chip can generate four kinds of waves: a **triangle wave**, a **pulse wave**, a **sawtooth wave**, and a **noise wave**.

To understand the concept of waveforms, it is necessary to have a fundamental understanding of musical harmonics. So here goes:

With the help of an electronic instrument, it is possible to generate a tone that has just one pure frequency. But when a note is played on a musical instrument, more than one frequency is usually produced. In addition to a primary frequency, or a **fundamental**, there is usually a set of secondary frequencies called **harmonics**. It is this total **harmonic structure** which determines the timbre of a sound.

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the screen is that of a pure **sine wave**. The waveform a flute produces is very close to this (see figure 1).

When harmonics are added to a tone, the result is a richer sound that produces what is known as a **triangle wave** (see figure 2). Triangle waveforms, or waves that are close to triangle waveforms, are produced by such instruments as xylophones, organs, and accordions.

When still more harmonics are added to a note, other kinds of waves are formed. Harpsichords, and trumpets, for example, produce what is called a **sawtooth wave** (see figure 3). And a piano generates a squarish type called a **square wave** or a **pulse wave** (see figure 4).

PULSE WAVEFORM WIDTH CONTROLS

When the SID chip is called on to generate a pulse wave, it is necessary to use a **pulse waveform width control**. As Figure 1 illustrates, the pulses in a pulse waveform have a certain width, and are separated by gaps that may have a different width. The SID chip has six registers—two for each voice—that can be used to control the widths of pulse waveforms. A pulse wave generated by the SID chip has a 12-bit resolution, so only 12 bits in each pair of width-control registers are used: all eight bytes of each low-order register, plus the lower nybble of each high-order register.

The setting of each width-control register determines how long a pulse wave will stay at the high part of its cycle. The

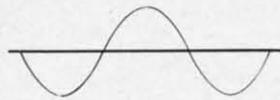


Figure 1: Sine Waveform

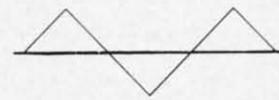


Figure 2: Triangle Waveform

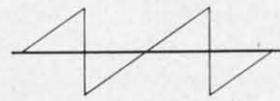


Figure 3: Sawtooth Waveform

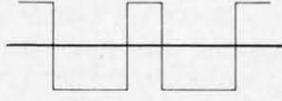


Figure 4: Pulse Waveform

possible range of 12-bit values, from 0 to 4095, makes it possible for a square wave to stay in the high part of its cycle from 0% to 100% of the time, in 4096 steps. duce some—in next month's column. □

NOISE WAVEFORMS

Another kind of waveform that the SID chip can produce is a **noise waveform**. A noise waveform creates a random sound output that varies with a frequency proportionate to that of an oscillator built into Voice 1. Noise waveforms are often used to imitate the sound of explosions, drums, and other nonmusical noises.

We'll take a look at how the Commodore 64 reproduces all these types of waveforms—and then we'll make it produce some—in next month's column. □

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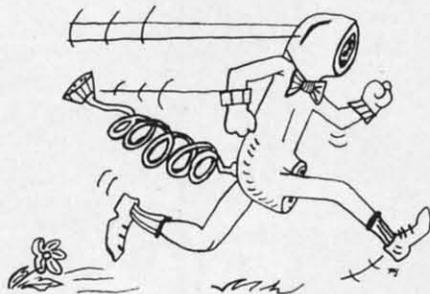
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COMMODORES

PROGRAMMING CHALLENGES

By Dale Rupert

Each 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. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. 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 *Commodares!*

PROBLEM #29-1: PRINT MAKER

This problem was suggested by Allan Flippin (San Jose, CA). When this program is run, the user specifies a line number, and then the screen clears with the cursor in the upper left corner. All keystrokes typed by the user are displayed on the screen just as they would be if they were entered in direct mode. All keystrokes are stored until the RETURN key is pressed. At that time, the program creates a PRINT statement with the given line number which, when executed, will generate the same sequence of keystrokes and screen display. All keystrokes are allowed, including Insert/Delete, cursor movement, text, and graphics.

For example, assume the user enters 5 for the line number, then types the word "COMMODORE", pressing the <cursor down> key after each letter is typed. The text is shown going diagonally downward on the screen. Once the RETURN key is pressed, this statement is displayed:

```
5 PRINT "CQOQMOMQOQDQOQRQEQ"
```

where *Q* is the normal screen symbol for the <cursor down> key.

PROBLEM #29-2: GENERIC GAME

Claude Landusky (Waianae, HI) suggested programming the old standard "guess the digits" game. The com-

puter picks a four-digit number, with no two digits alike. The user guesses the number. The computer responds with the number of correct digits in the guess and the number of correct digits in the correct position. The user attempts to deduce the computer's number in the fewest guesses.

For example, assume the computer picks "1234" and the user guesses "2534". The computer returns the score "3,2" since three of the guessed digits are correct, and two of them are in the proper positions. Make this a "no frills" program.

PROBLEM #29-3: BEAT KEEPER

Barry King (Nome, AK) suggested creating a musician's metronome with an audible tick, a character moving back and forth on the screen, and a speed displayed in beats per minute which is adjustable during operation. As usual, simplest is best.

PROBLEM #29-4: LARGE PRODUCT

This one should not be very difficult. Using the digits 1 through 9 only once, create two numbers which give the greatest product when multiplied together. For example, 12345 x 6789 is one choice, but obviously 54321 x 9876 is even better. Can you find the best?

This month we will look at readers' solutions to *Commodares* from the January 1986 issue of *Ahoy!* As promised, my solution to *Problem #24-1: Printing Permutations* is listed below.

```
•10 REM PROBLEM #24-1 :
•15 REM PRINTING PERMUTATIONS
•20 N=5 :REM # TO BE PERMUTATED
•30 K=0 : NW=-1 : L=1
•40 GOSUB 100
•50 END
•100 NW=NW+1 : VL(K)=NW
•110 IF NW=N THEN GOSUB 500
•120 FOR T=1 TO N
•130 IF VL(T)<>0 THEN 160
•140 T(L)=T : K(L)=K : K=T : L=L+1
•150 GOSUB 100 : L=L-1 : T=T(L) : K=K(L)
•160 NEXT T
•170 NW=NW-1 : VL(K)=0
•180 RETURN
•500 KK=KK+1 : PRINT KK,
•510 FOR I=1 TO N : PRINT VL(I); : NEXT
•520 PRINT
•530 RETURN
```

This is a BASIC implementation of the following algorithm discussed last month for printing all permutations of a given set of numbers.

```

procedure visit(k)
  begin
    now=now+1 : val(k)=now
    if now=n then print all values of val(k)
  for t=1 to n
    if val(t)=0 then call visit(t)
  next t
  now=now-1 : val(k)=0
end.

```

The routine is initially called with k=0, now=-1, n is the number of items to be permuted, and all elements of val() are 0 (i.e. k=0 : now=-1 : n=3 : gosub visit). It is true that BASIC does not handle recursion very well, but this program is one more example that nothing is impossible in BASIC (except time-dependent applications, perhaps).

The only tricky part of this program is in lines 140 and 150. The algorithm says to recursively call the subroutine at line 100 with the argument K equal to the current value of T if VL(T) equals 0. Otherwise repeat the FOR/NEXT loop with the next value of T. The subscript L in line 140 keeps track of the "level" or depth of recursion of the subroutine as well as the current values of K and T at that level.

Once all values of T from 1 to N have been used at the lowest level of the subroutine, lines 170 and 180 will finally be executed. The program returns to the statements after the GOSUB 100 in line 150. Eventually all levels are completed, and the RETURN brings the program back to line 50 where it ends.

The program is very slow compared to the solutions presented last month. It may interest you to know that the C-128 in the FAST mode executes this program roughly 20 percent faster than the IBM PC does. Alan Flippin's solution last month is still six times faster than this program. Those of you who are ready for a real challenge might enjoy "playing computer" to figure out how this program works.

Although not exactly *Commodore* material, these problems from Robert E. Smith (Van Alstyne, TX) might intrigue you. Robert asks if it is possible to use the C-64 as a videotape attachment for editing, fade-out, fade-in, and other effects. He also suggested putting a sprite on the screen over the VCR image (just as in some of the newer video arcade games). If you have any experience or information about the feasibility of such tasks, let us know.

There was quite a bit of interest in *Problem #25-2: Character Spiral* submitted by Necah Buyukdura (Ankara, Turkey). The problem requested the fastest BASIC solution for winding a character spiral outward in the counter clockwise direction, and then unwinding it clockwise in a 25 by 25 character figure. Three solutions are

listed below.

The following program from Clifford Dedmore (North Bend, OR) can be compressed by merging lines 30 and 40 as well as merging lines 50 and 60 if abbreviations are used. Clifford's program runs in roughly 246 jiffies on the C-64. It takes over 400 jiffies on the C-128 in 40-column mode, and less than 200 jiffies on the C-128 in FAST 80-column mode.

```

•1 REM
•2 REM PROBLEM #25-1 :
•3 REM CHARACTER SPIRAL
•4 REM SOLUTION BY
•5 REM CLIFFORD DEDMORE
•6 REM
•10 T=1:V=25:PRINT"[CLEAR][13][DOWN]"TA
  B(12)". ";
•20 J=J+T:FORK=TTOJ+(J=V):PRINT". ";:NEXT:
  IFJ=VTHEN50
•30 FORK=TTOJ:PRINT"[LEFT][UP]". ";:NEXT:J=
  J+T:FORK=TTOJ:PRINT"[LEFT][LEFT]". ";:NEXT
•40 FORK=TTOJ:PRINT"[LEFT][DOWN]". ";:NEXT:
  GOTO20
•50 FORK=JTOT+(J<>V)STEP-T:PRINT"[LEFT] [
  LEFT]";:NEXT:IFJ=T THEN RUN
•60 FORK=JTOT+TSTEP-T:PRINT"[UP] [LEFT]";
  :NEXT:J=J-T:FORK=JTO.STEP-T:PRINT" ";:NE
  XT
•70 FORK=JTOT+TSTEP-T:PRINT"[DOWN][LEFT]
  ";
•80 NEXT:J=J-T:GOTO50

```

Clifford mentioned some of the characteristics of his program which increase its speed. He used a decimal point in line 60 instead of a zero. Using a FOR-NEXT loop which counts down to zero is faster than one which counts up. Using variables rather than constants also speeds up the program. Clifford put the REM statements with his name, address, and problem number at the end of his program originally, which further reduces execution time.

The program from Barry King (Nome, AK) is also very fast. Barry's program adds some variety to the characters displayed, producing quite a hypnotic presentation. Lines 50 and 55 as well as lines 90 and 95 may be merged into single lines if abbreviations are used.

```

•1 REM
•2 REM PROBLEM #25-1 :
•3 REM CHARACTER SPIRAL
•4 REM SOLUTION BY
•5 REM BARRY KING
•6 REM
•10 PRINT"[CLEAR]"
•20 FORX=49TO127STEP2:R$=CHR$(X):U$=R$+"[
  UP][LEFT]":L$=R$+"[LEFT][LEFT]":D$=R$+"[
  DOWN][LEFT]"
•30 PRINT"[HOME]":FORA=1TO11:PRINT"[DOWN]
  [RIGHT]";:NEXT:PRINTR$;U$;

```

- 40 FORA=0TO22STEP2
- 50 FORB=0TOA:PRINTL\$;:NEXT:FORB=0TOA+1:P
RINTD\$;:NEXT
- 55 FORB=0TOA+1:PRINTR\$;:NEXT:FORB=0TOA+2
:PRINTU\$;:NEXT:NEXT
- 70 R\$=CHR\$(X+1):U\$=R\$+"[UP][LEFT]":L\$=R\$
+"[LEFT][LEFT]":D\$=R\$+"[DOWN][LEFT]"
- 80 FORA=22TO0STEP-2
- 90 FORB=0TOA+2:PRINTD\$;:NEXT:FORB=0TOA+1
:PRINTL\$;:NEXT
- 95 FORB=0TOA+1:PRINTU\$;:NEXT:FORB=0TOA:P
RINTR\$;:NEXT
- 100 NEXT:NEXT:GOTO20

The third solution is from Matt Shapiro (Fort Lee, NJ). Matt's program spends a few moments at first initializing some data strings. The result of the preliminary preparation is a lightning fast display. Be careful to include the two null strings in line 40.

- 1 REM
- 2 REM PROBLEM #25-1 :
- 3 REM CHARACTER SPIRAL
- 4 REM SOLUTION BY
- 5 REM MATT SHAPIRO
- 6 REM
- 10 C\$(0)="[s Q]":C\$(1)=" "
- 20 FORJ=0TO1:FORK=0TO3:READD\$:D\$=C\$(J)+D
\$:FORL=1TO5:D\$=D\$+D\$:NEXT
- 30 D\$(J,K)=D\$:NEXT:NEXT
- 40 DATA"[LEFT][UP]","[LEFT][LEFT]","[LEF
T][DOWN]","","[LEFT][LEFT]","[LEFT][UP]"
,"","[LEFT][DOWN]"
- 50 DIME\$(1,3,12):FORJ=0TO1:FORK=0TO3:M=3
+2*(J+K=3)
- 60 FORL=1TO12:N=(2*L+(K=0)-(K=3))*(1-2*J
)+26*J
- 70 E\$(J,K,L)=LEFT\$(D\$(J,K),M*N):NEXT:NEX
T:NEXT
- 80 E\$(1,0,1)=LEFT\$(E\$(1,0,1),72):E\$(0,3,
12)=E\$(0,3,12)+"[LEFT]"
- 90 E\$(1,3,12)=E\$(1,3,12)+C\$(1)+"[LEFT][L
EFT]"+C\$(1)+"[LEFT]":E\$(0,0,1)=C\$(0)+E\$(
0,0,1)
- 100 J=0:PRINT"[CLEAR][12][RIGHT]""[12][D
OWN]""";
- 110 FORL=1TO12:FORK=0TO3:PRINTE\$(J,K,L);
:NEXT:NEXT:J=1-J:GOTO110

Wallace Leeker (Lemay, MO) and Allan Flippin (San Jose, CA) found that the quickest solutions consisted of separate POKE or PRINT statements. Unfortunately that amounts to a lot of statements. Alan's solution requires only 69 jiffies (1.15 seconds). Wallace found a way to let the computer create its own POKE statements. He used ideas from Don French's solution to the *REM Remover Commodore* in the January 1986 issue of *Ahoy!* as well as *The Magical Link* in the *Rupert Report* of the

same issue.

Richard Wilson (Toronto, ONT) used the C-64 SET CURSOR routine located at 58636 (\$E50C) to position the cursor before each PRINT. It is used as follows:

```
POKE 781,ROW : POKE 782,COL : SYS 58636
: PRINT A$
```

where ROW is a value between 0 and 25, COL is from 0 to 40, and A\$ is the string to be printed.

The corresponding memory location for the C-128 is 52332. You may access this routine on the C-128 with the following:

```
SYS 52332,,ROW,COL : PRINT A$
```

The adjacent commas indicate that nothing is to be loaded into the accumulator when the routine is called. The ROW and COL values are loaded into the X and Y registers when the SYS command is executed. The C-128 has a BASIC command built in, which makes the process easier and quicker still:

```
CHAR,COL,ROW : PRINT A$
```

Notice the reversed order of the ROW and COL.

Other readers who sent solutions to this problem include Alan Leish (Los Angeles, CA), Jim Speers (Niles, MI), Frank T. Smith (Wilmington, DE), Ron Weiner (Levittown, PA), Jeff Szarek (San Antonio, TX), Steven Steckler (Columbia, MD), Douglas Underwood (Walla



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---	---

FREE CATALOG!

Walla, WA), Dennis Furman, Bill Okerblom (Providence, RI), and Billy Thompson (Richmond, VA).

Allan Flippin (San Jose, CA), Ron Weiner (Levittown, PA), Matt Shapiro (Fort Lee, NJ), Barry King (Nome, AK), Clifford Dedmore (North Bend, OR), and Mark Breault (Brandon, MAN) sent solutions to Jim Speers' *Problem #25-2: Dandy Deletion*. Mark Breault's program is listed below:

```

•1 REM
•2 REM PROBLEM #25-2 :
•3 REM DANDY DELETION
•4 REM SOLUTION BY
•5 REM MARK BREAUULT
•6 REM
•60000 INPUT"BEGIN,END";B,E:A=2049:PRINT
[CLEAR][3"[DOWN]"]][8" "]:E="E":GOTO60010
"
•60010 N=PEEK(A+2)+256*PEEK(A+3):IFN<BTHE
NA=PEEK(A)+256*PEEK(A+1):GOTO60010
•60020 IFN<=ETHENPRINT"[HOME][DOWN][DOWN]
"N:PRINT"A="A"[HOME]";:POKE631,13:POKE63
2,13:POKE198,2:END

```

This program is for the C-64. These lines must be added to the program in memory. Type RUN 60000 and specify the beginning and ending line numbers of the original program to be deleted. In the blink of an eye, unwanted lines will vanish by means of the "dynamic keyboard" routine in line 60020. C-128 users have it a bit easier. Simply type DELETE XXX-YYY to accomplish the same task.

Problem #25-3: Color Criteria, which was suggested by Steven Steckler (Columbia, MD), brought many solutions. A program such as this which requests color names for the screen border, background, and text colors should certainly provide prompts for the convenience of the user. The program submitted by Ron Weiner (Levittown, PA) is listed below.

```

1 REM
2 REM PROBLEM #25-3 :
3 REM COLOR CRITERIA
4 REM SOLUTION FOR THE C-64 BY
5 REM RON WEINER
6 REM
10 DIM CO$(15):FOR I=0TO15:READ CO$(I):N
EXT:FOR I=1TO3:READ LOC(I):NEXT
20 PRINT"ENTER BORDER,BACKGROUND,TEXT":F
OR I=0TO7:PRINTCO$(I),CO$(I+8):NEXT
30 INPUT"YOUR CHOICE";CH$(1),CH$(2),CH$(
3)
40 FOR I=1TO3:FOR J=0TO15:IF CH$(I)=CO$(
J) THEN POKE LOC(I),J
50 NEXT J,I:DATA BLACK,WHITE,RED,CYAN,PU
RPLE,GREEN,BLUE,YELLOW,ORANGE,BROWN
60 DATA LT.RED,GREY1,GREY2,LT.GREEN,LT.B
LUE,GREY3,53280,53281,646

```

The user must type the colors by name, properly spelled. It is nice that the program prints out the possible choices. Then again, as several readers mentioned, it would be nicer still if the program provided a menu to allow a simple numerical entry. How about adding some artificial intelligence so that the program would take a guess even if the user abbreviated or misspelled the colors?

The program from Kevin Nauss (Seattle, WA) is written for the C-128 in the 40-column mode. It allows the user to enter either the color name or the color number.

```

1 REM
2 REM PROBLEM #25-3 :
3 REM COLOR CRITERIA
4 REM SOLUTION FOR C-128 (40 COLUMN) BY
5 REM KEVIN NAUSS
6 REM
10 DIM C$(3),C(3),CN$(16):CLR:FOR I=1TO1
6:READCN$(I):PRINTI;CN$(I),:NEXT:FOR J=1
TO3:READ C(J):NEXT:PRINT:INPUT"BORDER,BA
CKGROUND,TEXT";C$(1),C$(2),C$(3)
20 FORJ=1TO3:I=1:OPEN OR I=16:IF C$(J)=C
N$(I) THEN LIST C(J),I:GET:GOTO IF LEN(C
$(J))<3 THEN IFVAL(C$(J))=I THEN LIST C
(J),I:GET
30 I=I+1:CLOSE:NEXT
40 DATA BLACK,WHITE,RED,CYAN,PURPLE,GREE
N,BLUE,YELLOW,ORANGE,BROWN,LIGHT RED,DAR
K GRAY,MEDIUM GRAY,LIGHT GREEN,LIGHT BLU
E,LIGHT GRAY,4,0,5

```

Thanks also to Keith Smith (Tonawanda, NY), Pat McConville (Manassas Park, VA), Len Lindsay (Madison, WI), Bill Okerblom (Providence, RI), Gary Hudach (Youngstown, OH), Marvin Segal (Springfield, NJ), Claude Landusky (Waianae, HI), and Arthur Furrow (Fort Kent, ME), as well as several readers already mentioned.

Finally, *Problem #25-4: Central Locator* produced a variety of solutions. This problem was to center the text on a line as it is typed. Several solutions met the requirement for a single line of text. Others went further, allowing a full screen of centered text, along with deletions, flashing cursor, and text color changes.

The COMAL solution from Len Lindsay (Madison, WI) is a compact program which centers the text on a single line.

```

1 REM
2 REM PROBLEM #25-4 :
3 REM CENTRAL LOCATOR
4 REM COMAL SOLUTION BY
5 REM LEN LINDSAY
6 REM
10 USE SYSTEM
20 TEXT$=""
30 REPEAT
40 PRINT AT 0,(40-LEN(TEXT$)) DIV 2: T
EXT$,

```

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```
50 TEXT$:+INKEY$
60 UNTIL TEXT$(LEN(TEXT$))=CHR$(13)
```

The PRINT AT statement is certainly a handy feature of the COMAL language.

The program listed below from Jim Speers (Niles, MI) allows a whole screen of text to be printed and centered, line by line.

```
•1 REM
•2 REM PROBLEM #25-4 :
•3 REM CENTRAL LOCATOR
•4 REM SOLUTION BY
•5 REM JIM SPEERS
•6 REM
•100 X%=20:Y=20:PRINT"[CLEAR]HIT RETURN,
THEN ENTER TEXT":INPUTZ$:PRINT"[CLEAR]"
•110 PRINTTAB(X%)A$"[RVSON] [RVSOFF]";:PO
KE198,0:WAIT198,1:GETZ$:A$=A$+Z$:Y=Y-.51
: X%=Y+.5
•120 IFX%>1ANDASC(Z$)<>13ANDZ$<>"[BACKARR
OW]"THENPRINT"[UP]":GOTO110
```

```
•130 IFZ$="[BACKARROW]"THENPRINTCHR$(20):
END
•140 PRINTCHR$(20)Z$:X%=20:Y=20:A$="":PRI
NT"[UP]":IFZ$=CHR$(13)THENPRINT"[UP]";
•150 GOTO110
```

Jim's program handles all characters except the cursor keys. Perhaps you can modify the program to use those as well. C-128 owners can replace the POKE, WAIT, and GET statements in line 110 with the GETKEY Z\$ command. To exit, press the back-arrow key.

Congratulations to Matt Shapiro (Fort Lee, NJ), Ron Weiner (Levittown, PA), Allan Flippin (San Jose, CA), Paul Lalli (McAlester, OK)—thanks for the invitation to Oklahoma State Firefighters' Convention, James Dunavant (Gainesville, FL), Dennis Furman, Kevin Collins (Toledo, OH), Claude Landusky (Waianae, HI), and Barry King (Nome, AK) for your solutions to this problem.

We are looking forward to some clever and creative solutions as well as some intriguing and thought-provoking challenges from all of you next month. □

The program listings in Commodores and all the other programs in this issue of Ahoy! are available on disk or cassette. See page 73 for details.

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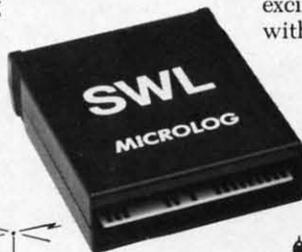
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THE GREAT ESCAPE

Continued from page 23

but finally you can put an end to that flashing. ESC F returns the default flash mode.

ESC T and ESC B let you create a window on the screen simply by positioning the cursor. Put the cursor at the top left corner of the desired rectangular window and press ESC T. Move the cursor to the bottom right corner of the window and press ESC B. All cursor movement, listings, and printings will appear within the window. Pressing the Shift-CLR key clears only the window. Pressing HOME moves the cursor to the top left corner of the window.

If you press ESC T followed by ESC B without moving the cursor, you create a one-character window. It looks like the cursor is stuck. You may press RUN-STOP and RESTORE to regain access to the whole screen. A less drastic procedure is simply to press the HOME key twice. That also eliminates the window.

On the 80-column display, you may change the cursor to an underline or back to a solid block with ESC U and ESC S. If you prefer dark text on a light background in 80-column mode, press ESC R. Return to a normal, non-reverse video display with ESC N.

ESC J and ESC K save wear and tear on the cursor keys and your fingers. Move quickly to the left or the right end of the current program with these escape sequences. They are not mnemonic, but J is to the left of K on the keyboard.

If the cursor is in the middle of a line, ESC P erases everything from the start of the line up to the cursor. To erase from the cursor to the end of the current line, press ESC Q. These sequences should give the DEL and SPACE keys a break.

Need room to work? ESC @ clears the screen from the cursor to the end of the screen (or current window).

ESC D deletes the entire line in which the cursor is located, and it closes up the gap. Note that ESC Q will delete an entire line if the cursor is at the beginning of it, but the lines below are not scrolled up to fill the gap.

To create a gap between two lines, press ESC I. The line containing the cursor and all lines below it are moved down, and the cursor is moved to the start of the blank line just created.

ESC V and ESC W move the text on the screen up and down while the cursor remains at a fixed location. These look like handy functions for a word processor.

Tabs may be defined on the screen with the CONTROL-X sequence. The CONTROL key is held down while the X key is pressed to set a tab at the cursor's location. The default tabs are at every eighth character position. Press ESC Z to clear all tabs. Press ESC Y to restore the default tabs. The TAB key moves the cursor to the next defined tab position, if there is one. Otherwise, it moves the cursor to the end of the current line.

The final escape sequences enable or disable the bell function. ESC G allows the CONTROL-G keystroke or PRINT CHR\$(7) to ring the bell. ESC H silences the bell.

USING THEM

Now that we have described their functions, let's look at some of the ways to use the Escape sequences. A first application might be to fix up the default function key definitions. If the cursor is in the middle of a screen full of text when you decide to save your program, you might be tempted to press function key f5 (DSAVE™). Unfortunately you may either generate a syntax error or use the wrong filename.

What's the problem? The f5 key prints DSAVE™ on the screen wherever the cursor is. If there is text on the line to the left of the cursor, the DSAVE command is preceded by irrelevant characters and is not interpreted properly. If there is text on the line after the DSAVE™, additional characters will be appended to whatever filename you type.

The solution? Obviously you could move the cursor to an empty line before pressing f5. That is not always convenient, and it certainly isn't necessary. Simply modify the definition of the f5 key as follows:

```
KEY 5,CHR$(27)+"J"+CHR$(27)+"QDSAVE"+CHR$(34)
```

		
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You may recognize the CHR\$(27) as the ASCII code for Escape. The two Escape sequences used in the f5 definition are ESC J and ESC Q. Now the first two functions performed by the f5 key are "Move the cursor to the start of the current line" and "Delete all characters to the end of the line." The remaining characters DSAVE and CHR\$(34) are merely echoed to the screen. CHR\$(34) represents the quotation mark. Consequently pressing the f5 key clears the line and prints DSAVE".

You might wonder why not use ESC D to delete the entire line regardless of the position of the cursor. The problem with ESC D is that any text below the deleted line is scrolled up to fill the gap, so the cursor still might not be on a blank line.

There is one simpler solution. That is to use ESC I to insert a blank line and move the cursor to the start of it. In that case, the definition for f5 is as follows:

```
KEY 5,CHR$(27)+"IDSAVE"+CHR$(34)
```

You might write a program which redefines all of the function keys to include the ESC I or the ESC J, ESC Q sequences. The first program that I run upon power up is listed on page 113. The variable EE\$ is assigned the ESC I sequence. CR\$ represents the carriage return. Most of the function key definitions are similar to the f5 description above. F1 and f4 are the only definitions

that need any explanation.

F1 provides an enhancement which I sorely missed on the C-64, a genuine DELETE key. I consider the DEL key on the Commodore computers to be actually a "rub-out" key rather than a "delete" key. What's the difference, you might ask? The DEL key "rubs out" characters to the left of the cursor and moves the cursor to the left. The DELETE key deletes the character at the cursor and pulls all text to the right of the cursor towards the left, while the cursor sits stationary.

Both types of delete keys are useful. The DEL key is handy for erasures as text is being entered. I find the f1 "delete" key to be more convenient when modifying a program line after it has been entered. You must use the f1 "delete" key for a while to fully appreciate the difference.

The other function I really missed on the C-64 is the LLIST command. In most other versions of BASIC, LLIST sends a program listing to the printer. Commodore BASIC makes you work for your hardcopy.

Function key f4 is programmed in line 14 to create an LLIST command. My printer is given a file number 222. F4 CLOSEs then OPENs file number 222, issues CMD 222, then LISTs the program. When the listing is done, the remaining characters in the f4 definition are displayed ("PRINT#222:CLOSE222") and a final carriage return (CHR\$(13)) is executed, clearing the printer channel and closing the file.

Certainly these functions could have been defined for the function keys of the C-64. The advantage of the C-128 implementation is that the keys are very easily changed without a special program, and the definitions are not lost after pressing RUN/STOP-RESTORE.

We have seen that the Escape sequences may be executed in direct mode by pressing and releasing the ESC key followed by the second command key. It is also possible to press and hold the CONTROL key and the "[" key simultaneously to simulate the ESC key. Both keys must be released before pressing the command key. That is just some trivia. There is probably no reason *not* to use the ESC key rather than CONTROL-[.

Just one more tidbit. If you accidentally press the ESC key, simply press it a second time to cancel the first press. Actually any second keystroke besides "" and "A" through "Z" nullifies the ESC keystroke.

The Escape sequences are immediately useful in direct mode while you are creating and editing programs. Don't overlook their usefulness in programs as well. The sample program discussed earlier shows how to access the Escape commands. By defining the function keys and utilizing the Escape sequences, it should be possible to create a very powerful word processor or program editor in BASIC.

Practice using the Escape sequences. Make a reference card listing them and keep it handy. Before long, you won't need the card. You will wonder how you managed before you had the power of the great Escape sequences at your fingertips. □

SEE PROGRAM LISTING ON PAGE 113



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PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets []. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J],

and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSOR left commands in a row, [5 "[s EP]"] would be 5 SHIFTEd English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See	When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME		[BLACK]	Black	CNTRL 1	
[HOME]	Home	CLR/HOME		[WHITE]	White	CNTRL 2	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓		[RED]	Red	CNTRL 3	
[DOWN]	Cursor Down	↑ CRSR ↓		[CYAN]	Cyan	CNTRL 4	
[LEFT]	Cursor Left	SHIFT ← CRSR →		[PURPLE]	Purple	CNTRL 5	
[RIGHT]	Cursor Right	← CRSR →		[GREEN]	Green	CNTRL 6	
[SS]	Shifted Space	SHIFT Space		[BLUE]	Blue	CNTRL 7	
[INSERT]	Insert	SHIFT INST/DEL		[YELLOW]	Yellow	CNTRL 8	
[DEL]	Delete	INST/DEL		[F1]	Function 1	F1	
[RVSON]	Reverse On	CNTRL 9		[F2]	Function 2	SHIFT F1	
[RVSOFF]	Reverse Off	CNTRL 0		[F3]	Function 3	F3	
[UPARROW]	Up Arrow	↑		[F4]	Function 4	SHIFT F3	
[BACKARROW]	Back Arrow	←		[F5]	Function 5	F5	
[PI]	PI	π		[F6]	Function 6	SHIFT F5	
[EP]	English Pound	£		[F7]	Function 7	F7	
				[F8]	Function 8	SHIFT F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent*. (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```

•100 FOR X = 49152 TO 49488:READY:S=S+Y      AB
•110 IF Y<0 OR Y>255 THEN 130                EA
•120 POKE X,Y:NEXT:GOTO140                   ID
•130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN]
PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END  ID
•140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
-500":END                                     HJ
•150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
KE646,1                                       NP
•160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
TALED[6" "]"                                  LF
•170 DATA32,161,192,165,43,133,251,165,44,133  DL
•180 DATA252,160,0,132,254,32,37,193,234,177  DB
•190 DATA251,208,3,76,138,192,230,251,208,2   OF
•200 DATA230,252,76,43,192,76,73,78,69,32    KN
•210 DATA35,32,0,169,35,160,192,32,30,171    CA
•220 DATA160,0,177,251,170,230,251,208,2,230  CE
•230 DATA252,177,251,32,205,189,169,58,32,210  JE
•240 DATA255,169,0,133,253,230,254,32,37,193  CL
•250 DATA234,165,253,160,0,76,13,193,133,253  NB
•260 DATA177,251,208,237,165,253,41,240,74,74  MB
•270 DATA74,74,24,105,65,32,210,255,165,253  EP
•280 DATA 41,15,24,105,65,32,210,255,169,13  GH
•290 DATA32,220,192,230,63,208,2,230,64,230  AN
•300 DATA251,208,2,230,252,76,11,192,169,153  NG
•310 DATA160,192,32,30,171,166,63,165,64,76  BF
•320 DATA231,192,96,76,73,78,69,83,58,32    EP
•330 DATA0,169,247,160,192,32,30,171,169,3   PJ
•340 DATA133,254,32,228,255,201,83,240,6,201  FK
•350 DATA80,208,245,230,254,32,210,255,169,4  FL
•360 DATA166,254,160,255,32,186,255,169,0,133  CL
•370 DATA63,133,64,133,2,32,189,255,32,192   GC
•380 DATA255,166,254,32,201,255,76,73,193,96  NN
•390 DATA32,210,255,173,141,2,41,1,208,249  NH
•400 DATA96,32,205,189,169,13,32,210,255,32  IM
•410 DATA204,255,169,4,76,195,255,147,83,67  KC
•420 DATA82,69,69,78,32,79,82,32,80,82      DC
•430 DATA 73,78,84,69,82,32,63,32,0,76      ML
•440 DATA44,193,234,177,251,201,32,240,6,138  GN
•450 DATA113,251,69,254,170,138,76,88,192,0  JK
•460 DATA0,0,0,230,251,208,2,230,252,96     NA
•470 DATA170,177,251,201,34,208,6,165,2,73  DM
•480 DATA255,133,2,165,2,208,218,177,251,201  JA
•490 DATA32,208,212,198,254,76,29,193,0,169  FM
•500 DATA13,76,210,255,0,0,0                PA
    
```

COMMODORE 128 VERSION

```

•100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
:S=S+Y:TRAP110:NEXT:SLOW                      IH
•110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
**ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
S 140-390":END                                JA
    
```

```

•120 PRINT"[CLEAR][DOWN] C-128 BUG REPELLENT
INSTALLED"                                    II
•130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"  IN
•140 DATA 32,161,12,165,45,133,251,165,46,133,
252,160,0,132,254,32,37                      OF
•150 DATA 13,234,177,251,208,3,76,138,12,230,2
51,208,2,230,252,76,43                       NC
•160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
,12,32,80,13,160,0,177                      OL
•170 DATA 251,170,230,251,208,2,230,252,177,25
1,32,89,13,169,58,32,98                     EF
•180 DATA 13,169,0,133,253,230,254,32,37,13,23
4,165,253,160,0,76,13                       JO
•190 DATA 13,133,253,177,251,208,237,165,253,4
1,240,74,74,74,74,24                       LC
•200 DATA 105,65,32,98,13,165,253,41,15,24,105
,65,32,98,13,169,13,32                     DE
•210 DATA 220,12,230,65,208,2,230,66,230,251,2
08,2,230,252,76,11,12                      GM
•220 DATA 169,153,160,12,32,80,13,166,65,165,6
6,76,231,12,96,76,73,78                   CP
•230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
3,169,3,133,254,32,107                    HC
•240 DATA 13,201,83,240,6,201,80,208,245,230,2
54,32,98,13,169,4,166                     GK
•250 DATA 254,160,255,32,116,13,169,0,133,65,1
33,66,133,250,32,125,13                   LB
•260 DATA 32,134,13,166,254,32,143,13,76,73,13
,96,32,98,13,165,211                      JF
•270 DATA 234,41,1,208,249,96,32,89,13,169,13,
32,98,13,32,152,13,169,4                  GD
•280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
9,82,32,80,82,73,78,84,69                 PL
•290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
01,32,240,6,138,113,251,69                OK
•300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
,208,2,230,252,96,170,177                 FJ
•310 DATA 251,201,34,208,6,165,250,73,255,133,
250,165,250,208,218,177                   GA
•320 DATA 251,201,32,208,212,198,254,76,29,13,
0,169,13,76,98,13,0,0,32                 FI
•330 DATA 170,13,32,226,85,76,180,13,32,170,13
,32,50,142,76,180,13,32                   OF
•340 DATA 170,13,32,210,255,76,180,13,32,170,1
3,32,228,255,76,180,13,32                 AK
•350 DATA 170,13,32,186,255,76,180,13,32,170,1
3,32,189,255                               BP
•360 DATA 76,180,13,32,170,13,32,192,255,76,18
0,13,32,170,13                             FP
•370 DATA 32,201,255,76,180,13,32,170,13,32,20
4,255,76,180,13,32,170                    ID
•380 DATA 13,32,195,255,76,180,13,133,67,169,0
,141,0,255,165,67,96                      BJ
•390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
,0                                           IF
    
```

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.

f7 temporarily freezes the output as well.

•100 POKE53280,12:POKE53281,11	LL 5	HD
•105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "];	ED •390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:	AG
•110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "	GOTO415	KN
]"	MC •395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415	EI
•115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]	DM •400 PRINT"?ERROR IN SAVE":GOTO415	GL
•120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.	•405 PRINT"?ERROR IN LOAD":GOTO415	PG
[3" "]	DH •410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT	BH
•125 FORA=54272TO54296:POKEA,0:NEXT	IM •415 POKE54276,17:POKE54276,16:RETURN	IM
•130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO	•420 OPEN15,8,15:INPUT#15,A,A\$:CLOSE15:PRINTA\$:RETURN	PC
KE54296,15	NH •425 REM GET FOUR DIGIT HEX	GM
•135 FORA=680TO699:READB:POKEA,B:NEXT	KO •430 PRINT:PRINTB\$;:INPUT\$	II
•140 DATA169,251,166,253,164,254,32,216,255,96	HJ •435 IFLen(T\$)<>4THENGOSUB380:GOTO430	AD
•145 DATA169,0,166,251,164,252,32,213,255,96	JB •440 FORA=1TO4:A\$=MID\$(T\$,A,1):GOSUB450:IFT(A)=16THENGOSUB	GF
•150 B\$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B	HC 380:GOTO430	EH
•155 GOSUB480:IFB=0THEN150	FO •445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN	KP
•160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16	KE •450 IFA\$>"@ANDAS<"G"THENT(A)=ASC(A\$)-55:RETURN	NP
•165 B\$="ENDING ADDRESS IN HEX":GOSUB430:EN=B	IF •455 IFA\$>"/ANDAS<":"THENT(A)=ASC(A\$)-48:RETURN	LI
•170 GOSUB470:IFB=0THEN150	FP •460 T(A)=16:RETURN	MI
•175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16	MN •465 REM ADDRESS CHECK	MG
•180 IFB>255THENB=B-255:POKE254,PEEK(254)+1	GE •470 IFAD>ENTHEN385	MI
•185 POKE253,B:PRINT	HN •475 IFB<SRORB>ENTHEN390	MI
•190 REM GET HEX LINE	IL •480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395	IM
•195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8	FG •485 RETURN	EB
•200 FORB=0TO1:GOTO250	MD •490 REM ADDRESS TO HEX	HG
•205 NEXTB	ME •495 AC=AD:A=4096:GOSUB520	CE
•210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340	LH •500 A=256:GOSUB520	PN
•215 PRINT" [c P][LEFT]";	IK •505 A=16:GOSUB520	MJ
•220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "	PD •510 A=1:GOSUB520	IM
•225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255	LK •515 RETURN	CJ
•230 NEXT	IA •520 T=INT(AC/A):IFT>9THENA\$=CHR\$(T+55):GOTO530	JP
•235 IFA%(8)<>TTHENGOSUB375:GOTO195	FK •525 A\$=CHR\$(T+48)	AC
•240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195	MN •530 PRINTA\$;:AC=AC-A*T:RETURN	AI
•245 REM GET HEX INPUT	AB •535 A\$="**SAVE**":GOSUB585	LH
•250 GETA\$:IFA\$=""THEN250	HO •540 OPEN1,T,1,A\$:SYS680:CLOSE1	EO
•255 IFA\$=CHR\$(20)THEN305	GC •545 IFST=0THENEND	FJ
•260 IFA\$=CHR\$(133)THEN535	MD •550 GOSUB400:IFT=8THENGOSUB420	FF
•265 IFA\$=CHR\$(134)THEN560	KF •555 GOTO535	AB
•270 IFA\$=CHR\$(135)THENPRINT" ":GOTO620	GE •560 A\$="**LOAD**":GOSUB585	MF
•275 IFA\$=CHR\$(136)THENPRINT" ":GOTO635	BJ •565 OPEN1,T,0,A\$:SYS690:CLOSE1	JH
•280 IFA\$>"@ANDAS<"G"THENT(B)=ASC(A\$)-55:GOTO295	GM •570 IFST=64THEN195	CM
•285 IFA\$>"/ANDAS<":"THENT(B)=ASC(A\$)-48:GOTO295	LE •575 GOSUB400:IFT=8THENGOSUB420	FO
•290 GOSUB415:GOTO250	LL •580 GOTO560	FG
•295 PRINTA\$"[c P][LEFT]";	OA •585 PRINT" ":PRINTTAB(14)A\$	OM
•300 GOTO205	CG •590 PRINT:A\$="" :INPUT"FILENAME";A\$	GF
•305 IFA>0THEN320	OP •595 IFA\$=""THEN590	DF
•310 A=-1:IFB=1THEN330	OB •600 PRINT:PRINT"TAPE OR DISK?":PRINT	IG
•315 GOTO220	CJ •605 GETB\$:T=1:IFB\$="D"THENT=8:A\$="@0:""+A\$:RETURN	FN
•320 IFB=0THENPRINTCHR\$(20);CHR\$(20);:A=A-1	HG •610 IFB\$<"T"THEN605	IM
•325 A=A-1	BE •615 RETURN	DK
•330 PRINTCHR\$(20);:GOTO220	KH •620 B\$="CONTINUE FROM ADDRESS":GOSUB430:AD=B	MA
•335 REM LAST LINE	AD •625 GOSUB475:IFB=0THEN620	OI
•340 PRINT" ":T=AD-(INT(AD/256)*256)	GJ •630 PRINT:GOTO195	FH
•345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255	PL •635 B\$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B	NK
•350 NEXT	IA •640 GOSUB475:IFB=0THEN635	DI
•355 IFA%(A)<>TTHENGOSUB375:GOTO195	KF •645 PRINT:GOTO670	BK
•360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT	HN •650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G	EC
•365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535	ON OSUB410:GOTO195	GN
•370 REM BELL AND ERROR MESSAGES	FL •655 PRINT" ":NEXTB	MN
•375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415	DH •660 PRINT:AD=AD+8	JD
•380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415	JA •665 GETB\$:IFB\$=CHR\$(136)THEN195	
•385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41	•670 GOSUB495:PRINT" ":GOTO650	

SPRITE FROM PAGE 85

Assembler required for entry! See introductory article.

```

1 *
2 * SPRITE
3 *
4          ORG      $9000
5 *
6 COLOR   EQU      $E0
7 *
8 TABLEN EQU      $800
9 MAPLEN  EQU      1000
10 SCRLN  EQU      8000
11 SP0ADR EQU      $8000
12 COLMAP EQU      $8400
13 NEWADR EQU      $8800
14 *
15 SPRPTR EQU      $87F8
16 SPENA  EQU      $D015
17 SP0COL EQU      $D027
18 SP0X   EQU      $D000
19 SP0Y   EQU      $D001
20 MSIGX  EQU      $D010
21 YXPAND EQU      $D017
22 XXPAND EQU      $D01D
23 *
24 HMAX   EQU      320
25 VMID   EQU      100-8
26 *
27 R6510  EQU      $0001
28 BASE   EQU      $A000
29 CHRBAS EQU      $D000
30 VICTRL EQU      $D011
31 VICMEM EQU      $D018
32 BORDER EQU      $D020
33 CIACRE EQU      $DC0E
34 CI2PRA EQU      $DD00
35 CIADIR EQU      $DD02
36 *
37 TEMPA  EQU      $FB
38 TEMPB  EQU      TEMPA+2
39 TABPTR EQU      TEMPA
40 *
41 MVRCE  EQU      $61
42 MVDEST EQU      MVRCE+2
43 BYTPTR EQU      MVDEST+2
44 *
45 TABSIZ EQU      $02A7
46 *
47 HPSN   EQU      TABSIZ+2
48 VPSN   EQU      HPSN+2
49 CHAR   EQU      VPSN+1
50 ROW    EQU      CHAR+1
51 LINE   EQU      ROW+1
52 BYTE   EQU      LINE+1

```

```

53 BITT   EQU      BYTE+2
54 *
55 MPRL   EQU      BITT+1
56 MPRH   EQU      MPRL+1
57 MPDL   EQU      MPRH+1
58 MPDH   EQU      MPDL+1
59 PRODL  EQU      MPDH+1
60 PRODH  EQU      PRODL+1
61 FILVAL EQU      PRODH+1
62 LENPTR EQU      FILVAL+1
63 CHCODE EQU      LENPTR+2
64 HPTR   EQU      CHCODE+2
65 VPTR   EQU      HPTR+2
66 ONEBYT EQU      VPTR+1
67 COUNT  EQU      ONEBYT+2
68 LTTR   EQU      COUNT+1
69 *
70          JMP      START
71 *
72 TEXT   DFB      9,32,32,32
73          DFB      13,25,32,3
74          DFB      15,13,13
75          DFB      15,4,15,18
76          DFB      5,32,54,52
77          DFB      0
78 *
79 * BLOCK FILL ROUTINE
80 *
81 BLKFIL LDA      FILVAL
82          LDX      TABSIZ+1
83          BEQ      PARTPG
84          LDY      #0
85 FULLPG STA      (TABPTR),Y
86          INY
87          BNE      FULLPG
88          INC      TABPTR+1
89          DEX
90          BNE      FULLPG
91 PARTPG  LDX      TABSIZ
92          BEQ      FINI
93          LDY      #0
94 PARTLP  STA      (TABPTR),Y
95          INY
96          DEX
97          BNE      PARTLP
98 FINI    RTS
99 *
100 * 16-BIT MULTIPLICATION
101 * ROUTINE
102 MULT16 LDA      #0
103          STA      PRODL
104          STA      PRODH
105          LDX      #17
106          CLC
107 MULT    ROR      PRODH
108          ROR      PRODL
109          ROR      MPRH
110          ROR      MPRL

```

```

111          BCC      CTDOWN 169
112          CLC 170
113          LDA      MPDL 171
114          ADC      PRODL 172
115          STA      PRODL 173
116          LDA      MPDH 174
117          ADC      PRODH 175
118          STA      PRODH 176
119 CTDOWN  DEX 177
120          BNE      MULT 178
121          RTS 179
122 * 180 *
123 * PLOT ROUTINE 181 *
124 * 182 *
125 * ROW=VPSN/8 183
126 * (8-BIT DIVIDE) 184
127 PLOT    LDA      VPSN 185
128          LSR      A 186
129          LSR      A 187
130          LSR      A 188
131          STA      ROW 189
132 * 190 *
133 * CHAR=HPSN/8 191 *
134 * (16-BIT DIVIDE) 192 *
135          LDA      HPSN 193
136          STA      TEMPA 194
137          LDA      HPSN+1 195
138          STA      TEMPA+1 196
139          LDX      #3 197
140 DLOOP   LSR      TEMPA+1 198
141          ROR      TEMPA 199
142          DEX 200
143          BNE      DLOOP 201
144          LDA      TEMPA 202
145          STA      CHAR 203
146 * 204
147 * LINE=VPSN AND 7 205
148 * 206 *
149          LDA      VPSN 207 *
150          AND      #7 208 *
151          STA      LINE 209
152 * 210
153 * BITT=7-(HPSN AND 7) 211
154 * 212
155          LDA      HPSN 213
156          AND      #7 214
157          STA      BITT 215
158          SEC 216 *
159          LDA      #7 217 *
160          SBC      BITT 218 *
161          STA      BITT 219
162 * 220
163 * BYTE=BASE+ROW*HMAX 221
164 * +8*CHAR+LINE 222
165 * FIRST MULTIPLY 223
166 * ROW * HMAX 224
167          LDA      ROW 225
168          STA      MPRL 226 *

```

169	LDA	#0	227	*	POKE BYTE, PEEK(BYTE)	285	*	THE INSIDE LOOP:
170	STA	MPRH	228	*	OR2^BIT	286	*	
171	LDA	#<HMAX	229		LDX BITT	287	*	(Y IS ZERO AT START)
172	STA	MPDL	230		INX	288	*	
173	LDA	#>HMAX	231		LDA #0	289	RSHIFT	LDA ONEBYT
174	STA	MPDH	232		SEC	290		ASL A
175	JSR	MULT16	233	SQUARE	ROL	291		STA ONEBYT
176	LDA	MPRL	234		DEX	292		BCS SHOW
177	STA	TEMPA	235		BNE SQUARE	293	*	
178	LDA	MPRL+1	236		LDY #0	294		INC HPSN
179	STA	TEMPA+1	237		ORA (TEMPB),Y	295		BNE ITSOK
180	*		238		STA (TEMPB),Y	296		INC HPSN+1
181	*	ADD PRODUCT TO BASE	239		RTS	297	ITSOK	JMP NOSHOW
182	*		240	*		298	*	
183		CLC	241	*	CALCULATE CHCODE'S	299	*	DISPLAY BIT
184	LDA	#<BASE	242	*	ADDRESS	300	*	
185	ADC	TEMPA	243	GETADR	LDA #0	301	*	SAVE X AND Y REGISTERS
186	STA	TEMPA	244		STA CHCODE+1	302	*	
187	LDA	#>BASE	245		LDA CHCODE	303	SHOW	TXA
188	ADC	TEMPA+1	246		CLC	304		PHA
189	STA	TEMPA+1	247		ASL A	305		TYA
190	*		248		ROL CHCODE+1	306		PHA
191	*	MULTIPLY 8 * CHAR	249		ASL A	307	*	
192	*		250		ROL CHCODE+1	308	*	JSR PLOT
193	LDA	#8	251		ASL A	309	*	
194	STA	MPRL	252		ROL CHCODE+1	310	*	NOW DO IT AGAIN
195	LDA	#0	253		STA CHCODE	311	*	
196	STA	MPRH	254	*		312		INC HPSN
197	LDA	CHAR	255		CLC	313		BNE NOINC
198	STA	MPDL	256		LDA CHCODE	314		INC HPSN+1
199	LDA	#0	257		ADC #<NEWADR	315	*	
200	STA	MPDH	258		STA BYTPTR	316	NOINC	JSR PLOT
201	JSR	MULT16	259		LDA CHCODE+1	317	*	
202	LDA	MPRL	260		ADC #>NEWADR	318	*	RETRIEVE X AND Y
203	STA	TEMPB	261		STA BYTPTR+1	319	*	REGISTERS
204	LDA	MPRH	262		RTS	320		PLA
205	STA	TEMPB+1	263	*		321		TAY
206	*		264	*	DRAW A CHARACTER	322		PLA
207	*	ADD LINE	265	*		323		TAX
208	*		266	DRAWCH	LDA LTTR	324	*	
209		CLC	267		STA CHCODE	325	NOSHOW	INC HPSN
210	LDA	TEMPB	268		JSR GETADR	326		BNE LEAP
211	ADC	LINE	269	*		327		INC HPSN+1
212	STA	TEMPB	270	*	A NESTED LOOP:	328	*	
213	LDA	TEMPB+1	271	*		329	LEAP	INY
214	ADC	#0	272	*	(X IS THE OUTSIDE	330		CPY #8
215	STA	TEMPB+1	273	*	LOOP)	331		BCC RSHIFT
216	*		274		LDX #8	332	*	
217	*	TEMPA + TEMPB = BYTE	275	*		333		INC VPSN
218	*		276	*	SET UP COUNTER FOR	334	*	
219		CLC	277	*	2 VERT LINES	335		LDA HPTR
220	LDA	TEMPA	278	SETLIN	LDA #2	336		STA HPSN
221	ADC	TEMPB	279		STA COUNT	337		LDA HPTR+1
222	STA	TEMPB	280	*		338		STA HPSN+1
223	LDA	TEMPA+1	281	DRAWLN	LDY #0	339	*	
224	ADC	TEMPB+1	282		LDA (BYTPTR),Y	340	*	2 VERT LINES DONE YET?
225	STA	TEMPB+1	283		STA ONEBYT	341	*	
226	*		284	*		342		DEC COUNT

```

343      BNE  DRAWLN
344 *
345      INC  BYTPTR
346      BNE  OKMSB
347      INC  BYTPTR+1
348 OKMSB  DEX
349      BNE  SETLIN
350      RTS
351 *
352 * MAIN ROUTINE STARTS
353 * HERE
354 START  LDA  VICMEM
355      ORA  #8
356      STA  VICMEM
357 *
358      LDA  VICTRL
359      ORA  #32
360      STA  VICTRL
361 *
362 * USE BANK 2
363 *
364      LDA  CIADIR
365      ORA  #3
366      STA  CIADIR
367 *
368      LDA  CI2PRA
369      AND  #252
370      ORA  #1
371 * BANK 2
372      STA  CI2PRA
373 *
374 * CLEAR BIT MAP
375 *
376      LDA  #0
377      STA  FILVAL
378      LDA  #<BASE
379      STA  TABPTR
380      LDA  #>BASE
381      STA  TABPTR+1
382      LDA  #<SCRLN
383      STA  TABSIZ
384      LDA  #>SCRLN
385      STA  TABSIZ+1
386      JSR  BLKFIL
387 *
388 * SET LINE, BKG AND
389 * BORDER COLORS
390      LDA  #COLOR
391      STA  FILVAL
392      LDA  #<COLMAP
393      STA  TABPTR
394      LDA  #>COLMAP
395      STA  TABPTR+1
396      LDA  #<MAPLEN
397      STA  TABSIZ
398      LDA  #>MAPLEN
399      STA  TABSIZ+1
400      JSR  BLKFIL

```

```

401      LDA  #13
402 * GREEN
403      STA  BORDER
404 *
405 * MOVE CHARACTER SET
406 * INTO RAM
407 * THIS ROUTINE TURNS
408 * BASIC OFF
409      LDA  R6510
410      AND  #$FE
411      STA  R6510
412 *
413 * TURN OFF KB INTERRUPT
414 * TIMER
415      LDA  CIACRE
416      AND  #$FE
417      STA  CIACRE
418 *
419 * SWITCH I/O OUT, CHAR
420 * ROM IN
421      LDA  R6510
422      AND  #$FB
423      STA  R6510
424 *
425 * COPY CHARACTERS INTO
426 * RAM
427      LDA  #<CHRBAS
428      STA  MVSRC
429      LDA  #>CHRBAS
430      STA  MVSRC+1
431 *
432      LDA  #<NEWADR
433      STA  MVDEST
434      LDA  #>NEWADR
435      STA  MVDEST+1
436 *
437      LDA  #<TABLEN
438      STA  LENPTR
439      LDA  #>TABLEN
440      STA  LENPTR+1
441 *
442 * START MOVE
443 *
444      LDY  #0
445      LDX  LENPTR+1
446      BEQ  MVPART
447 MVPAGE LDA  (MVSRC),Y
448      STA  (MVDEST),Y
449      INY
450      BNE  MVPAGE
451      INC  MVSRC+1
452      INC  MVDEST+1
453      DEX
454      BNE  MVPAGE
455 MVPART LDY  LENPTR
456      BEQ  MVEXIT
457 MVLAST LDA  (MVSRC),Y
458      STA  (MVDEST),Y

```

```

459      INY
460      DEX
461      BNE  MVLAST
462 MVEXIT
463 *
464 * SWITCH I/O BACK IN
465 *
466      LDA  R6510
467      ORA  #4
468      STA  R6510
469 *
470 * TURN TIMER BACK ON
471 *
472      LDA  CIACRE
473      ORA  #1
474      STA  CIACRE
475 *
476 * POSITION MESSAGE ON
477 * SCREEN
478      LDA  #8
479      STA  HPSN
480      STA  HPTR
481      LDA  #0
482      STA  HPSN+1
483      STA  HPTR+1
484      LDA  #VMID
485      STA  VPSN
486      STA  VPTR
487 *
488 * PRINT LINE OF LARGE
489 * TYPE
490      LDX  #0
491 DISP   LDA  TEXT,X
492      CMP  #0
493 * EOF
494      BEQ  DONE
495      STA  LTRR
496      TXA
497      PHA
498      JSR  DRAWCH
499      PLA
500      TAX
501 *
502 * ADVANCE CURSOR
503 *
504      CLC
505      LDA  HPTR
506      ADC  #16
507      STA  HPTR
508      STA  HPSN
509      LDA  HPTR+1
510      ADC  #0
511      STA  HPTR+1
512      STA  HPSN+1
513      LDA  VPTR
514      STA  VPSN
515 *
516 * PRINT NEXT LETTER

```

IMP

517 *
518
519
520 *
521 DC
522 *
523
524 *
525 *
526 *
527 *
528 *
529
530
531
532
533
534
535
536
537
538
539
540 *
541 * ()
542 * ()
543
544
545
546 * H
547
548
549 *
550

BIG FROM

- 10 IFP
- EN80
- 20 POK
- [BLACK
- S FOR I
- 30 PRI
- 40 REA
- 50 H=6
- 60 FOR
- ASC(RI
- 70 P=X*
- ,P:NEXT
- 80 RT\$=
- 10
- 90 TP\$=

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

517 *		551	LDX	#8	584	LDA	#10
518	INX	552 *			585 *	RED	
519	JMP	DISP	553	DEFSP0 LDA (BYTPTR),Y	586	STA	SP0COL
520 *			554	STA (TEMPA),Y	587 *		
521	DONE		555 *		588 *	POSITION	SPRITE
522 *			556	INC BYTPTR	589 *	ON	SCREEN
523 *	DISPLAY	SPRITE #0	557	INC TEMPA	590	LDA	#62
524 *			558	INC TEMPA	591	STA	SP0X
525 *	DEFINE	SPRITE	559	INC TEMPA	592	LDA	#0
526 *			560 *		593	STA	MSIGX
527 *	CLEAR	SPRITE MAP	561	DEX	594	LDA	#34
528 *			562	BNE DEFSP0	595	STA	SP0Y
529	LDA	#0	563 *		596 *		
530	STA	FILVAL	564 *	STORE	SPRITE'S	ADDRESS	
531	LDA	#<SP0ADR	565 *	IN	PTR		
532	STA	TABPTR	566 *	(ADDRESS	IS \$8000)		
533	LDA	#>SP0ADR	567 *	(NO	OFFSET)		
534	STA	TABPTR+1	568	LDA	#0		
535	LDA	#64	569	STA	SPRPTR		
536	STA	TABSIZ	570 *				
537	LDA	#0	571 *	EXPAND	SPRITE		
538	STA	TABSIZ+1	572 *	(VERT	& HORZ)		
539	JSR	BLKFIL	573	LDA	#1		
540 *			574	STA	XXPAND		
541 *	(COPY	HEART FROM	575	STA	YXPAND		
542 *	CHAR	SET)	576 *				
543	LDA	SP0ADR	577 *	TURN	ON	SPRITE	#0
544	STA	TEMPA	578 *				
545	LDA	#83	579	LDA	#1		
546 *	HEART		580	STA	SPENA		
547	STA	CHCODE	581 *				
548	JSR	GETADR	582 *	MAKE	SPRITE	RED	
549 *			583 *				
550	LDY	#0					

BIG PRINT FROM PAGE 49

```

•10 IFPEEK(49152)=165ANDPEEK(50056)=251TH
EN80
•20 POKE53280,0:POKE53281,1:PRINT"[CLEAR]
[BLACK][3"[DOWN]]"[6" "[RVSON]30 SECOND
S FOR ML SET UP[4"."]"
•30 PRINT"[DOWN]"TAB(20);:POKE204,0
•40 READA:IFA<>9999THEN40
•50 H=64:L=48:S=7:X=16:N=1
•60 FORI=49152TO50057:READA$:A=ASC(A$):B=
ASC(RIGHT$(A$,N))
•70 P=X*((A-L)+S*(A>H))+B-L+S*(B>H):POKEI
,P:NEXT:POKE204,1
•80 RT$=CHR$(13):BP=49152:CL=59903:BC=596
10
•90 TP$=CHR$(164):BT$=CHR$(183):FORI=1TO5

```

```

:TP$=TP$+TP$:BT$=BT$+BT$:NEXT BP
•100 TP$=TP$+RT$:S8$="[8" " ]":UP$="[13"[U
P]" ]"
•110 AC$="[5"[RIGHT]" ]":DN$="[12"[DOWN]" ]"
"
•120 SA$=S8$+" "
•130 POKE53280,0:POKE53281,1:GOSUB1750
•140 PRINT"[BLACK][008][142]"TAB(9)"[RVSO
N] BIG PRINT FUNCTIONS "
•150 PRINTTAB(9)LEFT$(BT$,21)
•160 PRINT"[DOWN]"TAB(4)TP$SPC(4)"[RVSON]
PLEASE CHOOSE ANY OPTION BELOW "
•170 D$="[RVSON] [D] [s *][s *] DEMONSTRA
TION[3" " ]":V$="[RVSON] [V] [s *][s *] V
IEW CHARACTERS "
•180 Q$="[RVSON] [Q] [s *][s *] QUIT[12"
" ]":S$="[RVSON] [S] [s *][s *] SAVE ML P
ROGRAM "
•190 T2$=S8$+RIGHT$(TP$,25)+S8$
•200 PRINT"[DOWN]"T2$D$"[DOWN]"[RVSOFF]"SP
C(8)T2$Q$

```

•21G PRINT"[DOWN]"T2\$\$"[DOWN][RVSOFF]"SP C(8)T2\$V\$	LL	•56G C1\$(3)="[6" "]UPSIDE DOWN":C2\$(3)="	HP
•22G PRINTUP\$:FORI=1TO14:PRINTTAB(4)"[RVS ON] "SPC(3G)"[RVSON] ":NEXT	DE	•57G C1\$(4)="UPSIDE DOWN AND INVERTED":C2	MN
•23G PRINTSPC(4)"[RVSON]"S8\$\$S8\$\$S8\$\$S8\$	LC	•58G C1\$(5)="[6" "]ROTATED LEFT[6" "]:C2	CE
•24G PRINTUP\$"[UP][UP]"AC\$"[SEP]"SPC(28)"	BC	•59G C1\$(6)="[5" "]ROTATED RIGHT[5" "]:	HA
[c *]":PRINTDN\$AC\$"[RVSON][c *][RVSOFF]"	HK	C2\$(6)=".[s R]."	
SPC(2G)S8\$"[RVSON][SEP]"	CG	•60G AW\$=AC\$+AC\$+"[RIGHT][RVSON][SEP][RVS	
•25G GETA\$:IFA\$=""THEN25G	IK	OFF|[c 0][c 0]"AC\$+AC\$+"[RIGHT][RIGHT][
•26G IFA\$="D"ORA\$=RT\$THENUP=13:M\$=D\$:GOTO	NI	c 0][c 0][RVSON][c *]"RT\$+AC\$+AC\$+"[RIG	
31G	FN	HT][c *][c U][c U]"AC\$+AC\$+"[RIGHT][RIG	GL
•27G IFA\$="S"THENUP=7:M\$=S\$:GOTO33G	IM	HT][c U][c U][SEP]"	
•28G IFA\$="Q"THENUP=1G:M\$=Q\$:GOTO51G		•61G GOSUB175G:PRINTTAB(9)"[RVSON] VIEW L	
•29G IFA\$<"V"THEN25G		ARGE CHARACTERS "	HA
•30G UP=4:M\$=V\$		•62G PRINTTAB(9)LEFT\$(BT\$,23)"[UP]"	ME
•31G PRINTLEFT\$(UP\$,UP)SPC(8)"[RED]"RIGHT	HP	•63G FORI=1TO21:PRINTTAB(19)"[RVSON] ":N	
\$(TP\$,25)SPC(8)M\$"[BLACK]"	KE	EXT:PRINT"[HOME][DOWN][DOWN] UPPER/GRAP	IP
•32G FORI=1TOUP-1:PRINT:NEXT:ON(UP-1)/3GO	GH	HICS";	
TO52G,51G,52G,93G	NJ	•64G PRINTSPC(7)"UPPER/LOWER CASE":PRINTS	NI
•33G B=G:E=24:GOSUB171G	CF	PC(2)CS\$SPC(8)CS\$"[DOWN]"	
•34G PRINT"[CLEAR]"TAB(11)"[RVSON] SAVE M	NL	•65G PRINT"[RVSON][7" "]"LN\$"[RVSON][7" "	OI
L PROGRAM "RT\$TAB(11)LEFT\$(BT\$,17)	FB];	
•35G PRINTTAB(1G)LEFT\$(DN\$,8)::INPUT"FILE	DI	•66G PRINTSPC(6)"[RVSON] [RVSOFF]"SPC(26)	IN
NAME[3" "]BIGPRINTML[12"[LEFT]""]";NM\$	NJ	"[RVSON] ":PRINTSPC(6)"[RVSON] [RVSOFF]"	
•36G PRINTTAB(1G)"[DOWN][DOWN]";:INPUT"DE	EK	LN\$"[RVSON] "	
VICE[3" "."][3" "]8[3"[LEFT]""]";DV\$:DV=VAL	NN	•67G PRINT"[DOWN]"TAB(14)H1\$SPC(14)"[s -]	BD
(DV\$):NM\$=LEFT\$(NM\$,16)	EF	REGULAR [s -]"RT\$TAB(14)IM\$SPC(14)H2\$	
•37G PRINT"[DOWN]"TAB(2G)" "LEFT\$(TP\$,LE	OO	•68G PRINT"[DOWN][DOWN][RVSON]"SPC(14)H1\$	BN
N(NM\$))	LF	SPC(14)"[RVSON][s -] REVERSE [s -]"RT\$T	
•38G PRINTAC\$AC\$"NOW SAVING [RVSON]"NM\$	OP	AB(14)"[RVSON]"IM\$SPC(14)"[RVSON]"H2\$	
•39G DV\$="N":IFDV>7ANDDV<12THENDV\$="Y":OP	GC	•69G PRINT"[DOWN][DOWN][3" "][RVSON][c D]	PM
EN1,DV,15,"IG":PRINT#1,"SG:"+NM\$:CLOSE1	CK	[8"[s F]""]LEFT\$(LN\$,24)"[c F]":PRINTTAB	
•40G SYS57812 NM\$,DV,1:POKE193,G:POKE194,	EE	(3)"[c K]"SPC(32)"[RVSON][c K]"	AJ
192:POKE174,138:POKE175,195:SYS62957	CA	•70G PRINTTAB(3)"[c K]"SPC(32)"[RVSON][c	JE
•41G IFDV\$="N"THEN13G	IO	K]";	NP
•42G PRINT"[DOWN]"TAB(2G)" "LEFT\$(TP\$,LE	MC	•71G PRINT"[UP][UP]":PRINTTAB(4)"[RVSON]	DP
N(NM\$))	GJ	CTRL [RVSOFF] CHANGES CHARACTER COLOR"	
•43G PRINTTAB(1G)"VERIFYING.. [RVSON]"NM\$	OP	•72G PRINTTAB(4)"[RVSON]SPACEBAR[RVSOFF]	
•44G POKE147,1:SYS57812 NM\$,DV,1:SYS62631	EE	CYCLES DISPLAY OPTIONS"	
:IFST=64THEN49G	CA	•73G PRINTTAB(3)"[c K][RVSON] RETURN [RVS	
•45G PRINTAC\$"[DOWN][DOWN]VERIFY ERROR -	IO	OFF] EXITS[3" "]]TO MAIN MENU[3" "][RVSON	
TRY AGAIN [Y/N?]"	MC	][c K]";	
•46G GETA\$:IFA\$="Y"THEN33G	GJ	•74G BX\$="[HOME][RVSOFF]"LEFT\$(DN\$,6)+AC	
•47G IFA\$="N"THEN13G	OP	\$+LEFT\$(AC\$,3):SM\$=" PRESS A KEY TO BEG	
•48G GOTO46G	EE	IN"	FD
•49G FORI=GTO15:POKE646,I:SYSBP,"-OK-",3,	CA	•75G PRINTBX\$"[GREEN]"SM\$"[BLACK]"	GA
12:FORJ=1TO5G:NEXT:NEXT:POKE646,G	IO	•76G PRINT"[3"[DOWN]]]"AW\$RT\$"[4"[DOWN]]"	LE
•50G GOTO13G	MC	"AW\$:RESTORE	PP
•51G B=G:E=24:GOSUB171G:SYSBP,"BYE!",8,12	MC	•77G READX:IFX=9999THEN8G	ME
:PRINT"[HOME]"DN\$RUN[3"[UP]""]":END	MC	•78G IFX<1G24THENP=X:GOTO77G	JA
•52G LN\$="":FORI=1TO26:LN\$=LN\$+"[c I]":NE	GJ	•79G POKEX,P:POKE(X-1G24)+55296,.:GOTO77G	BA
XT:CS\$="CHARACTER SET"	OP	•80G C\$="1":CM=1:CG\$=C2\$(CM):FT=G	MO
•53G H1\$="[s U][1G][s *]"][s I]"RT\$:H2\$=	GJ	•81G GETB\$:IFB\$=RT\$THEN13G	LJ
"[s J][1G][s *]"][s K]":IM\$="[s -] IMAG	OP	•82G IFB\$<"ANDB\$<" "THENC\$=B\$:GOTO89G	CB
E[3" "][s -]"RT\$	ID	•83G IFB\$=" "THENFT=FT+1:IFFT=1THENCM=G	
•54G C1\$(1)="[3" "]"STANDARD CHARACTER "		•84G IFB\$=" "THENCM=CM+1-(-6*(CM=6)):GOTO	
•55G C1\$(2)="[8" "]"INVERTED[8" "]:C2\$(2)		88G	GC
=".[s I]."			

•850 IFPEEK(653)<>4THEN810	BK	•1170 CM\$="ALTERNATING COLORS 1":GOSUB172	
•860 IFCC=0THENCC=1	AN	0	LG
•870 CC=(CC+1)AND15:GOTO890	FJ	•1180 X\$(1)="[RED]":X\$(2)="[GREEN]":X=1:C	
•880 CG\$=C2\$(CM)	PD	A\$="ALT COLORS"	HL
•890 D1\$=CG\$+C\$:D2\$="[RVSON]"+CG\$+C\$:D3\$="		•1190 X=3-X:SYSBP,X\$(X)+CA\$,10,,,"":FORI	
"[014]"+CG\$+C\$:D4\$="[014][RVSON]"+CG\$+C\$		=1TO150:NEXT	JI
:POKE646,CC	MK	•1200 GETA\$:IFA\$=""THEN1190	KH
•900 PRINTBX\$"[BLACK]"C1\$(CM):POKE646,CC	AH	•1210 IFA\$=RT\$THEN130	LO
•910 SYSBP,D1\$,9,4,,46;D2\$,15,4,,46;D3\$,9		•1220 CM\$=LEFT\$(CM\$,19)+"2":GOSUB1720	IN
,32,,46;D4\$,15,32,,46	KM	•1230 X\$(1)=".[s A][RED][GREEN]":X\$(2)="	
•920 GOTO810	CN	.[s A][GREEN][RED]."	FA
•930 UL\$=AC\$+"[3][RIGHT]":FORI=1TO23:UL		•1240 X=3-X:SYSBP,X\$(X)+CA\$,10,,,"":FORI	
\$=UL\$+"[c U]":NEXT:MS\$="[HOME][RVSOFF][3		=1TO150:NEXT	JI
"[DOWN]"]"+LEFT\$(UL\$,8)	KO	•1250 GETA\$:IFA\$=""THEN1240	KB
•940 BG\$="[4][DOWN]"][4][LEFT]":G1\$=""		•1260 IFA\$=RT\$THEN130	LO
:FORI=1TO4:G1\$=G1\$+MID\$("GOOD",I,1)+BG\$:N		•1270 B=10:E=14:GOSUB1710	IC
EXT	MK	•1280 CM\$="STANDARD COUNTER":GOSUB1720:CV	
•950 BG\$="[4][LEFT]"][4][DOWN]":G2\$=""		=15	PC
:FORI=1TO4:G2\$=G2\$+MID\$("GOOD",I,1)+BG\$:N		•1290 GOSUB1760:SYSBP,CV\$,10,15:FORI=1TO1	
EXT	NP	75:NEXT:GETA\$:IFA\$=""THEN1290	JO
•960 POKE53280,2:PRINT"[CLEAR][RED]"SPC(7		•1300 IFA\$=RT\$THEN130	LO
)"[RVSON] BIG PRINT DEMONSTRATION "	BP	•1310 CM\$="COUNTER WITH OVERLAY":GOSUB172	
•970 PRINTSPC(7)LEFT\$(BT\$,25)	BL	0:CV=15	OA
•980 PRINTDN\$LEFT\$(DN\$,8)SPC(4)"[RVSON][c		•1320 GOSUB1760:SYSBP,".[s 0]."+CV\$,10,15	
D][10][s F]"][20][c I]"][c F]"	IH	,,"":FORI=1TO15:NEXT:SYSBP,CV\$,10,15	AN
•990 PRINTSPC(4)"[c K][RVSON] SPACEBAR [R		•1330 FORI=1TO175:NEXT:GETA\$:IFA\$=""THEN1	
VSOFF] [BLUE]CONTINUES THE DEMO [RED][RV		320	IJ
SON][c K]"	EL	•1340 IFA\$=RT\$THEN130	LO
•1000 PRINTSPC(4)"[c K][RVSON] RETURN [		•1350 CM\$="WHAT'S THE ANSWER?":GOSUB1720:	
RVSOFF] [BLUE]EXITS TO MAIN MENU [RVSON]	FE	FORI=10TO14:POKE781,I:SYSCL:NEXT	AD
[RED][c K]";	OO	•1360 X=INT(RND(.)*10):Y=INT(RND(.)*(10-X	
•1010 J=0:FORI=1TO3:CB\$(I)="[RVSON]":GOSU	NI	):IFX=.0RY=.THEN1360	JN
B1020:NEXT:GOTO1050	GO	•1370 SYSBP,STR\$(X),6,14;STR\$(Y),11,14;"	
•1020 K=4:IFJ=0THENK=5	EJ	" ,9,12;"[4][c Y]"" ,15,12	MC
•1030 FORJ=JTOJ+K:CB\$(I)=CB\$(I)+CHR\$(PEEK	PA	•1380 GETA\$:IFA\$=""THEN1380	KC
(BC+J))+ " ":IFJ=0THENJ=1	DH	•1390 IFA\$="" THEN1470	IP
•1040 NEXT:RETURN		•1400 IFA\$=RT\$THEN130	LO
•1050 PRINTMS\$RT\$UL\$:CM\$="A STANDARD MESS		•1410 IFA\$<"0"ORA\$>"9"THEN1380	NG
AGE":GOSUB1720:SYSBP,"HELLO!",10,8		•1420 SYSBP,A\$,17,18:IFVAL(A\$)=X+YTHEN144	
•1060 GOSUB1730:IFA\$=RT\$THEN130		0	EA
•1070 CM\$="A MULTI-COLOR MESSAGE":GOSUB17		•1430 SYSBP,"[RED]NO.[s I].[BACKARROW]",1	
20:SYSBP,".[s A][RED][GREEN].HELLO!",10,	NG	7,5,,46:CM\$="SORRY - TRY AGAIN?":GOSUB17	
8,,,""	DH	20:GOTO1460	HM
•1080 GOSUB1730:IFA\$=RT\$THEN130		•1440 SYSBP,G1\$,5;G1\$,5,36	BK
•1090 CM\$="MULTI-COLOR REVERSED":GOSUB172		•1450 CM\$="CORRECT - TRY AGAIN?":GOSUB172	
0	NO	0	JI
•1100 SYSBP,".[s A][RED][GREEN][RVSON].HE		•1460 GETA\$:IFA\$=""THEN1460	LN
LLO!",10,8,,,"":[s A][RED][GREEN].[6"[		•1470 B=5:E=20:GOSUB1710	GG
c @]"" ,6,8,,,""	DG	•1480 IFA\$="Y"THEN1350	MG
•1110 GOSUB1730:IFA\$=RT\$THEN130	DH	•1490 IFA\$=RT\$THEN130	LO
•1120 CM\$="A FLASHING MESSAGE":GOSUB1720:	LM	•1500 CM\$="COLOR BARS":GOSUB1720	DH
POKE781,9:SYSCL	PA	•1510 FORI=1TO3:SYSBP,CB\$(I),(I*5)+1,6,2,	
•1130 X\$(1)=SA\$:X\$(2)="FLASHING":X=1		46:NEXT	NF
•1140 X=3-X:SYSBP,X\$(X),10,4:FORI=1TO150:		•1520 GOSUB1730:IFA\$=RT\$THEN130	DH
NEXT	KC	•1530 B=5:E=21:GOSUB1710	GL
•1150 GETA\$:IFA\$=""THEN1140	KE	•1540 CM\$="A MOVING MESSAGE":GOSUB1720:MM	
•1160 IFA\$=RT\$THEN130	LO	\$="MOVING"	JP

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•1550 FORI=6TO17:SYSBP,MM$,I,8:POKE781,I-
1:SYSCL:FORJ=1TO100:NEXT:NEXT IN
•1560 IFPEEK(198)>0THEN1580 KM
•1570 FORI=16TO6STEP-1:SYSBP,MM$,I,8:POKE
781,I+4:SYSCL:FORJ=1TO100:NEXT:NEXT DE
•1580 GETA$:IFA$=""THEN1550 NP
•1590 IFA$=RT$THEN130 LO
•1600 B=5:E=20:GOSUB1710 GG
•1610 CM$="A JUMPING MESSAGE":GOSUB1720 BD
•1620 J$(1)="J[DOWN]U[UP]M[DOWN]P[UP]I[DO
WN]N[UP]G":J$(2)="[DOWN]J[UP]U[DOWN]M[UP
]P[DOWN]I[UP]N[DOWN]G":WH=1 AH
•1630 WH=3-WH:FORI=10TO14STEP4:POKE781,I:
SYSCL:NEXT:SYSBP,J$(WH),10,3,1 GB
•1640 FORI=1TO100:NEXT JG
•1650 GETA$:IFA$=""THEN1630 LO
•1660 IFA$=RT$THEN130 LO
•1670 B=10:E=14:GOSUB1710:GOTO1050 GI
•1680 K=4:IFJ=0THENK=5 NI
•1690 FORJ=JTOJ+K:CB$(I)=CB$(I)+CHR$(PEEK
(BC+J))+"" :IFJ=0THENJ=1 GO
•1700 NEXT:RETURN EJ
•1710 FORI=BTOE:POKE781,I:SYSCL:NEXT:RETU
RN OE
•1720 NS=((23-LEN(CM$))/2):PRINT"[BLUE]"M
S$LEFT$(S8$,NS)CM$$S8$:RETURN LK
•1730 GETA$:IFA$=""THEN1730 LH
•1740 RETURN IM
•1750 FORI=24TO6STEP-1:POKE781,I:SYSCL:NE
XT:PRINT"[CLEAR]";:RETURN OA
•1760 IFCV=0THENIV=1 DH
•1770 IFCV=15THENIV=-1 CN
•1780 CV=CV+IV:CV$=RIGHT$(STR$(CV),2):RET
URN OI
•1790 DATA 105,1024,1264,223,1184,1205,18
45,1984,233,1202,1223,1842,2023 KP
•1800 DATA 95,1063,1303,249,1403,1404,248
,1523,1524,9999 CB
•1810 DATA A5,D1,48,A5,D2,48,20,FD,AE,20 HK
•1820 DATA 9E,AD,24,0D,30,05,A2,16,4C,37 DJ
•1830 DATA A4,A0,00,B1,64,D0,06,20,F8,A8 LD
•1840 DATA 4C,CF,C0,85,D7,C8,B1,64,85,FB NJ
•1850 DATA C8,B1,64,85,FC,A5,64,A4,65,20 OP
•1860 DATA DB,B6,20,05,C1,90,04,A5,D6,B0 AJ
•1870 DATA 06,A9,16,20,D6,C0,8A,48,20,05 AB
•1880 DATA C1,90,15,A5,D3,AA,C9,28,90,05 BD
•1890 DATA E9,28,B8,50,F6,A9,25,85,FF,20 CK
•1900 DATA F6,C0,90,05,A9,25,20,D6,C0,86 OG
•1910 DATA FF,68,AA,20,F0,E9,18,A5,D1,65 HI
•1920 DATA FF,85,D1,90,02,E6,D2,20,24,EA OB
•1930 DATA A9,21,20,D6,C0,86,CE,20,15,C1 NH
•1940 DATA 90,35,D0,0D,A9,00,85,9E,20,24 AL
•1950 DATA C1,20,73,00,4C,09,C0,20,FD,AE LK
•1960 DATA 20,9E,AD,24,0D,30,08,20,A1,B7 GG
•1970 DATA 86,9E,4C,BB,C0,A0,00,B1,64,F0 JJ
•1980 DATA 0E,C8,B1,64,85,FD,C8,B1,64,85 PO
•1990 DATA FE,A0,00,B1,FD,85,9E,A5,64,A4 NO

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•2000 DATA 65,20,DB,B6,20,15,C1,90,02,F0 DB
•2010 DATA C1,20,F8,A8,20,24,C1,68,85,D2 FN
•2020 DATA 68,85,D1,60,85,FF,20,15,C1,90 LN
•2030 DATA 0C,F0,0A,20,FD,AE,20,79,00,C9 NJ
•2040 DATA 2C,D0,03,A2,00,60,20,9E,AD,24 FL
•2050 DATA 0D,30,0D,20,A1,B7,E4,FF,90,05 AM
•2060 DATA A2,0E,4C,37,A4,60,A2,16,4C,37 IE
•2070 DATA A4,A0,01,B1,7A,C9,AC,F0,02,18 AO
•2080 DATA 60,20,FD,AE,4C,73,00,20,79,00 GI
•2090 DATA F0,08,49,3A,F0,04,C9,01,38,60 AC
•2100 DATA 18,60,A9,00,85,BF,AE,86,02,86 HF
•2110 DATA 6E,86,6F,85,FD,AD,18,D0,29,02 FG
•2120 DATA 0A,0A,09,D0,85,FE,AD,0E,DC,29 BO
•2130 DATA FE,8D,0E,DC,A0,FF,84,69,C8,84 OL
•2140 DATA CF,84,BE,A5,CE,20,17,C3,2C,11 IK
•2150 DATA D0,10,FB,A4,69,C8,84,69,B1,FB JD
•2160 DATA C5,9E,D0,09,A5,BF,49,80,85,BF JO
•2170 DATA 4C,E1,C1,B8,C9,12,F0,35,C9,92 GM
•2180 DATA F0,37,C9,0E,F0,39,C9,8E,F0,39 LP
•2190 DATA C9,91,F0,3B,C9,11,F0,3B,C9,1D JG
•2200 DATA F0,3B,C9,9D,F0,3E,20,31,C3,10 BA
•2210 DATA 50,24,BF,10,56,C9,C1,F0,38,A2 JI
•2220 DATA 08,DD,6F,C3,F0,37,CA,10,F8,30 DB
•2230 DATA 46,A9,80,85,CF,50,36,A9,00,85 IC
•2240 DATA CF,50,30,A9,D8,50,02,A9,D0,85 NE
•2250 DATA FE,50,26,A9,28,50,0D,A9,28,50 BD
•2260 DATA 02,A9,01,20,FD,C2,50,17,A9,01 IP
•2270 DATA 20,17,C3,50,10,A9,01,85,70,D0 MO
•2280 DATA 0A,A5,BF,1D,78,C3,3D,81,C3,85 IL
•2290 DATA BF,C6,D7,D0,03,4C,F4,C2,4C,57 OJ
•2300 DATA C1,A2,07,DD,4F,C3,B0,03,CA,D0 JE
•2310 DATA F8,5D,57,C3,05,CF,A2,00,86,6B LL
•2320 DATA 0A,26,6B,0A,26,6B,0A,26,6B,65 HN
•2330 DATA FD,85,6A,A5,6B,65,FE,85,6B,A5 GA
•2340 DATA 01,29,FB,85,01,A0,07,B1,6A,99 NL
•2350 DATA 61,00,88,10,F8,24,BF,50,14,A2 BM
•2360 DATA 00,A0,03,B5,61,48,B9,65,00,95 PJ
•2370 DATA 61,68,99,65,00,E8,88,10,F0,A9 EN
•2380 DATA 20,24,BF,F0,0F,A2,07,A0,08,16 NL
•2390 DATA 61,6A,88,D0,FA,95,61,CA,10,F3 OJ
•2400 DATA A9,10,24,BF,F0,03,B8,50,07,4A CI
•2410 DATA 24,BF,F0,1F,69,7F,A0,07,A2,07 LE
•2420 DATA 70,05,56,61,6A,50,03,16,61,2A HF
•2430 DATA CA,10,F3,48,88,10,ED,A2,07,68 FL
•2440 DATA 95,61,CA,10,FA,A5,01,09,04,85 BL
•2450 DATA 01,A9,00,85,6C,18,A5,BE,65,CE EP
•2460 DATA A8,A9,04,85,6D,A6,6C,A9,00,36 MO
•2470 DATA 61,2A,36,61,2A,36,62,2A,36,62 BB
•2480 DATA 2A,85,FF,A5,BF,29,04,F0,13,A6 PN
•2490 DATA FF,F0,1B,B1,D1,A2,0F,DD,5F,C3 KI
•2500 DATA F0,05,CA,10,F8,30,0D,8A,05,FF CI
•2510 DATA AA,BD,5F,C3,91,D1,A5,6E,91,F3 NN
•2520 DATA C8,C6,6D,F0,02,D0,C2,A6,6C,E0 FF
•2530 DATA 06,F0,0C,E8,E8,86,6C,98,18,69 HK
•2540 DATA 24,A8,4C,8B,C2,C6,D7,F0,11,98 MD
•2550 DATA 38,E9,78,85,BE,A5,6E,A6,6F,85 FM
•2560 DATA 6F,86,6E,4C,57,C1,AD,0E,DC,09 CP

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•2570
•2580
•2590
•2600
•2610
•2620
•2630
•2640
•2650
•2660
•2670
•2680
•2690
•2700
•2710
•900 P
•910 P
"
•920 P
•930 P
•940 P
•950 P
•960 P
•970 I
•980 P
•990 I
•1000
EATE"
•1005
CAN"
•1010
MIST"
•1015
•1020
ON."
•1030
•1035
•1040
U"
•1045
•1050
A BEA
•1060
•1065
•1070
•1075
VEN SL
•1080
GREDE
•1085
TS."

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•2570 DATA 01,8D,0E,DC,60,85,FF,18,A5,D1 OH
 •2580 DATA 65,FF,85,D1,90,03,E6,D2,18,A5 LG
 •2590 DATA F3,65,FF,85,F3,90,02,E6,F4,B8 ID
 •2600 DATA 60,85,FF,38,A5,D1,E5,FF,85,D1 JK
 •2610 DATA B0,03,C6,D2,38,A5,F3,E5,FF,85 EC
 •2620 DATA F3,B0,02,C6,F4,B8,60,A2,0F,DD EG
 •2630 DATA DA,E8,D0,13,8A,A6,70,F0,09,95 CP
 •2640 DATA 6D,8A,0A,29,03,85,70,60,85,6E NJ
 •2650 DATA 85,6F,60,CA,10,E5,60,00,20,40 FN
 •2660 DATA 60,80,A0,C0,FF,80,00,40,20,40 AB
 •2670 DATA C0,80,A1,20,6C,7B,62,7C,E1,FF NO
 •2680 DATA FE,7E,7F,61,FC,E2,FB,EC,A0,D5 CM
 •2690 DATA 55,C9,49,CC,D2,CF,4F,C3,40,00 HN
 •2700 DATA 20,00,10,08,04,00,00,E7,A7,E7 NC
 •2710 DATA C7,97,8F,FF,FB,00 GN

•1100 PRINT"ONCE YOU HAVE THE RIGHT COMBI
 NATION" LP
 •1103 PRINT "OF INCANTATIONS AND INGREDIE
 NTS," MD
 •1105 PRINT"IT CAN ONLY CHANGE 10 STONES
 AT A TIME." LG
 •1200 PRINT"YOU MAY USE UP YOUR INGREDIEN
 TS" PG
 •1203 PRINT"AND HAVE TO FETCH MORE." IM
 •1205 PRINT"EVEN THE WEATHER CAN CHANGE A
 SPELL'S" FP
 •1208 PRINT"EFFECTIVENESS." NB
 •1210 PRINT"IF THE ALCHEMIST RETURNS BEFO
 RE YOU GET YOUR GOLD HIDDEN" LD
 •1220 PRINT"YOU LOSE YOUR GOLD AND GET WH
 IPPED." LP
 •1230 PRINT"[14" "[RVSON]GOOD LUCK[RVSO
 F]." PG
 •1300 GOSUB 10100 JF
 •1500 REM SETUP EE
 •1550 PRINT"[CLEAR]" HH
 •1560 DIM A(17), M1(17), M2(9), WT(10), R
 (11), RC(10) CD
 •1570 I=0 CK
 •1900 CS=0:SB=0:Y=0:TL=0:G=0 AD
 •1910 PRINT"[CLEAR]" HH
 •2000 REM MAIN ROUTINE CC
 •2002 IF TL>0 THEN 2010 PD
 •2005 T=INT(RND(1)*10+1) DJ
 •2010 R=INT(RND(1)*10+1) DH
 •2015 IF TL>0 THEN TL=TL+1 PI
 •2045 REM PRINT"[CLEAR]" CA
 •2050 ON R GOSUB 4000,4500,5000,6000,7000
 ,7000,8000,8000,9000,6000,4000 NH
 •3000 REM CLOCK ROUTINE EE
 •3005 IF T<>1 THEN 2000 FG
 •3006 IF TL=0 THEN TL=1 LC
 •3010 IF TL=60 THEN GOTO 3500 LK
 •3020 IF TL<>45 THEN 3030 NL
 •3025 PRINT"THE ALCHEMIST WILL RETURN IN
 15 MINUTES." JF
 •3030 IF TL<>30 THEN 3040 IP
 •3035 PRINT"THE ALCHEMIST WILL RETURN IN
 30 MINUTES." CO
 •3040 IF TL<>15 THEN 3050 HL
 •3045 PRINT"THE ALCHEMIST WILL RETURN IN
 45 MINUTES" GH
 •3050 GOTO 2000 EP
 •3500 RC=INT(RND(1)*15+1) HI
 •3501 PRINT"GAME OVER" HL
 •3510 GOTO 2000 HL
 •4000 REM FOUND IT SUBROUTINE OC
 •4020 IF Y=1 THEN RETURN AC
 •4030 PRINT"HEY WOW YOU FOUND IT!" KJ
 •4032 PRINT"THAT'S 10 PIECES OF GOLD." AO
 •4034 IF TL>0 THEN TL=TL+1 IM
 •4040 G=G+10 FF

MORE BASIC PROGRAMMING FROM PAGE 79

ALCHEMIST'S APPRENTICE

•900 PRINT "[CLEAR]" FH
 •100 PRINT "[10" "]ALCHEMIST'S APPRENTICE
 " JF
 •920 PRINT "[17" "]COPYRIGHT" JL
 •930 PRINT "[12" "]CHERYL COX PETERSON" FL
 •940 PRINT "[19" "]1986" NP
 •950 PRINT:PRINT:PRINT:PRINT BN
 •960 INPUT"DO YOU NEED INSTRUCTIONS";X\$ AI
 •970 IF X\$="N" THEN GOTO 1500 LL
 •980 PRINT"[CLEAR]" HH
 •990 I=1 CJ
 •1000 PRINT"THE GAME'S OBJECTIVE IS TO CR
 EATE" HB
 •1005 PRINT"AND HIDE AS MUCH GOLD AS YOU
 CAN" AB
 •1010 PRINT"BEFORE YOUR MASTER, THE ALCHE
 MIST" BJ
 •1015 PRINT"RETURNS FROM THE ALCHEMIST'S"
 GI
 •1020 PRINT"ASSOCIATION'S ANNUAL CONVENTI
 ON." KE
 •1030 PRINT"THE BOSS MAY CALL TO LET YOU"
 EH
 •1035 PRINT"KNOW WHEN HE'S RETURNING." KJ
 •1040 PRINT"THEN AGAIN, HE MAY NOT. IF YO
 U" CA
 •1045 PRINT"DON'T HAVE THE SHOP CLEANED"
 FE
 •1050 PRINT"BEFORE HE RETURNS, YOU'LL GET
 A BEATING." JP
 •1060 GOSUB 10100 JF
 •1065 PRINT"[CLEAR]" HH
 •1070 PRINT"THERE ARE DANGERS INVOLVED." BP
 •1075 PRINT"THOUGH YOU'VE LEARNED MUCH, E
 VEN SLIGHT" CC
 •1080 PRINT"CHANGES IN INCANTATIONS OR IN
 GREDIENTS" HH
 •1085 PRINT"CAN CAUSE UNPREDICTABLE RESUL
 TS." EN

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.4050 GOSUB 10010
.4100 RC=INT(RND(1)*15+1)
.4110 IF RC>14 THEN GOSUB 20500
.4120 IF RC>11 THEN GOTO 4200
.4130 G=G+10:PRINT"YOU CHANGED ANOTHER 10
STONES."
.4140 PRINT "YOU NOW HAVE ";G; "GOLD NUGG
ETS.":GOSUB 10010
.4150 GOTO 4100
.4200 PRINT "THE WEATHER CHANGED AND"
.4210 PRINT "YOUR SPELL NO LONGER WORKS.
TOO BAD."
.4220 GOSUB 10010
.4499 RETURN
.4500 REM PARTLY SUCCESSFUL SUBROUTINE
.4600 G1=INT(RND(1)*6+1)
.4610 PRINT"CONGRATULATIONS! YOU MANAGED
TO"
.4620 PRINT"CHANGE ";G1; "OF THE STONES I
NTO GOLD.":G=G+G1:GOSUB 10010
.4625 TL=TL+1
.4630 PRINT"DO YOU WANT TO USE THE [RVSON
]S[RVSOFF]AME SPELL"
.4640 INPUT"OR TRY SOMETHING [RVSON]D[RVS
OFF]IFFERENT";X$
.4645 PRINT"[CLEAR]"
.4650 IF X$="D" THEN RETURN
.4660 IF X$<>"S" THEN 4630
.4700 Y=INT(RND(1)*15+1)
.4710 IF Y>14 THEN GOTO 5000
.4720 IF Y<13 THEN 4800
.4740 PRINT"TOO BAD. THE WEATHER CHANGED,
SO YOUR"
.4750 PRINT"SPELL ISN'T WORKING ANY MORE.
"
.4760 Y=1
.4780 GOSUB 10010
.4790 RETURN
.4800 PRINT"YOU'VE TURNED ";G1;" MORE OF
THE STONES TO GOLD.":G=G+G1
.4810 TL=TL+1:GOSUB 10010
.4820 GOTO 4630
.5000 REM EARLY SUBROUTINE
.5010 IF TL<20 THEN RETURN
.5100 GOTO 20510
.6000 REM COUNTERSPELL ROUTINE
.6010 IF CS=1 THEN RETURN
.6100 PRINT"YOU STUMBLE ACROSS A COUNTERS
PELL"
.6110 PRINT"THAT REVERSES THE LAST SPELL
MADE."
.6120 PRINT"IT MUST BE REPEATED EXACTLY A
S WRITTEN"
.6130 PRINT"IN THE BOOK IN ORDER TO WORK.
"
.6140 PRINT"YOU MEMORIZE IT!":CS=1
.6150 GOSUB 10010
.6999 RETURN
.7000 REM WASTED TIME SUBROUTINE

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IN .7010 WT=INT(RND(1)*9+1):IF Y=3 THEN RETU
HI RN NK
FP .7020 ON WT GOSUB 7100,7200,7300,7400,750
DO 0,7600,7700,7800,7900,7960 MP
.7030 GOSUB 10010 IN
.7040 RETURN IM
.7100 IF SB=1 THEN RETURN EL
.7110 PRINT"YOU FOUND THE ALCHEMIST'S SPE
FO LL BOOK," HG
LG .7120 PRINT"BUT THE SPELL YOU WANT ISN'T
IN IT." OG
EK .7130 PRINT"YOU WASTED 20 MINUTES LOOKING
IN FOR IT!" DJ
IM .7135 PRINT"TOUGH LUCK!" OM
GG .7140 IF TL>40 THEN GOSUB 20010 IB
DI .7150 TL=TL+20:SB=1:RETURN LJ
KA .7200 PRINT"YOU CAN'T SEEM TO FIND THAT" OF
.7210 PRINT"INGREDIENT YOU WANT." IG
.7220 PRINT"YOU WASTE 6 MINUTES LOOKING F
LP OR IT." KO
OO .7250 TL=TL+6:RETURN KA
BO .7300 PRINT"A FRIEND CALLS YOU UP. YOU WA
STE 10" BI
OP .7310 PRINT"MINUTES TRYING TO GET RID OF
HIM." GH
HH .7320 TL=TL+10 BG
HI .7350 TL=TL+10:RETURN OD
GO .7400 PRINT"DELIVERY MAN BRINGS SUPPLIES.
IB " AH
PG .7410 PRINT"YOU WASTE 7 MINUTES CHECKING
HE CONTENTS" MG
KL .7420 PRINT"AND SIGNING FOR IT." AA
.7450 TL=TL+7:RETURN KB
ML .7500 PRINT"YOU MISPLACED THE MORTAR AND
PESTLE," CG
DJ .7510 PRINT"AND YOU NEED TO GRIND SOME IN
IN GREDIENTS." OO
IM .7520 PRINT"YOU SPEND 3 MINUTES LOCATING
THEM." OO
AK .7550 TL=TL+3:RETURN KF
LC .7600 PRINT"THERE'S NEVER A LIGHTER WHEN
FI YOU" JA
BJ .7610 PRINT"NEED ONE. YOU SPEND 2 MINUTES
IC LOOKING." EM
IJ .7650 TL=TL+2:RETURN LE
IA .7700 PRINT"EVERYTHING IS SO CONFUSING." GL
DC .7710 PRINT"TAKE A MINUTE TO STOP AND THI
NK." JI
CL .7750 TL=TL+1:RETURN LL
HA .7800 PRINT"YOU REMEMBER SOMETHING THE AL
CHEMIST" BD
EH .7810 PRINT"WANTED YOU TO DO." EP
.7820 PRINT"YOU TAKE 5 MINUTES TO DO IT." FP
.7850 TL=TL+5:RETURN KH
JC .7900 PRINT"YOU NEED SOME MORE DISTILLED
PD WATER." LH
IN .7910 PRINT"YOU SPEND 4 MINUTES SETTING I
IM T UP." BN
IE .7950 TL=TL+4:RETURN KG

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.7960
"
.7970
INUT
.7980
.7990
.8000
.8010
.8100
.8200
0,83
.8300
.8310
.8320
.8330
.8340
.8350
.8360
.8370
.8380
.8390
.8400
.8410
.8415
.8420
.8430
.8435
.8440
.8450
.8600
.8610
0,87
.8620
.8650
.8660
.8663
.8665
.8670
.8675
.8700
.8710
.8720
.8750
ON'S"
.8760
.8765
.8800
OURSE
.8810
.8820
.8825
.8830
.8850
ASTY.
.8855
N YOU
.8860
.8999
.9000

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•7960 PRINT"YOU'LL NEED MORE STONES SOON. "	EE	•9100 A=INT(RND(1)*12+1)	DE
•7970 PRINT"COLLECTING MORE TAKES YOU 8 M INUTES."	MA	•9200 PRINT"YOU'VE CHANGED YOURSELF INTO A ";	PD
•7980 TL=TL+8:RETURN	LC	•9210 ONAGOSUB 9310,9320,9340,9350,9360,9 370,9380,9390,9400,9410,9420,9430,9440	GN
•7999 RETURN	IM	•9290 GOTO 9500	FP
•8000 REM MONSTER SUBROUTINE	OD	•9310 PRINT"DOG. ":RETURN	NG
•8010 M1=INT(RND(1)*9+1)	GL	•9320 PRINT"PIG. ":RETURN	OM
•8100 PRINT"OH NO! YOU CREATED A ";	EF	•9330 PRINT"CAT. ":RETURN	MO
•8200 ON M1 GOSUB 8310,8320,8330,8340,835 0,8360,8370,8380,8390	EB	•9340 PRINT"TURKEY. ":RETURN	NG
•8300 GOTO 8400	FN	•9350 PRINT"FOX. ":RETURN	NF
•8310 PRINT"SMALL DRAGON ":RETURN	PN	•9360 PRINT"COW. ":RETURN	NH
•8320 PRINT"CHIMERA ":RETURN	MF	•9370 PRINT"DUCK. ":RETURN	DO
•8330 PRINT"HYDRA ":RETURN	EF	•9380 PRINT"GOAT. ":RETURN	DK
•8340 PRINT"LION ":RETURN	PA	•9390 PRINT"FROG. ":RETURN	CF
•8350 PRINT"BEAR ":RETURN	PM	•9400 PRINT"LIZARD. ":RETURN	NO
•8360 PRINT"TIGER ":RETURN	GM	•9410 PRINT"NEWT":RETURN	OP
•8370 PRINT"HARPY ":RETURN	EB	•9420 PRINT"SNAKE. ":RETURN	IP
•8380 PRINT"WOLF ":RETURN	BI	•9430 PRINT"TURTLE. ":RETURN	OK
•8390 PRINT"ALLIGATOR":RETURN	HI	•9440 PRINT"GOLDFISH. ":RETURN	FD
•8400 PRINT"AND IT LOOKS HUNGRY!"	PA	•9500 IF A>12 THEN GOTO 9900	PF
•8410 PRINT"DO SOMETHING QUICK!"	FJ	•9510 IF A>7 THEN GOTO 9700	LE
•8415 GOSUB 10100	IN	•9600 PRINT"EVEN IF YOU KNOW THE COUNTERS PELL, "	PF
•8420 IF CS=0 GOTO 8600	FI	•9610 PRINT"YOU CAN'T USE IT. TRY SWISHIN G"	CB
•8430 PRINT"USE THE COUNTERSPELL."	II	•9620 PRINT"YOUR TAIL OR SOMETHING."	DK
•8435 GOSUB 10100	IN	•9630 GOSUB 10100	IN
•8440 GOSUB 10010	IM	•9650 F=INT(RND(1)*2+1)	AC
•8450 RETURN	GB	•9660 IF F=2 THEN GOTO 9685	LL
•8600 M2=INT(RND(1)*9+1)	BC	•9670 PRINT"THAT DID IT!"	PN
•8610 ON M2 GOSUB 8650,8700,8750,8700,885 0,8700,8750,8700,8650,8800	IM	•9675 GOSUB 10010	IN
•8620 RETURN	IM	•9680 RETURN	IM
•8650 PRINT"OH NO! YOU MADE ANOTHER ONE!"	EK	•9685 PRINT"THAT DIDN'T WORK. TRY AGAIN."	EH
•8660 PRINT"YOU'D BETTER TRY AGAIN."	DF	•9690 GOSUB 10100	IN
•8663 GOSUB 10100	IN	•9695 TL=TL+1:GOTO 9650	KK
•8665 TL=TL+1	OO	•9700 PRINT"WHAT A PREDICAMENT! TRY FLICK ING "	IA
•8670 GOTO 8600	FP	•9710 PRINT"YOUR TONGUE OR WIGGLING SOMET HING."	CP
•8675 TL=TL+1:GOTO 8600	JC	•9715 GOSUB 10100	IN
•8700 PRINT"WOULD YOU BE MORE CAREFUL?"	BO	•9720 F=INT(RND(1)*2+1)	AC
•8710 GOSUB 10010	IN	•9730 IF F=1 THEN GOSUB 9980	NK
•8720 RETURN	IM	•9740 IF F=1 THEN GOTO 9720	LO
•8750 PRINT"THAT DIDN'T WORK. THE SITUATI ON'S"	LP	•9750 PRINT"THAT'S AN IMPROVEMENT. AT LEA ST, "	BJ
•8760 PRINT"GETTING DESPERATE. HURRY!"	AB	•9760 PRINT"YOU'RE WARM-BLOODED."	OF
•8765 GOSUB 10100	IN	•9765 GOSUB 10100	IN
•8800 PRINT"WHAT ARE YOU DOING? TURNING Y OURSELF "	KL	•9770 A=INT(RND(1)-5+12)	DH
•8810 PRINT"INTO A CHICKEN WON'T HELP!"	LH	•9780 GOTO 9200	FM
•8820 PRINT"CHANGE BACK AND TRY AGAIN."	JE	•9900 PRINT"YOU ARE SUPPOSED TO MAKE [RVS ON]GOLD[RVSOFF], NOT"	IH
•8825 GOSUB 10100	IN	•9910 PRINT"TURN YOURSELF INTO A [RVSON]G OLD[RVSOFF]FISH."	EC
•8830 TL=TL+1:GOTO 8600	JC	•9920 PRINT"START BLOWING BUBBLES. MAYBE YOU'LL"	NM
•8850 PRINT"TOO LATE. AT LEAST YOU WERE T ASTY."	GG	•9930 PRINT"STUMBLE ACROSS THE RIGHT PATT ERN."	KC
•8855 PRINT"YOU HAD ";G;" GOLD PIECES WHE N YOU DIED."	OC	•9935 GOSUB 10100	IN
•8860 GOTO 10070	IP		
•8999 RETURN	IM		
•9000 REM ANIMAL SUBROUTINE	DH		

IMPORTANT! Letters on white background are **Bug Repellent** line codes. Do not enter them! Pages 97-99 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

.9940 F=INT(RND(1)*2+1)
.9945 IF F=1 THEN GOSUB 9980
.9950 PRINT"THAT'S A LITTLE BETTER."
.9955 GOSUB 10100
.9970 GOTO 9700
.9980 PRINT"THAT DIDN'T WORK. TRY AGAIN."
"
.9981 GOSUB 10100
.9985 TL=TL+1:RETURN
.9999 END
.10010 PRINT"DO YOU WANT TO START CLEANIN
G UP?"
.10020 PRINT"THE ALCHEMIST COULD RETURN E
ARLY."
.10030 INPUT"[RVSON]Y[RVSOFF] OR [RVSON]N
[RVSOFF]";X$
.10050 IF X$<>"Y"THEN 10090
.10060 PRINT"CONGRATULATIONS, YOU'VE GOT
";G;" GOLD PIECES."
.10070 PRINT"WOULD YOU LIKE TO TRY AGAIN?
"
.10080 INPUT "[RVSON]Y[RVSOFF] OR [RVSON]
N[RVSOFF]";D$
.10085 IF D$="Y"THEN 1900
.10089 END
.10090 IF TL>20 THEN PRINT"[CLEAR]":RETUR
N
.10094 PRINT"[CLEAR]"
.10095 PRINT"OK, LET'S TRY IT AGAIN.":RET
URN
.10100 IF I=1 THEN GOTO 10110
.10105 PRINT"PRESS A KEY TO TRY SOMETHING
ELSE.":GOTO 10200
.10110 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
.10200 GET Q$
.10300 IF Q$="" THEN 10200
.10400 IF Q$<>" " THEN PRINT"[CLEAR]"
.10500 RETURN
.20000 REM ALCHEMIST RETURNS
.20010 PRINT"TOO BAD. THE ALCHEMIST IS BA
CK"
.20020 GOTO 20515
.20500 REM ALCHEMIST RETURNS EARLY
.20510 PRINT"TOO BAD. THE ALCHEMIST RETUR
NED EARLY"
.20515 IF G<1 THEN GOTO 20525
.20520 PRINT"YOU LOSE ALL YOUR GOLD"
.20525 PRINT"AND YOU GET A BEATING."
.20530 PRINT"BETTER LUCK NEXT TIME."
.20540 PRINT"CARE TO TRY AGAIN?"
.20545 INPUT"[RVSON]Y[RVSOFF] OR [RVSON]N
[RVSOFF]";D$
.20550 IF D$="Y" THEN GOTO 1900
.20560 IF D$="N" THEN 9999
.20570 GOTO 20540

```

AC
NK
BC
IN
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KN
LO
IM
DO
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IM
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OD
BB
KE
MP
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EH
EI
KP
IA

C-128 GRAPHIC BIT MAP FROM PAGE 37

Note: codes listed alongside the five programs under this heading are for use with the C-128 Bug Repellent.

HI-RES BIT MAP DRAW & SAVE

```

.5 REM PLANETS HI RES GRAPHIC FC
.6 REM BY DOUG GANNON CO
.10 COLOR0,1:COLOR1,2:COLOR3,1:COLOR4,1 HE
.20 GRAPHIC1,1 GP
.30 FORS=1TO180 PF
.40 REM PLOT STARS FD
.50 SY=INT(RND(0)*159) PP
.60 SX=INT(RND(0)*319) AG
.70 DRAW1,SX,SY:NEXTS OF
.80 REM DRAW FORGROUND HD
.90 COLOR1,6 HN
.100 FORY=160TO199STEP3 CJ
.110 DRAW1,160,160TO0,Y:NEXTY AE
.120 FORX=0TO319STEP10 CL
.130 DRAW1,160,160TOX,199:NEXTX FI
.140 FORY=199TO160STEP-3 PP
.150 DRAW1,319,YTO160,160:NEXTY JI
.160 REM DRAW NORTHERN LATITUDINAL LINES AL
.170 COLOR1,10:R=32:XR=9+R BD
.180 FORY=30TO78STEP12 BD
.190 CIRCLE1,158,Y,XR,5 ND
.200 R=R/2:XR=XR+R:NEXTY HP
.210 REM DRAW SOUTHERN LATITUDINAL LINES OF
.220 R=2:XR=71-R DK
.230 FORY=90TO126STEP12 DH
.240 CIRCLE1,158,Y,XR,5 ND
.250 R=R*2:XR=XR-R:NEXTY GP
.260 REM DRAW LONGITUDINAL LINES IM
.270 R=2:XR=72-R:FORI=1TO8 BF
.280 CIRCLE1,158,78,XR,62 MD
.290 R=R+2:XR=XR-R:NEXTI JF
.300 REM DRAW STAR PJ
.310 COLOR1,7 HM
.320 CIRCLE1,40,30,20,18 HB
.330 PAINT1,40,30,1 IK
.400 REM HIGH RES BIT MAP SAVE ROUTINE DP
.410 REM FOR THE COMMODORE 128 KI
.430 REM BY MORTON A. KEVELSON NG
.440 REM HAVE SAVE DISK IN DRIVE JL
.450 REM WHEN RUNNING THIS PGM DB
.500 BANK15:A=PEEK(DEC("D020"))AND15 PI
.510 POKE8168,A NC
.520 BSAVE"PLANETS.BMP",B0,P7168 TO P1619
1 BA
.530 GRAPHIC0 AO

```

HI-RES BIT MAP LOAD

```

.10 REM HI RES LOADER FOR THE C128 GH
.20 REM BY MORTON A. KEVELSON NG
.100 GRAPHIC1 BB

```

•110 BANK0:BLOAD"PLANETS.BMP"
 •120 A=(PEEK(8168))+1
 •130 COLOR4,A

MULTICOLOR BIT MAP DRAW & SAVE

•5 REM MICKEY MOUSE
 •6 REM MULTICOLOR DEMO FOR THE C128
 •7 REM BY DOUG GANNON
 •10 COLOR0,2:COLOR1,1:COLOR2,8:COLOR3,3:COLOR4,2
 •20 GRAPHIC3,1
 •30 CIRCLE1,38,33,22,33
 •40 CIRCLE1,122,33,22,33
 •50 CIRCLE1,80,109,41,70,250,110
 •60 CIRCLE1,68,152,32,35,183,334
 •70 CIRCLE1,92,152,32,35,26,177
 •80 CIRCLE1,80,170,18,28,105,255
 •90 CIRCLE1,68,96,8,24
 •100 CIRCLE1,92,96,8,24
 •110 CIRCLE1,68,105,4,12
 •120 CIRCLE1,92,105,4,12
 •130 CIRCLE1,66,80,9,20,270,25
 •140 CIRCLE1,94,80,9,20,335,90
 •150 CIRCLE1,58,92,10,34,213,340
 •160 CIRCLE1,102,92,10,34,20,147
 •170 CIRCLE1,65,80,15,29,310,80
 •180 CIRCLE1,95,80,15,29,280,50
 •190 CIRCLE1,80,109,30,55,118,242
 •200 CIRCLE1,60,152,12,20,290,358
 •210 CIRCLE1,100,152,12,18,2,70
 •220 CIRCLE1,80,160,35,38,332,28
 •230 CIRCLE1,80,160,13,22,90,270
 •240 CIRCLE1,76,178,8,9,310,70
 •250 CIRCLE1,86,178,8,9,325,35
 •260 CIRCLE1,80,137,12,12
 •270 CIRCLE1,79,134,6,4
 •280 CIRCLE1,30,187,30,20,90,200
 •290 CIRCLE1,130,187,30,20,140,270
 •300 CIRCLE1,32,200,37,40,75,90
 •310 CIRCLE1,128,200,37,40,270,285
 •320 PAINT1,77,199
 •330 PAINT1,42,109
 •340 PAINT1,80,147
 •350 PAINT1,80,165
 •360 PAINT3,65,198,1
 •370 PAINT3,95,198,1
 •380 PAINT3,80,175,1
 •390 PAINT1,40,33
 •400 PAINT1,120,33
 •410 PAINT1,68,105
 •420 PAINT1,92,105
 •430 PAINT2,70,152,1
 •500 REM MULTICOLOR BIT MAP SAVE
 •510 REM FOR THE C128
 •520 REM BY MORTON A. KEVELSON
 •530 BANK15:A=PEEK(DEC("D020")) AND 15
 •540 B=PEEK(DEC("D021")) AND 15
 •550 BANK0:POKE8168,A
 •560 POKE8169,B

DA •570 BSAVE"MMOUSE.BMP",B0,P7168 TO P16383 EL
 AP •580 BANK15 GM
 IN •590 POKE(DEC("D01A")),PEEK(DEC("D01A"))A
 ND254 HN
 •600 POKE1,PEEK(1)AND254 IJ
 •610 BSAVE"MMOUSE.CMM",B15,P55296 TO P563
 19 HA
 •620 POKE1,PEEK(1) OR 1 BH
 •630 POKE(DEC("D01A")),PEEK(DEC("D01A"))
 OR 1 AP
 •640 GRAPHIC 0 AO

MULTICOLOR BIT MAP LOAD

•1 REM MULTICOLOR BIT MAP LOADER OM
 •2 REM FOR THE COMMODORE C128 KD
 •3 REM BY MORTON A. KEVELSON NG
 •10 GRAPHIC3,1 HB
 •20 BLOAD"MMOUSE.BMP",B0,P7168 FI
 •30 BANK15 GM
 •40 POKE(DEC("D01A")),PEEK(DEC("D01A")) A
 ND 254 HN
 •50 POKE1,PEEK(1) AND 254 IJ
 •60 BLOAD"MMOUSE.CMM",B15,P55296 LK
 •65 POKE1,PEEK(1) OR 1 BH
 •70 POKE(DEC("D01A")),PEEK(DEC("D01A")) 0
 R 1 AP
 •80 BANK15:A=(PEEK(8168)AND15)+1 IJ
 •90 B=(PEEK(8169)AND15)+1 EB
 •100 COLOR0,B:COLOR4,A FF

KOALA TO C-128 CONVERTOR

•10 REM KOALA TO MULTICOLOR BIT MAP GI
 •20 REM CONVERTER FOR THE C128 CM
 •30 REM BY MORTON A. KEVELSON NG
 •40 REM PUT FILE TO BE CONVERTED ON SAVE
 DISK PK
 •50 BLOAD"?PIC A*",B1,P24576 HE
 •60 REM USE YOUR FILE NAME IN LINE 50 BL
 •70 BANK 1 DD
 •80 FOR VM =0 TO 999 EN
 •90 POKE 23552+VM,PEEK(32576+VM) IC
 •100 NEXT VM CO
 •110 POKE 24554,(PEEK(34576)AND15) IM
 •120 BSAVE"PIC A.BMP",B1,P23552 TO P32575 CG
 •130 BSAVE"PIC A.CMM",B1,P33576 TO P34575 AF

FREE RAM CHECK FROM PAGE 35

•10 REM *** FREE RAM CHECK *** BUCK CHILD
 RESS (01/27/86) *** PM
 •20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 *** DC
 •30 POKE56,PEEK(56)-4:CLR HP
 •40 PRINTCHR\$(147)"LOADING AND CHECKING D
 ATA[3"."]":PRINT:J=40000:L=100:C=11 LI
 •50 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB

AHOY! 111

```

:READA
•60 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
END
•70 X=0:J=J+12:L=L+10:IFL<260THEN50
•80 IFL=260THENC=7:GOTO50
•90 PRINT"DATA OK AND LOADED[3"."]":PRINT
:PRINT"SYS 4[4"0"] TO ACTIVATE[3"."]:EN
D
•100 DATA32,68,229,169,167,162,2,133,251,
134,252,134,1733
•110 DATA253,162,0,142,219,216,232,32,186
,156,230,253,2081
•120 DATA162,0,160,0,138,141,219,4,145,25
1,209,251,1680
•130 DATA208,66,232,208,243,230,251,208,2
39,230,252,165,2532
•140 DATA252,197,253,144,231,201,208,176,
37,32,158,156,2045
•150 DATA165,253,201,4,176,12,169,60,133,
251,162,2,1588
•160 DATA32,186,156,76,86,156,169,192,162
,207,133,252,1807
•170 DATA134,253,162,3,32,186,156,76,86,1
56,160,13,1417
•180 DATA32,194,156,160,30,76,194,156,160
,20,32,194,1404
•190 DATA156,165,253,201,208,176,240,169,
0,133,251,76,2028
•200 DATA124,156,160,6,24,32,240,255,160,
0,185,230,1572
•210 DATA156,240,7,32,210,255,200,76,194,
156,192,13,1731
•220 DATA144,1,96,166,251,165,252,32,205,
189,169,45,1715
•230 DATA32,210,255,162,255,165,253,76,20
5,189,67,72,1941
•240 DATA69,67,75,73,78,71,32,42,42,32,0,
32,613
•250 DATA42,42,32,79,75,0,32,42,42,32,69,
82,569
•260 DATA82,79,82,0,17,17,17,0,294

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FE •70 IFL=460THENC=4:GOTO40
MC •80 PRINT"DATA OK AND LOADED[3"."]":PRINT
AN :PRINT"SYS 49152 TO ACTIVATE[3"."]:END
DI •90 DATA173,3,3,201,192,208,8,160,0,32,25
4,192,1426
GH •100 DATA76,104,193,169,14,141,32,208,160
,6,32,254,1389
HA •110 DATA192,32,159,255,32,228,255,201,68
,208,7,162,1799
JH •120 DATA8,160,27,76,50,192,201,84,208,23
5,162,1,1404
PC •130 DATA160,34,142,199,193,32,254,192,16
0,41,32,254,1693
KD •140 DATA192,169,48,162,58,160,0,132,253,
160,2,132,1468
HK •150 DATA254,32,10,193,160,59,32,254,192,
169,65,162,1582
PM •160 DATA91,160,16,132,254,32,10,193,165,
253,141,194,1641
OC •170 DATA193,32,88,193,169,111,162,192,14
1,2,3,142,1428
BP •180 DATA3,3,96,173,32,208,41,15,201,12,2
40,27,1051
JF •190 DATA141,191,193,173,197,193,208,9,16
5,161,201,212,2044
DE •200 DATA144,36,141,197,193,166,215,224,1
3,208,27,202,1766
DG •210 DATA142,32,208,162,0,160,0,32,225,25
5,240,11,1467
BE •220 DATA232,208,248,200,208,245,132,198,
76,173,192,32,2144
AK •230 DATA78,193,76,131,164,173,192,193,20
8,188,162,24,1782
GN •240 DATA160,0,24,32,240,255,169,17,32,21
0,255,174,1568
BM •250 DATA199,193,160,0,32,186,255,173,194
,193,162,208,1955
DI •260 DATA160,193,32,189,255,169,43,166,45
,164,46,32,1494
HM •270 DATA216,255,160,1,185,208,193,170,23
2,138,153,208,2119
•280 DATA193,201,58,144,8,169,48,153,208,
193,136,16,1527
•290 DATA235,32,78,193,169,118,160,163,32
,30,171,76,1457
•300 DATA131,164,185,118,193,240,40,32,21
0,255,200,76,1844
•310 DATA254,192,133,251,134,252,169,0,13
3,198,32,159,1907
•320 DATA255,32,228,255,240,244,197,197,2
40,240,201,13,2342
•330 DATA208,10,164,253,192,2,144,230,32,
210,255,96,1796
•340 DATA201,20,208,5,104,104,76,15,192,1
97,251,144,1517
•350 DATA213,197,252,176,209,164,253,196,
254,176,203,153,2446
•360 DATA208,193,32,210,255,230,253,76,14
,193,173,191,2028

```

FAILSAFE FROM PAGE 56

```

•10 REM *** FAILSAFE *** BUCK CHILDRESS (
01/18/86) ***
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
9 ***
•30 PRINTCHR$(147)"LOADING AND CHECKING D
ATA[3"."]":PRINT:J=49152:L=90:C=11
•40 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB
:READA
•50 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
END
•60 X=0:J=J+12:L=L+10:IFL<460THEN40

```


•530 PRINT"[RVSON][4"[RIGHT]"[s M][30"[R	HJ	•860 FORS2=12352TO12414:READD2:POKES2,D2:	EP
IGHT]"[s N][HOME]"		NEXT	
•540 PRINTLEFT\$(CR\$,19+F)TAB(4-F)"[RVSON]	CM	•870 FORS3=12416TO12478:READD3:POKES3,D3:	HC
[s N]";TAB(35+F)"[s M]":F=F+1		NEXT	
•550 IFF<>3THENPRINT"[HOME]":GOTO540	GL	•880 FORS4=12480TO12542:READD4:POKES4,D4:	IL
•560 PRINT"[HOME][UP]"	HO	NEXT	
•570 FORED=1063TO2023STEP40:POKEED,160:PO	GH	•890 FORS5=12544TO12606:READD5:POKES5,D5:	KP
KEED+SN,0:NEXT		NEXT	
•580 PRINTLEFT\$(CR\$,20)"[YELLOW][5"[RIGHT	NM	•900 FORS6=12608TO12670:READD6:POKES6,D6:	AJ
]"]N I I L [RVSON][c 1][22" "][HOME]"		NEXT	
•590 PRINTLEFT\$(CR\$,23)TAB(2)"[YELLOW]EFG	AA	•910 FORS7=12672TO12734:READD7:POKES7,D7:	HD
H[4" "];TAB(15)"LMJHH[4" "];TAB(28)"IF	AN	NEXT	
HHJH[4" "][HOME]"	IM	•920 FORS8=12736TO12798:READD8:POKES8,D8:	GL
•600 POKE53265,PEEK(53265)OR16	GE	NEXT:RETURN	CI
•610 RETURN	MO	•930 REM STAR SPRITES	BD
•620 REM CUSTOM CHARACTERS	DM	•940 DATA0,16,0,0,16,0,0,16	LK
•630 FORI=0TO46:READA:POKE828+I,A:CK=CK+A	EF	•950 DATA0,0,084,0,1,85,0,0	NA
:NEXT	JJ	•960 DATA84,0,0,16,0,0,16,0	FI
•640 IFCK<>6871THENPRINT"ERROR IN LINES[3	JJ	•970 DATA0,16,0,0,0,0,0,0	FG
"."]":END	EG	•980 DATA0,0,0,0,0,0,0,0	FG
•650 SYS828	CK	•990 DATA0,0,0,0,0,0,0,0	FG
•660 FORI=10240+0TO10240+175:READA:POKEI,	MG	•1000 DATA0,0,0,0,0,0,0,0	PD
A:NEXT	DK	•1010 DATA0,0,0,0,0,0,0,0	FC
•670 POKE53272,(PEEK(53272)AND240)OR10:RE	PJ	•1020 DATA0,4,0,0,4,0,0,4	HG
TURN	OH	•1030 DATA0,0,21,0,0,4,0,0	EO
•680 DATA120,165,1,41,251,133,1,169,0,133	KJ	•1040 DATA4,0,0,4,0,0,0,0	FG
,251,133,253,169,40,133,252,169,208,133	MD	•1050 DATA0,0,0,0,0,0,0,0	FG
•690 DATA254,162,8,160,0,177,253,145,251,	OC	•1060 DATA0,0,0,0,0,0,0,0	FG
136,208,249,230,252,230,254,202,208,240	GJ	•1070 DATA0,0,0,0,0,0,0,0	FG
•700 DATA165,1,9,4,133,1,88,96	PN	•1080 DATA0,0,0,0,0,0,0,0	FG
•710 REM *** CHARACTER DATA ***	FI	•1090 DATA0,0,0,0,0,0,0,0	PD
•720 DATA56,124,102,227,231,126,56,48,31,	HC	•1100 DATA0,16,0,0,16,0,1,17	PD
17,11,28,56,232,200,248	FK	•1110 DATA0,0,0,0,1,17,0,0	KA
•730 DATA56,124,248,204,222,255,99,0,140,		•1120 DATA16,0,0,16,0,0,0,0	OP
222,63,63,62,204,128,0		•1130 DATA0,0,0,0,0,0,0,0	FG
•740 DATA 255,255,255,255,255,255,255,255		•1140 DATA0,0,0,0,0,0,0,0	FG
•750 DATA195,195,195,255,255,243,243,243,		•1150 DATA0,0,0,0,0,0,0,0	FG
24,24,24,28,28,28,28,28		•1160 DATA0,0,0,0,0,0,0,0	FG
•760 DATA126,126,48,48,56,56,56,56,254,19		•1170 DATA0,0,0,0,0,0,0,0	PD
8,192,252,6,134,198,254		•1180 DATA0,32,0,0,84,0,0,32	AC
•770 DATA255,255,155,219,219,219,195,195,		•1190 DATA0,0,32,0,1,221,0,0	OH
127,127,96,96,126,112,112,127		•1200 DATA32,0,0,32,0,0,84,0	LC
•780 DATA127,127,99,96,112,115,115,127,12		•1210 DATA0,32,0,0,0,0,0,0	HC
7,103,103,99,99,99,127,127		•1220 DATA0,0,0,0,0,0,0,0	FG
•790 DATA126,70,70,127,127,99,99,99,62,54		•1230 DATA0,0,0,0,0,0,0,0	FG
,54,127,115,115,115,115		•1240 DATA0,0,0,0,0,0,0,0	FG
•800 DATA254,198,198,255,255,195,195,255,		•1250 DATA0,0,0,0,0,0,0,0	PD
99,99,99,127,28,28,28,28		•1260 DATA0,16,0,0,84,0,1,17	DG
•810 DATA12,12,12,12,14,206,206,254,127,1		•1270 DATA0,0,84,0,0,16,0,0	JO
27,99,99,115,115,115,115		•1280 DATA0,0,0,0,0,0,0,0	FG
•820 DATA127,99,99,115,115,115,115,127		•1290 DATA0,0,0,0,0,0,0,0	FG
•830 DATA96,96,112,112,112,112,126,126,23		•1300 DATA0,0,0,0,0,0,0,0	FG
0,230,230,230,102,36,60,60		•1310 DATA0,0,0,0,0,0,0,0	FG
•840 REM *** READ SPRITE DATA ***		•1320 DATA0,0,0,0,0,0,0,0	FG
•850 FORS1=12288TO12350:READD1:POKES1,D1:		•1330 DATA0,0,0,0,0,0,0,0	PD
NEXT		•1340 DATA0,16,0,0,16,0,0,16	BD


```

FT$(MSG$,I)
•2160 GOSUB2090
•2170 PRINT"[DOWN][DOWN][YELLOW]"LEFT$(AU
T$,I)
•2180 FORT=1TO15:NEXTT:NEXTI
•2190 PRINT"[DOWN][DOWN][12"[RIGHT]]NRLG
EJM GMP P/R"
•2200 GETGA$:IFGA$=""THEN2200
•2210 IFGA$="Y"THENR=0:PRINT"[CLEAR]":GO
TO40
•2220 IFGA$="N"THENSYS64738
•2230 GOTO2200
•2240 REM VICTORY R[016]INE
•2250 POKEV+21,0:PRINT"[CLEAR]"
•2260 MSG$="[4" "]IFHHFLR: H G N M[3" "]H
J N M K E"
•2270 AUT$="[11" "]KLRSFGFLR: UFKGLMP"
•2280 FORI=1TOLEN(MSG$)
•2290 PRINT"[HOME][WHITE]";LEFT$(CR$,5)LE
FT$(MSG$,I)
•2300 GOSUB2090
•2310 PRINT"[DOWN][DOWN][YELLOW]"LEFT$(AU
T$,I)
•2320 FORT=1TO15:NEXTT:NEXTI
•2330 PRINT"[DOWN][DOWN][8"[RIGHT]]** HL
TNM HPHGJI HNUJS **"
•2340 PRINT"[DOWN][DOWN][12"[RIGHT]]LMJH
H:"XX
•2350 PRINT"[DOWN][DOWN][12"[RIGHT]]GFLJ
:";TI$;" KJRGLRH"
•2360 PRINT"[DOWN][DOWN][12"[RIGHT]]NRLG
EJM GMP P/R"
•2370 GOTO2200

```

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BF •155 REM: ***BILLBOARD*** IC
FK •160 : DI
•165 GOSUB700:GOSUB555:PRINT:PRINT:PRINTF
CA $TAB(12)NA$:GOSUB680 AI
ND •170 PRINTC2$RO$TAB(13)" WHICH GAME? ":PR
INT:PRINTTAB(8)"301 "RO$" <1> "; DO
FG •175 PRINTRF$" OR 501 "RO$" <2> ":PRINT DD
ED •180 GETK$:K=VAL(K$):IFK<10RK>2THEN180 CL
•185 IFK=1THENGA=301:GOTO195 JJ
FK •190 GA=501 NI
PJ •195 PRINTRO$TAB(7)" NUMBER OF PLAYERS? " MM
EJ RF$" (1-7)"
AK •200 GETK$:Z=VAL(K$):IFZ<10RZ>7THEN200 LK
AP •205 GOSUB585 DI
•210 : DI
MN •215 REM: ***SCREEN PRINT*** OJ
FI •220 : DI
GL •225 POKEBC,1:PRINTH$RO$"[12" "]"NA$"[8" DB
"]":REM* -11- AND -8- SPACES DE
BF •230 PRINTC5$RO$" PLAYER NUMBER "RF$PP;
FK •235 PRINTC3$RO$TAB(20)" DART NUMBER[3" " JP
]"RF$TH
CA •240 PRINTC4$RO$" ROUND SCORE[3" "]"RF$RS CE
ND ;
•245 PRINTC1$RO$TAB(20)" ROUND NUMBER "R NF
HI F$RD
OG •250 PRINTC2$RO$" CURRENT SCORE "RF$TP(PP DD
);
•255 PRINTC6$RO$TAB(20)" # OF PLAYERS "R DA
LB FSZ:GOSUB680:FORK=1TOZ:CC=K+1:POKECL,CC
FG •260 PRINTRO$TAB(21)" PLAYER # "RF$K;:PRI MF
NTTP(K):NEXT:GOSUB680
EJ •265 PRINTC4$TAB(1)A$:PRINT:PRINTF$TAB(7) FP
SN$:PRINT:PRINTC4$TAB(4)B$:PRINT
•270 IFTH>3THENGOSUB640:FORK=1TO9:POKEV+K PJ
,0:NEXT:GOSUB585:GOTO225
•275 POKE198,0:GOSUB640:PRINTC5$"PRESS "R CI
O$F$"<KEY>"RF$C5$" TO TOSS"
•280 : DI
JM •285 REM: ***THROW SEQUENCE*** NO
DI •290 : DI
KL •295 FORK=1664TO1683:POKEK,32:NEXT:FORK=1 AG
DI 744TO1763:POKEK,32:NEXT
•300 FORK=1824TO1843:POKEK,32:NEXT:IFTH=1 DO
THENQ=4:W=5:Y=215:G=6:GOTO315
•305 IFTH=2THENQ=6:W=7:Y=211:G=14:GOTO315 IC
ML •310 IFTH=3THENQ=8:W=9:Y=219:G=30 NG
•315 POKEV+21,G:POKEV+23,2:POKEV+29,28:FO JO
LC RK=1TOZ:IFK=PPTHECC=K+1:GOTO325
•320 NEXT IA
MJ •325 POKEV+40,11:FORK=41TO43:POKEV+K,CC:N KE
EXT:POKEV+2,255:POKEV+3,90
IM •330 FORL=90TO110:POKEV+Q,30:POKEV+W,L:IF BN
PEEK(198)=1THEN350
FA •335 FORT=1TO10:NEXTT:NEXTL PH
DI •340 FORL=110TO90STEP-1:POKEV+Q,30:POKEV+

```

ENGLISH DARTS FROM PAGE 60

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•100 REM: ***ENGLISH DARTS***
•105 :
•110 REM: ***INITIALIZATION***
•115 :
•120 C$=CHR$(147):D$=CHR$(17):H$=CHR$(19)
:F$=CHR$(144):RF$=CHR$(146):RO$=CHR$(18)
•125 C1$=CHR$(28):C2$=CHR$(30):C3$=CHR$(3
1):C4$=CHR$(156):C5$=CHR$(158):BC=53280
•130 C6$=CHR$(159):V=53248:CL=646:S=102:N
A$="*ENGLISH DARTS*":A$="":SN$="":B$=""
•135 RD=1:POKE53281,1:POKEBC,9:FORK=0TO62
:READA:POKE832+K,A:NEXT
•140 FORK=0TO62:READA:POKE896+K,A:NEXT:FO
RK=49152TO49245:READA:POKEK,A:NEXT
•145 POKE49152+19,0:POKE2041,13:POKE2042,
14:POKE2043,14:POKE2044,14:SYS49152
•150 :

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W,L:IFPEEK(198)=1THEN350
•345 FORT=1TO10:NEXTT:NEXTL:GOTO330
•350 FORK=1904TO1923:POKEK,32:NEXT:POKEV+
Q,0:POKEV+W,0:POKE198,0:POKEV+21,G
•355 FORK=30TOY:POKEV+Q,K:POKEV+W,L:NEXT:
GOSUB660:R=N:GOSUB660:D=N
•360 A=0:FORK=80TO99:A=A+1:IFL=KTHEN380
•365 NEXT
•370 A=21:FORK=101TO110:A=A-2:IFL=KTHEN38
0
•375 NEXT:IFL=100THENA=50
•380 IFA=50THENB=A:A$="YOU THREW A[3".]"
:SN$="BULLSEYE!":GOTO405
•385 IFA=RANDB=DTHENB=A*3:A$="YOU THREW A
TRIPLE":GOTO400
•390 IFA=RTHENB=A*2:A$="YOU THREW A DOUBL
E":GOTO400
•395 B=A:A$="YOU THREW A SINGLE"
•400 SN$=STR$(A)
•405 B$="FOR"+STR$(B)+" POINTS":TP(PP)=TP
(PP)+B:RS=RS+B
•410 IFTP(PP)=GATHENFORK=1TO9:POKEV+K,0:N
EXT:GOTO475
•415 IFTP(PP)>GATHENFORK=1TO9:POKEV+K,0:N
EXT:GOTO440
•420 TH=TH+1:GOTO225
•425 :
•430 REM: ***BROKE STATEMENT***
•435 :
•440 POKEBC,2:GOSUB700:GOSUB555:GOSUB680
•445 PRINTC4$TAB(14)"YOU THREW"B:PRINT:PR
INTTAB(18)"AND":PRINT
•450 PRINTF$TAB(14)"B*R*O*K*E!!":PRINTC4$
:GOSUB640:TP(PP)=TP(PP)-B
•455 RS=0:TH=1:GOSUB585:FORK=1TO9:POKEV+K
,0:NEXT:GOTO225
•460 :
•465 REM: ***WINNER STATEMENT***
•470 :
•475 POKEBC,5:GOSUB700:GOSUB555:GOSUB680:
PRINTC4$TAB(5)NA$ " WINNER IS[3".]"
•480 PRINT:GOSUB640:PRINTF$TAB(10)"PLAYER
NUMBER"PP:PRINT
•485 PRINT:PRINTC4$TAB(8)"SEE FINAL SCORE
S? (Y/N)"
•490 GETK$:IFK$=""THEN490
•495 IFK$="Y"THENPP=Z:NU=1:GOTO585
•500 IFK$="N"THEN515
•505 IFK$<>"Y"ORK$<>"N"THEN490
•510 GOSUB680
•515 PRINT:PRINTC5$RO$TAB(10)" PLAY AGAIN
? "RF$" (Y/N)"
•520 GETK$:IFK$=""THEN520
•525 IFK$="Y"THENCLR:GOTO120
•530 PRINTC$:GOSUB680:PRINTC2$TAB(12)NA$:
PRINT:PRINTTAB(17)"E*N*D":GOSUB640

```

```

IG •535 POKEV+21,0:PRINTC$:END
GC •540 :
•545 REM: ***SPRITE LOGO***
NO •550 :
•555 POKEV+21,30:POKEV+23,2:POKEV+29,28:P
OKEV+40,12:POKEV+41,11:POKEV+42,12
IF •560 POKEV+43,15:POKEV+2,180:POKEV+3,100:
LD POKEV+4,144:POKEV+5,104:POKEV+6,147
IA •565 POKEV+7,111:POKEV+8,142:POKEV+9,118:
LB RETURN
NP •570 :
•575 REM: ***NEXT PLAYER/BOX SCORE SUBROU
TINE***
HC •580 :
BL •585 POKEBC,5:GOSUB700:GOSUB555:TH=1:RS=0
:PP=PP+1:IFPP>ZTHEN600
JP •590 GOSUB680:PRINTC2$TAB(8)"PLAYER NUMBE
R"FP$PP;:PRINTC2$ "UP NEXT":GOSUB640
IG •595 FORK=1TO9:POKEV+K,0:NEXT:A$="":SN$="
":B$="":PRINTC$:RETURN
NC •600 PRINT:PRINT:PRINTC2$RO$TAB(4)" PLAYE
R NUMBER "TAB(25)" POINTS ":PRINT:PRINT
PJ •605 FORK=1TOZ:CC=K+1:POKECL,CC:PRINTTAB(
10)K;:PRINTTAB(26)TP(K):PRINT:NEXT
GP •610 PRINTH$:FORK=1TO22:PRINTD$;:NEXT:PRI
NTH$RO$TAB(12)" PRESS ANY KEY "
HO •615 POKE198,0:WAIT198,1:POKE198,0:RD=RD+
DI 1:PP=0:IFNU=1THENGOSUB700:GOTO510
KH •620 GOTO585
DI •625 :
PG •630 REM: ***TIME DELAY SUBROUTINE***
OL •635 :
•640 FORT=1TO1500:NEXT:RETURN
CH •645 :
•650 REM: ***RANDOM SUBROUTINE***
BA •655 :
DI •660 N=INT(20*RND(0))+1:RETURN
HK •665 :
DI •670 REM: ***CENTER SUBROUTINE***
•675 :
LB •680 PRINTH$:FORK=1TO15:PRINTD$;:NEXT:RET
URN
AA •685 :
•690 REM: ***BORDER SUBROUTINE***
CC •695 :
HM •700 PRINTC$:POKECL,7:FORK=1024TO1063:POK
ND EK,S:NEXT:FORK=1024TO1984STEP40:POKEK,S
IB •705 NEXT:FORK=1063TO2023STEP40:POKEK,S:N
FF EXT:FORK=1984TO2023:POKEK,S:NEXT:RETURN
CO •710 :
•715 REM: ***DATA***
NJ •720 :
GO •725 DATA0,16,0,0,56,0,0,85
PI •730 DATA0,0,146,0,1,17,0,2
•735 DATA56,128,5,85,64,8,146,32
JE •740 DATA17,85,16,34,56,136,127,255

```

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FK •745
DI •750
MJ •755
DI •760
•765
OO •770
•775
MJ •780
•785
FE •790
DI •795
•800
AL •805
DI •810
•815
DI •820
•825
FI •830
•835
NL •840
•845
KM •850
•855
FM •860
IN
LP
DE
DI
NO
DI
ME
DI
KH
DI
BA
DI
ND
DI
CN
DI
KI
DI
FO
EN
DI
PI
DI
AJ
CC
CC
AK
•10 P
1:PO
•20 D
•30 D
•40 D
•50 D
•60 D
•70 D
•80 D
173,0
•90 D
,233,
•100 F
•110 S
•120 G
•130 G
•140 P
•150 X
•160 S
•170 P
•180 F
160
•190 P
•200 F
EU+33
•210 P

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•745 DATA252,34,56,136,17,85,16,8
 •750 DATA146,32,5,85,64,2,56,128
 •755 DATA1,17,0,0,146,0,0,84
 •760 DATA0,0,56,0,0,16,0,0
 •765 DATA0,0,0,0,0,0,0,0
 •770 DATA0,0,0,0,0,0,0,0
 •775 DATA0,0,0,0,240,0,0,127
 •780 DATA0,0,63,254,0,31,255,255
 •785 DATA63,254,0,127,0,0,254,0
 •790 DATA0,0,0,0,0,0,0,0
 •795 DATA0,0,0,0,0,0,0,0
 •800 DATA0,0,0,0,0,0,173,21
 •805 DATA192,141,22,192,120,169,24,141
 •810 DATA20,3,169,192,141,21,3,88
 •815 DATA96,5,0,20,0,0,206,22
 •820 DATA192,208,61,173,21,192,141,22
 •825 DATA192,173,33,208,41,15,141,20
 •830 DATA192,160,0,132,251,169,216,133
 •835 DATA252,238,23,192,173,23,192,41
 •840 DATA1,170,177,251,41,15,205,19
 •845 DATA192,240,5,205,20,192,208,5
 •850 DATA189,19,192,145,251,200,208,234
 •855 DATA230,252,165,252,201,220,208,226
 •860 DATA76,49,234,52

BI E54272+U+39,14:NEXT JO
 EO •220 POKE53281,1 AE
 GO •230 FORU=0T014STEP2:POKEU+VIC,(U*18):NEX MN
 OL T CI
 FG •240 POKE2040,203 BP
 FG •250 POKEVIC+28,34:POKEVIC+37,5:POKEVIC+3 KL
 FE 8,5 GN
 FM •260 FORU=40T047:POKEVIC+U,5:NEXT MN
 DN •270 POKEVIC+21,255 NI
 FG •280 FORI=1T07:POKE2040+I,202:NEXT ED
 FG •290 DI=254 LB
 DG •300 X=150:DI=0 CK
 EM •310 POKEVIC,X:TI\$="[6"0"]":A\$(2)="FAST[6 LM
 JK " "]" GJ
 IP •320 A\$(3)="REAL FAST ":A\$(4)="VERY FAST! MH
 PI " EK
 AM •330 A1=PEEK(VIC+30):FORI=0T024:POKE54272 OG
 BI +I,0:NEXT HA
 KB •340 POKE54296,15:POKE54273,0:POKE54277,8 KD
 KC 5:POKE54278,85:POKE54276,129 GP
 MB •350 A\$(1)="WHOA[6"!"]":G=2:A\$(5)="TOO FA ML
 IF ST ! OE
 PM •360 I=0:A=INT(RND(1)*7)+1:IFPEEK(VIC+(A* CP
 ON 2)+1)>240THENI=1 BJ
 •370 A1=PEEK(VIC+30)AND1:IFA1THEN1790 CN
 •380 IFBR=0THENPOKE856,G PI
 •390 IFBR=0THENIF(PEEK(56321)AND16)=0THEN ND
 POKE856,1:BR=1:GOSUB2280 DF
 •400 IFBRTHENDI=DI-1 BF
 •410 IFBRTHENIF(PEEK(56321)AND16)=16THEN LF
 OKE856,G:BR=0:POKE54276,129:GOSUB2310 IB
 •420 DI=DI+1:PRINT"[RVSON][HOME][RIGHT]EN MH
 D OF SLOPE:[4" "][4"[LEFT]]"]400-DI"[LEF IJ
 T] FT.";:IFDI=>400THEN1520 AN
 •430 IFTI\$="[4"0"]11"THENENG=3 OM
 •440 IFTI\$="[4"0"]49"THENENG=4 OG
 •450 PRINTTAB(20);"[RVSON][RIGHT]SPEED:"; KP
 A\$(PEEK(856)); CJ
 •460 PRINT"[HOME][DOWN][DOWN]"TAB(34)"TIM
 E: AN
 •470 PRINT"[DOWN]"TAB(33);"[RVSON]"TI\$ " DF
 •480 POKE54272,G*30+20 BF
 IO •490 IFTI\$="[5"0"]9"THENPRINT"[HOME][4"[D
 IA OWN]"]"TAB(8);"SLOPE STEEPENING! LF
 CG •500 IFTI\$="[4"0"]47"THENPRINT"[HOME][4"[
 FK DOWN]"]"TAB(8);"SLOPE STEEPENING! IB
 JC •510 IFTI\$="[4"0"]12"THENPRINT"[HOME][4"[
 FL DOWN]"]"TAB(8);"[17" "]" MH
 CK •520 IFTI\$="[4"0"]50"THENPRINT"[HOME][4"[
 AG DOWN]"]"TAB(8);"[17" "]" IJ
 •530 IFI=0THENGOTO360 AN
 HA •540 POKE2040+A,202 OM
 KK •550 POKEVIC+(A*2)+1,0 OG
 •560 A1=PEEK(VIC+30)AND1:IFA1THEN1790
 HJ •570 POKE54272,PEEK(856)*12 KP
 •580 GOTO360 CJ

SKI FOLLY FROM PAGE 67

•10 PRINT"[CLEAR]":POKE53281,1:POKE53280,
 1:POKE52,60:POKE56,60 BO
 •20 DATA 120,169,73,141,20,3,169,3,141 FA
 •30 DATA 21,3,88,96,169,208,133,252,169 LD
 •40 DATA 3,133,251,162,1,160,0,177,251 FN
 •50 DATA 105,1,144,2,169,251,145,251,224 NC
 •60 DATA 7,240,8,232,230,251,230,251,24 NO
 •70 DATA 144,234,173,1,220,41,15,201 LK
 •80 DATA 11,240,7,201,7,240,16,76,49,234,
 173,0,208,201,32,240,246,206,0,208 OK
 •90 DATA 24,144,240,173,0,208,201,255,240
 ,233,238,0,208,24,144,227,0,0,0,0,0 EA
 IO •100 FORU=828T0921:READQ:POKEU,Q:NEXT
 IA •110 SYS 828:POKE53248+21,0:VIC=53248
 CG •120 GOSUB600
 FK •130 GOSUB1260
 JC •140 POKE856,2
 FL •150 X5=RND(-SQR(RND(1)*TI))
 CK •160 S=53248:PRINT"[CLEAR][BLACK]
 AG •170 POKE53281,3
 HA •180 FORU=1024T01063:POKEU,160:POKEU+960,
 160
 KK •190 POKE54272+U,6:POKE54272+U+960,6:NEXT
 •200 FORU=1024T01984 STEP40:POKEU,160:POK
 EU+33,160:POKEU+39,160
 HJ •210 POKEU+54272,14:POKE54272+U+33,14:POK

•590 REM ---- OPENING SCREEN ----	IJ	B+W+29,6:NEXT	HC	•144
•600 PRINT"[CLEAR]	FH	•1040 PRINT"[15"[DOWN]]"[15"[RIGHT]]"[BLA	DC	•145
•610 DATA 0,0,0,0,0,0,0,0	GK	CK]PRESS [RVSON]FIRE[c 7]	KC	-[
•620 DATA 0,63,198,3,127,230,3,192	BE	•1050 GETA\$:IFA\$=""THEN1050	LA	ART
•630 DATA 6,24,192,6,48,192,6,99	FH	•1060 POKEVIC+21,0:FORU=0TO14:POKEU+VIC,0	LA	•146
•640 DATA 255,230,195,127,247,131,0,55	PG	:NEXT	LA	SB+
•650 DATA 3,0,55,3,0,55,131,0	PB	•1070 POKEVIC+23,0:POKEVIC+29,0:PRINT"[CL	KO	•147
•660 DATA 54,195,0,54,99,127,230,51	FP	EAR]":POKE53280,0:RETURN	KN	T
•670 DATA 255,198,27,0,0,0,0,0	OJ	•1080 FORI=202*64TO204*64+62	AK	•148
•680 DATA 0,0,0,0,0,0,0,0	GK	•1090 READQ:POKEI,Q:NEXT:RETURN	GA	•149
•690 DATA 0,0,0,0,0,0,0,0	GK	•1100 DATA 0,16,0,0,40,0,0,84,0	BC	,16
•700 DATA 0,255,198,192,255,198,192,192	JN	•1110 DATA 0,170,0,1,85,0,2,170,128	IE	•150
•710 DATA 6,192,192,6,192,192,6,192	FP	•1120 DATA 5,85,64,2,170,128,5,85,64	GI	•151
•720 DATA 254,6,192,254,6,192,192,198	JI	•1130 DATA 10,170,160,21,85,80,10,170,160	AM	•152
•730 DATA 211,193,230,211,195,54,211,194	NB	•1140 DATA 21,85,80,42,170,168,0,56,0	IF	•153
•740 DATA 22,211,195,54,211,193,230,211	GD	•1150 DATA 0,56,0,0,56,0,5,85,64	MK	•154
•750 DATA 192,198,207,0,0,3,0,0	DL	•1160 DATA 42,128,168,0,0,0,0,0,0	LG	•155
•760 DATA 3,255,255,254,127,255,252,0	EJ	•1170 DATA 0,0,62,0,0,127,0,0,127	AI	•156
•770 I=200:GOSUB780:GOTO790	GJ	•1180 DATA 0,2,62,0,4,28,0,24	LC	•157
•780 FORU=I*64TOI*64+63:READQ:POKEU,Q:NEX	GN	•1190 DATA 127,128,24,255,192,45,190,96	DI	•158
T:RETURN	AK	•1200 DATA 71,62,48,130,62,80,0,62	NF	•159
•790 I=201:GOSUB780	FK	•1210 DATA 56,0,190,16,4,118,8,6	EF	•160
•800 POKE2040.200:POKE2041.200:POKE2042.2	JA	•1220 DATA 54,4,3,54,2,1,182,0	FG	•161
01:VIC=53248	PN	•1230 DATA 0,230,0,0,99,0,0,49	IO	•162
•810 POKEVIC+21,6:POKEVIC+29,7:POKEVIC+23	LD	•1240 DATA 128,0,24,192,0,0,0,0	IM	•163
,7	LG	•1250 RETURN	AG	•164
•820 POKEVIC+2,136:POKEVIC+4,188	MA	•1260 REM ---- INSTRUCTIONS ----	CA	•165
•830 POKEVIC+41,14:POKEVIC+40,14	PN	•1270 PRINT"[c 7][CLEAR]":A1=PEEK(56321)A	JA	MAD
•840 POKEVIC+3,0:POKEVIC+5,0	LD	ND16:IFA1=0THEN1260	9	•166
•850 S=54272:POKES+24,15:POKES+5,85:POKES	LG	•1280 POKE856,0	HK	•167
+6,85:POKES+12,85:POKES+13,86	MA	•1290 POKEVIC+23,0:POKEV+29,0	KK	0
•860 POKES+4,33:POKES+11,17	PN	•1300 POKE53281,6:FORI=12TO27:POKE1064+I,	AA	•168
•870 IFPEEK(VIC+3)=>127THENPOKEVIC+1,PEEK	GE	160:POKE1064+I+160,160:NEXT	JB	5
(VIC+3):GOTO900	NE	•1310 FORI=1064TO1064+160STEP40:POKEI+12,	AL	•169
•880 POKES+1,128-PEEK(VIC+3):POKES+8,128-	CP	160:POKEI+27,160:NEXT	FN	2
PEEK(VIC+5)	JF	•1320 PRINT"[DOWN]"TAB(14);"[c 8][12"[c @	AL	•170
•890 GOTO870	OM	]"":PRINTTAB(14);"[RVSON]INSTRUCTIONS"	FN	5
•900 POKEVIC,PEEK(VIC+2):POKEVIC+21,5:POK	FO	•1330 PRINT"[6"[DOWN]]"[c 7] [YELLOW]YOU	KK	•171
EVIC+1,127:POKEVIC+39,6	CK	'RE ON A SKI VACATION AT THE MT.	KK	2
•910 IFPEEK(VIC+5)>=127THEN940	EH	•1340 PRINT" KENDALL SKI LODGE. YOU FIN	KK	+12,
•920 POKES+8,128-PEEK(VIC+5)	FL	D THAT YOU	KK	•172
•930 GOTO910	LB	•1350 PRINT" HAVE ACCIDENTALLY GOTTEN ON	KK	•173
•940 POKE856,0:POKEVIC+41,6:POKEVIC+5,127	BE	"CHR\$(34)"DEAD	KK	•174
•950 POKES+24,0	CF	•1360 PRINT" MAN'S SLOPE"CHR\$(34)"[4"!"	KK	•175
•960 FORU=0TO5:FORE=0TO14:POKEVIC+39,E:PO	KB	YOU MUST USE	JN	•176
KEVIC+41,E:NEXTE,U:GOSUB1080	ML	•1370 PRINT" YOUR LIMITED SKIING ABILITI	AM	•177
•970 POKE53254,171:POKE53255,200:POKE5325	MP	ES TO	DF	•178
7,100:POKE53256,171:POKE2044,204	OF	•1380 PRINT" SAVE YOUR LIFE !	NF	•179
•980 POKE2043,203:POKEVIC+21,13+16		•1390 PRINT" [3"[DOWN]]"[7"[RIGHT]]"[RVS	HE	•180
•990 POKEVIC+42,12:POKEVIC+43,10		ON][WHITE]THIS IS YOU:[RVSOFF]"	AJ	•181
•1000 POKE198,0:FORDL=1TO400:NEXT		•1400 PRINTTAB(22);"[UP][c @][c @][s M]	IO	•182
•1010 SB=1024:CB=SB+54272:FORI=10TO29:POK		•1410 PRINTTAB(22);"[c T][c T][s N]":VIC=		•183
ESB+I+160,160:POKECB+I+160,6		53248		
•1020 POKESB+I+880,160:POKECB+I+880,6:NEX		•1420 POKEVIC+5,104:POKEVIC+4,170:POKE204		
T:FORI=4TO22:W=I*40:POKESB+W+10,160		2,202:POKEVIC+41,0		
•1030 POKECB+W+10,6:POKESB+W+29,160:POKEC		•1430 POKEVIC+21,5:POKE2040,203		

•1440 POKEVIC,235:POKEVIC+1,200	HG	•1840 FORI=200TO251:POKE53249,I:NEXT	FD
•1450 PRINT"[c 8][DOWN][10"[RIGHT]]PRESS -[WHITE][RVSON]FIRE[RVSOFF][c 8]- TO ST ART	EJ	•1850 POKE856,1:T\$=TI\$:POKES+4,0	EJ
•1460 SB=1024:CB=54272+SB:FORI=0TO39:POKE SB+I,160:POKECB+I,7	AI	•1860 FORY=32TO50:POKE2040,Y:NEXT	MM
•1470 POKESB+I+960,160:POKECB+I+960,7:NEX T	CF	•1870 POKEVIC+21,254	GO
•1480 FORI=0TO960STEP40	CL	•1880 S=54272:POKES+24,15:POKES+5,85:POKE S+1,1:POKES+4,17	JE
•1490 POKESB+I,160:POKECB+I,7:POKESB+I+39 ,160:POKECB+I+39,7:NEXT	MH	•1890 FORDL=1TO200:NEXT:POKES+4,16:FORDL= 1TO200:NEXT:POKES+4,0	NL
•1500 A=PEEK(56321)AND16:IFATHEN1500	FK	•1900 PRINT"[HOME][4"[DOWN]]"TAB(8);"[4" "]YOU CRASHED! "	NK
•1510 PRINT"[CLEAR]":POKEVIC+21,0:RETURN	HF	•1910 POKE54276,0	PI
•1520 REM ---- YOU MADE IT ----	PO	•1920 PRINT"[DOWN][DOWN]"TAB(13)"GAME OVE R!":PRINT"[DOWN][DOWN]"TAB(13)"PRESS [RV SON]FIRE[RVSOFF]	LL
•1530 POKEVIC+11,0:POKE2045,204	GE	•1930 POKES+4,0:POKES+4,33:POKES+5,85:POK ES+24,15	MB
•1540 T\$=TI\$	PL	•1940 A1=PEEK(56321)AND16:POKE53280,RND(1) *16	FD
•1550 POKEVIC+21,252	GA	•1950 SC=ABS(INT(((300-VAL(T\$))*DI)/2)):I FDI=400THENSC=SC+500	DF
•1560 IFPEEK(VIC+5)=<50THEN1560	HM	•1960 A=INT(RND(1)*7)+1:IFPEEK(VIC+(A*2)+ 1)=251THENPOKEVIC+(A*2)+1,0	EH
•1570 SP=53251:FORU=1TO7	EO	•1970 IFA1THEN1940	HN
•1580 IFU=5THEN1600	DJ	•1980 POKE56321,0:POKE53280,0	CL
•1590 POKESP,0	KG	•1990 POKES+24,0	FL
•1600 SP=SP+2:NEXT	JG	•2000 POKE53281,14	EB
•1610 IFPEEK(VIC+11)=<150THEN1610	LL	•2010 POKEVIC+21,0	PM
•1620 POKE856,2	JC	•2020 A1=PEEK(56321)AND16:IFA1=0THEN2020	HC
•1630 IFPEEK(VIC+11)=<179THEN1630	PE	•2030 PRINT"[CLEAR][6"[DOWN]][11" "][WHI TE]YOUR SCORE:"SC	PK
•1640 POKE856,0	JA	•2040 IFSC=>HSTHENHS=SC	LB
•1650 PRINT"[HOME][4"[DOWN]]"TAB(9);"YOU MADE IT !	AC	•2050 PRINT"[BLUE][DOWN][DOWN][11" "]BEST SCORE:"HS	CC
•1660 H1(1)=25:L1(1)=30:H2(1)=18:L2(1)=20 9	KP	•2060 PRINT"[DOWN][DOWN][4"[RIGHT]]"[BLUE][7" "]WOULD YOU LIKE TO	DN
•1670 H1(2)=33:L1(2)=135:H2(2)=25:L2(2)=3 0	HC	•2070 PRINT"[DOWN][4"[RIGHT]]"[11" "]PLAY AGAIN?	BC
•1680 H1(3)=42:L1(3)=62:H2(3)=31:L2(3)=16 5	OP	•2080 PRINT"[DOWN][WHITE][RIGHT][RIGHT][1 4" "][RIGHT]Y / N	AH
•1690 H1(4)=50:L1(4)=60:H2(4)=37:L2(4)=16 2	LJ	•2090 PRINT"[HOME][18"[DOWN]]"[14"[RIGHT] "][CYAN] [RVSON] [YELLOW][RVSOFF][UPARR OW][RVSON][CYAN][3" "] [YELLOW] [CYAN] [R VSOFF]	CG
•1700 H1(5)=42:L1(5)=62:H2(5)=31:L2(5)=16 5	LD	•2100 A4=1761:A5=1765	CA
•1710 H1(6)=50:L1(6)=60:H2(6)=37:L2(6)=16 2	LF	•2110 A=A4	GL
•1720 S=54272:POKES+5,85:POKES+6,85:POKES +12,85:POKES+13,85	OP	•2120 A1=PEEK(56321)AND15	FL
•1730 POKES+24,15:POKES+4,33:POKES+11,17	JO	•2130 IFA1=11THENA=A4	CB
•1740 FORX=1TO6:POKES,L1(X):POKES+1,H1(X) :POKES+7,L2(X):POKES+8,H2(X)	HH	•2140 IFA1=7THENA=A5	PI
•1750 IFH1(X)=50THENFORT=1TO200:NEXT	PG	•2150 POKEA4,32:POKEA5,32:POKEA,30	EN
•1760 FORT=1TO200:NEXT:NEXTX	LM	•2160 A1=PEEK(56321)AND16:IFA1THEN2120	AA
•1770 FORD=0TO24:POKES+D,0:NEXT	ME	•2170 IFA=A4THEN130	CG
•1780 GOTO1920	FJ	•2180 POKE198,0:FORI=1TO30:PRINT"[DOWN][W HITE]";:NEXT	NG
•1790 REM ---- YOU CRASHED! ----	PC	•2190 END	IC
•1800 POKE856,0:S=54272:POKES,240:POKES+1 ,33:POKES+5,8:POKES+22,104:POKES+23,1	HI	•2200 DATA 0,0,56,0,0,248,0,1	NE
•1810 POKES+24,79	JH	•2210 DATA 248,0,3,240,0,7,224,0	PB
•1820 POKES+4,129:FORDL=1TO100:NEXT:POKES +4,128	DI		
•1830 POKE856,1	JD		

- 2220 DATA 15,224,0,31,192,0,63,192
- 2230 DATA 0,63,128,0,127,0,0,127
- 2240 DATA 0,0,254,0,0,252,0,0
- 2250 DATA 124,0,0,112,0,0,0,0
- 2260 DATA 1,192,0,3,224,0,3,224
- 2270 DATA 0,3,224,0,1,192,0,0
- 2280 POKE54276,0:POKE54277,144:POKE54276

- HE ,33:POKE54276,32:POKE54278,144
- GM •2290 POKE54273,20
- GC •2300 RETURN
- AB •2310 POKE54276,0:POKE54276,129
- IE •2320 POKE54273,0:POKE54277,85
- EK •2330 RETURN

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SCUTTLEBUTT

Continued from page 14

Apple II+ compatible non-decoded 8-bit peripheral slot.

The system enables your 1541 or 2030 disk drive to read and write all standard Apple II+ media. You can automatically or manually select C-64 or Apple II+ formats while reading or writing.

Of open architecture design, the Spartan has 64K and a 6502A, 1 MHz processor, and is upgradable to 65816 (16 bit).

Other features include an Apple II+ switching power supply, shared resource capabilities, automatic or manual video and audio switching, mixed video capabilities, compatibility with standard audio cassette decks, and user-assignable system commands and coprocessing capabilities.

For all its many features, we don't expect the Spartan to found an empire. Two and a half years ago, when C-64 software was still relatively scarce, Mimic might have found many takers for a device that provided access to the thousands of Apple programs on the market. But we all know what happened in the two and a half years since then. Still, *Ahoy!* will provide a detailed review of this long-awaited product soon after we receive our evaluation unit.

Mimic Systems (see address list, this page).

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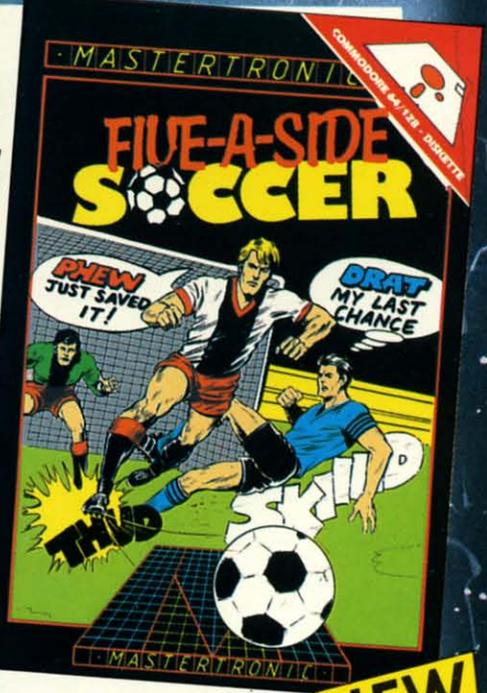
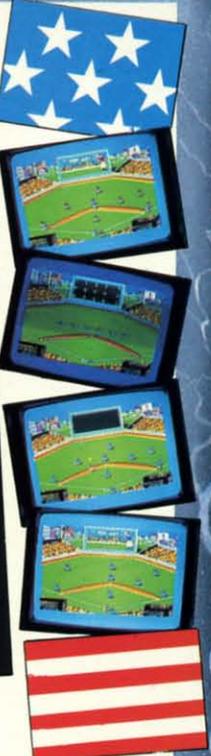
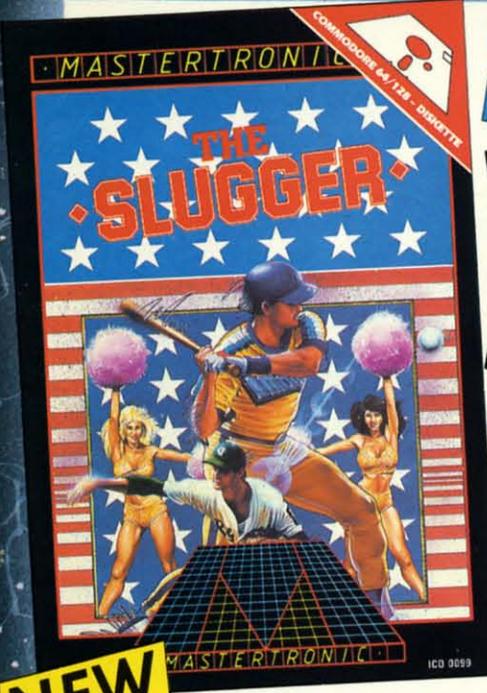
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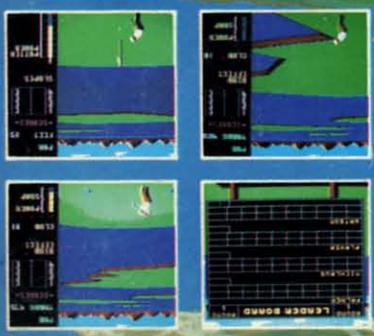


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