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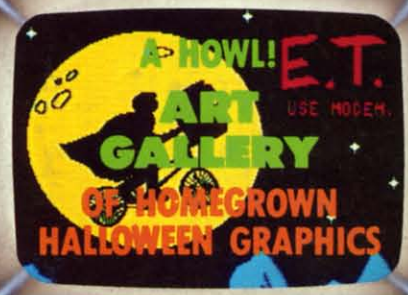

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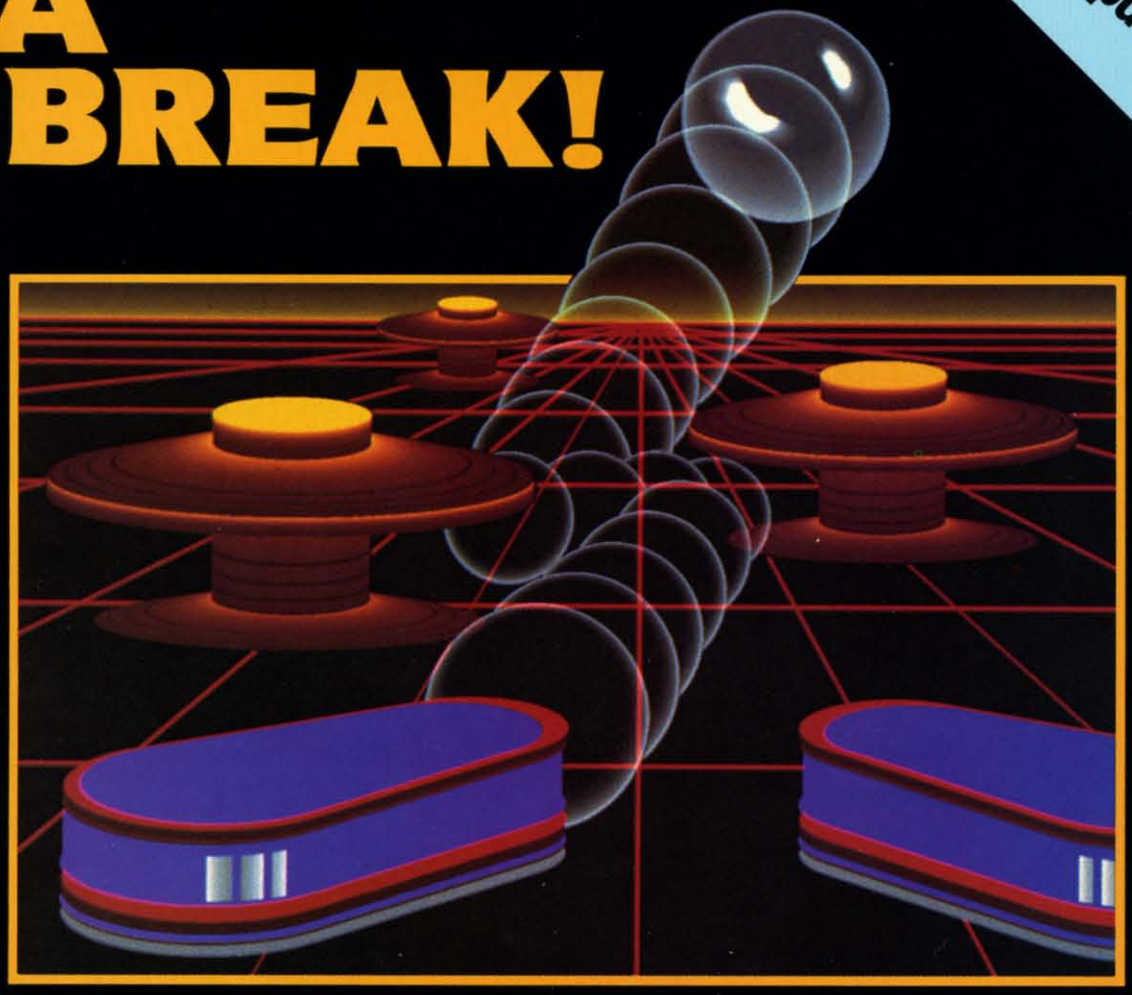

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VIEW FROM THE BRIDGE

A competitor of ours recently ran an editorial page explaining why their magazine had shrunk to 96 pages. Not that any explanation was really necessary--obviously, business had gone a little sour. Nor is any explanation really necessary for us this issue as we jump to 146 pages--business is going through the roof!

And we're not through yet. Premiering next issue will be an eight-page monthly addition that will make the best Commodore magazine on the market better still!

In order to provide our copious monthly collection of programs and articles geared to the more serious Commodore user, we've historically neglected some of the elementary aspects of Commodore home computing—among them, entertainment software. But now that we've grown in size we're going to correct that fault, with a monthly entertainment software section edited by *Ahoy!* game reviewer Arnie Katz, founder and former editor of *Electronic Games* magazine. Beginning next month, *Ahoy!* will feature more complete game coverage than any other Commodore magazine!

For this month, though, we'll have to content ourselves with leading the field in every *other* aspect of Commodore home computing, with articles and programs like the following:

Continuing his series on sprite programming, *Creating Your Own Games* columnist Orson Scott Card tells you how to create animated cartoon characters that are *Alive and in Living Color.* (Turn to page 18.)

Dale Rupert continues doing some of the most original work in computer magazines today with *Infinitesimal Intrigue,* computer simulations of sub-microscopic activity. (Turn to page 51.)

As the debate over copy protection continues, let's take a month off to learn what makes it tick with George Trepal's *Copy Protection: The Guarded Secrets.* Included is *Disk Error Checker,* a program that allows you to examine copy protection schemes. (Turn to page 59.)

It may sound like a cheap motel, but *ShadeyDump* is actually a boon to graphic artists, permitting them to dump multicolor screens in shades of black and white. (Turn to page 93.)

Mystery at Mycroft Mews is a murderously entertaining adventure game for the 64. (Turn to page 29.)

Shotgun takes its name from the speed with which programs can be loaded and run from the disk menu it generates. (Turn to page 97.)

The 1541 Disk Drive Cleaning Utility is a necessary complement to the many drive-cleaning disks on the market. (Turn to page 107.)

The leading playing card manufacturers begged us not to print it, but *Solitaire* appears in this issue anyway. It plays so much like the real game, you may never buy another deck of cards! (Turn to page 37.)

Gravinauts requires you to fight for survival in the hostile environment of the planet Arkion. (Turn to page 32.)

Maestro simplifies making and editing music on the C-64. (Turn to page 39.)

Mark Andrews continues to put the power of machine language under your control with this month's installment of Commodore Roots, dealing with performing single bit manipulations on binary numbers. (Turn to page 103.)

Our popular *Cadet's Column* continues this issue, with advice to beginning Commodore computerists on organizing their workspace while the organizing is good. (Turn to page 109.)

Also inside is a special *Scuttlebutt* report on Commodore's new Amiga computer; a modest first installment of *Tips Ahoy!,* our new programming hints column; *Reviews* of *Beach-Head II, Isepic, FAST-HACK'EM,* and other recent Commodore releases; the latest monthly batch of *Commodares;* and many other surprises.

Meanwhile, we dedicate this largest issue in *Ahoy!* history to you, the loyal readers who made our success happen. As long as you continue to support us, we'll continue to support you, with the best we can deliver, month after month.

—David Allikas

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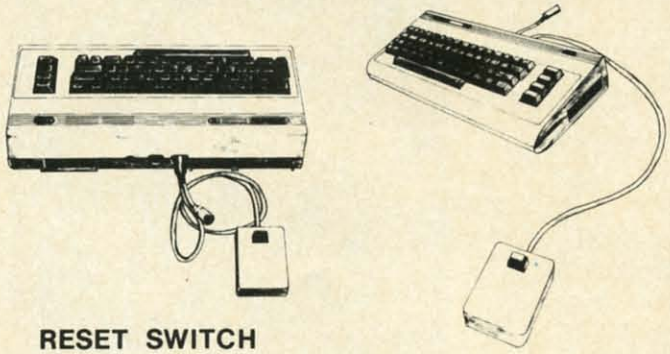

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UNVEILING THE AMIGA

By Tom Benford / *Ahoy!* Business Press Correspondent

NEW YORK (July 24, 1985)—The long-awaited Commodore Amiga made its official debut last night. The coming-out party was very similar to a debutante's ball—the trappings and festivities of the occasion fully befitted this dazzling new machine.

The event was held in Manhattan's Lincoln Center. Several celebrities, including Andy Warhol and Debbie Harry, participated in showing off the machine's fantastic graphic capabilities. But the real star of the evening was the Amiga itself. The power, features, and performance of the machine are all truly stellar in scope. It was exciting to be there, to be among the first people to get a look at what personal computing will be like in the future.

The Amiga is obviously intended to do battle with the Macintosh and IBM-PC/AT in the personal computer market. Several speakers at the presentation mentioned superior features of the Amiga in direct comparison to these competitive machines. The Amiga's creators have endowed it with impressive armor that should be able to withstand repeated jousts with Big Blue and the Mac.

Unlike the PETs, VIC, C-64, Plus/4, C-16, "B" series, or even the C-128 computers, which utilize an 8-bit microprocessor, the Amiga's heart is a Motorola 68000 16/32-bit CPU—the same as the Macintosh. The PC uses an 8/16-bit chip, the Intel 8088; the AT is driven by an 8/24-bit CPU, the Intel 80286.

The Mac and IBMs rely heavily on the CPU to handle many mundane chores, such as graphics mapping, controlling the I/O ports, and managing keyboard input and functions; these necessary tasks all sap strength, speed, and power from the CPU. Since less of the CPU's power is available for actual computations, the microprocessor is never fully available to the user—he must share the CPU with the machine itself. The Amiga makes a radical departure from such "traditional" task-networking at this point; the prospect of having the 68000 totally available for use is positively awesome. The Amiga's heart is strong, fast (7.8 MHz), and accessible.

The soul, however, comes from three independent, dedicated VSLI chips. One handles the audio/sound capabilities, disk control, and other I/O functions; another chip handles the graphics screen mapping and sprites; the third custom chip takes care of the Amiga's dual animation capabilities. All the while the CPU is barely used, which leaves its power available for data handling and computing—this remarkable engineering feat is what sets the Amiga apart from the competition.

But that's only the tip of the iceberg. Though jaded from witnessing the introduction of several "revolutionary" computers first-hand, I was genuinely excited by the Amiga. And the more I saw, the more excited I grew. With the introduction of the Amiga, we're into a whole new ballgame of personal computing. "Wow!" was an utterance used very frequently by myself and others who attended the Amiga's premier. And the "wows" continued throughout the 2-hour presentation of the machine; the more I saw and heard, the better it got.

Out of the box the Amiga comes with 256K RAM and 192K ROM. Like the Mac, the Amiga's RAM can be "hardware" expanded to 512K (Tecmar already has a 1MB expansion module available); it also handles external hard-disk expansion up to 8MB. Wow!

The Amiga comes equipped with a built-in 3.5" disk drive which has a formatted capacity of 880K, more than double that of the Mac and PC. Additionally, RS232, parallel, and serial ports are all standard on the machine. Wow!

Three video output formats are supported by the Amiga: RGB, composite, and color TV; the high-resolution mode yields an incredible 640x 400 pixel display; any 16 of the Amiga's 4,096 colors may be displayed at one time. It's important to note that multiple windowing is also supported, and each window may display its own set of 16 colors; an impressive demonstration of this capability displayed all 4,096 colors on the screen simultaneously. Double wow!

In the music and sound depart-

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ments, the Amiga is in a class by itself. A built-in four-voice synthesizer with stereophonic output capability only belies the aural goodies available within the machine. Add built-in voice synthesis with unlimited text-to-speech capabilities, MIDI compatibility, full polyphonic capabilities with superior synthesis features, and you have a machine which the competition can't even come close to. The Mac can support four voices by sapping the CPU heavily; the PC and AT offer only single-voice sound. None have speech synthesis capabilities. Wow!

An 89-key keyboard with numeric keypad is the standard input device on the Amiga; in contrast, the Mac sports only 58 keys while the PC and AT provide 82 and 84 keys respectively. The Amiga also handles input from a two-button mouse, joystick, light pens, and a host of external input devices including video digitizers, audio A/D (analog to digital) converters, MIDI-equipped instruments, and numerous other input/control devices either already available or nearing completion.

Microsoft developed the powerful dialect of BASIC supplied with the Amiga. All of the computer's abundant features and capabilities—sound, music, speech, graphics, animation, windowing, etc.—are directly accessible through BASIC programming. Additional programming languages for the Amiga include Pascal, C, Logo, Lisp, Assembler, and others. The machine is very flexible as to which programming language is used, since all languages—including BASIC—are disk-based and are booted into the system prior to use.

Another highly innovative feature of the Amiga is that it uses a "kick-start" disk to configure and control the machine. Unlike a boot disk which places the operating system directives into RAM memory locations, the "kick-start" disk addresses the three custom-designed VSLI chips solely, leaving the machine's entire 256K of RAM available for use. Wow, again!

Since the CPU's computing power is available to do useful work at all times, multitasking is a powerful reality on the Amiga. An impressive demonstration of multitasking was provided by having word processing, data sorting, animated graphics, business graphics, sound, and spreadsheet programs all running simultaneously within the Amiga's multiple windows. While we witnessed this very busy display, we were told that less than 9% of the 68000 CPU's power was being utilized—trying to imagine what you could do with the remaining 91%+ simply boggles the mind. No wow—utterly speechless this time!

The Amiga includes 256K of ROM, built-in 3.5" drive (format capacity of 880K), and parallel, serial, and RS232 ports. It has 4 voices, 4096 colors, and a 640X400 pixel display. But can it type? Yes—with an 89-key keyboard that includes a numeric keypad. Scheduled for September release, at a price of $1295. READER SERVICE NO. 192

With a suggested retail price of $1,295 and September availability, the Amiga has without a doubt broken new ground on the scene of personal computing. Optional equipment including an ultra-high-res monitor, hard-disks, tape back-ups, modems, laser videodisc controllers, video interfaces and digitizers, and external musical keyboards, promise to shatter the creative chains that have hindered computers and users in the past.

The Amiga can even be de-tuned to emulate an IBM. A demonstration of this was provided in grandiose style in keeping with the theme of the evening. A PC Emulator program was booted via the 3½" built-in drive and, lo and behold, the PC-DOS message visible on the screen indicated that the Amiga had just changed its normal way of doing things to conform to the IBM standard. Another disk was inserted into the drive, and the word "lotus" entered at the "A>" prompt. We waited in suspense for several seconds while the screens of the three large video monitors in the theatre remained blank. Then a comment from Bob Parasal, one of the Amiga's patriarchs: "Lotus 1-2-3 takes just as long to load on the Amiga when it is emulating a PC as it does on a PC!" The opening screen and spreadsheet video display of Lotus's best-selling program became visible on the giant screens. Parasal commented dryly, "You'll notice the display looks identical to the PC...same flavor...standard IBM vanilla," referring to the white characters on black background.

Software support was evidenced by such companies as Arktronics, Broderbund, Mindscape, Electronic Arts, EasyWare, Metacomco, Cherry Lane Technologies and others (see below). The features and creative

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freedom the Amiga affords programmers are such to make it a hit among software developers, which will insure its success in the marketplace.

As far as pushing the state-of-the-art in personal computers goes, the Amiga is what the world—myself included—has been waiting for. Congratulations to everyone who had a hand in making the Commodore Amiga a reality, and good luck on your beautiful new baby.

AMIGA SOFTWARE

The New York Times reported that the Amiga's premier was attended by a meager contingent of committed developers. We can only assume that the reporter who covered the event for that esteemed publication was attending his first computer introduction. The amount of software and hardware displayed or announced at the Amiga's coming out party is staggering compared to that available for any new micro within memory—so much that we have room for only the briefest description of each.

Available upon Amiga introduction:

The Amiga Eye, a color video digitizer of monochrome or color images that lets the user vary hue, saturation, and luminance, as well as brightness over the computer's range of 4,000-plus colors. (A-Squared Systems Group, 7200 Sayre Drive, Oakland, CA 94611.)

Textcraft, a word processor with four type styles, three fonts, and six templates of pre-formatted documents. (The Arktronics Corporation, 520 East Liberty St., Ann Arbor, MI 48104.)

Graphicraft, a paint and art program driving 32 high resolution colors that lets users airbrush with variable density and diameter, spread color, repeat objects, and cycle colors; *Moviecraft*, an animated drawing program that uses a "tweening" technique to produce animated sequence without having to read from a disk; and *Presentationcraft*, a business graphics program that lets you produce 3D objects, and explode and expand bar and pie charts. (Island Graphics Corporation, One Harbor Dr., Sausalito, CA 94965.)

Lattice C Compiler, allowing programs designed for other PC operating systems to work on the Amiga; *Lattice C Cross Compiler/IBM MS-DOS*, allowing Amiga programs to run on the IBM PC; *Lattice C Cross-Compiler/UNIX* (Amiga programs on UNIX), *Lattice C Cross-Compiler/VAX* (Amiga programs on VAX); *LMK*, a development tool similar to UNIX-Mate; *LSE*, a multi-language screen editor; and *TMN*, providing text management utilities for searching simple or complicated files. (Lattice, Inc., P.O. Box 3072, Glen Ellyn, IL 60138.)

TLC-Logo, for programming in LISP and AI (artificial intelligence). (The Lisp Company, 430 Monterey Ave., #4, Los Gatos, CA 95030.)

Amiga Assembler/Linker, a Motorola standard macro-assembler with a corresponding linker; *Cambridge LISP 68000*, a language for use in artificial intelligence; *Metacomco BASIC*, a BASIC interpreter; *Amiga DOS*, a multitasking operating system; and *MCC Pascal 6800*, a full ISO 7185 standard Pascal single pass compiler. (Metacomco, 201 Hoffman Ave., Monterey, CA 93904.)

ABasiC, a language exploiting most of the Amiga's advanced features, including multiple windows, animation, four-voice sound, and menus. (Microsoft Corporation, 10700 Northup Way, Bellevue, WA 98009.)

Deja Vu, a graphics text adventure set in 1940's Hollywood; and *Amiga Tutor*, a chapter-by-chapter look at the machine's major features. (Mindscape, Inc., 3444 Dundee Road, Northbrook, IL 60062.)

Enable/Write, an advanced word processor for professional users. (The Software Group, Northway Ten Executive Park, Ballston Lake, NY 12019.)

T-Card, an expansion card with up to 1MB of memory featuring a serial port, clock/calendar with battery backup, hard disk interface, parallel printer port, and additional power supply; *T-Disk*, a 20MB 3.5-inch hard disk drive; *T-Modem*, Hayes-compatible with 300, 1200, and 2400 baud rates; and *T-Tape*, a 20MB tape backup for a hard disk drive. (Tecmar, 6225 Cochran Rd., Solon, OH 44139.)

The following were scheduled for August release:

RAGS to RICHES Ledger, a double-entry ledger handling up to 5,000 accounts/10,000 transactions. (Chang Laboratories, Inc., 5300 Stevens Creek Blvd., San Jose, CA 95129.)

Harmony, utilizing artificial intelligence to create musical accompaniment that follows the musician's tempo. (Cherry Lane Technologies, 110 Midland Ave., Port Chester, NY 10573.)

Penmouse Input Device, emulating both a mouse and a graphics tablet. (Kurta Corporation, 4610 South 35th St., Phoenix, AZ 85040.)

Scheduled for September release: *RAGS to RICHES Payables* and *RAGS to RICHES Receivables*, which can integrate with each other and with *Ledger*, described above. (Chang Laboratories, Inc.)

Dr. J & Larry Bird Go One-on-One and *Seven Cities of Gold*, en-

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hanced version of the popular games. (Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403.)

The following from the Infocom canon: *Zork I, II,* and *III, Enchanter, Sorcerer, Suspect, The Witness, Cutthroats, Deadline, Seastalker, Infidel, Planetfall, Suspended, Starcross, Invisi Clues,* and *The Hitchhiker's Guide to the Galaxy.* (Infocom, Inc., 125 CambridgePark Drive, Cambridge, MA 02140.)

CalCraft, a spreadsheet with pull-down menus and flexible formatting options. (Synapse Software, 5221 Central Ave., Richmond, CA 94804.)

RAGS to RICHES Sales, a register program for point-of-sale income accounting (integratable with other *RAGS to RICHES* programs described above). (Chang Laboratories, Inc.)

Texture, a modular music recording program. (Cherry Lane Technologies.)

Archon and *Skyfox*, two more game adaptations. (Electronic Arts.)

Musicraft, which turns the Amiga into a synthesizer and sequencer. (Everywhere, Inc., P.O. Box 3418, Northridge, CA 91323.)

Enable/Calc, a spreadsheet with Lotus-like macros and over 50 math functions. (The Software Group.)

Telecraft, a communications and terminal emulation package. (Software 66, 3119 East Des Moines, Mesa, AZ 85203.)

Scheduled for November release:

The Print Shop, presumably an enhanced version. (Broderbund Software, 17 Paul Dr., San Rafael, CA 94903.)

Deluxe Video Construction Set, for creating animated business graphics with sound effects; and *Marble Madness* and *Return to Atlantis.* (Electronic Arts.)

Enable/File, a database manager that can handle up to 1301 bytes of information with over 26 fields per record. (The Software Group.)

Scheduled for December release:

Enable/The Office Manager, consisting of integrated word processing, spreadsheet, database, telecommunications, and graphics programs. (The Software Group.)

Scheduled for the nebulous "4th quarter 1985":

The Helley Project: A Mission in Our Solar System, playable with joystick or mouse; and *Keyboard Cadet.* (Mindscape, Inc.)

Radar Raiders, a flight simulation game with 3D imaging, color graphics with shading, hidden surface removal and patterning in real time. (SubLOGIC Corporation, 201 West Springfield Ave., Suite 1001, Champaign, IL 61820.)

Scheduled for 1st quarter 1986:

Turbo Pascal, a single-pass, native code compiler. (Borland International, 4585 Scotts Valley Drive, Scotts Valley, CA 95066.)

Sargon III, chess simulation with nine levels of play. (Hayden Software Company, 600 Suffolk St., Loweil, MA 01854.)

And for January 1986:

Scorewriter, allowing musicians to score and print music. (Cherry Lane Technologies.)

BridgePro®

BridgePro is the first program I've seen that provides a challenge for the average-to-excellent bridge player. . . The documentation is excellent and allows a new bridge player to learn the basics.
—Harvey Bernstein, Antic Magazine, Feb. 1985

After having tried three other bridge programs, I find that BridgePro is indeed a pro game. . . It is designed for both the beginner and the advanced player. . . I didn't find anything that could be improved upon.
—Helen Garret, Apple-Dayton Journal, March 1985

If you like to play bridge and don't have three other players ever-eager to play, this software is a must. For bridge freaks it's good enough to justify buying a computer . . . Whether you are a "master" or a beginner, this is great software.
—Christian Basler, NY Commodore Users Group Review, Sept. 1984

BridgePro is designed to let you learn, improve, or just enjoy the card game of bridge. The program provides complete bidding, play and scoring for 1 or 2 players. Features include random hands, bidding help, demonstration mode, hand replay/quit, best hand, auto finish, duplicate mode, and fast machine language speed.

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SP-1200 Plus has German, Spanish, Italian, Swedish, Danish fonts. READER SERVICE NO. 193

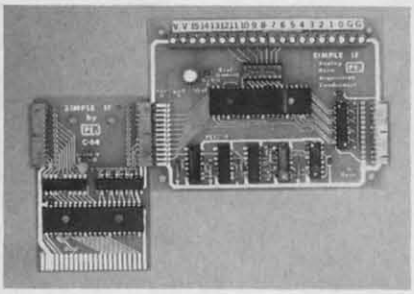
SAKATA PRINTER

Sakata's SP-1200 Plus printer offers 120 character per second speed, double-print and near letter quality modes, and the capacity to print eight international character fonts. Price will be $359.00.

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

OUTSIDE WORLD INTERFACES

Two devices designed to link your Commodore computer with the outside world:



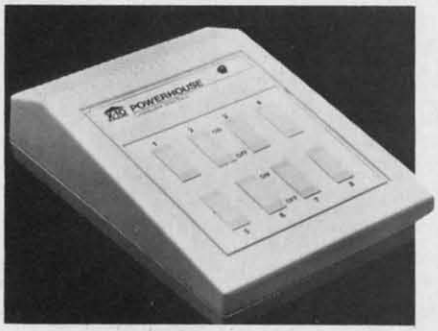
Proteus' Simple IF & conditioner. READER SERVICE NO. 194

With an X-10 Powerhouse in your C-64's user port, you can automatically control up to 72 lights, appliances, heating and air conditioning units, and other electrical devices. The unit contains its own microprocessor, and memory backed up by a battery that can sustain it without AC power for more than 100 hours. Price of interface, software disk, and connecting cable is $120.

X-10 (USA) Inc., 185A Legrand Ave., Northvale, NJ 07647 (phone: 201-784-9700).

Enabling VIC 20, C-64, and C-128 users to digitize 16 channels of analog signals (and thus use their computers to perform heating/cooling/solar control, voltage measurement, weather station monitoring, and other tasks), the Simple Interface Analog Data Acquisition System consists of the Simple IF card and the Analog Data Acquisition Conditioner. Price is under $100; demo disk is $9.95. Other plug-in conditioning boards are also available.

Proteus Electronics Inc., Spayde Road RD2, P.O. Box 693, Bellville, OH 44813 (phone: 419-886-2296).



X-10 Powerhouse handles 72 appliances. READER SERVICE NO. 195

C-128 80-COLUMN ADAPTER

Cardco's C-128/80 video adapter cable will enable the Commodore 128 to output 80-column monochrome displays to any standard composite video monitor. (The unaided C-128 will output to non-RGB monitors only in 40-column mode.) The 5' cable, which connects to the computer's RGB port and the monitor's video input jack, will sell for $9.95.

Also coming from Cardco: a 32K printer buffer that wil return the computer to the C-64, C-128, C-16, or Plus/4 user up to 15 times sooner than when you send data directly to the printer.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202 (Phone: 316-267-6525).

ENGINEERING PROGRAM

Intended to make life easier for engineers, technicians, and students, BAMTEK's *Professional Electronic Engineering Software* for the C-64 provides electronic circuit analysis, neg/pos feedback active filters, frequency response plots, and a polynomial root finder. Price is $39.95 plus $1.95 shipping (CA residents add 6% sales tax).

BAMTEK, 1541 N. China Lake Blvd., Suite 584, Ridgecrest, CA 93555 (phone: 619-446-5311/ext. 584).

$4.95 SOFTWARE

Hoping to singlehandedly drive software pricing down several strata, Green Valley Publishing is offering a number of disks for the C-64, each containing three programs, at $4.95-$9.95 each. Available at K-Mart (under the name Load 'N' Go!), Target Stores (as One-Step Software), and other chains, current titles include the following:

Games: *Championship Gambler, Bits, Pieces & Clues, Board Game Challengers, Star Trek Evolution, Maze Madness, Board Games I, Chess Champion, Adventure Master.*

Utilities: *Home Financial Organizer I, My C-64 Computer Tutor, Pro Financial Organizer II, Home Property Manager, Home Income Manager, Personal Spreadsheet, Personal File Keeper, Recipe Box, Word Writer.*

Green Valley Publishing, Inc., 7122 Shady Oak Road, Minneapolis, MN 55344 (phone: 612-829-0398).

BOOK RELEASES

Commodore 64 Assembly Language Arcade Game Programming includes advice on topics like the use of macros and subroutines, and entering graphics data by use of a graphics tablet. Two sample games are included. $14.45 from TAB Books Inc., Blue Ridge Summit, PA 17214 (phone: 717-794-2191).

The *Minute Manual for the Dot Matrix Printer* guides the non-programmer through buying, using, and understanding a dot matrix printer. $12.95 plus $2 shipping from MinuteWare, P.O. Box 2392, Columbia, MD 21045 (phone: 301-995-1166).

Epson, Epson, Read All About It! teaches the user the ins and outs of his Epson or Epsonworkalike printer. $14.95 from Addison-Wesley General Publishing Group, Reading, MA 01867 (phone: 617-944-3700).

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Timeworks' C-64 spreadsheet, word processor, and database manager stepped up to 128 capability. READER SERVICE NO. 196

THREE 128 UTILITIES

Timeworks, Inc. has announced enhanced C-128 versions of three C-64 products, each at $69.95:

Word Writer 128 includes an 85,000-word spell checker, a 5-function calculator, and word processing features like document chaining, form letter printout, page separations, and horizontal/vertical scrolling.

Data Manager 128 includes report-writing and label-making capabilities, in addition to search, sort, and chart functions.

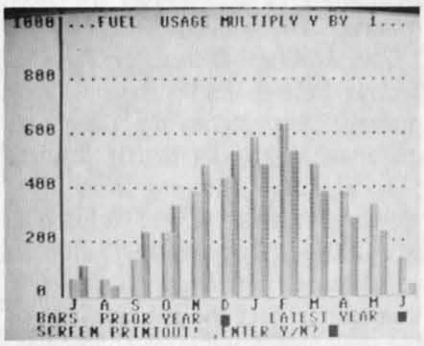
Swiftcalc 128, incorporates the *Sideways* vertical spreadsheet printing utility (see Aug. '85 *Scuttlebutt*).

Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015 (phone: 312-948-9200).

ENERGY USE ANALYZER

Energy Manager lets C-64 users analyze use of heating and cooling energy in homes and buildings by comparing utility bills for the same months in different years. Information is displayed in tabular and bar chart form. Price of $39.95 includes shipping and handling.

Powerline Software, P.O. Box 635, New Hartford, NY 13413 (phone: 315-735-0836).



Analyze energy use in homes, buildings. READER SERVICE NO. 197

HOME BUDGET SOFTWARE

Plan Ahead consists of three integrated modules, each of which accounts for inflation: *Retirement Planning, Life Insurance Planning,* and *College Funding.* Price of any one module is $29.95, any two $49.95, and all three $59.95.

Advanced Financial Planning, 20922 Paseo Olma, El Toro, CA 92630.

Timeworks has released *Sylvia Porter's Personal Financial Planner* and scheduled for fall release the second in the series—*Sylvia Porter's Personal Investment Manager.* Both for the 64; $59.95 each.

Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015 (phone: 312-948-9200).

Completing the series begun last year, *J.K. Lasser's Your Money Manager* provides a check writer, financial statements, balance sheets, and budget reports. If records are kept accurately all year, they can be downloaded to *J.K. Lasser's Your Income Tax* (1986 version available in December) which will calculate a return in a single step. Price of each C-64 program is $69.95.

Simon & Schuster Electronic Publishing Group, 1230 Ave. of the Americas, New York, NY 10020 (phone: 212-245-6400).

Lifeplan is designed to help middle-income families control and eliminate debts, increase savings, and improve their financial security. A 100% money-back guarantee is included. For the C-64; $99.95.

Lifeware, 2318 Second Ave., Seattle, WA 98121 (phone: 206-322-5454).

Lifeplan: *for middle-income families.* *READER SERVICE NO. 198*

Sylvia Porter: *first in a series.* *READER SERVICE NO. 199*

SUPER PASCAL

A complete Pascal development system for the C-64 and C-128, *SUPER Pascal* includes a source file editor with renumber, auto, find, and other functions, an assembler for optionally coding in machine language routines, and a comprehensive utility package. The program utilizes a DOS that speeds up 1541 read and write operations by 300%. Included for the $59.95 price is a handbook of over 200 pages.

Abacus Software, 2201 Kalamazoo S.E., P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).

PAPER AIRPLANE MAKER

Why settle for one of the numerous slight simulation programs on the market when your C-64 will now let

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you pilot an actual craft? Based on the famous book, *The Great International Paper Airplane Construction Kit* is a set of over a dozen paper airplane templates (to be printed and folded) and a library of aeronautical art for the wings and fuselage, including logos, rockets, and windows. Scheduled for fall release; $24.95.

Simon & Schuster Electronic Publishing Group, 1230 Ave. of the Americas, New York, NY 10020 (phone: 212-245-6400).

The 10' grounding cord of the Model 9250 is fastened to a 3.5' right angle strip extension that folds down and underneath the keyboard. The cord's opposite end should be fastened to a suitable ground. READER SERVICE NO. 200

ANTI-STATIC STRIP

The First Touch Model 9250 Keyboard Strip ($19.95) sticks to your Commodore (or other microcomputer keyboard, where by touching it periodically you help prevent equipment malfunction due to operator-induced static electricity. No, it isn't magic—it's attached to a 10' grounding cord.

3M, P.O. Box 33600, St. Paul, MN 55133-3600 (phone: 612-736-2355).

PROVOICE

The second generation of Genesis' COMvoice speech synthesizer, ProVoice features an unlimited English vocabulary, screen echoing (allowing almost any BASIC program to become a talking program), and variable translation modes for conversational, verbatim, and character by character speech output. Thirteen new BASIC commands can be accessed with a single keystroke.

The plug-in device contains a built-in speaker/amplifier. New BASIC commands and text-to-speech translation are handled by onboard ROM, eliminating the need to load additional software.

Price of ProVoice will be $99.95; a complete talking telecommunications package consisting of ProVoice, a 300 baud auto-dial/auto-answer modem, and communications software will sell for under $150. (A Talking Word Processor will be available from Genesis by year-end.)

Genesis Computer Corporation, Ben Franklin Technology Center, Lehigh University, Bethlehem, PA 18015 (phone: 215-861-0850).

ProVoice: 13 new BASIC commands. READER SERVICE NO. 201

MOBILE ROBOT KIT

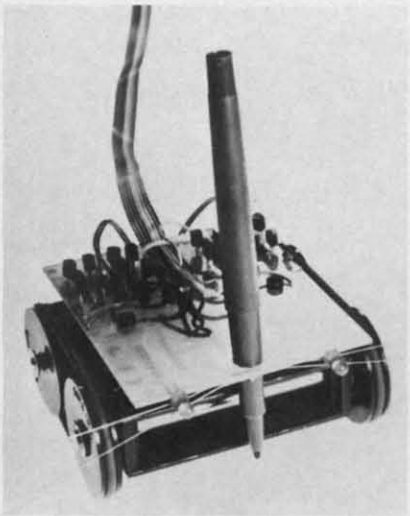
The latest in the Movit family of robot kits (see next issue's feature on *Robotics and the Commodore User*), WAO (Wise, Argent, Orb) includes a microcomputer chip that stores a system program in ROM (2K) and a user program in RAM (128 X 4 bits). The robot can solve high-grade problems and (via the penholder in the center of its mechanism) perform graphics.

OWI Inc., 1160 Mahalo Place, Compton, CA 90220 (phone: 213-638-4732).

Also to be included in next month's robotics feature, the Versatile Mobile Robot Kits from Spectron Instrument include computer interface circuits for the C-64 or VIC 20 that provide remote manipulative output (specify computer when ordering). Pictured is the basic Micro-Kitten.

Base list price is $80 (assembled, $120); with radio control, $195 (assembled, $330). Postage included.

Spectron Instrument, Robot Div., MS 22, 1342 W. Cedar Ave., Denver, CO 80223 (phone: 303-744-7088).



Micro-Kitten: robot for C-64/VIC 20. READER SERVICE NO. 202

BETTER WORKING WORD PROCESSOR

The *Better Working Word Processor* pre-announced in July's *Scuttlebutt* (see page 10) has been released by Spinnaker. The program includes a 50,000-word spellchecker based on the American Heritage Dictionary. For the C-64; $49.95.

Through the Christmas Season, Spinnaker will offer consumers a free Spinnaker product of their choice when they purchase any three of the 50 products offered by Spinnaker's five brands: Spinnaker, Fisher-Price, Telarium, Windham Classics, and Better Working. Details can be found inside appropriately marked packages or with your dealer.

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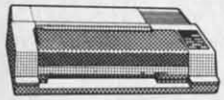

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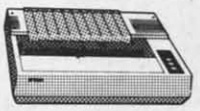

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NEW GAME RELEASES

Infocom's new introductory level fantasy, *Wishbringer,* plunks you down in a town whose locales and inhabitants have disappeared or been changed into sinister new forms—the doing of the Evil One and her henchmen, the Boot Patrol. Worse yet, they've kidnapped a cat, which you must rescue while avoiding the villains. Aiding you is the Wishbringer stone, granting you seven wishes under the proper circumstances. For the 64; $34.95.

Infocom, Inc., 125 Cambridge Park Drive, Cambridge, MA 02140 (phone: 617-492-6000).

Scheduled for fall release are three war simulations for the 64 from MicroProse: *Acrojet, The Advanced Flight Simulator; GunShip, The Daring Attack Helicopter Simulation;* and *Silent Service, The Submarine Simulation.*

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

Two introductory-level strategy contests for the C-64 from SSI, each $39.95.

Colonial Conquest recreates the struggle for world dominance waged in the late 1800's and early 1900's by Germany, France, England, Japan, Russia, and the United States. The computer controls countries not represented by a player.

A solitaire WWII game, *Panzer Grenadier* depicts platoon/company level warfare between the Germans and the Russians on the Eastern Front. Five scenarios are included, each lasting 1-2 hours.

Strategic Simulations Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043-1983 (phone: 415-964-1353).

Powerline Casino Roulette allows for most styles of play popular in European and American casinos. On cassette or disk for the C-64; $39.95 (free shipping in Continental US).

Powerline Software, P.O. Box 635, New Hartford, NY 13413 (phone: 315-735-0836).

Included with* Wishbringer: *a map of the town, a sealed special delivery letter, and* The Legend of Wishbringer, *a booklet explaining how to use your seven Magick wishes. READER SERVICE NO. 203

The Wizards have announced that the Cubological Formulation (also known as Rubik's Cube, etc.) will be released in the form of a game for the C-64 by Christmas.

The Wizards, P.O. Box 7118, The Woodlands, TX 77387.

Incorporating 50 animated screens, *Maxwell Manor* requires you to solve the mystery of the previous owner's murder. The man-eating bugs in the garden and the huge spiders downstairs number among your obstacles. For the C-64; $25.00.

Microcomputer Games (division of The Avalon Hill Game Company), 4517 Harford Road, Baltimore, MD 21214 (phone: 301-254-5300).

Onscreen wheel of* Casino Roulette. *READER SERVICE NO. 204

EDUCATION PROGRAMS

Ten new C-64/C-128 compatible releases from Learning Technologies:

In the Early Learning Series are five programs for prekindergartners through second graders: *The Flying Carpet* (shape recognition), *Let's Go Fishing* (number recognition), *How to Weigh an Elephant* (ordering and sequencing), *Learning to Add and Subtract,* and *Clowning Around* (visual memory skills).

The Thinking Strategies Series also consists of five programs, these designed to develop problem-solving skills through observation, deduction, and evaluation: *Scrambled Eggs, Sliding Block, Monkey Business, Speedy Delivery,* and *Alpine Train Ride.*

Learning Technologies, Inc., 4255 LBJ, Suite 131, Dallas, TX 75224 (phone: 214-991-4958).

ED SOFTWARE NEWSLETTER

Though the flood of educational software releases have tapered off to a trickle, *The New England SoftNews* will advise users and parents on what's newest and best in home educational programs for children, high schoolers, and adult self-improvers. The newsletter is published six times a year.

New England Software Company, P.O. Box 1154, Kennebunkport, ME 04046 (phone: 207-967-5977).

MIDI PRODUCTS

The latest releases in the burgeoning field of MIDI (Musical Instrument Digital Interface) products for the 64, allowing your computer to interface with MIDI-equipped electronic instruments:

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Continued on page 98

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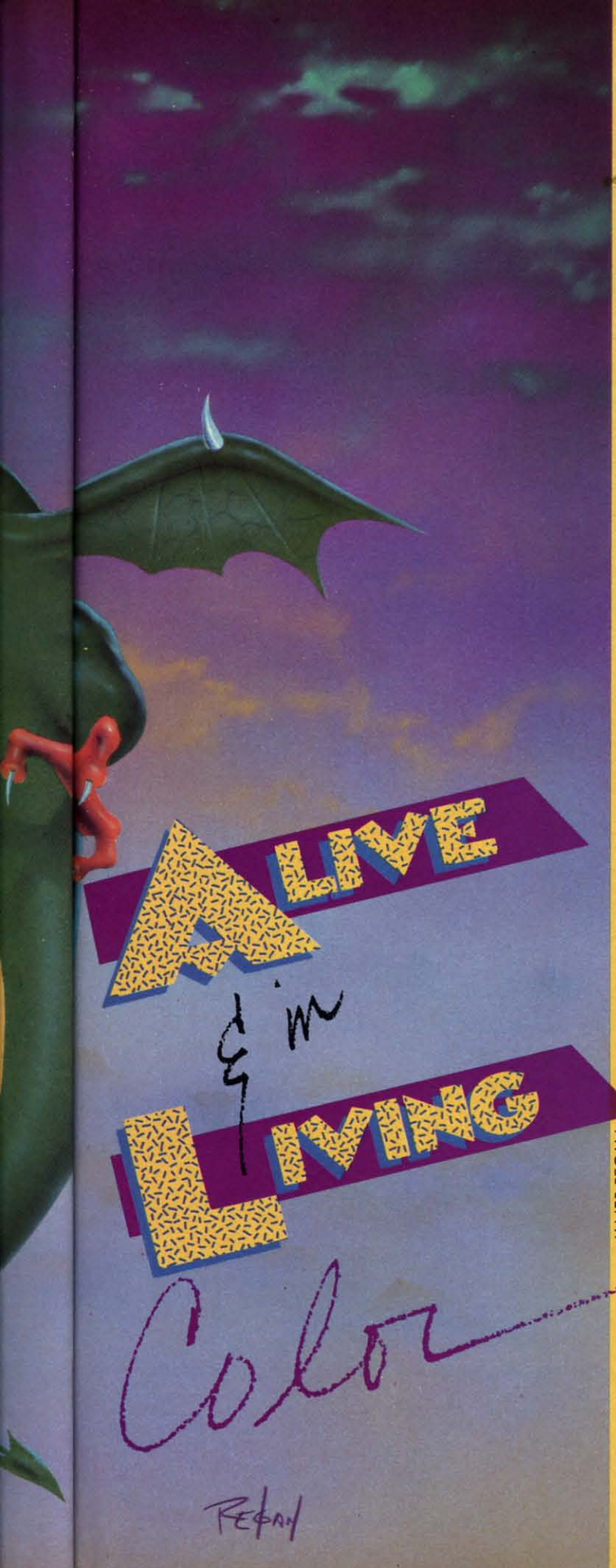

JAMES REGAN

Alive & in Living Color

By Orson Scott Card

Not all action games require realism. Remember when *Asteroids* was new in the arcades? The vector graphics were very abstract—your spaceship consisted of a little wedge, the enemy ships were only slightly more detailed, and the asteroids were nothing but jagged outlines.

At the time, we didn't care. We didn't think it was primitive—it blew us away. To have the little spaceship completely under our control, acting the way it really would in null gravity, with dozens and dozens of things going on at once—I remember crowds standing around the first machine in Orem, Utah, just watching the game.

But we got more sophisticated. The little ghosts in *Pac-Man* with their roving eyes, Mario's padding feet and chugging arms in *Donkey Kong*, the dragons and other odd little creatures in *Dig-Dug*, all led us to expect much more believability, detail, *life* in our games.

Even games that could have been abstract—*Galaxians, Galaga, Firebird*—came ablaze with color and startling, pleasing designs and animation. But there was a limit to what computers could do. Raster graphics couldn't escape from the bumpy look of drawings made out of little square pixels. Animation ate up memory. The more detailed it was, the more memory each shape required. And speed—if your new, lifelike shape used sixteen times as many bytes, then of course it took sixteen times as long to draw it on the screen.

So computer animation became very good—but it reached a limit. Until just a couple of years ago, when they hit us with laser disc games. First-rate cartoonists were going to show us how computer graphics ought to be done, with smooth animation like the best Disney cartoon features.

It should have been nirvana. But it wasn't. And the reason is that once the computer "knows" the shape of a figure, it can "draw" it anywhere on the screen, at any time; but laser disc animation couldn't do that. It was more like a movie. If the hero is two inches from the left side of the screen in frame 1044, then he will *always* be two inches from the left side of the screen in frame 1044.

In other words, while the action became more realistic and lifelike and smooth-moving and pleasing to the eye, the players lost control of the game. You had very little more to do than choose between option A and option B at certain key points. The fluidity, the dexterity of animated games like *Dig-Dug*?

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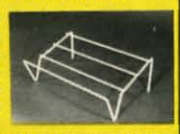

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Out of the question for the laser disc.

The power of computer action games is not just in the lifelike animation, though I believe that it is very important. The greatest power is in the fact that the player is in control.

This isn't just a subtle difference. In a movie—animated *or* live—the finished product is the finished product. The audience comes and sees it, and that's it. The audience can't do anything to change the story as it unfolds (except by stamping and screaming and making it impossible to hear, but that's mere aural vandalism).

Now, a computer action game loses the complexity of plot and character and sacrifices much (but not all) of the visual realism. In exchange, however, we players get to create the story ourselves. The gamewright creates a milieu of sights and sounds and gives us certain powers and limitations—you can move here but not there, you can attack this but not that, you have only this many seconds and that many "lives."

Then, within those limitations, and using those powers, we players tell the story ourselves. No, I take it back. We don't tell the story, we live the story, we control a figure that acts it out for us. That's something no other art form can do—let the artist and the audience collaborate in creating related but non-identical stories every time we play.

As the makers of laser disc games discovered, the right balance between realistic animation and player control was struck by the best raster graphics games; the cartoon graphics games were too forced, too predictable, too *uninteresting* for most of us, once the novelty wore off. We were used to being in charge. The laser disc games were like going back to kindergarten.

ANIMATED SPRITES

Which brings us to animating sprites on the Commodore 64. If you've been following this column for the past many months, you'll remember an earlier demonstration of character-graphics animation through character-set flipping (January '85). The sprite shape-flipping technique is closely related. For the sake of newcomers to *Ahoy!*, however, I won't take anything for granted.

Computer animation depends on the same basic technique as cartoon animation. Many pictures are displayed in series for a fraction of a second each. Every picture, called a "frame," is almost identical to the one before, showing only a slight change. In the movies, each frame lasts about a sixteenth of a second. In the old days, the frames came every twelfth of a second—the audience could detect a slight jump or flicker between frames. Today's faster speed has smoothed out the picture completely. Our brain, in the effort to make sense of the image before our eyes, ignores the momentary darkness between frames and "sees" smooth movement.

With sprites, we animate using the same technique. In the example program included with this column (see *Dragon* on page 120), we want to move a dragon around on the screen. We want to create the illusion that the dragon is walking swiftly and breathing fire.

To do this, the program sets up four different shapes for the dragon. Each shape is very similar to the one before it in the sequence. In the shape created using the DATA statements in lines 1020-1031, we see the dragon with its mouth closed, its legs and arms balanced.

The next shape (1040-1051) moves the dragon's farther leg forward, as if he were stepping with his right foot. Also, his mouth opens and flame starts to emerge.

The third shape (1060-1071) evens out the dragon's legs again, just as in the first shape. However, the flames have come farther from the dragon's mouth. The tail is also undulating.

The fourth shape (1080-1091) moves the dragon's nearer leg, as if he were stepping with his left foot. The flames have burst far to the left; the dragon's mouth is now closed.

This sequence is completely circular in suggesting a walking movement. Lewgs even, step right, legs even, step left, and back to the beginning again. The undulation of the tail also completes a cycle. In other words, by repeating the sequence over and over, we can create the illusion of a walking, fire-breathing dragon.

However, the dragon does not always move from right to left. Sometimes he must move from left to right. So we need four more shapes, held in the DATA statements from 1120 to 1191. They are the mirror images of the left-facing shapes from 1020 to 1091.

When the dragon moves to the left, we cycle through the first four shapes, one after the other.

When the dragon moves to the right, we cycle through the last four shapes, one after the other.

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SPRITE SHAPE-FLIPPING

In last month's column, we went over sprite creation and movement in detail. If you missed that issue, you can still probably figure out what's going on by consulting the Sprite Memory Map reprinted here, which lists all the key locations for sprite control.

When it comes to animation, the vital locations are the last eight bytes of the 1K block of memory that holds screen memory. When your Commodore 64 powers up, screen memory is at location 1024. That 1K block runs, then, from 1024 to 2047. The last eight bytes are 2040-2047.

These bytes, together, form the Sprite Shape Location Table. The first byte holds the code for the location of the shape for sprite 0; the second byte, the shape for sprite 1; and so on. Since all the sprites are handled similarly, from now on we'll only discuss animating a single sprite, sprite 0.

For the purpose of defining sprite shapes, the VIC-II video chip "thinks" of the 16K video block as being divided into 256 sprite shape blocks consisting of 64 bytes each. Each 64-byte block has its own unique code number, consisting of a number from 0 to 255. The code number for the first sprite shape block in video memory is 0; the code number for the second sprite shape block, the one starting in byte 64, is 1; the code for the last block, the one starting at byte 16320, is 255.

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SPRITE MEMORY MAP

For easy reference, here are the sprite-control registers in the Commodore 64. For full explanations, see the text of this month's and last month's articles.

Floating Memory Locations

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

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

Permanent Control Registers

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

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

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

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

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

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

screen location=(PEEK(53272)AND 240)/16+*video block starting address*

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

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

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

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

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

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

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

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

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

To tell the VIC-II chip where to find the shape for sprite 0, you POKE the code number into location 2040 (or the first of the eight bytes of the Sprite Shape Location Table, if screen memory is somewhere else).

Our dragon relies on two separate animation sequences, one for leftward movement, the other to move right. Each sequence consists of four shapes. The routine at lines

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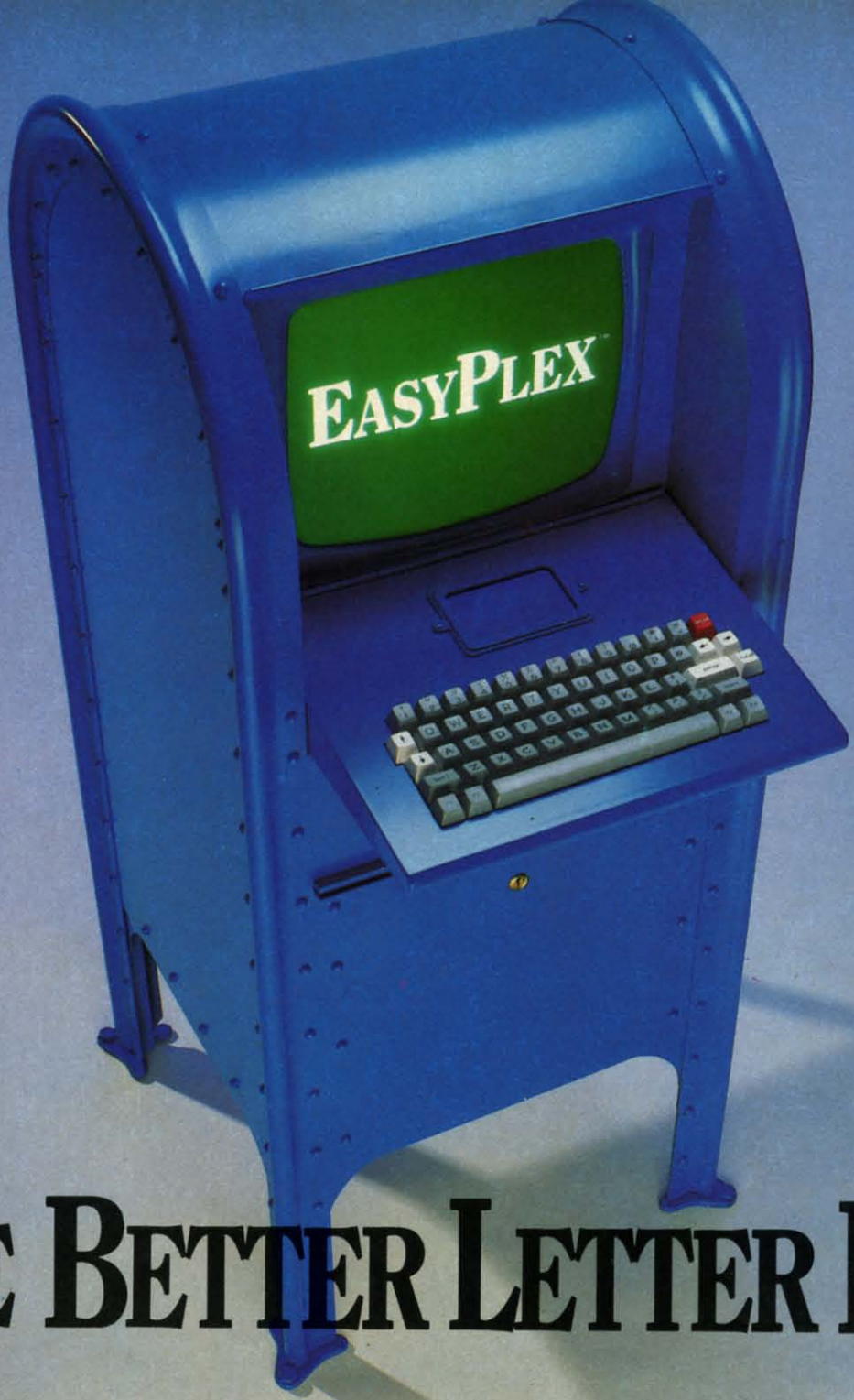

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1000-1010, after deciphering the DATA statements and converting them into bytes, POKEs the bytes of the sprite shapes into eight sprite shape blocks, the ones with code number 16 through 23.

Now, to display the sprite shapes in order, the main loop in lines 100-196 keeps POKEing different codes into the Sprite Shape Location Table. The variable LT(0) holds the address of sprite 0's shape location register. Line 140, which is executed *every* time the dragon moves, POKEs a different shape code into location LT(0).

If the dragon is moving to the left, line 140 POKEs the codes 16, 17, 18, and 19, and then starts over again with 16. Each time this happens, the VIC-II chip instantly "flips" to the new sprite shape block and displays whatever shape it finds there. If the dragon is moving to the right, the codes 20, 21, 22, and 23 are repeated in an endless cycle.

(The codes, of course, are held in the array ST(XK,AN). XK is either a 0 or a 1, depending on which direction the dragon is facing. AN is a counter variable. Notice that line 100 puts the entire main loop within a FOR-NEXT loop: FOR AN=0 TO 3. Thus, every time the dragon moves, AN changes from 0 to 1, 1 to 2, 2 to 3, and from 3 back to 0. By using AN as an index into the variable ST(XK,AN), we automatically cycle through all four sprite shape blocks for whichever direction the dragon is moving.)

Smoothness—and the Lack of It. When you run the program *Dragon,* you'll find that the animation is not particularly smooth. There is a detectable jump from one shape to the next.

That's because of the speed of BASIC. Every time through the loop, we PEEK location 653, make a few tests, and then POKE three locations. Alas, POKE is a slowish command; it takes time. If the movement lines were omitted, of course, the animation would speed up considerably—but the dragon would just stand in place, which isn't what we had in mind.

Imagine what would happen if we were trying to animate all eight sprites! Each animation step would mean at least one more POKE, and all smoothness would be lost.

If we were using machine language, each change could come very quickly, with plenty of time left over for many other activities. It would be simple to have all eight sprites being animated at once, and each sprite's animation sequences could include dozens of shapes—sequences for movement in four directions, for instance, each of which might include six or seven steps.

Shared Shapes. Since any sprite's register in the Sprite Shape Location Table can point to any of the 256 64-byte blocks in video memory, there's nothing to stop you from having many or all of the sprites point to the *same* shape at the same time. You could easily have eight sprites on the screen, all of them cycling through the same dragon animation sequences. The VIC-II doesn't care whether two sprites are using the same shape block at the same time.

Animation and Movement. Keep in mind that movement and animation are two different things with sprites. Movement is taken care of by POKEing the horizontal and vertical position registers. The dragon *moves* three horizontal dots at a time in this program; it would do this just as smoothly (or jerkily) whether the dragon were *animated* or not. Movement has to do with the sprite's *location* on the screen. Animation has to do with the changing *shape* of the sprite.

MULTICOLOR SPRITES

Besides cycling through animation sequences, you can greatly increase the realism and visual appeal of your sprites by letting them display more than a single color at a time. This is done by "enabling" sprite multicolor mode by turning on the correct bit of the sprite multicolor enable register at 53276.

Bit 0 controls sprite 0. To enable multicolor mode for that sprite, you would POKE 53276,PEEK(53276)OR 1. Bit 7 controls sprite 7. To enable multicolor mode for that sprite, you would POKE 53276,PEEK(53276)OR 128.

If a multicolor mode has been selected for a sprite, the VIC-II looks in the same location to find its shape, but it interprets the shape data differently. In one-color mode, which we discussed last month, the data is arranged like this:

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BYTE 0	BYTE 1	BYTE 2
BYTE 3	BYTE 4	BYTE 5
BYTE 6	BYTE 7	. . .
. . .	BYTE 61	BYTE 62

Within each byte, each bit controls one dot on the screen. If the bit is a 1, that dot on the screen displays the sprite's color. If the bit is a 0, then the sprite is "transparent" for that dot, and the regular screen display shows through.

Multicolor mode doesn't see each bit individually. Instead, the VIC-II sees the bits in pairs, four bit-pairs per byte. Each byte, then, looks like this:

00 00 00 00

Each bit-pair, instead of controlling a single dot, controls two dots. Both dots on the screen, side by side, will display the *same* color, whichever color was called for by the bit-pair.

The bit-pair 00 causes the dot-pair to be transparent. The bit-pair 01 causes color 1 to be displayed. The bit-pair 10 causes color 2 to be displayed. The bit-pair 11 causes color 3 to be displayed.

Color 2, displayed by "10" bit-pairs, is individually selected for each sprite. The sprite color registers at 53287-53294 allow you to select any of the 16 possible colors (from 0 to 15) for each sprite.

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Color 1, displayed by "01" bit-pairs, is the same for all sprites; that color is set at location 53285. Likewise, color 2, displayed by "02" bit-pairs, is controlled for all sprites at location 53286.

Thus, if all eight sprites were in multicolor mode, and all eight sprites were displaying the same shape, all the 01 bit-pairs in every sprite would display the same color; all the 11 bit-pairs would display the same color; but all the 10 bit-pairs might have different colors. If you plan to have sprites that share the same shape, and you want the player to be able to tell them apart, make sure that the color you want to change from sprite to sprite is represented by 10 bit-pairs.

The dragon in this program is primarily composed of 10 bit-pairs, and sprite 0 is set to green. If another dragon were on the screen, its individual color could be set to blue, and the two dragons would be clearly and obviously different. In a two-player game, this difference in color would let the two players tell their dragons apart. However, if the 10 bit-pairs had been used for the dragon's flame, then the only visible difference between the dragons would come when the dragons were moving and flame was coming out of their mouths; when they were still, with no flame, they would be exactly alike.

HOW THE PROGRAM WORKS

This program, like last month's example programs, reads the sprite shapes from DATA strings. This is not the fastest way to load sprites. The fastest way is to have the sprite data in numeric form in a special disk file and load it with machine language. In BASIC, the fastest way is to have the sprites as numbers in DATA statements.

But for my purposes in these example programs, it's a lot more helpful to give you sprite shapes in a form you can easily edit and change. The idea is for you to type in my dragon program, then change the shapes so the sprite displays whatever shape you want. So instead of speed, I've designed the program for easy editing.

For multicolor sprite shapes, there are twelve bit-pairs in each row of the sprite shape. Therefore, each DATA string consists of twelve characters. Wherever you want the sprite to be transparent, put a period (.) in the string. (Actually, any character except "1" or "2" or "3" would work in the program, but I use the period because it is unobtrusive—but easier to count than blanks.)

Wherever you want color 1 to display, type a 1; for color 2 (10 bit-pairs, remember, the ones individually selectable for each sprite), type a 2. For color 3, type a 3.

The routine at 1000-1010 reads all the strings, converts them into numeric bytes, and POKEs them into memory. There are 21 possible rows in every sprite shape; for the dragon, however, I only used 12 rows. Therefore in line 1000 I set the variable TS to 11 (that is, 12 minus 1). If you want more or fewer rows, make sure you adjust line 1000 accordingly. Likewise, if you want more shapes in your animation sequences, set the variable AS to the number of shapes in your sequence *minus 1. Dragon* uses two animation sequences, one for left movement and one

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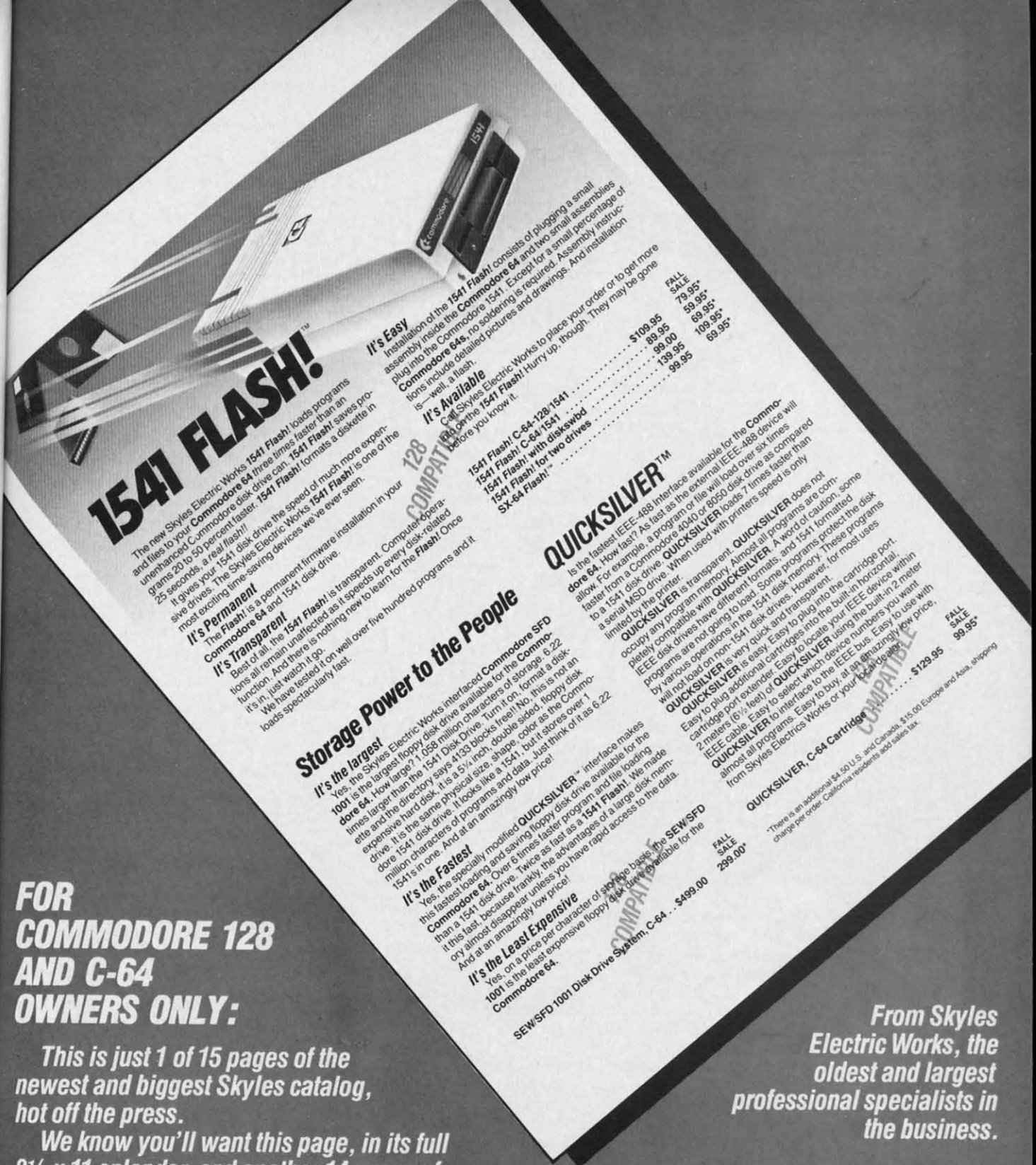

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for right. To have more sequences, change the variable NS in line 1000 to the number of sequences *minus 1.*

The variable MS*(n,n)* is used to hold the possible values for each bit-pair. The values for each bit-pair position are as follows:

BIT-PAIR	POSITION IN BYTE (DECIMAL VALUES)			
00	0	0	0	0
01	64	16	4	1
10	128	32	8	2
11	192	48	12	3

If you want the leftmost bit-pair in a byte to display color 2 (10), you would OR that byte with 128. If you want the bit-pair second from the right to display color 3 (11), you would OR the byte with 12.

The Variables. To help you keep track of what is going on in the program, here's a list of the main variables used in *Dragon.* I deliberately kept it as consistent as possible with last month's programs.

VB	Address of the video block
SB	Address of the screen memory
BB	The screen memory page number (used by BASIC)
LT(0-7)	The address of each sprite's shape location register, located starting at byte 1016 after the start of screen memory.
CT(0-7)	The address of each sprite's color register.
HT(0-7)	The address of each sprite's horizontal position register.
VT(0-7)	The address of each sprite's vertical position register.
HR	The address of the flag-bit register for horizontal movement across the "International Date Line."
ES	The address of the sprite enable register.
VE	The address of the vertical expansion register.
HE	The address of the horizontal expansion register.
PR	The address of the priority register.
EM	The address of the multicolor enable register.
MR	The address of the first multicolor color-selection register.
CS	The address of the sprite/sprite collision register.
CF	The address of the sprite/foreground collision register.
BS(0-7)	The bit-set values for each sprite.
BC(0-7)	The bit-clear values for each sprite.
MS(0-3,0-3)	The bit-pair values for multicolor byte selection. The first index determines which bit-pair is called for (numbered from *right* to *left*), and the second index determines which color is being called for.
ST*(n,n)*	The codes for the location of each sprite shape block; these numbers are POKEd into the sprite 0 location register LT(0). The first index determines which animation sequence is being used, left or right; the second index determines which step in the four-shape sequence is to be displayed.
NS	The number of sprite animation sequences, minus 1.
AS	The number of shapes per animation sequence, minus 1.
TS	The number of three-byte (12 bit-pair) lines per sprite shape.
VV*(n)*	The vertical position array; these values are POKEd into the vertical position registers at VT*(n).*
HH*(n)*	The horizontal position array; these values are POKEd into the horizontal position registers at HT*(n).*
HB*(n)*	The horizontal flag-bit array; these values are POKEd into the flag-bit register at HR.
VZ	The lowest vertical position allowable on the screen, minus 1.
HZ	The rightmost horizontal position allowable on the screen, minus 1.
VP	The current vertical position (a number from 0 to VZ).
HP	The current horizontal position (a number from 0 to HZ).
AN	The current step in the animation sequence.
XP	The direction the dragon is currently facing.
Q	A flag. If it is 1, it means the dragon has been moved since it was last at rest; if it is 0, it means the dragon is at rest and has not been moved. It is used to determine whether the dragon needs to be set back to "resting" position—with no flame showing.

Starting and Stopping. The program relocates video memory and disables the RUN-STOP/RESTORE, and SHIFT/COMMODORE interrupts. If an error interrupts the program, you will probably have to turn off the machine and reload the program. So *please* SAVE the program *before* you RUN it, since the slightest typo can crash the program and make it very hard to recover it.

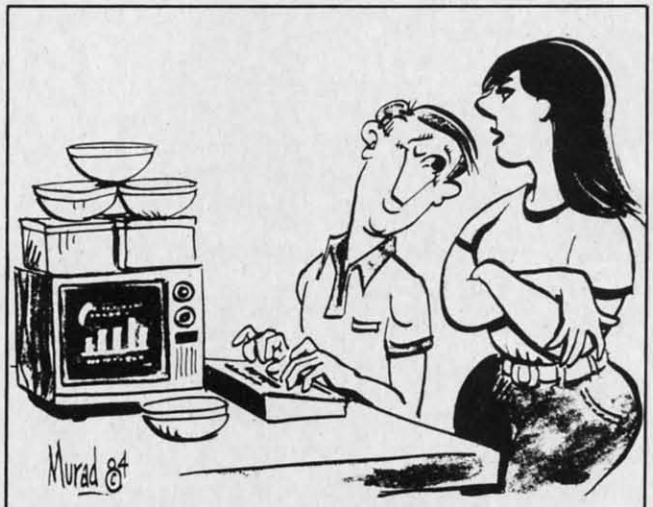
To stop the program once it is running, press SHIFT/COMMODORE/CTRL. This restores all the video pointers and reenables the interrupts.

To move the dragon to the left, press COMMODORE. To move the dragon to the right, press SHIFT.

NEXT MONTH

Next month we'll conclude this series on sprites with a program that creates a spaceship that can move in eight different directions, along with a few celestial objects. The BASIC version of the program will be quite slow, unfortunately; if I'm feeling particularly ambitious I'll create a machine language interrupt routine to read the keyboard and move the spaceship, in addition to the BASIC movement method. □

SEE PROGRAM LISTING ON PAGE 120



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MYSTERY AT MYCROFT MEWS

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By John R. Prager

Scandal has rocked the small village of Mycroft Mews: a prominent citizen has been callously murdered for reasons unknown. Your job as a detective is to ensure that justice triumphs. It won't be easy. The bank president won't talk. The hotel clerk's alibi is clearly bogus. The vicar's fingerprints are on the elephant gun you found at the Pawnshop. Any of these shifty characters could be the killer!

Mystery at Mycroft Mews is a game for the Commodore 64 that requires all the logic and cunning you can muster. Competing against you will be as many as five other detectives; you'll have to outfox them to solve the mystery first. There are nearly 5000 possible solutions, but the single correct answer is chosen anew each time the program runs. To crack the case, you must correctly deduce this unique answer before the other players do.

To play, type in the program from the listing on page 127 exactly as it is shown. It is especially important that you do not alter the DATA statements which appear from line 30000 onward. If you wish to use a joystick, you may insert it into either port. The game accommodates from one to six players, who can compete as individuals or as teams of equal size. You may want to supply pencils and paper for each player to use in taking notes.

MOVING THROUGH TOWN

As each player begins his or her turn, all other players should position themselves so they cannot see the screen. After all, one goal of the game is to acquire information that other players do not have. To help preserve secrecy, you will have to type in a password at the start of your turn whenever two or more players are competing. This password can be any two characters from the keyboard…letters, numerals, or even special keystrokes such as the function keys. Only after you type your code will you be allowed to continue with your turn. This prevents other players from illegally using your turn to gather information for themselves.

After you type in your code, you may travel to any of the 16 buildings in *Mycroft Mews*. A sprite "detective" will appear on the screen; he moves from building to building on the map under joystick control. If you wish to play without a joystick, use function keys f1, f3, f5, and f7 to move, respectively, North (up), West (left), East (right), and South (down). To enter a building, position

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the detective immediately to the right of the door and press the joystick button or RETURN key. Of course, if you start your turn in a building, you may remain there for as long as you wish, merely by pressing the button instead of moving.

One of the buildings—the home of the victim—has been locked by the police at the start of the game. It can be entered only by a player who carries the Master Key, which is originally located at the Police Station. The map of the village changes every time the game is run, so finding the Police Station is a challenge in itself. Be sure to note the nature of every building you enter!

After you enter a building, the computer will describe your surroundings. It tells you what building you occupy; notes what object you carry; lists all suspects, weapons, and useful items in view; and names any other players that are present.

TURN OPTIONS

Following this description, you may press the joystick button or RETURN key for a list of options for your turn. The menu of options will vary, depending on your location and the items immediately available. To choose from any menu, use the joystick or function keys to position the highlighted bar at your choice, and press the joystick button or the RETURN key.

The SEARCH option is available every turn. Choose it if you believe an object may be hidden in the building you occupy. Initially, all 12 of the possible murder weapons are hidden in one building or another. Each time a player searches a given area, there is a 60% chance of finding each item hidden there. For this reason, a location may have to be searched repeatedly before all the objects hidden there have been found. The Magnifying Lens, initially located at the Police Station, allows the player carrying it to search with 100% effectiveness. A successful search gives you the choice of taking the object that you have found.

Choose the TAKE option to pick up a weapon or useful item in the area you occupy. Since you may carry only one item at any time, you will drop any object that you carry when you take another. If you select this option, you may even take objects that other players possess. The DROP option allows you to get rid of an object that you no longer wish to carry. If you so choose, you may even hide the object that you drop, so that other players will have difficulty tracking down specific clues.

Certain optioins are limited to specific locations. Only at the Morgue can you choose to READ THE CORONER'S REPORT, which will reveal the gender of the murder victim and provide a hint about the weapon used. At the Police Station, you may FINGERPRINT an item to determine its owner, or you may ACCUSE a suspect in hopes of winning the game. At the Bank, Law Office, and Mental Health Clinic, EXAMINE THE RECORDS about a suspect to discover useful facts about the motive behind the crime.

Hidden somewhere in the victim's house is a vital piece of evidence: a will, diary, or ledger. Find it. READ it. You will learn the motive behind the slaying and obtain a list of suspects that includes the murderer. Try to hide this clue where the other detectives won't find it.

GRILLING SUSPECTS

At the heart of the game are the suspects: the dozen leading citizens of Mycroft Mews. You will encounter only eleven of them in the course of the game, for the twelfth was the victim. One of the survivors is the killer. Although each suspect has a particular building as his or her "home base," they move about from turn to turn, so you can encounter anyone in any location except the victim's house. A suspect will return to his home building, however, on the turn after you arrive there.

If you are in a location with one or more suspects, you may choose the INTERROGATE option. If several suspects are present, you will be asked to choose one to question. You may ask three questions of your informant by moving the highlighted bar to the subject you want to know more about. Press the joystick button or RETURN key to ask about the item or suspect currently highlighted. If you move to the bottom line of the menu and press the joystick button or RETURN key, you will be presented with a new menu of topics for your inquiries; changing menus in this manner is not counted as one of your three questions.

Interrogating will help you enormously by revealing alibis, motives, and interests of the suspects. Remember, though, that the character you are questioning answers on the basis of rumor and hearsay, and his answers are not always reliable. Often, too, suspects are too busy to gossip with a nosy detective...although they will not refuse to answer if you possess the Police Badge, which lends an air of authority to your investigations. Like the other two useful items, the badge is originally found at the Police Station.

Most important, the murderer himself is free to lie. He will always deny ownership of the murder weapon, even though his fingerprints are on it! For this reason, it is vital that you jot down not only the testimony that you gather, but also the source who disclosed it.

WINNING THE GAME

When you are certain that you have all the pertinent facts at hand, go to the Police Station and choose the ACCUSE option. You will need to identify the victim, the murderer, the weapon used, and the motive behind the crime. If your answer is not correct, you are eliminated from the game. A correct solution wins! If all players have made incorrect guesses, or if the case if solved, the correct answer will be displayed.

Finally, to cut down on trips to the dictionary: an "arquebus" is an antique form of rifle that is greatly prized by gun collectors, and a "herpetologist" specializes in the study of reptiles, and might well have a vial of snake venom on hand. Happy sleuthing! □

SEE PROGRAM LISTING ON PAGE 127

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GRAVINAUTS

for the C-64

BY CLEVELAND M. BLAKEMORE

On the world of Arkion, survival is a tough business. Because the surface of the planet is covered by a deadly acidic ocean,the inhabitants must remain continuously in the air, supported by rocket backpacks. To stay up, they engage in a never-ending war for fuel. The loser is doomed to a very short lifespan.

The Gravinauts, as they are called by the colonies of the Milky Way, battle each other by trying to reach a higher vantage point in the air than their opponents and smashing into them, destabilizing their gyros and causing their backpacks to explode.

Because the fuel tanks stored higher up in the atmosphere are more closely guarded, they are entrusted with greater fuel supplies. They are therefore more important than the ones resting on the lower "ice glaciers," which are huge bodies of frozen chemicals floating in the air above the ocean.

The purpose of the game is to take fuel off the glaciers, destroy your opponents for points, and advance to the next level. The game gets increasingly more difficult at each level, as the speed of the game increases, and at the highest level your visibility is affected when a fog bank of chemicals sets in, obscuring your view of the glaciers.

You must conserve fuel, using rebounds off objects as much as possible, and try to knock out your enemies with as little effort as is necessary. If you run out of fuel, your rocket backpack will explode.

The game is played with a joystick in control port 2. The controls are simple. Push the fire button with the joystick centered to fire a straight thrust of exhaust, push the fire button with the joystick to the left to propel yourself left, and with the joystick to the right to go right. These are the only controls!

Gravity is the only thing that will make you sink, so if you fire too much fuel you may begin gyrating out of control, rebounding off glaciers until you can stabilize yourself. Because you are in "Zero G" gravity, there is no loss of kinetic energy when you bounce off something—so you could keep bouncing *ad infinitum* until you slow yourself down with short bursts of fuel.

Each enemy gravinaut is worth 250 points—you may occasionally get a double score of 500 off one opponent. The fuel tanks contain fuel supplies in increments of five from top to bottom, with the tank at the lowest level worth five and the highest worth twenty. If you manage to destroy all three of your opponents, and pick up all the tanks of fuel, the screen color will change and you advance to the next level. Each time you start out on your platform at the bottom, the only safe spot on the sea of acid. Any contact with this solution at the bottom will destroy your player. You can also score points by leading your opponents into the acidic sea, where they will be quickly burned up.

You only have one man per game. If he blows up, push f1 to start a new game at level one.

There are situations where you may have to hit an object solidly for it to be affected. Sometimes you can take a glancing blow on the surface of the acid sea or from one of your opponents without being killed.

High score since the game was started is displayed in light blue in the upper right corner. My highest so far is 7550, which you will have to beat by passing through several of the upper level "invisible" screens, where the screen is the same color as the glaciers and they cannot be seen.

The game is typed in as a hex listing. Be sure to use *Flankspeed* (see page 118) when typing it in so that you can be assured of an error free program. □

SEE PROGRAM LISTING ON PAGE 143

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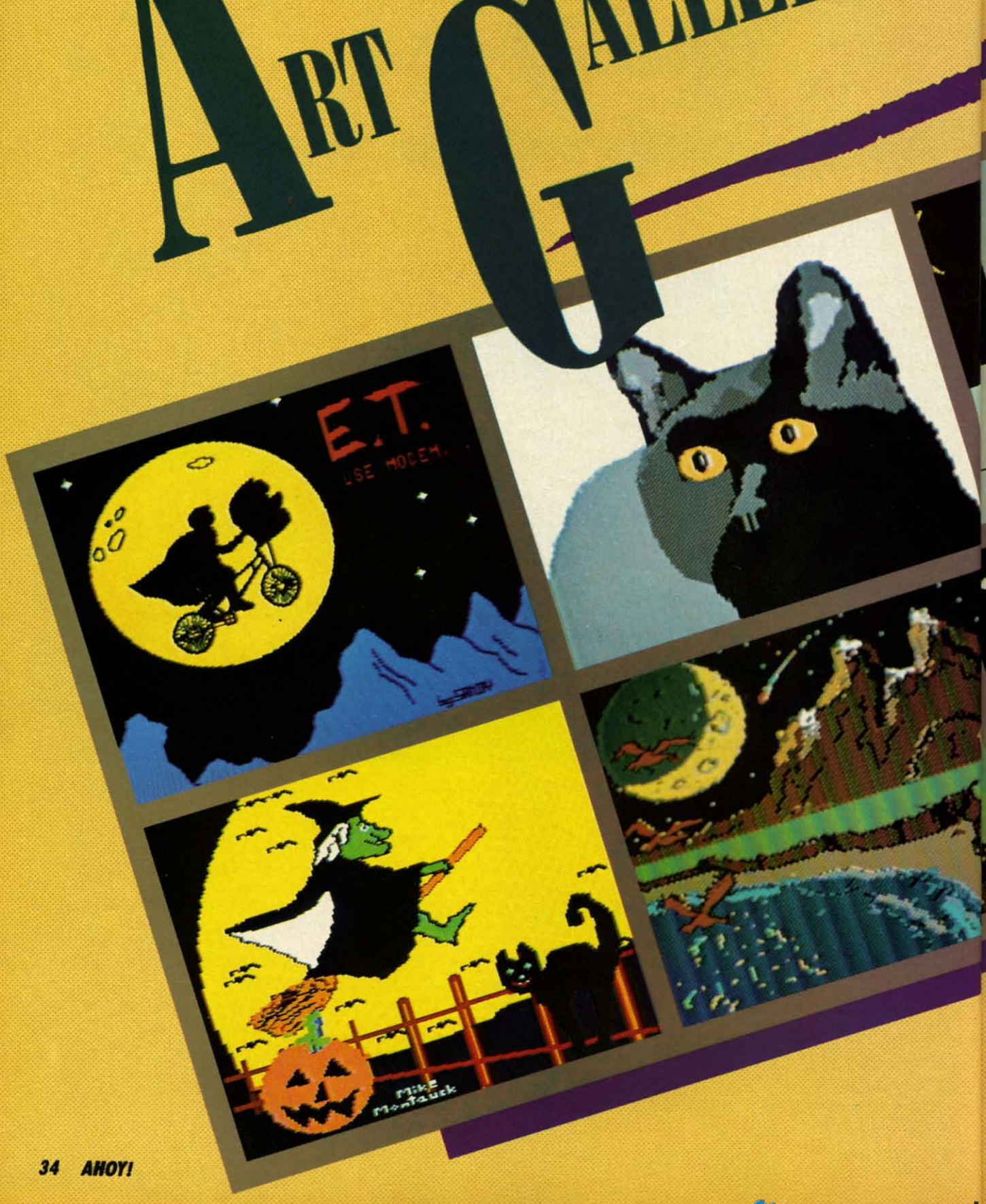
ART GALLERY



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Thanks to the tremendous response to *Ahoy!*'s *Art Gallery,* we're able to present collections of computer-generated art with seasonal themes, like the Halloween spread seen here. Why not help to keep our inventory fat and healthy, while earning (if your pictures are published) royalties based on the sale of our *Art Gallery* disks? Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.

Top row, left to right: *E.T.* by Sandra Steele (Rockford, IL), drawn on *DOODLE!; Our Cat,* a *Koala* rendering by Mark Richey (Boulder City, NV); *Trick or Treat,* another *DOODLE!* from Sandra Steele; and *Wizard* by David Moroz-Henry (Downington, PA). This last was done completely using programmable characters—no mean feat. The dragon inside the crystal ball is actually composed of four sprites. When the program is run, the wizard appears first. A few seconds later the dragon appears inside the crystal ball. Bottom row, left to right (all drawn on *Koala*): *Witch* by Michael Montauck (Brooklyn, NY); *Nightfall* by Don Cadle (Riverside, CA); *Dr. Strange* by Michael Montauck; and *Skull* by Mark Richey.

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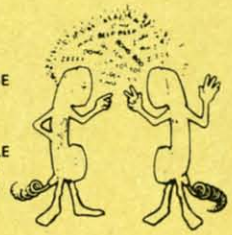
11-CYCLE LOG
12-READ DOWNLOAD FILE
13-SCRATCH DOWNLOAD FILE
14-ADD TO OTHER SYSTEMS
15-CREATE OTHER SYSTEMS



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SOLITAIRE 64

By Eric W. Sink

Almost everyone has lost at solitaire. This computer version is your chance to get even. Sure, you'll still lose, but when you get really frustrated, you can just turn the computer off.

I'm not going to go into the rules of the standard game. If you don't know how to play solitaire, someone around you certainly does.

Type the game in and save it immediately. Then run it. A title screen will appear and disappear, followed shortly by the game selection screen. *Solitaire* will ask you if you wish to play Las Vegas style or regular. For now, choose regular by responding with a joystick in port 2. I'll explain Las Vegas style later.

A graphic display of your "table" will appear, complete with your beginning cards. All the blue numbers above the seven piles indicate the number of cards that are still hidden from your view. The blue numbers above the two stacks of the deck at the bottom indicate how many cards are in each stack.

Notice the blue arrow in the middle of the screen. This is your pointer. All facets of gameplay are controlled by moving this pointer with your joystick. To move a card from anywhere to anywhere else (assuming it's a legal move!), move the pointer, with the joystick, to the card you wish to move. Press the fire button to pick the card up. The card to be moved will turn blue. Now move the pointer to the card's destination. Press the button again to drop the card and the move will be executed. If the move is illegal, the computer will buzz at you and give you a chance to try again. If you make a mistake and pick up the wrong card, simply drop it right back where it came from.

To move more than one card at a time, pick up the first card in the group you wish to move. For example, if you wished to move a King and all the cards on top of it to a blank pile, simply pick up the King, and the computer will assume you wish to pick up all the cards on top of it. You may move only one card at a time up to the aces.

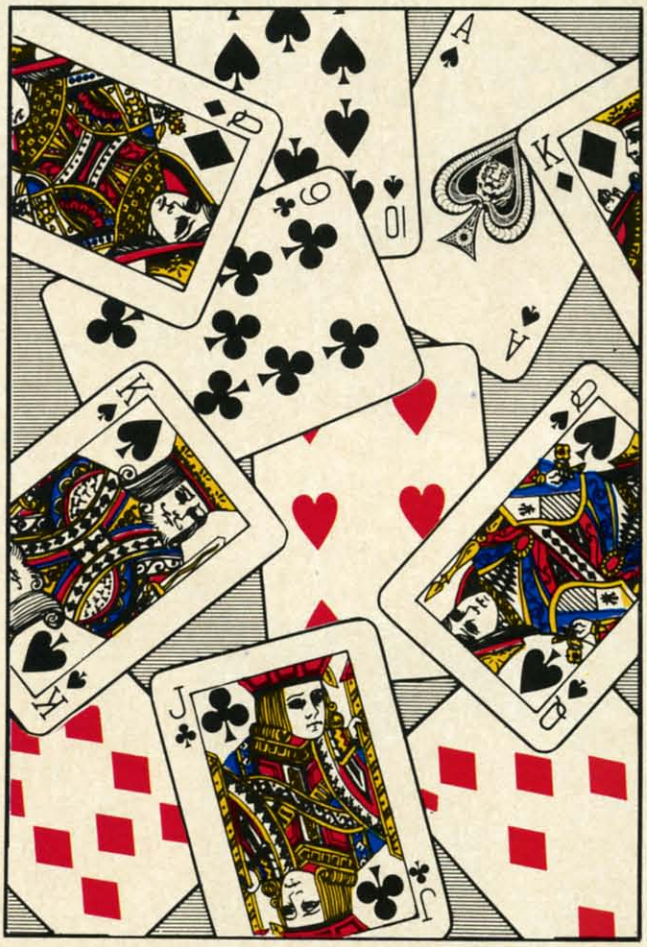
Very soon, this process of moving your pointer around will become second nature to you. When it does, here are a couple of shortcuts you will probably have figured out on your own. First, to drop a card on the aces at the top of the screen, simply move the pointer anywhere above the blue numbers and drop it. The computer will put the card where it belongs, since it can have only one destination. Second, when dropping cards to a pile, vertical positioning doesn't matter as long as you are below the blue numbers (at top) and above the top of the deck (at bottom). To turn up the next three cards, move the pointer to the deck and press the button. When you get to the bottom of the deck, the words "Turn deck over" will appear in place of it. Press the fire button on these words to do just that. Press the fire button on the word "Concede" at the bottom right to quit a game.

The computer is the judge in this game. It will not allow you to cheat. It will play out the rest of the game if it sees that you cannot lose. It will never tell you that you have lost. You get to keep trying until you concede.

Now a word about Las Vegas style. In this variation, you buy the deck for $50. You turn up one card at a time instead of three, but you may only go through the deck once. You get $5 for each card that is in the aces section at the top. At the end, the computer will tell you how much you won or lost. Everything else is the same as the regular version.

I hope you enjoy playing the game, and may the luck of the cards be with you! □

SEE PROGRAM LISTING ON PAGE 123



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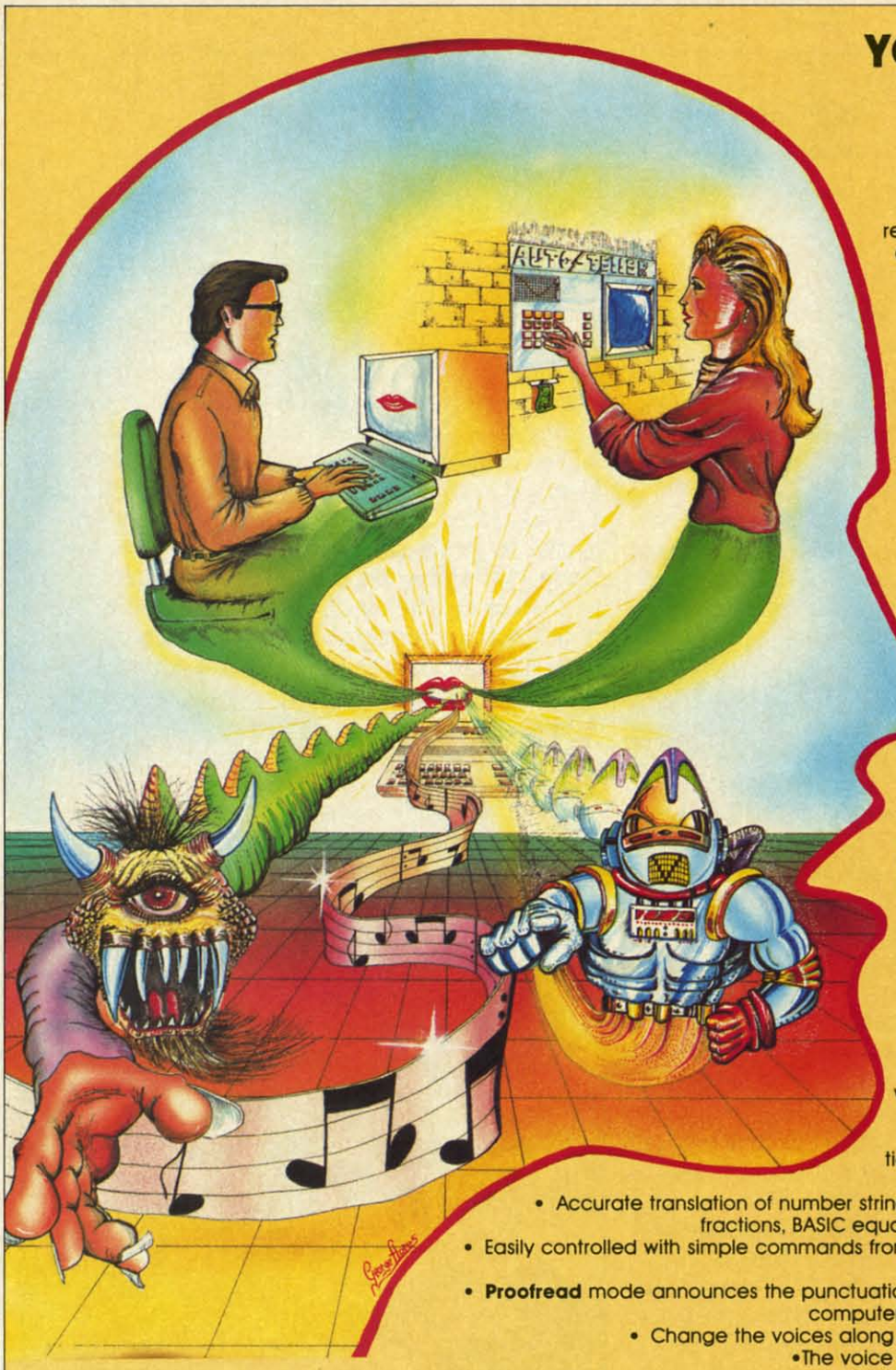

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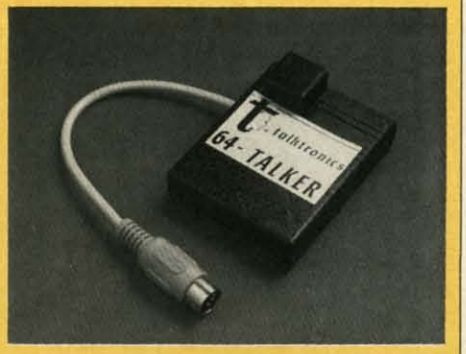

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MAESTRO

An Advanced Music Editor for the C-64

By William T. Eveleth

This extremely versatile music editor makes playing music on the Commodore 64 as easy as Do-Re-Mi. If you think word processors make writing easy, wait till you try your hand at *Maestro.* You can create original music for up to three independently controlled voices with no more trouble than typing a letter. And that's not all. *Maestro* lets you make changes as you go. Change a wrong note. Change the rhythm—or, if you like, change the tempo. Type in your favorite song from the sheet music. Or, create your own melodies. You be the composer—with an electronic orchestra at your fingertips! And once you've completed your masterpiece, you can save it on disk for a future premiere concert.

Maestro is organized into 10 operating modes as follows:

MODE 0: MUSICAL KEYBOARD

In this mode your keyboard becomes the musical instrument of your choice. Every key produces a sound (except RESTORE, SPACE, CONTROL, and the COMMODORE key). The corresponding notes on the piano are shown in the illustration on page 40. The same notes are shown in the staffs above each keyboard section. To switch instruments, type SHIFT to return to the menu, select MODE 5, make your choice, and return to MODE 0. (Note: not all 10 instruments can be played from the keyboard in this mode.)

MODE 1: PLAY IT AGAIN!

This mode is similar to MODE 0, but with one major difference: *Maestro* remembers what you played! Type SHIFT after playing a few notes, and *Maestro* will play it back. Exactly the way you played it—the same notes, rhythm, and tempo.

To leave this mode before the playback cycle is completed, press the COMMODORE key.

MODE 2: COMPOSE A TUNE

Use this mode to create an original composition or to enter notes from sheet music. First indicate the number of voices. Think of a voice as one musical instrument. With only one voice, we are limited to the melody. If we wish to add harmony, additional voices are required. Most music is written for several voices, and the SID chip can handle up to three. With a little experimentation, you will find that the more voices, the fuller the music sounds. If you're trying to input notes from sheet music, you will probably find that more than three voices are needed. For example, five voices would be required to play a five-note chord. However, if three notes are carefully chosen from such a chord, the same effect can usually be achieved.

Once you've indicated how many voices will be needed (and it's always possible to add or delete voices later), you will start to input the notes to be played by each voice. Using Figure 1 or 2 as a guide, type the notes in the correct order. Be sure to include rests (pauses) by typing SPACEs. If you forget a rest, the rhythm will probably be incorrect.

After you have input a series of notes, type SHIFT, and you will be prompted for the corresponding rhythm for each note. For each note, you must indicate the note's duration.

The letters of the alphabet are used to represent rhythms. The letter "A" represents the smallest unit of time in a piece of music, usually a sixteenth note. The letter "B" makes a note play twice as long as "A", "C" three times as long, and so on.

If "A" is used for a series of notes, they will slur, with no distinct separations in between. If this effect is not desired, use "B" for the shortest notes. Two typical rhythm assignments are shown here.

Typical Rhythm Assignments

RHYTHM	OPTION 1	OPTION 2
Sixteenth	A	B
Eighth	B	D
Dotted Eighth	C	F
Quarter	D	H
Dotted Quarter	F	L
Half	H	P
Dotted Half	L	X
Whole	P	...

If you accidentally type a wrong note or rhythm, simply press CURSOR LEFT while holding down the COMMODORE key. The note or rhythm will be cancelled, and you can then input the correct one. The CURSOR LEFT key cannot be used to correct notes after you have typed SHIFT and are prompted to input the rhythms. Furthermore, the CURSOR LEFT key cannot be used to correct the last rhythm entered. Once the last rhythm is typed, *Maestro* immediately begins to compile the music. But have no fear. From that point on, corrections can be made using the Music Editor (MODE 4).

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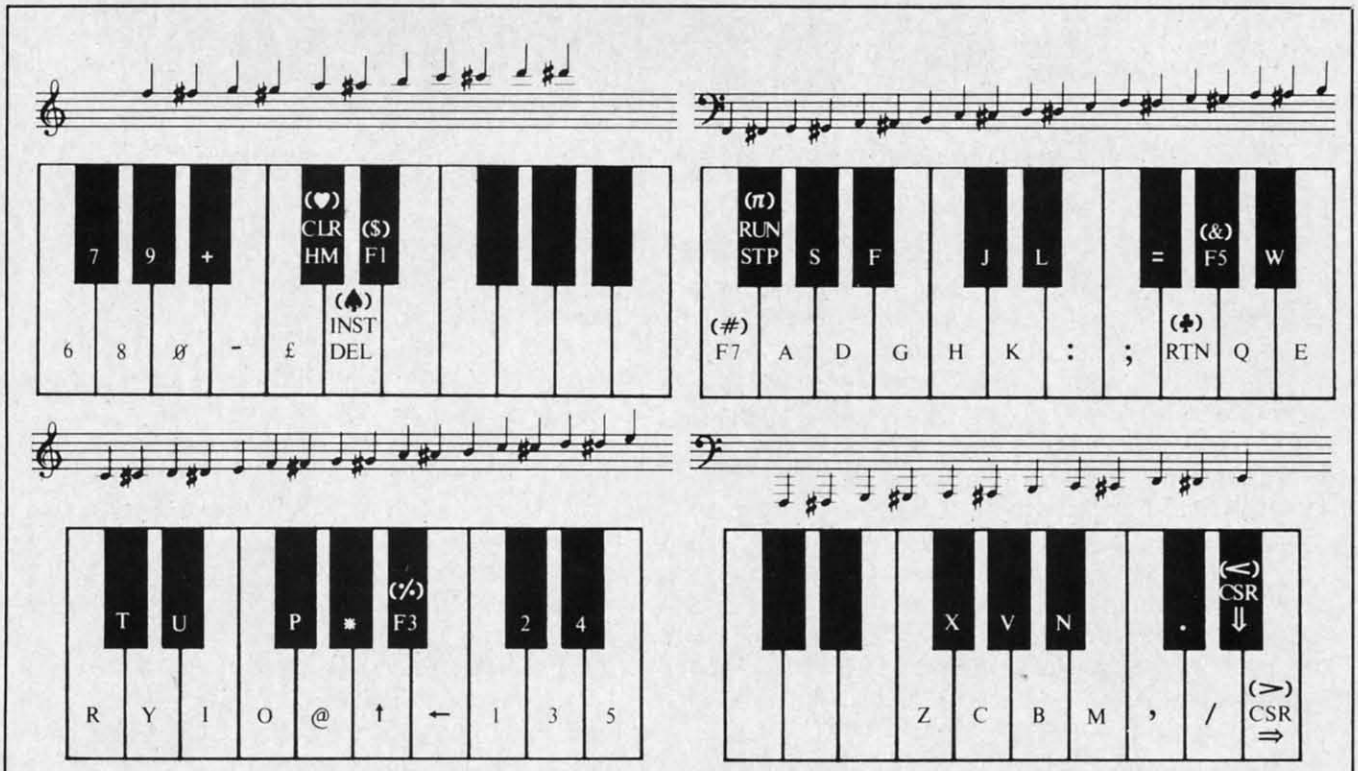

Piano equivalents of notes played by C-64 keys under **Maestro** *control (also shown on staffs above each keyboard section).*

(Note: when MODE 2 is selected, any notes and rhythms previously entered will be erased unless you *immediately* exit the mode by typing SHIFT when prompted for the desired number of voices.)

MODE 3: LOOK AT MUSIC

This mode permits you to examine the notes and corresponding rhythms of any voice. Type SHIFT to return to the menu.

MODE 4: MUSIC EDITOR

The Music Editor permits four operations:

1. Add additional notes to any voice.
2. Change the notes and/or rhythm of an existing voice by retyping (from the beginning) the correct notes and/or rhythms.
3. Eliminate a voice.
4. Add an additional voice to a piece of music presently consisting of fewer than three voices.

For example, if you have composed a single-voice melody (using MODE 2) and wish to add a second voice for harmony, use the Music Editor to EDIT Voice 2. The Editor will allow you to input notes and rhythms for that new voice. Similarly, to eliminate an undesired voice, EDIT the voice: type "B" to edit from the beginning, and type SHIFT when prompted to enter notes and rhythms. Naturally, to eliminate all voices, it is easiest to start from scratch by using MODE 2.

MODE 5: SELECT INSTRUMENT

Select the desired instrument for each voice by typing a number key. 10 instrument sounds are available. For greater musical color, try using a different instrument for each voice.

MODE 6: LISTEN TO MUSIC

In this mode, select the desired tempo (0 being the fastest), and indicate which voice you wish to hear. In this way it is possible to listen to each voice separately. To hear all voices simultaneously, type "4".

To stop music that is being played, simply type SHIFT.

MODE 7: SAVE MUSIC ON DISK

Reserve a spare formatted disk for saving music. Use this mode to name and save music on that disk.

MODE 8: GET MUSIC FROM DISK

Load music you have saved on disks. Other sequential files may be confused with music files, so do not attempt to load them.

MODE 9: LOOK AT DISK INDEX

Examine the titles of music you have saved on disk.

MAESTRO SUMMARY

SHIFT	Return to menu
	Start playback (PLAY IT AGAIN!)
	Stop playback
	Ready to input rhythms
COMMODORE KEY	Stop playback (PLAY IT AGAIN!)

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WHAT IS THIS GIRL DOING?

THE			GIRL				IS	
TH	AX	PAS	GG3	ER2	LL	PAS	IH	SS
29	15	04	34	52	45	04	12	55

FEEDING								
PAS	FF	IY	PA3	DD2	IH	NG	PAS	BB1
04	40	19	02	33	12	44	04	28

BREAD						TO	
RR1	EH	EH	PA1	DD1	PAS	TT2	UW2
14	07	07	00	21	04	13	31

A		DUCK			
PAS	EY	PAS	DD2	AA	KK2	PAS
04	20	04	33	24	41	04

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COMMODORE KEY/
CSR RT — Erase note or rhythm
SPACE — Rest (silence)

INSTRUMENTS:

0	Accordian	5	Drum
1	Organ	6	Guitar
2	Clarinet	7	Xylophone
3	Synthesizer	8	Banjo
4	Kazoo	9	Piano

HELPFUL HINTS

When inputting notes, keep in mind that *no SHIFTed characters are used to represent notes* (for obvious reasons!).

After using MODE 4 to add a voice, be sure to assign it an instrument using MODE 5.

Do not use rhythm "A" when the same note is to be sounded twice in a row.

If no sound is heard when playing notes in MODE 0, 1, or 2, try changing instruments.

EXAMPLE MUSIC

From the menu, select MODE 2 (COMPOSE A TUNE). Then type 2 to indicate that two voices will be used, and input the following notes:

```
●I↑1←I←315*5↑I↑1←I←31↑●●515↑1I@Ո↑363←3@←
YՈI@151↑1Ո3←@←I1↑Ո↑Y←1
```

(From Figure 1 or 2 we know that 0 = SPACE)

Now type SHIFT, and enter the following rhythms:

```
BBBBBBBBDDDDBBBBBBBBDDHBBBBBBBBDDDFBBBBB
BBDDDFBBBDFBBBDFBBBDDH
```

In a moment, you will be prompted to indicate a tempo for the immediate playback of Voice 1. Type any number and playback will begin. (To halt playback type SHIFT).

Now you are prompted to input the notes and rhythms for Voice 2. As before, type the following:

```
DQ&Q:QRE:EYRQ&:Q:QRE:EYRQRQYQ;QK;DHGK♣E♣
:♣H:AGDHK;GKAGH:DH#/A♣;♣H
```

(Here again, ♣ =RTN, & = f5, and # = f7.)

Type SHIFT and input these rhythms:

```
DHDBBBBBBBBDDDDBBBBBBBBDDDDBBBBBBBBDDDFB
BBBBBBDDBBBBDDBBBBDDBBBBH
```

And that's all there is to it. You will be prompted to indicate a tempo for the immediate playback of Voice 2. Select any tempo, then type SHIFT to halt playback and move on.

Now, assign instruments using MODE 5. For this piece you might like 2-Clarinet for Voice 1 and 1-Organ for Voice 2.

Ready? You should see the menu once again. To hear all those notes and rhythms you have just provided, type 6 (LISTEN TO MUSIC), then 4 (both voices at once) and then whatever tempo you prefer (2 is good for this piece). Sit back and enjoy! □

SEE PROGRAM LISTING ON PAGE 134

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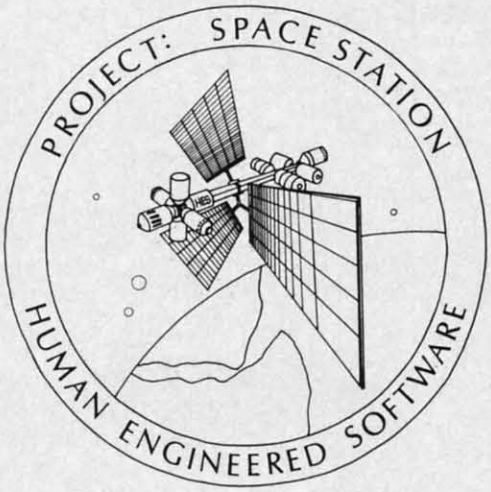

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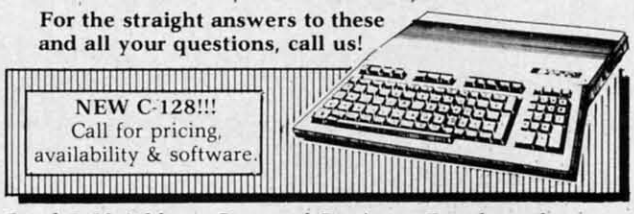

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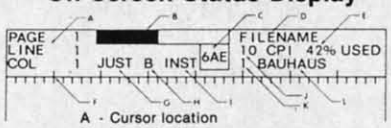

A - Cursor location
B - Scroll Indicator
C - Print features currently being used
D - Filename of text
E - Percentage of RAM (memory) used
F - Ruler (also message line)
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I - Insert mode flag
J - Characters per inch
K - Number of the current font
L - Name of the current font

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ERRATA

Line 685 of *Formatter* (August) was omitted during printing. It should read

```
685 GET D$: IF D$="" THEN
685
```

Users of some newer C-64's will find that *Gators N Snakes* (August) will occasionally cause the screen to flash, then blank out with unusual characters appearing. To correct the problem, turn off the machine and reload the program.

We apologize for any inconvenience caused by these problems. Remember that corrections to *Ahoy!* programs and articles are listed on the *Ahoy!* Bulletin Board (718-383-8909 —modem required) as soon as they are spotted.

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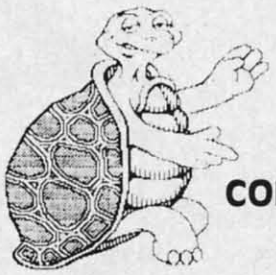

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TIPS AHOY!

We kept our part of the bargain—we came up with the title for *Ahoy!*'s programming tips column. And many of you readers have kept your part of the bargain, by supplying us with useful hints, tips, and programming routines for the Commodore computers—many more than we can fit into the limited space available in this issue. But *Tips Ahoy!* will be expanding in future issues, and we hope to receive input from a great many more of you. We'll pay top industry rates for accepted submissions. Send your best to *Tips Ahoy!*, Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001.

LIFESAVERS TO SCOTCH TAPE TO YOUR COMMODORE

Many readers have called up or written regarding problems entering the BUG REPELLENT program. The most typical error is an:

?ILLEGAL QUANTITY ERROR IN 5000

Until now there was no way to know where the bad data statement was, but with one simple command typed in immediate mode you can tell what line number the bad data element is in. Simply use the following line:

```
PRINT PEEK(63) + PEEK(64)*
256 [RETURN]
```

The computer will return the line containing the error.

If you have ever inadvertently typed NEW, the following line will restore your program:

```
POKE2050,1:SYS42291:POKE45
,PEEK(34):POKE46,PEEK(35):
CLR [RETURN]
```

Your program will be restored back into memory. —H. Roth
Los Angeles, CA

HIDING YOUR PROGRAMS

If you wish to make a program "unlistable" enter the following line into your program:

```
1 REM (SHIFT L)
```

When someone types LIST the computer will show

```
1 REM

? SYNTAX ERROR
```

If people wise up to this trick, you may wish to be a bit more devious. Put the REM statement with the (SHIFT L) in the same line as an important statement, such as

```
100 V=53248:REM [SHIFT L]
```

If this line is deleted in order to view the program, the variable will not be defined and the program will not run.

To make your program unstoppable once running, use POKE 788,52. This will disable the RUN/STOP key.
—Craig Buchaman
Huntsville, AL

AUTO RUNNER

Instead of having to LOAD and RUN a program in separate steps, typing

```
LOAD"(FILENAME)",8,1(SHIFT
)(RUN/STOP)
```

will LOAD and RUN a program automatically. —Barry Allyn
Arlington, VA

UNDIM YOUR DIMS

One limitation of BASIC on the C-64 is the inability to redimension an array. The following line will allow you to undimension an array so that you may redimension it.

```
POKE 49,PEEK (47):POKE 50,
PEEK (48)
```

—Jerry Jarvis
Spokane, WA

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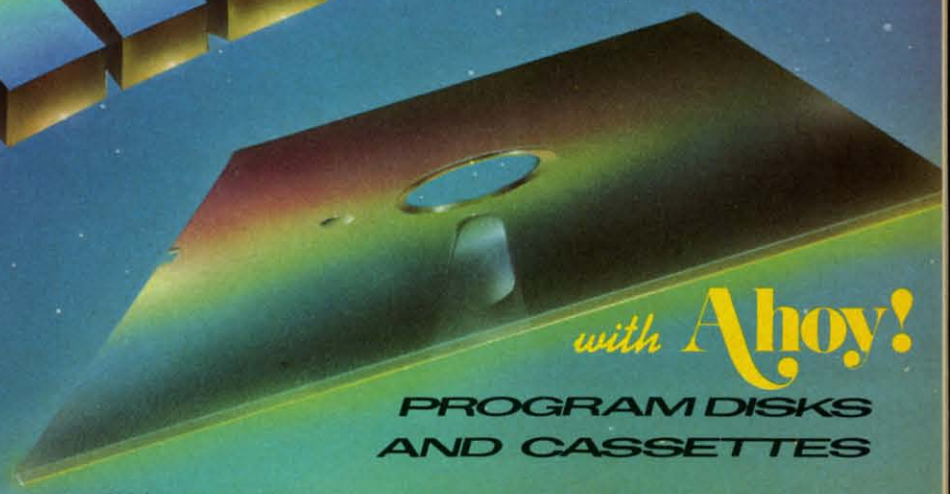
BREAK THROUGH

The

THE BARRIER



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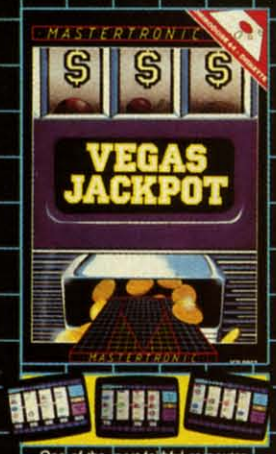

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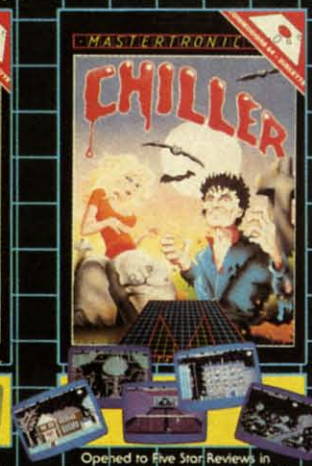
A satellite retrieval game that includes 16 levels of "low pressure" death awaiting the unskilled astronaut.

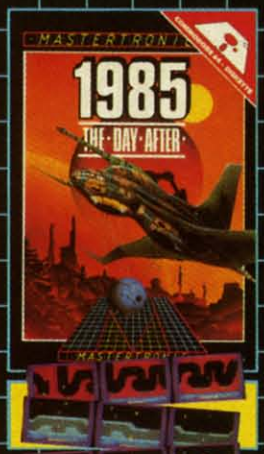
A sure chart winner. You will need skill and fast reflexes to beat this one! You can ride on 5 different courses, each course ranges from 8 to 25 different scrolling screens.



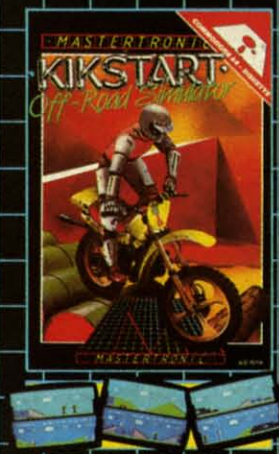
Opened to Five Star Reviews in Europe recently this is surely one of the most challenging and unusual games available for the C64. Written by Commodore Programmers of the Year Richard and David Darling. The game has five different spectacular screens with hidden twists — if you get this far you have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

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

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

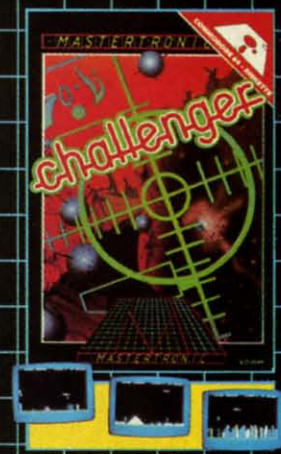


A scrolling multi screen game that takes Commodore graphics to a new state of the art level previously seen only in a handful of other games. Playability is a keyword on this five star game!



A one or two player game with split screen scrolling graphics that realistically simulates off road riding on eight different and challenging courses.

Multi screen arcade action with real twists needing a steady hand and a bold strategic game play. It will keep your interest alive for hours.



Neat variation on a city bomber theme using excellent scrolling graphic routines that is extremely addictive.

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

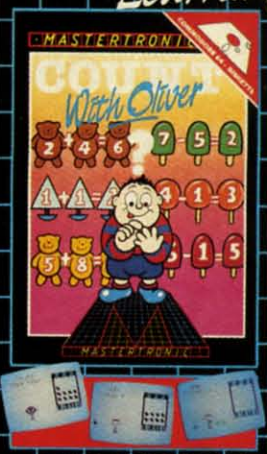
'Star Wars' 1985 style with a very fast moving five screen arcade action game with multi skill levels.

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

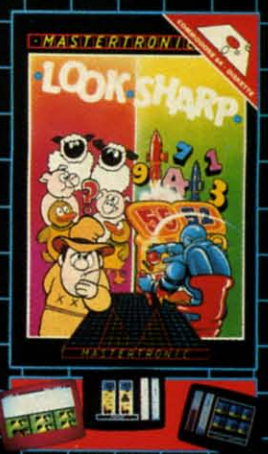
Truly 'State of Art' programming in this latest Third Continent adventure. Launched to rave reviews in England. This is a 120K adventure in three programs that comes with a beautifully illustrated 158 page descriptive 'book of shadows' set not to be missed by serious games players.

EDUCATIONAL

Learning is Fun



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



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

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

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

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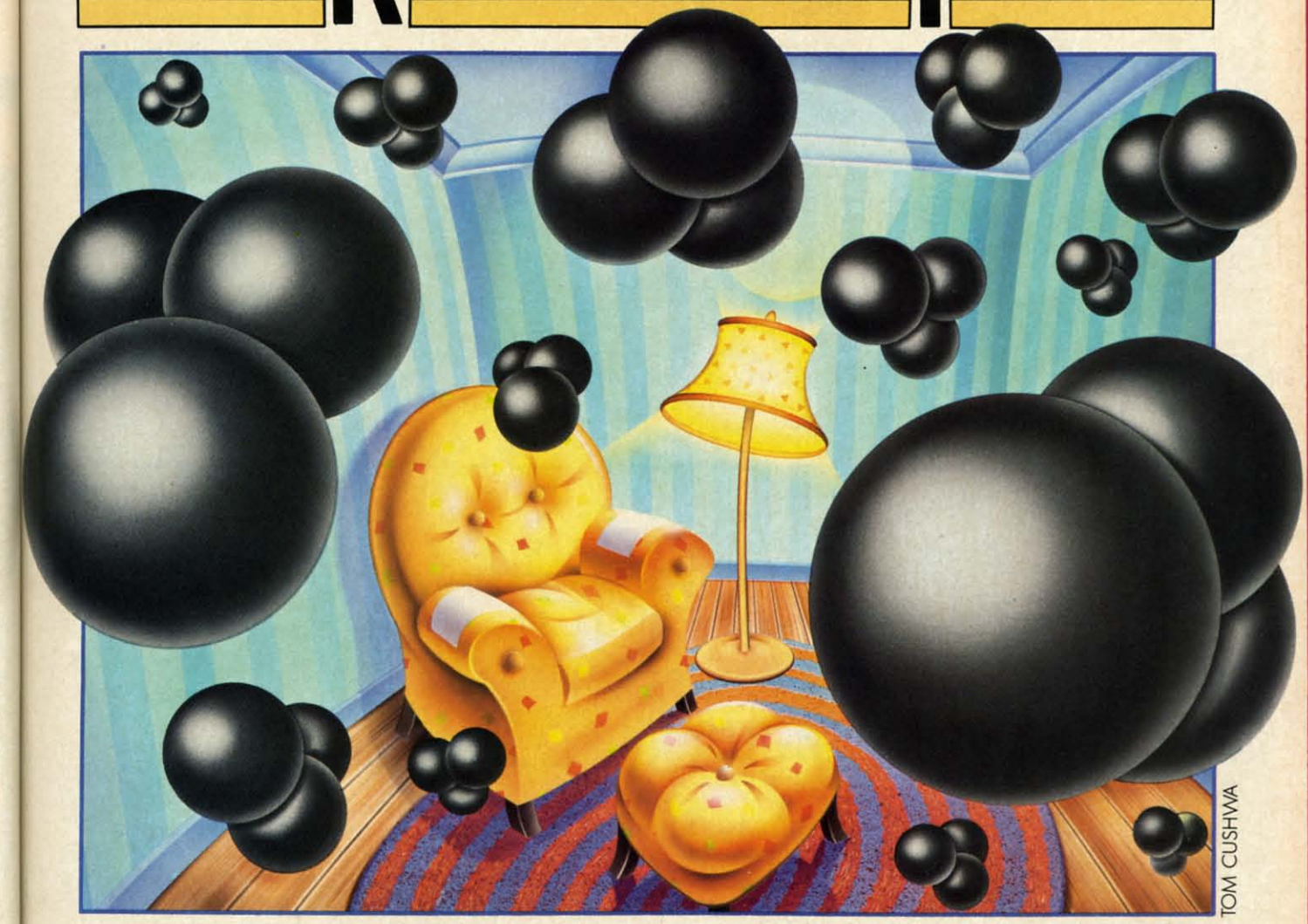
RUPERT REPORT



TOM CUSHWA

Infinitesimal Intrigue

By Dale Rupert

Computer Explorations of Sub-microscopic Activity

How often do you get the chance to watch molecules in motion, or to monitor short-lived radioactive isotopes? This month you can add those two activities to your list for the skeptic who asks, "What can you do with a personal computer, anyway?"

We will continue exploring ways to simulate the real world with the microcomputer. These investigations may not uncover any revolutionary, fundamental truths (although they may). Our goal is simply to gain some insight into the behavior of objects beyond the realm of our normal senses.

Suppose you could see the molecules of air in a room. Undoubtedly they would be scattered randomly and rather uniformly. Now imagine that as you watch, all the molecules gradually migrate to the left half of the room, leaving a vacuum in the right half.

Is there any reason this couldn't happen? In fact, from a physical standpoint, it certainly *could* happen. Each molecule has a certain velocity. If the velocities of all molecules just happened to be in the same direction at the same time, theoretically all the air could travel to one side of the room.

From a statistical standpoint it's a different story. The

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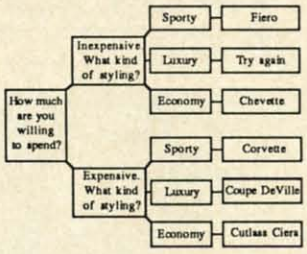
XPER - expert system



XPER is the first *expert system* - a new breed of intelligent software for the C-64 & C-128. While ordinary data base systems are good at reproducing facts, **XPER** can help you make decisions. Using its simple entry editor, you build the information into a *knowledge base*. XPER's very efficient searching techniques then guide you through even the most complex decision making criteria. Full reporting and data editing. Currently used by doctors, scientists and research professionals. **$59.95**

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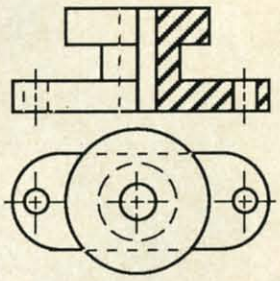

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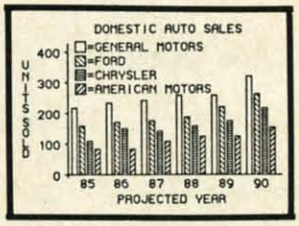

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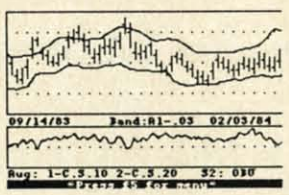
TAS - technical analysis



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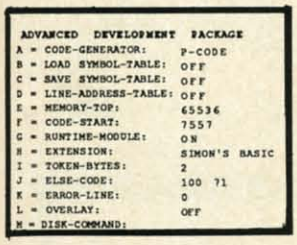
BASIC-64 full compiler



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B = LOAD SYMBOL-TABLE:     OFF
C = SAVE SYMBOL-TABLE:     OFF
D = LINE-ADDRESS-TABLE:    OFF
E = MEMORY-TOP:            65536
F = CODE-START:            7557
G = RUNTIME-MODULE:        ON
H = EXTENSION:             SIMON'S BASIC
I = TOKEN-BYTES:           2
J = ELSE-CODE:             100 71
K = ERROR-LINE:            0
L = OVERLAY:               OFF
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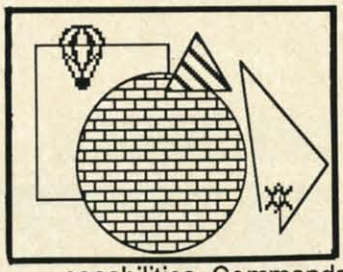

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FORTH Language

```
SCR # 20
 0 P ( RANDOM NUMBER TESTER ?RND )
 1 P FORTH DEFINITIONS DECIMAL
 2 P : ?RND
 3 P       ( INITIALIZE FIRST SCREEN)
 4 P       1024 1000 ASCII 0 FILL
 5 P       BEGIN
 6 P          1000 RND   ( RANDOM 0.999)
 7 P          40 /MOD    ( COLUMN, LINE)
 8 P          SWAP       ( EXCHANGE)
 9 P          2DUP 5$    ( CHARACTER)
10 P          1+ -ROT    ( ADD 1)
11 P          5!         ( SAVE)
12 P       ?TERMINAL UNTIL
13 P ;
```

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Send a copy of your program on disk or tape, accompanied by a printout and documentation, to *Ahoy!*, 45 West 34th Street—Suite 407, New York, NY 10001. Include a self-addressed mailer with sufficient return postage affixed. (Program printouts not accompanied by a disk or tape will be returned unread; programs not accompanied by sufficient return postage will not be returned.)

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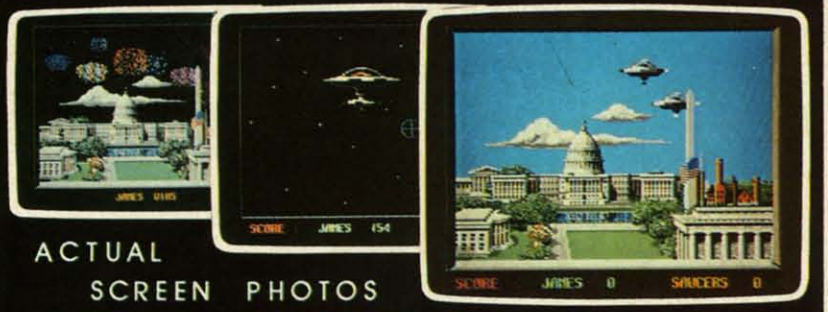

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We are a small software company operating in California's San Bernardino Mountains. This is a rural area, so all businesses must have P.O. boxes. Our local post office is very efficient, however, and if your request for SAUCER ATTACK is sent with a money order, the package will be sent out the same day, reaching most states within three days.

SAUCER ATTACK is our first product, and has enjoyed considerable favor with the magazines. (See the reviews in RUN magazine, JAN. '85, and Commodore's POWER PLAY, MAY '85.) To answer the most asked question: YES, the screen photos are real! They were taken from a normal (in fact, well-used) Commodore monitor with an ordinary 35 mm camera. We have had orders for the game from every state in the union, and 21 other countries.

Thanks to the kind public support for SAUCER ATTACK, we will be introducing our second product, hopefully this coming January. 16 months in the making, TIME CRYSTAL will offer even more spectacular graphics than SAUCER ATTACK, as well as the depth of game play offered by adventure games. We hope to push the state-of-the-art ahead a couple of years with this program. The screen photo below is from the Prehistoric Age in TIME CRYSTAL. Watch for our next ad in the Dec. AHOY! for more info on TIME CRYSTAL.

Thanks again for your support and see you in two months.

Jim Sachs

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likelihood of all air molecules in a room spontaneously having velocities in the same direction at the same time is negligibly small. The situation (on a smaller scale) is analogous to flipping a million coins and having them all come up tails. Possible? Yes. Probable? Don't bet on it.

TOWARD INCREASING DISORDER

If you watched a movie of thousands of identical molecules moving around in a container, would you be able to tell if the movie was going forward or backward? If the molecules were uniformly distributed and remained so throughout the movie, you certainly could not tell.

(You might prefer a simpler and more familiar example if you find it difficult to picture molecules moving around. Consider the wind-filled box containing Ping-Pong balls that is used for drawing lottery numbers or for choosing bingo values. The balls continuously float around, bouncing off the sides of the container and each other. This is not really an isolated system because of the external fan, but it gives you the idea of the random motion with which we will be dealing.)

Suppose that the molecules gradually began congregating in the left half of the container, until the final scene showed no molecules at all in the right half. Assuming the molecules have no attraction for each other, it doesn't require a course in statistical mechanics to realize that the movie was probably running backward.

We would conclude that the film started with all molecules on the left and that they migrated in all directions until they "filled" the container. The concept that things in the universe tend to become more disorganized or more randomized is perhaps common sense. The physicist says in the Second Law of Thermodynamics that the natural tendency is for the entropy of a system to increase. This is another way of expressing our notion that the amount of disorganization of the molecules in the container should be increasing. If we see the molecules organize themselves in one half of a container, it seems somewhat mysterious, or downright unnatural!

The program *Molecular Motion* on page 120 simulates the random movement of molecules within a container. (The program is only for the Commodore 64.) The table on this page lists the variables and their uses. The molecules all begin on the left side of the screen. A random number is chosen to decide if the next molecule to trade sides comes from the left or from the right side of the screen.

The probability that a molecule moves to the other side of the screen depends upon how many molecules are currently on its side of the screen. If all molecules are on the left, then obviously the next movement must be from the left side to the right side. If the molecules are evenly distributed, the next molecule to move to the other side is just as likely to be on the right side as on the left.

The relative number on the left (RL) is calculated in line 80 from the total number on the left (NL) divided by the total number (TTL) of molecules. Since all molecules start on the left side, this ratio is initially one. Line 90 picks a random number between zero and one. If the random number is less than the relative number on the left side, it is assumed that one of the molecules migrates from the left to the right.

As more molecules move to the right, the relative number on the left decreases. Consequently it becomes less probable that a molecule will move from left to right. For example, when half are on each side, the relative number on the left is one half. If the random number is less than one half, one moves from left to right. It is just as likely in this case that the random number will be greater than one half, meaning that one moves instead from right to left.

After the program has run for awhile, you should notice that the numbers on the left and right sides are nearly equal. They vary some as would be expected. Hopefully

VARIABLES FOR *MOLECULAR ACTION*

A$ keyboard input
KK direction: 1=normal; 0=reversed
K1 start of screen memory
K2 width of screen
K3 blank character
K4 molecule character
L$ format character
L1$ cursor left
ML memory to POKE on left
MR memory to POKE on right
NL number on left
PL POKE character for left
PN random number
PR POKE character for right
RL relative number on left
T time counter
TTL total # of molecules
X screen column (0-39)
Y screen row (0-24)

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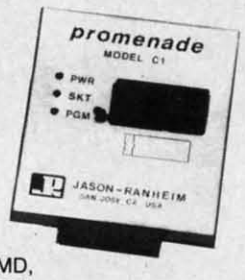

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you agree that it is most unlikely for the original distribution to occur again with all molecules on the left. Chances are equally remote that all of the molecules would ever end up on the right side of the screen at once.

THE ARROW OF TIME

Robert Eisberg describes this problem as a calculator simulation in his book *Applied Mathematical Physics with Programmable Pocket Calculators* (McGraw-Hill, 1976). He refers to "the arrow of time" as the natural direction for the system to progress.

We can easily simulate reversing the arrow of time. That way we will be able to make our "computer movie" run backward. Normally K3 represents the empty space character (ASCII value 32), and K4 represents the molecule (ASCII value 81). If any key is pressed while the program is running, the values of K3 and K4 are swapped in line 270.

Now when the test in line 110 says to move a molecule from left to right, the opposite will occur. A molecule will be put on the left and a blank will be put on the right. Now it is more likely for a molecule to go from right to left whenever there are already more molecules on the left. Let the program run for a while with the arrow of time reversed. All of the molecules regathering on one side of the screen seems unnatural. Pressing another key reswaps the values of K3 and K4 and sets the arrow of time straight again.

The numbers at the top of the screen tell the numbers of molecules on each side and the number of time intervals that have elapsed since the last key was pressed. Time is displayed as a negative value when the arrow of time has been reversed.

This concept of the increasing entropy or disorder of an isolated system relates only to systems containing reasonably large numbers of objects. If there were only two molecules in the container, it wouldn't seem unusual for both of them to be on the same side at one time. It would be impossible to know whether the movie is going forward or backward if it showed just two molecules. With 480 molecules, it should be readily apparent when things are behaving naturally and when they aren't.

RADIOISOTOPE ACTIVITY

Radioactive nuclei decay at random. A nucleus of Uranium 234 (U-234) splits into a Helium nucleus and a nucleus of Thorium 230. U-234 has a half-life of a quarter of a million years. This means that after that amount of time, half of the nuclei in the original sample of U-234 will have decayed.

Just as with the probabilities of coin flipping, you can't predict what any one nucleus will do at any given time. You can only come up with averages for many nuclei or many time intervals. A particular U-234 nucleus might decay today or it might wait several million years before decaying.

Thorium 230 is called a "daughter product" of U-234. Thorium 230 itself is radioactive. It breaks down into other products which eventually decay to become Lead 206 nuclei.

The program *Radioactive Decay* on page 120 simulates the decay of a sample of a radioactive substance. (This program is written for the Commodore 64. The first part of this program also runs on the VIC 20 if lines 240 and 250 are deleted. The Plot Routine works only on the Commodore 64.) The initial substance decays to one radioactive daughter product which itself decays to a stable second daughter product.

Common sense tells us that as the amount of the original substance decreases, the amount of the first daughter product should increase. Furthermore the amount of the stable second product should gradually increase as some of the first product decays. Eventually only the stable nucleus, the second daughter product, remains.

The relative amounts of each substance at any time depend upon the relative half-lives of each substance. If the initial substance decays rapidly and the first daughter product decays much more slowly, we would expect the amount of the first daughter product to increase rapidly. Its concentration should remain fairly high for quite a while as it slowly decays into the second daughter product.

The first time you run *Radioactive Decay,* line 170 calls the subroutine at line 400 to print the quantities of each type of nucleus. You may add an appropriate OPEN statement and change lines 400 and 420 to PRINT# state-

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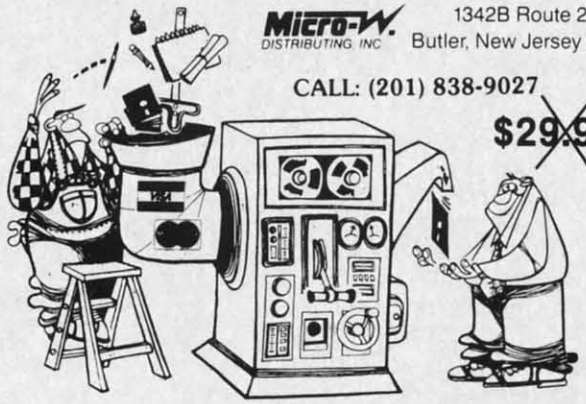

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ments if you want the output to go to your printer instead of to the screen.

If you are using the Commodore 64, you may change line 170 to GOSUB 500. This calls the Plot Routine which creates a graph of the quantities of the three substances as a function of time. Pressing any key after the first screen is completed will continue the graph onto the next screen.

This program is easy to modify. First of all, the decay constants in lines 110 through 130 may be changed. A value of one means that the substance decays instantly. A value of zero means that the substance is stable. The closer the decay constant is to one, the shorter its half-life is. See how changing the decay constants changes the relative numbers of each type of isotope.

For the technically oriented readers, the relations between the decay constant (DC) and the half-life (t) are as follows:

$$DC = 1 - EXP(-0.693/t)$$
$$t = -0.693/LOG(1 - DC)$$

The number −0.693 is the natural log of one half.

Initially there are 100 type 0 nuclei. The computer selects a random number for each nucleus. If that number is less than the decay constant for a given nucleus, then that nucleus decays. A type 0 nucleus becomes a type 1 nucleus when it decays. A type 1 nucleus decays into a type 2 nucleus. Since the type 2 nucleus has a decay constant of zero, it will never decay.

The array NUC( ) keeps track of each nucleus' type. For example, if the tenth nucleus has decayed twice, it is a type 2 nucleus, and NUC(10) equals two. The array M( ) keeps track of the total numbers of each type of nucleus. Initially M(0) is 100 while M(1) are each zero, since all 100 nuclei are type 0. When a type 1 nucleus decays, there is one less type 1 and one more type 2. Line 210 does the accounting.

It is not difficult to change the initial number of nuclei or the number of different daughter products. Line 10 defines the total number and line 30 gives the number of daughter products. If you change the number of daughters, you should change the numbers of decay products beginning at line 110. There should be a decay constant for each type of nucleus.

John R. Merrill provides a more technical discussion of radioactivity simulations and many other topics in his extensive book *Using Computers in Physics* (Houghton Mifflin, 1976). You could certainly learn a lot of physics by running the programs in his outstanding book.

As usual, the programs this month are merely a starting place for your investigations. Simulations on your microcomputer provide a window into the workings of the universe. Enjoy your explorations and your discoveries. □

SEE PROGRAM LISTING ON PAGE 120

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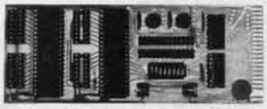

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COPY PROTECTION:

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By George Trepal

It seems that every other ad in computer magazines is for programs that copy other programs (but not themselves). What's going on? Why should a program be hard to copy, anyway? Shouldn't a simple LOAD then SAVE to another disk make a copy?

Imagine being given the job of designing a book that anyone could read but no one could copy. Making software copyproof is a lot like this. The computer must read the information from the disk in order to run the program, yet the information must somehow be protected from being copied. When the program is in the computer it can alter the computer's SAVE and BREAK instructions and protect itself. When it's on the disk it has no such protection and can be copied a block at a time. Yet there are programs that can't be copied.

To understand what's happening we have to start with the disk drive. It's not simply a box. Inside is a full computer with ROM and RAM and a dull little filing program that runs constantly.

In addition to the computer circuitry is the disk turning motor and a system to move the magnetic head over the disk. The head is responsible for reading or writing information to the disk. The head moves in steps across the disk with each step representing a track. The steps are referenced to solid objects called stops. When you format a disk the drive starts the process with internal banging. Each bang is the head whacking against a stop to make sure it's gone as far as it can. When it is satisfied about its position it starts laying down tracks.

If you're thinking that this is a pretty sloppy way to run things you're right. If the head can't position itself over the tracks it's said to be out of alignment. Since the alignment for each drive is slightly different, a disk that works on one drive may not be readable by another.

If you'll look at a disk you'll see a little round hole near the hub. Some drives have a light beam-photocell combination to look for the hole. When the hole shows up, the computer has a reference point to work from. This is called hard sectoring a disk. Commodore computers use soft sectoring, which means the hole isn't used and the drive has no idea where it is on the disk. It gets around this problem by putting a marker called a sync character at the start of things. Each track is divided into sectors with the outer tracks having more sectors than the inner tracks. The sectors of a track take up equal room, and a space between the last and first sectors is provided as a safety margin. If the space weren't there and the drive's timing were off, the last sector could overwrite the first sector.

The computer and drive are both dedicated to 100.000% accuracy. A program that takes up 100 blocks on the disk represents about 25,000 bits of program information and 9,000 bits of error detection information. If even one is wrong, the program won't run right!

One way to detect errors is to add the values of all the bytes stored in a sector and store this checksum separately. When the information is read off the sector the addition is done again and compared with the checksum. If the two don't match, the information is read again, since an error has been detected. After a number of tries and failures, an error is declared and the red drive light starts to flash.

Each sector has the disk ID written into it. If the ID doesn't match the ID the computer found when it checked the directory, an error is declared.

Synch characters tell the drive where it is on the disk. If a synch character is missing you'll get an error.

Virtually all copy protection takes advantage of the fact that the drive and computer hate anything abnormal. Normal copy programs won't copy errors because—well, because they're errors and are therefore WRONG!

This is easier to understand if we humanize the machines. The scene: a program has been loaded into the computer and it has started to run.

Computer: Hmm! The first thing the program tells me to do is check to see if this disk is original or a copy. If it's a copy, I won't run the program. Hey! Drive, get me the data in sector one of track one.

Drive: OK, sector one of track one. Coming right up.

Unbeknownst to Drive, the entire track is empty and has been reformatted, thus providing it with an ID different from the rest of the disk.

Drive: Here it is. Better check to see if the ID matches. Oh, oh! it doesn't. My head is probably put out of alignment, so I'll whack it against the stop to align it. BANG! Nope, the error is still there so I'll whack my head again to align it. BANG!...

Drive whacks his head for some time. You hear it as about a second of machine gun fire. Eventually Drive gives up and an error is declared.

Drive: Yo, Computer! I can't give you the information. I tried hard to get it, but the ID doesn't match.

Computer: The program says that if Drive tells me there's an ID error, the disk is the original and it's okay to run

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the program.

The thing that confuses some people is that the error is not part of the program. If the error were part of the program, the program couldn't be loaded, since it would have an error in it. The error is always confined to a portion of the disk not used to hold program information.

There are two ways to read errors and both are (poorly) covered in the Commodore drive instruction manual. One way is the block read just described. It involves a great deal of head banging, which can indeed cause head misalignment. All programs copy protected with block reads work to send your drive to the repair shop. The other method is called memory reading. A memory read actually looks inside the drive's buffers to extract information. There is no banging. The program that accompanies this article uses memory reads to check a disk for errors.

Simple errors were adequate protection two years ago, but now there are dozens of copy programs on the market that copy them. A war is on between those who want to protect software and those who want to copy it. Needless to say, almost no one wants to tell how they protect their software. The following information is probably right, but as I've said, people are reluctant to talk.

A disk normally has 35 tracks on it, but the head can be told to make extra tracks. Track 36 is the easiest to work with and track 40 is the hardest. Since a normal disk copy program only copies 35 tracks, vital program information stored on track 36 is lost. The error checking program I've included will check to track 40. If the tracks don't exist, the program will give error #21. If the tracks beyond 35 get a format command that tells the computer to lay down more blocks than there is room, the last blocks overwrite the first. This sort of "dirty format" will hang up my reader (and most copy programs).

There is room between the tracks for information, and this half-track space can be used to store critical data. I think true half-tracking is impossible with the 1541 drive since the head alignment isn't good enough for it. The half-traced track tends to destroy one of the tracks it's between. But that's taken into account. When a half-tracked program is copied, if the head alignment is very good the half-track is missed entirely. If it's normal, the head wiggles and picks up some information from the normal track and some from the half track, not getting clear information from either.

Similar to half-tracking is renumbering tracks, two tracks 34's for example. This can be terribly worrisome to copy programs.

Remember that the sync character lets the drive know where the information on the disk is. If a track sync character is removed, a normal copy program can never find where it is and hangs up. Of course, the track has no information on it.

Extra sectors can be put after the last sector of a track and information can be hidden in them.

The spacing of bits stored in the outer tracks differs from that of the inner tracks. By altering the bit density of a track it can be made unreadable.

There are a few other tricks (including the one my company uses) that I've promised not to write about.

A technique that has been proposed is to write a sector with a magnetic strength halfway between a 1 and a 0. When the computer reads this track it will read garbage which will vary with drive vibration, disk flexing, heat, and other factors. The sector will be read several times and if the result is different each time, the disk is assumed to be the original. If the disk were copied, the garbage read from the original would always be the same.

Another technique which is almost impossible to use with soft sectored disks is laser protection. A tiny hole representing one bit of a byte is burned in the disk. The byte is written with the last bit being 1. If it is read back as being 0 (i.e., hole) the disk is an original. This is really a technique for hard sectored disks.

There are two general classes of copy programs sold. The first sort reads information from a disk a block at a time and makes a copy of it. The second sort is called a nibble copier and is the meaner of the two. The destination disk is put in the drive and the drive rotation is timed. The source disk is then put in and a whole track (rather than block at a time) is read and stored to be fed to the destination disk later. Since the nibble copier doesn't have to worry about such things as synch characters, it's harder to protect against. Interestingly enough, most copiers tend to randomly introduce errors to the destination disk. Since most disks that are copy protected have lots of extra room on them, the introduced errors hardly ever hit a vital spot.

Why should errors be created? For one thing, the programs bypass the normal error traps to be able to write errors. Also, they bypass (usually) vital routines to gain speed. A normal copier written in BASIC takes about 25 minutes to copy a disk. By using machine language and bypassing things, a nibble copy of a disk (including half-tracks) takes about 8 minutes. Fast copy routines can do the job in about 3 minutes. Spoolers can do the job in about half a minute!

Spooling means to get peripheral devices talking to each other. A copy spooler uses two disk drives and has them sending information directly to each other. Once the process is underway, the computer can be turned off. Non-spooling copiers have to read the information into the computer, then out onto the destination disk.

Now to my error checking program. It only finds errors rather than writes them. What use could this be in making copies? Answer: Well, uh.... You may get a certain thrill in using it to find how commercial disks are protected. You can also use it to see if a disk, copy or not, has errors. If it is a copy, you can see if they are in the right places. You can use it to check formatted disks for bad spots. If you have critical information to save, it pays to check the disk first. The program doesn't hurt any information on the disk.

Copyright law allows you to make a copy of your copy protected disks for archival purposes.

You may want to format a disk and see how many errors you can create with a magnet. Be careful not to get it near the middle track since you may make the whole disk unreadable. You can also put blank formatted disks in different places to see if they are safe. Does it hurt to leave a disk on top of the monitor? How about under a ringing telephone? Are errors caused by freezing? What happens if a disk gets too hot? □ *SEE PROGRAM LISTING ON PAGE 134*

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BEACH-HEAD II

Access Software
Commodore 64
Disk; $39.95

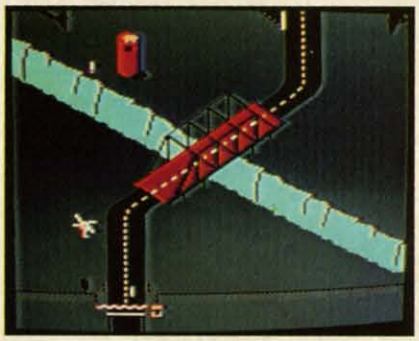
As any fan of movie serials knows, defeating a villain is one thing, keeping him down is quite another. *Beach-Head II* proves the same is true in the world of computer entertainment.

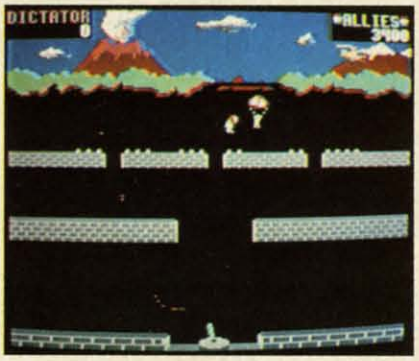
The Dictator Strikes Back is the ominous subtitle of this action strategy simulation of small-unit combat at the end of World War II. The implacable enemy, whom many computerists defeated in 1984's *Beach-Head*, has survived the destruction of his fortress. Now "The Dragon" is spoiling for revenge.

One major difference between *Beach-Head II* and its predecessor is that it can be played head-to-head as well as solitaire. In the solo mode, the gamer can control either the Allies or the Dictator in the program's four linked scenarios.

The only exception, a slap in the face to logic, is "Escape." The human player always controls the rescue helicopters against computer-directed ground forces. Even if the computerist takes the Dictator's side in the other scenarios, he or she must control the chopper in "Escape." There is no sensible explanation for the Dictator's sudden desire to ferry hostages to safety. The instruction booklet doesn't even try to offer a rationale. Possibly "The Dragon" intends to ransom his prisoners back to the Allies at a later date.

No one can accuse designers Roger and Bruce Carver of leading with anything less than their best. "Attack," the initial assault on the Dictator's sanctuary, is the most satisfying part of the game from several standpoints. It depicts an intriguing situation, has superlative audiovisual effects, and features the most original play-mechanic in the whole program.





You can't keep a good bad man down.
READER SERVICE NO. 165

"Attack" begins with a paratroop drop from the Allied helicopter in the background. The Dictator's machine gun at the bottom-center of the display tries to shoot as many soldiers as possible before they overrun the gun emplacement. There are two rows of brick walls which provide cover between death-defying dashes across open terrain, but this is fundamentally a war of attrition. In other words, the Allied commander must expect to lose some men in order to achieve his goal.

The Allies earn one reinforcement for each trooper who reaches either of the two walls closest to the machine gun. The attackers need every man, because the only way to get to the second scenario, "Rescue," is to charge into the teeth of the gun and blow the door behind it. The soldiers can toss grenades at the machine gun nest, but avoiding bullets is the main tactical concern.

After the assault group successfully storms the gun position, the display switches to the "Rescue" phase. The Dictator's arsenal is depleted, so he must prevent the 20 hostages from crossing the courtyard to the waiting helicopters with four oddly assorted weapons: a man on the roof who drops stones on the prisoners, a non-firing tank which runs them down, a truck which shoots at them with a small-caliber machine gun, and a guy who pops out of a trap door and sets landmines. The Allies' machine gun at the bottom of the screen can shoot the various obstacles out of the path of the hostages.

"Escape," the third scenario, is as prosaic as "Rescue" is wacky. It resembles *Choplifter* viewed from an

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overhead perspective. The Allies must airlift hostages to freedom in three pairs of choppers despite tenacious defenders on the ground.

"Battle" pits the commander of the Allies against the Dictator in personal combat. The large body of water at the center of the screen separates the rivals, who throw heavy sharpened sticks called poontas at each other.

Each man can move back and forth along his pier, duck or jump to avoid blows, and toss poontas at his foe. A fighter can throw straight by hitting the action button or try a curving toss by moving the joystick at the instant the onscreen figure releases the stick.

This is a fitting climax to this installment of the *Beach-Head* saga, but not half as entertaining as "Attack" or "Rescue." A combatant who scores four hits wins a round and sends the loser into the drink. It's fun once or twice, but players may feel that nine rounds, the length of a complete engagement, is too much.

It's hard to fault either the sound or the graphics. Speech Systems of Berkeley, the folks who did the voice for Activision's *Ghostbusters,* has clearly surpassed itself. The pathetic cries of wounded soldiers in "Attack" are almost too heart-tuggingly realistic. The squeamish can shut off the voice prior to the start of the game.

The visuals are generally outstanding, though "Escape" looks bland next to the other three scenarios. The animation is particularly fine in the opening and closing sequences, and it's hard not to smile at the antics of the little man who pops out of the trap door with the mines in "Rescue."

The four parts of *Beach-Head II* combine into an enjoyable play-experience, even though none is really strong enough to stand alone. It's one of the best head-to-head games for the Commodore, and the computer makes a powerful solitaire opponent.

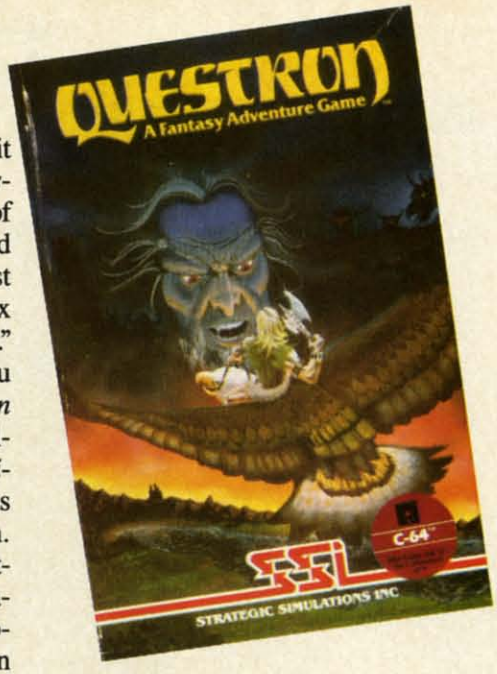
Who knows? Maybe the Dictator swam away after losing in "Battle" to plague the Allies anew in *Beach-Head III*. Fans of the Carvers' inimitable design style can only hope so.

Access Software, 925 East 900 South, Salt Lake City, UT 84105.

—Arnie Katz

QUESTRON

Strategic Simulations, Inc.
Commodore 64
Disk; $39.95



Warning! Can put bags under your eyes.
READER SERVICE NO. 166

You can't imagine how difficult it was to drag myself away from *Questron* to write this review. It's one of those games that you start playing and suddenly realize it's three hours past bedtime. SSI should label the box "potentially hazardous to your sleep."

If you've ever played *Ultima II,* you have some idea of how *Questron* works. In fact, the game style is licensed under Richard Garriott, *Ultima's* author. You begin the game as a poor peasant kid, fresh off the farm. From there, it's a straight uphill battle to become a knight. Every creature you meet along the way is a potential enemy. Most will attack on sight. But among them there may lurk a few friends. Only an adventurous spirit will ever find out.

You'll have some important considerations to make along the journey, like "Where is your next meal coming from?" It doesn't take long to starve to death out in the wild. Distributed around the countryside are small towns whose businessmen will be happy to take your hard-won gold in exchange for weapons, armor, food, or advice. Of course, this means you've got to get some gold. If you approach the right salesman, you might cut a deal on a horse, whama lama, or raft.

In some of the towns, you can even do a little gambling. I admit to spending a great deal of time in front of the blackjack tables (in real life, one of my few vices). There are also roulette tables and a game called double or nothing. Sorry folks, no ponies or dogs. The closest they get to a greyhound is a Blind Blood Dog that can rip your throat out if you aren't careful.

Hit points is a rather nebulous term for your good health. The more points you have, the more damage you can take in a fight. When the points are gone, so if your life. The people and monsters of *Questron* are not equally dangerous. Some can only inflict minor damage, while others can end your life in a few strokes. The guards that populate the towns and the castle are quite strong. And if you ever make it to the Land of Evil, you'll find out just how tough beasties can be.

What's the point, you ask? The Evil Magician Mantor is threatening to destroy all of Questron and you've got to stop him. With the help of the princess, the king, the doctor and the Wizard Mesron, you might be able to defeat Mantor. But first you have to prove yourself by attaining the rank of knight.

There are a number of puzzles to overcome in order to do well in *Questron*. My only hint would be to talk with as many people (things) as possible. You could pick up something that will be useful down the road.

I can't tell you a couple of the really neat features of the game without giving away some of the puzzles. I will say that *Questron* has incorporated an arcade game and a puzzle that make it more interesting than your average strategy/adventure game. The arcade game tests your dexterity; the puzzle tests your intelligence.

Questron has great graphics and the sound is marvelous. I especially liked the opening theme, despite its lengthening the load time. Be warned, *Questron* takes a long time to load. Also, as you have gathered from my earlier statements, it takes a long time

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to play. Even a seasoned adventurer will spend a few days working his way through it. A save feature is included. Four characters can be stored on the disk at one time, so more than one person can be using the same disk.

Whew! Now that this is out of the way, I can get back to that dungeon in the Land of Evil and see what awaits me. The outline effect used to portray the limited visibility in the dungeons is perfect. You really feel like you have to crawl along and watch out for the traps. Ooops! Another trip wire.

Strategic Simulations, Inc., 883 Stierlin Road, Building A-200, Mountain View, CA 94043-1983 (phone: 415-964-1353).

—Cheryl Peterson

THE MUSIC SHOP

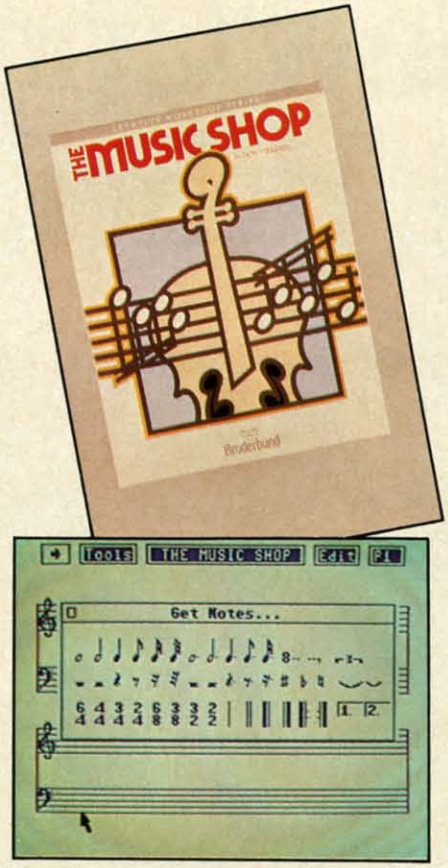
Broderbund Software
Commodore 64
Disk; $44.95

After doing a comparison of a dozen music packages for *Ahoy!* (Nov. '84), I thought I'd seen every configuration imaginable. So when a favorite editor asked me to look at *The Music Shop,* I was prepared to be disappointed. What a pleasant surprise awaited me. Not only does *The Music Shop* have all the great features needed to make it a useful music processor, it emulates the user interface of the Apple Macintosh, almost legendary for its icons, pulldown menus, and dialog boxes.

The Music Shop single-handedly proves my contention that the Commodore's limitations are perpetuated by the programmers who don't make the most of it. In operation, *The Music Shop* functions much as any good Macintosh program. Substitute a joystick for a mouse and off you go.

Any chores that need to be performed are identified by icons at the top of the screen. Pointing to them brings down a menu with highlightable options. The fire button activates the option. What could be simpler?

Even so, I must compliment the documentation. It is attractive, informative, and logically laid out, with sufficient illustrations and tutorial material. In addition, short sections explain a little music theory and how the SID chip works. A handy reference card is included, making it easy to use and learn the keyboard commands available (if you choose to use them instead of the joystick).



Emulates the Macintosh user interface.
READER SERVICE NO. 167

One of last year's better music programs, *Music Construction Set,* used a hand icon—controlled by a joystick—to point at musical symbols that were put onto a staff to create sheet music. Though it functions much the same way, *The Music Shop* uses the pulldown menus to provide a greater variety of options. "Get notes," for instance, brings up a dialog box with notes and rests (whole to 32nd duration), time signatures, bars, repeat symbols, and other musical notations. Another choice in the "Tools" menu allows you to set up the staff groupings, color combinations, and key signatures. One option even allows you to verify the timing of each bar.

Although *The Music Shop* appears to require more steps to operate than *Music Construction Set* or other on-screen music editors, I felt more comfortable with it because the screen didn't look so cluttered. Two double (or four single) staves can be on the screen simultaneously, allowing room for at least four bars of music. Since dialog boxes only appear when they are needed, there is nothing between your and your music.

The editing commands include cut and paste, copy, delete, clear, home, and the most important safety feature, UNDO. While the commands can be entered using the Edit menu, there are two-key combinations that also can be used. When the menu is pulled down, each option is followed by its keyboard command—sort of a subliminal learning experience.

At almost any point in editing, you can play the entire piece to see how you're doing. Though each note is played as it is entered on the staves, it doesn't hurt to occasionally hear the whole thing from the beginning. Pressing the joystick button will stop the playback.

If you aren't happy with the instruments that are playing the music, another menu will allow you to change the three voices. There are eight preprogrammed instruments; or you can design your own by modifying wave forms and envelope data. When you save your song, the instruments are saved as well. Although there are only three voices, you can change each song's instruments up to eight times for each voice.

Though this is enough to make the program functional, *The Music Shop* goes one step further. You can play the music while making the adjustments, so it is easy to judge how effective your modifications are. There are coarse, medium, and fine controls, giving maximum flexibility.

If that's not enough, the program will print out sheet music for you; the whole song in one pass or a page at a time. My only gripe is that it doesn't work with the Cardco printer interface, but if the sheet music meant that much to me, I'd go buy one of the other three interfaces that do work.

Broderbund, 17 Paul Drive, San Rafael, CA 94903-2101 (phone: 415-479-1170). *—Cheryl Peterson*

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DISK MAINTENANCE

Reflexive Software
Commodore 64
Disk; $29.95

Disk Maintenance is a group of three utility programs designed to help you get the most out of your Commodore 1541 disk drive. The main program offers the user the ability to change and edit any disk directory at will. The list of commands available with this program is both lengthy and impressive. With a single keystroke users will be able to perform the following functions:

Find the starting and ending address of any file.

View/edit Block Availability Map.

Disassemble any ML file.

Exchange the position of any two files in the directory.

Kill any disk file permanently.

List any file as a BASIC program.

Create a disk menu.

Rename a disk.

Append two BASIC files.

Rename a file.

Scratch a file.

Compare any two BASIC programs.

Validate the disk.

Read a sequential file.

Unscratch a file.

Change a file type.

Protect a file from being scratched.

While I could spend the next 20 pages describing each of these functions, my esteemed editor would, no doubt, frown on my doing so. I will therefore restrain myself and concentrate on but two.

The KILL function listed above is similar to the scratch command that all disk users are familiar with. Unlike a scratched file, however, a killed file can never be recovered. This would be useful if you wanted to give a copy of a terminal disk to a friend, but wanted to be sure that your password file could never be unscratched and used by someone else.

The second function I'll elaborate on is MENU. By using this little gem of a command, it is possible to create a menu of all the programs on your disk that will also load and run each of them. Any program, BASIC or machine language, can be included. With such a menu listed as the first file on each of your disks, loading a program and running it becomes a simple matter of loading the menu with the command LOAD"*",8 and then pressing the key that is indicated next to the program you wish to run. You'll never again have to remember the proper spelling of a filename or the correct SYS to use with a machine language program!

ABLE, the second program in this package, is an Advanced Block Editor that will allow the user to view and/or alter the contents of any block on the disk. Included in *ABLE* are functions for working with sprites directly on the disk, numerous help screens, and the ability to enter information as decimal numbers, hex numbers, ML instructions, and BASIC tokens. *ABLE* also supports the use of undocumented opcodes which makes machine code editing a breeze.

Compactor/Uncompactor, the final program, performs two functions. The first is compacting a BASIC program. This is equivalent to shortening the program because each line will be filled to its maximum of 250 bytes. The compactor will also remove all REMs and any leading colons it encounters. The second function will take any BASIC program and expand it by putting each individual command on its own line. This makes debugging much easier since a line can be changed without worrying about affecting other commands on the same line.

Disk Maintenance is, quite simply, one of those programs that no serious Commodore user should be without. Its speed, versatility, and friendliness have earned this program a permanent spot, not on my shelf, but alongside my computer where it will always be within easy reach.

Reflexive Software, 6507 39th Ave N.E., Seattle, WA 98155 (phone: 206-525-6873). ***—B.W. Behling***

CARTRIDGE EXPANDER

Navarone Industries, Inc.
C-64, C-128
$24.95

The Cartridge Expander from Navarone Industries is a handy gadget that allows you to have up to three ROM cartridges plugged into your C-64 or C-128 at once. Through the use of a three-position slide switch, you can change from one cartridge to another without the hassle of turning off the computer and removing the present cartridge and replacing it with another. This not only saves you time by keeping your most used cartridge in one place, but also reduces the amount of wear and tear your cartridge port would normally receive. Being able to rapidly switch from one ROM cartridge to another might not seem like a big deal to many people but those of us who have paid $60.00 to $70.00 repair charge for a new cartridge port connector can readily appreciate the advantage of owning this particular piece of equipment!

Another nice feature of this device is its push-button reset switch that allows you to return your computer to its power-up state without any loss of memory. By combining the use of this switch with a program to recover accidentally newed programs, you need never fear losing a program by the inadvertent use of the "NEW" command. This tiny switch is also great for breaking out of an ML program that has "crashed" or otherwise "locked up" your computer.

Although there are similar devices on the market for Commodore computers, the $24.95 price tag of this model places it easily within the reach of most users.

Navarone Industries, Inc., 19968 El Ray Lane, Sonora, CA 95370 (phone: 209-533-8349).

—B. W. Behling

FOREWORD

Experienced users are well aware of the need to maintain backup copies of important disk files. It only takes a single incident of "diskus destructus" to turn the most complacent operator into a dedicated archivist. Even software purveyors with the most complex of copy protection schemes stress the importance of maintaining backup copies of all disk files. The reasons are simple. It takes very little effort to permanently damage the mylar film (only 3/1000 of an inch thick) and its microscopic magnetic coating on which digital data is stored. The typical computer's environment is teeming with forces hostile

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to the well-being of the floppy disk, the most common of which are dust, smoke, magnetic fields, and temperature extremes; not to mention the ever-present possibility of physical damage due to improper handling.

In spite of this universal need for backup copies, early 1540/1541 disk drive users were severely handicapped when it came to backing up disk files. Although the Commodore DOS has a built in COPY command, it is of very little value for a single drive system. Having multiple copies of a file on single disk does very little to enhance data security. The only backup utility on the Test/Demo disk supplied with the disk drive (Jim Butterfield's *Copy/All*) required two disk drives for its use. Even then it took half an hour to back up a single disk.

It wasn't until the coming of the *Commodore 64 Disk Bonus Pack* that single drive users obtained some relief. The *1541 Backup* program on that disk allowed for a full disk backup with a single drive. Of course it did require six pairs of disk swaps and about 40 minutes to copy a full disk.

Nevertheless, we old-timers persevered. We gritted our teeth and hung in there, meanwhile inventing ingenious ways to keep ourselves amused while waiting for a disk to be copied. Of course, the 1541 wasn't too happy with this state of affairs. It frequently made its displeasure well known by demanding periodic alignment of its read/write head, as well as other chronic complaints. Ultimately our patience was rewarded. Third party software vendors strived to fill the gap which Commodore has left open to this very day. Both commercial and public domain copy programs have been developed which greatly reduced the time required for the copy process. The very latest of these offerings, which we will look at, gives very impressive performance.

An inevitable side effect of creating a high speed copy utility for the 1541 is the ability to reproduce many of the existing copy protection schemes. Although it would be feasible to omit these features from a copy utility, the publishers rarely do so. It has been found to make good economic sense to promote a copy program with these capabilities included.

Copy protection, piracy, and the software buyer's rights are regular topics in the editorial pages of every computer publication. The discussions appearing in both national publications and local newsletters have ranged hot and heavy under, over, and all around the fence. In the midst of all the controversy one thing remains abundantly clear. The advertising for products designed to assist the user in backing up his software continues unabated. Furthermore, in what seems to be an otherwise depressed market, these products continue to command premium prices. This is in spite of the fact that many of these products are rapidly obsoleted as software producers improve their copy protection schemes.

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At the risk of being outdated before these reviews are published, we present two products which as of this writing represent the state of the art in their respective fields for the C-64. We feel that both of these utilities have sufficient legitimate purpose to remain of value for some time to come. This is in spite of the rather colorful names under which they are being marketed.

FASTHACK'EM

Basement Boys Software
Commodore 64
Disk; $29.95

Based on physical appearances, *FASTHACK'EM* certainly lives up to its company's name. Packaging and documentation is minimal, consisting of a custom printed cardboard disk mailer and a single sheet of instructions. The brief documentation is further emphasized by the warranty and copyright notices which make up more than 60% of it. Fortunately, the program is menu driven and easy to use. Most users will require a minimum of experimentation to discover the program's capabilities. In addition, better documentation has been promised for the final release.

FASTHACK'EM is the product of Mike J. Henry. For newcomers in the audience, Mr. Henry was one of the people behind *Disector,* one of last year's most successful copy programs, as well as a powerful and still pertinent disk utility. Apparently Mr. Henry has decided to take his disk drive expertise and branch out on his own. The results are quite impressive. *FASTHACK'EM* is probably the fastest way to copy an entire 1541 formatted disk at the present time.

Actual performance depends on your system configuration. With a single 1541 disk drive, copying time for an unprotected disk is on the order of two minutes. Actual results will depend on the manual dexterity of the user, as three pairs of disk swaps are required. With two disk drives, a 35-second unverified and 56-second verified copy is possible: a truly impressive performance. Users of a single 1541 also have the option of copying many forms of protected software with a nibble copy utility.

If this is not enough, *FASTHACK'EM* provides an auto backup feature. In this mode, two 1541 disk

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drives are set up to talk to each other all on their own. You can even pull the disk drive serial port cable and turn off the computer once the process has begun. What's more, multiple copies are possible. The drives will sense the removal and insertion of the source and destination diskettes. Some manual dexterity is required, as copying automatically starts three seconds after the destination diskette is inserted into the drive. It is of course up to the user to maintain the proper sequence of disk removals and insertions. To further speed things up, the auto backup utility also lets you select a range of tracks (from 1 to 40) for copying.

Owners of the MSD SD-2 will be immensely pleased with *FASTHACK'EM*. Two full disk backup versions are provided for this drive. These result in a 60-second and 68-second backup of an entire disk, nearly twice as fast as the MSD SD-2 can do on its own. In addition, these utilities allow the SD-2 to copy many types of protected software. The SD-2 copy routines also allow the setting of a range of tracks from a minimum of track 1 to a maximum of track 40.

Copy protection schemes have matured considerably since the introduction of the 1541. Current methods no longer bump the disk head mechanism against the track one stop, a contributing cause to 1541 alignment problems. Many of these schemes are rather sophisticated, employing such esoteric procedures as variable density recording on a single track, half tracking, and recording on normally unused tracks beyond track 35. As a result, it is very difficult if not impossible to design a general purpose copy utility for these schemes. A number of programs have attempted to handle this problem with limited success. These generally have required the user to provide several disk parameters which describe the protection to be duplicated. The problem with this approach is the difficulty involved in discovering the proper parameters.

The *FASTHACK'EM* nibble utility has some limited parameter input capabilities. However, the user is left totally on his own as to their proper application. Instead, taking the bull by the horns, a parameter copier is included which lists 17 specific programs and a single major publisher by name. Actually the copy utility sometimes cheats. No attempt is made to duplicate the original protection scheme of all of these programs. Instead an unprotected copy is created by modifying the original program code right on the disk. The programs represented are all currently popular titles. We expect the exact roster to vary as time goes on. We leave you to your own means in finding out if your favorite program is represented.

A high speed utility loader is part of the *FASTHACK'EM* program. This seven-block routine may be easily copied for your own use. Installation in the C-64's $C000 block is simple. The result is a better than six to one improvement in the LOADing times of program files. Other disk operating times are not affected.

FASTHACK'EM is a much-needed utility for Commodore disk users. As of this writing it is the fastest whole disk backup utility we know of. Two single 1541 disk drives can now back up a disk in less time than was formerly possible with a dual disk drive. Even the performance of the MSD SD-2, the mainstay of the cottage industry Commodore publisher, has been improved by nearly 100%. User groups across the country have already recognized *FASTHACK'EM*'s capabilities in making real-time copies of public domain libraries during club meetings.

Of course there are some disadvantages. The demands on the user are now greater than ever before. Very little time remains between disk swaps for writing disk labels or other mundane activities. Gone are the leisurely coffee breaks or refrigerator raids while waiting for a 1541 to do its stuff. Insted the user is tied down to the machine, feeding it disks at an ever increasing rate. Most users will gladly make the sacrifice.

Basement Boys Software, P.O. Box 30901, Portland, OR 97230-0901 (phone: 503-256-5506).

—Morton Kevelson

ISEPIC

Starpoint Software
Commodore 64
$64.95

In a related but independent event, Chip Gracey in conjunction with *Starpoint Software* (publishers of *Disector,* mentioned above) have released *Isepic* (pronounced ice pick) for the Commodore 64. *Isepic* is a plug-in cartridge which at the flick of a switch replaces the Kernal ROM with its own operating system. This has the effect of literally stopping the microprocessor in its tracks and removing control from whatever program is running at the time. *Isepic* then lets you save the entire contents of memory to disk. This includes the full contents of the 64 kilobytes of RAM as well as the status of the microprocessor registers and the computer's I/O registers. The resultant "snapshot" is in a form suitable for reLOADing by *Isepic*, at which time the originally executing program picks up at the precise moment at which it left off.

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The *Isepic* cartridge contains two kilobytes of static RAM, several digital logic chips, and a single switch. Before booting the source program, the cartridge RAM is LOADed with the *Isepic* operating system. A flick of the cartridge switch then hides the *Isepic* cartridge by electronically disconnecting it from the expansion port. The computer is then reset to the power up state, at which time the subject software is booted up in the appropriate fashion.

The *Isepic* operating system lets you do several things before you relinquish control back to the C-64. You can view the disk directory, format a disk, and create a special *Isepic* disk for use during the snapshot process. For advanced users a memory editor and mini disassembler are included. At the time of flicking the switch, *Isepic* also fills all of memory with a predetermined pattern of its own choosing. The purpose of this will be seen shortly.

The ramifications of all this activity are startling, to say the least. Most significant is the fact that this treatment will bypass any disk copy protection schemes which may have been used by the original software boot routines. Backup copies can thus be made of the resulting snapshot files. However, in the original snapshot form, the *Isepic* cartridge and software is required to reboot the original program. To get around this, *Isepic* lets you "break" the program.

For those unfamiliar with this term, breaking a program refers to the process whereby the true hacker disassembles a copy protected program and removes the original protective code. The origin of the term probably lies in the activity burglars perform in the still of the night. A properly broken software package can be easily archived. Very often, operating convenience in the form of shorter loads is enhanced as well.

Although we have no definitive proof, it is generally believed that true hackers have no real interest in the programs they are breaking. Their primary concern lies in what is perceived as the challenge of discovering the secrets of the code placed into the program by the original authors. Some original software authors even encourage this behavior by placing hidden messages on the disk or in the code. Very often these are phrased as a dare to the hacker, in effect challenging him to do his worst.

Of course, most major software publishers take a very dim view of these activities and generally wish it would all just go away. As we mentioned above, there are many aspects to this situation. We can only encourage our readers to let their consciences guide them along the proper path.

As applied to *Isepic*, breaking the program is a compacting process which results in a stand alone LOADable file which can RUN without the additional benefit of the *Isepic* package. To accomplish this, *Isepic* makes use of the pattern previously placed in RAM as mentioned above. This allows unused parts of the snapshot to be eliminated from the final disk files. Also, *Isepic* looks for any repetitive patterns in the program code for possible additional compaction.

Not all snapshots can be broken by *Isepic*. A small amount of memory has to be made available for the stand alone boot routines which are included with the broken program. These routines reconstruct a RUNable image after the program is LOADed. In the tradition of the true hacker, these routines also display the *Isepic* logo while booting the program.

Isepic will convert many copy protected programs to easily archivable form. Many broken programs will LOAD faster due to the elimination of the initial opening screens and menus associated with most commercial software. Of course, some protected programs have their own built-in speedup routines which will be negated by the *Isepic* treatment. *Isepic* supplies its own boot utility which is incorporated in every broken program. A typical *Isepic*'d program is on the order of 35 kilobytes. These LOAD in less than 30 seconds with the *Isepic* speedup routines.

Isepic will not remove the protection from software which relies on security keys or dongles for copy protection. Of course, such programs do not require the attention of *Isepic* in the first place. *Isepic* will not successfully remove the protection from programs which check the disk at regular intervals during normal operation. These programs will still require the original protected disk for proper operation.

The *Isepic* process is fairly lengthy. It takes about five minutes to create the initial snapshot. A similar interval is needed to perform the break operation. Additional overhead is consumed by disk formatting and LOADing the original program. It should take about 30 minutes for a complete *Isepic* procedure.

Once again we caution our readers that *Isepic*'d programs are still copyrighted by the original authors and publishers. In addition, there is the matter of the copyright on the *Isepic* code itself. Illicit distribution of copies of *Isepic*'d programs may bring down the wrath of the original publishers, as well as Starpoint Software

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and Scott Blum, the official Starpoint Cynic.

Starpoint Software, Star Route 10, Gazelle, CA 96034 (phone: 916-435-2371). *—Morton Kevelson*

EASY GUITAR

DJ Software
Commodore 64/128
Disk; $39.95

In 1955, the image of Elvis rocking and reeling on TV provoked thousands of teenage boys to learn to play guitar. You probably saw more than a few of those boys—grownup now—at the recent Live Aid extravaganza. This "Electronic Woodstock" may inspire the *next* generation of guitar players the same way Elvis did the last. In 1985, however, we've got something Townsend, Clapton, McCartney and the rest never had—a Commodore 64/128 and a program called *Easy Guitar.*

There are dozens of software packages that teach us how to read music, write music, and create music. Oddly, there are only a few that actually teach us how to *play* a musical instrument. And *Easy Guitar* may be the only one that teaches the instrument most people want to learn to play. It was conceived and programmed by David Perry, a Seattle-based musician and record producer.

The program follows a very simple step-by-step method. Beginning players are shown a graphic labeling the parts of a guitar, and the computer generates the six tones needed to tune the strings. (Unlike most of us, the C-64/128 has perfect pitch.) A short lesson in music theory follows, but you don't need it to learn how to play beautiful music. The Beatles, among others, proved that.

The computer is a good guitar teacher because it can do more than books or audio tapes. A book can show you where to place your fingers on the frets. A tape can let you hear what it should sound like. But the computer can do both—and at the same time. In demonstrating how to play scales, for instance, you see the correct fingering and hear the scale being correctly played. A guitar teacher can do this too, but try to find a *human* who will teach you how to play guitar for a flat fee of $39.95.

The program contains diagrams of the 50 most common chords you'll run into, which can be practiced in over a dozen different progressions. During practice sessions the computer plays the chord changes with you, backed by a bass and drum simulation called "The Commodore 64 Back-Up Band." You can set the band to play as fast or slow as you'd like with a built-in metronome that clicks on each beat.

Easy Guitar claims to be for both beginners and advanced players, but it's really only a tool for the complete novice guitar player. There's no mention of fingerpicking at all, and hardly any guidance on strumming or what to do with the hand that strikes the strings. This doesn't mean it's bad, just that people who already play well won't get much out of it.

Only one chord diagram fits on the screen at once, and the program suggests buying a regular chart illustrating the common chords. I thought the designers could have easily included one in the package. The program could also have been improved by including some synthesized pop tunes for users to play along with the computer. The designers chose to include a multiple-choice test and a "Catch a Chord" video game instead, both of which seem like filler.

Still, as a guitar player myself, I found *Easy Guitar* to be the perfect way for people who have never played a note to get their feet wet. The lessons are clear, simple, and take advantage of the computer's interactive capabilities. You can learn at your own pace. You don't have to plow through a thick instruction manual—in fact, instructions aren't even included in the program. Everything you need to know is right up there on the screen.

For the kids who caught the guitar bug watching Live Aid, enjoy your guitar. It's an easy instrument to learn, but a hard one to master. You probably won't see this program in your local store, but you can make an order or get more info by writing DJ Software, 10636 Main St., Suite 414, Bellevue, WA 98004.

—Dan Gutman

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9 a.m. - 12 noon Saturdays

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Reader Service No. 208

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GIANT PRINTER SALE

10"/15½" COMSTAR 10X/15½X 120-140 CPS

COM-STAR PLUS + (Tractor-Friction Printer)

"Premium Quality" **$179.00**

- Tractor Friction Printer
- Dot Matrix, Impact, Prints Single Sheets or Continuous Feed Paper, 10" or 15½" Carriage
- Print buffer
- 9 x 9 Dot Matrix, Double Strike
- Near Letter Quality, High Resolution, Dot Bit Image
- Underlining, Left-Right Margin
- True Low Descenders, Super and Subscript
- Prints Standard, Block Graphics, Italics
- Centronics Parallel Interface

COM-STAR 10X List $399 **Sale $179**
COM-STAR 15½X List $599 **Sale $249**

One Year Free Replacement Warranty

PRINTER
Impact Dot Matrix

PRINT HEAD
9 Wire (User Replaceable)

PRINT SPEED — Bi-directional Logic Seeking
Super 10X 120-140; Super 15½X 120-140

PAPER SLEW SPEED
10 LPS at 1/6" Spacing

PRINT BUFFER
One Line Standard

PRINT SIZE
10, 12, 17, 5, 6, 8.5 CPI

NUMBER OF COLUMNS
Super-10X: 80, 96, 136 (40, 48, 68 Double Width)
Super-15½X: 136,164, 232 (68, 82, 116 Double Width)

CHARACTER MATRIX
9 x 9 Standard, with True Descenders
18 x 9 Emphasized
18 x 18 Double Strike
6 x 6 Block Graphics
60 x 72 Low Resolution, Bit Image Graphics
120 x 144 Hi Resolution, Bit Image Graphics
240 x 144 Ultra Hi Resolution, Bit Image Graphics

CHARACTER SETS
96 Standard ASCII, 32 Block Graphic Characters, 96 Italics Characters

CHARACTER FONTS
Normal (10 CPI)
Elite (12 CPI)
Condensed (17 CPI)
Enlarged (5, 6, 8.5 CPI)
Emphasized
Double Strike
Super and Sub Script

SPECIAL FEATURES
Self-Test
Macro Instruction
Continuous Underline
8 Bit Selectable Interface
Column Scan Bit Image Graphics
Vertical and Horizontal Tabs
Skip Over Perforation
15.5" Carriage (Super-15½X Only)

LINE SPACING
1/6", 1/8" Plus Programmable by n/144" or n/72"

PAPER HANDLING

	SUPER-10X	SUPER-15½X
Roll Paper:	8.5" to 10" Wide	8.5" to 15" Wide
Cut Sheet:	8" to 10" Wide	8" to 15" Wide
Copies:	3 Carbonless Sheets	3 Carbonless Sheets

RIBBON
Super 10X Cartridge Ribbons $9.95, Super 15½X Cartridge $14.95

INTERFACE
Standard Parallel (Centronics Compatible)

DIMENSIONS — in inches & WEIGHT — in lbs.
SUPER-10X
14W X 10.9/16D x 2 7/8H, 11 lbs.

All product data subject to change without notice.

Parallel Interfaces: Commodore 64 — $39.00 Apple II,IIe,II+ —$59.00 Atari — $59.00

Add $10.00 ($14.50 for 15½" Printers) for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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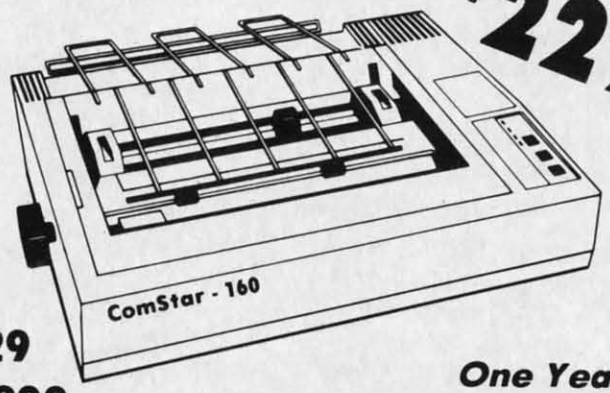
GIANT PRINTER SALE

10"/15½" COMSTAR 160 150-170 CPS

COMSTAR 160 + High Speed (Tractor-Friction Printer)

- Tractor Friction Printer
- Dot Matrix, Impact, Prints Single Sheets or Continuous Feed Paper, 10" or 15½" Carriage
- Print buffer
- 9 x 9 Dot Matrix, Double Strike
- Near Letter Quality, High Resolution, Dot Bit Image
- Underlining, Backspacing, Left-Right Margin
- True Low Descenders, Super and Subscript
- Prints Standard, Block Graphics
- Better than Gemini 10X
- Centronics Parallel Interface



$229.00

10" COMSTAR 160 List $499 **Sale $229**

15½" COMSTAR 160 List $699 **Sale $299**

One Year Free Replacement Warranty

PRINTER

Impact Dot Matrix

PRINT HEAD

9 Wire (User Replaceable)

PRINT SPEED — Bi-directional Logic Seeking

10" ComStar 160: 150-170 CPS; 15½" ComStar 160: 150-170 CPS

PAPER SLEW SPEED

10 LPS at 1/6" Spacing

PRINT BUFFER

2K

PRINT SIZE

10, 12, 17, 5, 6, 8.5 CPI

NUMBER OF COLUMNS

10" ComStar 160: 80, 96, 136 (40, 48, 68 Double Width)
15½" ComStar 160: 136,164, 232 (68, 82, 116 Double Width)

CHARACTER MATRIX

9 x 9 Standard, with True Descenders
18 x 9 Emphasized
18 x 18 Double Strike
6 x 6 Block Graphics
60 x 72 Low Resolution, Bit Image Graphics
120 x 144 Hi Resolution, Bit Image Graphics
240 x 144 Ultra Hi Resolution, Bit Image Graphics

CHARACTER SETS

96 Standard ASCII, 64 Special, 32 Block Graphic, 96 Downloadable, 88 International Characters

CHARACTER FONTS

Normal (10 CPI)
Elite (12 CPI)
Condensed (17 CPI)
Enlarged (5, 6, 8.5 CPI)
Emphasized
Double Strike
Super and Sub Script

SPECIAL FEATURES

Self-Test
Macro Instruction
Continuous Underline
8 Bit Selectable Interface
Column Scan Bit Image Graphics
Vertical and Horizontal Tabs
Skip Over Perforation
15.5" Carriage (15½" ComStar 160 Only)

LINE SPACING

1/6", 1/8" Plus Programmable by n/144" or n/72"

PAPER HANDLING

	10" COMSTAR 160	15½" COMSTAR 160
Roll Paper:	8.5" to 10" Wide	8.5" to 15" Wide
Cut Sheet:	8" to 10" Wide	8" to 15" Wide
Sprocket:	3" to 10" Wide	5" to 15.5" Wide
Copies:	3 Carbonless Sheets	3 Carbonless Sheets

RIBBON

10" ComStar 160 Cartridge $9.95, 15½" Comstar 160 Ribbon $14.95

INTERFACE

Standard Parallel (Centronics Compatible)

DIMENSIONS — in inches

10" COMSTAR 160	15½" COMSTAR 160
15.36W X 12.6D x 5H	23.4W x 14.3D x 5.2H

WEIGHT — in pounds

10" COMSTAR 160: 11 lbs. 15½" COMSTAR 160: 18.7 lbs.

All product data subject to change without notice.

Parallel Interfaces: Commodore 64 — $39.00 Apple II,IIe,II+ —$59.00 Atari — $59.00

Add $10.00 ($14.50 for 15½" Printers) for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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GIANT PRINTER SALE

10" ComStar 2000 165-185 CPS

Super Letter Quality 10" ComStar 2000 Plus Super High Speed

Lifetime Warranty*

- Tractor Friction Printer
- 165 - 185 CPS Dot Matrix Impact, prints single sheet or continuous form paper
- Letter Quality Mode 40 CPS
- 9x9 or 17x17 dot matrix
- 256 user definable characters
- Super script, subscript
- Pica, elite, proportional and italics
- Super bit image graphics
- 1920 byte print buffer
- **Lifetime printhead warranty***
- Better than Epson FX80
- Automatic dark mode

$259.00

One Year Free Replacement Warranty

10" ComStar 2000 List $599 Sale $259

PRINTING METHOD	**VERTICAL TAB**
Impact dot matrix system	Programmable
PRINT SPEED	**LINE FEED PITCH**
160-180 cps PICA; 40 cps FINE MODE (Letter Quality)	1/6", 1/8", 7/72" (programmable pitch), 1/72" (programmable pitch), n/72" (programmable pitch), n/216" (programmable pitch)
PAPER FEED SPEED	**CHARACTER SET**
100 msec/line (in case of 1/6 inch line feed)	Full ASCII 96 characters with descenders. International characters: USA, Germany, Italy, U.K., France, Denmark, Sweden, Spain
CHARACTER FONT	**PAPER FEED SYSTEM**
9x9 matrix (pica, elite, condensed), 9xn matrix (proportional), 17x17 matrix (fine mode) 2 pass	Adjustable sprocket feed, friction feed
BIT IMAGE GRAPHICS	**FORM HANDLING, FANFOLD PAPER**
480, 640, 960, 1280, 1920 dots/line	Width: 4-10"; number of copies, original & 2 copies without carbon
PRINT DIRECTION	**RIBBON**
Bi-directional in text mode with logic seeking Uni-directional in bit image graphic mode	Cartridge ribbon
CHARACTER PITCH	**PAPER END SENSOR**
1/10" (pica), 1/12" (elite), 7/120" (condensed), 2/10" (double width pica), 2/12" (double width elite), 14/120" (double width condensed)	Mechanical switch (printer stops printing 0.6 inches from end of paper)
CHARACTERS PER LINE	**INTERFACE**
137 characters (condensed) 96 characters (elite) 80 characters (pica) 68 characters (double width condensed) 48 characters (double width elite) 40 characters (double width pica)	Parallel (Centronics compatible) Buffer memory size: 1920 byte
HORIZONTAL TAB	**RELIABILITIES: PRINTER LIFE**
Programmable positions & manual selection by control panel switches	MTBF: 5,000,000 lines; ribbon life, 3,000,000 chars.
	DIMENSIONS & WEIGHT
	Width 16.0"; depth 11.8"; height 4.72"; weight 14 lbs.

All product data subject to change without notice.

Parallel Interfaces: Commodore 64 — $39.00 Apple II,IIe,II+ —$59.00 Atari — $59.00

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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Commodore 64

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Commodore 64

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- News Updates and Information
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- Research and Reference Materials

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- On-line Clock
- Capture and Display High Resolution Characters
- Download Text, Program or Data Files
- Stores on Disk Downloaded Files
- Reads Files from Disk and Uploads Text or Program Files
- Select Any Protocol (access almost any computer or modem)
- Plus Much, Much More

List $99.00 **Sale $39.95** *Coupon $29.95*

We are so sure this is the only telecommunications package you will need we will give you 15 days Free Trial.

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Sale

16 COLORS

(Premium Quality)

- **Built in Speaker and Audio**
- **Front Panel Controls**
- **For Video Recorders**
- **For Small Business Computers**
- **Apple - Commodore - Atari - Franklin - etc.**

13" Color Computer Monitor

*Connecting cable $9.95

(Premium Quality)

- **Beautiful Color Contrast**
- **High Resolution**
- **Separated Video**
- **Sharp Clear Text**
- **Anti-Glare Screen**
- **40 Columns x 24 Lines**
- **Supports 80 Columns**

List $329.00

Sale $169.95*

Add $14.50 shipping, handling and insurance. Illinois residents please add 6% tax. We do not ship to foreign countries (including Canada), Alaska, Puerto Rico, APO-FPO.
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13" RGB & COMPOSITE MONITOR List $399.00
Must be used to get 80 columns in color with 80 column computers (C128 & Atari ST). (add $14.50 shipping)
Sale $279.00*

14" COMMODORE 1702 COLOR MONITOR
(add $14.50 shipping) List $299.00
Sale $179.00*

15 Day Free Trial - 90 Day Immediate Replacement Warranty

12" XTRON SUPER HI-RESOLUTION MONITOR
80 Columns x 24 Lines, Super Hi-Resolution 1000 lines Green or Amber
Super-Clear "Easy to Read" text with special anti-glare screen! *(Ltd. Qty.)* List $249.00
Sale $109.95*

12" ZENITH HI-RESOLUTION GREEN OR AMBER TEXT DISPLAY MONITOR
80 Columns x 24 Lines, Hi-Resolution, crisp clear easy to read text with anti-glare screen! A MUST for word processing. *(Ltd. Qty.)* List $199.00
Sale $89.95*

12" MONITOR GREEN OR AMBER TEXT List $159.00
80 Columns x 24 Lines, easy to read up front controls *(Ltd. Qty.)*
Sale $69.95*

* Connecting cable $9.95

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WORD PROCESSING BREAKTHROUGH!

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40 or 80 Columns in Color

Paperback Writer 64

40 or 80 Columns in Color

This is the easiest to use and most powerful word processor available for the Commodore 64. As you type on the screen, you will see your letters and words appear on the screen exactly as they will be printed (i.e. Italics will be *Italic*, Bold Face will be **Bold Face**). With the printer files you can customize Paperback Writer 64 to use all the fancy features of your printer. Loads EZ Script®, Paperclip®, & Wordpro 64® Files so you can easily upgrade your past wordprocessing text that you've written with obsolete wordprocessors. Take a look at some of the other features:

- **Wordwrap** — No Words Break At The Edge Of The Screen.
- **Flexible Cursor Movement,** Including Tabs And Other Timesavers.
- **Deletion And Insertion** Of Characters, Lines And Blocks Of Text.
- **On-screen Text Enhancement**, Such As Bold Face, Italics, Underlining, Superscripts And Subscripts, And Foreign And Other Characters.
- **Manipulation Of Blocks (ranges)** Of Text For Functions Such As Moving And Deleting, Even Between Files.
- **Sorting Lists** In Order Of Numbers And Letters.
- **Aligning And Adding Numbers** In Columns, Helpful With Tables.
- **Variable Margins** At Left And Right, And Paragraph Indentation.
- **Lines Centered, Justified** Or **Aligned** At The Right Side.
- **Variable Page Lengths** And **Line Spacing.**
- **Borders** At Top Or Bottom With Optional Title Lines And Page Numbers.
- **Linked Files** To Print Extra-long Documents In Sequence.
- **Flexible Printer Set-up** To Allow Use With Any Printer.
- **Find And Replace** Text Functions That Can Be Automatic.
- Complete Or Selective **Directories** Of Files On The Disk.
- **Sequential Files** For Mail Lists And Communication With Other Computers.
- **Spelling Checker**, Checks Your Spelling.

INTRODUCTORY PRICE

$29.95

COUPON

Sale Price $39.95

☆ ☆ ☆ **Plus** ☆ ☆ ☆

Full help screens on line with additional help on the disks mean you don't even need a manual. If you're in the middle of a page and you want to know how to use a special function just hit F7 and the information will appear before your eyes. If you still don't understand hit F7 again and a more detailed explanation appears. Then simply hit F8 and you're back in the letter where you left off. No manual lookup necessary. This is the easiest word processor in the world to use. List $99.00.
Introductory Sale Price $39.95. *Coupon $29.95.*

DOUBLE PROTECTO FREE TRIAL

We are so sure this is the easiest and most powerful word processor available, we will give you 30 days to try it out. If you are not completely satisfied, we will refund your purchase price.

PAPERBACK DATABASE (Datafax) List $69.00. **Sale $34.95.** * *Coupon $24.95.*

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