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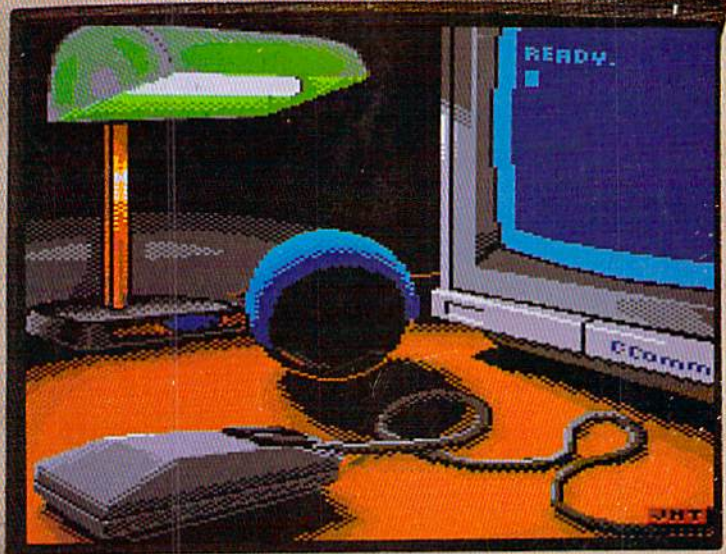
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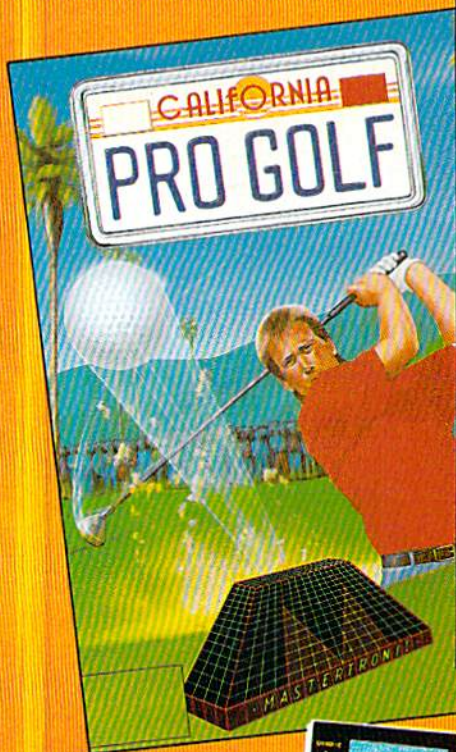
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Listing



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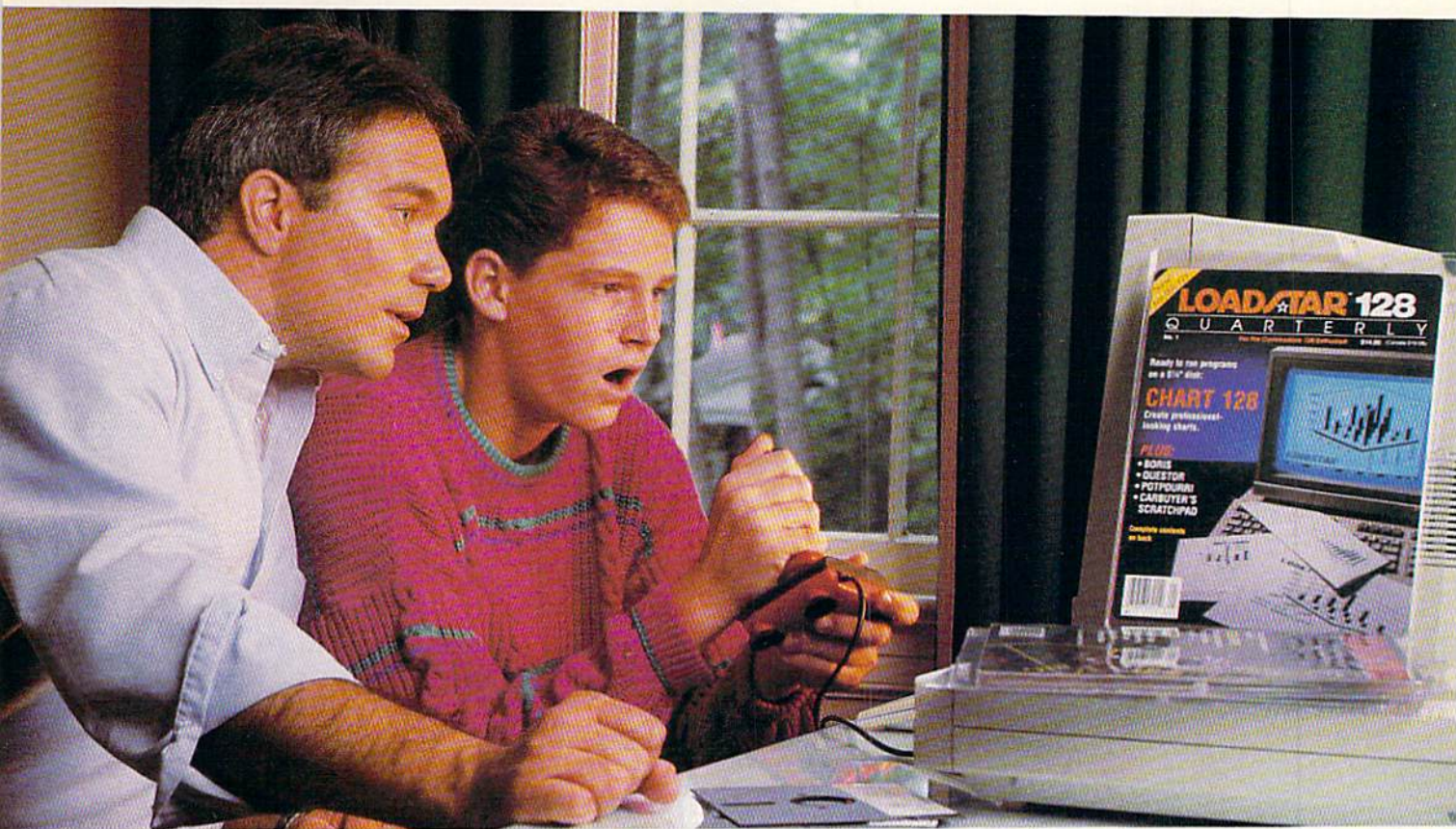
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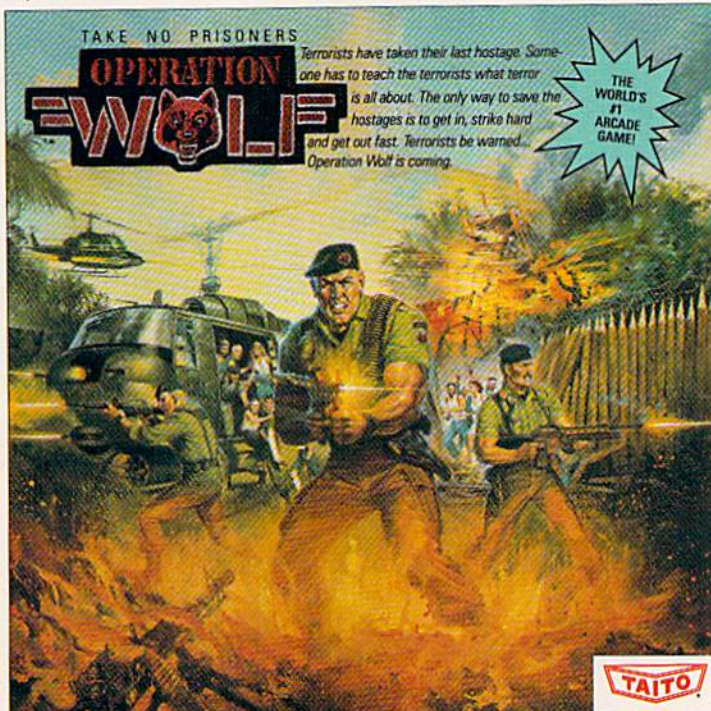
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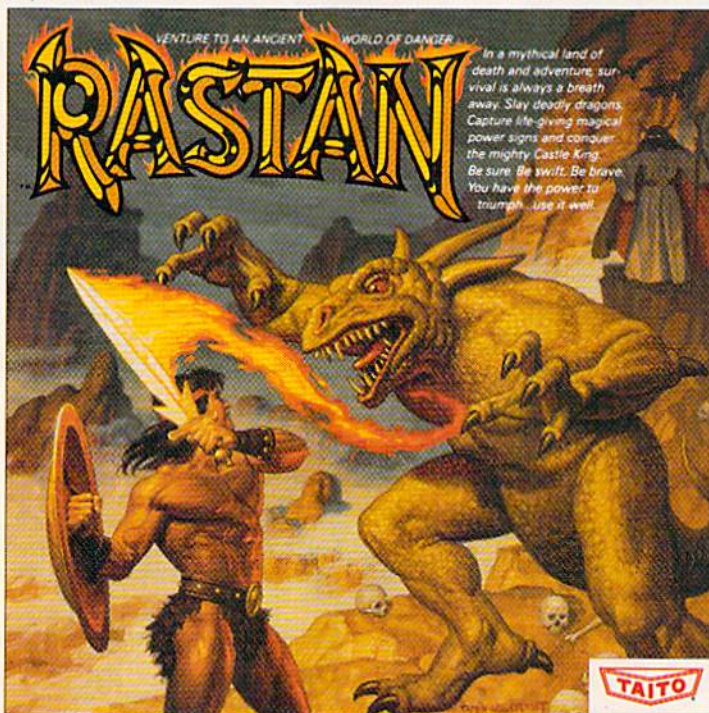
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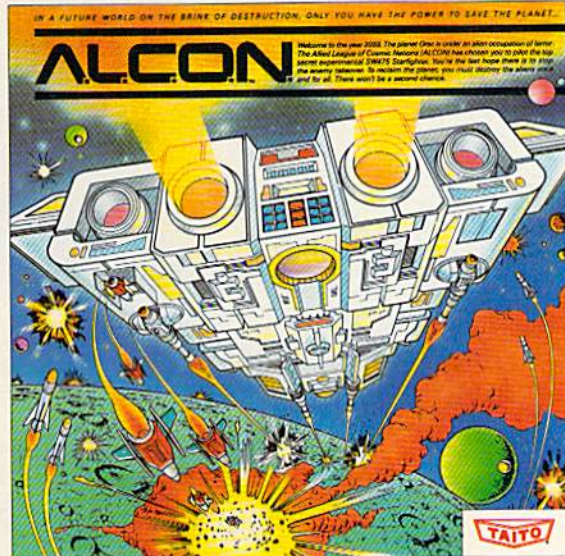
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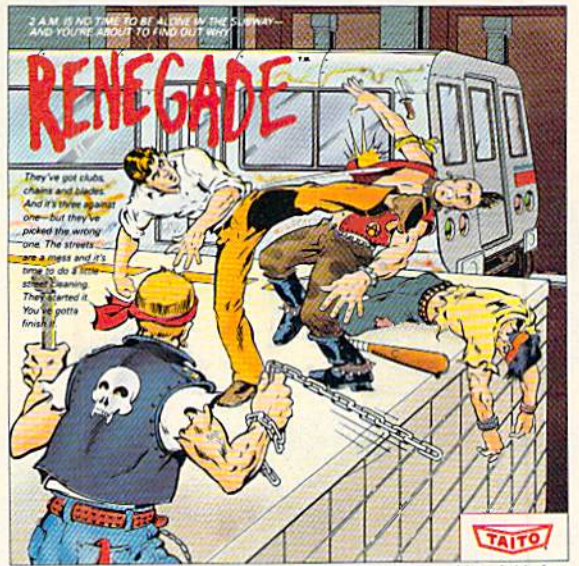
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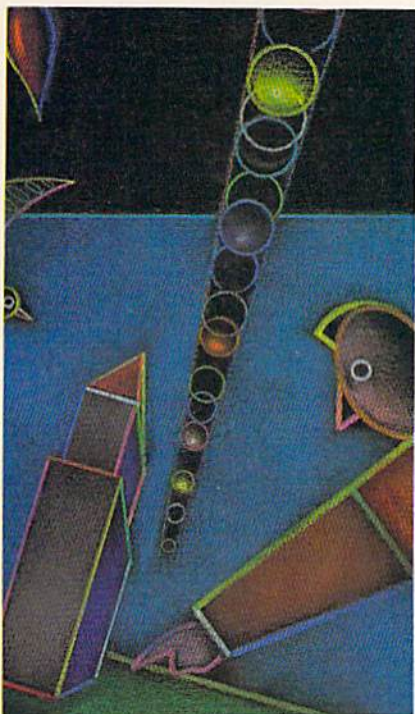
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COVER ILLUSTRATED BY R.M. SCHNEIDER

SCREEN SHOT CREATED BY JAMES HASTINGS-TREW



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RUNNING RUMINATIONS

WHILE WE GET many questions from readers on many subjects, we are sometimes inundated by calls, letters and electronic mail on a particular area, indicating unusual concern. Starting last summer, we began getting calls from irate and bewildered Commodore owners who have tried, unsuccessfully, to purchase the 1750 RAM expansion unit and the 1571 disk drive. Users of GEOS 128 were particularly incensed because the 1750 is a virtual necessity for them. Then dealers and distributors started calling, telling us they just couldn't get these products, and wondering if we had heard anything from Commodore. We had not.

In an effort to trace the problem, we called various individuals at Commodore, all of whom assured us that these devices were being manufactured and were available, and they were as puzzled as we that consumers couldn't get them. They did admit that large inventories were not maintained, and that only enough units were manufactured to meet the estimated demand for a given period of time.

At this writing, it is early January, and the shortage continues to be a major problem, fueling renewed rumors that Commodore is dropping the C-64 and C-128 computers. We again contacted Commodore and talked with Jon Winters, Vice President of the Consumer Products Division in West Chester, about these shortages.

According to him, Commodore remains committed to its C-64/C-128 line, but, just as with any other product, it is subject to the pressure of market forces. The 1750 problem is a good case in point.

As most people know, there has been a general shortage of RAM chips in the past year, and what has been available has become much more costly. Due to this, Winter explained, Commodore has had to make hard choices about what products to manufacture, and since the 1750 contains as much RAM as one Amiga 500, four C-128Ds or eight C-64s, they decided to concentrate on the computers rather than on the 1750. I was able to confirm that they did manage to ship some 1750s in the last quarter of 1988, but not enough to eliminate the shortage. They hope to produce and ship more as the chips become available.

As for the 1571 problem, Winter said there were drives in stock, but he couldn't say how many. Since the C-128D comes with a built-in 1571, the demand for single drives has diminished, so they manufacture fewer than before.

The editors and readers of *RUN* would of course like to see all these computers and peripherals produced for a long time into the future. But if, for business reasons, that cannot be, Commodore could greatly ease the problems this would cause by allowing third-party companies to buy the proprietary controller and ROM chips required to manufacture essential peripherals such as the 1571 and 1750. Such a move would allow the continued use of the millions of eight-bit computers for as long as they were needed.

*The peripheral
shortage is
real. . .but is
it lasting?*



Lou Wallace
Technical Manager

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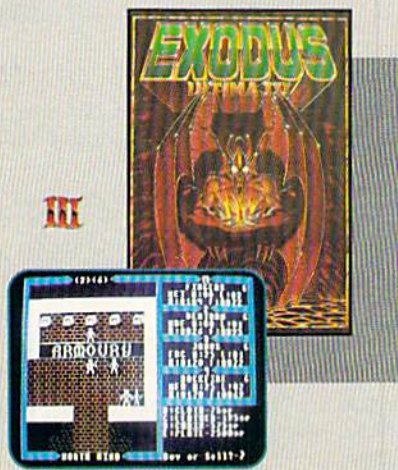
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\$50E DISK DRIVE RUNNING? DON'T TURN ON THE PRINTER!

Recently, while testing a serial Commodore-compatible printer for an upcoming *RUN* review, I broke a fundamental printer rule: I turned on the printer while a file was loading from disk. The result was a lot of garbage on the screen and a partially loaded file.

While it's unlikely that the disk drive could suffer any physical damage, turning on the printer while the drive is busy is potentially disastrous. If you unknowingly loaded in a file and corrupted it in the process, you might also inadvertently re-save it and lose the original. So always remember: Never turn on a printer while the drive is busy.

—TIM WALSH, *RUN* STAFF

\$50F AUTOBOOTING THE 1581

Commodore 128D owners who also own a 1581 disk drive face two problems if they want to autoboot or automatically activate a 1581 file. First of all, the C-128D's built-in 1571 disk drive has no DIP switches to reconfigure it with a different device number. Second, the built-in drive can't be de-activated to let the 1581 autoboot.

However, you can make an autoboot disk for the 1571 that boots the desired file from the 1581. Begin by writing a line of Basic such as:

```
10 RUN"1581 FILE",U9
```

(Of course, "1581 File" can be any 1581 file.)

Next, save this program as a file to your 1571 disk, then use the Autoboot Maker program from the 1571 Test/Demo disk to make that an autoboot file. Now, when you turn on your 128D with that disk in the 1571 drive and your second file in the 1581, the program will activate the desired file on the 1581. Many alternatives are possible, such as having autoboot files in both drives. In that case, an autoboot program in the 1571 drive need only consist of a line such as:

```
10 BOOTU9
```

This autoboots the file on the 1581. After you've done this a few times, it will be second nature to you.

—KEITH SILLS, REGO PARK, NY

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"Captain, she's going to break apart in the meteors!"

Meteor Dodge 64 places you in control of your own starship, indicated by the blue diamond on the screen, which you must pilot through a meteor shower. After you successfully maneuver your ship through a shower, the program goes to the next highest level, which has more meteors for you to contend with.

For those who like to tinker with programs, I'll list the

functions of the variables: SC is the score, S is the character position of the ship, C is the color of the ship, and L and X are the level and number of meteors per line, respectively.

```
Ø REM METEOR DODGE - GARRET D. WILSON
:REM*161
1Ø PRINT "{SHFT CLR}{CTRL 7}":POKE5328Ø,Ø:
POKE53281,Ø:SC=Ø:C=55316:DIM R(4Ø):L=1:
X=1Ø :REM*17
2Ø S=1Ø44:PRINT"{11 CRSR DN}"TAB(16)"LEVE
L 1":FOR A=55316 TO 56295:POKE A,1:NEXT
:REM*44
3Ø FORN=1TO2ØØØ:NEXT:PRINT"{SHFT CLR}{3Ø C
RSR DN}"{CTRL 2}{CRSR DN}":FORT=1TO75
:REM*77
4Ø POKES,9Ø:POKEC,6:SC=SC+1:FORG=1 TO X:R(
G)=(1984+(INT(RND(Ø)*4Ø))):GOSUB12Ø
:REM*19Ø
5Ø POKER (G),42:NEXT:PRINT"{CRSR DN}";
:REM*2Ø8
6Ø IF PEEK(S)=42 THEN POKE C,6:GOTO 9Ø
:REM*9Ø
7Ø NEXT:L=L+1:PRINT"{SHFT CLR}{CTRL 7}{12
CRSR DN}"TAB(16)"LEVEL"L:X=X+2:IFX>39
THEN X=4Ø :REM*239
8Ø GOTO 3Ø :REM*2Ø6
9Ø POKE S,1Ø2:FORN=1TO2ØØØ:NEXT:PRINT"END
OF GAME":PRINT"SCORE="SC :REM*17Ø
1ØØ POKE 198,Ø:INPUT"PLAY AGAIN (Y/N)";PA$
:IF PA$="Y" THEN RUN :REM*53
11Ø END :REM*238
12Ø GETM$:P=PEEK(5632Ø) :REM*157
13Ø IF (M$=","ORP=123)ANDS=1Ø24THENS=1Ø63:
C=55335:M$="":POKE1Ø24,32:POKE55296,1
:REM*137
14Ø IF M$=","ORP=123THENS=S-1:C=C-1:POKES+
1,32:POKEC+1,1 :REM*85
15Ø IF (M$="."ORP=119)ANDS=1Ø63THENS=1Ø24:
C=55296:M$="":POKE1Ø63,32:POKE55335,1
:REM*46
16Ø IF M$="."ORP=119THENS=S+1:C=C+1:POKES-
1,32:POKEC-1,1 :REM*219
17Ø IF PEEK(S)=42 THEN POKEC,6:GOTO 9Ø
:REM*232
18Ø POKES,9Ø:POKEC,6:RETURN :REM*18Ø
```

—GARRET D. WILSON, CHELSEA, OK

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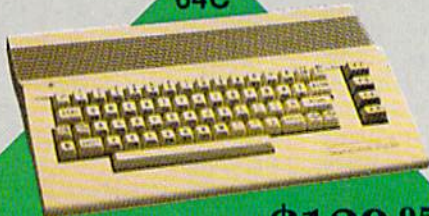


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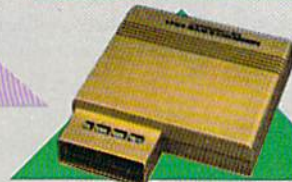
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head, caused by ink, dust, ribbon fabric and other contaminants. Don't rush out to buy a new printhead; instead, spray it with some carburetor spray cleaner or similar spray solvent.

Unbolt the printhead from the printer's carriage and unplug the wire connecting it to the printer. Place the printhead over a newspaper and spray the pins thoroughly with the cleaner. Then use an old toothbrush to scrub loose any matter clogging the pins. Continue spraying and scrubbing the printhead until it's clean.

Let the printhead dry thoroughly for at least an hour before re-installing. Chances are, it'll print like new once you re-install it.

—DWIGHT D. MOODY, GROTON, VT

\$512 64 KEYBOARD BUFFER EXPANDER

The C-64's keyboard buffer is a major limitation when used as a dynamic keyboard—it only has a capacity of ten characters. 64 Keyboard Buffer Expander is an interrupt-driven utility that expands the capacity of the keyboard buffer by 245 characters by relocating it to a new memory location.

After you've typed in and run the program, you can use and program it the same way you would the default buffer. With a 255-character limit, you'll want to incorporate this program into all of your dynamic keyboard routines.

```
Ø REM 64 KEYBOARD BUFFER EXPANDER - RICHARD PENN :REM*11Ø
1Ø A=88:B=255:C=56334:D=65535:POKE1,55:POKEC,PEEK(C)AND(B-1) :REM*84
2Ø POKEA+7,Ø:POKEA+8,16Ø:POKEA+2,B:POKEA+3,B:POKEA,B:POKEA+1,B:SYS41919 :REM*227
3Ø POKED,PEEK(D):POKEC,PEEK(C)OR1:POKEC-9,56:POKE1,53 :REM*3Ø
4Ø POKE588Ø5,Ø:POKE588Ø6,192:POKE5881Ø,1:POKE58811,192 :REM*17
5Ø POKE58813,Ø:POKE58814,192 :REM*146
6Ø POKE6Ø221,Ø:POKE6Ø222,192:POKE649,255 :REM*11Ø
7Ø REM DEMO BELOW :REM*247
8Ø PRINTCHR$(147)"EXPANDED KEYBOARD BUFFER DEMO" :REM*187
9Ø FORT=49152 TO 494Ø7:POKET,65:NEXT:POKE198,255 :REM*222
```

—RICHARD PENN, MONTREAL, QUEBEC, CANADA

\$513 64 KEYBOARD BUFFER REDUCER

If you write programs that prompt for user input, you might find the 64's default ten-character keyboard buffer to be a tad too big for some tasks. I've discovered a command that performs the functional opposite of the above trick. Just enter POKE 649,X in your program, where X is any value from 1 to 10 that determines the size of the C-64's keyboard buffer.

—JEN ST. CLAIR, BELLEFONTE, PA

\$514 GENERAL HINTS & TIPS

I thought it would be appropriate to pass along a few hints and tips on Commodore hardware that I've found useful, both at work and at home. First, if your 1581 sits atop another disk drive and slips around, get a bottle of window cleaner and a clean cloth. Flip the 1581 over and spray its feet with

the cleaner and wipe them clean. Next, spray and wipe the top of the disk drive it sits on. Voila! No more slipping and sliding.

Commodore 128 users, like myself, who have large fingers, might find pressing the recessed reset button an exercise in futility. I glued a wire nut sized for 12 and 14 gauge wire to the reset button using Krazy Glue and now can easily reset the computer.

Finally, to reduce heat buildup, I've placed hard plastic ten-disk diskholders under my computer's power supply and under the 1541 disk drive. I've also glued four 3/4-inch corks to the bottom of my 1541 disk drive for improved ventilation.

I hope RUN readers find these tips as useful as I have.

—PATRICK WEST, COLUMBUS, OH

\$515 A DIFFERENT KIND OF INPUT

Eliminate the question mark from all Input statements in both 64 and 128 programs by opening a channel to the keyboard. Both the C-64 and C-128 can use the command OPEN 2,0 to access the keyboard, so by writing an input routine, question marks following Input statements can be a thing of the past.

The following program demonstrates how to write an input routine that will eliminate the question mark in Input statements, yet work just like an Input statement.

```
Ø REM 64/128 NO QUESTION MARK INPUT - CHAD HELFENBERGER :REM*28
1Ø OPEN2,Ø :REM*83
2Ø PRINT"ENTER THE ANSWER TO 5 TIMES 5" :REM*115
3Ø INPUT#2,T :REM*216
4Ø IF T<>25THENPRINT"NO, "T" IS WRONG":CLOSE2:END :REM*238
5Ø PRINT"{CRSR DN}RIGHT, "T" IS CORRECT" :REM*6
6Ø CLOSE2 :REM*65
```

—CHAD HELFENBERGER, OWENSBORO, KY

\$516 C-64 FILE OPEN COUNTER

Whenever you need to know the number of files open on your C-64 or C-128 in 64 mode, just enter:

```
PRINT PEEK(152)
```

The number that appears is the number of files currently open.

—CHAD HELFENBERGER, OWENSBORO, KY

\$517 64/128 GREATEST COMMON FACTORS

As a math teacher, I've found my students often have difficulty finding the greatest common factor of a pair of whole numbers. I wrote the following program, 64/128 Greatest Common Factors, to quickly find the answer. As the name implies, the program works on both the C-64 and C-128.

```
Ø REM GREATEST COMMON FACTOR - TIM MCCAFFE RTY :REM*225
1Ø INPUT"LARGER #";L :REM*19
2Ø INPUT"SMALLER #";S :REM*14
3Ø IF L<S THEN RUN :REM*46
4Ø IF L<1 OR S<1 THENPRINT"NUMBER MUST BE GREATER THAN 1":RUN :REM*13Ø
```

MAGIC

```
50 IF INT(L/S)=L/S THENPRINT"GREATEST COMM
   ON FACTOR=";S:END :REM*49
60 FOR J=2 TO INT(SQR(S)) :REM*196
70 IF INT(L/J)=L/J AND INT(S/J)=S/J THEN G
   CF=J :REM*107
80 IF INT(L/(S/J))=L/(S/J)GOTO 110 :REM*81
90 NEXTJ :REM*113
100 GOTO130 :REM*170
110 PRINT"GREATEST COMMON FACTOR = ";S/J
   :REM*203
120 END :REM*248
130 PRINT"GREATEST COMMON FACTOR = ";GCF
   :REM*42
```

—TIM MCCAFFERTY, FLORENCE, AL

\$518 FLASHY 64 DISK LOADS

Make loading programs more interesting and less boring by using Flashy 64 Disk Loads in either Direct mode or in your programs. After typing in and running the program, whenever the disk drive loads a file, the C-64's screen border will rapidly cycle through all 16 colors until the drive stops.

The interrupt-driven program won't be affected by most other programs. Pressing the run-stop/restore key combination will disable it, while POKE 1,53 will re-enable it.

```
0 REM C-64 FLASHY DISK LOADS - RICHARD PEN
   N :REM*193
10 A=88:B=255:C=56334:D=65535:POKE1,55:POK
   EC,PEEK(C)AND(B-1) :REM*84
20 POKE A+7,0:POKE A+8,160:POKE A+2,B:POKE
   A+3,B:POKE A,B:POKE A+1,B:SYS 41919
   :REM*227
30 POKE D,PEEK(D):POKE C,PEEK(C) OR 1:POKE
   C-9,56:POKE 1,53 :REM*30
40 FOR T=679 TO 679+8:READ D:POKE T,D:NEXT
   :REM*25
50 DATA 238,32,208,120,169,0,76,22,238
   :REM*244
60 POKE 60947,76:POKE 60948,167:POKE 60949
   ,2 :REM*40
```

—RICHARD PENN, MONTREAL, QUEBEC, CANADA

\$519 RIBBON STORAGE TIPS

Here's a handy tip for both new printer ribbons and color ribbons that are used infrequently: Store all nylon and fabric printer ribbons in resealable plastic bags. You'll find that they won't dry out as soon as they will when sitting in their original boxes or in the printer.

—DON ENGLERT, GREEN RIVER, WY ■

Magic is a forum for RUN's imaginative and inventive readers to share their programming tips, brief software or hardware modifications, shortcuts or items of general interest. If you have an idea to make computing easier, faster, more exciting and enjoyable, send it to: Magic, RUN Magazine, 80 Elm St., Peterborough, NH 03458.

RUN pays \$10 to \$40 for each trick published in the column. If you'd like a copy of the latest edition of RUN's Magic Trick Writer's Guide, send your request with a self-addressed, stamped, business-size envelope; you'll receive a copy in two or three weeks.

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NEWS AND NEW PRODUCTS

New products for March have come in like a lion, from timely tax programs to sketchpads and games for your C-128 and 64.

Compiled by HAROLD R. BJORNSEN

SHOGUN AND ZORK

CAMBRIDGE—It's the 16th century and you're John Blackstone, an English sea pilot who finds himself in the foreign and exotic Japans. You're thrust in the upper echelons of feudal Japanese society at the moment a political power struggle is erupting between two Japanese regents who aspire to be Shogun. The action revolves around this struggle, which influences and ultimately controls your life. Shogun, a game for the C-128, is available for \$49.95.

Zork Zero, the prequel to the Zork trilogy, covers a century of time and explores the collapse of the Great Underground Empire. The game has more than 200 locations and as many puzzles as in all of the Zork trilogy. As the game opens, the Flathead family, rulers of the kingdom, has already been destroyed. Your challenge is to save the rest of the kingdom from the fated curse that Megaboz, the evil wizard, has cast. Zork Zero is available for the C-128 for \$49.95. Infocom, 125 Cambridgepark Drive, Cambridge, MA 02140.

Check Reader Service number 400.

HOLD ON TO YOUR WALLET

TWO HARBORS, MN—Taxaid, an income tax preparation program for the C-64, includes all the current changes in the tax laws for the tax year 1988. It prepares Form 1040, Schedules A, B, C, D, E, SE, and Form 2441 (Child Care). Calculations are automatic and all tax tables are built in. The program is completely menu driven. It costs \$49.95 from Taxaid Software, Inc., PO Box 100, Two Harbors, MN 55616.

Check Reader Service number 404.

PREHISTORIC COLORING BOOK

BATAVIA, IL—Polarware (1055 Paramount Parkway, Suite A, Batavia, IL 60510) has released Dinosaurs are Forever, an educational coloring book for the C-64. Your child is the artist, who can choose his or her own colors to color in each

Children can color up to 22 dinosaurs in Polarware's Dinosaurs are Forever.



dinosaur. The child will learn how each dinosaur evolved, its approximate weight and size, and its eating habits. The program also makes banners and posters. There are 22 line drawings of different dinosaurs and 16 colors on the color palette. It's available for \$29.95.

Check Reader Service number 401.

BIG BROTHER'S WATCHING YOU

RANDALLSTOWN, MD—Master Software (6 Hillery Court, Randallstown, MD 21133) has released its 1988 version of Tax Master to help aid in the preparation of U.S. Federal Income Taxes. It covers all the confusing new tax laws and guides you through the preparation of Forms 1040 and 4562 (Depreciation), and also Schedules A (Itemized Deductions), B (Interest and Dividends), C (Small Business), D (Capital Gain/Loss), E (Rent/Royalty Income/Loss), and F (Farm Income/Loss). Tax tables are also included, and the program figures your tax automatically, performs all calculations and can transfer results from one tax form to another. Tax Master is fully menu driven and is available for the C-64 for \$32.

Check Reader Service number 402.

CONQUER THE TEMPLE OF DEMONS

SAN JOSE—Victory Road, the arcade sequel to Ikari Warriors, has been released for the C-64 by Data East USA (470 Needles Drive, San Jose, CA 95112). The sequel continues the quest of the two heroes from Ikari Warriors to battle fearsome enemies and conquer the Temple of Demons. Using an assortment of weapons, the player must fend off bizarre enemies to successfully complete all four levels of the game. \$29.95.

Check Reader Service number 405.

SKETCHPAD 128

KUTZTOWN, PA—Free Spirit Software (PO Box 128, Kutztown, PA 19530) has released Sketchpad 128, a drawing system for the 128's 80-Column mode and 1351 mouse. Sketchpad can be used to create artwork, slideshows, signs, posters and letterheads. Features include a selection of drawing tips, 3-D solids, fill patterns, type fonts, and pixel and grid editors. In addition, the program is completely menu driven, enlarges and scrolls screens and supports 64K video RAM and the 1581 disk drive. \$17.50.

Check Reader Service number 406.

YES, BUT CAN YOU BEAT UP THE REFEREE?

NEWARK, DE—Two volumes in the World Wrestling Federation SuperStars series are now available for the C-64 at \$19.95 each. Volume 1 pits the Honky Tonk Man against Randy "Macho Man" Savage in a fight for Elizabeth's affection. A second match has "Hacksaw" Jim Duggan battling



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King Harley Race. In Volume 2, Match 1, Hulk Hogan faces Ted DiBiase, the "Million Dollar Man." Match 2 has Ravishing Rick Rude squaring off against Jake "The Snake" Roberts and his snake. In all matches, you apply your managerial and directorial talent to bring your man to victory. The ML/WWF Game-Match disk is required. MicroLeague Sports, 2201 Drummond Plaza, Newark, DE 19711.

Check Reader Service number 407.

OUT INTO OUTER SPACE

GLEN ROCK, NJ—Absolute Entertainment (PO Box 116, Glen Rock, NJ 07452) has released Garry Kitchen's Star* Fighter, a high-speed, space-flight simulator for the C-64. It provides you with an intergalactic fighter armed with particle lasers, photon torpedos and heat-seeking missiles, an on-board computer system, shields, scanning capability and computerized maps of interstellar space. With these, the player who can combine cunning, caution and good judgment will find that success brings riches and power. \$34.95.

Check Reader Service number 409.

VOLLEYBALL IN ZERO GRAVITY

PONTIAC, MI—In Zero Gravity, an arcade game for the C-64, you're on a journey into the farthest reaches of space in the year 2189. But travel through space can be boring, so Zero Gravity, a game similar to volleyball, was developed. In the two-player game, the ball can careen off the bulkheads at strange angles, and panels along the sides can be struck at different times to add or subtract points from your score. It's available for \$29.95 from MichTron, 576 S. Telegraph, Pontiac, MI 48053.

Check Reader Service number 408.

HIGH-SPEED WP

DEERFIELD, IL—GEOS Writer 64, a word processor for the C-64 and GEOS 1.3 or later versions, features a Preview mode to display your document on-screen exactly as it will appear on the printed page; a 100,000-word spelling checker; a variety of built-in, special effect fonts; and high-speed text entry that, according to the manufacturer, is five times faster than other GEOS-based word processors. In addition, the program lets you use a mouse, joystick or the keyboard to move around a document and select editing and formatting options. It's also compatible with geoPaint and geoWrite so that you can import all GEOS fonts and graphics into your documents. Available for \$39.95 from Timeworks, Inc., 444 Lake Cook Rd., Deerfield, IL 60015.

Check Reader Service number 415.

OFF TO THE WARS

MOUNTAIN VIEW, CA—Typhoon of Steel, a sequel to the Panzer Strike! war game, covers the Pacific, Asian and European theatres, involving American troops versus German troops. The tactical game includes many different kinds of ground weapons, from tanks, tank destroyers and artillery to trucks, mortars and machine guns. Pillboxes, minefields, dragon's teeth, flamethrowers and naval gun support are also included. Players can choose to simulate single battles or an entire campaign. The objective is to win as many battles as possible before the war ends. Available for the C-64 for

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157 DUNGEON LEVELS

SAN MATEO, CA—Deathlord, a fantasy role-playing game for the C-64, has you storming 157 dungeons, facing 128 different kinds of monsters, exploring 16 separate continents, mastering 84 magic spells, and dealing with the problems posed by changing climate, weather and the time of day. You create your own characters but may also transfer characters from The Bard's Tale, Wizardry I, II and III and Ultima II role-playing games, and use them in 16 character classes. The Deathlord had besieged the Emperor of Kodan and claimed the Empire for his own. You and your party must restore peace to the land. Begin your adventure for \$29.95 from Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404.
Check Reader Service number 412.

GUT-BUSTING KARATE ACTION

MENLO PARK, CA—Chop and Drop, a karate action game for the C-64, has been released by Activision (3885 Bohannon Drive, Menlo Park, CA 94025). The one-player game has two karate characters on the screen at all times, and the two-player game has three. To earn points, you must use a combination

of 16 different karate blows to knock down your opponents as many times as possible in timed rounds. \$29.95.
Check Reader Service number 413.

\$#%&!%\$#!

BELLINGHAM, WA—What do you do when your computer goes awry? Push the panic button. The bright red computer key is imprinted with the word PANIC, and its adhesive backing lets you mount it on any computer keyboard key. The buttons are available for \$1 each plus an SASE. For 10 orders or more, Memory Makers (3024 Haggin St., Bellingham, WA 98226) pays postage.

Check Reader Service number 414.

WE LOVE TO BE ONLINE

MOUNTAIN VIEW, CA—A report released by Market Intelligence Research Company says that the online database market, which was only slightly over \$1.3 billion in 1984, more than doubled in size to reach over \$2.6 billion in 1987. Outstanding growth will continue, according to MIRC, with annual growth rates exceeding 20 percent, and market revenues are projected to reach over \$11.7 billion in 1994.

The number of subscribers is expected to show similar growth, from around 283,000 in 1984, to nearly 540,000 in 1987, to over 2.1 million in 1994. ■

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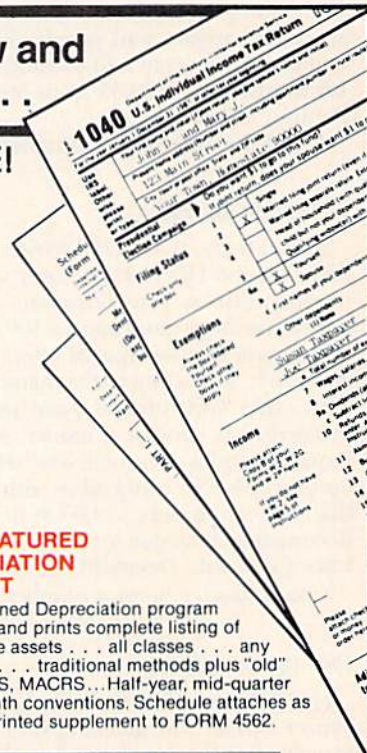
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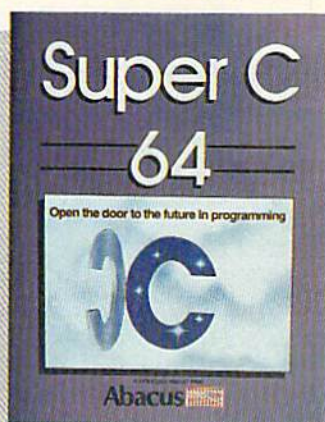
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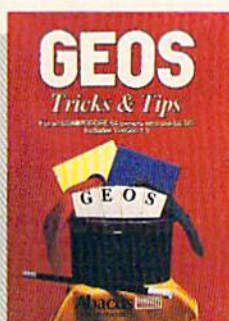
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SOFTWARE GALLERY

'Tis the luck of C-64/128 owners this month that brings reviews of sports, fantasy, music and trivia programs, and much, much more!

Compiled by BETH S. JALA

TOWER TOPPLER A

*Going Up? Next Stop...
The Top Floor!*

Just when you thought you'd seen every possible variation of the arcade-style climbing contest, along comes Tower Toppler to throw you a curve—in more ways than one. The object of this game is to destroy eight towers that loom high above a toxic ocean. To do so, you must mount the treacherous spiral staircase that winds around the outside of each tower, and eventually reach the top.

Of course, some of the steps are rather slippery, others crumble beneath your feet and some are missing. At various points, you can take advantage of outside elevators that bring you part of the way up to the top. In other places, you must enter doorways only to re-emerge on the opposite side of the tower to continue the climb.

You also have to contend with flying eyeballs, mutant molecules, indestructible rolling cannon balls and deadly flashing blocks. Each of the eight towers is more difficult to scale than the one before. Their names—Tower of Eyes, Realm of Robots, Broken Path, Slippery Slide, and so on—give some indication of the type of trouble you can expect. To survive, you must be sure-footed and a good shot with your only weapon, a snowball gun that's capable of destroying many of the obstacles.

Tower Toppler boasts some of the most impressive animation I've seen in a long time. As your joystick-controlled character—an adorable green head with big eyes and tiny legs—climbs the winding stairs to the top of the tower, your perspective smoothly shifts to keep him in the center of the screen. Thus, the tower, along with the star-filled background, rotates as the green guy moves to the left or right. In addition, simultaneous vertical movement by the on-screen character results in smooth vertical scrolling of the tower.

Tower Toppler is the type of game

that's almost as much fun to watch as it is to play. In fact, because the game demands your undivided concentration to scale its eight colorful towers, it might be impossible to fully appreciate the sharp graphics and smoothly animated action except as a spectator. (Epyx, 600 Galveston Drive, PO Box 8020, Redwood City, CA 94063. C-64/\$39.95.)

—BOB GUERRA
SOUTH BOSTON, MA

OUT RUN B+

*Rev It Up in
Road Rally Racing!*

A powerful car + splendid sound + fantastic graphics = one hit game. This is the formula Sega employs for the arcade version of Out Run, and the same elements have been included in the C-64 adaptation.

The program offers five different courses and each is divided into four sections. Only by completing one stage within a predetermined time can you



Cool car, solid sound and groovy graphics characterize Out Run.

advance to the next. Failing to do so forces you to start back at a course's beginning in a new game.

Making the trip difficult are the cars and trucks that you overtake when traveling at up to 295 kilometers per hour; running into them costs precious seconds. Hitting the trees and structures that border the highways at top speed results in a spectacular tumbling wreck. After a crash, you and your car miraculously recover and continue from that point, but you've lost valuable time and momentum.

Points are awarded for fast driving. Out Run also gives a special bonus for completing a course. During each session, the program displays the top seven scores with their owners' initials, although none of this data is saved to disk.

You use a joystick to steer, accelerate and brake your auto, and pressing the button shifts between gears. This arrangement is surprisingly effective, especially considering that the program's coin-operated model was equipped with a steering wheel, gas pedal and gear shift lever.

Out Run's sound effects are excellent. While there is an option to turn off all game noises, you'll probably want to hear one of the two pulsating background themes. Equally well done are the car sounds, like the screech of tires as you fight to keep control when rounding a curve. ▶

REPORT CARD

A Superb!

An exceptional program that outshines all others.

B Good.

One of the better programs available in its category. A worthy addition to your software library.

C Average.

Lives up to its billing. No major hassles or disappointments here.

D Poor.

This program has some problems. There are better on the market.

E Failure.

Many problems; should be deep-sixed!

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The software's graphics are even better, filled with exotic scenes painted by bright and continually changing colors. Sega has also done a tremendous job with the game's animation; it gives the exciting illusion of racing at breakneck speed.

Yet, for some players, all of this sensory richness won't be enough. In particular, those who enjoy the mental challenge of devising elaborate tactics might best look elsewhere. Fast reflexes, instead of heavy thinking, are needed to win in this contest.

Nevertheless, Out Run does deliver what its package promises: "Hot car. Hot music. Sensational scenery." For hundreds of thousands of racing fans, that's enough to guarantee that Sega's gaming formula is as big a success on the C-64 as it is in the arcades. (Sega; distributed by Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062. C-64/\$34.95.)

—WALT LATOCHA
OAK PARK, IL

FAST BREAK B+

*"He Steals the Ball,
Runs the Length of the Court,
and... Swish!"*

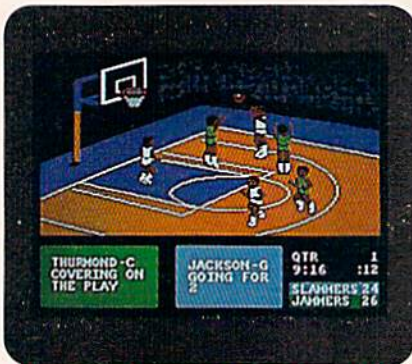
Think of Fast Break as Accolade's version of an in-your-face slam dunk. It might not shatter backboards in any one area, but it does feature a combination of attributes worthy of a champion. It's an impressive program that should score plenty of points with roundball fanatics.

Fast Break hits from three-point range with its graphics and life-like animation. The on-screen players are as clear and well-defined as any sports simulation I've seen; no flickering images here.

Players move smoothly up and down the court, realistically running, jumping and shooting. They also respond fairly quickly and accurately to joystick input.

But Fast Break isn't only about slam-bam action and quick reflexes. It's also a strategy game that lets computerists choose the players on their team and select the plays they'll run. Other features include competing against the computer or a friend, playing quarters that last from three to 12 minutes, or opting for the Practice mode.

The rules in Fast Break are essentially the same as in the NBA. Six fouls and a player is ejected from the game. Teams have 10 seconds to get the ball past half-court and 24 seconds to take



Information boxes on the bottom of the Fast Break screen keep you abreast of what's happening on the court.

a shot. Unlike real basketball, however, there are no foul shots, nor are there any walking or double dribble violations, and you can't throw or dribble the ball out of bounds.

Fast Break is a full-court game, but only one half of the court appears at any time. Players who happen to be on the half of the court opposite the ball aren't visible and are therefore difficult to control.

While perspective is good, there's one minor problem. Since there's virtually no horizontal scrolling, it's a little disconcerting when a player moves from one half of the court to the other. The screen seems to go blank for a split second, and then the players and court reappear.

One player per team can be controlled by the joystick at any time. This player flashes to distinguish him from his teammates. On offense, the joystick controls the player with the ball. On defense, the joystick controls the player closest to the ball at a change of possession, but a quick jab at the firebutton shifts control to the other two players in sequence. Because operation is logical and intuitive, it doesn't take long to get used to Fast Break's controls.

There really is a noticeable difference in the performance of the players. Some shoot better, run faster or rebound more strongly than others. So, it's important to keep an eye on the information boxes at the bottom of the screen, which identify the man with the ball and his defender. It's also wise to make substitutions, since minutes played affect performance.

That's what you call attention to detail. And it's details such as those that make Fast Break a class act. (Accolade, 550 S. Winchester Blvd., Suite 200, San Jose, CA 95128. C-64/\$29.95.)

—SCOTT WASSER
WILKES-BARRE, PA

OCEAN RANGER B

*Dangerous Reconnaissance
Activity from the Safety
Of Your Computer Room*

Ocean Ranger puts you in command of a modern hydrofoil patrol craft and offers you a variety of missions. Your assignments include Basic Training Duty, Regular Forces Duty, Central Intelligence Agency Duty and National Security Council Duty, and you can patrol four increasingly hazardous areas of the world—the Bering Sea, Southeast Asia, Central America and the Persian Gulf.

Each mission involves destroying a primary and a secondary target. A single target might be an entire squadron of Soviet MIGs or a small fleet of enemy destroyers. Other targets include submarine packs and underwater mines. You're given a set of coordinates for each target within the general area you're patrolling.

To eliminate the primary and secondary targets, as well as any enemy threats you'll face en route, the Ocean Ranger is equipped with several types of weapons, including a 76mm cannon, Sea Sparrow surface-to-air missiles, Harpoon missiles and depth charges. In addition, chaff rockets and ECMs (Electronic Counter Measures) can be used to throw incoming radar-guided missiles off your trail.

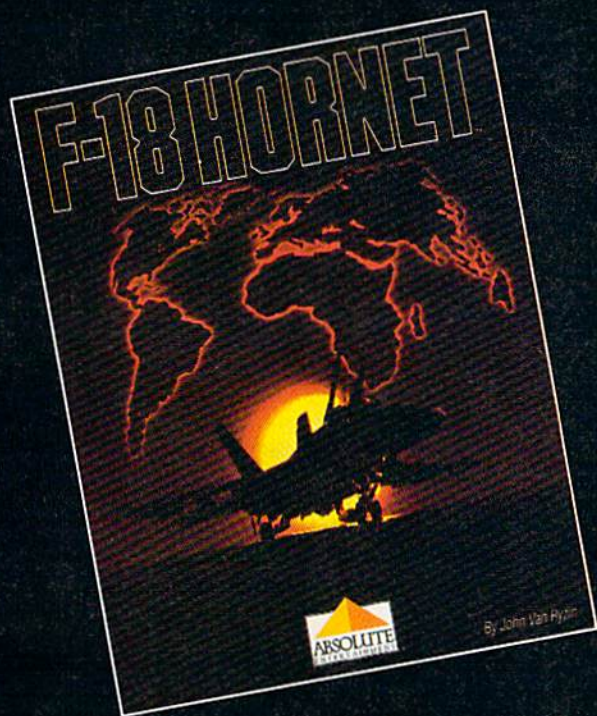
You have a choice of several main displays: the view from the bridge facing the bow, stern, port or starboard sides of the boat; damage and maintenance reports; or a tactical, area or coordinate chart. In addition to the main display, two small monitors at the bottom of the screen can be set independently to any of seven channels. Unfortunately, most of these displays are more decorative than functional.

Ocean Ranger comes with a Captain's Manual that contains complete instructions for commanding your ship, along with the security codes needed to access the personnel-records screen and to begin the game. These codes serve as copy protection for Ocean Ranger; the disk can be backed up using the program's built-in copy utility. Also included in the game package is a keyboard overlay that makes a snap of finding the correct weapon and navigation keys.

Although Ocean Ranger has a bit of an arcade feel, on the most difficult levels, it gives even veteran hydrofoil captains more action than they can handle. In addition, it lets you start as a Lieuten- ▶

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SOFTWARE GALLERY

ant and work your way up to the rank of Admiral, earning medals and service ribbons along the way. (Activision; distributed by Mediagenic, 3885 Bohannon Drive, Menlo Park, CA 94025. C-64/\$34.95.)

—BOB GUERRA
SOUTH BOSTON, MA

BARBARIAN B

*A Better Barbarian
Has Barely Been Born!*

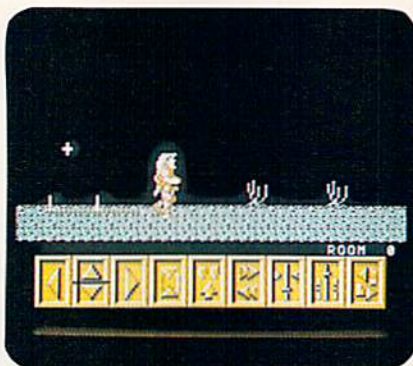
After playing the fantasy arcade game Barbarian, any C-64/128 owner considering the purchase of a Nintendo or other game system should certainly reconsider. After all, why invest hundreds of dollars in a dead-ended, cartridge-based machine when the very types of programs one is looking for in a game system are available on disk for one's own computer?

Thematically, Barbarian breaks no new ground. In the role of Hegor the Barbarian, the great dragonslayer, you must enter an underground world to do battle with your father's murderer, the evil Necron. Along the way, there are numerous screens to traverse, treasures to secure, traps to avoid and monsters to kill. The quest doesn't end with the defeat of Necron, however. Other tasks must be accomplished, including returning to the surface before the underground volcano blows.

Barbarian's graphics and animation are first-rate. A variety of evil characters populate this world, all clearly and colorfully drawn, and each type possesses individualized movements. Hegor travels smoothly from screen to screen against vivid, sharply etched backgrounds. Occasionally, he appears to be floating up steps, and the arrows he picks up look more like miniature columns, but these are relatively minor flaws.

One characteristic that sets Barbarian apart from its arcade-like competitors is the uniqueness of its control system, manipulated by either joystick (recommended) or keyboard. By positioning the cursor over any one of a series of icons located on the bottom of the screen and clicking the joystick button, you can access a variety of action commands.

This system tends to be a bit cumbersome on the C-64, possibly due to the game's origins as a mouse-controlled product for the Amiga and the Atari ST. The process is made easier, however, by the logical layout of the icons in relation to each other, and by letting the user control Hegor's walk-



Clicking on icons is the way you control Hegor in Barbarian.

ing, climbing, turning and stopping by placing the cursor in front of, behind, above or below the figure. That way, if you foresee disaster, you don't have to go looking for the appropriate icon in order to stave it off. My only complaint here is that Hegor seems to have his own mind at times, particularly when it comes to going up or down ladders.

Since there is no save-game feature, by the time Hegor reaches Necron, the average player should have almost every screen memorized. Nevertheless, mapping this relatively compact (48-room) underground world is recommended because you only have a limited amount of time to escape once your tasks are completed. A definite drawback to Barbarian is that it could have little replay value once your quest is concluded.

One very nice feature appears after you've used up the last of your four lives: The program informs you of the percentage of rooms you have explored. With the knowledge that with each game your percentage is improving, you begin once more to journey forth.

So, if it's attractive graphics, graceful animation and exciting game play you're after, hold off on buying that game machine, and instead put some of that money toward the purchase of Barbarian. (Melbourne House; distributed by Mastertronic International, Inc., Mesa Business Centre, Unit G9, 711 West 17th St., Costa Mesa, CA 92627. C-64/\$29.99.)

—LEN POGGIALI
SYRACUSE, NY

THE MAESTRO B—

*Music, Maestro,
Please!*

The Maestro is a music program that uses the C-64's three-voice SID (Sound

Interface Device) chip to play musical compositions in a variety of keys and time signatures. It's ideal for anyone familiar with musical notation who needs a way to turn printed sheet music into code the SID chip can play.

Music is entered, one measure at a time and one voice at a time, by moving a joystick-controlled cursor to the appropriate space on the musical staff and pressing the firebutton. Pre-programmed changes in tempo, volume and voicing can also be entered.

The Maestro's music-entry screen actually displays two staves: a treble staff for entering notes with a pitch of middle C or higher, and a bass staff for notes below middle C. As you might expect, vertical placement of a note determines its pitch. What's interesting about The Maestro's system of musical notation, however, is that note duration—whether a note is a 32nd, a 16th, an 8th or a quarter-note—isn't determined by the shape of the note as it is in standard notation, but rather by where the note is horizontally placed on the staff. Notes don't even appear on the one-measure staff as they're selected; instead, the note's letter name, octave and duration are listed below the staff.

After each note is selected, the staff is replaced by an Adjustments Menu that lets you alter the basic pitch and duration of the note by dotting it, making it a sharp or a flat (or natural if the key signature already designated the note as sharp or flat), raising or lowering the note's pitch by an octave, changing it to a triplet, or tying it to another note. Once all of the notes and rests for a single measure of one voice are entered, you get to review the list of notes and approve the current measure before moving on.

For each of your three voices, you can select one of eight pre-programmed instrument sounds: piano, reed, harpsichord, xylophone, organ, guitar, strings or brass. While none of these could ever be mistaken for the real instrument, they do offer a nice variety of timbres with which to arrange your compositions.

In addition, The Maestro comes with a separate utility that lets you create new sounds by selecting the waveform, setting the pulse width and defining the ADSR envelope. Unfortunately, other parameters controlled by the SID chip such as filtering and ring modulation, aren't adjustable through this utility.

You should also be aware of some of the program's other minor limitations. First, The Maestro has no MIDI capabilities, so if you have a MIDI-equipped synthesizer or are planning to buy one,

SOFTWARE GALLERY

you won't be able to use it with this program. Also, since it's designed basically as a tool for entering sheet music into your C-64, the designers felt it unnecessary to include an option that lets you print your music.

Finally, some users might have a problem with The Maestro's system for designating octaves. Usually, when you have eight octaves labeled zero through seven, zero represents the octave that's lowest in pitch and seven designates the highest. This is how things work within the aforementioned utility, but the system is exactly opposite within the main program.

On the plus side, The Maestro is not copy-protected, and it comes with 24 demonstration compositions right on the program disk, as well as an indexed, 66-page user's manual. The manual isn't slickly produced, but it's well-organized and does a thorough job of taking you through the various functions of the program. (*Zwetzig Associates, 5932 Bruns Court, Oakland, CA 94611. C-64/\$24.95.*)

—BOB GUERRA
SOUTH BOSTON, MA

Editor's Note: To give our readers more coverage of the many C-64/128 software products available, RUN is broadening the scope of Software Gallery by presenting more reviews in capsule form.

RASTAN **B**

You are Rastan, a mighty warrior in an ancient land, and you must defeat an evil king. While this plot is sure to be familiar to arcade gamers, there is much to make the program stand out from other sword-and-sandal offerings: the graphics—characters are bright, colorful and well defined; the scrolling—smooth, almost seamless; the response to joystick movement—crisp. This is a game that relies more on good hand-eye coordination than fast reflexes—timing is everything.

Rastan autoboots on a 128 and then configures the computer, via software commands, to 64 mode—that's a nice touch. Another plus is that the player is given the choice of music or sound effects during game play.

Regrettably, however, Rastan returns to the days of heavy-duty copy protection. Although my 1541 drive's heads may not be in perfect alignment (whose are?), Rastan is the only piece of software I have that won't load. It loaded from both of my 1571 drives, but only after I removed my 128's RAM expansion.

der. Rastan also failed to load with a fast load cartridge.

One other minor complaint involves the names of the enemies. Most are given names of creatures associated with terror or evil. However, two names, the "many armed bug" and the "fish," seem to indicate that the authors ran out of imagination. Those names just don't cut it for a deadly daddy long-legs and a killer carp.

Pleasant to look at and a pleasure to play, Rastan is an arcade game for those who want a program that requires more than just a fast thumb and a strong joystick. (*Taito Software, Inc., 267 West Esplanade, North Vancouver, British Columbia, Canada V7M 1A5. C-64/\$34.95.*)

—MICHAEL CAVANAUGH

BOOT CAMP **C+**

A military training and combat game for one or two players, Boot Camp turns your joystick into a physical development tool. Certain parts of this game require you to furiously waggle your joystick, and it is the speed of your waggle that determines your success in completing Chin Ups, the Assault Course and the Iron Man Race. Exhaustion and non-completion of sections send you back to the Assault Course to begin all over again.

I would've rated Boot Camp higher if starting over at the beginning hadn't been mandatory. I found it tiring and unrealistic not to be able to choose one event and stick to it.

The game's graphics stand out with sharp, realistic detail and good sound effects, ranging from "gung-ho"-type music to grunts and thuds.

I don't recommend this program to "couch potatoes." However, if you own a joystick with a good hand grip, and if you love a grueling workout, then go ahead, make your day! (*Konami, Inc., 815 Mittel Drive, Wood Dale, IL 60191. C-64/\$29.95.*)

—JOHN DIPRETE

ENLIGHTENMENT **C-**

There's a lot of "good stuff" in Enlightenment: fast action, a challenge for quick reflexes and a colorful terrain. I can't ignore a host of wonderful spells, 15 difficulty levels or the two-player feature. And, the graphics deserve passing grades while the musical interludes offer beautiful Canterbury themes.

However, I didn't like several aspects of Enlightenment. You start the game as a Druid and only get one chance as that character. Unfortunately, I sometimes died while simply standing around, debating my next move.

Joystick control lacks some precision. I had to position myself exactly on a spell site, sometimes over and over again before I could pick up a spell.

The game doesn't proceed in real time. After you've eaten a meal, you're suddenly informed that you need more food. A few seconds pass and you're told it's chow time again. Apparently, a Druid eats a million square dinners a day!

Some folks might like this game, but players looking for more direct adventuring would probably prefer something else. (*Rainbird Software; distributed by Mediagenic, 3885 Bohannon Drive, Menlo Park, CA 94025. C-64/\$19.95.*)

—JOHN DIPRETE

TICKET TO HOLLYWOOD **B**

Blue Lion Software has transformed movie lore into a computer trivia contest.

The game's graphics are well-drawn, although not very elaborate, and the sound effects are also rather limited. However, these sensory elements adequately fulfill their "supporting roles" as decorations for the quizzes.

The software tests you on an interesting array of facts—some easy, others rather obscure. Unfortunately, some players will quickly be able to memorize most of the game's answers, although the different types of questions do give the program more staying power.

The most impressive feature of this game is undoubtedly its control system. Primarily based on menus that are accessed by keyboard, joystick or mouse, it makes the game fun and extremely user-friendly. A Save function that keeps track of the progress of up to eight players is also included.

A few older copies of Ticket to Hollywood have one minor flaw that involves obtaining the final clues. Owners of software with this problem can find the clues by merely going to the game's review screen or getting a free replacement disk from Blue Lion.

This program should fascinate anyone who has even a casual interest in films. And, judging by the continuing boom in video rentals, that audience probably includes most C-64 owners. (*Blue Lion Software, 90 Sherman St., Cambridge, MA 02140. C-64/\$29.95.*)

—WALT LATOCHA ■

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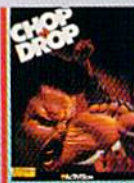
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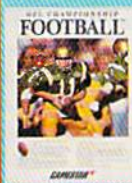
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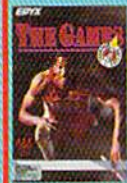
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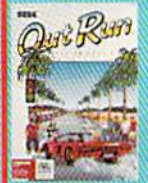
Rack 'Em
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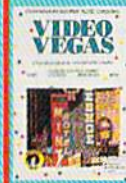
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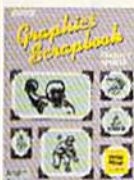
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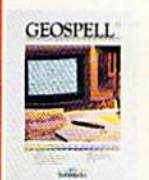
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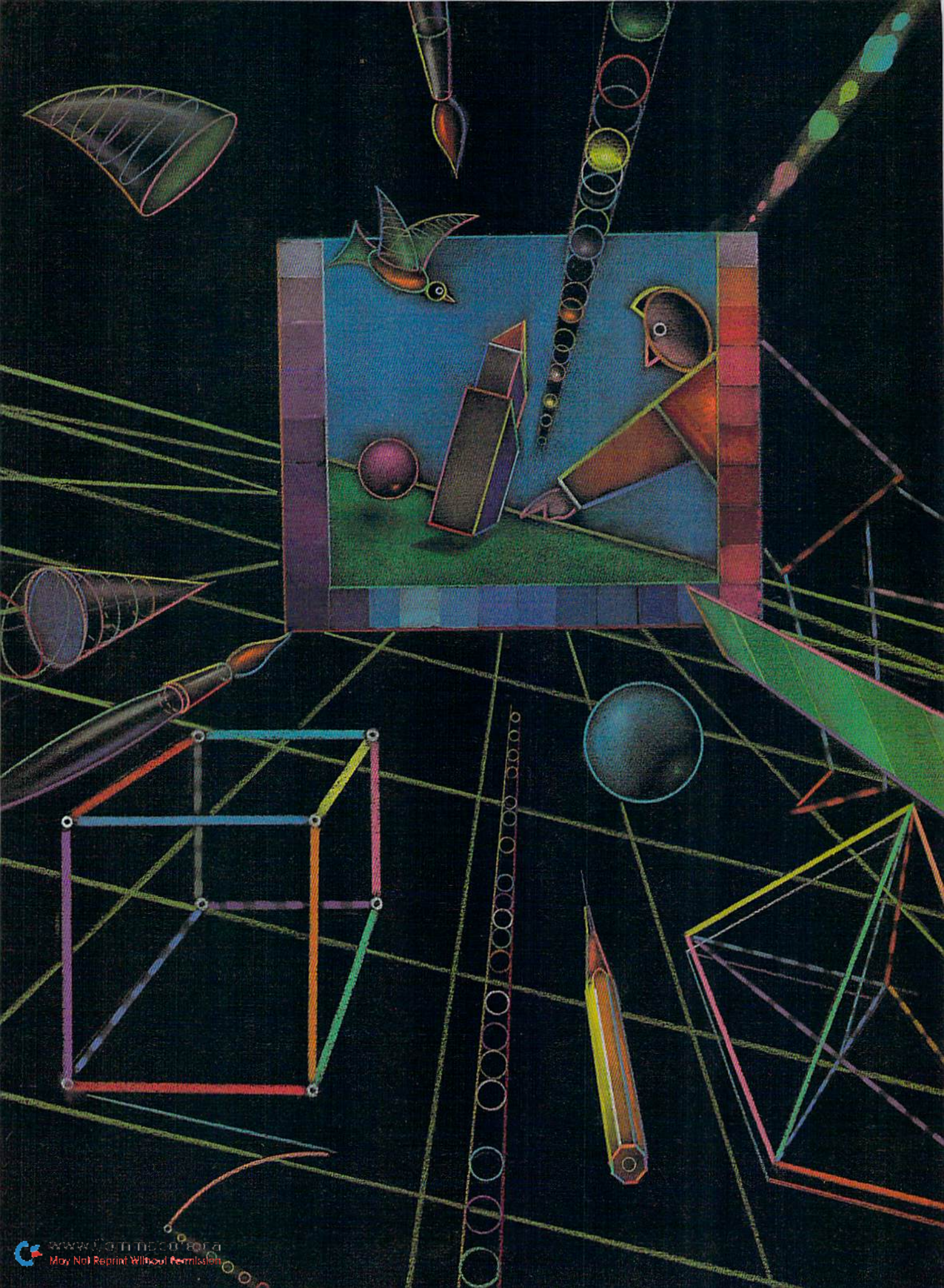
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RUN Paint

Here is easily the most advanced, powerful and easy-to-use draw and paint program ever published in a magazine for the C-64 or C-128.



UN Paint is a sophisticated, joystick-based paint program that lets C-64 and C-128 users create and print out bit-mapped graphics. It runs in 40-Column mode and uses both hi-res and multicolor screens. An easy-to-use system of nested, pop-down menus makes it unnecessary to study and memorize sets of complicated commands or to continually refer to the documentation.

Getting Started

RUN Paint is presented here as four program listings. Before using the program, you'll need to type in all four listings (use RUN's Checksum program) and save them to a disk that we suggest be new and freshly formatted. All the listings are in a hexadecimal data format. It is important to name them only as indicated and not as the actual programs that they will create. So Listing 1 should be saved to disk with the name LISTING1, Listing 2 as LISTING2, and so on.

Once you've typed in all four programs, you can begin to create the actual RUN Paint files. (Make sure the Checksum program has been disabled before running any other programs.) Load LISTING1 and, with your RUN Paint disk in the drive, run it. Your disk light will come on, and there will be a brief amount ▶

By ROBERT ROCKEFELLER

RUN it right: C-64 or C-128
(in 40-Column mode); joystick or 1351 mouse

of disk activity while it creates the actual RUN Paint file.

After a few minutes, you'll get your cursor back, and the familiar READY prompt will appear. Repeat this for LISTING2 through LISTING4. Depending on the size of the listing, the time required to create the files on disk will vary. Just be patient and wait until the READY prompt reappears.

Before starting to use RUN Paint, make sure you have a joystick or 1351 mouse plugged into port 2 (do not plug them in with the power on). Then turn on the computer. RUN Paint defaults to a joystick in port 2, so if you're using a 1351 mouse instead, press the F3 key at this point. Pressing F1 will reselect the joystick.

To start RUN Paint in either 64 or 128 mode, just load the program called RUNPAINT and run it. After half a minute or so, the screen clears and a flashing arrow appears in the center. The arrow is a pointer that you move around with the joystick or mouse to make menu selections and to draw on the screen.

The rest of this article will take you step by step through each of RUN Paint's functions. By the time you've finished, you'll have a good working knowledge of the power and sophistication of this program. After that, you can use the documentation as a reference guide.

The Menu System

You can't draw anything until you select an option from a menu. To activate the menu system, move the pointer at least five pixels above the top of the screen border and press the firebutton. When the main menu appears, select one of the options thereon by moving the pointer onto it and pressing the firebutton. This operation is known as "clicking." Take care not to move the pointer off the menu until you're finished with it, because the menu will then disappear.

Clicking an option displays a submenu from which you can make further selections. Some of the submenu options perform an action, and some make yet another submenu pop down. Accessing some of RUN Paint's features requires descending through three levels of submenus.

Many of the program's menus include an option that's indented two spaces, possibly with an asterisk beside it. These are options you can click on and off. The asterisk means the option is turned on.

The Main Menu

The main menu contains six options and four arrows. The latter are "scroll arrows" that you use to move the screen within the page buffer (see below). To observe these arrows in action, draw something on the screen. Here's how:

Activate the menu system by clicking on the Draw option in the main menu; then, when a submenu appears, click the Freehand option. Note that making a selection may make the menu disappear.

Now, position the pointer on the arrow pointing right and press the firebutton. This will make the contents of the screen seem to scroll left, because the screen is being moved to the right through the page buffer. Releasing the firebutton stops the scrolling and makes the main menu reappear. There are arrows corresponding to the other three directions also, but the up and down arrows are nonfunctional on the C-64 because of insufficient memory.

Following is an explanation of the functions accessed through each of the six main menu options.

The Pen Submenu

The two main drawing tools in RUN Paint are the pen and the brush, and the various options associated with them are controlled through the Pen submenu. There are six different pen styles, and an unlimited number of brush shapes and patterns are possible, since RUN Paint allows saving and loading of brushes and patterns. Brushes work by painting the part of the screen covered by the brush with the current pattern whenever the firebutton is pressed. Here's an example:

Activate the menu system, click on Pen, then move the pointer down to Use Brush and click on a brush for drawing. Next, move the cursor back onto the main menu and click on Draw, followed by Freehand. When you move the brush around while pressing the firebutton, the current brush pattern appears wherever the brush goes. RUN Paint lets you select from 11 different brushes and 35 different patterns at any one time.

Following are descriptions of the options in the Pen submenu:

Select Color lets you choose the color you want to draw with. When you click on a color, the border color changes to your choice to indicate the current drawing color.

Use Pen and **Use Brush**, which specify the pen or the brush for drawing, are mutually exclusive; if you select one, you deselect the other. An asterisk is always present beside the currently selected tool. The drawing modes in which you can select either pen or brush are Freehand, Lines, Rays, Spray, Ellipse and Box. Flood always uses the pen, regardless of which tool you've selected.

Affect Color. This option is either on or off. When it's off, none of RUN Paint's graphics commands affect color memory. If you want to use a Monochrome mode, just turn off Affect Color after activating the program.

Reflect On simultaneously creates up to three mirror images of an object as you're drawing it. Here's an example:

Enable the menu system, click on Pen, then on Set Reflect and on X in the Set Reflect submenu. Next, return to the Pen submenu and activate Reflect On. Now move back to the main menu and click on Draw, then on Freehand. As you move the pointer around while pressing the firebutton, you can verify that a mirror image is

The two main drawing tools are the pen and the brush.

drawn, reflected in the x-axis. Try the other options in the Set Reflect submenu, namely Y and XY. (See Set Reflect and Move Mirror, below.)

Set Reflect displays a submenu of reflection modes you can choose from when Reflect On is enabled. X produces reflection on the x-axis, Y on the y-axis and XY in the opposing quadrant. (Also see Reflect On, above, and Move Mirror, below.)

Move Mirror is the option you use to position the reflective x and y axes anywhere you want on the screen.

Select Pen lets you choose one of six pens for drawing when the Use Pen option is on. The first option draws normal solid lines and the second draws double-width solid lines. The third to sixth options produce one of four styles of dotted lines. In Freehand mode, only solid lines can be used. The dotted lines work only in the Lines and Rays modes.

Select Brush lets you choose a brush shape to use when Use Brush is on. Just click on a brush.

Select Pattern lets you choose a pattern when Use Brush is on. Just click on any pattern.

The Draw Submenu

The Draw submenu is used more frequently than any of the others, since it contains most of the commands for placing graphics on the screen.

Alter Color changes colors on the screen. You'd use it, for example, if you drew a flower with white petals and then decided it would look better in red. Selecting Alter Color brings up a submenu containing two options: **Card** and **Screen**. Card restricts the color change to a single card (see Technical Notes, below), which you select with the pointer. Screen makes the color change affect the entire screen. After selecting one of these options, a third submenu pops down from which to select the new color. In our example, you'd select red.

Once you select a color, the menus disappear, the border color changes to the color you selected and you're ready to initiate the color change. Position the tip of the pointer over the color you want to alter and press the firebutton. The border color changes to match the color of the pixel under the pointer. If this is indeed the color you wish to change, press the firebutton and the change takes place.

If nothing happens, you probably have the pointer positioned on a blank pixel. Move the pointer a little bit and try again. If the pointer is placed on the wrong color, you can abort the change by executing an Undo (see below) or by activating the menus, then moving the pointer off the menu back onto the screen to try again.

Wash lets you change the background color on a card-by-card basis in Hi-Res mode. When you select Wash, a menu pops down from which to choose the new color. After you select a color and the menus disappear, move the pointer onto a card and press the firebutton to change the background color of that card.

Flood fills an enclosed area with a solid color.

Here also, a menu pops down from which to select the color you want, and the menus disappear after you choose. Then position the pointer over the area you want to fill and press the firebutton. You can abort a fill in progress by executing an Undo (see below).

Freehand makes a freehand drawing. Pressing the firebutton while moving the pointer around draws a line. (See the Pen submenu, above.)

Lines is the option used for drawing straight lines. Position the pointer where you want a line to start and press the firebutton; then move the pointer to the line-end position and press and hold down the firebutton until the line is completely drawn. (See the Pen submenu, above.)

Rays draws lines that radiate from a common origin. Move the pointer to the desired starting point and press the firebutton; then move the pointer to a line-end position and press the firebutton again to draw the line. Draw additional lines by moving the pointer to new end positions and pressing the firebutton again. As in the Lines option, you must hold the firebutton down until the line is complete. (See the Pen submenu, above.)

Spray produces a spray effect. When you select this option, a submenu pops down with three additional choices—Light, Medium and Heavy—which specify the intensity of the spray effect.

Spray uses either the pen or the brush and works on a timer. In Heavy mode, it plots a point or paints a brush shape every $\frac{2}{60}$ of a second. The corresponding times for Medium and Light modes are $\frac{3}{60}$ and $\frac{15}{60}$ seconds, respectively.

If Use Brush is on, you can get an airbrush effect by selecting a brush consisting of a grid of dots. (See Select Brush, above.)

Eraser mode erases the screen card by card.

Edit lets you modify either a section of the screen, the brushes, the patterns or the current character font. Selecting Edit displays a submenu. To modify a section of the screen, click on Pixel Edit. After your selection, the menus vanish and the pointer appears, surrounded by a flashing box. Position the box over the part of the screen you want to edit and press the firebutton. This enlarges the screen inside the box, copies it to the bottom of the display, and then brings a color menu to the center of the display, from which you select a new drawing color. The top of the display shows an unmagnified section of the screen, so you can see the effect of your edits.

You edit pixels by positioning the pointer over them and pressing the firebutton. To erase a pixel, set the drawing color to the screen color. You can select a new area to edit by moving the pointer to the top of the screen and pressing the firebutton.

The Font, Brush and Pattern editing modes operate in a similar manner. After selecting one of them, the screen clears and the font, brushes or patterns are copied to the top of the screen. Select a character, brush or pattern for editing by clicking on it. The center of the screen shows a color bar containing two colors: blue and black. Select blue to erase pixels and black to set pixels. ▶



Paint
can load
standard
Commodore
character
sets.

You select a different character, brush or pattern to edit by moving the pointer into the top area of the screen and pressing the firebutton.

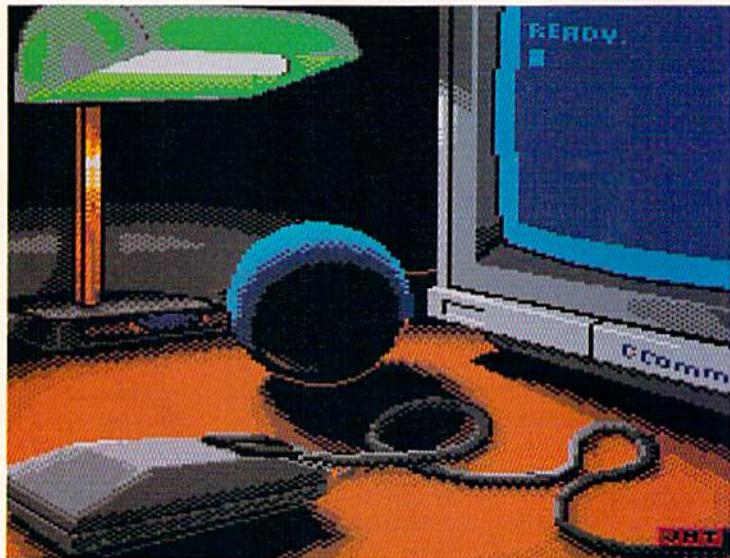
Ellipse uses either the pen or the brush to draw ellipses. Click twice to set two opposing corners of a box, and an ellipse will be drawn within the box. (See Solid, below.)

Box uses either the pen or the brush to draw boxes. Click twice to set two diametrically opposite corners, and a rectangle appears. (See Solid, below.)

Solid determines how Ellipse and Box work. When this option is on, ellipses and boxes are drawn filled-in. When it's off, they appear as outlines.

The Shape Submenu

The Shape submenu contains commands for cutting and pasting or erasing rectangular areas of the screen, along with whatever is within those areas. It uses a special area of memory called the "shape buffer," where shapes you cut or copy from the screen are stored. In Paste mode, the shape in the buffer is pasted on the screen. Note that it's impossible to paste a hi-res shape on a med-res (multicolor) screen, or vice-versa.



James Hastings-Trew produced this still-life picture using RUN Paint.

Cut duplicates a rectangular area and its contents from the screen to the shape buffer and erases it from the screen. Move the pointer to one corner of the shape and click, then to the opposite corner and click again.

Copy copies a shape on the screen into the shape buffer, but the shape remains on the screen. Execute this exactly as you would Cut.

Paste places a shape that's in the shape buffer onto the screen. In this mode, the pointer is surrounded by a box of the same size as the shape in the buffer. Move the box to where you want it located and click once. Note that it's

impossible to paste a hi-res shape on a med-res (multicolor) screen, or vice-versa.

Erase eliminates the contents of a rectangular portion of the screen. Move the pointer to one corner of the rectangle and click, then move it to define the opposite corner and click again.

Flip X. When this option is on, the shape is pasted and flipped horizontally about the y-axis.

Flip Y pastes the shape and flips it vertically about the x-axis.

RVS pastes the shape in reverse field. This option works well in Hi-Res, but not so well in Med-Res (Multicolor) mode.

Cover mode makes the shape completely cover the screen area where it's pasted. Normally, blank areas of the shape are not pasted.

The Type Submenu

The Type submenu is used to place text on the screen. Type is essentially monochrome and uses the current color.

Font. Clicking this option selects a new character font and enables Type mode. After you click, a submenu will appear offering an additional three options. The first corresponds to the RAM font, which RUN Paint can load in via the Load submenu (see Disk, below). If this option is blank, a font hasn't been loaded yet. RUN Paint can use either standard Commodore 8-bit character sets or special RUN Paint fonts, which are 16 bits wide and 16 high.

Graphics, the second Type option, selects the built-in ROM character set that consists of the uppercase alphabet and special graphics characters.

Text, the third option, selects the ROM character set containing the upper- and lowercase alphabets and business graphics characters.

After clicking on an option, you can begin typing. A flashing box shows where the next character will appear, and, when you press the firebutton, you can move this box anywhere you wish on the screen. Press the firebutton again after the box is positioned. The following are special features available while typing:

Cursor keys: Move the flashing box around.

Control/RVS On: A standard Commodore character set has 256 characters, numbered 0-255, but RUN Paint can use only 128 characters at a time. Simultaneously pressing the control and 9 keys selects characters 128-255 for typing.

Normally, characters 128-255 are just reversed images of characters 0-127, and Commodore uses them to provide a flashing cursor. RUN Paint doesn't need these reversed characters, so they can be replaced by another font, such as italics. This lets two 8-bit character sets reside in memory at once. RUN Paint provides no way to replace the reversed characters.

Control/RVS Off: Simultaneously pressing the control and 0 keys selects characters 0-127 for typing.

Home: Moves the typing box to the home position.

Return: Moves the typing box to the start of the next line.

DEL: Pressing the insert-delete key deletes the character to the left of the cursor.

Now, getting back to the Type submenu:

Width displays a submenu with three options: Normal, Double and Quadruple. Click on the character width you want.

Height also produces a choice of Normal, Double and Quadruple. Click on the height you want.

The next five options, affecting how text is placed on the screen, are mutually exclusive; only one can be activated at a time.

Cover, which is the Default mode, makes characters you place on the screen completely cover the area inside the typing box. In this mode, it's impossible for you to make a character blend in with the background.

RVS is similar to Cover, except that characters are reversed before being placed on the screen.

Or places characters on the screen using the logical Or operation, thus letting them blend in with the background.

And. When this option is selected, characters are placed on the screen using the logical And operation. To see how this works, paint the entire top of the screen with a pattern using a large brush, then select the Quadruple option and the And option on the Type submenu. Now choose one of the fonts, position the typing box on the pattern and begin typing.

XOr lets you place selected characters on the screen using the logical Exclusive-Or operation. This means the characters can blend in with the background.

The Disk Submenu

The Disk submenu is used to save and load files to disk, as well as to issue disk commands and select the disk device number. RUN Paint filenames must not contain any spaces.

Load. This option on the Disk submenu can load a number of types of files, which are selected from a submenu. After you select a file type, RUN Paint displays a list of the files of that type available on the disk. Just move the pointer onto the filename you want and press the firebutton.

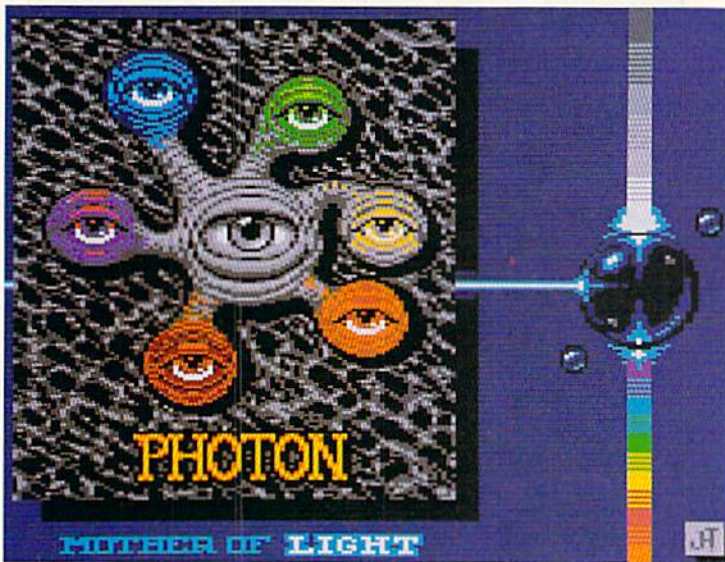
RUN Paint can load standard Commodore character sets, as well as files created with other programs, such as Koala Painter, Doodle! and Flexidraw. These files must be renamed to conform with RUN Paint format. (See Load Font, Monochrome, Hi-Res Screen and Med-Res Screen, below.)

Use the **Font** option in the Load submenu to load a font. As mentioned above, RUN Paint can use standard Commodore character sets. However, the file must be renamed according to RUN Paint format before the program can load them. All RUN Paint font filenames must begin with the letters RPF and a period. For example, a character set named ITALICS would have to be renamed RPF.ITALICS. Remember, no spaces are allowed in a filename.

The **Page** option loads an entire page, **Shape** loads a shape, **Patterns** loads a set of patterns and **Brushes** loads a set of brushes.

Monochrome provides a way to load a straight 8K monochrome bit map with no color. Flexidraw saves pictures in this format. Before you can load a Flexidraw picture into RUN Paint, you must rename it. For example, a Flexidraw file named JAGUAR would have to be renamed RPO.JAGUAR. Once again, there can't be any spaces in the filename.

After loading a monochrome bitmap, RUN Paint enters a special mode where you can copy a section of the screen to the shape buffer. If you go to a menu, the screen is copied to the page buffer. If you perform an Undo, the screen will go back to what it was before loading. ▶



Photon-eye, created with RUN Paint by James Hastings-Trew.



Glass and coaster, by James Hastings-Trew.

The Mode submenu is a catch-all for commands that don't fit in anywhere else.

Hi-Res Screen loads high-resolution screens that include color, such as Doodle! picture files. As with Flexidraw files, Doodle! files must be renamed to RUN Paint format before they can be loaded. A Doodle! file named DD.FIELD would be renamed RPH.FIELD.

Also as with Flexidraw files, after loading, RUN Paint enters a special mode enabling you to copy a section of the screen to the shape buffer. If you go to a menu, the screen is copied to the page buffer, and performing an Undo restores the screen as it was before loading.

Med-Res Screen loads medium-resolution (multicolor) screens, such as Koala picture files. Like the other file types I've mentioned, Koala files must be renamed according to RUN Paint format before they can be loaded. A Koala file named APICA.FIELD would be renamed RPM.FIELD.

As with the previous two commands, RUN Paint enters a special mode where you can copy a section of the screen to the shape buffer. Going to a menu copies the screen to the page buffer, and an Undo restores the screen as it was before loading.

The **Utility** option enables RUN Paint to load in and execute user-defined, machine language utility programs that can give RUN Paint more capabilities. The programs must be assembled to run at address \$6C00, and their filenames must begin with the letters RPU and a period.

Save. This option on the Disk submenu displays a further submenu from which various types of files can be saved. After selecting a file type, enter the desired filename, omitting a prefix, since RUN Paint will install it automatically. For example, if you enter ITALICS as the name of a font, RUN Paint will save it as RPF.ITALICS. As before, don't include any spaces in the filename.

There are eight commands for saving files, representing eight different file types. **Font, Page, Shape, Patterns** and **Brushes** are self-explanatory. **Monochrome** saves the contents of the screen as a straight 8K monochrome bit map with no color. **Hi-Res Screen** saves the contents of the screen as a Doodle!-compatible file. **Med-Res Screen** saves the screen as a Koala-compatible file. After you enter the filename for a med-res screen, the text screen will fill with strange colors. Don't worry. This is just because the text screen and the med-res screen share the same color memory.

Other Disk submenu options are:

Command. Select this option from the Disk submenu to issue a command to the disk drive for formatting a disk or scratching or renaming a file.

Set Device lets you specify device 8 or 9 for saving and loading.

The Mode Submenu

The Mode submenu is a catch-all for commands that don't fit in anywhere else. It lets you set the screen and pointer color, print, select high or medium resolution, and more.

Cursor. This Mode submenu option displays

a further submenu that offers three options: Solid, Flash and Card Restricted. **Flash**, the default, produces a flashing cursor. With **Solid**, you get a nonblinking cursor. You must also select the cursor color from a submenu. **Card Restricted** restricts cursor movement to coordinates that coincide with the upper-left corner of a card. This is often useful in Type mode and when pasting shapes.

Screen Color displays a submenu from which to alter the screen color. The color is actually changed for the entire page, not just the screen, and on the C-128 this takes a second or two. The change isn't finalized until the cursor is moved off the Screen Color submenu.

GoTo. This Mode submenu option lets you move around the page buffer quickly. On the C-64, three options are available in this submenu: Left, Middle and Right. On the C-128, you have an additional four options: Top, Bottom, Screen Up and Screen Down. As mentioned above, the page buffer is wider than the screen. In fact, it's 80 cards wide. Clicking on **Left** brings columns 0-39 of the page buffer to the screen. **Middle** and **Right** display columns 20-59 and 40-79, respectively. Clicking on **Top** moves the screen to the very top of the page buffer on the C-128. **Bottom** moves the screen to the bottom of the page buffer. **Screen Up** and **Screen Down** move up and down through the page buffer approximately half a screen at a time.

Clear Screen. This option in the Mode submenu predictably clears the screen. This action can be reversed with an Undo command.

Clear Page clears the entire page and cannot be undone.

Print. Various printout options are accessed through this submenu. They let you print part or all of a screen or page.

Screen prints just what is currently displayed. If the Define option (see below) is on, you can specify the number of screen lines to print. If Define is off, the full screen is printed.

Page prints the page buffer. Similar to printing a screen, if the Define option is on, you can specify the number of lines to print from the page. If Define is off, the full page is printed.

Rectangle defines a rectangular area of the screen to be printed. This area can be as large or as small as necessary. After the menus disappear, click once to define one corner of the rectangle, then move the pointer to define the diametrically opposite corner and click again to start printing. Rectangle doesn't work with the Prowriter printer.

RVS. If this is set to on, the printout will be in reverse field.

Disk. When Disk is on, the printer output will be sent to the disk. You must enter a disk filename before printing begins.

Define works with Screen and Page, but not Rectangle. As mentioned above, this option lets you define the number of lines to print from the screen. After you choose to print a screen, the menus disappear and a horizontal line appears. Move the line to define the bottom of the part

of the screen you want printed and press the firebutton. The screen will be printed from the top down to the line.

You can also define the bottom line when you print a page, but printing takes place from the top of the page buffer down to the line. You can use ScreenUp and ScreenDown to position the screen in any part of the page buffer on the C-128.

Click on **Select Printer** to tell RUN Paint what type of printer you have. The program supports three printers and their compatibles: the Commodore 1515, the Epson and the C.Itoh Pro-writer. If you have one of the printer interfaces that offer 1515 emulation, you should be able to use the 1515 printer driver, regardless of the type of printer you own.

Click twice on **Quit** to leave RUN Paint and return to Basic. On the second click, press the button for at least a second.

Use the **Device** option to tell RUN Paint whether you're using a joystick or a mouse.

Hi-Res and **Med-Res** specify either High Resolution or Medium Resolution mode. These options are mutually exclusive; selecting one unselects the other.

The Undo Feature

I'll wrap things up with a look at RUN Paint's most useful feature: Undo. Undo is not selected through the menu system, so I'll illustrate it with an example. Draw something on the screen, then activate Undo by moving the pointer five pixels below the bottom border of the screen (as far down as it will go) and pressing the firebutton. The screen will clear, "undoing" the last function performed.

Each time you access the menus, the screen's contents are copied to the page buffer, and Undo


works by copying the page buffer back to the screen. This means you can reverse any action performed since the last time the menus were accessed.

Technical Notes

The VIC chip in the C-64 and C-128 organizes the graphics screen into little rectangles called "cards." The screen contains 25 rows of cards, with 40 cards per row. In Hi-Res mode, each card contains eight pixels horizontally and eight pixels vertically, and only two colors are possible per card: a foreground color and a background, or screen, color. If you try to add a third color to a card, the foreground color will change to the new color.

In Med-Res mode, also called Multicolor mode, three different foreground colors are possible per card, and the background color is the same for all cards. The luxury of having three foreground colors is paid for by decreased screen resolution. The pixels are twice as wide as in Hi-Res mode, and a card contains only four pixels horizontally by eight vertically.

The Page Buffer

RUN Paint uses the screen as a window atop a larger area, referred to as the "page buffer." On the C-64, RUN Paint can handle drawings up to 640 pixels wide and 200 pixels high. With its larger memory, the C-128 can handle a full 8½×11-inch page, allowing drawings of up to 640×792 pixels. 

Robert Rockefeller is probably best known to RUN readers as the creator of our fine word processing program, RUN Script, for both the 64 and 128.

Listing 1. Create RUN Paint boot program. (Note: RUN Paint's listings are available on the RUN Works and March-April ReRUN disks.)

```

0 REM CREATE RUNPAINT BOOT PROG      AS,(20)+RIGHT$(AS,(LEN(AS)-21 103 DATA 821C1E008B2041B23020 A
RAM                                ):GOTO 70                          :REM*137      72041B2313A20932230 3A53595
5 OPEN 8,8,8,"RUNPAINT BOOT,P,W     65 B$=LEFT$(AS,20)+MID$(AS,22,2 32E5354554646      :REM*195
"                                     )+RIGHT$(AS,LEN(AS)-42)      104 DATA 2E48222C382C313A208F 2
10 READ AS:IF AS="-1" THEN CLOS      :REM*140
E8:END                                :REM*78      70 FOR I=1 TO LEN(B$)/2:REM*221
15 IF LEN(AS)<62 THEN 55              75 C$=MID$(B$,(I*2)-1,2):H$=LEF 105 DATA 205041545445524E532E 0
                                     :REM*254      T$(C$,1):L$=RIGHT$(C$,1)
20 B$=MID$(AS,1,20)+MID$(AS,22,     :REM*140
20)+MID$(AS,43,20)                   :REM*242      80 H=VAL(H$):IF H$>"9" THEN H=A 106 DATA 333229B3B132323620A7 2
25 FOR I=1 TO 30                       :REM*181      SC(H$)-55                          :REM*56
30 C$=MID$(B$,(I*2)-1,2):H$=LEF     85 L=VAL(L$):IF L$>"9" THEN L=A 85 L=VAL(L$):IF L$>"9" THEN L=A
T$(C$,1):L$=RIGHT$(C$,1)           :REM*84      107 DATA 3000EC1C3C008B20CC28 2
                                     :REM*209      90 BY=H*16+L:PRINT#8,CHR$(BY);
35 H=VAL(H$):IF H$>"9" THEN H=A     :REM*148
SC(H$)-55                             :REM*85      95 NEXT:GOTO 10                       :REM*160
40 L=VAL(L$):IF L$>"9" THEN L=A     100 REM HEX DATA FOR RUNPAINT B 108 DATA 4E41424C452034302043 4
SC(L$)-55                              :REM*136      ASIC BOOT PROGRAM :REM*65      F4C554D4E204D4F4E49 544F522
45 BY=H*16+L:PRINT#8,CHR$(BY);      101 DATA 011C191C0A008F204453 4 109 DATA 00DE20303A2097203235 3
                                     :REM*67      15645224052554E2050 41494E5
50 NEXT:GOTO 10                       :REM*115      422003B1C14000      :REM*116
55 IF LEN(AS)<21 THEN B$=AS:GOT      102 DATA 8F20424F4F542050524F 4 110 DATA 022031353A20FE11224F 4
O 70                                    :REM*184      752414D20464F522052 554E205
60 IF LEN(AS)<42 THEN B$=LEFT$(     041494E542E00      :REM*160      1282230433030      :REM*231

```

Continued on p. 69.

RUN Paint Primer

◆
*To create a graphics masterpiece,
you need a quality program
(RUN Paint) and these hints
from a professional computer artist.*
◆



RUN Paint (see previous article) for the C-64 and 128 is an easy-to-use and versatile art program, and, like all powerful utilities, it responds well to a little advance planning. As a professional computer artist, I'm always amazed at the impact, in time and results, that some careful forethought can have on a project. It can mean the difference between "just another computer picture" and that eye-grabbing display I've been striving to create.

GETTING STARTED

Unlike many commercial draw and paint programs, RUN Paint offers the computer artist a choice of screen modes: High-Resolution (HIRES) mode, which produces the crispest screen images but severely limits the way you can apply color, and Multicolor (MEDRES) mode, which compromises the screen resolution but offers much more latitude in handling color.

Your choice will depend largely on your art experience and whether the image you plan to create is intended to appear on the screen or on paper. Since I came to computer art from a traditional

oil background, Multicolor is the mode I almost always use.

Once you've set the Screen mode, it's time to select the background color for your piece, making sure that it complements the intended image. Some people pick the color that will cover the largest area in the picture; for instance, blue for a landscape with lots of sky. However, this is usually a mistake.

Instead, consider using a color that will be distributed evenly over the picture. Black is a great choice, as you'll almost always be using black to delineate objects, shade colors, and so on. White would be appropriate where you want to place a lot of highlights on objects for shiny effects. Dark or medium gray is good if you want a lot of muted colors. The choice of background color is a crucial one, because it will directly affect the ease with which your picture comes together.

CREATING A FRAMEWORK

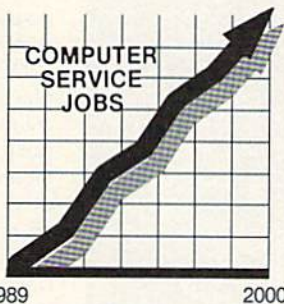
RUN Paint's unique virtual-page feature is a great tool for composing a picture, and it provides room to maneuver in case you paint yourself into ►

By JAMES HASTINGS-TREW

5 sure steps to a fast start as a high-paid computer service technician

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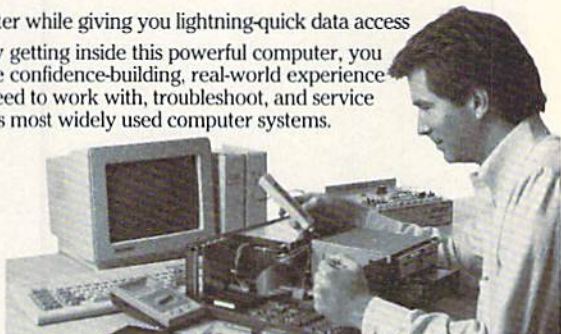
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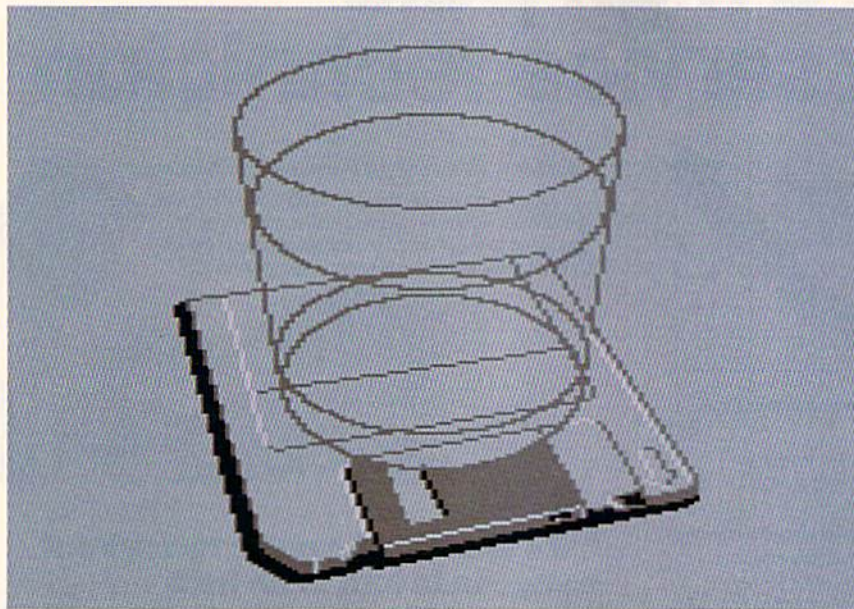


Figure 1. Example of a layout sketch.

a corner. I always move into the virtual-page area when I start a new picture; all it takes is a few presses on the down- and right-arrow keys.

Composition is to a picture as the framework is to a house: If the framework isn't sound, the house will never be right. Normally, you should lay out the entire composition of a computer painting before you begin to apply color, working out all perspective problems and object placements in the process. (See Figure 1 for an example of a layout sketch.)

Pick a simple color, such as dark gray; then, with the line tool, rough in the outlines. You can also use the ellipse and freehand tools to rough in shapes. Working with outlines, it's easy to correct layout mistakes, without ruining hours of work, by using a large brush shape in the background color.

If you find that you've placed your picture too high, too low, or too far to the left or right, use the arrow keys to

move your window on the virtual page. This capability can save lots of work when you want to get an image positioned "just so."

Try to resist the temptation to "get in there" and start adding details at this point. Remember, you're creating the framework for your picture, so the screen should be uncluttered to make major changes easy. You need to be free to try out different ideas without worrying about spoiling hours of work. Keep the "precious" work until the end, when the framework is all but graven in stone and most of the colors and blendings are set.

BLENDING AND SHADING

Once you get the framework of your image together, it's time to color it in. If you're using Multicolor mode, this means first getting to know the color restrictions of that mode and the peculiar way it makes the colors interact on the screen. In this mode, you can

have only four colors in any "place" on the screen at one time; if you try to add a fifth, one of the first four will change and several pixels may suddenly pop to the new color. I usually ignore color restrictions when I'm creating and deal with them only when necessary.

Of the four colors you can have in any place, one is always the background color. This means, for all intents and purposes, that when you're shading or blending, you'll be dealing with only three colors. A few combinations of the 16 colors in your Commodore palette provide blended effects that are especially nice.

To blend colors with RUN Paint, you can use a Zoom-mode technique called "dithering," which alternates two or more colors in a checkerboard pattern. When viewed on the screen, the colors will appear to blend into an in-between color. Bear in mind, though, that there is a price to pay with dithering. It lends a texture to the areas where it's used. A kind of clothlike softness is often the feel of a dithered area, so you should use it minimally when you're creating images of hard, shiny or rough surfaces. Figure 2 shows two images shaded with the same colors, but notice the textured effect that dithering has created in the image on the left.

There are several main groups of colors to keep in mind when blending and shading:

Black, dark gray, medium gray, light gray and white all fit into an excellent gray scale, which, when used properly, can produce very smooth blending effects.

Blue, light blue and cyan make a fairly short scale of blue values. However, you can create good in-between shades by dithering with one of the gray values. In a pinch, a very dark blue can be achieved by dithering dark blue with black, but the resulting area will have a definite texture.

Brown, red, orange and light red constitute a good scale of red colors. Highlights can be created in this scale with light gray or white, while dark and medium gray will produce shadow effects and muted shades. Yellow sometimes works with the red values as a highlight color and is a good way to get a better orange value. Light red and light or medium gray work well as flesh tones and combine into some smooth colors.

Green and light green are the only values in their very short scale. However, they work extremely well with all the grays, plus light blue and cyan, to create a wide and subtle range of colors

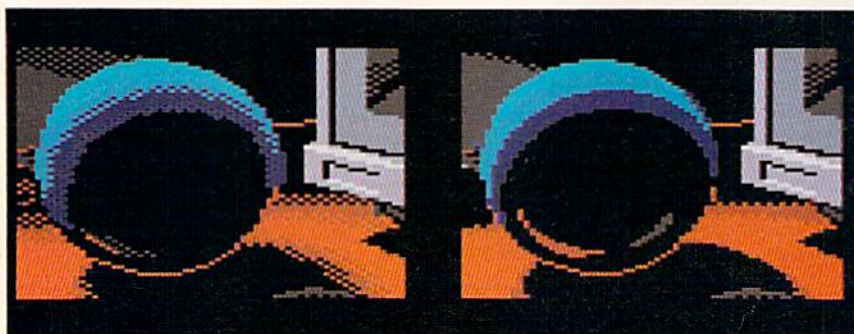


Figure 2. Example of the textured effect resulting from "dithering." The image on the left is dithered.

that show minimal texturing on the screen.

Purple seems to stand alone, but you can get surprising results by dithering purple with the gray colors. Purple and light red or light blue also yield interesting results.

Yellow, like purple, is a loner. A good light yellow can be achieved by dithering yellow with light gray or white.

BUILDING YOUR PICTURE

In traditional oil painting, the artist often works from the background of the picture to the foreground, washing in the sky, clouds, hills and trees before painting in the people, horses and buildings. This makes sense when you're laying real paint down on a real surface, with later work lying on top of earlier work. In computer art you have a two-dimensional surface, and it makes more sense to render foreground objects first and then rough in the background. After all, you're most interested in the foreground objects, so, if you're going

to have problems fitting in colors, you'd do better to make compromises in the background. Also, if you fill the background in first, you may find yourself fighting with those colors in order to do justice to your subject matter.

trast, poor composition, bad color balance or other deficiencies.

See Figure 3 for an example of a raw line and an anti-aliased version of the same line.

THE LONG VIEW

The best way to get a good look at a work in progress is to occasionally get your face out of the monitor, rise from your chair and walk several feet away. You might turn your head upside-down, too; that's a great way to discover a flaw that you've grown used to seeing. If you don't get up and away from the monitor from time to time, you may end up with a picture that suffers from lack of con-

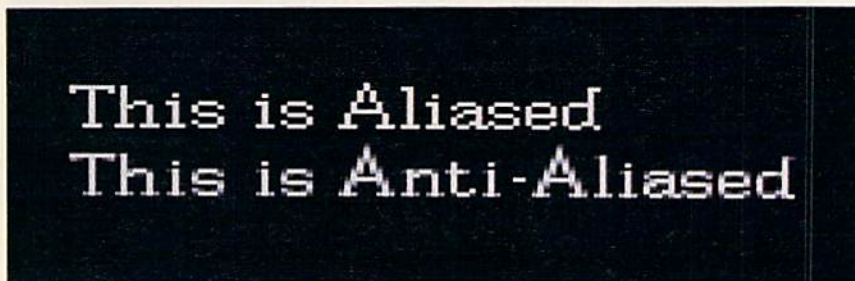


Figure 3. A raw line and the same line anti-aliased.

I concentrate on one image at a time as I build a picture, rendering it completely before moving on to the next. This is also the fastest way to work, since it minimizes moving the Zoom window around.

PATTERNS AND TEXT

The pattern and text capabilities of RUN Paint work best in Hi-Res mode. When you're filling in a background with a repeating pattern, you'll get the most satisfying results by creating a small patch of pattern in Zoom mode and then using the Copy and Paste commands under the Shape menu. For text I also work in Zoom mode, which lets me create really nice letters.

Another trick in the computer artist's bag is anti-aliasing, a Zoom-mode tech-

Canadian James Hastings-Trew is a professional graphics designer whose pictures and utility programs are well-known to users of the Graphics SIG on QuantumLink.

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Many Happy Returns

Make tax-time as painless as possible with your Commodore and one of these tax-preparation programs.

By SANDRA COOK JEROME

Doing your income taxes after the Tax Reform Act of 1986 can be a long and tedious task, but now there's help for those who are overwhelmed with the complexity of the forms and schedules. This article reviews four Commodore-compatible tax programs available today, at least one of which should be suitable for your tax situation.

Each of the programs has features that are unique. Two are for the C-64 only, while the other two come in both C-64 and C-128 versions. Refer to Table 1 for a summary of program features and Table 2 for the manufacturers' addresses.

SWIFTAX

Swiftax, from Timeworks, is an easy-to-use program that's suitable for a simple tax return. It features pull-down menus, help screens and a pop-up calculator. You enter your wages, deductions and credits in any order, easily changing from one form to the next. Then, when all your information is in, it's ready to print directly on IRS forms or blank paper.

Swiftax has four pull-down menus: File, Print, Forms and Schedules. You use the File menu to change the general configuration, get an overview of 1988 changes, update the file and quit. The Print option lets you change the printer configuration.

The Forms and Schedules menus let you input most of your tax information. The first option in the Forms section is for entering taxpayer information such as filing status, address, number of children and wages. Next, you select specific forms or schedules to work on. If information is needed from another form (for example, adjusted gross income is needed from Form 1040 to complete computations in Schedule A), the program just skips that line. This is a

nice feature, since without years of tax training, it's difficult to know which forms or schedules should be completed first. Because it calculates the tax, you can use Swiftax for tax planning or estimating, although some schedules or forms might be incomplete or missing.

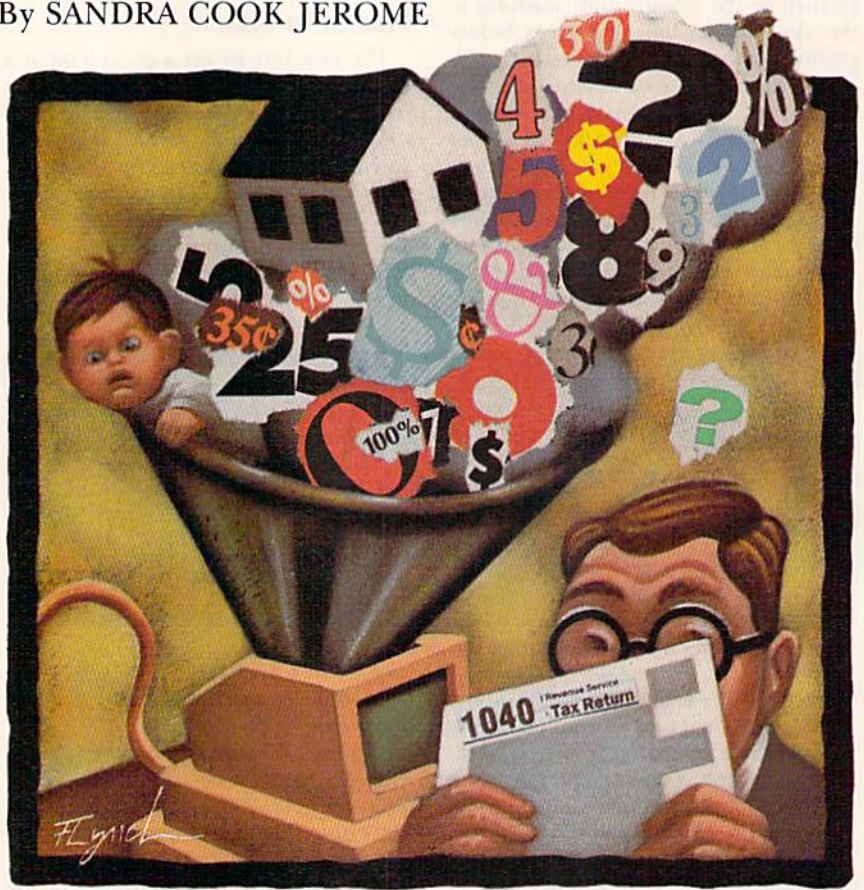
Throughout the program, pop-up help and instruction screens appear when you press the Commodore and H keys simultaneously, and the function keys let you move from page to page, from top to bottom of the form, and back and forth between fields.

A nice improvement in the latest version of Swiftax is the built-in "fast-load" utility, which enables the program to

load in 17 seconds, compared with over two minutes for the 1987 version.

The user's guide introduces the main functions of the program and contains a helpful chapter on simple steps to filing your tax return. It's not only an instruction manual, but a great tax guide as well.

Swiftax is not appropriate to the professional tax preparer, since it lacks important forms and schedules, such as Form 2119 (Sale of a Personal Residence) and Schedule E (Supplemental Income Schedule from Rents, Royalties and Partnerships). However, it is a worthwhile investment for preparing simpler tax returns or doing some tax planning. It's ▶



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I think RUNPAINT is awesome 'cause I can draw on the screen just by moving the pointer with my joystick or mouse. It's easy!

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HAPPY RETURNS



Swifttax form selection menu.

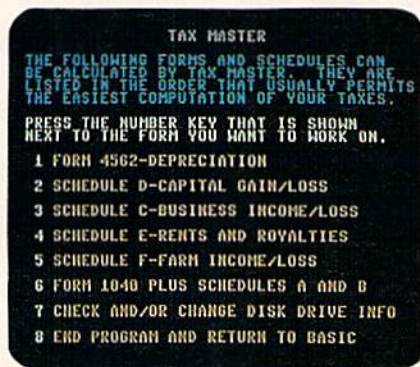
definitely easy to use and a reflection of Timeworks' commitment to quality in personal computer software.

TAX MASTER

Master Software's Tax Master is a functional, menu-driven tool that's designed to both store data from many different returns on the same disk and create multiple schedules for taxpayers with one or more businesses.

The program lists forms and schedules in an order that makes completing a return easy, starting with a depreciation form that contains information needed for the business income or loss schedule. However, the forms and schedules can also be completed in any order you desire. For example, if the only information you have at the time is your wages and mortgage interest paid, you can skip to the last selection, Form 1040 and Schedules A and B, and enter that information. The tax is instantly calculated, and the results can be viewed on the screen or printed on blank paper.

The remaining optional forms and schedules are Schedule D, Capital Gain/Loss; Schedule C, Business Income/Loss; and Schedule F, Farm Income/Loss. Each of these schedules has its own main menu with options to enter data from the keyboard, enter data



Tax Master forms and schedules.

from another disk, store the data, make corrections, print the data and display the data. Since this menu is included for each schedule and form, it's easy to complete all 1040s for your family or your clients and print them without changing disks or programs.

Unfortunately, Tax Master does not print directly on IRS forms and lacks some of the most important forms—such as 2106, 2441, and 3903—needed by the professional tax preparer. I also wouldn't recommend it for preparing your own taxes for the first time, since there's little tax help. However, for the budget-minded person with experience doing taxes or a professional preparer who just wants to double-check the major schedules, Tax Master is a bargain.

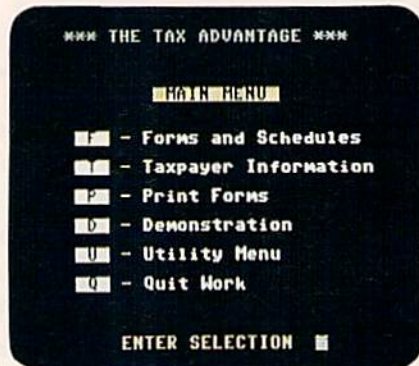
THE TAX ADVANTAGE

The Tax Advantage, from Double Eagle Software, is a complete and easy-to-use program with a main menu that contains six options: Forms and Schedules, Taxpayer Information, Print Forms, Demonstration, Utility Menu and Quit. The Demonstration option, which is highly recommended in the user's manual, is indeed surprisingly informative. Most users familiar with taxes could toss the manual away after sitting through this demonstration.

Following the demo, the program forces you into the Utility option to configure your hardware and initialize a data disk. When you're done initializing the data disk, the program takes you directly to the Taxpayer Information section to enter personal information and your filing status and exemptions.

The Forms and Schedules options include Forms 1040, 2106, 2441 and 6251, and Schedules A, B, C, D, E, F and SE. The entry screen for these forms and schedules is unique to this program. You can jump to any line on a form or schedule with the Line option, and use the function keys to move forward or reverse a screen or line. Also, you can itemize any line. For instance, rather than entering a total for Other Taxes, you can choose to itemize the line and enter the descriptions and amounts. Then the program totals the items and enters the total on the original line. If you want to add only amounts on a line, without descriptions, just enter the dollar amount and press the plus key. At any time, you can select the Help function for tax tips, such as including personal property taxes on the Other Taxes line.

The program automatically recalculates totals, and the tax can be computed anywhere on Form 1040. The new tax,



Tax Advantage 64 main menu.

the overpayment and your tax bracket are displayed at the bottom of the screen.

The Print option lets you print all the forms continuously or any form individually, and, within each form, you can print on plain paper or IRS forms. You can also print any item or line of items on a form and change the printer setup without returning to the Utility option.

The Tax Advantage offers two tax planning features. By pressing the control and X keys simultaneously, you can override the amount entered on a line with an estimate for next year, and selecting the Option function you can activate an override to quickly determine the tax consequences of a year-end tax decision.

Most features are identical between the C-128 and C-64 versions of the program, and the data disk is interchangeable between them. The user's manual is complete and includes a reference guide and printer code appendix.

The only problem I found with this program is the long loading time for each form and schedule and the need to swap between data and program disks. All in all, The Tax Advantage is ideal if you want a complete and efficient program. It may require a little more time for entering information than other programs, but its options



Tax Advantage 128 screen display.

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and features can be worth it, especially if you need forms not included in other tax packages.

TAX COMMAND PROFESSIONAL

Practical Programs offers two tax programs: Tax Command Professional and Tax Command Planner. Their tax-preparation program, Tax Command Professional, contains more forms and schedules than the other programs I've reviewed here. In fact, it's generally a more professional program, combining completeness and speed.

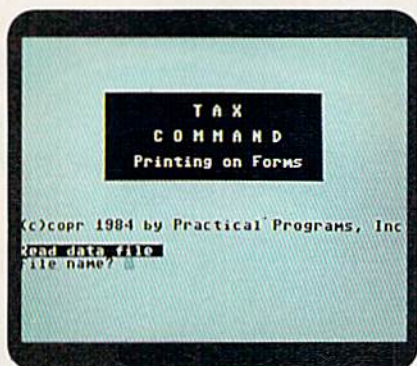
It'll probably take you a few minutes to figure out how to enter information at the opening screen. Your options are to enter your filing status, your exemptions, or other schedule and IRS line-number information. It's also possible to save to the disk, print or quit from this screen.

By pressing the cursor-down key at the opening screen, you can display each line of Form 1040. Then you can select any line, and place information directly into lines that collect information from another schedule or form or switch to the appropriate form or schedule. While you're entering information, the built-in calculator will simplify totaling items.

The program switches quickly between forms and schedules without going back to the disk drive, doesn't force you to save data and makes subtotal and tax calculations automatically.



Tax Command Professional screen display.



Tax Command Planner screen display.

The Print function works with both blank paper and IRS forms, and it will produce more than one schedule at a time.

The Tax Command Professional manual is basically a reference guide,

with very little tax help. It does provide a relatively simple example to follow, but if this is your first time doing your own taxes, I'd recommend buying a tax guide for assistance.

This program is suited to the professional preparer for completing most returns and quickly checking previously prepared returns. It can't print multiples of Schedule C or SE, or Form 2106, but makes up for that in speed.

Practical Programs' Tax Command Planner, while not a tax-preparation program, can be useful for computing various types of depreciation and comparing income and deductions at different tax rates. It can also calculate the present value of future taxes, predict taxes based on a percentage of increased income and figure your marginal tax rate. I would recommend this program if you just want to see an estimate of your refund before turning your records over to your preparer. Tax Command Planner can be used from year to year, as long as you get the updates from Practical Programs. ■

Editor's note: Another Commodore-compatible tax program we've heard about but have not yet seen is Taxaid, from Taxaid Software, 606 Second Ave., Two Harbors, MN 55616. Available in 64 and 128 versions. The price is \$49.95, with yearly updates for \$18.

Sandra Cook Jerome is a Certified Public Accountant, small-business computer consultant and book and magazine author on business computer topics.

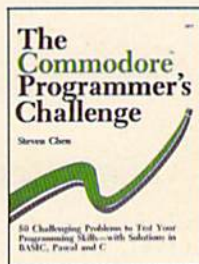
Table 1. Features of Commodore-compatible tax programs.

Feature	Swiftax	Tax Command	Tax Master	Tax Advantage
Price	\$49.95	\$49.95	\$32	\$49.95
Form 1040	x	x	x	x
Forms 1040A, 1040EZ	x			
Schedules:				
A	x	x	x	x
B	x	x	x	x
C	x	x	x	x
D	x	x	x	x
E		x	x	x
F	x		x	x
R		x		
SE	x	x		x
2106	x	x		x
2119		x		
4562			x	x
6251				x
8615	x	x		
2441	x	x		x
3903		x		
Prints on IRS forms	x	x		x
128 mode		x		x
1989 update	half-price	half-price	discount	discount

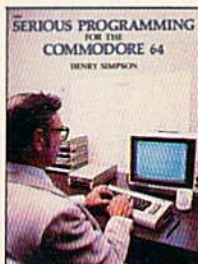
Table 2. Manufacturers' addresses.

Swiftax Timeworks, Inc. 444 Lake Cook Rd. Deerfield, IL 60015
Tax Command Professional Tax Command Planner Practical Programs, Inc. PO Box 93104 Milwaukee, WI 53203
Tax Master Master Software 6 Hillery Court Randallstown, MD 21133
The Tax Advantage Double Eagle Software, Inc. 2210 Wilshire Blvd. Suite 875 Santa Monica, CA 90403

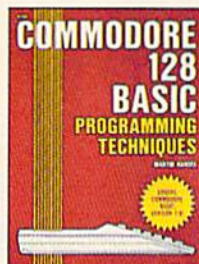
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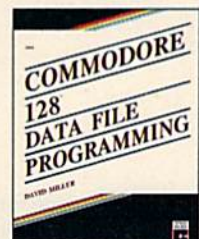
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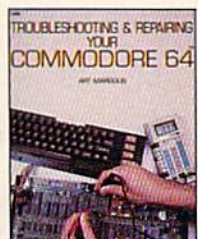
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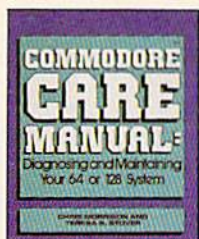
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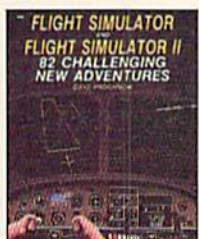
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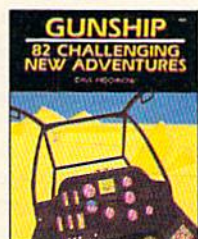
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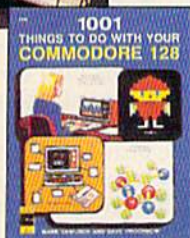
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Kalah

Are your wits sharp enough to win at this centuries-old board game?



By MICHAEL BROUSSARD

Kalah, written completely in Basic for the C-64 or 128 (in 40-Column mode), is a game of strategy based on a popular African pastime that involves moving counters, usually pebbles, among 14 pits dug in the ground. To play the game, first type in the program in Listing 1, and save it to disk before running it. The computer is your opponent.

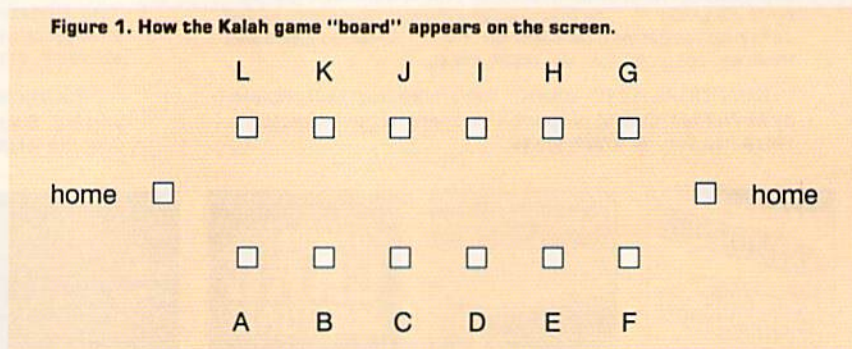
When you type RUN, Kalah clears the screen and asks you to declare the skill level you want: Beginner, Intermediate or Expert. To make your choice, type 1, 2 or 3, respectively, and press the return key. Try level 1, Beginner, for your first game. Later, I'll touch on how Kalah varies its strategy according to the skill level chosen.

Next, Kalah prompts you to enter the number of counters (called "stones") that you want in each pit to begin with. Pressing the return key chooses the default number, which is 3. (You may actually specify any number from 1 to 6, but more about this later.) After you make your choice, the screen clears again and shows the game "board," which consists of 14 squares, representing the pits of the original game. (See Figure 1.)

Each pit displays a value that indicates the number of stones it currently contains. If no value is shown, that pit is "empty." The six pits in a row at the bottom of the board—labeled A through F—are under your control. The six above—labeled G through L—are controlled by the computer. The pit at the right end of the two rows is your "home pit"; the one at the far left is the computer's. The object of the game is to accumulate more stones in your home pit than the computer does in its.

HOW TO PLAY

The computer randomly decides who



will play first. In the physical game, you would play by removing all the stones from one of your pits and redistributing them, one at a time, to adjacent pits in a counter-clockwise fashion, skipping no pits *except* the home pit of your opponent. In the computer game, the principle is the same, but the machine does the moving for you.

To choose a pit to play from when it is your turn, simply type the letter (A through F) of the one you want and press return. (Use the delete key if you change your mind or make a mistake.) When you make your selection and press return, the numbers in the squares on the screen change to reflect the new situation. The computer's play is similar, except it chooses from pits G through L and skips *your* home pit.

For example, if your move selection is A, the three stones are removed from that pit and deposited in pits B, C and D. When you've completed the move, pit A is empty and pits B, C and D each contain 4 stones. This ends your turn. If your first move is from pit E, the three stones end up in pit F, your home pit and the computer's pit G. As another example, if a play is from pit E, and it already contains ten stones, the ten would be "sown" into pits F, your home pit, pits G through L, and pits A and B.

Note, again, that you sow a stone into your home pit when you pass it, but you skip the opponent's home pit. Moreover, stones may not be played *from* a home pit. Once a stone is "home," it stays there for the rest of the game.

Two further rules underlie much of the strategy involved in the game. One is that if you make a play that ends with the last stone deposited into your home pit, you immediately get another turn. Through careful playing, you can sometimes get several turns in a row.

The other rule is that if the last stone you play ends up in an empty pit that belongs to you, any stones in the computer's pit that's directly opposite are "captured" and placed immediately in your home pit, thus swelling your score. For example, suppose your pit C is empty and pit A contains two stones. If you play from pit A, the first stone ends up in pit B and the last one in C, which was empty. You then capture any stones that may be in the computer's pit J, which is directly opposite C. You place the stones from pit J (if any) in your home pit, and your turn ends.

Play continues until one player has no more stones in any of the six pits on his side of the board. The game is then over, and any stones remaining on the opponent's side are moved to his home

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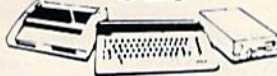


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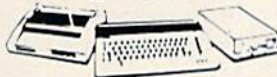
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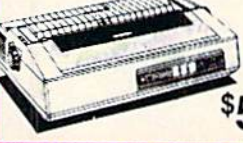
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pit and count toward his score. (For this reason, it's not always wise to "go out" too early!) Whoever then has the most stones in his home pit is the winner of the game.

FURTHER WRINKLES

As the computer ponders its next move, it displays "Thinking. . ." on the screen, so that you know it is doing something. As a play is made by either player, the values in the affected pits turn red momentarily so that you can better see the effect of the move.

The computer pauses briefly before continuing or prompting for your next move. If you prefer not to wait, you can end the pause by pressing the space bar.

Alternatively, you can adjust the length of the pause by changing the value assigned to the variable T1 on line 100 of the program. Decreasing that value shortens the pause between moves, and vice versa.

A word about the skill levels from which you choose at the beginning of the game: At the Beginner level, the computer takes any free moves it can find and then moves at random. At Intermediate level, the game also adds capture and capture-avoidance features to its strategy. And in Expert mode, the computer tries to determine which play leaves it in the best position with respect both to extra plays and to captures on its next move.

Your choice, also at the start of the game, of the number of stones per pit will somewhat determine the quality of the game. The default is 3, but you may select any number from 1 to 6. Choosing a greater number increases the length and complexity of the game.

The rules of Kalah are easy to learn, but you soon find that the more you play, the more strategy you discover. Try it and find out for yourself why this game's popularity has endured for hundreds of years. ☐

Michael Broussard is a systems engineer for Stratus Computer. He has written many articles for RUN, the first as long ago as April 1984.

Listing 1. The Kalah game program.

```

1 REM KALAH - M. BROUSSARD                {SHFT I}                :REM*57          SPACES}E(4 SPACES}F"
                                           :REM*46          230 PRINTX$"{SHFT -}{3 SPACES}{
100 T1=0 : REM DELAY BETWEEN TU          2 SHFT -s}{3 SPACES}{2 SHFT    :REM*127
    RNS                                     :REM*178          -s}{3 SPACES}{2 SHFT -s}{3
110 DEF FNB(X)=X+14*(X>14)-1*(X        SPACES}{2 SHFT -s}{3 SPACE    :REM*115
    >20)+14*(X>27)-1*(X>33)+14*        s}{2 SHFT -s}{3 SPACES}{SHF    330 X$="YOU":F=1:IF RND(0)<.5 T
    (X>40)-1*(X>46)                       :REM*92          T -)                :REM*79
120 POKE53280,3:POKE53281,1:PRI        240 PRINTX$"{SHFT J}{3 SHFT *s}  340 PRINTMID$(R$,1,19)TAB(12)X$
    NT"{CTRL 1}{SHFT CLR}{CRSR        {SHFT K}{SHFT J}{3 SHFT *s}    "{SHFT SPACE}WILL GO FIRST.
    DN}"TAB(18)"{CTRL 9}KALAH(2        {SHFT K}{SHFT J}{3 SHFT *s}    "":FORK=1TO1600:NEXTK
    CRSR DNs}"                             :REM*124          {SHFT K}{SHFT J}{3 SHFT *s}    :REM*82
130 R$="{HOME}":FORK=1TO80:C$=C        {SHFT K}{SHFT J}{3 SHFT *s}  350 PRINTMID$(R$,1,19)TAB(12)"{
    $" {CRSR RT}":R$=R$+"{CRSR        {SHFT K}{SHFT J}{3 SHFT *s}    18 SPACES}":IF F=2 THEN 44
    DN}":NEXT                               :REM*22          {SHFT K}{SHFT J}{3 SHFT *s}    0
140 DIMR(14),C(14),A(14),S(14),        250 PRINT"{2 SPACES}{SHFT U}{3    360 PRINTMID$(R$,1,19)TAB(14)"Y
    T(14):FORK=1TO14:READR(K),C          SHFT *s}{SHFT I}{26 SPACES}    OUR MOVE?{2 SPACES}{CRSR LF
    (K):NEXT                                 :REM*253          {SHFT U}{3 SHFT *s}{SHFT I}    }":X$=""                :REM*83
150 PRINT"PLEASE CHOOSE SKILL L        :REM*84          370 GETZ$:IFZ$=""THEN370
    EVEL:{CRSR DN}":PRINTTAB(5)          260 PRINT"{2 SPACES}{SHFT -}{3    :REM*220
    "1) BEGINNER"                          SPACES}{SHFT -}{26 SPACES}{    :REM*220
160 PRINTTAB(5)"2) INTERMEDIATE        SHFT -}{3 SPACES}{SHFT -}      380 IFZ$=CHR$(20) AND X$<>"" TH
    ":PRINTTAB(5)"3) EXPERT"            :REM*217          EN PRINT"{CRSR LF}{CRSR LF
                                           :REM*230          "":X$=""GOTO370                :REM*45
170 PRINT"{CRSR DN}"TAB(5):INPU        270 PRINT"{2 SPACES}{SHFT J}{3    390 IF Z$=CHR$(13) AND X$<>"" T
    T"(1, 2, OR 3){2 SPACES}2{3        SHFT *s}{SHFT K}{26 SPACES}    HEN 420                :REM*218
    CRSR LFs}":N$:LV=VAL(N$):I        {SHFT J}{3 SHFT *s}{SHFT K}    400 IF Z$>="A" AND Z$<="F" AND
    F LV<1ORLV>3THEN150 :REM*40        :REM*152          X$="" THEN X$=Z$: PRINTX$:
180 N$="" :INPUT{CRSR DN}HOW MA        280 PRINTX$"{SHFT U}{3 SHFT *s}  :GOTO 370                :REM*220
    NY STONES PER PIT(2 SPACES)        {SHFT I}{SHFT U}{3 SHFT *s}    GOTO 370                :REM*237
    3{3 CRSR LFs}":N$:N=VAL(N$)        {SHFT I}{SHFT U}{3 SHFT *s}    420 K=ASC(X$)-64:GOSUB470
                                           :REM*84          {SHFT I}{SHFT U}{3 SHFT *s}    :REM*238
190 IFN<1ORN>6THENPRINT"PLEASE        {SHFT I}{SHFT U}{3 SHFT *s}  430 ON F GOTO 360,440 :REM*229
    CHOOSE A VALUE BETWEEN 1 AN        {SHFT I}                :REM*252          440 PRINTMID$(R$,1,22)TAB(14)"{
    D 6":GOTO180                          :REM*219          290 PRINTX$"{SHFT -}{3 SPACES}{    CTRL 9)THINKING...{CTRL 0}
200 X$="{5 SPACES}":PRINT"{SHFT        2 SHFT -s}{3 SPACES}{2 SHFT    "":GOSUB790:K=P                :REM*99
    CLR}{CRSR DN}"TAB(18)"{CTR        -s}{3 SPACES}{2 SHFT -s}{3    450 PRINTMID$(R$,1,22)TAB(14)"{
    L 9)KALAH(2 CRSR DNs)":F=1          SPACES}{2 SHFT -s}{3 SPACE    12 SPACES}":                :REM*210
                                           :REM*33          s}{2 SHFT -s}{3 SPACES}{SHF    460 PRINTMID$(R$,1,19)TAB(14)"M
210 PRINTX$"{2 SPACES}L(4 SPACE        T -)                :REM*184          Y MOVE IS "CHR$(K+63):GOSUB
    s)K(4 SPACES)J(4 SPACES)I(4        {SHFT J}{3 SHFT *s}          470 X=1:GOTO430                :REM*110
    SPACES)H(4 SPACES)G"                {SHFT K}{SHFT J}{3 SHFT *s}    470 J=A(K):IFJ=0THENON F GOTO 3
                                           :REM*139          {SHFT K}{SHFT J}{3 SHFT *s}    60,1160                :REM*113
220 PRINTX$"{SHFT U}{3 SHFT *s}        {SHFT K}{SHFT J}{3 SHFT *s}    480 A(K)=0:I=K                :REM*139
    {SHFT I}{SHFT U}{3 SHFT *s}        {SHFT K}{SHFT J}{3 SHFT *s}    490 X$=STR$(A(I)):IF A(I)=0 THE
    {SHFT I}{SHFT U}{3 SHFT *s}        {SHFT K}{SHFT J}{3 SHFT *s}    N X$="{2 SPACES}" :REM*127
    {SHFT I}{SHFT U}{3 SHFT *s}        {SHFT K}{SHFT J}{3 SHFT *s}    500 PRINT"{CTRL 3}":PRINTMID$(R
    {SHFT I}{SHFT U}{3 SHFT *s}        {SHFT K}                :REM*13          $,1,R(I))MID$(C$,1,C(I))XSM
    {SHFT I}{SHFT U}{3 SHFT *s}        310 PRINTX$"{2 SPACES}A(4 SPACE    ID$(" ",1,-(A(I)<10))"{CTRL
    {SHFT I}{SHFT U}{3 SHFT *s}        s)B(4 SPACES)C(4 SPACES)D(4    7}":                :REM*182
    {SHFT I}{SHFT U}{3 SHFT *s}

```

KALAH

```

510 FORZ=1TO40:NEXTZ:IF J=0THEN      V=1THEN100      :REM*186      )+2*T(14-X)      :REM*184
550      :REM*122      870 FORJ=8TO13:X=FNB(A(J)+J):IF 1040 IF T(K)=13THENS(J)=S(J)+2*
520 I=I+1:IF(I=14ANDF=1)OR(I=7A      X>7THENIF(A(X)=0)ANDA(J)THE      T(14-K)      :REM*127
NDF=2)THENI=I+1      :REM*53      NS(J)=S(J)+10*A(14-X)      1050 X=T(14-K):IF X<>0THEN1090
530 IF I>14 THEN I=1      :REM*40      :REM*45      :REM*94
540 A(I)=A(I)+1:J=J-1:GOTO490      880 X=A(14-J):IFX<>0ORJ=13THEN9      1060 FOR L=1TO14-K-1:IF T(L)>0A
      :REM*1      20      :REM*178      NDT(L)+L=14-KTHENS(J)=S(J)
550 X=-I+14:IF F=1ANDA(I)=1ANDI      890 FORK=1TO14-J-1:IFA(K)+K=14-      -10*T(K)      :REM*185
<7THEN A(7)=A(7)+A(X):A(X)=      JTHENS(J)=S(J)+10*A(J)      1070 IF A(L)=13THENS(L)=S(L)+10
0:GOTO570      :REM*58      *A(14-L)      :REM*146
560 X=-(I-14):IF F=2 AND A(I)=1      900 IF A(K)=13THENS(J)=S(J)+10*      1080 NEXT L      :REM*87
ANDI>8 THEN A(14)=A(14)+A(      A(14-K)      :REM*149      1090 NEXT K:NEXT J      :REM*139
X):A(X)=0      :REM*88      910 NEXTK      :REM*162      1100 X=-999:FORK=8TO13:IFS(K)>=
570 IF (I=7ANDF=1)OR(I=14ANDF=2      920 NEXTJ:IF LV=2 THEN 1100      XTHENIFS(K)=XANDRND(-1)>.5
)THEN590      :REM*168      :REM*42      THEN1130      :REM*222
580 F=2+(F=2)      :REM*102      930 FORJ=8TO13:FORK=1TO14:T(K)=      1110 IF S(K)<X THEN 1130
590 GETX$:IFX$<>"ORX">T1 THEN 6      A(K):NEXTK      :REM*153      :REM*197
10      :REM*180      940 IFT(J)=0THEN990      :REM*83      1120 X=S(K):P=K      :REM*127
600 X=X+1:GOTO590      :REM*78      950 M=T(J):N=J:T(J)=0      :REM*227      1130 NEXTK:IF X=-999 THEN RETU
610 GOSUB730      :REM*178      960 N=N+1:IFN>14THENN=1      :REM*98      RN      :REM*227
620 IF A(1)+A(2)+A(3)+A(4)+A(5)      970 IFN=7THENN=8      :REM*139      1140 IFA(P)=0THENS(P)=-999:GOTO
+A(6)=0 THEN 640      :REM*33      980 T(N)=T(N)+1:M=M-1:IF M THEN      1100      :REM*117
630 IF A(8)+A(9)+A(10)+A(11)+A(      990 FORK=13TO8STEP-1      :REM*120      1150 RETURN      :REM*9
12)+A(13)<>0 THEN RETURN      1000 IFT(K)=14-KTHENS(J)=S(J)+1      1160 PRINT"LOGIC ERROR!!":END
      :REM*130      :REM*32      :REM*30
640 PRINTMID$(R$,1,21)TAB(15)"G      1010 NEXTK      :REM*15      1170 DATA 13,6,13,11,13,16,13,2
AME OVER"      :REM*10      1020 FOR K=8 TO 13      :REM*197      1,13,26,13,31,10,34,7,31,7
650 FORJ=1TO8STEP7:FORL=JTOJ+5:      1030 X=FNB(T(K)+K):IFX>7THENIF(      :REM*220
IFA(L)THENA(J+6)=A(J+6)+A(L      T(X)=0)ANDT(K)THENS(J)=S(J)
):A(L)=0:GOSUB730      :REM*149
660 NEXTL:NEXTJ      :REM*209
670 X=A(7):Y=A(14):X$=MID$("TIE
GAMEYOU WIN! I WIN! ",1+-(
(X>Y)+(X<Y)*2)*8,8)      :REM*7
680 PRINTMID$(R$,1,22)TAB(16)X$
      :REM*198
690 PRINT"{CRSR DN}WOULD YOU LI
KE TO PLAY AGAIN (Y/N)? ";
      :REM*186
700 GET X$:IF X$<>"Y" AND X$<>"
N"THEN700      :REM*237
710 PRINT X$;:IF X$="N"THENEND
      :REM*127
720 RUN      :REM*89
730 K2=K:PRINT"(CTRL 7)"
      :REM*149
740 X=A(K):PRINTMID$(R$,1,R(K))
;      :REM*108
750 X$=STR$(X):IF X=0 THEN X$="
{2 SPACES}"      :REM*129
760 PRINTMID$(C$,1,C(K))X$MID$(
" ",1,-(X<10));:K=K+1:IFK>1
4THENK=1      :REM*112
770 IF K=K2 THEN PRINT"(CTRL 1)
":RETURN      :REM*51
780 GOTO 740      :REM*90
790 FORK2=1TO14:T(K2)=A(K2):NEX
TK2:P=0      :REM*91
800 X1=0:X2=0:FORK=13TO8STEP-1:
X=FNB(A(K)+K)      :REM*48
810 IFA(K)=13OR(X>7)AND(A(X)=0)
THENIFA(14-X)>X2THENX1=K:X2
=A(14-X)      :REM*92
820 NEXTK      :REM*72
830 FORK=13TO8STEP-1:IFA(K)=-K+
14THENIF(K>X1)AND(P=0)THENP
=K      :REM*168
840 NEXT K      :REM*100
850 IF P THEN RETURN      :REM*162
860 FORJ=1TO14:S(J)=0:NEXT:IF L

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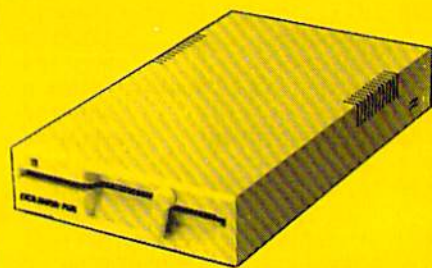
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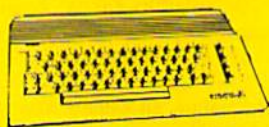
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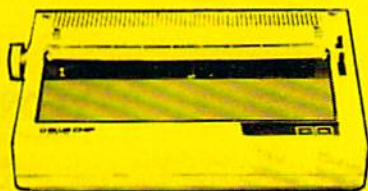
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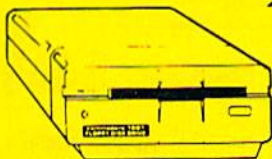


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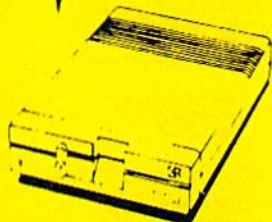


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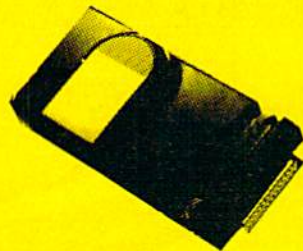
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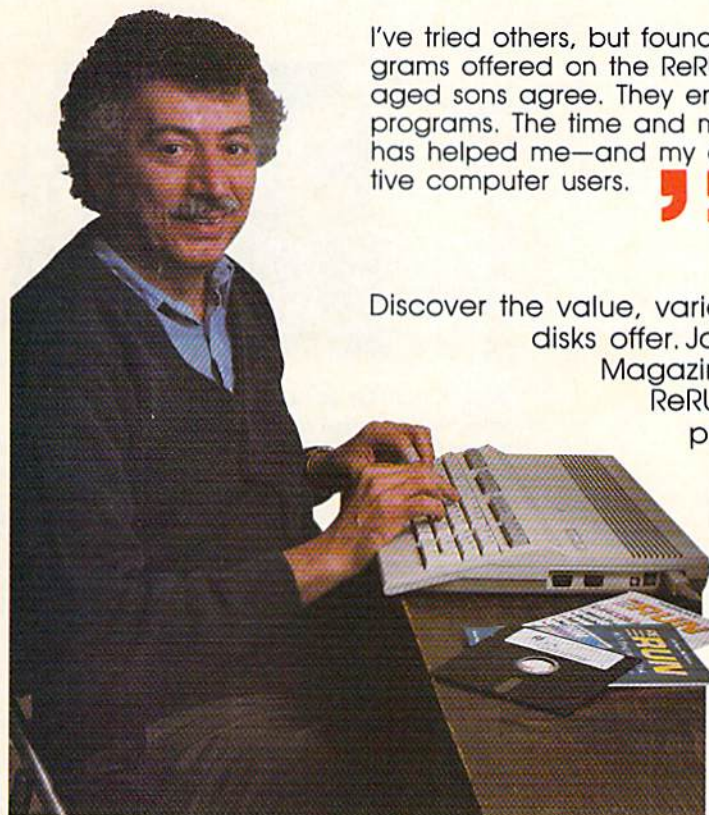
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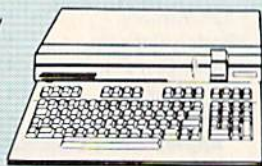
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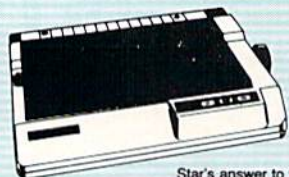


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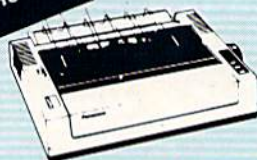
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GAMES GALLERY

Get the lead out, soldier, and take aim at the land combat adventures you'll meet in *Steel Thunder* and *Heavy Metal*.

By BOB GUERRA

SEVERAL NEW SIMULATIONS are released each year for the C-64 that let you defend the computerized skies in a modern fighter plane. Currently, computer warriors have a wide variety of aircraft to choose from, including the F-14 Tomcat, F-15 Eagle, F-18 Hornet and F-19 "Stealth" fighter. Even our silicon seas are well-defended, thanks to submarine simulations such as *Silent Service*, *Up Periscope!* and *Red Storm Rising*, as well as games like *Destroyer*, *PHM Pegasus* and *Ocean Ranger*, all of which put you in command of armed surface vessels.

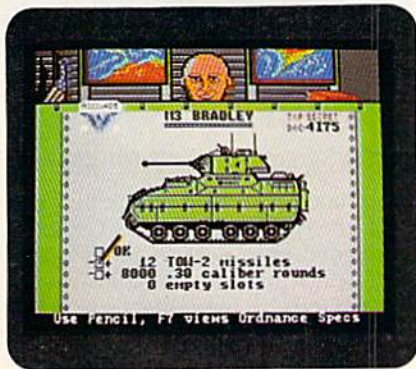
But when it comes to military land vehicles—tanks, armored personnel carriers, mobile air defense/anti-tank systems, fast attack vehicles and the like—war gamers have been left virtually unarmed.

Fortunately, software companies are beginning to fill this gap in the software arsenal. Two of the latest games to take an overland route to the front are Accolade's *Steel Thunder* and Access Software's *Heavy Metal: Modern Land Combat*.

STEEL THUNDER

If you've ever had the urge to take a spin in a modern battle tank like the M1A1 Abrams or M48A5 Patton but weren't quite prepared to spend the next few years in training in West Germany, then *Steel Thunder* is the next best thing. Besides the Abrams and Patton tanks, *Steel Thunder* can also put you in the driver's seat of the M3 Bradley or M60A3 tank. But, just because *Steel Thunder* is from Accolade, don't expect your trip to be a relaxing "test drive" up a long and winding road. Here, you have a lot more to worry about than an occasional speeding ticket from the highway patrol.

The program offers more than 20 combat missions in three areas of the world. All new recruits begin active duty in Cuba but, if you've really got what it takes to be a first-rate tank commander, you may eventually transfer to Syria or—if you're feeling brave—the most hazardous tour of duty, West Germany.

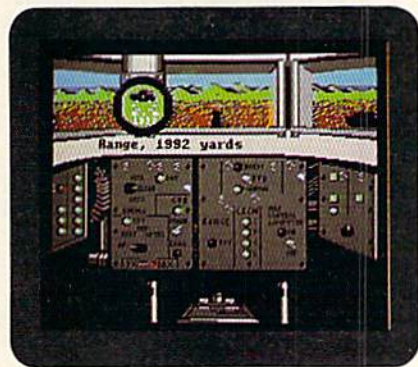


Dig the specs of the M3 Bradley tank in *Steel Thunder*.

Along the way you can advance from private to the rank of general by successfully completing a variety of dangerous combat missions, ranging from destroying an enemy mortar post in Cuba to wiping out the enemy's entire stock of nuclear, biological and chemical weapons spread out among five West German bunkers.

What gives *Steel Thunder* its realistic feel, however, isn't the types of missions—it's the appearance of the tank's interior and the three-periscope view as you roll over the hillsides.

Before designing the tanks' interiors, programmer Tom Loughry actually climbed inside an M1 and took some pictures. "I wanted to see what it really feels like to be inside the tank so that I



The graphics of the interior of the tanks in *Steel Thunder* are modeled after the real thing.

could duplicate that in the game." In addition, Loughry talked with the soldiers who use the tanks to find out about the capabilities, advantages and disadvantages of the vehicles.

In talking with Loughry, I also discovered the reason I was having such a tough time getting through one of the Syrian missions. In the mission, you are instructed by the general to go behind enemy lines and destroy an oil depot. The general suggests taking a Bradley, but Loughry had other advice: "Don't always trust the general. I mean, he does his best but you're supposed to become good enough and be able to evaluate the missions enough to pick your own tank. He suggests something that will work, but I think I'd take an M1. Your chances of survival are better."

HEAVY METAL

Back in 1983, Access Software released its first C-64 program, *Beach Head*. Designed by Bruce Carver, *Beach Head* is a multi-screen action game with realistic sound effects and dazzling graphic animation of incoming fighters and outgoing anti-aircraft shells.

In many ways, the company's latest offering, *Heavy Metal*, is similar to its original product. For *Heavy Metal*, Brent Erickson and brothers Bruce and Roger Carver teamed up to create a war game with plenty of action and some strategy elements. The action comes from three combat simulations that can be played individually or as part of the larger, tactical game.

One combat simulation lets you take the controls of an M1A1 Abrams main battle tank (MBT). Like the old arcade game *Battlezone*, the MBT sequence simply requires you to cruise around the battlefield with your 120 mm cannon blasting anything that moves. Though not equipped like the *Steel Thunder* Abrams, this tank does come with a thermal imaging system, laser range-finder, three types of shells and a smoke generator.

The second type of vehicle you can command is an air defense anti-tank

system, ADAT, for short. The ADAT can fire both missiles and 30 mm shells from its turret-based launch platform. While the joystick button is used to fire your cannon at approaching MIGs or passing T-80 tanks, missiles are aimed automatically and are launched by simultaneously pressing the firebutton on a second joystick (your big toe is great for this), by yelling "Fire!" (or some other word that isn't likely to cause the inadvertent evacuation of your apartment building) into an Access LipStik or by pressing the space bar on your 64. Surprisingly, according to both Roger Carver and Brent Erickson, the method of choice around the Access camp is the space bar.

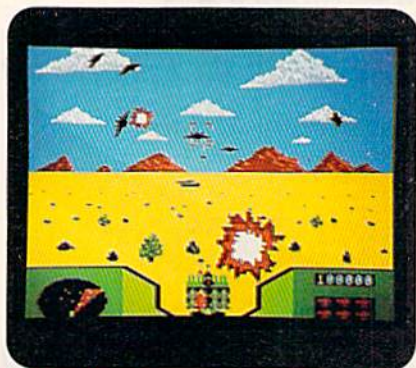
The third combat sequence, the fast attack vehicle (FAV), is like a dune buggy with a TOW missile launcher attached. Your object here is to drive through many defense levels while destroying or avoiding incoming artillery shells, enemy tanks and helicopters, and wending your way around various types of rubble strewn about the battlefield.

In the tactical game, your goal is to defend your Tactical Command Center (TACC) against enemy forces by using all three types of units mentioned above, along with a fourth unit of your choice. At the start of a game, you're shown a map of the area surrounding your TACC. The positions of the attacking enemy units, as well as your own four units, are displayed along with statistics describing your units' strength and supply state.

Although you can play the entire game from the map by instructing your units to move, engage the enemy or resupply when necessary, this approach will never result in victory. You enter each conflict outnumbered and, if left to computer control, your existing forces will perform only as well as the enemy, ultimately losing by attrition. What you must do to win is to alternate between tactical command and direct control of one of your units—preferably the one you're most successful with in battle.

Brent Erickson also suggests attacking the enemy as far away from the TACC as possible and cautions that the enemy's main objective is to reach the command center. "If you don't engage the enemy, they'll go right around you and head for your TACC." Erickson further suggests that if the enemy does take control of your headquarters, you can quickly regain control by engaging the enemy unit in combat.

The possibility of a sequel to Heavy Metal is still up in the air. According to



Ka-boom! Right on target! But watch out for approaching MIGs in Access Software's Heavy Metal.

Erickson, "we're kind of waiting to see what the response is to [Heavy Metal]; if it's good, then we'll do another one."

So which war game should you buy if a limited defense budget forces you to make a choice? I suggest Steel Thunder because it's by far the more richly detailed and realistic of the two, not only graphically but also in terms of mis-



sions, instrumentation and control. However, if you can appropriate additional funds from domestic spending, then Heavy Metal is a good second line of defense. ■

Bob Guerra, editor for a Boston hospital, has successfully fought his way through many war games.

STEEL THUNDER STRATEGY HINTS

- 1.—Learn to control sight magnification and slew rate so you can quickly see targets on the horizon and destroy them before they get close enough to destroy you.
- 2.—Once you spot enemy vehicles, slow down and, as they come into range, pick them off before they start putting holes in you. Also scan the horizon continuously with your three-power scope and learn to pick up enemy vehicles when they're still just dots.
- 3.—If all else fails, lay smoke. Then, either go slow enough or back up to stay in the smoke. While surrounded by smoke, you can see the enemy by using your thermal gun-sight, but they can't see you.
- 4.—Of the three types of external armor—tank treads, sand bags and blazer reactive—the blazer offers the best protection in all situations.
- 5.—Use a shell like the APFSDS armor-piercing round to destroy enemy tanks at long range.

6.—Try to control everything from the commander's turret, which provides the greatest viewing range.

HEAVY METAL STRATEGY HINTS

- 1.—During the ADAT sequence, the single MIGs that fly in from the side of the screen are worth more points than those that are in formation. Also, the T-80 tanks are worth twice the points of MIGs.
- 2.—The FAVs are a good supporting unit to select because they're faster than all other types of units and can head off the attacking enemy sooner.
- 3.—While at the tactical map, monitor the fuel and ammunition supplies of your units carefully. Remember, once a unit's fuel supply has been depleted, there's just no way to make it back to the TACC to get more.
- 4.—Keep an eye on the radar display during the ADAT sequence. Sometimes it's easy to forget about a fighter squadron attacking from the side if you rely solely on the view from your turret. ☐

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MAIL RUN

Readers applaud our disk-based GEOS Power Pak, berate us for publishing so many games and deplore our downgrading of the Lt. Kernal.

FANTASTIC VOYAGE

Please thank author Ellen Rule for the fantastic article in the December 1988 issue of *RUN*, "Journey to the Center of Your Commodore." I did find an error, however. The article is confusing about the location of the PLA and SID chips. The close-up photo on page 82 shows the SID chip directly east of the CPU, and the large photo on the same page clearly shows the PLA is south of the SID.

—JAMES C. HASKELL
PRESQUE ISLE, ME

You're absolutely right, Jim. Our technical editors used a motherboard from a 64C for illustration, and it's configured a bit differently from the author's C-64.

—EDITORS

DOWN WITH GAMES

Polls do not indicate that most *RUN* readers are interested in games. So why allocate so much editorial space to games? Polls do indicate a more mature reader, in age, education and income (see "RUNning Ruminations," July 1988). Do what a computer magazine was meant to do: educate, solve readers' problems and review productivity and utility software (games will always sell to kids and technical editors). So please, no more games!

—DANIEL H. TOTH
BATH, SC

I'm 62 years old, I've worked as an electronics engineer for 40-plus years, and I have absolutely no earthly use for all those C-64 games being advertised on far too many *RUN* pages.

—JOHN G. SCHMID
LOMPOC, CA

I'm sick of games! I use three C-64s to take care of my business and home needs. They do everything from word processing to scientific work. But no games! I've looked through your advertisers' ads for the past three months; no spreadsheet programs, no database programs. Just games!

I know many Commodore users who'd like to read more about business applications. I hope you recognize the fact that many of us use the Commodore in everyday life. We need you. We need product support. Not games!

—JOHN W. CORR
MARTINEZ, CA

*Anti-gamers are no doubt dismayed to see *RUN*'s new column, Games Gallery, devoted to reviews and discussion of games, but we started it in response to all the interest expressed by pro-gamers.*

C-64 users complain that we devote too much space to the 128, and vice-versa. We try to maintain a balance and print what our readers want and need, but not all readers' wants and needs are alike, so obviously we can't please everybody. Sorry about that.

—EDITORS

MEASURING UP

Michael Broussard's Measure Mate program ("For Good Measure," *RUN*, November 1988) is wonderful! I was able to consolidate a lifetime collection of weight-and-measure charts and verify most of the values.

Here are some additional conversions your readers might want to include.

2065 DATA 1,1,219.456,CABLE LENGTHS :REM*217 (120 fathoms)
2105 DATA 1,4,1.268604,CHALDRONS :REM*103 (36 bushels)
2153 DATA 1,1,20.1168,CHAINS :REM*169 (66 feet; surveyor's measure)
2156 DATA 2,3,404.685637,CH2,CHAINS2 :REM*125 (10 square chains = 1 acre)
2173 DATA 1,4,3.60556416,CORDS :REM*134 (8 cord feet)
2176 DATA 1,4,45069552,CORD FEET :REM*30 (16 cubic feet)
2235 DATA 1,4,9.85787297E-6,DESSERTSPOONS :REM*231
2245 DATA 1,4,8.21489415E-8,DROPS :REM*218 (60 drops = 1 teaspoon)
2415 DATA 1,4,2384802,HOGSHEADS :REM*116 (63 gallons)
2693 DATA 1,1,10000,MYRIAMETERS :REM*16
2696 DATA 1,1,1853.184,NAUTICAL MILES :REM* (6080 feet)
2855 DATA 1,3,1011.7141,ROODS :REM*130 (4 roods = 1 acre)
2885 DATA 1,4,99477515,STERE :REM*153
2893 DATA 1,4,1.47868095E-5,TABLESPOONS :REM*149
2896 DATA 1,4,4.92893648E-6,TEASPOONS :REM*14

Also, my source has different values for rods, so you may want to make these changes:

2840 DATA 1,1,5.0292,RODS :REM*
2850 DATA 1,3,25.292853,RODS2 :REM*119

—MARJI UMBRIGHT
HOUSTON, TX

We've devoted 4⁹/₁₆ column inches, or 27¹/₂ picas, of space to your additions and corrections. Thanks bushels, Marji.

—EDITORS

HOW DARE YOU!

I was extremely disappointed in your review of the Lt. Kernal. It lacked an overall sense of the product, and several features were mentioned only briefly or completely omitted. In my opinion, the Lt. Kernal is the best hard drive available for the Commodore computer.

I admit that no hardware is perfect, but the Lt. Kernal deserves a better grade. I've had little trouble with the drive. ▶

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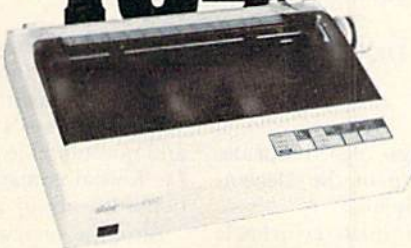
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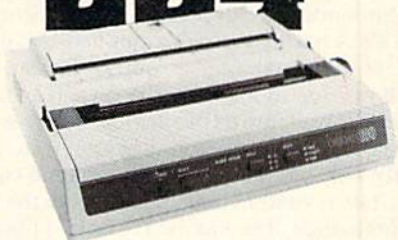
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MAIL RUN

The manual is helpful, though some commands could be explained more fully.

The reviewer mentioned he had trouble using the Basic Load "\$" command. Read the manual! To get the directory, just type in DIR.

In closing, I think the review should be repeated. And, this time, treat the Lt. Kernal fairly and accurately, or please do not review it at all.

—JAMES DEAN WALLACE
CANON, GA

I've long held the reviews in *RUN* in high regard, but the review of the Lt. Kernal hard disk drive in the December 1988 Hardware Gallery is not one of them.

The reviewer claims you must connect "insulated clip leads to a few small chips." The fact is, you connect one clip lead to one chip in the C-128 version, and one clip lead to one chip and one clip lead to one resistor in the C-64 version. This is hardly the effort implied by your reviewer.

He also lambastes as "quirksome" an operating system that allows one to load any file merely by typing 1 filename and have it load into its proper load address. Quirksome? Hardly. The Lt. Kernal operating system is so user friendly that even my wife can use it, and she's a total computer illiterate!

The reviewer could benefit from the Validate and Recover commands, if he has the 7.1 DOS. I doubt he took the trouble to look at these commands, since he seems to know nothing about them and laments the "loss" of his system index, which

these commands would rebuild for him.

Saying the Lt. Kernal's operating system is "intimidating and quirksome" only proves his total lack of familiarity with the equipment.

—FRED S. DART
SALEM, UT

I've come to rely on *RUN*'s accurate software and hardware reviews to assist me in making purchasing decisions. But this time the Lt. Kernal review fails to meet this standard.

The reviewer's article is rife with technical inaccuracies and questionable comments. For example, he states that the Lt. Kernal contains "... the circuit board from a conventional PC power supply. . .", which it does not.

Also, the reviewer was taken aback by the "... status line with a lot of unfamiliar information." The manual supplied with the drive, which he apparently skimmed over, explains the "unfamiliar information."

The comments about transferring files from floppy disk to the Lt. Kernal further support my contention that he skimmed the documentation. The DOS includes several utilities for performing such operations, all of which are discussed in the manual.

There are many other inaccuracies and questionable comments that would make my letter too long to publish, but I think you get my drift.

—WILLIAM J. BRIER
BENSENVILLE, IL

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MAIL RUN

Like all reviews, our review of the Lt. Kernal was one person's (John Premack, who has extensive experience as a Commodore user and SYSOP for the Boston Computer Society) experience and opinion about using the product. We've read other reviews of this hard drive, some of which are equally critical of the product for its lack of documentation in some areas, its expense, and its being difficult or inappropriate or unsuitable for the average Commodore home computer user. However, we are pleased to hear that you and many others enjoy using this system and have experienced no difficulties.

—EDITORS

MUCH ADD ABOUT NOTHING

I enjoyed your article on the pros and cons of Quantum-Link (Telecomputing Workshop, *RUN*, December 1988). While I agree with the article in general, I feel there are a few things you neglected to mention.

Q-Link likes to advertise itself as an inexpensive online service; they even give you a free "Plus" hour. I was disappointed to find that the basic services consist of the newspaper and an encyclopedia. That's nice, but how much of an encyclopedia can anyone read in one sitting? Other functions, such as downloading, Email or anything fun, cost extra. I was amazed at how quickly my free hour of Plus time went by, because 80 percent of that hour was spent waiting for Q-Link to get around to me again.

When I cancelled my membership, a Q-Link sales representative asked me why, and I gave her an earful. I hope Q-Link will consider my comments and improve the system.

—JOSH JACOBY
ONTARIO, CA

C-128 R.I.P.

I'm amazed! Commodore has discontinued the C-128, and I was just about ready to buy one. The 128D sells for \$500 with a disk drive, but that's too much to pay. With that money, I'd buy an Amiga 500 with a disk drive. Besides, I already have a 1571 drive, which I had planned to use with the plain C-128 I am now apparently too late to get.

—DAVID DUNSON
WICHITA, KS

Alas, the standard C-128 computer has gone the way of the C-16, Plus/4 and VIC-20—they all are no longer being produced. Perhaps discount or mail-order outlets can help, or maybe one of our readers knows of a distributor who is still selling the machines but doesn't advertise the fact. Write in and let us know.

—EDITORS

GEOKUDOS

As an editor for the GEOS section of a disk-based, monthly newsletter, I recently reviewed *RUN*'s GEOS Power Pak and gave the product a favorable rating. Although I was pleased with the majority of its utilities, I thought the terminal program fell short because it lacked an auto-dial feature. The product could be vastly improved by adding this feature.

—DAVID SWAINBANK
ST. ALBANS, VT

Thanks for the positive review, David. Be assured that the next version of geoTerm, the GEOS terminal program, will contain the auto-dial capability, among other new features.

—EDITORS ■

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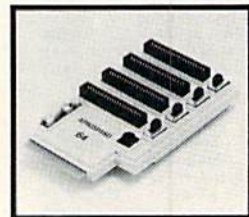
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COMMODORE CLINIC

Commonly asked questions about the 1581 disk drive, transferring text files to an Amiga and dealing with quirks in disk-file programs.

By LOU WALLACE

Q *Is there a nibbler that will copy disks from my 1541 drive to my 1581? Since very few stores sell 3 1/2-inch disks for the 1581, can I purchase them through mail order? Also, is there any software that lets you upload and download from the 1581 drive?*

—SHIBU KINATUKARA
YONKERS, NY

A The 1581 continues to be a mystery to many Commodore users, as your questions so vividly point out. First, there is no such thing as 3 1/2-inch disks made especially for the 1581. All it requires are double-sided, double-density (DSDD) disks, which are the same disks used by the Amiga, the Apple Macintosh and many other computers that use the 3 1/2-inch format. You can order them through the mail if you wish, and in most cases they'll be a little cheaper that way. But almost any computer store carries them.

You cannot use any disk nibbler to copy a 1541 format disk to a 1581 format disk. Nibblers work by reading each track and sector of the disk, then writing them back in the same location on the destination drive. This will not work when copying from a 1541 or 1571 to a 1581. The best way is to use a file copier.

Just about every terminal program I own works with the 1581. Look in the public domain libraries of your local BBS or users group for a good terminal.

Q *I'm a member of the Southeast Louisiana Commodore Users Group, and we have a problem we hope you can help us with, the answer to which might be useful to other users groups as well. Our group consists of C-64, C-128D and Amiga users. We use an Amiga to produce our newsletter, but many of the articles submitted are in standard C-64/128 format. My question is, "How can we transfer and use Commodore text files on an Amiga?"*

—RUSSELL A. DAVIS
LAROSE, LA

A First, make sure your C-64 and 128 authors use a word processor

that can save files in ASCII (SEQ) format. If possible, files should be saved in true ASCII format (RUN Script does this nicely) and not just Commodore ASCII. Once the files are in this format, they can be used by the Amiga as soon as they're transferred.

The easiest way I know to transfer is to copy all the files to a 1581 disk, then use a utility called Transfer, supplied with release 2 of the Amiga C-64 Emulator from ReadySoft (PO Box 1222, Lewiston, NY 14092; 416-731-4175). This program allows the Amiga to read 1581 disks and transfer their contents to an Amiga-formatted drive. And, of course, once on the Amiga disk, they'll be available for newsletter production.

A second method is to connect a 64 or 128 to the Amiga by a null modem cable and use a terminal program on both machines to send and receive the ASCII files. This is somewhat inconvenient, as you need to have both machines near one another. Still a third way is to use modems and the phone line to send the files.

Q *Is there an adapter that will let me use my Commodore 64 joysticks on my IBM computer?*

—RODNEY TRAUB
ROCHESTER, MN

A None that I know of. The C64/128 joystick is a simple 8-way directional switch, while those for IBM PCs and compatibles use an analog joystick that has 256 directions. These are more complex and more expensive. But I suspect the price of any adapter designed to use a 64 joystick on an IBM would cost as much, if not more, than the IBM joystick itself. You'd be better off getting one made for your PC.

Q *Help! I started to format a disk, only to discover that I had inadvertently inserted the wrong disk in the drive. I pulled it out quickly, and have been able to get most of my files off it. But every time I try loading the last four files, I get a File not Found*

error. Since they're on the directory, why can't I load them? Can they be restored?

—ANDREW VAN BAESCHOTEN
SOMEWHERE IN BELGIUM

A Frankly, you're quite lucky you managed to recover any of the files at all. My guess is that in another few seconds everything on the disk would have been gone for good. The reason you're unable to load the files is that the formatting process had reached the area of the disk where they were actually stored, but before the disk sector where the directory is written. Their names still show up when you read the directory, but the actual files are gone. It's unlikely that you'll be able to get them back, even if you're technically adept and know how to use a disk editor.

Accidentally formatting a disk can be a terrible disaster, and the only foolproof solution is to always keep a backup of important data files or programs. Remember, sooner or later everyone loses data, either by accidental erasure or formatting, hardware failure or even physical damage to the disk itself. In these situations, only a backup will save you. If the data is important, spend the few seconds it takes to duplicate the disk. It can be time well spent.

Q *I'm writing a C-128 relative file database program that uses a sprite as a cursor to move between fields. Sometimes, for no apparent reason, the program just hangs up and the disk light comes on, but control never returns to the program. At other times, when doing exactly the same thing, the program works perfectly. Are there any bugs in relative files on the C-128?*

—JEFFERY BARNES
JACKSONVILLE, FL

A I wouldn't call them bugs, but there definitely are some odd quirks in the file-access system on both the 64 and 128. For example, when programming relative files, it's a good practice (and recommended in the 1571 disk drive manual) to position the relative file pointer not once, but twice

before writing to the record. This ensures that it's always where you think it should be.

Another quirk concerns sprites and disk access. It's a good idea to turn off sprites when accessing the disk drive from within a program, then turn them back on when you've finished reading or writing a file. Sometimes, if one or more sprites are on, you'll get the effect you described. It also makes a difference where the sprite is on the screen. Some screen positions are more prone to this effect than others.

Q I'm writing a C-128 Basic 7.0 program that plots high-resolution graphs of mathematical equations. I'm using the DEF FN command extensively in the program to allow me to create complex equations and use them almost like new commands. I can even combine functions to create more complex functions in much the same way that some of the more advanced Basics on the



newer computers let you create new commands from subroutines. Everything works fine, but as soon as I try to plot the results, my new functions quit working and seem to disappear, giving me an Undefined Function error message! Is there something wrong with the function command?

—TOM KERTILE
SAN FRANCISCO, CA

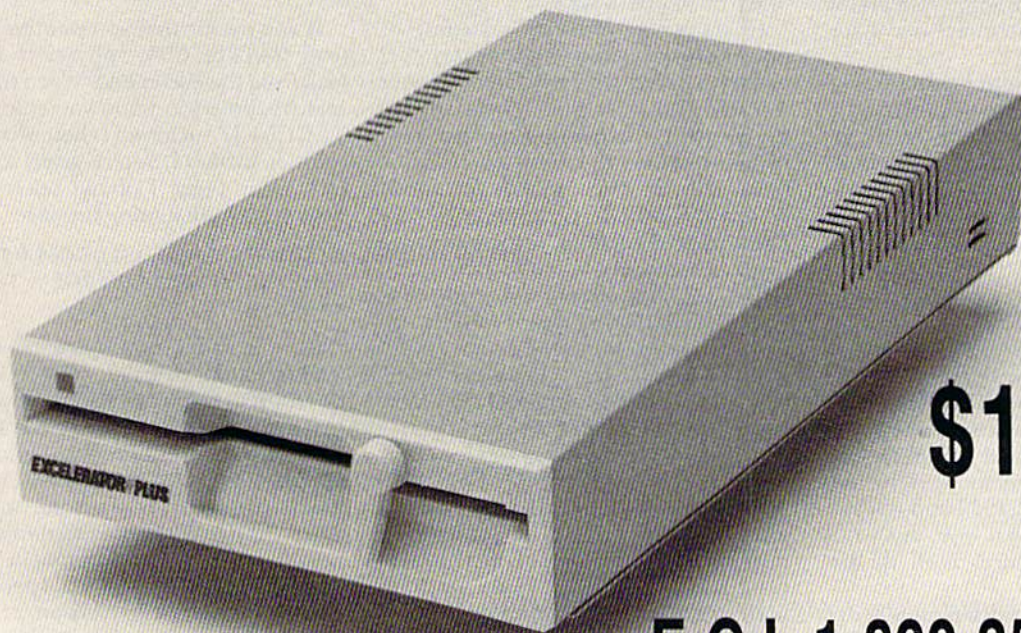
A No, there aren't any real bugs, but there is a small requirement to using the DEF FN with bitmap graphics. Unless I'm greatly mistaken, you're defining the functions early in the pro-

gram, before you allocate the graphics screen. If so, this is your problem. The DEF FN command uses some of the memory where graphics screens are defined. If you allocate a graphics screen before defining the functions, the function definitions will be stored elsewhere in memory and be safe. Otherwise, by defining them first, the definitions will be erased when the graphics screen is created, and you'll get the error message when you try to call them. The best solution is to issue a Graphics command at the beginning of the program, before the DEF FN command is used. ■

Do you have a problem or question about your Commodore computer system, software or programming? Just send your questions to: Commodore Clinic, RUN Magazine, 80 Elm St., Peterborough, NH 03458. Queries are answered only through this column, and, due to the volume of mail, only questions likely to appeal to the majority of our readers can be published.

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TELECOMPUTING WORKSHOP

There's a world of information and entertainment awaiting you on local BBSs, including RUN's RUNning Board.

By LOUIS WALLACE

CONTINUING WITH THE TOPIC of telecommunications systems, this month I'll turn the focus to local bulletin board systems (BBSs). In particular, I'll discuss *RUN's* own BBS, the *RUNning Board*, where I am the *SYSOP*.

For the benefit of those who have never previously gone online, what follows is a brief explanation and description of a BBS's features. The traditional bulletin board, such as those you hang in your kitchen or den, is used to leave messages for others. A computer bulletin board is used for the same reason, but in most cases, the available features go beyond merely leaving messages. For example, a BBS can hold lengthy documents like tutorials or articles.

More advanced options include electronic mail (Email) that can be addressed to an individual or to the public. Most modern BBS software packages also let the user send private mail. As the name implies, private mail can only be read by the sender and the person it is addressed to. (On some systems the *SYSOP* can, if absolutely necessary, read private mail.)

One of the most popular features of a BBS is the ability to upload programs to and download programs from the BBS's private library. Depending on the storage capacity of the BBS, a library can hold anywhere from a few dozen to literally thousands of public domain programs.

THE RUNNING BOARD

RUN's *RUNning Board* contains all of the aforementioned features, and more. To access our BBS, you need either a C-64 or C-128 equipped with a modem and terminal program. You can use just about any modem, including 300-, 1200- or 2400-baud speeds. The BBS detects what you use when you call and configures itself to that speed.

The number for the *RUNning Board* is 1-603-924-9704. It is available 24 hours a day for anyone to call and sign on as a member. The first time you log on to *RUN's* BBS, you're asked a few general questions and given a pass-

word; you then have access to the system and its resources. Once online, you're presented with a menu of options for each section of the BBS. This makes the *RUNning Board* extremely easy to use even for first-timers. After you develop some expertise with the system, you can work on two more advanced levels that don't require on-screen menus.

TERMINAL SOFTWARE

While almost any general-purpose terminal program can be used to access a BBS, some contain more features than others. The two packages I use most often with the *RUNning Board* are *RUN Term*—available on the *RUN Works* disk—and *geoTerm*, one version of which is available on *RUN's* *GEOS Power Pak I*. Another will soon appear on *Power Pak II*. There are good commercial terminal programs available, and you can find many public domain packages in your local users group library or online a BBS.

If you're interested in uploading or downloading software, your terminal program must support one or more transfer protocols. These protocols are specialized techniques used in transferring programs and data over phone lines. The two most popular protocols in the Commodore community are *Punter* and *Xmodem*. Others that are gaining support are *Ymodem* (also called *1K Xmodem*) and *Xmodem-CRC*. The *RUNning Board* supports all of these protocols except *Punter*, and it has an *ASCII Text Transfer* mode, which can be used for sending or receiving pure text files.

DOWNLOADING AND UPLOADING

As a *SYSOP*, I find that one of the most commonly asked questions from new users is: "How do I download a program?" Depending on the software used, the specifics for downloading can vary slightly from one BBS to another. For the most part, however, the technique the *RUNning Board* uses is comparable to other BBSs, so I'll use it as an example.

First, determine what program you want to download. On our system, the software library is broken down into subject categories. A partial listing of the categories we've created so far includes *Fun and Games*, *Productivity*, *GEOS*, *Basic 8*, *The Best of Public Domain*, *C-128 Only*, *Graphics*, *Sound and Music and Magic*.

The total number of programs available is in the hundreds. If you select the *List* option from the *Files* menu and tell the BBS what category you want, it gives the names, sizes, times required to download and brief descriptions of the files in that category. Here's a short example from *Fun and Games*:

```
Listing : [A] — Fun and Games
CASTLE.C64  20,352  10/24/88
  C64 graphic adventure
  DwnLds: 14  Trans Time 00:03:39
CREEPS.SDA  15,872  10/26/88
  C64 arcade game in a self-
  dissolving ARC
  DwnLds: 15  Trans Time 00:02:51
```

If you decide that you want to download *CASTLE.C64*, you select *Download* from the *Files* menu. When the BBS asks what file you want, you enter *CASTLE.C64*. If you haven't chosen a default transfer protocol, you're given some to pick from. Since I always select *Xmodem*, I get the following message:

```
READY TO SEND CASTLE.C64 USING
XMODEM. PRESS CONTROL-X TO
ABORT.
```

Now, in order to complete the downloading link, instruct your terminal program to begin receiving a download using the same protocol as the BBS. I suggest you determine that before you log on to the BBS, because how you do this depends entirely on the software you're using. With some terminals, this step merely means selecting a *Menu* option; with others, it's a specialized keypress (the C-128 version of *RUN Term* uses *ALT/D* and the C-64 version uses *Commodore/D*). *GeoTerm* has you select a menu option with a mouse.

Once you tell the terminal package to receive a file, it handles everything

and simply lets you know how many blocks have been sent. When the file finishes downloading, you're returned to the normal BBS menus.

Uploading a file to a BBS is accomplished in much the same manner, except that you must tell the system what directory to store it in and tell your software to send, instead of receive, a file. Some systems have options for password-protecting uploads so only those who know the password can download the file. And, on many BBSs, including the RUNning Board, you get bonus on-line time for uploading public domain programs to share with others.

EMAIL

Electronic mail is an important part of any BBS, and the RUNning Board supports it. Users can send and receive messages and letters up to 150 lines in length. While letters can be made public, most personal mail is marked private and is only available to the person it's intended for. Once a message has been sent, it waits until the recipient logs on, then tells him or her that mail is waiting.

One of the nice things about Email is that you can generate dialogues on a lot of different topics. The RUNning Board offers you the option of making multiple replies to a specific message. You can also view replies and follow the trail of a subject that might have built up over a number of weeks.

Another Email feature notifies you when other online folks have received



the mail you sent them. This is useful when a long period of time has passed after you originally posted messages. Scanning of messages is also supported, including an option to report only those that were posted since the last time you logged on.

A good way to look for topics is with a Text Search. If you were only interested in messages on games, for example, you can get a list of those messages that have the word "games" in them. Because messages can be categorized in much the same way as programs, you can customize your account to report only on those topics you're interested in.

JOIN US!

One of the problems we've had with our BBS concerns the system's capacity. Earlier BBS systems we used were somewhat limited in the number of messages, programs and users they allowed. While systems like these are fine for local BBSs, we needed one with a very large capacity. We settled on Wildcat!, which runs on an IBM-PC dedicated entirely to the BBS. Besides allowing for a 300-, 1200- or 2400-baud

modem, we added a 60-megabyte hard disk drive to give us enormous program and Email storage. It also supports over 32,000 users, so we expect it to last us for a year or two.

We welcome and encourage all RUN readers to log on to the RUNning Board. The only cost to you is the phone call, and, besides all its other features, the RUNning Board is a great way to ask questions of and get answers from the RUN staff.

RUNNING ON Q-LINK

I want to take this opportunity to let you know about another aspect of RUN's commitment to Commodore telecommunications: the RUN area on QuantumLink. In cooperation with Quantum Computer Services, we've set up our own private area in the News and Information section of the Commodore Information Network.

Just as on the RUNning Board, we have our own RUN Software Libraries, a message section for Letters to the Editor, monthly online articles and a lot more. Staffed entirely by RUN editors, it's the perfect place to find programs and information from RUN. If you're a Q-Linker, we invite you to stop by and visit with us. ■

Louis Wallace, RUN's technical manager, fills in this month for Telecomputing Workshop's regular columnist, Loren Lovhaug. You can send Lou electronic mail on Q-Link (LRW or LouWallace) or on GENie (LRWallace).



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R U N P A I N T

From p. 31.

```

111 DATA 2229293A20F920312CC7 2      09E20D1282230433030 2229008      1008B1D5A009E      :REM*147
      8313333293A20F92033 2CC7283      01D50008B2041      :REM*147      114 DATA 2034333532000000A0
      13334293A20F9          :REM*165      113 DATA B23120A72041B2323A20 9      :REM*125
112 DATA 20352CC728313335293A 2      322303A4F422E525022 2C382C3      115 DATA -1          :REM*226
    
```

Listing 2. Create RUN Paint Object boot.

```

0 REM CREATE RUNPAINT OBJECT BO      SC(L$)-55          :REM*136          SC(H$)-55          :REM*56
  OT          :REM*63      45 BY=H*16+L:PRINT#8,CHR$(BY);      85 L=VAL(L$):IF L$>"9" THEN L=A
5 OPEN 8,8,8,"OB.BOOT RP,P,W"      :REM*67          SC(L$)-55          :REM*84
          :REM*19      50 NEXT:GOTO 10      :REM*115          90 BY=H*16+L:PRINT#8,CHR$(BY);
10 READ A$:IF A$="-1" THEN CLOS      55 IF LEN(A$)<21 THEN B$=A$:GOT      :REM*148
  E8:END          :REM*78          O 70          :REM*184          95 NEXT:GOTO 10      :REM*160
15 IF LEN(A$)<62 THEN 55          :REM*254          60 IF LEN(A$)<42 THEN B$=LEFT$(      100 REM HEX DATA FOR OB.BOOT RP
          :REM*242          A$,20)+RIGHT$(A$, (LEN(A$)-21      :REM*242
20 B$=MID$(A$,1,20)+MID$(A$,22,      ):GOTO 70          :REM*137          101 DATA 000CA9008D00FFA900A2 0
      20)+MID$(A$,43,20)          :REM*242          65 B$=LEFT$(A$,20)+MID$(A$,22,2      02068FFA208A9000A000 20BAFFA
25 FOR I=1 TO 30          :REM*181          0)+RIGHT$(A$,LEN(A$)-42)          :REM*165
30 C$=MID$(B$, (I*2)-1,2):H$=LEF      70 FOR I=1 TO LEN(B$)/2:REM*221      102 DATA BDFFA200A011A90020D5 F
  T$(C$,1):L$=RIGHT$(C$,1)          :REM*209          75 C$=MID$(B$, (I*2)-1,2):H$=LEF      0          :REM*155
          :REM*85          T$(C$,1):L$=RIGHT$(C$,1)          103 DATA -1          :REM*214
35 H=VAL(H$):IF H$>"9" THEN H=A      :REM*140
  SC(H$)-55          :REM*85          80 H=VAL(H$):IF H$>"9" THEN H=A
40 L=VAL(L$):IF L$>"9" THEN L=A
    
```

Listing 3. Create RUN Paint Sys. Stuff file.

```

0 REM CREATE RUNPAINT SYS.STUFF      0FF0000FF0000FF0000 FF0000F      FF000000000000 :REM*151
  .H FILE          :REM*125      F000000000000000 :REM*35      116 DATA 00000000000000000000 0
5 OPEN 8,8,8,"SYS.STUFF.H,P,W"      102 DATA 00000000000000000000 0      00000000000000000000 0000000
          :REM*120      00000000000000000000 00000000      :REM*52
10 READ A$:IF A$="-1" THEN CLOS      0000000000000000 :REM*42      117 DATA 00000000000000000000 0
  E8:END          :REM*78      103 DATA 00000000001000008000 0      00000000000000000000 0000000
15 IF LEN(A$)<62 THEN 55          :REM*254      0010000080000400000 0200000      00000FF0000FF :REM*107
          :REM*242      00000200000004          :REM*90      118 DATA 0000FF0000FF0000FF00 0
20 B$=MID$(A$,1,20)+MID$(A$,22,      104 DATA 00000000000000000000 0      0FF0000FF0000FF000 0000000
      20)+MID$(A$,43,20)          :REM*242      00000000000000000000 0000000      :REM*252
25 FOR I=1 TO 30          :REM*181      105 DATA 000000000000000010 0      00000000000000000000 0000000
30 C$=MID$(B$, (I*2)-1,2):H$=LEF      0100000000020020000 0002008      00000000000FF :REM*173
  T$(C$,1):L$=RIGHT$(C$,1)          :REM*209      00000000000108          :REM*107      120 DATA FF00FFFF00FFFF00FFFF 0
          :REM*85      106 DATA 0000000080004000000 1      0FFFF00FFFF00FFFF00 FFFF00F
40 L=VAL(L$):IF L$>"9" THEN L=A      0000000400000000800 0100000      :REM*108
  SC(L$)-55          :REM*136      00004200000000          :REM*97      121 DATA FF00FFFF00FFFF00FFFF 0
          :REM*67      107 DATA 04000400000000400080 0      0FFFF00FFFF00FFFF00 0000000
45 BY=H*16+L:PRINT#8,CHR$(BY);      :REM*229      00000000000000000000 6000000      :REM*160
          :REM*115      108 DATA 00000000000000000000 0      00000000000000004000002000 0
50 NEXT:GOTO 10          :REM*184      00000000000000000000 0000000      :REM*106
55 IF LEN(A$)<21 THEN B$=A$:GOT      :REM*44      123 DATA 00000000000000000000 0
  O 70          :REM*137      109 DATA 00000000000000000000 0      00000000000000000000 0000000
60 IF LEN(A$)<42 THEN B$=LEFT$(      FE000FFE0000FF          :REM*26      0000000000000      :REM*61
  A$,20)+RIGHT$(A$, (LEN(A$)-21      110 DATA E0007FC0003F8000E00 0      124 DATA 00000000000100000200 0
  ):GOTO 70          :REM*112      00000000000000000000 0000000      0040000080000100000 2000004
65 B$=LEFT$(A$,20)+MID$(A$,22,2      :REM*140      00000000000000000000 0000000      00000800000000          :REM*177
      0)+RIGHT$(A$,LEN(A$)-42)          :REM*221      111 DATA 00000000000000000000 0      125 DATA 00000000000000000000 0
          :REM*142      00000000000000000000 0000000      00000000000000000000 0000000
70 FOR I=1 TO LEN(B$)/2:REM*221      7FFE00FFFF01F          :REM*142      00000000000000000000 0000000
75 C$=MID$(B$, (I*2)-1,2):H$=LEF      112 DATA FFF83FFFC3FFFC7FFF F      E7FFF0000000000000 FFFF007
  T$(C$,1):L$=RIGHT$(C$,1)          :REM*177      FFFFE7FFFE3F          :REM*177      127 DATA E8E8F1F1E2E24444E2E A
          :REM*56      113 DATA FFFC3FFFC1FFF80FFF F      AAFFFF5555FFFAAAA FFFF555
80 H=VAL(H$):IF H$>"9" THEN H=A      007FFE001FF80003C00 F000000      5FFFFAAAF0000          :REM*132
  SC(H$)-55          :REM*84      0000000000000000          :REM*175      128 DATA 5555FFFAAAFF0000555 F
          :REM*148      114 DATA 00000000000000000000 0      FFFFFFFCC00000000000 FFFCCC
95 NEXT:GOTO 10          :REM*54      00000000000000000000 0000000      CFFFF3333FFF          :REM*59
100 REM HEX DATA FOR SYS.STUFF.      115 DATA 00000000000000000000 0      129 DATA CCCCFFFF3333FFFCCC F
  H FILE          :REM*225      00000000000000000000 0000000      FFF3333888811112222 4444888
101 DATA 17F7FF0000FF0000FF00 0
    
```

RUN PAINT

```

8111122224444      :REM*60      033330C0C3333      :REM*10      81C10222041C0      :REM*135
130 DATA 88881111222244448888 1 142 DATA C0C033330C0C3333C7C7 8 154 DATA CCCCCCCCCCCCCCCCCC C
11122224444B4B4B4B D2D2D2D2 3830101010101013939 7D7DFFF CCCCCCCCCCCCCCCCCC CCCCCC
D24D2DB2D4AB4      :REM*176      F7C7C38381010      :REM*233      CCCCCCCCCCCCCC      :REM*44
131 DATA B54B2D2DD2D2B4B44B4B 143 DATA 1010101093937D7FFF0 155 DATA CCCC8F8F8F8F7777F8F8 F
B4BB4B42D2DD2D2A185 43C2A66 1011111010101013939 5555939 8F8F8F877778F8F8F8F 8F8F777
51C381818381C      :REM*101      3101010101111      :REM*138      7F8F8F8F8F8F8      :REM*80
132 DATA 65A6C243C423624635AC 1 144 DATA 10103838444483831111 0 156 DATA 77778F8F000010101010 5
8181C38A66543C2A185 2C345A5 101FFFF8888FFFF8888 FFFF888 454BABA101010100000 0000010
AB18D6186C183      :REM*164      8FFF8888FFFF      :REM*234      0010005400BA0      :REM*96
133 DATA 418221841FF81FF82184 4 145 DATA 8888FFFF8888FFFF8888 F 157 DATA 010001000000000002020 A
182C1836186B18D5A5A 2C34494 9949422224141      :REM*207      1E2E244442E2E      :REM*159      8A87070202020202020 0000000
9949422224141      :REM*207      2E244442E2EB1B13030 03031B1 0010145458383      :REM*158
134 DATA 8888414122229494949 2 146 DATA 1F1F8E8E4444E8E8F1F1 E 158 DATA 01010101010100001111 8
2221414888814142222 4949949 8FFF8888FFFF      :REM*14      BD8D8C0C0C0C      :REM*14      2111188884444      :REM*181
4404040404040      :REM*171      147 DATA 8D8DB1B130303031B1B D 159 DATA 22221111888844442222 3
404040404040A1111 A0A0404 8D8C0C0C0C8D8DFFFF 8080808 8080808 333FFF3033FFF33333 F3FF330
040403939444      :REM*228      080808080808      :REM*103      0F3FF3333FFF3      :REM*45
136 DATA 82820101010101018282 4 148 DATA 08080808FFF808080808 8 160 DATA 0033FFF33333F3FF330 F
4443939444482820101 0101010 AAAAAAAA      :REM*149      3FFFAAF0AA8FAAF0AA8 FFFFA80
18282444FEFE      :REM*51      AAAAAAAA          :REM*149      AAF0AA811118A84444 8A8A111
C2C2CEFEF0000      :REM*226      DATA AAAAAAAAAAAAAAAAAA A 161 DATA A80AAFFAA80AFFFF0AA8 F
EFEF0000FEFEFEF2C2C 2C2C2C2 AAAAAAAAAAAAAAAAAA AAAAAAAA 1232345458989      :REM*225
C2C2CEFEF0000      :REM*226      A5555AAAA5555      :REM*230      AAFFAA80AAFFA      :REM*123
138 DATA 00000000000000000000 0 150 DATA AAAA5555AAAA5555AAAA 5 162 DATA 1111A2A244442A2A1111 9
00000000000000000000 00000000 555AAAA5555AAAA5555 AAAA555 89854543232FFE30222 0222022
0000000000000      :REM*14      5FFF0000FFFF      :REM*66      2FE3F22202220      :REM*136
139 DATA 0000FFFFFFFFFFFFFFFF F 151 DATA 0000FFFFFFFF0000FFFF0000 F 163 DATA 2220E3FF22022202202 3
FFFFFFFFFFFFFFFF FFFFFFFF F0000CCCC3333      :REM*217      FFE2022202220221111 FFFF404
FFFFFFFFFFFFFFFF      :REM*162      F0000CCCC3333      :REM*217      04040FFFF0404      :REM*72
140 DATA FFFFFFFFF303FC003F00 0 152 DATA CCCC3333CCCC3333CCCC 3 164 DATA 0404FFFF40404040FFFF 0
FC00303030F003F00FC 3030FC0 333CCCC3333CCCC3333 CCCC333 4040404FFFF1111111 00FF00F
03F000FC00303      :REM*112      3CCCC33338080      :REM*13      F00FF00FF00FF      :REM*213
141 DATA C00F003000F00C0C3333 0 153 DATA 01010202040408081C10 2 165 DATA 00FF006000080      :REM*77
C0C3333C0C0C33330C0C 3333C0C 22041C0808001010202 0404080 166 DATA -1      :REM*20

```

Listing 4. File Creator program.

```

0 REM OB.RP FILE CREATOR      :REM*140      E24AD880C85201005F0 0920444
:REM*231      520CF244CF911      :REM*225
5 OPEN 8,8,8,"OB.RP,P,W" :REM*0 80 H=VAL(H$):IF H$>"9" THEN H=A 109 DATA 2C960C100320EB3B20D2 2
10 READ A$:IF A$="-1" THEN CLOS SC(H$)-55      :REM*56      420411220BD13A2008E 9D0C8E8
EB:END      :REM*78      85 L=VAL(L$):IF L$>"9" THEN L=A 100 DATA 0011A200A083ADFCFFC9 E 108 DATA 10C8E870C865A      :REM*206
15 IF LEN(A$)<62 THEN 55 90 BY=H*16+L:PRINT#8,CHR$(BY); 110 DATA 8E9F0CE88667ADD5148D 2
:REM*254      95 NEXT:GOTO 10      :REM*148      0DDA2BAA0224C4B1B24 2C10096
20 B$=MID$(A$,1,20)+MID$(A$,22, 100 REM OB.RP HEX DATA :REM*107 88D00FF68A868      :REM*17
20)+MID$(A$,43,20) :REM*242 100 DATA 0011A200A083ADFCFFC9 E 111 DATA AA6840A917A0F7A23FD0 1
25 FOR I=1 TO 30      :REM*181 101 DATA 0011A200A083ADFCFFC9 E 2F004A280A087862C8C 7621A90 6A9808523A971A024A2 18D00AA
30 CS=MID$(B$, (I*2)-1,2):H$=LEF 020B714A92B8D      :REM*130 9008523A959A0      :REM*249
TS$(C$,1):L$=RIGHT$(C$,1) 102 DATA 11D0A908206014A90920 6 112 DATA 24A20C8D5F128C60128E 6
:REM*209 01420411220BF18000C 5801002 31220BF18805B800000 20CC175
35 H=VAL(H$):IF H$>"9" THEN H=A 0CC1784120B00      :REM*135 924C05B0C0020      :REM*47
SC(H$)-55      :REM*85 103 DATA 1F0078AD14038D9515AD 1 113 DATA CC176524805B0C0020BF 1
L=VAL(L$):IF L$>"9" THEN L=A 5038D9615A92A8D1403 A9158D1 8F85F04006EEEF85FA9 080DFE5
40 SC(L$)-55      :REM*136 503A91F8D1803      :REM*181 FA9608DF5F60      :REM*141
45 BY=H*16+L:PRINT#8,CHR$(BY); 104 DATA A9128D190358A9018D2C 8 114 DATA B70095000000000008000 0
:REM*67 0208037AD2C808D21D0 2032142 0000000180057012DFE 0000020
50 NEXT:GOTO 10      :REM*115 07413203D3F2C      :REM*159 000004001C800      :REM*114
55 IF LEN(A$)<21 THEN B$=A$:GOT O 70      :REM*184 105 DATA 870C1005AD880C8520A9 0 115 DATA 400F0F0A0A0E0E0D0DB7 9
60 IF LEN(A$)<42 THEN B$=LEFT$( A$,20)+RIGHT$(A$, (LEN(A$)-21 08D870C8D960C8D9F0C 8D810C2 5000000000000000 0000000
)):GOTO 70      :REM*176 0CF2420E1F18AD      :REM*12 000003BFFAAAA      :REM*130
65 B$=LEFT$(A$,20)+MID$(A$,22,2 106 DATA D5148D20D020BD134CF9 F 116 DATA 01C80078AAAA00000020 C
0)+RIGHT$(A$, LEN(A$)-42) 1200114C985D00320B0 15C986D 9FE2CA92DC50D      :REM*195
:REM*140 00320B615D0ED      :REM*70 117 DATA D0187820EC129004A900 8
70 FOR I=1 TO LEN(B$)/2:REM*221 107 DATA 2C810C100DAD000C3008 2 5145860A9202414F006 2413300
75 CS=MID$(B$, (I*2)-1,2):H$=LEF 0671CA9008D810C2032 1420741 23860186078A9      :REM*152
TS$(C$,1):L$=RIGHT$(C$,1) 3203D3F2C810C      :REM*40 118 DATA 202414F0F7241330F110 F
108 DATA 3016A9702C870C100A20 B 120BF1800093F000020 CC17592

```


R U N P A I N T

Table with columns for line numbers (e.g., 119, 120, 121), data strings (e.g., DATA 8DF807A993204514A999 2), and REM comments (e.g., :REM*74). The table contains approximately 180 rows of data.

RUN PAINT

188	260A658A459A9 :REM*152 DATA 08567F0168631A65AA5 5 89DAB0CA5599DAC0CE8 E8865A8 667A631865884 :REM*204	211	D80241E571D00 :REM*197 DATA B23B6D1D80011E771D80 F 31D831D80FA1D080068 24E3F74 608007024E4E7 :REM*168	234	40C8512090708 :REM*249 DATA 94140F90020F14140F8D 1 3031205050E00159013 0312050 50E0040F178E :REM*93
189	DATA 59A9008523A65ABDA312 A C2C80D0020910853620 981AA92 02465500BD006 :REM*141	212	DATA 460800600986921D00C3 4 7991D00C047A01D00AA 47A71D0 0AD47AE1D00B0 :REM*45	235	DATA 130F0C0984060C011388 1 2050314010E970C8513 050C050 314001012090E :REM*132
190	DATA 20FA374C751B20D945A5 6 7F009A55D18693EA820 CB13246 5102120611A24 :REM*95	213	DATA 47B51D00B34708005009 8 3901C005A478D1C0054 47931C0 0604708002807 :REM*255	236	DATA 14059203028D0510130F 8 E10120F171209140592 8800180 D8A3F20805721 :REM*239
191	DATA 65101AA511C54A90008A5 4 A6906C511B00C20611A A51129F 8854A4C821B20 :REM*50	214	DATA D0D147031594030F1099 1 0011314850512011385 0000060 C091000980000 :REM*213	237	DATA 2F2080A9213B20807221 4 520007A375120007737 5B20801 B216020003437 :REM*93
192	DATA 2F17A511C562B018C55D 9 014A50FC55BA510E55C 900AA50 FC560A510E561 :REM*69	215	DATA 060C0910009900001216 9 30000030F1605922000 1809883 F1E001942421E :REM*86	238	DATA 6420809A216A20000728 7 1200021289000500F87 F01E00B F2E022009E2E :REM*124
193	DATA 90034C3F1C20E01290B9 A 908854320611AA90120 5542C64 3D0F424651007 :REM*1	216	DATA 000D42461E0099434B1E 0 02742501E00B644581E 00BC446 01E00B044651E :REM*57	239	DATA BC20004E2EB41C0006B39 B 91C005539BF1C004939 C520804 3219800900F83 :REM*192
194	DATA 20851AB0A0901AA200E4 6 8B04EA50FDDDB30CA510 FDB40CE 8E8B0EE8A4A85 :REM*214	217	DATA D0AA44010C1405120003 0 F0C0F9217011388060C 0F0F840 612050508010E :REM*188	240	DATA D320008939D6200008F39 D B200083399000281283 B220806 B21B720003F39 :REM*103
195	DATA 31D00EA54A38E55D4A4A 4 A8531246570260A0A65 316920A 8B15808C8B158 :REM*141	218	DATA 840C0900059312011993 1 3101201990512011305 9205040 9940500C0C910 :REM*102	241	DATA A31C007139980003807D0 3 6399000380C878620000 47378A2 0004A37902000 :REM*154
196	DATA AAC8B15828F004A84C35 1 B8E371C8D381CA6318E AA0C4C9 F11A004A900F0 :REM*193	219	DATA 1385020F98100918058C 0 2121513881001141405 128E060 F0E9403011284 :REM*220	242	DATA 4D379520005B37982000 5 F379E20006337A72000 6F37900 0600982792000 :REM*59
197	DATA DDA65AF01E2465500320 6 71C20A324A65ABCAA0C BDA90CC ACA865AAAA900 :REM*177	220	DATA 13031205058E0C090708 9 40D0504091580080501 1699400 0180C8C991E80 :REM*80	243	DATA A4158120000AA15900030 0 7DD00370C0F01841301 1685030 F0DD0D10E8413 :REM*242
198	DATA 85674C4B1B20CF244C66 1 1AD21D0290PCD2C80F0 0848208 83868207F1C60 :REM*41	221	DATA 5B1FA41E80911FA81E80 9 81FAD1E004C3AB51E00 EE39BA1 E00A539BE1E00 :REM*234	244	DATA 051400040516090385B0 0 0180B84B021804422B4 2180762 2B82100BC29BF :REM*232
199	DATA AD21D0290F8D2C808D21 D 00A0A0A0A8DD6146000 0099000 0980000189900 :REM*57	222	DATA 471FC31E00423AC91E80 7 81PCD1E00AF35D41E00 7435D51 C004F39480058 :REM*171	245	DATA 2180EF211B0005090708 9 4000000090E85B80040 0982E22 100A429E92100 :REM*199
200	DATA 001205060C050314000F 8 E000003011204001205 1314120 9031405840000 :REM*166	223	DATA 0883F61E002A3AFB1E00 2 A3A011F002A3A480020 0882EC1 E806A1FF01E80 :REM*126	246	DATA AA29060F0E9410010785 1 3080110851001141405 120E930 2121513080593 :REM*91
201	DATA 12169300000409138B00 0 0040506090E851B0001 0606050 31400030F0C0F :REM*66	224	DATA 711F50003007D03F4C50 0 03807D0CD4C48006808 84D71E0 09D48DC1E0017 :REM*213	247	DATA 0DF0E0F0308120F0D85 0 8091205130013031205 058E0D0 5041205130017 :REM*231
202	DATA 920000130F0C09841B00 0 E0F120D018C0000040F 15020C8 5000011150104 :REM*146	225	DATA 48E11E002D48E81E00FB 4 748003007D0313A4800 3807D05 F3D060F0E9417 :REM*25	248	DATA 031205058E1514090C09 1 499B800280E89FE2100 402A022 200492A062200 :REM*3
203	DATA 1215100C851B000E0F12 0 D018C0000040F15020C 8500001 1150104121510 :REM*181	226	DATA 09041488080509070894 0 000000000000000000 0080071 20110080000393 :REM*198	249	DATA 462A0B2200432A132200 4 C2A1A2200372A242200 3D2A302 2003A2A3D2200 :REM*177
204	DATA 0C851B00030F16059200 0 012169300000F920000 010E840 000180F924F57 :REM*173	227	DATA 1405189468001807889F 1 F80F31FA31F800720A8 1F801B2 0121D000224D19 :REM*172	250	DATA 302AB800300E88FE2100 7 B2B022200A22B062200 9F2B0B2 200932B132200 :REM*47
205	DATA 5F6A727A858C91959A13 0 50C05031400030F0C0F 921B001 513050010058E :REM*168	228	DATA 1D00224D1E1D00224D22 1 D00224D271D00224D70 00280D8 3AE1F003E4DBA :REM*221	251	DATA 6E2B1A2200AA2B242200 A 72B302200AD2B10058E 0412019 7141910850D0F :REM*68
206	DATA 00001513050002121513 8 80D0F1605000D091212 0F92130 514001205060C :REM*195	229	DATA 1F003E4DC21F003E4D70 0 0300C83DC1C00EE4CE4 1C00EE4 CEC1C00EE4C70 :REM*178	252	DATA 04850409138B9D9CA6A7 0 00000250AA32280BC1D 0622806 C1EA62280061F :REM*231
207	DATA 05039413050C05031400 1 0058E13050C05031400 0212151 38813050C0503 :REM*84	230	DATA 00380C83F71C00084DFF 1 C00084D071D00084D13 0312050 50E00030F0C0F :REM*255	253	DATA AA2280C61FAE2280E420 B 22280C921B622003A26 B72200F 525B822002226 :REM*199
208	DATA 140010001141405128E80 0 0002B2B2BAB000022 222222A 200002C2C2C2C :REM*82	231	DATA 92070F148F03151213F 9 2030C05011200130312 05058E0 30C0501120010 :REM*77	254	DATA B922004826000000000 0 0000003F033F333F00 0030303 F33333F000000 :REM*126
209	DATA AC000028282828A80000 2 9292929A900002A002A 00AA000 0180F8A371D80 :REM*192	232	DATA 0107851012090E941115 0 9940405160903851B00 0809120 593000000D0504 :REM*102	255	DATA 3F303030303030303030 3 3333F0000003F3333F00 3F00000 F0C3F0C0C0C00 :REM*163
210	DATA 381E431D0098474C1D00 9 247C71C00E747971C00 7547621	233	DATA 1205930A0F1913140903 8 B0D0F1513850C050694 0D09040	256	DATA 00003F33333F00303030 3 03F3333330000C000C 0C0C0C0

RUN PAINT

```

0000300030303 :REM*251
257 DATA 033F0030303333C333300 0 280 DATA 22A52038E901B002A900 2
00C0C0C0C0C0C00000 333F3F3 0072690EE85202C851F 20CF24A
3330000003F33 :REM*72 5133006C90DF0 :REM*1
258 DATA 333333000003F333333 3 281 DATA 0218606868A90085674C 2
F000003F33333F3030 00003F3 1BA52C10F5A9012030 2620072
3333F03030000 :REM*210 690F2186520C9 :REM*106
259 DATA 3F333030300000003F30 3 282 DATA 4A9002A94A60A51F38E9 0
F033F00000C3F0C0C0C 0F000000 1B002A900200A2690F2 A51F186
0333333333F00 :REM*68 901C9289002A9 :REM*66
260 DATA 00003333333333C000000 3 283 DATA 282000A2690F0A2FAB501 4
333333F330000000333F 0C3F330 AB5006A4A4A60AAA003 BD202E9
000003333333F :REM*38 91515CA8810F6 :REM*30
261 DATA 033C00003F030C303000 0 284 DATA 60A000AEDC14A97F4C4E 1
000330C3F0C3300000C 3F3F0C0 44A4A0A48A8B9EE2DAA B9EF2DA
C0C0C00C30FF :REM*19 8686020232720 :REM*111
262 DATA FF300C000000003F3030 3 285 DATA BF183004200020A201A0 0
F30300000FF0000FF00 000000F 8208914A259A00C863F 8440A00
C0C0CFC0C0C0 :REM*29 0B13FF0062045 :REM*133
263 DATA 30303F3F000000000000 F 286 DATA 14C8D0F660A90C482085 1
FFF0000000C0C0CFCFC 0000003 468A2F5A02C853120A0 268543A
0303030303030 :REM*241 20EA02720A026 :REM*213
264 DATA 300C0C0C0C0C0C0C0C00 0 287 DATA 20CF12B030200114C900 F
C0C0C0C3F0C300C30FF FF0C300 0F4A443C914F017C90D F01F201
0000000000C00 :REM*88 327B0E5C431B0 :REM*8
265 DATA 00000000000F0000000 0 288 DATA E199300C204514E643D0 D
000000FF0000000000 0000FF0 0C000F0D3204514C643 4CCA26A
000000000000 :REM*46 4438C2F0CA900 :REM*166
266 DATA AA00000000FF00000F000 0 289 DATA 99300CAE300C98601220 9
0CC000C30000C000000 F00000C 29D00C920900AC9A0B0 04C980B
C0000C30000FF :REM*60 00218603860AE :REM*218
267 DATA 0000C30000C30000C300 0 290 DATA DC14209C14B034204429 B
0C30000C30000C30000 FF00000 02FA00020011499590C C8C90DD
0000028190000 :REM*5 0F5202914A900 :REM*42
268 DATA 00280ACD8FA022C070E B 291 DATA 99590CAD590C290F8531 0
E2D800013206140AFA9 008D990 A0A65310A8531AD5A0C 290F653
C20CC175B00FA :REM*177 1C91490096020 :REM*232
269 DATA 000500E6FDE6FDE6FEE6 F 292 DATA 2914A9008D590C18602C 5
ED025A9002CA9808D99 0C20CC1 32C57002C502C5700A2 002CA20
78E24FA000500 :REM*237 5AC2F0CB6D692 :REM*231
270 DATA 4CE024A9002CA9808D99 0 293 DATA F00799300CC8E8D0F460 2
C20CC178924FA000500 2058261 0E14B03D204429B038 60A9002
8651F8D970CA5 :REM*207 0A514B0306020 :REM*130
271 DATA FC4A4A4A1865208D980C A 294 DATA AE14B02A60A27F209C14 B
0FA205817A0FA207E17 204A25A 022204429B01D60AEDC 142CA27
5FD0A0A0A8543 :REM*72 F209314B01120 :REM*255
272 DATA A9002A854420C7252095 2 295 DATA 4429B00C60204514B006 2
520C725209525A9D0A2 0720494 04429B00160C903F004 C905D00
7A542290309D8 :REM*86 3A9002CA98048 :REM*154
273 DATA 854220C725A940186552 8 296 DATA 20321468100820232720 8
552A90165538553A928 18654C8 D26F00920CC173F2D30 0412002
54C9002E64DEE :REM*202 0C91220321420 :REM*220
274 DATA 980CC6FED0B4AD970C20 0 297 DATA CF24AD2B8852920843B 2
619853F8640AD980CA2 FE38E91 06D132429301A208913 A900A21
9E8E8B0FA6919 :REM*212 B8D71208E6A20 :REM*150
275 DATA 8D9B0C8E9A0C0A0AA2A0 2 298 DATA ADA10C8525ADA20C8526 4
00819204947AC9A0CB9 9424AAB C2B1B20AA13A200A91B D0E4206
99324204947A5 :REM*142 326A92A8D1915 :REM*236
276 DATA 528541A5538542A93F85 4 299 DATA A9248D1215207126A908 A
7AE9A0CF002A97F8546 60AE9A0 212A015205714201D29 2088272
CBD9B24186D97 :REM*218 0A12790033CCA :REM*96
277 DATA 0C853FBD9C2469008540 A 300 DATA 27203A29B0F870662037 2
250AD9B0C2008192049 47A54C8 9202629A9008D860C18 6978854
541A54D8542A5 :REM*60 1A90469008542 :REM*56
278 DATA FD8543A9008544A90ED0 C 301 DATA A9008D850C203729B0D6 7
22C990C10FA23FA041 20DE25A 044A922202829703D20 3729A00
546A647854786 :REM*201 0203D29B0C370 :REM*112
279 DATA 464CE517A9018531B500 4 302 DATA 31C9220082043179141 C
8B90000950068990000 E8C8C63 8D0ED202629EE850CAD 850CC91

```

RUN PAINT

C291590EBB9A7 :REM*20
326 DATA 1F098099A71F4CF2278D 1 349 DATA F64E0BFA17F700602B80 0 372 DATA A9088D010CAD020CCD4E 2
7152093274C752920CC 1717F70 060005CFE5F006C5250 462E525
060F402A90BD0 :REM*143 0502E5250422E :REM*209
327 DATA 39ADC114D0034C2B1B8D F 350 DATA 5250532E5250302E5250 4 373 DATA 4CBF2760A53F18690885 3
42C20CC17EC2F64E09 00A903D 02120CC170BFA :REM*27 F8D35319005E640EE36 3160A00
328 DATA 00608004A9072CA90F2C A 351 DATA 3B4C2B1B2C4F2F30F820 F 374 DATA 8020BF278810F3608A48 1
9134CB42BA91B2CA917 2CA91F4 820CF246848A2 :REM*184 0E06A2C502F10046A4C 13312AC
329 DATA 0720DE29684820632620 B 352 DATA 0C0A0A0A8D082FA9002A 8 375 DATA 8AB0062C502F1004A2C 1
126F056AC2F0C6848C9 1FD0032 07627200C2920 :REM*62 D812F984A4A4AF0CD48 20843BA
330 DATA CC17300C191510002071 2 353 DATA 208D980CA65BA55C2076 4 376 DATA 006AC8E8D0F260207C31 A
66848C91FD005A00220 7326684 8207B26863884 :REM*99 318651FAA68A86838E9 014CD32
331 DATA 39186910207E26C0000F 5 354 DATA 2C1002A06320C92FB008 6 377 DATA 99006AC8C00790F820F4 3
BC001F01CC05BD00BAD C114C90 7D004A2FFA056 :REM*66 520D0034C2B1BA8A94F A2008E9
332 DATA 207029B0C768C913F01D 4 355 DATA A91920C92FA8F0E8A520 8 378 DATA A02FAD702F4C302FAD02 0
CF227208827207529B0 B720CF2 D980CA927A61F8C030C 8E970CC
420B22720A62C :REM*142 D4E2F9003AD4E :REM*57
333 DATA AD2C8020BF274CF227A2 3 356 DATA 2F8D020C68A21C20DE29 A 379 DATA A531A268A02FAD672FA C
120972CA2318E1715A9 01201F2 9A9008538A913 :REM*33 9008523201D29A90020 5714208
62F20B227A252 :REM*212
334 DATA 8539A260A0FD0270294 C 357 DATA A02FAD512F20302F20CC 3 380 DATA 08540A9648D3631604 C F
22720CC1700D0006047 1FAE056 4A9088D010C204A25A9 808543A 902854420DC17 :REM*127
335 DATA 200819186907488A6960 A 358 DATA 20452FEE980CCE030CD0 E 381 DATA 55460012041B4B4001FF 4
868AA207029A2589006 20972C4 CDC2B8E171520 :REM*98 720482F2032144CF227 863F844
08543F00CA000 :REM*251
336 DATA CC1747EF0060D007A2D0 A 359 DATA B13F00BF27C8C44390F6 6 382 DATA 4144534156041B4B8002 0
0674C102CAD1715488E 1715205 04C85304C6A31070000 3C07000 0100283207C31A007B1 3F99006
329688D171560 :REM*118 04841524D4F44 :REM*187 A8810F8C8A207 :REM*170
337 DATA A942A21F20C02CA900A2 5 360 DATA 450010020B0C0108FF46 4 383 DATA 20043120BF27C8C00890 F
C20B82CA900A2D88538 8639A9E 8A20385438644 :REM*130 0F4E543490108001002 000CAE0
0010F48415253 :REM*125
338 DATA A000C443D005C6441001 6 361 DATA 495A450013020D010802 F 384 DATA 2FA9408D9F0CA9800D9F 0
0AD820CD00B203D29B0 F591387 0F464F4E5441AEC014E0 04F033A 91020B326D003 :REM*81 C8D9F0C209D3BA20086 6486662
0F19005B13820 :REM*173 91020B326D003 :REM*81 0D032A20220D0 :REM*157
339 DATA BF27C8D0DFE639D0DB60 5 362 DATA 4CF22720732720CC1730 0 385 DATA 32A56938E567A56AE568 0
2504620522E522E0045 4E54455 C15151400AC2F0C200C 29AEC01 8A202B002A200B56749 FF856DB
22046494C454E :REM*132 4A002207626AD :REM*200 56849FF856E86 :REM*254
340 DATA 414D45203F20000444953 4 363 DATA 29152012292088272075 2 386 DATA 71A26920F43228B003A2 6
B20434F4D4D414E4420 3F20004 9B0EA60AC4B2F207626 4C88273 72CA269B5016A856CB5 006A856
6494C45204558 :REM*129 82C150C102920 :REM*132 B900AA46C1006 :REM*82
341 DATA 495354532E205245504 C 364 DATA F92F20253AB0FB20153B 2 387 DATA E66BD002E66C204433E 6
143452049542028592F 4E29203 0CF3B20183CA9032055 4220183 DD00AE66ED006A9008D 9F0C60A
F200053544154 :REM*231 C20CF1290E5A5 :REM*227 67120B132246C :REM*128
342 DATA 55533A44455649434520 4 365 DATA 4A4820843B684A4A4A18 6 388 DATA 3003A2002CA202E471F0 D
EAFF542050524553454E 544C4F4 0202A2AA98085234CCF 244CFA3 D20B1324C8832B56318 7548954
1443A20005341 :REM*29 14C1F32050000 :REM*198 8B56475499549 :REM*4
343 DATA 56453A200004449534B20 4 366 DATA 508000041B5431360C4D 0 389 DATA 8A4902AAA56B18756785 6
34F4D4D414E443A0050 52494E5 1FF44415441061B5330 3332301 0F38F5489567B5 :REM*45
43A2000455845 :REM*27 402061B533036 :REM*201
344 DATA 435554453A20000464F4E 5 367 DATA 34305441021B41444550 5 390 DATA 60F549956830071567D0 0
4005041545445524E00 4252555 448001402180C4C01FF 4441544 2956360A0FF94649463 8A6967A
3480053484150 :REM*168 142494C85304C :REM*191 AA90038F50095 :REM*168
345 DATA 450050414745004D4F4E 4 368 DATA 6A310700003C070000FF 4 391 DATA 00A900F501950160A200 2
F4348524F4D45205343 5245454 252555348444952464C 4101081 CA202B52538F5489548 B526F54
E004849524553 :REM*100 4021A0CC101FF :REM*111 9954960A90118 :REM*18
346 DATA 2053435245454E004D45 4 369 DATA 01084954524947485401 0 392 DATA 654885489002E64960A9 F
4524553205343524545 4E00555 F520015021B0CBB01FF 4544010 02CA9FE1865488548B0 02C6496
4494C49545900 :REM*38 8424F54544F4D :REM*81 0A01F2CA0072C :REM*103
347 DATA 52454354414E474C4500 5 370 DATA 42207C31202B3198AAA0 0 393 DATA A003A203B54899DF1488 C
3435245454E0000050D 13191E3 0E007B009B13F9D006A C8E8D0F A10F7602C9F0C703DA9 0E2C9D0
03D4B535DF64E :REM*172 3843120F43020 :REM*154 CF036203333A9 :REM*129
348 DATA 0060006000602B800060 0 371 DATA E230C64410E020CC1700 6 394 DATA 022C9D0CF00920023320 8
05CFE5F7F5B8064F462 00004DC 000648002A5318D010C C902B00 63320BF36A9042C9D0C F009200



R U N P A I N T

53320863320BF :REM*5	44B203C45B00F :REM*128	C102220223785 :REM*104
395 DATA 36A9082C9D0CF00C2002 3 320053320863320BF36 20B3349 00160A9202C9F :REM*91	406 DATA A548A4494C2B4520BF18 4 800040000602C334A5 482DA30 C855024291005 :REM*136	417 DATA 35C8D002E6358434A201 2 0D03620FF3620223720 FD36EE2 40CA9034C5536 :REM*232
396 DATA 0CD01B30132CD8141011 2 CA00C100920153320C2 3320213 34CC8334C0B3E :REM*225	407 DATA 0648264908205617A54A 2 90718655285529002E6 53207C1 7242910052866 :REM*184	418 DATA 200E3785348635089005 A 23420F432A20020D036 289005A 23420F432A534 :REM*224
397 DATA 20374410016085320A0A 0 A0A853320CF344CE933 20B3349 0016020CF34AD :REM*253	408 DATA 49664860006040618062 C 063006540668067C068 006A406 B806CC06D006F :REM*7	419 DATA A63520FF36200E3720FF 3 6206236CE260CA902A2 0020FF3 6AD260CC9FFD0 :REM*36
398 DATA D5148532ADD71485332C 9 F0C3048242A500BEE9E 0CAD9E0 C2DD414F03CA0 :REM*171	409 DATA 40708071C07200744075 8 076C0770079407A807B C07C007 E005C285C505C :REM*155	420 DATA 9460A55BA65C186D240C 8 55F9001E88660A55BA6 5C38ED2 40C8548B001CA :REM*63
399 DATA 00AD2C8024293004B14C 2 90F8531C532F0297024 2C1D0C3 01FB14C290FC5 :REM*156	410 DATA 785CA05CC85CF05C185D 4 05D685D905DB85DE05D 085E305 E585E805EA85E :REM*158	421 DATA 8649A55DA65E186D260C 9 001E8209936A55DA65E 38ED260 CB001CA854A85 :REM*54
400 DATA 32F014AAB14E290FC532 F 008E431F007C531D006 A2032CA 2022CA2012CA2 :REM*229	411 DATA D05EF85E205F485F705F 9 85FC05F00FF00008040 2010080 40201C0300C03 :REM*97	422 DATA 61864B86622036332C14 0 C1005202D37F00E2044 33A55F8 548A560854920 :REM*91
401 DATA 00A52A29FC852A8A052A 8 52A8AA8A6502429700D B970353 D6C358551BD6C :REM*113	412 DATA 0055A0FF20703B20B439 2 05D42A56148A55D8561 209D3B2 02D376848C55D :REM*114	423 DATA 4433A0032CA0072CA01F A 203B9DF14954888CA10 F760A90 28543BD220C85 :REM*249
402 DATA 35D00BB960353D643585 5 1BD6435A0002C9FC10 07A5515 15291526049FF :REM*63	413 DATA F012E65DD002E65E209D 3 BA54AA64B20993630E8 68855D8 561209D3B202D :REM*142	424 DATA 36A90085372063198A49 0 1AABD220C8536A90085 37203C1 98A4901AAC643 :REM*201
403 DATA 315205519152AD1D0C30 3 2A52A302E2903242970 1C2903A AF023E003B01B :REM*188	414 DATA 37F0CB20703B20B43920 5 D424A8A6A8D220C1865 5B855B9 002E65C984A8D :REM*51	425 DATA D0DCA534A63560AA9818 6 D280C8D280C8A6D290C 8D290C6 0A20220243749 :REM*207
404 DATA B14CE002F006290F0533 5 00429F00532914C60C9 01D008A AB850E5A53291 :REM*88	415 DATA 230C18655D855D9002E6 5 E20DB354CB535A9008D 240CAD2 30C8D260C0A49 :REM*152	426 DATA FFAA9849FF1869029001 E 8E00060A200BD240C0A A8A9002 A60A900852A4C :REM*52
405 DATA 4E602903F0FBAAE001D0 F 6B14C290F1D0C15914C 60A54AA	416 DATA FF69038D280CA9FF6900 8 D290C2C140C30032062 362C290	427 DATA 3932A91E20554220CF12 9 00620EF186CF04C2B 1BA2002 ▶



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R U N P A I N T

CA2142CA22886 :REM*162	43920253AB0FB :REM*89	003B9643548A0 :REM*32
428 DATA 1FA520852020CF244C2B 1	451 DATA 20123B202E32202E3220 C	474 DATA 0068485152915220043F C
BA900F0F4A94AD0F0A5 2038E90	93C20CF1290EAAED414 CA8E9E0	AD0F4686020FC3B2001 3CA90E2
CB002A90004C53 :REM*128	C4C3632A9802C :REM*53	C9D0CF035A225 :REM*201
429 DATA 37A90C2030264C533720 8	452 DATA A900852460A511C9C860 2	475 DATA A02D20A13B2429100406 2
037208D184C9011201D 3AA0082	05D3BA920D020206C3B 2429100	D262EA20FA0FA20A13B 204C3DA
42C3002A002A2 :REM*90	34C2B1B203512 :REM*24	20220063D204F :REM*188
430 DATA 0188B993249DAE37B99B 2	453 DATA A900F01C20703B203512 A	476 DATA 3DA20620063DA20FA0FA 2
49DB637CA10F08443A20 C337AD2	940D01220703BA98048 20D4392	0A13B204F3DA2042006 3D60A5F
C800DD7148DBA :REM*138	CD8143003202D :REM*52	AC940A5FBE901 :REM*60
431 DATA 3720C618CD8F803E0020 C	454 DATA 12688DA80CA9008D9F0C 2	477 DATA B029A5FCC9C8B0231869 3
6182D80A00F0A43AD0 CC20203	0003B20943B20C93C20 253AB0F	29D01D0A5FA1869189D 00D0A5F
A60A93FC000F0 :REM*139	220123B208C3A :REM*166	B6900088A4AAA :REM*184
432 DATA 02A97F8546854760AD21 D	455 DATA 241310EB30E620153B20 4	478 DATA BD483D28F0D0D10D08D 1
0290F8544CA8E21D024 2C300188	433ADC144C5542202F 17A9202	0D060A9FA9D01D06049 FF2D10D
D62388E643820 :REM*80	CA80CD0EA1007 :REM*1	08D10D0600102 :REM*69
433 DATA CC175E386900070020F1 3	456 DATA A900852A4C363220153B 2	479 DATA 0408A2002CA202B52D38 F
8005C005CE8034C2B1B A05B207	0B334001320CF342CA8 0C700CA	50F95FAB52EF51095FB 6020543
E17A90008531A9 :REM*210	000B14C29F00D :REM*181	B20FA3AA90085 :REM*114
434 DATA 2818654C854C9002E64D A	457 DATA A9C914C60A007A90091 5	480 DATA 2A8DA00C2002458579CD D
003A202A531914CC8CA 10F8A91	28810FBC8AD2C80914E 0DD7149	514F0EC20FD3DD0E7A4 4AA200F
1186531853190 :REM*33	14C6020CC34A9 :REM*198	014A678F0DDCA :REM*67
435 DATA E0A55BA45DC9008008C9 4	458 DATA E88543A9038544A0077A9 0	481 DATA BC0004CABD00048549CA B
8D00AC038D006AED514 4C4438C	011528810FBC9000D003 20C43A2	D00048548867888844A E64A20F
990F00160AD21 :REM*240	0451A22E4CC6 :REM*48	D3DF0F9C64A20 :REM*49
436 DATA D0290FAAE88A0A0A0A18 6	459 DATA 43D0E6C64410E260A048 2	482 DATA 153320CB3D20243320CB 3
55D854A9018537A924 A200A01	CA05B2CA05F984820C9 3C68A82	D20153320C233C64A20 FD3DD0C
B208D194CEC19 :REM*231	0CF1290F42CA0 :REM*225	520153320F13D :REM*24
437 DATA C080800F00F00C08080 F	460 DATA 526CA05F2CA04878A60F A	483 DATA 20243320F13D4CAF3D20 F
0000F00A54CA64D8DEA 388DEC3	510242910064A488A6A AA68960	D3DD01FA678E0FC9005 68684C6
88EEB388EED38 :REM*224	0990100A90099 :REM*85	23DA5489D0004 :REM*233
438 DATA 60A9E8A2038DEE388EEF 3	461 DATA 0300A5119902005860BD C	484 DATA E8A5499D0004E8A54A9D 0
860201D3AA9A0A20F20 8138A00	0148D00BCBDC3148D0C 0C8A0AA	004E886781860E64A20 FD3D08C
8242C3002A002 :REM*126	ABDC5148D0D0C :REM*56	64A28D0CF6020 :REM*245
439 DATA A20188B99B249DEA389D E	462 DATA BDC6148D0E0CD01C20D7 4	485 DATA B3349003A9FF60200245 C
C38CA10F3843A20C337 AD21D02	74C703B0F0502BD593B 8DCD14D	57960A54A290F85310A 0A18653
90FAAAD2C8020 :REM*175	00BCA8E1E0C4C :REM*87	1857720CF3420 :REM*77
440 DATA CB38AED714ADD61420CE 3	463 DATA 703BCA8EA90CAD371C18 6	486 DATA 3033ACEE14A9C838E54A C
8A43AD0D320203A60A0 002CA00	9038D9D11AD381C6900 8D9E114	DCE14B001AA86742021 3F29078
7488A48A200B9 :REM*38	CCF2420BF36A2 :REM*133	5750AA8B92D3F :REM*123
441 DATA 5E389569C8E8E00790F5 6	464 DATA 48A00BD014A20BD00EA2 4	487 DATA 8D8E3E8D993EB92E3F8D 8
8AA68856D866F20F138 2D802D8	82CA25FA05BD007A25F 2CA25BA	F3E8D9A3EA017A93F38 E548AAA
0A00F60A006A2 :REM*61	0488EA73BA200 :REM*190	901E549D006E0 :REM*73
442 DATA 44204018A000C443D007 C	465 DATA B5009900000E8C8E0049 F	488 DATA 17B0028AA8981865754A 4
64410034CEF18201E18 2469500	56020CF2420E03BA025 20173BA	A4A8576A9008D1C0CAD D714853
B1002256CC56D :REM*52	001A200162536 :REM*71	3A548290FC908 :REM*180
443 DATA D016201E18246A100225 6	466 DATA 26E8E88810F74C901185 4	489 DATA 9002E677A5771869408D 9
E246B1002056F500245 70202F1	AA90085488549ADA10C 855FADA	C3EA909690089D9D3EA0 00A200B
8C8D0CDE640E6 :REM*41	20C8560602025 :REM*106	DC90CF02849F :REM*251
444 DATA 42D0C74CEF1878CA8A20 9	467 DATA 3AB0FB20C33C20CF1290 F	490 DATA 31529152BDC90C3D0005 1
715A9802CA900788D12 0C584C2	360A9002CA980788D96 0C209D3	1529152AD1C0CD0132C 1D0C300
B1BA232A005D0 :REM*32	BB00AA0542017 :REM*94	E98488A48A8A2 :REM*96
445 DATA 26A248A004D020A22CAC D	468 DATA 3BA254209F3BA54A48A9 0	491 DATA 01208033468AA68A89818 6
C14A904CDD014F002A0 048CC01	0854AA9C7856120983C 6820CD3	908A8E8E47690C9F0C7 AD8E3E1
4C0044C7D39A2 :REM*76	BA9002CA98085 :REM*28	869048D8E3E8D :REM*62
446 DATA 27A003D004A216A001A9 8	469 DATA 4020CF34A20020D032A2 F	492 DATA 993E9006EE8F3EEE9A3E 2
059100C99100C208047 4C2B1BA	FA5502429100B244030 02A2550	0043FAD1C0CD00BA54C 1869288
003A23D000A00 :REM*177	A066726688632 :REM*57	54C9002E64DA5 :REM*239
447 DATA 44A230D004A0B9A2318C 9	470 DATA A8B9B841253248984907 A	493 DATA 77186905C9509002E950 8
C398E9D3920CC174430 452F410	8C88431A56738E53185 67A568E	577C674F0034C7A3E4C C236E65
04C2B1B20703B :REM*73	90090234AA567 :REM*27	2D002E653A552 :REM*98
448 DATA 20D43920FD3A20FD394C A	471 DATA 6A4A4AAA68A8A532489 6	494 DATA 29078D1C0CD00DA93818 6
E392CD814301B2C140C 101620B	000F002684824401002 3152515	5528552A90165538553 60A5482
F18190D3F0000 :REM*109	2915220451ACA :REM*193	42910050A2649 :REM*60
449 DATA A98024291002A9C08D19 0	472 DATA 10EEA55F2DA30C242910 0	495 DATA 85486000055405A805FC 0
D20493FAD90C291FAC 971CD00	10AAA683DC141A00024 4010023	55006A406F8064C07A9 0018209
2A9008D9D0C09 :REM*78	1525152915218 :REM*203	846A9001820C7 :REM*191
450 DATA 018D15D0AD110C852360 2	473 DATA 586020CF34A56138E54A 9	496 DATA 4620AB3F20BF1800005A0 0
0703B20D43920FD3A20 FD394CF	0F5AAE8A450B96C3529 5524293	200A9008D743F8D843F A9058D7

RUN PAINT

53F8D853FA907 :REM*89	582A000A200A9 :REM*0	F186901657285 :REM*244
497 DATA 8550A000A9038543A201 B 9190D9D0005E8C8C643 D0F4984 8A450A203183E :REM*69	508 DATA C0248108B17285838484 A 48084852808F029A47F A900068 32A88D0FAA824 :REM*159	519 DATA 72900FE67360A907C818 6 55285529002E6536020 CF24209 A42203C424C90 :REM*158
498 DATA 0005CA10FA8810F4AD74 3 F1869048D743F8D843F 9006EE7 53FEE853F68A8 :REM*80	509 DATA 29100E28083005B9DC41 7 011B9F041500C280830 05B9CC4 17003B9EC419D :REM*230	520 DATA 1120CF24209A42203542 2 0D03A300EF20703B205D 4220354 220D03A30F520 :REM*147
499 DATA C03F90C4C65010BE60A9 1 68DCE14A03FCECE14D0 04EECE1 460A203A90088 :REM*231	510 DATA C90CE8E028B00DC685D0 C BA484C8C47D90B6F0B4 68A57D2 0F441A4758830 :REM*244	521 DATA 3F42A9803005203F42A9 0 085400209D3B201F3CE6 4AA54AC 56190F5F0F3A9 :REM*156
500 DATA 19190DCAD0F9C900F0E8 6 0AE487F24291005E88A 0AAACA8 E1015AD4A7F8D :REM*44	511 DATA 13A2001808287EC90C08 E 8E47690F6F0F468B0EA A476A68 8BD941117891 :REM*223	522 DATA 061865A2C5A2D0FC60AD 1 10C852320E03B200F3B 20F13B2 0E03B200EE3B20 :REM*9
501 DATA 1115A9028DA60C8DA70C A 24FA07FA90886728473 857EA9C 98578A90C8579 :REM*140	512 DATA 783DB94151789178A950 2 47E08F010ADF10C0DC9 0C8DC90 CB9F10C117891 :REM*24	523 DATA 123B206543B00AA25BA0 5 F20DE25206543488A48 207043B 00AA25DA06120 :REM*213
502 DATA 20CF34A900857BAE1015 E 88AAEA60C202A19857A 267B29F FD002C67BC67A :REM*162	513 DATA 7828700BF009B17849FF 9 1788810F7A918247E08 A552854 1A5538542A000 :REM*173	524 DATA DE25207043A868AA6860 2 05D42A900A2D0A000085 4186428 43D206543B002 :REM*199
503 DATA AD10154A4A4857DAE11 1 5E88AAEA70C202A1985 7C8574C 67C20213F2907 :REM*19	514 DATA A200B14128083036701E F 0033DF10C1DC90C9141 A541186 90885419002E6 :REM*23	525 DATA 3860207A18A001914188 8 A9141C8207043C89141 853AE63 A90E6A55B2DA3 :REM*212
504 DATA 857518657A48A900657B 4 A686A4A4A8576A57A18 6548482 9078588A57B65 :REM*12	515 DATA 42E8E47690DEF0DCB01C 2 429100CBDC9C0A1DC9 0C31414 C76413DC90C4C :REM*28	526 DATA 0CC89141AAA55D2907C8 9 1418A18A0007141AA98 C871412 076438545E645 :REM*103
505 DATA 49AA68C9408AE901B009 A 57C18654AC9C8900160 AEA60CB DC941857F2028 :REM*142	516 DATA 76415DC90C4C76416820 0 43FC674F007C682D0A1 4C9D406 0FF7F3F1F0F07 :REM*178	527 DATA A0059141C8A5299141A9 0 718654185419002E642 209D3BA 9478534A9EF85 :REM*206
506 DATA 19858000A0A0A0A0A581 A 900A47699F10C8810FA A675BDC 0418DF10CA688 :REM*55	517 DATA 03010080C0E0F0F8FCFE F F00402000030C0F3033 3C3FC0C 3CCCFF0F3FCFF :REM*87	528 DATA 35A92F8536A9F3853720 C F34A000A2000A1529141 20451AC 8C44590F49818 :REM*229
507 DATA BDB941A47619F10C99F1 0 CA900A4769178AEA70C 2028198	518 DATA 00050A0F50555A5FA0A5 A AAFF0F5FAFF000FF0F0 0055AAF	529 DATA 654185419002E642E64A C 63AD0DD20EF18A53DD0 28209D3

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562 DATA 20463F4C2B1BA0108C8B 0 585 DATA 1E4B20C91220153BAD8E 0 608 DATA A2020813820153B20D8 4
   CAA50F38ED8B0CA8A5 10E9009   C200F47AE8E0C200819 855B865   4C900F0D62005452008 4C4C4D4
   0034C3219A900         :REM*75   C186D8B0C855B         :REM*105   CCD1E0CF0268D         :REM*224
563 DATA 6008843F864084418642 A 586 DATA 9002E65C186D8F0C855F A 609 DATA 20D08D200C0A0A0A0A8D 2
   23FC01708F002A2220 0819204   55C6900242910074A66 5F465C6   10C20C912A90E854685 47206C3
   947A9F4A20228        :REM*91   65B8560A44AA9        :REM*15   8AD210CAE1F0C        :REM*184
564 DATA F004A940A20228900A18 6 587 DATA 00AE8E0C203219AE8E0C 2 610 DATA 20CE38242930016020B6 4
   53F853F8A6540854060 A902A20   00819855D865E186D90 0C85618   CA54EA64F207038AD20 0CAE1E0
   0F00AA904A203        :REM*221   A690085624C46        :REM*200   C4CCB38AD1E0C        :REM*208
565 DATA D004A908A206484D9C0C 8 588 DATA 4B20BF188071C00D00A9 0 611 DATA 8D20D00A0A0A0A8D1F0C 6
   D9C0C682D9C0C208047 4C2B1BA   F8536A05820314AA060 20314AA   020653B20BF4C20FA3A 20D844C
   D971C491B8D97        :REM*253   050202E4AA068        :REM*100   900F0F3200545        :REM*42
566 DATA 1C4C2B1BF0048A4C8A47 8 589 DATA A91F2CA9008431AAA026 8 612 DATA 48207D3820CC34682080 4
   AA2002CA21BA88A998D 1C60A20   437A8208D19A9008548 8549A53   C4CD04CCA8A48AE080C BD2C1D2
   0A900F004A200        :REM*230   1854A4CEC19AD        :REM*101   08747688D080C        :REM*158
567 DATA A91B8D431D491B8D4C1D 8 590 DATA 1B0C8543A9708531A900 A 613 DATA AABD2C1D208A474C2B1B C
   ED8144C2B1BA9012CA9 022CA90   22520724AA531186908 8531C64   A8A48AE090CBD2F1D20 8747688
   42CA9088DD414        :REM*148   3D0EEA9102C87        :REM*140   D090CAABD2F1D        :REM*89
568 DATA A940052AA2001009A208 2 591 DATA 0CF00160A922A223AC1A 0 614 DATA 208A474C2B1B8A38E904 4
   CA200A52A29BF852A8E A00C4C2   C88D0C020B334900160 2C870C3   8AE0A0CBD321D208747 688D0A0
   B1B20D7474C2B        :REM*15   01020CF34A201        :REM*94   CAABD321D208A        :REM*127
569 DATA 1BCA8ED5148E20D08A0A 0 592 DATA 2C9F0C3003AE0B154C27 3 615 DATA 474C2B1B20373B20E839 A
   A0A0A8DD71460A21BAD 1D0C498   8C86020913BA2        :REM*18   E0B0CE88A48AE080C8E A60C202
   08D1D0C1002A2        :REM*100   8086020913BA2        :REM*18   A19242910014A        :REM*88
570 DATA 008EC71C4C2B1BA9408D 8 593 DATA 5BA05F20A13BADA30C49 F 616 DATA 8D920CA9008D930CCE92 0
   70C208D18AEC114D002 A207E88   F255B855B0DA30C855F 6028004   C68AE090C8EA70C202A 198D940
   AA8A900E010F0        :REM*82   7013800370120        :REM*32   CCE940C20253A        :REM*35
571 DATA 2BA920D024A9108D870C 2 594 DATA 153B20333320BF36A54C 8 617 DATA B0FB20CF12900D20394B 2
   08D1820B51800D8E803 00A218A   950B003A90060E970B0 01602C8   0153BA01B20383330E9 20CC17F
   015100CA9208D        :REM*224   70C3010CD8A0C        :REM*76   7145B00040020        :REM*106
572 DATA 870C208D18A210A010A9 1 595 DATA B0F1A649D0EDA648EC89 0 618 DATA 5B4B9008200E4E204B4E F
   08D8B0C8A4A8D1A0C8A 8E8E0CC   CB0E64A4A186DF51485 4AACF41   0D3205B4B20094E2001 14C900F
   A8E8F0C0A0A2        :REM*173   4A248205A262A        :REM*200   0C62013279000        :REM*220
573 DATA 2910014A8D890C984A69 0 596 DATA 186DF31485489001C884 4 619 DATA 20164E4C734D204317AE 0
   08D1B0C980A0A8D8A0C 888C900   920784A20A24A20A84B 38A9016   B0CF013E007D004186D 0F0C20D
   CA980852AAD0B        :REM*225   08E930C4C334B        :REM*155   64D209F4E9003        :REM*255
574 DATA 15208D4920BF18005CE8 0 597 DATA A9808523A94FA200A015 8 620 DATA 204B4E4C734D8E10158E 1
   30EA90E8D21D020114A 204B4A2   E930C242910044E930C 6A8D920   015A8AD0DCAE0E0C20 AC17206
   04E45A9028543        :REM*27   C8C940C20253A        :REM*171   A18A000B15499        :REM*122
575 DATA A000A200BD0C1520964A C 598 DATA B0FB200F3B204E4B90F3 2 621 DATA 190DC8CC0C0C90F520EF 1
   8E8E44390F44C4E4920 703BA98   09D3BA0174C3833205B 4B90021   8AE0A0C2028190A0A0A A219A00
   08D870CA5208D        :REM*73   860205B44CCF        :REM*233   D4CEE3F0A01B4C        :REM*152
576 DATA 880C201E4BA55D4A4A4A C 599 DATA 12209D3BA548186D920C 8 622 DATA 436200114C900D0F960 C
   9129007E90FA8A90FB0 0C38E90   55FA5496D930C8560A8 A55F202   90DF031C914F043C912 D006A98
   4A004B0056904        :REM*206   B45B032A54A48        :REM*25   08D0F0C60C992        :REM*127
577 DATA A8A9001865208520980A 0 600 DATA 186D940C900368B026C9 C 623 DATA D004A900F0F4C99DF04C C
   A0A855D186915856120 BB24A91   8B0F94820183C684885 4A20183   91DF067C991D0034CBF 4EC911D
   08D8B0C20114A        :REM*222   C209D3B688561        :REM*132   0034CD24EC913        :REM*123
578 DATA A900A02820964A186911 9 601 DATA A900856220983C209A3B 6 624 DATA F00D6020D24EA9008DF7 1
   0F820464BA0AA20CB13 A900852   8854A20983C1860A948 A27FA08   48DF81460A9008DF914 8DFA14F
   320A84B20253A        :REM*247   020A342A55B38        :REM*86   0EF20804EB001        :REM*142
579 DATA B0FB9A9808D9F0C20C34A 2 602 DATA EDF3140A0A8548A90085 4 625 DATA 6020094EAD0A0C48A900 8
   0C94A20CF1290EB202F 17A9008   B2A8549A55D38EDF514 0A0A186   D0A0CAE0B0CA92020D6 4D688D0
   D9F0C20C34AF0        :REM*94   970854A20CB3F        :REM*98   A0C60EE920CAD        :REM*146
580 DATA 2D9006241330D810EBA5 4 603 DATA 2C870C1C056A01720C436 2 626 DATA F71438ED920CCE920C48 A
   AC968B0E52C870C300B A21820A   0CF34A054A24C20A13B A00F20C   DF814E900B00268608D F814688
   949208D494CF0        :REM*18   43620CF34A90B        :REM*185   DF71460EE920C        :REM*120
581 DATA 48A21020A949290FAAE8 2 604 DATA 8D910CA200A9048544A0 0 627 DATA ADF714ACF814186D920C C
   0D7474CFF482C870C30 2A5012A   0A9048543B154814CB1 56814E2   E920C9001C8202B4590 01608CF
   D8B0CF02320CC        :REM*23   02E4CC643D0F1        :REM*105   8148DF71460EE        :REM*58
582 DATA 17BF4A19000400A071D0 1 605 DATA C8C00A90E8CE910CF015 C 628 DATA 940CADF91438ED940CCE 9
   820CC17BB4A19000400 A9102D8   644D0DDA55418692885 5485569   40C90038DF91460EE94 0CADF91
   70CF003A0462C        :REM*210   0CEE655E657D0        :REM*75   4186D940CCE94        :REM*139
583 DATA A0512CA06C841E20CB13 2 606 DATA C860A24CF600D002F601 F 629 DATA 0CC9C8B0038DF914604C
   0B04920BD134CF348A2 0E2901F   602D002F603A2006020 653BADA   0CC9C8B0038DF914604C
   00FA200242910        :REM*27   30C8D920CA907        :REM*221   630 DATA -1          :REM*229
584 DATA 09A010CC870CD002A903 8 607 DATA 8D940C20BF4C20253AB0 F
   E20D08D0B1560A40FA5 104C321   B20153B20A24AA55D29 F8855D2

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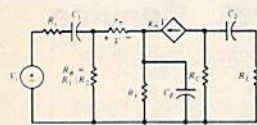
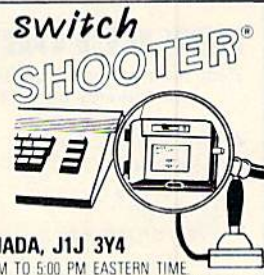
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RUN'S CHECKSUM

TYPE IN *RUN'S* CHECKSUM, which serves for both the C-64 and for the C-128 in either 40- or 80-Column mode, and save it to disk before running. When typing in a program from *RUN*, first load and run *RUN'S* Checksum. The screen will display a SYS number that deactivates and reactivates the Checksum. Always disable *RUN'S* Checksum before attempting to run another program. Note: You can abbreviate Basic keywords; spaces affect the checksum only when within quotes; and the order of characters affects the checksum.

With this new version, when you press return after typing in a program line, a one-, two-, or three-digit number from 0 to 255 appears in the home position. If this number matches the checksum value in the program listing, the line is correct. If the number that appears *doesn't* match the checksum value, compare the line with the magazine listing to find your error. Then move the cursor back up to the line and make your corrections. Now, after you press return, the correct checksum value should appear. Continue entering the listing until all the lines have been correctly typed. Then deactivate *RUN'S* Checksum, using the SYS number. Save the finished program.

All the graphics and control characters in the listings in *RUN* have been translated into understandable key combinations. They are the instructions you see inside the curly braces. For example, {SHIFT L} means you hold down the shift key while you press the L key. You do *not* type in the curly braces. What appears on the screen will look quite different from what is designated inside the braces. Here are some more examples:

- {22 SPACES}—press the space bar 22 times
- {SHIFT CLR}—hold down the shift key and press the clr-home key
- {2 CRSR DNs}—press the cursor-down key twice
- {CTRL 1}—hold down the control key and press the 1 key
- {COMD T}—hold down the Commodore logo key and press the T key
- {FUNCT 1}—press the F1 key
- {5 LB.s}—press the British pound key (*not* #) five times 

Listing 1. *RUN'S* Checksum program. This program is available on *RUN'S* BBS for users to download.

```

10 REM RUN'S CHECKSUM 64/128 - BOB KODADEK
20 MO=128:SA=3328:IF PEEK(40960)THEN MO=64:SA=4
  9152
30 FOR I=0TO169:READB:CK=CK+B:POKE SA+I,B:NEXT
40 IFCK<>20651 THENPRINT"DATA ERROR!":END
50 POKESA+110,240:POKESA+111,38:POKESA+140,234
60 PRINTCHR$(147)STR$(MO)" RUN CHECKSUM":PRINT
70 PRINT"TO TOGGLE ON OR OFF, SYS"SA:IF MO=128
  THEN 100
80 POKESA+13,124:POKESA+15,165:POKESA+25,124:PO
  KESA+26,165
90 POKESA+39,20:POKESA+41,21:POKESA+123,205:POK
  ESA+124,189
100 POKESA+4,INT(SA/256):SYS SA:NEW
110 DATA 120,162,24,160,13,173,4,3,201,24,208,4
  ,162,13,160,67,142,4,3,140
120 DATA 5,3,88,96,32,13,67,152,72,169,0,141,0,
  255,133,176,133,180,166,22
130 DATA 164,23,134,167,132,168,170,189,0,2,240
  ,58,201,48,144,7,201,58,176
140 DATA 3,232,208,240,189,0,2,240,42,201,32,20
  8,4,164,180,240,31,201,34
150 DATA 208,6,165,180,73,1,133,180,230,176,164
  ,176,165,167,24,125,0,2,133
160 DATA 167,165,168,105,0,133,168,136,208,239,
  232,208,209,169,42,32,210
170 DATA 255,165,167,69,168,170,169,0,32,50,142
  ,169,32,32,210,255,32,210
180 DATA 255,169,13,32,210,255,104,168,96,104,1
  70,24,32,240,255,104,168
190 DATA 96,56,32,240,255,138,72,152,72,24,162,
  0,160,0,32,240,255,169
200 DATA 42,208,198
  
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IS COMPUTING HAZARDOUS TO YOUR HEALTH?—

Do you have concerns about spending long hours at your computer? In April we'll offer some safety precautions you should take to prevent eye-strain, fatigue, aches or other health-related complaints, and take a look at *ergonomics*, the study of how technology affects the human body.

BIG BLUE COPIER—

Next month we begin a series of programs that let you copy files from MS-DOS to the Commodore computers and format an MS-DOS-compatible disk.

CES REPORT—

Commodore manufacturers and developers showcased their latest products at the Winter Consumer Electronics Show in Las Vegas in January. We'll present the highlights of the show and give you a preview of the products you'll be seeing in 1989.

QUICK WRITER—

If you're still searching for a C-128 80-column word processor, then this easy-to-use, menu-driven program may be just what you're looking for.

PLUS—

Reviews of the latest software releases, a hands-on review of the four-member family of NX-1000 printers, and *RUN*'s regular features and columns—including news, hints and tips and answers to readers' questions to help you get the most out of your Commodore computer.

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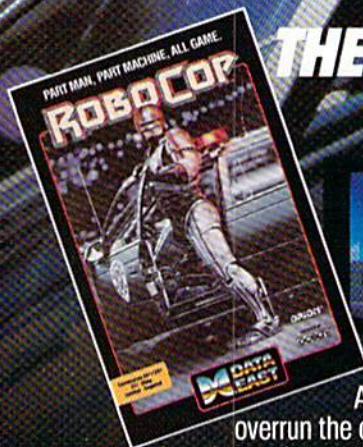
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