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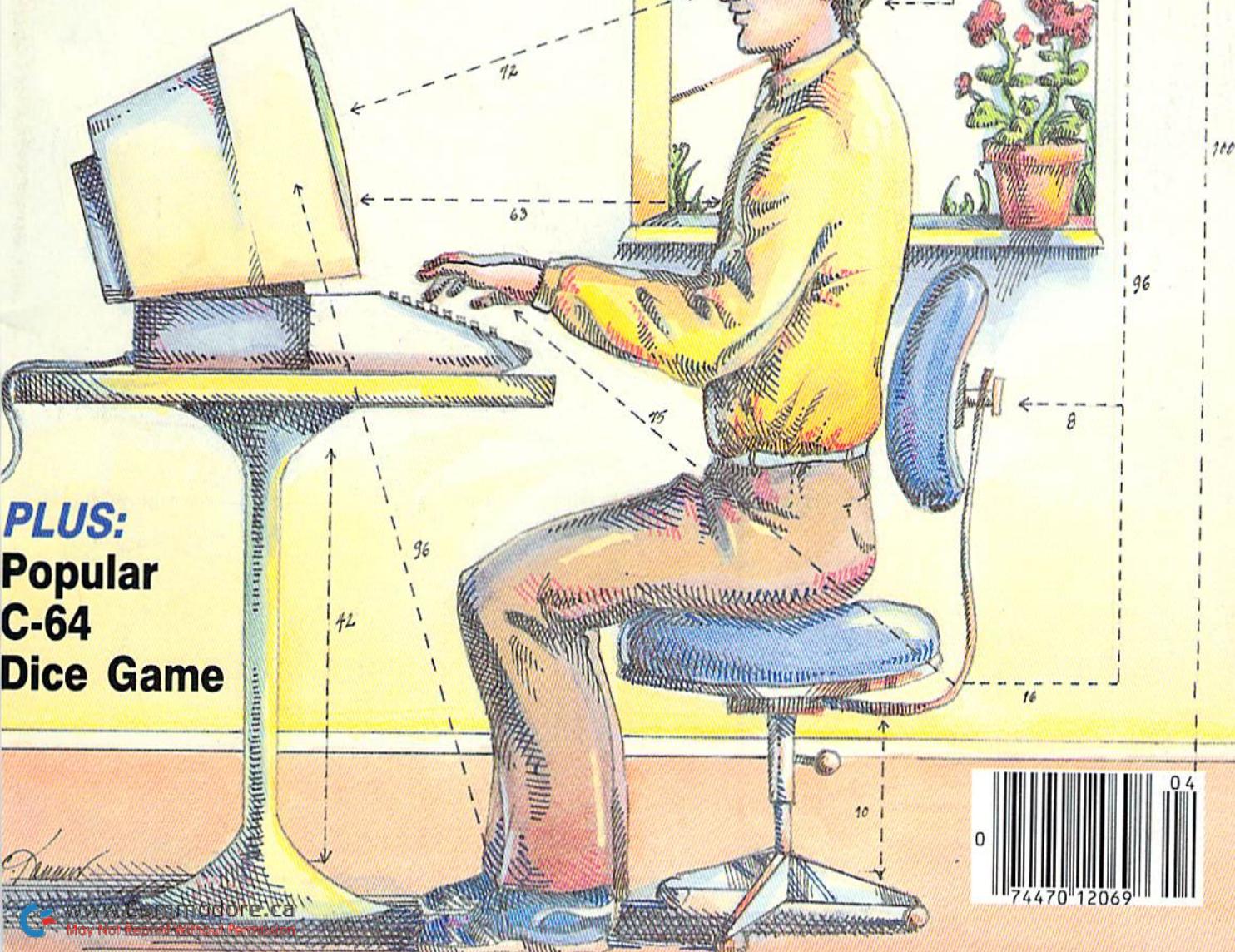
THE COMMODORE 64/128 USER'S GUIDE

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April 1989
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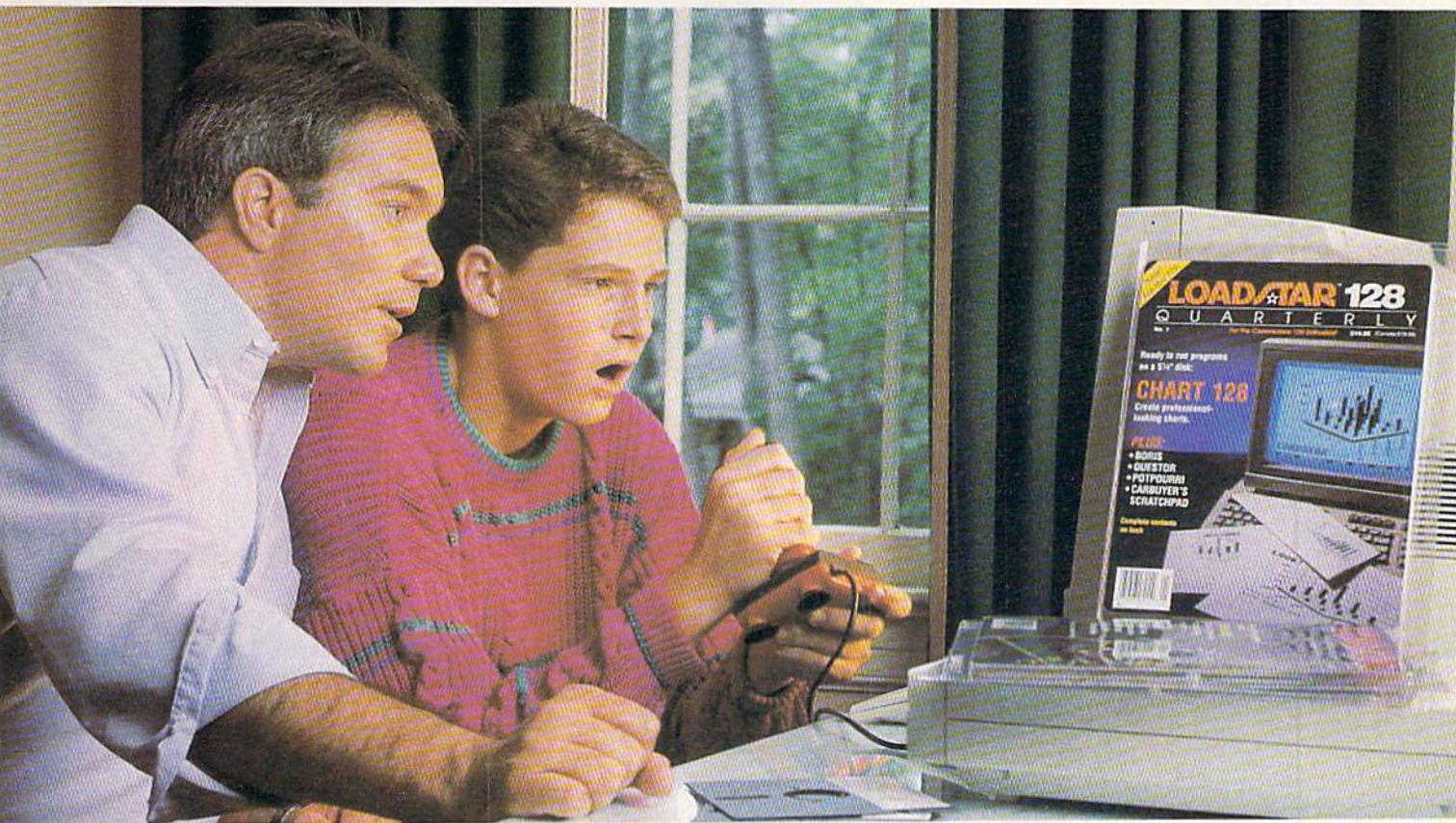


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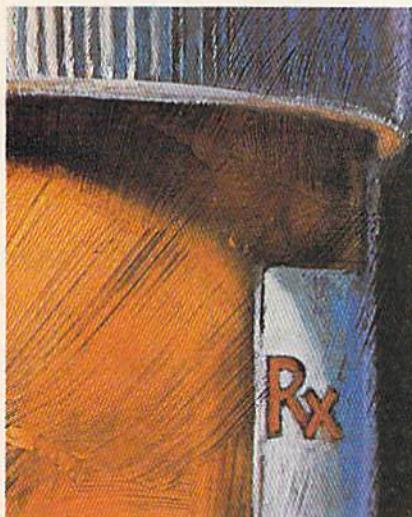


APPLE II SCREENS SHOWN

CONTENTS

VOLUME 6, NUMBER 4

APRIL 1989



PAGE 26



PAGE 35

COVER ILLUSTRATED
BY CATHERINE KANNER

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FEATURES

26 RX FOR HEALTHY COMPUTING by Lonnie Brown

Spending long hours in front of your computer can affect your health. Find out what you can do to avoid problems.

30 THE MS-DOS CONNECTION* by Miklos Garamszeghy

Transfer text and data files back and forth between MS-DOS and C-128 disks.

35 ROLL THEM BONES* by Robert Cook

Combining strategy with chance makes you a winner at this addictive dice game.

42 THE MULTITASKING FACTOR* by Jim Butterfield

A demonstration in multitasking—making a computer seemingly do two things at once.

53 JOURNEY TO THE CENTER OF YOUR DISK DRIVE by Ellen Rule

A searching look at the inner workings of your 1541 or 1571 disk drive.

57 AMAZING!* by Harold Bjornson

Some advanced C-128 commands heretofore available only on top-of-the-line personal computers.

DEPARTMENTS

4 RUNNING RUMINATIONS

Looking for signs of a "kinder, gentler" computing community.

6 MAGIC

The original column of hints and tips for performing Commodore computing wizardry.

10 NEWS AND NEW PRODUCTS

Recent developments and releases in the world of Commodore computing.

14 MAIL RUN

Input from our readers.

18 SOFTWARE GALLERY Reviews of:

- Caveman Ugh-Lympics
- Mavis Beacon Teaches Typing
- Who Framed Roger Rabbit?
- Wizardry II:
Knight of Diamonds
- Take Down
- GEOS Writer 64
- Jet-Boys
- Mars Saga
- Faery Tale Adventure
- Alcon
- Pool of Radiance
- Dungeon Masters Assistant Volume I: Encounters

60 HARDWARE GALLERY Reviews of:

- Star Micronics' NX-1000 Multi-Font
- NX-1000C Multi-Font
- NX-1000 Rainbow
- NX-1000C Rainbow printers

64 COMMODORE CLINIC by Lou Wallace

Answers to your questions about Commodore computing.

68 GEOWATCH by Bruce Thicksten and Tim Walsh

Answers to some commonly asked questions about GEOS.

72 RUN AMOK

We run corrected.

75 RUN'S CHECKSUM PROGRAM

Run it right the first time.

76 COMING ATTRACTIONS; LIST OF ADVERTISERS

* The listings for these articles are also available on the March-April 1989 ReRUN disk. To order, see page 52.



PAGE 53

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RUNNING RUMINATIONS

IN SEARCH OF "KINDER, GENTLER" COMPUTING

George Bush, our 41st president (and the fourth prime-numbered president to take office this century), ascended to the office partly on the promise of a "kinder, gentler nation." We're eager to see, then, if this promise will apply to the world of Commodore computing. We recently set out on a quest, of sorts, to locate signs of a "kinder, gentler" computing community.

Not at CES, where violence and mayhem are the themes of most of the games software being developed today—from street-fighting gangs to boot camp combatants to repulsive wrasslin' behemoths. This macho, no-wimp-type software dominated the scene at CES, which, aside from Berkeley Softworks' demonstration of the new GEOS 2.0 for the 128, was devoid of so-called productivity software.

We also witnessed other points of light, er, interest at the show. Commodore's attendance marked the first time in a long time that Commodore has been at CES. Their presence, however, did little to either stave off developers' growing support for video game machines and other home-computer systems (MS-DOS, Amiga and Macintosh) or encourage support for the Commodore 64 or 128. The hoopla at the Commodore booth centered around big brother, the Amiga. Many of the developers we talked with indicated that they will continue to champion the Commodore eight-bit market, while also developing software for other machines that they consider better growth markets.

Not in customer service, where some companies, now that they've made their money in the Commodore market, have turned their backs on the customers who helped them get to the top. Companies should provide toll-free numbers that customers can call for help, without putting the burden of customer service on the consumer. If they sold products in the Commodore market, they ought to continue to be responsible for providing customer support.

Not in product availability. Where have all the peripherals gone? Why can't customers get the products they need? A "kinder, gentler" development community would feel for the plight of users who can't obtain such necessities as a 1750 REU or a 1571 disk drive.

Not at Commodore, which, over the years, has developed a bad reputation of introducing computers and suddenly forsaking them. Well, they're doing it again. Their decision to no longer market the "flat C-128" or the 1571 drive in the U.S. effectively signals the death knell for that system, which was heralded as revolutionary at its introduction in 1985, but never received the support from software developers that it deserved. A "kinder, gentler" Commodore would continue to support the millions of C-128 owners who have invested time and money in using their machines.

Not in the Commodore user community, which, despite its sometimes blind loyalty to a computer brand name, is becoming less and less tolerant of indifferent attitudes from the manufacturing community. It's difficult to display kindness and gentleness toward companies who give you the cold shoulder or treat 64 and 128 customers shabbily in favor of Amiga owners.

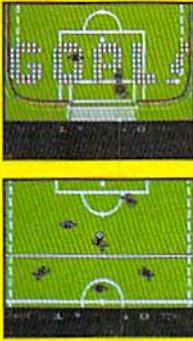
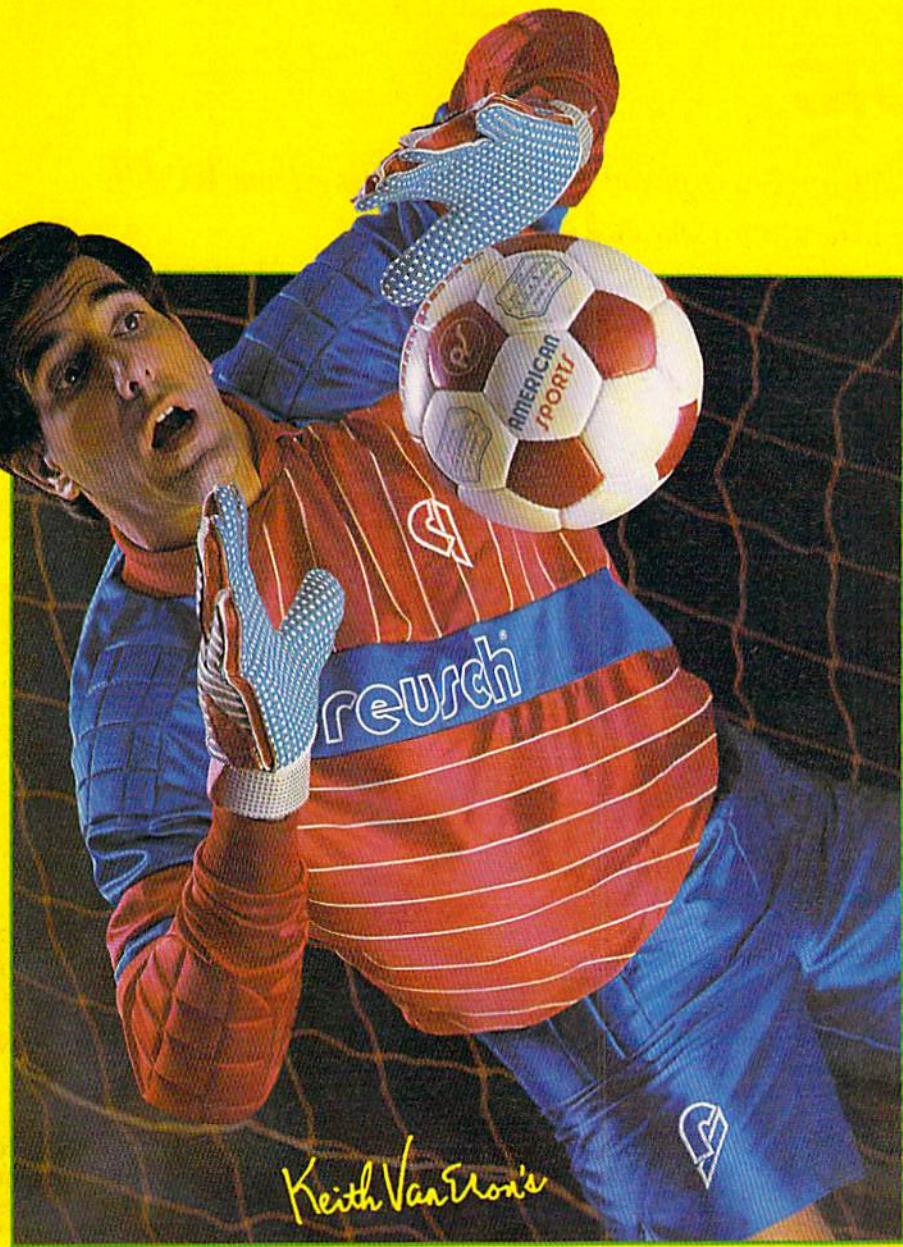
Not in the RUN editorial offices. Will you see a softening of our stance on issues and a slackening in our support of the Commodore eight-bit community?

READ MY LIPS: "Not a chance!"

*Will George
Bush's vision
for America
extend into the
computing
field?*



Dennis Brisson
Editor-in-Chief



C-64/128 Screens Shown



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MAGIC

Give your C-64 an Insert mode; make downloading from RUN's BBS a snap; or try out a moving-message routine.

Compiled by TIM WALSH

\$51A READING ALL FILETYPES

Hardly a Magic column or two goes by without presenting some sort of file reading utility. By now, most *RUN* readers are familiar with the following commands:

Read a Sequential file: OPEN 8,8,8,"0:file,s,r"

Read a Program file: OPEN 8,8,8,"0:file,p,r"

This process can be simplified, and it allows for the reading of all file types, including relative and user files. Just use a question mark in place of the first letter of the command as follows:

Read all filetypes: OPEN 8,8,8,"0:file,?,r".

—HOWARD LEW, SAN FRANCISCO, CA

\$51B MS-DOS-TO-C-128 TRANSPORTER

It has been generally true that even small programs posed large problems when a computerist wanted to convert MS-DOS Basic programs from an IBM-compatible with the intention of transporting them to work on the C-128. And converting the file into a format that permitted the C-128 to tokenize keywords shared by both Commodore and MS-DOS Basic was an exercise in futility.

My MS-DOS-to-C-128 program makes transporting your favorite MS-DOS Basic programs to the C-128 a lot easier. The MS-DOS Basic program you want to convert must first be saved to an MS-DOS disk as an ASCII file. Then you can use a utility such as The Big Blue Reader to convert and save the MS-DOS ASCII file to a Commodore-formatted disk as a Commodore-compatible sequential file. After typing in and saving the MS-DOS-to-C-128 program below, run it, and it will create a binary program on disk called ASCII Loader.

When you're ready to start, follow this simple two-step transporting process:

1. Enter: BLOAD"ASCII LOADER"
2. Enter: POKE 58,160:CLR:OPEN 1,8,8,"seq.filename,S,R":
SYS 4866

In the above example, "seq.filename" is the filename of the MS-DOS Basic program saved to a Commodore disk.

The sequential Basic program file is automatically read from disk and tokenized into Basic 7.0 using the C-128's keyboard buffer. Then it is simply a matter of editing any keywords that aren't compatible and saving the program to a Commodore-formatted disk as a program file.

```
Ø REM MS-DOS TO C-128 TRANSPORTER - DAVID  
KAPsanis :REM*45  
1Ø FOR I=4866 TO 5Ø33:READA:CK=CK+A:POKE I  
,A:NEXT :REM*96  
2Ø IF CK<>19296 THEN PRINT"ERROR IN DATA S  
TATEMENTS...":END :REM*24  
3Ø BSAVE"ASCII LOADER",BØ,P4866 TO P5Ø34
```

```
4Ø NEW :REM*35  
5Ø DATA 12Ø,169,Ø,133,251,141,Ø,21,169,96,  
133,252,141,1,21,169,251,141 :REM*123  
6Ø DATA 185,2,162,1,32,198,255,176,77,32,2  
Ø,255,162,1,16Ø,Ø,32,119,255 :REM*186  
7Ø DATA 165,144,2Ø8,63,238,Ø,21,23Ø,251,2Ø  
8,235,238,1,21,23Ø,252,76,29 :REM*237  
8Ø DATA 19,165,251,2Ø5,Ø,21,2Ø8,7,165,252,  
2Ø5,1,21,24Ø,83,169,3,197,2Ø8 :REM*185  
9Ø DATA 2Ø8,3,1Ø8,Ø,19,169,251,162,1,16Ø,Ø  
,32,116,255,166,2Ø8,157,74,3 :REM*250  
1ØØ DATA 23Ø,2Ø8,23Ø,251,2Ø8,213,23Ø,252,7  
6,58,19,169,1,32,195,255,32 :REM*76  
11Ø DATA 2Ø4,255,169,Ø,133,251,169,96,133,  
252,238,Ø,21,2Ø8,3,238,1,21 :REM*1Ø9  
12Ø DATA 12Ø,173,2Ø,3,141,Ø,19,173,21,3,14  
1,1,19,169,58,141,2Ø,3,169,19 :REM*32  
13Ø DATA 141,21,3,88,96,173,Ø,19,141,2Ø,3,  
173,1,19,141,21,3,1Ø8,Ø,19 :REM*1Ø0
```

—DAVID KAPsanis, ERIE, PA

\$51C 64 INSERT MODE

One of the major weaknesses of the C-64's Basic editor is its lack of an Insert mode. Most computers have an Insert mode in Basic that "pushes" characters over to the right of the cursor to simplify inserting characters into program listings. C-128 users just need to press ESC A to turn on Insert mode and ESC C to turn it off. C-64 users, though, must first place the cursor to the left of the text, hold down the insert-delete key until they think they have enough space, type in text, and then delete excess spaces.

My program, 64 Insert Mode, gives you this mode and improves the flexibility of the 64's built-in Quote mode. After typing it in and saving it to disk, run 64 Insert mode to activate the routine. Press the control and shift keys at the same time to toggle Insert mode on and off, and press run-stop to turn off the normal C-64 Quote mode and the Insert mode.

Another benefit of the program is that if you deactivate it by pressing run/stop-restore, it can be reactivated by pressing return without an entry.

```
Ø REM 64 INSERT MODE - SCOTT WEISGARBER  
:REM*151  
1Ø FOR T=5313Ø TO 53246:READ A:POKE T,A:CK  
=CK+A:NEXT :REM*16  
2Ø IF CK<>15472 THEN PRINT"ERROR IN DATA S  
TATEMENTS...":END :REM*211  
3Ø SYS 5313Ø :REM*166  
4Ø DATA 169,76,133,115,169,227,133,116,169
```



Pocket Author

TM

For the C-64

```
,207,133,117,169,1,141,156 :REM*0
50 DATA 207,96,0,173,156,207,240,47,165,20
3,201,8,144,41,201,64,240,37 :REM*171
60 DATA 201,51,240,33,201,63,240,23,197,19
7,240,25,165,157,240,21,165 :REM*226
70 DATA 212,208,17,169,1,133,198,169,148,1
41,119,2,208,6,169,0,133,212 :REM*161
80 DATA 133,216,173,141,2,201,5,208,8,173,
156,207,73,1,141,156,207,76 :REM*196
90 DATA 72,235,230,122,208,2,230,123,173,1
43,2,201,157,240,12,120,169 :REM*198
100 DATA 157,141,143,2,169,207,141,144,2,8
8,76,121,0 :REM*69
```

—SCOTT WEISGARBER, MONROEVILLE, NJ

\$51D SONGS IN THE KEY OF C OR F?

In Magic trick \$359 (*RUN*, November 1986), I told my fellow tricksters that the SID chip in my C-128 played music in the key of F rather than the key of C. I was pleasantly surprised to discover that my new C-128D's SID chip plays in the key of C. I guess that's one of the long list of improvements incorporated into the C-128D.

Regardless, to determine which musical key your C-128 plays in, I wrote the following program, Key of C or F. It first plays a C scale, followed by an F scale.

```
0 REM KEY OF F OR KEY OF C - NEAL SMITH
:REM*65
10 PRINT"(SHFT CLR)LISTEN TO THE KEY OF C.
..":REM*181
20 VOL 9:READ C:SOUND1,C,30:IF C=0 THEN 40
:ELSE GOTO20 :REM*124
30 DATA 4297,4822,5412,5724,6429,7217,8102
,8578,0 :REM*179
40 SLEEP2 :REM*211
50 PRINT"(CRSR DN)NOW THE KEY OF F...
:REM*124
60 READ F:SOUND 1,F,30:IF F=0 THEN END:ELS
E GOTO 60 :REM*233
70 DATA 5724,6429,7217,7643,8578,9644,1082
4,11448,0 :REM*187
```

—NEAL SMITH, ROCHESTER, NY

\$51E DOWNLOADING TIPS

The *RUN* editorial offices regularly get calls (and an occasional visit) from frustrated neophyte RUNning Board users who log on to our bulletin board and attempt to download some of the great software that's available there. Once they list the programs in a download area, then select a file for downloading, they're stumped at the "Ready for x-modem download" prompt that suddenly appears.

Here's what to do at that point: Your terminal package offers a download option that must be activated in order to initiate the download. For demonstration purposes, the procedure for downloading with *RUN* Term 64/128 (found on the *RUN* Works disk) entails pressing ALT/D (Commodore/D for the 64 version), followed by a 2 to select X-modem download, entering a filename, and finally specifying the filetype—program or sequential. Just be sure you have enough free disk space to capture the whole file. ▶

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M A G I C

This process varies from one terminal package to another, but is rarely more complicated than the above procedure. Familiarize yourself with your terminal program's documentation, and you'll be surprised at the ease with which programs and files can be downloaded. You'll find that many of the RUNning Board programs are worth the long distance phone bill you'll get at the end of the month!

—TIM WALSH, MAGIC COLUMNIST

\$51F C-128 DARTBOARD

If you have a C-128 or C-128D and a 1700 or 1750 RAM Expander, don't waste another minute! Type in C-128 Dartboard for an amazing 40-Column-mode animation demonstration. To gain control of the action, pressing + slows down the animation and - speeds it up. Finally, pressing E stops the program.

```

Ø REM C-128 DARTBOARD WITH RAM EXPANDER -
DAVID L. HARP :REM*161
1Ø FAST:GRAPHIC3,1:B=Ø:BK=Ø:S=1 :REM*24
2Ø COLOR1,2:COLOR2,7:COLOR3,3:COLORØ,15 :REM*35
3Ø C1=65:C2=45:N=1 :REM*114
4Ø FORA=4ØTO8ØSTEP2Ø:CIRCLE,8Ø,1ØØ,A,A:NEX
T :REM*226
5Ø FORA=ØTO36ØSTEP3Ø:DRAW,8Ø,1ØØTO8Ø:A:NEX
T:IFN=3THEN7Ø :REM*112
6Ø FORA=15TO36ØSTEP6Ø:CIRCLE2,8Ø,1ØØ,C2,C2
,A,A+1:PAINT2,+2,+1,1:NEXT:IFN=4THEN8Ø :REM*126
7Ø FORA=45TO4Ø5STEP6Ø:CIRCLE3,8Ø,1ØØ,C1,C1
,A,A+1:PAINT3,+2,+1,1:NEXT :REM*114
8Ø SLOW:STASH8192,8192,B,Ø:FAST :REM*9
9Ø B=B+8192 :REM*193
1ØØ IFN=1THENGRAPHIC3,1:C1=45:C2=65:N=N+1:
GOTO4Ø :REM*3
11Ø IFN=2ORN=3THENGRAPHIC3,1:C1=35:C2=35:N
=N+1:GOTO4Ø :REM*49
12Ø GRAPHIC3,1:SLOW :REM*47
13Ø B=Ø:BK=Ø:FORA=1TO4 :REM*239
14Ø FETCH8192,8192,B,Ø :REM*41
15Ø B=B+8192:IFB=8192*4THENB=Ø :REM*88
16Ø GETA$ :REM*45
17Ø IFCHR$(43)=A$THENS=S+2 :REM*59
18Ø IFCHR$(45)=A$THENS=S-2:IFS<1THENS=1
:REM*27
19Ø FORZ=ØTOS:NEXT:IFA$="E"THEN21Ø:REM*213
2ØØ NEXT:GOTO13Ø :REM*58
21Ø GRAPHICØ :REM*18

```

—DAVID L. HARP, NORWALK, OH

\$520 SLICK 64/128 SLIDER

Sliding message routines seem to be the most popular programs written for the C-64 and C-128, since there are so many of them. My contribution is an efficient catch-all sliding routine that works for the C-64 and the C-128 in both 40- and 80-Column modes. Hopefully, Slick 64/128 Slider will provide RUN readers with the ultimate sliding message maker.

```

Ø REM SLICK 64/128 SLIDER - JAMES WALKER
:REM*73

```

```

1Ø PRINTCHR$(147):FORI=1TO2Ø :REM*248
2Ø IF PEEK(65533)>253 THEN 4Ø :REM*94
3Ø D=211:GOTO5Ø:REM C-64 :REM*126
4Ø D=236:REM C-128 :REM*241
5Ø POKE D,I:FORS=1TO35:NEXT :REM*247
6Ø PRINT"(CRSR UP) {CTRL 8}HERE IT COMES..
. " :REM*64
7Ø NEXT :REM*2ØØ
8Ø FORI=2ØTO1 STEP-1:FORS=1TO35:NEXT :REM*148
9Ø POKE D,I :REM*34
1ØØ PRINT"(CRSR UP) {CTRL 2}THERE IT GOES.
. " :REM*29
11Ø NEXT :REM*24Ø

```

—JAMES K. WALKER, LYNCHBURG, VA

\$521 PACMAN'S REVENGE

Over the years, long-time computerists have developed mixed feelings towards the original Pacman character, a glutton who devoured other screen characters. Largely unseen for years, he recently resurfaced in Pacman's Revenge, a C-64/C-128 program that has the old villain back doing what he does best—devouring hapless souls.

```

Ø REM PACMAN'S REVENGE - MIKE DISMUKE :REM*174
1Ø PRINTCHR$(147):POKE 5328Ø,Ø:POKE 53281,
Ø:M=1:D=1:F=18:G=5Ø :REM*179
2Ø A1$=CD$(Ø)+"{HOME}{13 CRSR DNS}":A2$=A1
$+"{CRSR DN}" :REM*Ø
3Ø IF M=7 THEN GOTO 9Ø :REM*176
4Ø M=M+1:E=INT(RND(5ØØ)*2ØØØ)+1 :REM*26
5Ø PRINTA1$TAB(F+1)"{2 SHFT Qs}":FORA=1TOG
*2:NEXT :REM*52
6Ø PRINTA2$TAB(F)"{SHFT J}{2 SHFT Cs}{SHFT
K}":FORA=1TOG*2:NEXT :REM*2Ø
7Ø PRINTA1$TAB(F+1)"{2 SHFT Ws}":FORA=1TOE
:NEXT :REM*134
8Ø PRINTA2$TAB(F)"{SHFT J}{CTRL 9}{COMD U}
{CTRL Ø}{SHFT C}{SHFT K}":FORA=1TOG*2:N
EXT:GOTO3Ø :REM*77
9Ø P=INT(RND(1)*15)+1:POKE646,P :REM*215
1ØØ D=D+1:IF D=21 THEN GOTO 15Ø :REM*142
11Ø PRINTA1$TAB(D)"{SHFT W}{SHFT N}" :REM*169
12Ø PRINTA2$TAB(D)"{SHFT M}":FORA=1TOG:N
EXT :REM*169
13Ø PRINTA1$TAB(D)"{SHFT W}":REM*166
14Ø PRINTA2$TAB(D)"{2 COMD Ys}":FORA=1TOG
:NEXT:GOTO 1ØØ :REM*87
15Ø FORA=1TOG*9:NEXT:GOTO Ø :REM*1ØØ

```

—MIKE DISMUKE, BOONE, CO

\$522 64/128 DIRECTORY ARRAY

Using Basic, even compiled Basic, to read a disk directory into an array is painfully slow. The following program, 64/128 Directory Array, does the job much faster. It works with the 1541, 1571 and 1581 disk drives in both 64 and 128 modes, is relocatable, and selectively reads program files exclusively, sequential files exclusively, both program and



MAGIC

sequential files or all file types.

The two 80s in line 170 cause only program files to be read. Change either one of the 80s to 83 for reading both program and sequential files, or change both 80s to 83 for sequential files only. Change the two 80s to 82 and 69, respectively, for all file types. The first eight lines show how to use the routine.

```
0 REM 64/128 DIRECTORY INTO ARRAY - R. ERIC LEE :REM*207
10 DIMN$(288),E%(288):DN=8:IFFRE(0)=FRE(1)
   THEN30:REM DN IS DRIVE # :REM*73
20 Y=235:X=236:NC=208:B=842:IT=2816:GOTO40 :REM*127
30 POKE53280,0:POKE53281,0:Y=214:X=211:NC=198:B=631:IT=828 :REM*1
40 PRINTCHR$(147)CHR$(153):GOSUB90:OPEN1,DN,0,"$0":OPEN3,0:J=1:SYS IT+4 :REM*117
50 POKEB,13:POKENC,1:INPUT#3,N$(J) :REM*12
60 E%(J)=PEEK(252):J=J+1:SYS IT:IFPEEK(254)THEN50 :REM*48
70 CLOSE1:CLOSE3:PRINTCHR$(147):FS=J-1:FOR I=1TOFS:PRINTE%(I),N$(I):NEXT :REM*137
80 PRINT FS"FILES":BF=PEEK(251)*256+PEEK(252):PRINTBF"BLOCKS FREE":END :REM*233
90 FOR I=IT TO IT+171:READ A:POKE I,A:NEXT :RETURN :REM*96
100 DATA 169,0,240,97,32,204,255,162,1,134,254,32,198,255,32,228,255,32 :REM*68
110 DATA 228,255,32,183,255,208,116,160,29,32,228,255,136,208,250,240,71:REM*160
120 DATA 24,160,13,162,12,32,240,255,169,1,60,32,210,255,169,32,160,15,32:REM*114
130 DATA 210,255,136,208,250,24,160,13,162,12,32,240,255,32,228,255,201 :REM*89
140 DATA 13,240,77,201,34,208,245,160,0,32,228,255,133,253,32,210,255,32:REM*216
150 DATA 228,255,201,34,240,12,32,210,255,169,0,240,242,162,1,32,198,255:REM*117
160 DATA 32,228,255,240,10,201 :REM*221
170 DATA 80,240,43,201,80:REM READ INSTRUCTIONS FOR ALTERING LINE 170 :REM*58
180 DATA 240,39,208,241,32,228,255,32,228,255,32 :REM*40
190 DATA 228,255,133,252,32,228,255,133,251,169,0,240,150,169,1,32,195 :REM*239
200 DATA 255,169,0,240,8,169,0,133,254,169,0,240,239,32,204,255,24,160 :REM*238
210 DATA 13,162,12,32,240,255,165,253,96 :REM*123
```

—R. ERIC LEE, LOMPOC, CA ■

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

Commodore 64 games showcased at the Winter CES this past January highlight this month's column.

Compiled by HAROLD R. BJORNSEN

TV AND BOARD GAMES

NORTH MIAMI BEACH—GameTek (2999 NE 191st St., North Miami Beach, FL 33180) has released C-64 formats of popular board and television games. They retail for \$14.95 each.

In **The Price is Right**, guess the price of the prize. If you come closest without going over, you'll get a chance to go for the big money.

Answer questions, build up your spins and **Press Your Luck** for big bucks, but watch out for that nasty old Whammy!

In **Big Boggle**, shake the cubes and make as many words as you can before the timer runs out. The weirder the word, the higher the score.

Make big land deals, build hotels, win or lose millions as you **Advance to the Boardwalk**.

Get all four of your pieces home as fast as possible, but if you don't watch out for those slides—**Sorry!**—it's back to square one for you!

Try to keep a balanced budget and stretch that dollar till **Pay Day**.

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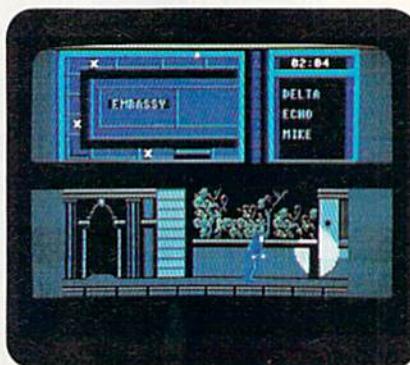
FOUR FOR THE 64

NORTHBROOK, IL—Mandscape has released four new games for the C-64, each retailing for \$29.95.

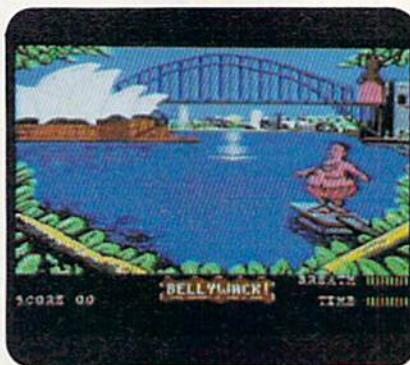
As a futuristic bounty hunter chasing Dr. A. Noid in **Road Raider**, an action-strategy game, you're on a quest to prevent the evil doctor from tainting your town with toxins, battling crazy rebel cars and armies of slimy mutants along the way.

Desperate terrorists have overrun the embassy and will stop at nothing to get what they demand. Your mission in **Hostage**, an action-adventure, is to neutralize the terrorists before their deadline expires.

In **Aussie Games**, a sports simulation, you compete in six offbeat and authentic games from Down Under. Give your beer gut a workout in the belly flop, break open a few tall, cool ones in the beer-bottle shoot, or cast yourself as a



Can you rescue the hostages before the deadline in Mandscape's game, **Hostage**?



Prepare to do the belly flop in Mandscape's **Aussie Games**.

fisherman in the marlin-fishing event. Then throw yourself into the boomerang toss, stream through the dry-river boat race, or prove how agile you are in beach football.

You've just been drafted for **Combat Course**, a top-secret training camp for the military elite. Test your skill and endurance, then create your own courses with the construction-set feature.

Check Reader Service number 403.

TWO RACES, TWO SPORTS

CHANDLER, AZ—ShareData (7400 West Detroit St., Suite C-170, Chandler, AZ 85226) introduces four new games for the C-64. Each retails for \$9.99.

In **SkateRock**, you help Awesome

Earl use his jumping, swerving, spinning and wheelie skills to thrash his way around ten courses and collect flags in a race against the clock.

Enter the Dragon's Temple in **Snapshot**, where you must use your karate skills to fight the army of Dragon Warriors as you search for the innermost secrets of the ancient master. **Cave Fighter**, a bonus game, has you battling horrible aliens.

Choose from one to eight players and a pool of ten teams in **World Cup Soccer**. You control the player as you dash across the field toward the goal. A bonus game, **Big KO**, wherein you match muscles with big-name boxers, is also included.

Racing Simulation Games contains two games: **Max Torque** has you doing wheelies and turbo boosts on your motorcycle; **Aqua Racer** contains 3-D graphics and 20 courses to test your boating skills.

Check Reader Service number 401.

TEN FOR THE PRICE OF TWO

NORTHBROOK, IL—Mandscape (PO Box 1167, Northbrook, IL 60062) has combined ten of its popular games for the C-64 in two packages under its Thunder Mountain label at a price of \$24.95 each.

Kick...Butt...& Slam contains **Bop'n Wrestle**, wherein you use pile drivers, airplane spins and other crazy wrestling stunts against ten wrestlers; **Rambo: First Blood, Part II**, which takes you on a rescue mission complete with grenades and machine guns; **Fist: The Legend Continues** to put your Kung Fu skills to the test against Ninja assassins and Shogun warriors; **Uchi Mata**, in which you can perfect your Judo throws; and **Usagi Yojimbo**, wherein you control a rabbit that deals death blows to fierce Ninjas and evil bandits in a quest for a kidnapped lord.

Top Flight packages **Top Gun**, which puts you in combat as a Navy F-14 fighter pilot; **Infiltrator**, where you control a Gizmo DHX-1 Chopper to infiltrate enemy lines in a search for the ►

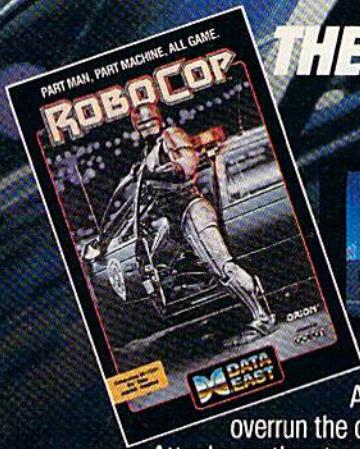
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NEW PRODUCTS

Mad Leader; Uridium, in which you battle wave after wave of attackers in your fight to destroy the evil Super-Dreadnought ship; Parallax, which lets you explore space and fight off aliens and deranged scientists in your race to disarm an evil computer; and Trailblazer, a high-speed race that takes place on a 3-D color grid, with 20 courses and five play modes.

Check Reader Service number 402.

AD&D, NAZIS AND FUTURE-PAST WARS

MOUNTAIN VIEW, CA—Strategic Simulations (1046 N. Rengstorff Ave., Mountain View, CA 94043) offers three new games for the C-64.

Every visit to **Hillsfar**, an Advanced Dungeons and Dragons role-playing, action-adventure game and the name of a city, is different each time you play. You can explore the city, meet its denizens on the streets or in pubs and discover many possible quests, which will keep you constantly on the move. You'll fight in the arena against raging minotaurs, ill-tempered orcs and other evil opponents. You'll need maze-running and lock-picking skills in the different buildings you enter; and archery and equestrian events may also be a part of your overall pursuit. \$39.95.

First Over Germany, a flight emulator, has you joining the men of the 306th Bombardment Group on 25 combat missions over the skies of Nazi Europe. You get to pick your own crew to fly a B-17 Flying Fortress, then train for flying missions to raise your crew's efficiency and experience. You'll need to learn to deal with flak, mechanical/engine failures, fuel conservation, bailing out and falling out of formation. \$49.95.

Overrun, a tactical game of modern armored warfare set in 1992, includes helicopters and new and near-future weapons systems. You can play eight pre-programmed scenarios, three of which depict the Arab/Israeli battles of 1973, or you can create your own scenarios, pitting NATO forces against the Warsaw Pact nations. \$49.95.

Check Reader Service number 404.

NEW YORK NINJA

MENLO PARK, CA—**Last Ninja 2**, the action-adventure sequel for the C-64, continues the original storyline after the defeat of Shogun Kunitoki, a Samurai Master who eliminated the entire brotherhood of the White Ninjutsu, except one—the Last Ninja. Players are trans-

ported from the Shogun's domain in Japan to the streets of Manhattan, where they begin the quest to destroy the evil Samurai Master Armakuni. To survive, players must use all their martial arts skills to outrun, outfight, outmaneuver and outwit New York's corrupt police, who protect the merciless villain.

You make your way through seven levels, including Central Park, the Street, the Sewers, the Mansion, the Highrise and the Inner Sanctum, with mazes to explore, puzzles to solve and enemies to fight. You'll be equipped with an arsenal of weaponry—sword, staff, nunchucks and a shuriken to break the evil stronghold. It's available for \$34.95 from Activision, 3885 Bohannon Drive, Menlo Park, CA 94025.

Check Reader Service number 405.

HEAVY BATTLE WITH ROBOCOP

SAN JOSE—Data East USA (470 Needles Drive, San Jose, CA 95112) introduces two new games for the C-64, available at \$29.95 each.

In **RoboCop**, an action-adventure game, Old Detroit has been taken over by the corrupt underworld. As RoboCop, a part-man, part-machine vigilante, you battle evil forces in the streets and must confront the corrupt leaders of the private company, O.C.P., who want to destroy you. The game features many levels of play that follow the movie's theme, including battles with the kingpin of the underworld and the evil robot Ed 209.

In **Heavy Battle**, a one- or two-player arcade game, you have to capture the underground control complex of a nuclear missile site currently occupied by terrorists who have tanks, treacherous waterways and bridges under their control. They also have the only weapon capable of destroying their organization—Heavy Battle, the most powerful gun ever created. You must find the dismantled gun, reassemble it and destroy the terrorist leader to regain control of the complex.

Check Reader Service number 406.

FROM AFRICA AND THE ORIENT

SAN JOSE—Capture your opponent's stone with **TrianGO**, an Oriental game for the C-64 from California Dreams (780 Montague Expressway, Suite 403, San Jose, CA 95131). The strategy game is played by placing brightly colored stones on a hexagon-shaped playing field in an attempt to create triangles, control territory and capture your

opponent's stones. The object is to be the last player able to make a move. TrianGO can be played against the computer or a friend. \$29.95.

Mancala, found in the jungles of central Africa and throughout the desert lands of Egypt, Africa's national game has been played by chieftain and peasant alike. The strategy is to place stones in your home cup to rack up points while preventing your opponent (a friend or the computer) from gaining points. It's available for the C-64 for \$29.95.

Check Reader Service number 407.

MON DEUX!

CRETEIL CEDEX, FRANCE—UBI Soft (1, voie Felix Eboue - 94021, Creteil Cedex, France) presents **Skateball**, a violent C-64 soccer game of the future, played in a space-age ice stadium. You lead your team to victory through a series of deadly hazard- and crevassestrewn rinks and the kicking and barging tactics of your opponents.

In **Puffy's Saga**, an arcade-style strategy game for the C-64, you and your girlfriend, Puffyn, are trapped in an alien world, where you must travel through mazes and face numerous enemies. Your only chance of survival is to solve clues that will help you discover weapons and escape hidden traps. Prices for these games were not available at press time.

Check Reader Service number 408.

ANOTHER WORLD

VAN NUYS, CA—**Might and Magic II: Gates to Another World**, for the C-64, is a sequel to Secret of the Inner Sanctum, wherein you're challenged to solve an adventure game through the use of cunning, might and intelligence. Enter the mysterious world of Cron and explore a doomed land, where rumors abound that terrible destruction will occur as the land approaches its millennium. As you and your party of eight travel across Cron, the truth of the rumors comes out, and you must seek out and vanquish their source. In looking for clues, you'll explore more than 60 different areas in Cron. You'll also have to face over 250 bloodthirsty, ravenous monsters. But you have at your disposal 96 magic spells, over 250 weapons and mystic items, an advanced combat system and hundreds of quests. No price had been set at press time. New World Computing, Inc., 14922 Calvert St., Van Nuys, CA 91411.

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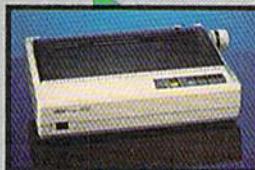
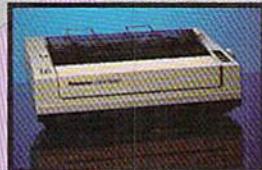
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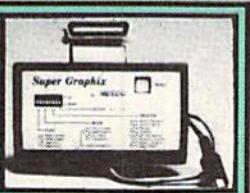
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MAIL RUN

Our Lt. Kernal critic responds to reader criticism; 128 owners defend their machine; and a reader has no trouble typing in listings from RUN.

ADDENDUM AND CORRIGENDUM

In last February's Software Gallery, I reviewed Xytec Software's Macro Set 1, a toolbox of assembler macros for the C-64. Now the company has released an enhanced version of the package. While the original supported only the Commodore Development System, this new release includes a version for users of the Merlin assembler.

Also, the February review erroneously reported that a version for the PAL assembler was in the works. Unfortunately, this is not the case, as PAL is not a macro assembler.

—MICHAEL BROUARD
HERNDON, VA

128 OWNERS RESPOND

Concerning Daniel O'Bryant's Atari vs. Commodore 128 comments in the February 1989 Mail RUN (see the letter entitled, "Double Trouble"), perhaps his problem is as simple as not yet having learned how to properly use his 128. I've a suspicion that the inconsistent performance of which he complains is caused by his lack of familiarity with the machine's capabilities.

—SI LABAR
BETHLEHEM, PA

I've had my C-64 for a number of years now, and I've moved up to an Amiga 500, but I still get plenty of use out of the 64. And, after working on a C-128, I'm ready to say that Commodore computers beat the pants off any Atari 800XLs and 130XEs, and my Amiga 500 kills an ST.

I won't criticize anyone for liking Ataris, but aren't Commodore users just as loyal? Maybe Mr. O'Bryant received a defective 128; it does happen sometimes, you know.

—CHRIS DIGIUSEPPE
CONSTABLEVILLE, NY

My first computer was an Atari 800 XL. Two months after I bought the

machine, it failed to recognize my printer and disk drive. And Atari Corp. was no help at all—they wouldn't even answer their phones. Since then, I've had two Commodore computers and an Atari 1200XL. Both Commodores work flawlessly under heavy use. The 1200XL, however, developed the same problem as the 800XL. All things considered, I find Commodore far more reliable.

—STEPHEN E. NOLAN
GREAT BEND, PA

Lt. KERNAL RESPONSE

After reading John Premack's review of the Lt. Kernal hard disk drive system (Hardware Gallery, December 1988), I felt as if I'd been on a roller coaster ride! In one statement, he loves it; in another, he hates it.

I've owned one of these drives since 1985, when it was first introduced. I now own four of these drives, and they've all performed flawlessly. Two of the drives are used for my BBS. They run 24 hours a day, every day.

Maybe this fantastic piece of hardware and DOS programming may not be right for Mr. Premack, but for the business user, BBS operator or even the home user who wants to get the most from his hardware, it is perfect.

—ALAN BRAGG
HOUSTON, TX

We've received a lot of letters regarding that review, Alan. John Premack writes: "I am delighted to find such spirited advocacy for the Lt. Kernal from RUN's readers. It is clear that its defenders are thoughtful, experienced and serious computer users."

"My judgments of the Lt. Kernal are based on personal experience with practically every storage device ever offered for Commodore's 8-bit machines, including the 4040, 8050 and 9060 hard drives."

"I'm a reviewer, not a cheerleader. I must introduce a product, hit the highlights, assess its quality and offer a conclusion—all in a limited space."

"I wholeheartedly agree that the Lt. Kernal offers previously unheard-of capabilities

to Commodore owners. Just because the review unit I used had a few glitches was no reason to condemn the system. And I didn't. Fiscal is a fine company and the Lt. Kernal is a fine product."

"Perhaps I ignored the obvious—that the majority of C-64 and 128 users have no interest in such an expensive and sophisticated device. However, since fixed storage is commonplace with almost every other personal computer on the market, the topic is of interest to a wide number of people. I felt it was necessary to review the Lt. Kernal from the perspective of the average user."

"Users who spend \$1000 for a fixed disk are certainly committed to their computers, but they represent only a minority of Commodore owners. My review was written for the majority."

—EDITORS

SEE—IT CAN BE DONE!

I want you to know that this novice computerist typed in her first magazine listing from RUN—Rainbow Plant ("Raising Rainbows," January 1989)—with no problems at all. Your Checksum program was simple enough for a beginner, and your explanations were clear. Then I typed in the Pumpkin program ("Scared Silly!" October 1988) and Calendar 2001 ("2001: A Calendar Program," January 1989). It was easy! Your Magic tricks are also great. Thanks, and keep up the good work.

—DONNA FERGUSON
SAN DIEGO, CA

Thanks for your letter, Donna. It's a welcome change to hear from someone who is not having trouble.

To any readers who are having problems typing in listings from RUN, there are a number of steps you should follow to ensure accuracy so that the programs run flawlessly (except for an occasional error on our part). First, become familiar with your computer system. Unfortunately, computers aren't as easy to use as your car, so read the manuals that came with your computer and peripherals! Second, read the text for the Checksum program found in every issue of RUN. Third, type in the listing carefully and



proofread your copy against the magazine listing. Be especially watchful for errors in Data statements. Fourth, if the program doesn't run after checking for typing errors, send a copy of your listing to us (with a SASE)—we can't tell you what's wrong without seeing it.

Donna, you are proof positive that it can be done!

—EDITORS

SERVICING OUR SOLDIERS

I wrote this letter on behalf of over 1,500,000 armed service personnel in countries around the world. We are a computer-literate bunch, and few of us work without computers. Many of us use our free time hacking away at our machines. If mail order firms would like to attract some business from us, here are some tips:

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2. Calls are very expensive, so try not to put us on hold. Give us quick attention, or the cost of the call will erase any price advantage of calling you.

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4. Please assign regular customers a number, or let us just give you our names so we don't have to dictate long addresses.

5. It costs no more to mail to us than to anyone else who lives on the East or West coasts. Once an item gets to New York or California, it ships free from there. Why, then, do you list special handling charges for APO and FPO orders?

6. For the junior soldiers, it is much easier for them to get Discover and Visa cards than other types. Please service those cards.

7. Please consider not requiring us to call first before returning truly defective merchandise.

8. Finally, consider running a box in your ads that says, "We appreciate GIs and their families overseas. We want to do business with you." You'll get our business.

—MAJOR KEITH H. HODGES
APO, NY

CORRECTION

Please inform your readers that the telephone number for Software Specialties listed in the Class Ads in the February 1989 issue of RUN is incor-

rect. The correct number is 1-205-351-9038. Thank you.

—GARY M. HUDSON
PRES., SOFTWARE SPECIALTIES
DECATUR, AL

PLEASE "ICONCONTROL" TIM!

I feel that reviewer Tim Walsh unjustly put down the IconTroller joystick in his article, "Trigger-Happy" (RUN, February 1989). In the instructions included with the stick, it states that it is not designed for use with games. I bought one just for use with GEOS. I really enjoy it, since I need not take both hands off the keyboard just to move or click on an icon. I believe it works very well, and does the job it was made to do.

—H. MARK NEWMAN
MIDDLEVILLE, MI

Yes, the IconTroller is a good stick for the purpose it was intended for. However, the

purpose of the review was to point out that the stick was not meant for game playing.

—EDITORS

HALF EMPTY OR HALF FULL?

Imagine my dismay on receiving the RUN GEOS Power Pak disk and finding that two of the utilities on it will not run under GEOS 128. The inability to run either geoTerm or Pattern Editor came as a shock. I urge you to provide a similar program expressly for GEOS 128.

—JEFFREY TSCHILTSCH
LA MESA, CA

The GEOS Power Pak was advertised and sold as a disk for the C-64 only. The fact that eight of the ten programs also run on the C-128 is an added plus for owners of the 128. We're currently working on another GEOS disk containing programs that are all intended to work on either the 64 or the 128.

—EDITORS ■

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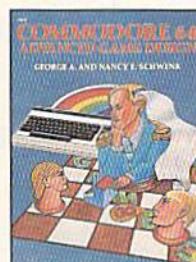
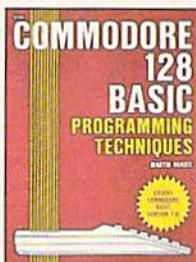
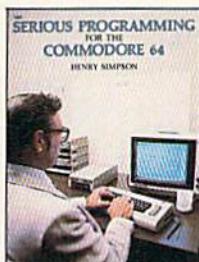
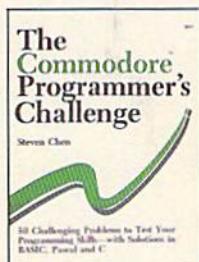
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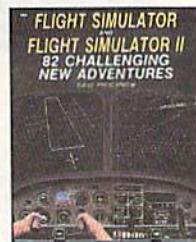
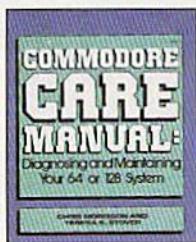
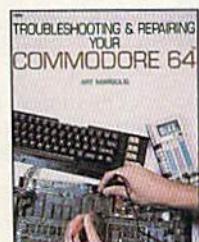
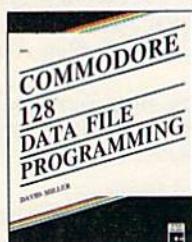
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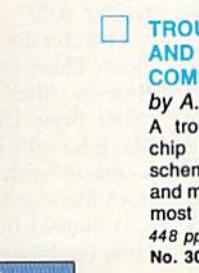
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SOFTWARE GALLERY

April showers bring a mixed bag of wrestling, role playing, adventure and productivity programs—no foolin'!

Compiled by BETH S. JALA

CAVEMAN UGH-LYMPICS A

Cowa-Bunga! Neanderthal Man Was Never This Funny!

Can a computer make you laugh? If you own Caveman Ugh-Lympics, then the answer is a definite "yes!" I've never had a piece of software make me cackle, chortle, tee-hee, chuckle or titter as much as Caveman Ugh-Lympics!

Unga-Bunga. That phrase typifies the overall feel of this ingenious parody of Olympic-style games. You won't find pole vaulting, relays, the discus throw or archery competition here. Instead, because you're working with prehistoric athletes, you get to try your hand at dino vaulting, saber racing, the mate toss, the dino race competition, fire starting or clubbing.

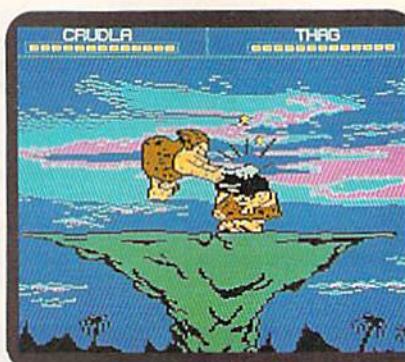
Whether you go head to head against a friend or the computer, you're bound to have a delightful time. What else would you expect with competitors named Thag, Ugha, Gronk and Glunk?

Caveman Ugh-Lympics opens with an Olympic theme song and ceremony. The song is distressingly familiar, but so purposely out of tune and primitive that it sounds more like a monkey bashing two garbage can lids together.

Since most of the would-be Olympians have the combined IQ of a tennis ball, don't be surprised if they snort, cluck, frown and make idiotic faces while you're selecting a competitor.

You have the option of practicing the events, which is advisable. It'll take more than a few tries at dino vaulting before you become proficient. (As the name suggests, dino vaulting finds your man attempting to vault over a huge dinosaur. One slip, and you're lunch for this overgrown lizard.)

The graphics and animation are so well done that they could easily be straight out of *The Flintstones*. Caveman's graphics weren't meant to be as upscale as those of Epyx' Summer/Winter Games series. They're more cartoon-like and easily lend themselves to the aura of the game. The animation is



Clubbing is one of the prehistoric games you can play in Caveman Ugh-Lympics.

so fluid that, at times, I felt as if I were watching a Saturday morning cartoon.

The program includes an amusing newspaper, the *Ugh Zaminer*. While the documentation is thorough and includes hints for the various events, the newspaper also contains clues to help you get the most out of your racing dinosaur, swinging your bashing club or vaulting over the nastiest dinos.

Caveman Ugh-Lympics is a comedy

that pokes fun at the proliferating Olympic-style games, and it certainly doesn't try to take itself too seriously. It's a captivating program that makes you smile, no matter how many times you play it.

Just to let you in on the kind of mentality you're up against here, a clip from the obituary section of the *Ugh Zaminer* reads: "Blog Blog, the oldest known caveman, died yesterday at the incredible age of 38. In an interview just before his death, when asked how he had managed to live so long, Blog replied, 'Not die.'"

Obviously, Blog Blog was a superb dino vaulter. (*Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/ \$29.95.*)

—JOHN RYAN
BILOXI, MS

MAVIS BEACON TEACHES TYPING A

Learning to Type Made Fun!

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!

There is light at the end of the learning-to-type tunnel. In fact, there's a "beacon." *Mavis Beacon Teaches Typing* can help you learn the keyboard (including Dvorak) or improve your typing skills.

First, let me make one thing perfectly clear: There is no such person as Mavis Beacon. She's only a marketing tool. What Betty Crocker is to the kitchen, Mavis is to the keyboard. As Betty works wonders with budding cooks, Mavis does likewise for typists.

It should be obvious she's not real: How could any typing instructor keep track of every student's every keystroke, and thereby determine that a particular student is having trouble with the home-row keys of the right hand? And I don't know of any human instructor who'd invite me to play an arcade-like race game, where I'm in a car, typing words that appear as clouds across the windshield. The program also includes a "Meet Mavis" demo that introduces ►

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Rick Keefer, San Diego, CA

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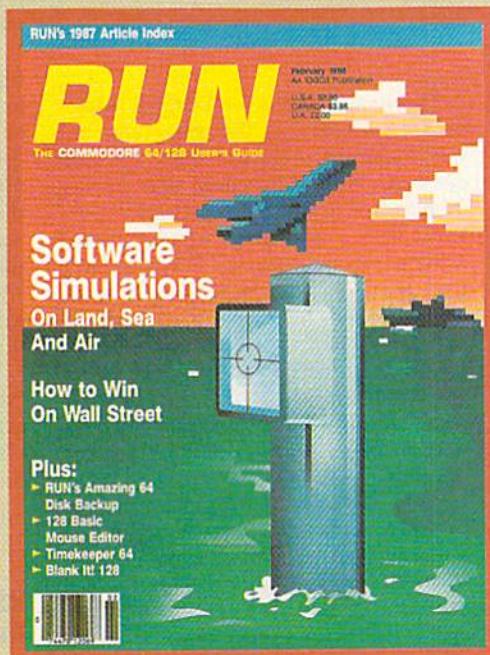
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SOFTWARE GALLERY

new students to the four areas they'll work in—Chalkboard, Classroom, Workshop and Game Room.

You won't be typing "fgf fgf fgf jhj jhj." Mavis offers quotes, excerpts from Sherlock Holmes' adventures, facts from *The Guinness Book of Records*, riddles, jokes and just about anything else that will hold a typist's interest.

It's no problem if you don't know where to put your fingers on the keyboard. A separate screen shows the keyboard and hands placed on the home row. When a key is struck, the screen tells you which key is depressed and what finger of which hand you should use to press it. An informative booklet also diagrams hand placement, as well as letter forms and sample resumes.

Pressing F7 produces an Options menu at the top of the screen. Under the Requests section, you can call up graphs that show errors on each key, errors by left and right hand or by finger, transposed letters, speed per letter and other combinations. This menu also lets you change the program's teaching style.

Unlike a real typing teacher, Mavis won't tell you when you're slumping in the chair, or when your wrists are hitting the desktop. But then again, she won't rap your knuckles with a ruler, either.

Pay attention, and you'll leave Mavis Beacon's mythical classroom a faster and more accurate typist. (But even Mavis would advise you to use *RUN's Checksum* program when you are entering program listings from the magazine.) (*The Software Toolworks, 19808 Nordhoff Place, Chatsworth, CA 91311. C-64/\$39.95.*)

—LONNIE BROWN
LAKELAND, FL

WHO FRAMED ROGER RABBIT? A—
*Great Graphics and Zany Fun
Step From the Big Screen
To Your Monitor*

You've seen the movie, and may even have read the book—now play the computer game! Your job as Roger's director is to help him pilot Benny the Cab from Maroon Cartoons to the Gag Factory where Jessica is being held captive by Judge Doom. On the way, you'll stop at the Ink & Paint Club to see if you can locate Marvin the Gag King's will. It can save Toontown from the judge and his cutthroat weasels.



Your job in *Who Framed Roger Rabbit?* is to get Roger around town with the help of Benny the Cab.

There are some well-drawn introductory screens in this program, but you'll want to press the space bar and get right into the action after seeing them a few times. The loading is slow. Even with a fast-load cartridge, you'll think someone's poured Stay-Put Glue from the Gag Factory into the disk drive.

The game begins with a ride in bouncing Benny, the street-wise cab, complete with accordion suspension for bounding over the Red Car trolley and those puddles of Toon-Dissolving Dip. Accumulate five buckets of dip, and Toontown is history.

Along the way, Benny can bounce up to catch various objects hanging on buildings: diamonds can wipe a bucket of dip from the tally sheet; green gloves can protect Benny from the puddles; and a tire gives Benny extra speed in the race to the Gag Factory. Benny can even run along on the rooftops to make better time.

First stop: The Ink & Paint Club, where Roger scurries around seven tables, picking up checks, menus and napkins placed on the tables by two persistent penguin waiters. Because Marvin's will was written in invisible ink, Roger must try to pick up as many items as possible while avoiding tumblers full of dip that are also on the tables. A magpie jazz trio provides delightful music for this three-minute table sprint. Be careful, though, because the big gorilla bouncer frowns on kwazy wabbits running about the restaurant.

Assuming Roger hasn't filled his dip-bucket quota, it's back into Benny for the final race to the Gag Factory where Jessica, Doom and the weasels await. If you think getting there was half the fun, you'll find out that all the fun is at the Gag Factory. Roger can use various gags from the factory crates to out-fox Judge Doom's goons: portable holes for drop-

ping through floors, Stay-Put Glue, giant magnets, vanishing cream and the handy Box-O-Matic mallet.

The computer game is faithful to the movie. It offers good graphics and game play, but it's not perfect. I don't like the fact that if Roger fails, he's pictured on the screen weeping, and the computer locks up. There's no way to restart the game without rebooting. Also, not only is the disk apparently copy protected, but the program is also further protected by the documentation. Before going into the Ink & Paint Club, you must first type in the answer to a question from the "Gag Factory Catalog." (Now where did I put that thing?)

Finally, there's no way to practice one segment of the game or to go directly to the Gag Factory, which could almost be a separate game in itself.

One thing I appreciate is that the screen displays shown on the back of the box are the same as those you'll see on the screen. Too many manufacturers picture "actual arcade," "Atari" or "Amiga" screens, so that you can't tell what the game you're buying is going to look like.

Well, it appears that I've reached the fifth bucket of dip. And we Toons know what that means: Roger. Over and out. (*Buena Vista Software, 500 S. Buena Vista, Burbank, CA 91521. C-64/\$29.95.*)

—LONNIE BROWN
LAKELAND, FL

WIZARDRY II: KNIGHT OF DIAMONDS B+
*Role-Playing Sequel
Takes Adventurers
A Step Further*

So you have been to the Proving Grounds of the Mad Overlord and dealt with Werdna. What more is there to life, you may ask? Prepare to tackle the second Wizardry scenario.

Knight of Diamonds continues in much the same vein as the Proving Grounds of the Mad Overlord, the main module of the Wizardry scenarios. Once again, you journey into a maze with a team of multi-dimensional characters. As in the original, you have before you a landscape that includes a tavern, trading post, inn, temple and training grounds.

This time, however, some expertise is required to begin. You cannot play Knight of Diamonds without the use of "high level characters." To get these, you must use characters you've created

SOFTWARE GALLERY

and adventured with in other Wizardry scenarios.

Once in the Knight of Diamonds maze, you're rewarded with booby-trapped treasure chests and treasure-guarding monsters that become more dangerous as you progress. (I must admit that the relatively amusing depiction of such creatures as "wereamoebas" and sad-faced blue "hellhounds" considerably alleviates the fear.)

An adventurer with one foot rooted in a late 1980s technological culture (and without infinite time to put into the game) might have some questions. Why, for example, in a universe with teleporters, is the treasure always old-fashioned gold pieces? Why can't the fighting team's plans change, so that if the monsters are decapitated by front line fighters, valuable spells cast by those in the rear aren't wasted? Is there a way to determine the powers of a level 6 thief (as opposed to the powers of a level 8 mage)? Also useful would be some descriptions of the differences among weapons, especially since the plot revolves around armor.

And a minor complaint: portentious announcements presented during the course of the game would be more effective without the distractions of grammatical errors. We should be able to assume that true powers would avoid such elementary mistakes.

As in the other scenarios, there's a price to pay for the game's complexity. With a single disk drive, it takes about 30 minutes to prepare a new scenario disk. And you must rely on the original Wizardry manual for basic instructions, with little or no help to make it through the Knight of Diamonds. Thankfully, fanatics do have recourse in the Sir-Tech "hot-line support system," a phone number available seven days a week. (Be prepared, however, to feel like a fool. "Did you look in the pit for the body?" I was asked. "Pit?" I shrieked. "What pit?")

Make no mistake about it; this is a complex game, a worthy reward (and a good return for the money) for those who have survived the secrets of the Proving Grounds of the Mad Overlord and have not overloaded on hobbits,

ninjas and so forth. More scenarios are forthcoming for those who cannot get enough of this world. Meanwhile, remember this: Don't waste your makani on a wereamoeba. Now as for a werelion, that's another story. . . (Sir-Tech Software, Inc., PO Box 245, Charlestown Ogdensburg Mall, Ogdensburg, NY 13669. C-64/\$39.95.)

—SHARON G. WEINER
CHICAGO, IL

TAKE DOWN B

Watch Out, WWF!

The Gamestar WF

Is on the Mat!

Wrestling occupies a special place in the world of professional sports. Take Down faithfully reproduces the athletic elements of this unique institution and also re-creates much of its pageantry. In other words, you get to grunt and grapple while prancing and posturing like famous mat stars. ▶



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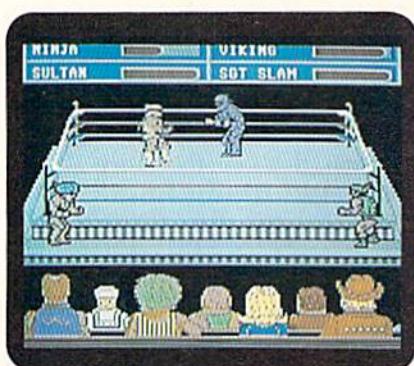
If you like to make friends and meet people, the quickest way to do it is through one of CompuServe's Special Interest Forums. Dedicated to a variety of professions, hobbies and particular interests.

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—Guruka Singh Kalsa, Physics Engineer

SOFTWARE GALLERY



Your mat men can play against the computer or a friend in Take Down.

Take Down begins with a fight promoter filling you in on the records and best moves of eight ring warriors. You select a two-man tag team from his list. Possible choices include Sgt. Slam, a Green Beret turned wimp-smasher, and Mr. Cool, macho master of the California beach. The computer randomly selects its grappling duo in a one-player game, while your human opponent also picks a pair of wrestlers in the two-player version.

All wrestlers share 11 common defensive and offensive moves, such as bouncing off the ropes for a flying body tackle and jumping on an opponent from a corner post. Each combatant also has a unique set of four special maneuvers. For example, while holding the joystick up and pressing the button causes Mr. Cool to deliver an airplane spin, doing the same with Sgt. Slam results in a back breaker.

Take Down's matches have no time limit; they continue until one wrestler weakens and is eventually pinned. On-screen energy meters indicate when this is about to happen.

Humorous reminders of the "real" world of wrestling frequently appear. For instance, wrestlers selected for combat briefly try to intimidate their foes with speech-synthesized voices, which are typical of the program's excellent sound effects. Also, the two grapplers outside of the ropes often spontaneously battle one another during the match. And, after the winning duo has prevailed, they proudly "strut their stuff" by dancing around before an appreciative audience.

Unfortunately, the software does suffer from a few shortcomings. The reaction to joystick input is sometimes erratic. Also, the one-player version isn't very challenging; the computer's moves are predictable, so it's not long before you develop a nearly foolproof strategy against it.

On the other hand, the two-player option can be extremely satisfying, as you spend many happy hours striving against a skilled human opponent.

Contributing greatly to the excitement are the software's graphics, which are even better than its sound effects. The depictions and animation of the wrestlers and their surroundings are crisp, colorful and finely detailed.

Although not perfect, Take Down has much to recommend it. It's a fun way for grappling fans to participate in their beloved pastime without even having to put on trunks. (*Gamestar; distributed by Mediagenic, 3885 Bohannon Drive, Menlo Park, CA 94025. C-64/\$29.95.*)

—WALT LATOCHA
OAK PARK, IL

GEOS WRITER 64 C

Word Processing With GEOS

GEOS Writer 64 is a somewhat unusual offering in the word processor market. Although designed for use with GEOS, it's not marketed by Berkeley Softworks, but rather by Timeworks.

The basic GEOS disk includes geoWrite, so why did Timeworks feel the need to produce a word processor? What makes this product different? The answer is easy. Unlike geoWrite, GEOS Writer 64 is a post-formatted word processor. There is no what-you-see-is-what-you-get (WYSIWYG) in Edit mode; to view your document prior to printing, you must move to a Preview mode. Timeworks claims that this re-

drives and accepts either joystick or mouse.

GEOS Writer 64's commands are quite similar to geoWrite's. Features are selected through a series of pull-down menus or via keystroke commands. Files load or print directly from the main GEOS screen. Saved files appear as desk-shaped icons. All of the basic functions you'd expect to see in a word processor—cut, paste, search, and search and replace—are found in GEOS Writer 64. There are also commands for headers, footers and page numbering.

Files in GEOS Writer 64 are divided into sections, with each section holding 7424 characters, or approximately two to five pages. A file can contain up to 120 sections. Sections of a file are all loaded at once and can be moved from within the file. When loaded, a file automatically moves to the last section in use when the file was closed. Sections are printed one at a time, which is tedious, but accommodates printing sections in different orders.

The differences between GEOS Writer 64 and geoWrite become apparent as soon as you begin using different fonts, graphics or type sizes. What appears on your screen is not 10 point dwinella or 18 point romano, but rather a simple "@". This indicates that, during a printout, some change in the text will occur at that point. When the cursor is placed over the "@", the enhancement to be printed is indicated in the Status Box at the upper part of the screen. All changes use the symbol @.

A Page option lets you view the formatted document in one of two ways.

This is ten point university, in outline.

Here is the same font in italics.

This is 18 point romano, in bold.

Here it is underlined.

This is 18 point dwinelle.

This is the default type, bsw 9 point, with no style changes.

Samples of fonts from Writer 64, printed out in Quality mode.

sults in faster text-entry and scrolling.

In many ways, GEOS Writer 64 is just like any other GEOS program. It's loaded from within GEOS, so ownership of a GEOS system disk, version 1.3 or higher, is a must. GEOS Writer 64 works with GEOS 128, but only in 40-Column mode. The program can be configured to work with one or two disk

You can either see the whole page, just as it'll be printed, or select Show Reduced Page. With the first, only about 10 percent can be seen on the screen at a time, but you can scroll around the document. The latter shows the entire page, but without detail.

A 100,000-word dictionary is included with the program. Found on the

SOFTWARE GALLERY

back of the disk, it can check from within Edit mode. While not terribly fast (one minute, thirty-one seconds to check a 150-word paragraph), its large size means that it recognizes almost all commonly used words. However, there's no provision for expanding the dictionary.

When all work is completed, the file is saved in GEOS Writer 64 mode or exported as ASCII sequential. Exported files can't be re-opened by GEOS Writer 64, so plan to save it as a GEOS Writer 64 file and then export it if you want to edit the file again.

Printouts are produced in a number of different modes: Fast, Draft and Quality, to name just three.

GEOS Writer 64 works well, within limits. For example, GEOS Writer 64 and geoWrite files are not compatible; neither recognizes the others' documents. Another limitation is that GEOS Writer 64 offers only partial support of the RAM expansion units. You can save a document to a RAM drive, but it can only be viewed or printed if all the fonts, photo albums and print drivers are also transferred to the RAM drive.

GEOS Writer 64 and documents work well with the 1581. However, the dictionary only works with a 1541 or 1571 drive; it won't operate with a RAM expander or a 1581. I called Timeworks and was told that this has to do with the dictionary searching for the disk header before it can begin to work.

For me, the biggest problem was the very premise upon which this program was created. Yes, it is, as Timeworks claims, faster to enter text in a Non-Graphics rather than a Graphics mode. Yet this speed advantage is negated by the constant need to move to Page mode to see how the document will look when printed out. Going to Page mode is time-consuming, since graphics have to be loaded from the photo albums each time the section is examined.

I also felt constrained in Edit mode. Since the precise information about a particular enhancement is only available when the cursor is over the appropriate "@", I found myself frequently scrolling back through the document to see what fonts I had called for earlier.

Spacing text around graphics is also a problem, and can only be resolved through trial and error, together with lots of movement to the Page menu.

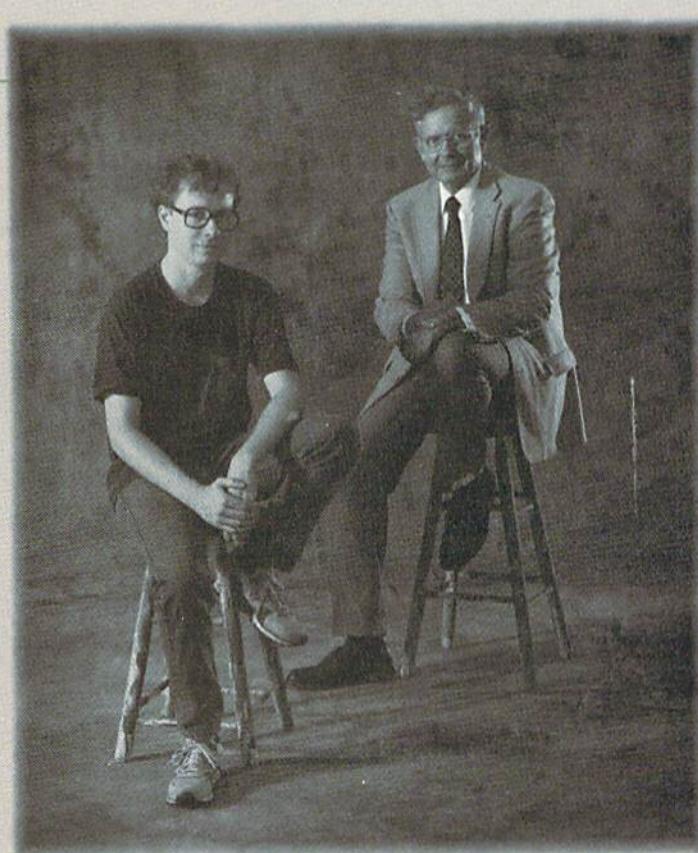
The irony is that this word processor is designed for use with the Graphic Environment Operating System. Yet, GEOS Writer 64 claims as its strength the fact that it is, to a large extent, non-graphic. There's nothing wrong with that position; it just seems to be an attempt to produce a solution for which there is no problem. (Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015. C-64/ \$49.95.)

—MICHAEL CAVANAUGH
LEVITTOWN, PA

JET-BOYS B

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And Melt the Megabeasts
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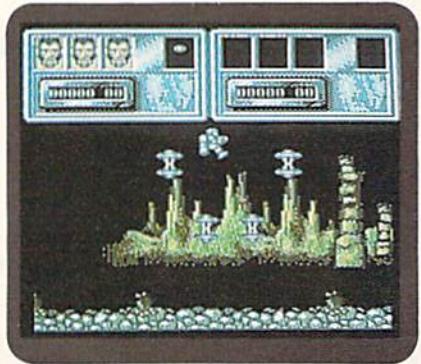
— David Babb, Attorney
— James Babb, Physicist

SOFTWARE GALLERY

and mind-boggling logic puzzles? Bored with realistic wargames that take longer to play than the actual battles they simulate? Ever feel like just grabbing your joystick and blasting some galactic terrorists? If the finger over your joystick button has grown rusty, then Jet-Boys may be just what you need to get back in shape.

Jet-Boys is a traditional shoot-'em-up that pits a laser-toting space man in a jetpack against several waves of flying alien terrorists. Your goal is to stop the enemy from causing a meltdown at a nuclear reactor on one of Saturn's moons.

Your joystick-controlled jet boy has unlimited mobility over the horizontally scrolling playfield. However, venturing



The jetpack on your back is activated by your joystick finger in Jet-Boys.

too close to the bubbling lava columns at the bottom of the screen does prove fatal.

While there are variations in the types of terrorists you'll face, their formations and the directions they come from, the patterns are identical from game to game. As a result, becoming familiar with these will eventually help you conquer Jet-Boys.

Although your jet boy begins each game with only a simple weapon, four different additional weapons can be attained if you're quick enough to snatch weapon pods from among the enemy formations and yet maintain enough caution to avoid blasting the pods with your laser.

Jet-Boys has only four levels: Wasteland, Temple, Blob and Reactor. At the end of each level, a Megabeast appears that you must defeat before you can advance. Make it through all four levels, and you'll successfully deactivate the reactor.

One of the best features of Jet-Boys is a Two-Player Cooperative mode that lets you take a laser-packing friend along for the ride. This is particularly useful for defending against terrorist attacks launched from both sides of the

playfield. Another plus is the simple startup. After reading through thick dungeon and dragon-spell books and complicated military briefing manuals, it's great to be able to just boot up a game and fire away. (*Avantage, 550 S. Winchester Blvd., Suite 200, San Jose, CA 95128. C-64/\$14.95.*)

—BOB GUERRA
SOUTH BOSTON, MA

MARS SAGA B+

Mars: a wild and murderous place where convicts do their time mining the planet. It's your job to hire five other specialists, acquire enough experience and skills to survive Martian pitfalls, and investigate the city of Proscenium's mysterious silence.

Mars Saga has the flavor of an old western movie, complete with rowdy city streets, bars, gambling saloons and abandoned mine shafts. Paradoxically, it's set against a futuristic backdrop of universities, computer centers and other institutions where the art of war is often more important than the traditional arts.

Mars Saga is completely menu driven, so finding your way around the command structure is easy; the player interface is as user-friendly and intuitive as any I've seen. This means you can concentrate more on your tactics and strategy and less on learning the game itself.

Mars Saga is addictive—a combination of good graphics, fine sound and extreme playability. My only real criticism of the game stems from a sense of frustration after spending several sessions developing a character, only to have him snuffed out by an adversary in the blink of an eye. I have yet to find a place to restore dead characters. A word to the wise: save your progress often.

Mars Saga brings a fresh feel to a theme that's beginning to run rampant. It looks good and plays even better. (*Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/\$34.95.*)

—JOHN RYAN

FAERY TALE ADVENTURE B+

The village of Holm and its citizens are protected by a talisman. But wait! The talisman's been stolen by an evil necromancer, and now it's up to you to get it back by successfully completing seven quests.

Your character needs to explore the village to find several magic items that

help build up strength and character points. Once you step outside, you'll meet with your first band of monsters. After you've built up enough bravery points, defeating the monsters is relatively easy.

Although there's combat involved in Faery Tale Adventure, this isn't the typical hack-and-slash computer role-playing game. Much more emphasis is placed on exploring and adventure.

The scenery is beautifully drawn, and the animation quite impressive. Swords flash and arrows fly through the air during battle. The disks are copy protected and three questions must be answered from the documentation before you can begin a game.

This was a "hot" game for the Amiga over a year ago, and I predict that a whole generation of C-64 owners will be just as impressed with their version. (*Microillusions; distributed by Mediagenic, 3885 Bohannon Drive, Menlo Park, CA 94025. C-64/\$49.95.*)

—ART LEWIS KIMBALL

ALCON B

Just when you thought it was safe to soak your joystick trigger finger in a bowl of muscle relaxant, along comes Alcon to test your skills again. A perennial favorite like the shoot-'em-up-in-space game doesn't stay in retirement too long; and neither do you!

Scrolling under you, Alcon's graphics treat you to a bird's-eye view of alien terrain. You might feel somewhat cramped playing this way because you're not able to fly beyond the scrolling view presented to you.

Alcon's background melody won't earn a gold record, and the sound effects would be lucky to get a Purple Heart, but remember that space is a vacuum!

It's tough to catch your breath with Alcon; the perils mount, and the action never stops. Surprises appear with each change of scenery.

Alcon offers old-fashioned thrills, fast and challenging excitement and adequate graphics for the diehard space fan with a trigger-happy finger. (*Taito Software, Inc., 267 West Esplanade, Suite 206, North Vancouver, British Columbia, Canada V7M 1A5. C-64/\$29.95.*)

—JOHN DiPRETE

POOL OF RADIANCE B+

In many ways, Pool of Radiance is similar to all the other available role-playing

SOFTWARE GALLERY

games. You begin by assembling a party of six adventurers—you know, the usual band of dwarves, elves, gnomes, halflings and humans. A character belongs to a specific class—fighter, cleric, thief, magic-user, or a combination of such. Each adventurer is rated for strength, dexterity, intelligence, wisdom, constitution, charisma, hit points and experience, and these traits affect how characters perform.

While you're exploring, the area directly in front of your band of adventurers is displayed in three-dimensional, first-person perspective. An Area command gives you an overhead view of the position of your party. One of the biggest differences between Pool of Radiance and similar role-playing games is that, during combat, instead of simply reading a brief description of the exchange of blows, you also watch all of the action.

This first volume of SSI's Forgotten Realms series is a significant addition to the genre. If their initial effort is any indication, the AD&D line should quickly take its place among the Bard's

Tales, Ultimas and Questrons of the role-playing world. (*Strategic Simulations, Inc.; distributed by Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/\$39.95.*)

—BOB GUERRA

DUNGEON MASTERS ASSISTANT, VOLUME I: ENCOUNTERS . . . C-

Dungeon Masters Assistant is not a game; it merely helps generate monster encounters for AD&D operations. The program contains no graphics, no sound, no fancy stuff. It's just a no-frills utility that's supposed to take the drudgery out of populating your campaign's wilderness.

I question how useful this program actually is. As a time saver, I think it falls somewhat short of the mark. Generating a specific or random encounter entails going through several menus and a lot of disk swapping.

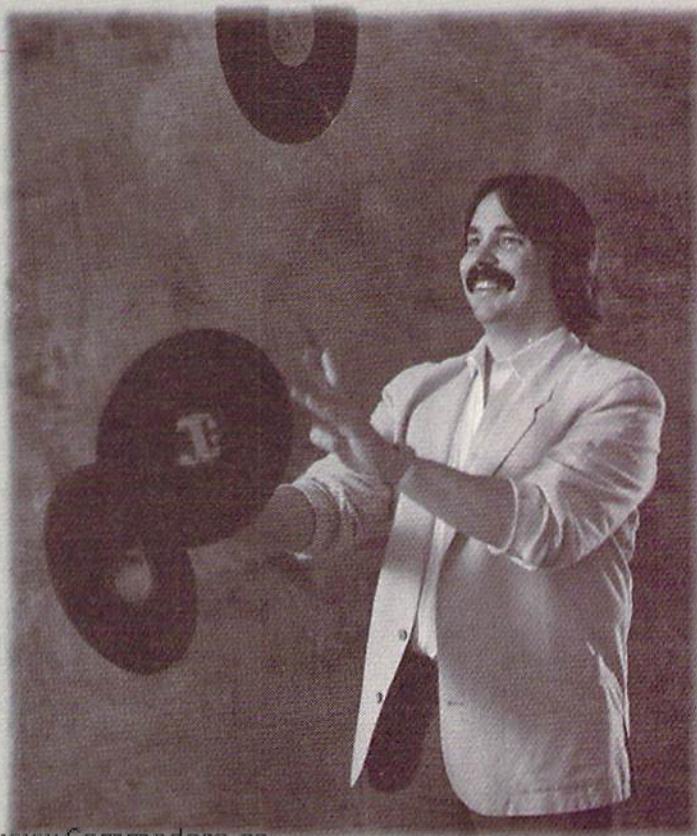
The program's database is fairly crude and the editing commands are relatively primitive and difficult to use.

I realize that the AD&D environment, with so many options to consider, can be hard to work with, but a word processing-type editor or more sophisticated database would almost have made the disk handling and loading periods bearable.

This program doesn't lend itself to interactive use during an actual game. While there is a dice-rolling function included, Dungeon Masters Assistant is best used expressly for preparing a campaign before a game.

There is a definite need in the AD&D world for a well-rounded and useful DMA utility, but I don't think this one is it. Perhaps the authors should search a back issue of *Dragon* magazine or look over any number of good public domain programs for ideas, and create a utility that takes advantage of the C-64's strengths and works around its weaknesses. (*Strategic Simulations, Inc.; distributed by Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/\$29.95.*)

—JOHN RYAN ■



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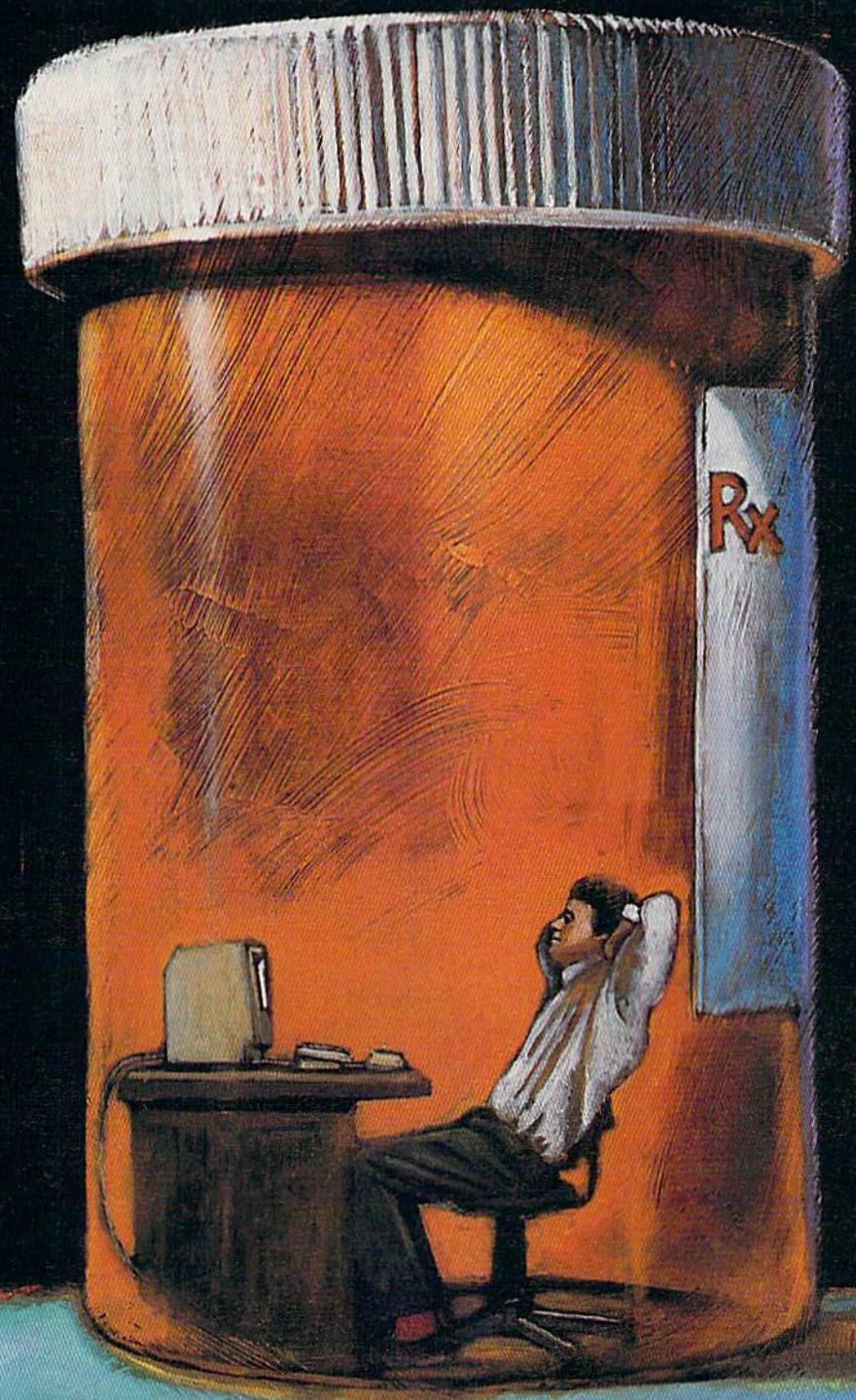
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— Douglas Bunker, Rock and Roll Business Manager



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In the course of a computing session, you may have several unconscious stare-down sessions, and they'll leave you wondering at the end of the evening why your eyes are sore. Learning to break these hypnotic trances is just one step toward a better physical relationship with your computer.

Joystick Cramp

Of course, when users discuss the physical effects of computing, "blink" is hardly a buzz-word. A more likely concern is "joystick cramp," brought on by playing some addictive game. After hours of moving images around the screen, your hand is shrink-wrapped to the joystick's base and the pain is intense as you pry your fingers loose.

The manufacturers' solution to this malady has been to redesign the joystick. The most comfortable are the Epyx 500 XJ and WICO's Ergostick, with bodies that fit comfortably into the palm of the hand—the left hand, however. Southpaws will find it extremely awkward to manipulate the fire-buttons of these two, and so had better use a joystick with a pistol-like grip, such as Mindscape's PowerPlayers.

Electromagnetic Radiation

Computers are relatively new to our lives, and the jury is still out on a question that understandably draws a lot of attention: the possible effects of electro-

magnetic radiation from monitors, or video display terminals (VDTs). Without controlled studies over a long period, of course, we can't fully determine the ultimate risks, but such evidence as exists is being introduced by both the defense and prosecution.

The most serious possible health threat from monitors concerns the nearly eight million U.S. and Canadian women of child-bearing age who work with them. However, the results of studies aren't clear on how much of a problem the electromagnetic radiation is. One study found that women who spent 20 hours per week or more in front of a computer screen had an 80 percent higher risk of having a miscarriage than those who didn't. Another study found only a slight increase in miscarriages among women who used VDTs more than 15 hours a week.

Marilyn K. Goldhaber, the chief author of one study, said radiation from monitors is "so tiny" it's "not our most likely explanation." Discomfort in seating, or stress from monotony or job pressures are more likely culprits, she said. The National Institute for Occupational Safety and Health and the World Health Organization both maintain that there has been no demonstrable evidence linking VDT usage to an increase in miscarriages.

Beverly Kane, a physician specializing in sports and preventative medicine at the Stamford Center for Research in Disease Prevention, said studies show that electromagnetic fields around VDTs are stronger at the sides and back than in front. "This means that the ra-

diation danger, if any, is theoretically higher from neighboring units than from the one you're using." To the extent this is true, it presumably places the home computer user with a single monitor in the low-risk category.

Monochrome monitors, usually with green or amber screens, are what you usually find in the work place. Home users, however, will more likely have a TV set or an RGB monitor. Are there differences in radiation levels?

A spokesman for Magnavox said the company uses lead in its picture tubes to cut down on radiation, which, he noted, was well below the permissible maximum set by government and industry standards. "RGB monitors emit a little bit more radiation than monochrome monitors," he said, "but the difference is negligible and probably offset by the difference in time spent by a home user, who might use the computer an hour or two at night, as compared to an office user who has to sit in front of the monitor all day long."

VDTs are still on trial in this matter, but they've already been convicted of aiding and abetting eye strain and muscle tension. Fortunately, there are steps you can take to make computing better on your eyes and muscles.

Lighting and Monitor Position

A lighting problem is usually the easiest to correct, particularly when artificial lights are involved. It's easy enough to shade a window to cut down glare, and you can easily redirect a lamp or position the monitor so that room ►

By LONNIE BROWN



www.Commodore.ca

ILLUSTRATED BY MARK MOSCARILLO

lighting doesn't create annoying and irritating reflections.

Keep in mind that working at a video terminal doesn't require as much light as doing paper work. In fact, a VDT needs only about half the light that's normally present in an office environment, or about the equivalent of a 60-watt bulb in a small room.

If you type in programs or do a lot of word processing, you might consider using something to cut the glare from the screen. Most commonly available are glare shields that fit over the screen. The least expensive resembles a black silk stocking stretched on a plastic frame that you can easily attach to the monitor with Velcro strips so the shield can be removed for cleaning.

Glare shields really do cut down on reflection, and they create a better contrast of the characters against the display background. A spokesman for one glare-shield company said a survey showed that users' eye complaints decreased by nearly two-thirds when these devices were installed.

If you do employ a glare shield, you may want to remove it when playing video games. While the shields cut reflections on the monitor, they also interfere with light radiating from it, making it more difficult to follow fast-moving objects on the screen. Prices range from \$30 up to \$90 for screens that block radiation.

While we're on the subject of monitors, try running a finger across your screen. Dusty? The monitor's electrostatic field makes it a dust magnet, but

the dust builds up slowly and blends in with the display, so you might not notice it. To help jog your memory into screen-cleaning, try this trick: Burn into your mind a picture of *RUN* magazine with a monitor screen on the cover. Now, each month when *RUN* arrives, it may remind you to wipe off your monitor.

Unless you're fortunate enough to have your own computer room, chances are your computer is sitting wherever there happens to be a little space for it. Maybe it travels like a nomad, going from kitchen table to card table to makeshift desk in the corner. Such migrations make it difficult to establish a comfortable work station, and, even if your computer does have a permanent home, the room lighting, table height and chair design may be causing you trouble.

In some areas of the country, computer users have pushed through laws requiring health-oriented computer equipment. Last summer, Suffolk County in New York State enacted a law that sets tough standards for businesses using computers. It requires employers to provide glare shields, adjustable chairs and tables, detachable keyboards and proper lighting.

It's unlikely that you'll want to go to the expense of buying an adjustable table, but for serious typing you should make sure your keyboard is set on a surface of standard typing height: about 26 inches. Of course, Commodore keyboards are easily moved, and you can even hold a 128D in your lap if you're feeling laid-back.

Twenty is an important number to remember when striving for computing comfort. The monitor should be about 20 inches from your face; every 20 minutes you should look around the room, focusing on distant objects, then refocusing on an object close at hand to give your eyes some exercise; and at least every three hours you should take a 20-minute break to rest not only your eye muscles, but those in your back, neck and shoulders. These periodic breaks are required by the Suffolk County law. Another requirement of that law that would be good to heed is getting a yearly eye examination.

Your Chair

Nothing can make hours of computing more tiring than a poorly designed chair. A few years ago, an "ergonomic" chair became popular, featuring no back and a seat that slants toward a padded bar on which the shins rest, taking most of the body weight. Many users find this modified kneeling arrangement comfortable at first, but, like sitting in a regular chair, any one position can become uncomfortable after a time.

If you want to try a chair that's comfortable, slide into the front seat in your car. Did you ever notice how you can sit there for hours and not feel tired or strained? Your legs are properly supported, the seat curves around to support your shoulders, and it may even have a stiff lumbar support for your lower back. On many seats, also, the bottom can be tilted and the backrest

Computing Health Tips

To avoid eyestrain...

- Your monitor screen's brightness should be three to four times the strength of the room's illumination.
- The screen should give a stable, non-flickering image, with high foreground-to-background contrast.
- Keep the screen clean and free of dust (particles that can obstruct vision and irritate the eyes).
- Adjust your monitor to sit 14 to 20 inches from your eyes, with the screen just below eye level.
- Adjust your screen colors to amber or black and white, which are easiest on the eyes.
- Room lights should not be aimed directly at your monitor screen.
- Keep your monitor away from windows, or use an anti-glare cover.
- Use a 60-watt bulb, which should be sufficient for illuminating a small computer room.
- Get periodic eye checkups. Depending on the distance and height of your monitor, you may need different glasses to focus on it properly.

—Ask your ophthalmologist about non-drying contact lenses appropriate for VDT use.

—Remember to blink every three seconds.

—Give your eyes a break by looking away from the screen to something in the distance.

To avoid backaches or other pain...

- Make sure your computer equipment has a detachable keyboard or one that swivels or tilts.
- Make sure the copyholder you use keeps paperwork close to the screen and at the same viewing distance as the screen.
- Your computer room should have proper ventilation.
- Take a 15-minute break every one to two hours.
- Your arms should be bent 90 degrees at the elbows when your hands are on the keyboard.
- If your legs don't reach the floor, use a foot rest so that your thighs are parallel to the floor.
- Make sure your chair's backrest supports your lower back and adjusts to spinal contours. 



placed in various positions.

Strive to find a computer chair that's as comfortable as a car seat, making sure it provides plenty of support for your lower back. Armrests are a matter of personal preference, but the chair should definitely be adjustable, at least in height. Changing the height of a chair only an inch can make a big difference in how you feel at the end of a long keyboard session.

A Copy Holder That Works

When typing in programs or text from printed material, it's a good idea to have the hard copy held vertically and close to the computer screen, but a gadget well-designed for the task has been slow to come. Recently, however, when *PC Magazine* rated products for its Best of 1988 awards, it praised a \$6.95 piece of plastic—The Curtis Clip, from the Curtis Manufacturing Co., 30 Fitzgerald Drive, Jaffrey, NH 03452. The Curtis Clip hangs off the top of either side of the monitor and folds back out of the way when not in use.

The Art of Blinking...

Now that you've positioned the monitor and hard copy correctly, moved lights to keep them from shining on the

screen, found a comfortable chair and placed the keyboard at the proper height, it's time to get back to that other matter: How often do you blink? Studies show that few computer users blink enough.

When the Data Entry Management Association conducted its latest survey of clerical employees, nearly half complained of burning eyes and blurred vision. According to Dr. Lowell Glatt, a New York optometrist involved in the American Optometric Association's study group on environmental and occupational vision, "The VDT is not a lethal weapon. It does not bombard the eye with things that are going to chew it up." However, eyes were made for seeing at a distance, while monitors are made for close-up viewing, and Glatt said this incompatibility puts a strain on any existing weaknesses in the optical organs, leading to stress on the eyes.

This stress can be aggravated by not blinking often enough to keep the eyes adequately moist. While we're reading printed material, our eyes move back and forth, which stimulates blinking. With a computer, they stare straight ahead, moving only slightly. Dust particles attracted by the monitor's electrostatic field can settle on the lens of the eye and add to the discomfort, but

blinking helps wash such particles away.

"The ideal blinking frequency is every three seconds," said Ernest Loewenstein, a contact-lens specialist who is an associate professor at the New England College of Optometry. Blinking is particularly important for contact-lens wearers. And even if you do blink frequently enough, you may not be doing it right.

Yes, there is a right way to blink! Loewenstein offers these one-minute exercises for daily practice until you get the knack of it:

—Concentrate on closing your eyes smoothly and completely, then keep them closed long enough to feel the upper and lower lids touching. Don't squeeze them shut.

—Keep the lids shut for two to five seconds while you breathe deeply and move your eyes left and right.

—Repeat this process for about one minute every day for three weeks.

During the second week, spend one minute each day repeatedly counting one thousand one, one thousand two, one thousand three and then blinking. Feel the lids touch each time, to be sure they close completely.

When you're typing at your computer—at about 40 words a minute—figure on blinking every other time you hit the space bar. The glare shields I mentioned earlier are said to improve your blinking, bringing it close to the desirable frequency.

... and of Exercising

Any discussion of computers and health inevitably comes around to exercise—or the lack thereof. Those who work at a computer move little during the day, and the free time many people once devoted to exercise is now spent playing simulated games in front of the monitor. No one knows the results better than one commercial programmer who said he's literally "gotten too big for my britches since I got my computer." He quipped that "it's worse than eye strain, tight muscles or an aching back. Yup—I've had to give up ice cream!"

Well, maybe he'd still be eating ice cream if he exercised regularly. There's no substitute for working up a good sweat for thirty minutes three or four times a week. Such a routine will help a lot toward keeping your body—and mind—in good shape. ■

Table 1. Reference materials.

Books:

The Eye Care Book, by Stephen C. Miller

American National Standard for Human Factors: Engineering of Video Display Terminal Workstations; Human Factors Society, Inc., Santa Monica, CA

Booklets:

How to Prevent Office Chair Backache and Sitting Fatigue, by Stanley Frank; Frank Eastern Co., New York, NY

The Eyes Have It;

Commonly Asked Questions About CRTs and Radiation; Take an Exercise Break; Optical Coating Laboratory, Inc., Santa Rosa, CA

Newsletters:

VDT News; New York, NY

Data Entry Management Association (DEMA) Newsletter; Stamford, CT

Reports:

Health and Safety Aspects of Video Display Terminals; American Council on Science and Health, New York, NY

For further information, contact:

VDT Coalition, c/o Labor Occupational Health Program, 2521 Channing Way, Berkeley, CA 94720

National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control, Atlanta, GA 30333

Lonnie Brown is an editorial writer and computer columnist for a newspaper in Florida, as well as a regular contributor to RUN.

The MS-DOS Connection

Give a big boost to your C-128's usefulness by transferring text and data files back and forth between MS-DOS and Commodore disks.



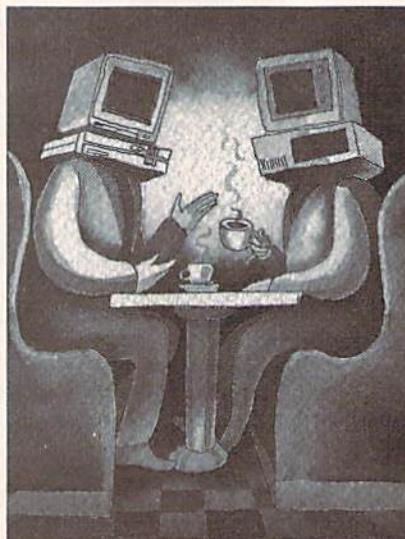
By MIKLOS GARAMSZEGHY

MS-DOS Connection is an easy-to-use Basic 7.0 program that enables the C-128 to read or write text and data files from or to almost any type of MS-DOS disk—5½- or 3½-inch, single- or double-sided, and with eight, nine or ten sectors per track. The only disks that won't work are those with a high density, 1.2- or 1.44-megabyte format. (*The author is working on a C-64 version of this program, which we hope to publish in the near future.—Eds.*)

The program can transfer files up to 45K long, which is adequate for most needs. It handles Commodore sequential (SEQ), program (PRG) and user (USR) files either in Binary mode, where the files aren't manipulated, or in ASCII-PETSCII Translation mode, where they are converted between standard ASCII and Commodore ASCII (also known as PETSCII). Most text- and data-file transfers will use the sequential file type.

In addition to transferring files between MS-DOS and Commodore DOS, this utility can also transfer them between 1571- and 1581-formatted disks and from one size MS-DOS disk to another (such as 5½-inch to 3½-inch). Because the 1541 disk drive doesn't support the MFM formatting scheme used by MS-DOS, a 1541 can be used only for Commodore-to-Commodore transfers.

Note that, while MS-DOS Connection transfers text and data files between MS-DOS machines and the C-128, it does not give your C-128 any form of compatibility with machine language program files and batch files written to run on an MS-DOS computer. These, usually identified by a file type of .EXE, .COM or .BAT, won't work on the C-128 in any mode. However, if, for example, you download a C-128 program to an



MS-DOS disk and then convert the file to C-128 format in Binary mode, the program will work on the C-128 as originally intended. This capability can be a real boon if, say, you have a faster modem on your MS-DOS machine than on your 128.

THE PROGRAMS

MS-DOS Connection is a combination of Basic and machine language. The program in Listing 1 creates a machine language file named MDOS.ML, which is automatically loaded by the main Basic program in Listing 2. Type in Listing 1, save it to disk and run it. It needs to be run only once. Then type in Listing 2, save and run it.

The main program assumes that MDOS.ML is on a disk in drive number 8. If you're using some other device number, note that it's set by the value of SD in line 170. Notice that Listing 2 contains no REM statements; I left them out to conserve buffer space.

The terms "source" and "target" that

you'll see on the screen designate the files being transferred from and to, respectively, and "MS-DOS" refers to any IBM-PC or compatible operating system (that is, any version of PC-DOS or MS-DOS). "Commodore DOS" and "CBM DOS" refer to the normal operating mode of Commodore disk drives (in which PRG and SEQ files are created on the 1541, 1571 and 1581, for example).

To transfer a file from one type of disk to another, follow the procedures described below. Screen prompts will show the way.

THE SOURCE

When you run the MS-DOS Connection main program, the machine language portion (MDOS.ML) is first loaded from drive 8, if it's not already in memory. Then the opening screen appears, at which time you can remove the disk from drive 8 if you wish.

The opening screen requests information about your source disk and drive. At the prompt for type of source disk, enter 1 for an MS-DOS disk or 2 for a Commodore disk. You can also enter 3 to quit the program. Press the return key after making your selection and then select the source disk drive. You can specify any serial-bus device number from 8 to 12. If you specify a number outside this range, the source disk type prompt will reappear.

Now insert the source disk into the source drive and press return to proceed, or, if you decide to use a different source, press the escape key to go back to the opening menu and make other choices.

After you've pressed the return key, the program reads the disk's directory, and, in the case of an MS-DOS disk, automatically determines the disk type (number of sides, number of sectors per ▶

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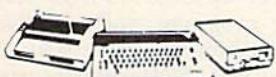
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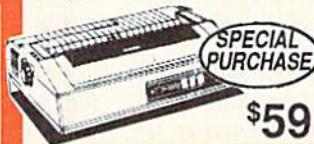
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MS-DOS CONNECTION

track, etc.) and decodes the MS-DOS file allocation table (FAT), which is similar in function to the Commodore disk bit allocation map (BAM). As this happens, a status display informs you of progress. This entire procedure should take less than a minute, the actual time depending on the number of files in the main, or root, directory of the disk. (It may take a bit longer to read the directory of a 3½-inch MS-DOS disk, because the 1581 won't immediately recognize that it holds a non-Commodore disk.)

The directory display basically lists files in alphabetical order. All 1581 directory partitions (CBM files) or MS-DOS subdirectories appear first, with the subdirectories identified by a <dir> under the file-size field. MS-DOS files are sorted by filename, and Commodore files by type—CBM, PRG, REL, SEQ, USR—and, within these, by filename. The sorting is done by machine language, so it's quite fast, even for long directories.

The directory appears in a 15-entry window and can be scrolled in both directions. If you scroll far down the list and wish to get back to the start, just press the home key.

The disk name and ID code (Commodore) or volume label (MS-DOS), along with the number of files in the directory and the total number of bytes these files occupy, are listed at the top of the directory screen. Note that file lengths are given in bytes, not the blocks usual for Commodore disks. As a result, the listed lengths of Commodore files are only approximate (block count times 254); MS-DOS file sizes, on the other hand, are exact, since they come straight from the directory entries.

To select a file to read or a subdirectory to access, use the cursor-up and cursor-down keys to move the highlighting bar to the desired file, then press return.

If you have your C-128 in 80-Column mode, the right side of your directory screen will contain a summary of these instructions.

Don't remove your source disk from the source drive until you see a prompt to insert another disk. If you change disks (especially MS-DOS disks) when the program doesn't know about it, it may transfer the file incorrectly and even corrupt other files on your target disk. You won't be prompted to insert a disk before reading a file from the on-screen directory, because the program will assume you haven't removed the disk that contains the file.

If you're transferring from a Com-

modore disk, you must, after selecting the file, also select the type of Transfer mode: Binary or PETSCII-ASCII Translation. Binary mode transfers the file exactly as is, while Translation mode converts it from PETSCII to ASCII as it's being read into memory. (All files in memory are assumed to be in ASCII format.)

While MS-DOS Connection will read PRG, SEQ and normal USR files, it will not read REL (relative) or GEOS-type USR files, even though it lists them in a Commodore disk directory.

THE TARGET

Now it's time to write the target file. At the prompt for target file type, select 1 for MS-DOS, 2 for Commodore DOS or 3 to return to the directory display without writing the target file. After designating a file type, select the target drive, which can be the same as, or different from, the source drive.

Next, enter a filename for the target file. In MS-DOS, the proper format is FILENAME or FILENAME.TYP, where the main name is 1–8 characters long and the optional extension is 1–3 characters. In Commodore DOS, the filename can have from 1 to 16 characters. When writing to a Commodore file, you must also select the transfer mode (Binary or PETSCII-ASCII) and the file type (SEQ, PRG or USR).

With all the target information entered, insert the target disk and press return to write the file. You'll return to the directory display automatically when it's done.

Several steps are involved in writing MS-DOS target files. The target disk directory is read and its FAT decoded, the file is written and then the directory and FAT are updated. With a Commodore disk, all this takes place automatically during the write operation.

SUBDIRECTORIES

MS-DOS Connection lets you transfer files from any MS-DOS subdirectory or 1581 partition. When you select an MS-DOS entry marked <dir> or a Commodore CBM file (on the 1581 only) and press return, the new directory is read and displayed on the screen, replacing the previous one. You can return to the previous directory in MS-DOS by selecting the first entry, <parent> <dir>, in the new directory. With the 1581, you can't go backward through a directory chain, but must return to the root directory, and then follow the chain forward again.

If you're several directories into a tree (either MS-DOS or 1581) and want

to get back to the first level or see the directory of a new disk of the same type (MS-DOS or Commodore DOS), press the R key. This will immediately reread the root directory of the disk.

When reading an MS-DOS directory, the program ignores the file attributes (byte 11), except those for the volume label and subdirectories, which do not represent valid files. Thus, you can access and display hidden and system files that won't appear in response to a normal MS-DOS directory (DIR) command.

All files that the program writes to MS-DOS and 1581 disks are listed only in the root directory, not in subdirectories.

OTHER TYPES OF TRANSFERS

As I mentioned earlier, MS-DOS Connection is useful for purposes other than transferring files between MS-DOS and Commodore machines. It can copy normal Commodore SEQ, PRG and USR files between a 1581 and 1571, and even most C-128-compatible hard drives. I also find it a convenient way to transfer MS-DOS files between 5¼- and 3½-inch disks for use on my various MS-DOS computers.

In addition to straight copying, the program can also convert text files between true ASCII and PETSCII, using any Commodore-compatible drive. For ASCII to PETSCII, read the file in Binary mode, then write it in Translation mode. For PETSCII to ASCII, read the file in the Translation mode, then write it in Binary mode. This kind of conversion is helpful for swapping files between incompatible word processors or for using text files that have been downloaded from bulletin board systems. (Most public-access BBSs store text in ASCII mode, while many Commodore word processors expect PETSCII.)

In addition to translating the normal upper- and lowercase text characters, conversion from PETSCII to ASCII automatically adds a linefeed (CHR\$(10)) after every carriage return character (CHR\$(13)), while conversion from ASCII to PETSCII removes all linefeeds. ASCII codes with the high bit set, as produced by some MS-DOS word processing programs, such as WordStar, are treated for text conversions just like their normal ASCII counterparts, without the high bit set. ®

Miklos Garamszeghy is a Toronto-based writer and software developer with numerous public domain, shareware and commercial programs for Commodore and MS-DOS computers to his credit. He has also written a short program for formatting MS-DOS disks, which RUN will publish next month.



MS-DOS CONNECTION

Listing 1. Machine language generator program.

```

1 OPEN 8,8,8,"MDOS.ML,P,W"
15 FAST :REM*86
20 READ A$:IF A$="-1" THEN CLOS
E8:END :REM*176
25 IF LEN(A$)<62 THEN 55
:REM*232
30 B$=MID$(A$,1,20)+MID$(A$,22,20)+MID$(A$,43,29) :REM*35
35 N=LEN(B$)/2 :REM*38
40 FOR I=1 TO N :REM*20
45 H$=MID$(B$,I*2-1,2):H=DEC(H$)
:REM*222
50 PRINT#8,CHR$(H);:NEXT:GOTO 2
:REM*100
55 IF LEN(A$)<20 THEN B$=A$:GOT
O 70 :REM*65
60 IF LEN(A$)<42 THEN B$=MID$(A
$,1,20)+MID$(A$,22,(LEN(A$)-
21)):GOTO 70 :REM*148
65 B$=MID$(A$,1,20)+MID$(A$,22,
20)+MID$(A$,43,LEN(A$)-42)
:REM*80
70 N=LEN(B$)/2 :REM*67
75 FOR I=1 TO N :REM*71
80 H$=MID$(B$,I*2-1,2):H=DEC(H$)
:REM*251
85 PRINT#8,CHR$(H);:NEXT:GOTO 2
:REM*129
100 REM CREATES ML FOR C128->M
SDOS :REM*250
101 DATA 0013F54C67134CF4134C 1
C144CB3144C1F154CBA 134C421
44CA5144CC915 :REM*164
102 DATA 4C71154CD116000000000 0
00002000000000000000 00FFA90
82C0DDCF0FBAD :REM*174
103 DATA 00DD49108D00DDAD0CDC 6
0A23F8E00FF91FAA200 8E00FFC
860A23F8E00FF :REM*233
104 DATA 91644C4C13A23F8E00FF B
1FA4C4C13A90085FAA9 0B85FBA
0009891FAC8C0 :REM*249
105 DATA 0AD0F9A8782C0DDC2039 1
3203213204513C90290 26290ED
0262032132045 :REM*218
106 DATA 13290ED01C2032132045 1
3203213204513C90290 2045132
:REM*234
107 DATA 4CCCFF8D2613D0F786FA 8
4FBA2028E2813A0008C 0FFF782
C0DDC20391320 :REM*33
108 DATA 3213290ED01920321320 4
513C000D0F6AE2813CA 8E2813E
6FBE000D0E958 :REM*237
109 DATA 608D2613D0F986FA84FB A
A20C6FFA000F00520B7 FFD0122
0CFFF204513C0 :REM*78
110 DATA 00D0F1E6FBA9FEC5FB0D E
984FA4CCCF8C2713EE 271386F
BA00084FAAA20 :REM*179
111 DATA C9FF205D1320D2FFC000 D
0F6E6FBAD2713C5FB0D ED4CCC
F86FA84FBA202 :REM*168
112 DATA 8E2813A9408D251378A0 0
0382047FFAD00DDCD00 DDD0F84
D25132940F0F1 :REM*234
113 DATA 205D138D0CDCAD251349 4
08D2513A9082C0DDCF0 FBC00D
0D8E6FBBAE2813 :REM*30
114 DATA CA8E2813D0CD182047FF 2
C0DDC20391320321385 FCAD0D
D29EF8D00DD58 :REM*82
115 DATA 4CCCFF86FBA90085FAA9 2
0204513D0FB6086FA84 FBAA20C
6FFA00020B7FF :REM*213
116 DATA F0034CEF1420CFFF8D22 1
3297FC90DD023204513 D008E6F
BA9FEC5FBF01 :REM*228
117 DATA A90A204513C000D0D6E6 F
BA9FEC5FB0DCE84FA4C CCFFC90
9F0E8C92090C1 :REM*46
118 DATA F0E2AD2213C94190DBC9 5
B9011C97B9004C98090 F2295FC
92090A64CE014 :REM*106
119 DATA 09204CE0148C2713EE27 1
386FBA00084FAAA20C9 FF205D1
3297F8D2213C9 :REM*199
120 DATA 0AF026C90DF01FC909F0 1
BC920901AC9419013C9 5B900DC
961900BC97BB0 :REM*142
121 DATA 07295F4C5E1509802D2 F
FC000D0CAE6FBAD2713 C5FB0D0C
14CCCFF86FA85 :REM*23
122 DATA FB78A93F8D00FFAD000C 8
D2B13CE2B13D007A900 8D00FF5
:REM*28
123 DATA 13A5FA8564A5FB856520 B
616A000B1FAD1649018 D005C8C
020D0F3A000B1 :REM*66
124 DATA FAAAB16491FA8A9164C8 C
020D0F1CE2913D0D820 C5164C8
11584FBAAA900 :REM*195
125 DATA 85FAA899000CC8C00AD0 F
8A92099000CC8D0FA20 C6FFA00
020AB1690034C :REM*153
126 DATA 7F16C922D0F420AB16C9 2
2F0F999100CC8C016D0 F1A920A
000204513C020 :REM*174
127 DATA D0F920AB16B0DAD0F920 A
B1620AB16B0D020AB16 8D2D13A
01620451320AB :REM*182
128 DATA 168D2E1320451318AD2D 1
36D080C8D080C9003EE 090CAD0
90C186D2E138D :REM*82
129 DATA 090CA00120AB16B030C9 0
0F02CC922D0F320AB16 B023C92
2F0F7204513C0 :REM*144
130 DATA 16D0F0A012205D13A000 2
0451320C516EE000CD0 03EE010
C4C011620CCFF :REM*234
131 DATA AD080C38ED2D138D080C A
D090CED2E138D090CA2 0A0162
05D139D040CE8 :REM*206
132 DATA C018D0F5A9FFA0004C45 1
31820B7FFD034CCFFF 3860A56
4186920856490 :REM*55
133 DATA 02E6656020B616A5FA18 6
92085FA9002E6FB6085 FB8665A
90085FA85648D :REM*250
134 DATA 000CEE000CA920A00020 5
313C020D0F9A000205D 13C900D
034C4717205D :REM*247
135 DATA 13C9E5F0F6C9F6F02A0 0
0205D13C9E5D00620C5 164CEC1
6A00B205D1329 :REM*237
136 DATA 10AAA946E000F002A944 A
000205313A000205D13 2053138
8C000D0F5A01A :REM*176
137 DATA 205D1388205313C020D0 F
520C2164CDE16A000A9 FF4C531
300 :REM*188
138 DATA -1 :REM*251

```

Listing 2. MS-DOS Connection main program.

```

10 T$="MSDOS - 128{2 SPACES}BY      D"MDOS.ML"           :REM*48      R DN}3 = QUIT":TC=Ø:SD=Ø
   M. GARAMSZEGHY"                 :REM*41      100 MØ$="READING...":M1$="WRITI      :REM*19Ø
20 :                                :REM*78      NG...":M2$=" DIRECTORY":M3$      15Ø PRINT:INPUT "YOUR CHOICE [1
30 COLOR Ø,7:COLOR 4,7    :REM*2      =" FAT"                  :REM*7      , 2, OR 3]";TC      :REM*2Ø
40 COLOR 6,1:COLOR 5,2 :REM*233     11Ø M6$="MS-DOS":M7$="CBM-DOS"      16Ø IF TC<1 OR TC>2 THEN 87Ø
50 WI=39:IF PEEK(215) THEN WI=7      :REM*Ø      12Ø BL$="{8 SPACES)":DB=PEEK(46      :REM*96
   9:FAST                         :REM*192      25)*256+256:TB=DB+5376      17Ø PRINT:PRINT:INPUT"SELECT SO
60 WINDOW Ø,Ø,WI,24,1: PRINT T$      :REM*12Ø      :REM*94      URCE DEVICE [8 TO 12]";SD      :REM*51
   :REM*12Ø
70 PRINT"3 CRSR DNS)INITIALIZI      13Ø GOSUB 88Ø:PRINT "{CRSR DN}S      18Ø IF SD<8 OR SD>12 THEN 13Ø
   NG...PLEASE WAIT"             :REM*56      ELECT SOURCE DISK TYPE:{CRS      :REM*1Ø3
80 GRAPHICCLR:DIM FA(81Ø),DI$(2      R DN)":PRINT"1 = ";M6$      19Ø T$=M6$:IF TC=2 THEN T$=M7$      :REM*191
   88),LE$(288),FM(112):REM*1ØØ      :REM*16
90 IF PEEK(4864)>>245 THEN BLOA      14Ø PRINT "2 = ";M7$:PRINT"(CRS      2ØØ DK$="("SOURCE)":DR=SD:GOSUB ►

```

M S - D O S C O N N E C T I O N

```

2040 :REM*55
210 XF=0:IF X$=CHR$(27) THEN 13
      :REM*2
220 GOSUB 880:PRINT M0$ M2$::EF
      =0 :REM*73
230 DX=1:ON TC GOSUB 890,1360
      :REM*200
240 IF EF THEN GOTO 1950:REM*35
250 GOSUB 880:PRINT "DISK NAME
      = ";TT$ :REM*57
260 PRINT US;"BYTES USED;(2 SPA
      CES)":DC;"ENTRIES" :REM*31
270 PRINT:PRINT "FILENAME";TAB(
      26);"SIZE" :REM*253
280 GOSUB 2030 :REM*81
290 IF WI>40 THEN GOSUB 1850
      :REM*158
300 WINDOW 1,7,35,22,1:Y1=0:Y2=
      1 :REM*224
310 FOR I=1 TO 15:IF I<=DC THEN
      PRINT DI$(I);TAB(24);LE$(I
      ) :REM*203
320 NEXT:WINDOW 0,22,WI,24:GOS
      UB 2030 :REM*66
330 IF WI<70 THEN PRINT "SELECT
      FILE TO READ & PRESS <CR>"
      :REM*125
340 WINDOW 1,7,35,21:POKE 208,0
      :REM*111
350 PRINT "(CTRL 9)":DI$(Y2);"(C
      TRL 0)":TAB(24);LE$(Y2);CH
      R$(27)"J"; :REM*149
360 GET A$:IF A$="" THEN 360:EL
      SE A=ASC(A$) :REM*201
370 IF A=13 THEN 480:ELSE IF A=
      82 THEN XF=1:GOTO 220
      :REM*221
380 PRINT DI$(Y2);TAB(24);LE$(Y
      2);CHR$(27)"J"; :REM*11
390 IF A=17 THEN Y2=Y2+1:Y1=Y1+
      1: IF Y2<=DC THEN PRINT
      :REM*49
400 IF Y1>14 THEN Y1=14:REM*254
410 IF Y2>DC THEN Y2=DC:IF Y1<
      4 THEN Y1=Y1-1 :REM*224
420 IF A=145 THEN Y2=Y2-1:Y1=Y1-
      1:PRINT A$; :REM*17
430 IF Y2<1 THEN Y2=1:Y1=0
      :REM*39
440 IF Y1<0 THEN Y1=0:PRINT CHR
      $(27)"I"; :REM*228
450 IF A=19 THEN 300 :REM*74
460 IF A=27 OR A=147 THEN 130
      :REM*98
470 GOTO 350 :REM*32
480 XF=0:IF TC=1 THEN GOSUB 148
      0:ELSE GOSUB 1550 :REM*20
490 IF XF THEN 240: ELSE WC=0:T
      D=0 :REM*196
500 GOSUB 880:PRINT "FILE LOADE
      D = ";DI$(Y2);";";LE;"BYTES
      ":PRINT :REM*32
510 PRINT "{CRSR DN}SELECT TARG
      ET DISK TYPE:{CRSR DN}":PRI
      NT"1 = ";M6$ :REM*181
520 PRINT "2 = ";M7$:PRINT"(CRS
      R DN)3 = RETURN TO SOURCE D
      IRECTOR" :REM*247
530 PRINT:INPUT "YOUR CHOICE [1
      , 2, OR 3]";WC :REM*244
540 IF WC<1 OR WC>2 THEN 240
      :REM*73
550 PRINT:PRINT:INPUT"SELECT TA
      RGET DEVICE [8 TO 12]";TD
      :REM*202
560 IF TD<8 OR TD>12 THEN 240
      :REM*196
570 DX=0: DR=TD:T$=M6$:IF WC=2
      THEN T$=M7$ :REM*178
580 PRINT:PRINT:INPUT"TARGET FI
      LENAME";TA$ :REM*47
590 GOSUB 880:DK$="(TARGET)":O
      N WC GOTO 610,600 :REM*11
600 GOSUB 1730:IF EF THEN 250:E
      LSE 1610 :REM*108
610 P=INSTR(TA$,"."):IF P=0 THE
      N TA$=TA$+".":GOTO 610
      :REM*25
620 F1$=LEFT$(LEFT$(TA$,P-1)+BL
      $,8)+LEFT$(MID$(TA$,P+1,3)+
      BL$,3) :REM*104
630 GOSUB 2040:GOSUB 880:PRINT
      M0$;M2$ :REM*227
640 GOSUB 890:BANK 0:GOSUB 880:
      PRINT M1$;F1$ :REM*6
650 FOR Z=DB TO FB STEP 32:IF P
      EEK(Z)=0 OR PEEK(Z)=229 THE
      N BZ=Z:Z=FB+1 :REM*101
660 NEXT:IF BZ>FB THEN 1950
      :REM*34
670 FOR Z=1 TO 11:POKE BZ-1+Z,A
      SC(MID$(F1$,Z,1)):NEXT
      :REM*165
680 FOR Z=11 TO 31:POKE BZ+Z,0:
      NEXT :REM*178
690 POKE BZ+28,LE-INT(LE/256)*2
      56:POKE BZ+29,LE/256
      :REM*144
700 FC=3:GOSUB 850:FC=J :REM*31
710 POKE BZ+26,FC AND 255:POKE
      BZ+27,FC/256 :REM*210
720 FOR AD=TB TO TP-1 STEP 512
      :REM*168
730 GOSUB 1310 :REM*16
740 GOSUB 850:FA(FC)=J:FC=J:NEX
      T:FA(FC)=4095 :REM*92
750 BANK 0:PRINT "ENCODING";NC;
      M3$;" CLUSTERS" :REM*180
760 FOR I=0 TO NC:P=FB+INT(1.5*
      I) :REM*170
770 IF I AND 1 THEN POKE P,((FA
      (I) AND 15)*16) OR PEEK(P):
      POKE P+1,FA(I)/16 :REM*135
780 IF (I AND 1)=0 THEN POKE P,
      FA(I) AND 255:POKE P+1,FA(I
      )/256 :REM*207
790 GOSUB 1840:NEXT:PRINT M1$:M
      3$:AD=FB :REM*221
800 FOR LS=1 TO P3:GOSUB 1330:A
      D=AD+512:NEXT :REM*149
810 AD=FB:FOR LS=P3+1 TO P3*2:G
      OSUB 1330:AD=AD+512:NEXT
      :REM*135
820 PRINT M1$:M2$ :REM*247
830 AD=DB:FOR LS=F1 TO F1+P4-1:
      GOSUB 1330:AD=AD+512:NEXT
      :REM*141
840 GOTO 2100 :REM*126
850 FOR Z=FC+1 TO NC :IF FA(Z)=
      0 THEN J=Z:Z=NC+1 :REM*165
860 NEXT:RETURN :REM*249
870 WINDOW0,0,WI,24,1:END
      :REM*79
880 WINDOW 0,2,WI,24,1:RETURN
      :REM*118
890 BANK 15:POKE 2588,0 :CLOSE1
      5:TX=16:OPEN 15,DR,15
      :REM*104
900 X=DS:IF PEEK(2588)=0 THEN E
      F=1:RETURN :REM*231
910 PRINT#15,"U0>B1":INPUT#15,A
      :REM*144
920 IF A THEN TX=0 :REM*17
930 TT$=<NO LABEL> :PRINT#15
      ,"U0>"+CHR$(10+TX) :REM*87
940 SYS 4865 :IF PEEK(2816) AND
      14 THEN EF=1 :RETURN
      :REM*155
950 B1=64+TX:S=1:T=0:AD=6144:P=
      AD: GOSUB 1230:P0=PEEK(P+13
      ) :REM*59
960 P1=PEEK(P+14):P2=PEEK(P+16)
      :P3=PEEK(P+22):P4=PEEK(P+17
      )/16 :REM*187
970 P5=PEEK(P+19)+PEEK(P+20)*25
      6:P6=PEEK(P+24):P7=PEEK(P+2
      6)-1 :REM*209
980 FS=P1+P2*P3+P4:NC=(P5-FS)/P
      0:PRINT :REM*243
990 AD=DB:F1=P1+P2*P3:FOR LS=F1
      TO F1+P4-1:GOSUB 1220:AD=A
      D+512:NEXT:FB=AD :REM*59
1000 IF DX=0 THEN 1150 :REM*85
1010 SYS 4895,DB/256,TB/256:SYS
      4892,TB/256,0:I=TB:REM*35
1020 DC=0:US=0:BANK 0 :REM*212
1030 IF PEEK(I)=255 THEN 1140
      :REM*159
1040 X$="":FOR J=1 TO 11:X$=X$+
      CHR$(PEEK(I+J)) :NEXT
      :REM*61
1050 IF LEFT$(X$,2)=". " THEN 11
      30 :REM*34
1060 IF(PEEK(I+12) AND 8)=8 THE
      N TT$=X$:GOTO 1130:REM*127
1070 LE=PEEK(I+28)+PEEK(I+29)*2
      56+PEEK(I+30)*256*256
      :REM*20
1080 FM=PEEK(I+26)+PEEK(I+27)*2
      56 :REM*68
1090 DC=DC+1:DI$(DC)=X$:FM(DC)=
      FM :REM*93
1100 US=US+LE:LE$(DC)=STR$(LE)
      :REM*75
1110 IF(PEEK(I+12) AND 16)=16 T
      HEN LE$(DC)=<DIR>:REM*99
1120 IF INSTR(X$,"..") THEN DI$(
      DC)=<PARENT>{3 SPACES}
      :REM*114
1130 GOSUB 1830:I=I+32:GOTO 103
      0 :REM*77
1140 IF XF THEN RETURN :REM*232
1150 PRINT:PRINT M0$;M3$;" ..."
      ;NC;"CLUSTERS" :REM*129
1160 FOR LS=1 TO P3:GOSUB 1220:
      AD=AD+512:NEXT:BANK 0
      :REM*109
1170 FOR I=0 TO NC :P=FB+INT(1.
      5*I):X1=PEEK(P):X2=PEEK(P+
      1) :REM*231

```

Continued on p. 70.

Roll Them Bones

The right combination of strategy and chance will make you a winner in this addictive dice game.



By ROBERT COOK

Yatzy is an easy-to-learn C-64 version of the popular dice game where you try to roll five dice to get as high a score as you can. It's designed for one to four players, adults or children who can do simple addition.

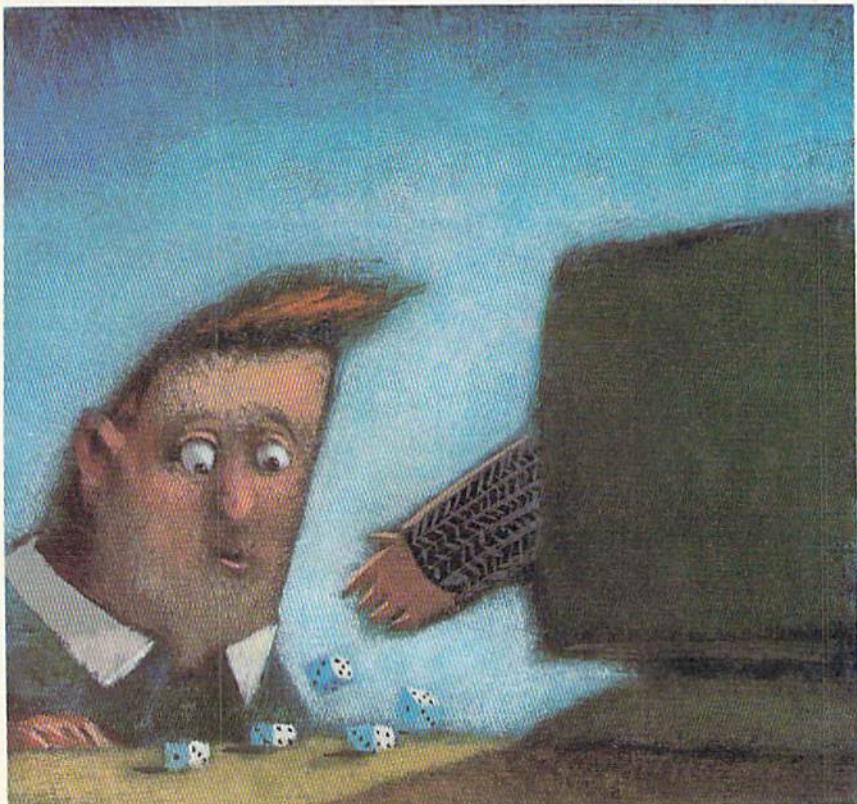
To begin each turn, the C-64 rolls the dice and displays them on the right side of the screen. Then you have two chances to improve your score by rolling any combination of the dice again. Using the joystick in port 2, move the pointing hand to select the dice you wish to reroll and press the firebutton; each die will disappear in turn.

When you've chosen all the dice you want to reroll, move the hand down to the Roll box and press the firebutton again. The dice you've chosen will be rerolled. If, before rolling, you decide you want to rechoose any dice, just move the hand up to the Undo box and press the firebutton. Note that the number in the Roll box is always the number of your current roll.

After your third roll, the pointing hand moves automatically to the scoring area on the left side of the screen. You can also proceed with scoring after your first or second roll—if you're satisfied with the total or the configuration—by moving the hand to the Roll box and pressing the firebutton.

SCORING

In the scoring area, there are two sections, the upper listing the possibilities for each die (1 through 6), and the lower showing various poker-hand bonus combinations. You score after each turn by moving the hand to the so-far-unused category that will give you the highest score with what's currently showing on the dice. Then press the firebutton to enter your score and display it in your score column.



Note that you *cannot* use a category more than once in a game, and, if your current dice don't fit in the category you've chosen, you get a zero for that category. The game ends when you (and each of the other players) have chosen each of the thirteen categories.

The categories in the upper part of the scoring area are for specific numbers, 1 (ace) through 6. Your score for each turn is the category number multiplied by the number of dice displaying the same category number. For example, if you roll three 3s and choose the 3's category, your 3's score will be 9. If

you roll fewer than three 3s, don't use that turn for the 3's category unless you have no better choice. A total score of 63 or more for aces through 6s entitles you to a 35-point bonus.

The categories in the lower half of the scoring area can be satisfied with any numbers; it's the configuration of the dice that counts. For three and four of a kind, you need at least three or four dice of the same number, but all five dice are totaled in the score. A full house—three dice of one number and two of another—is worth a flat 25 points. Small and large straights are ►

RUN it right: C-64; joystick

ROLL THEM BONES

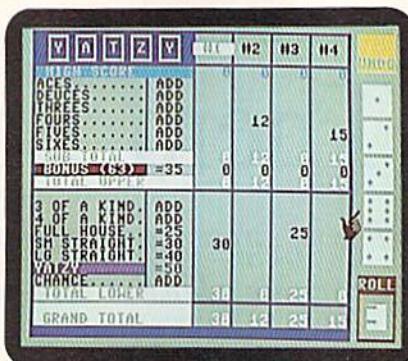
runs of four and five dice, respectively, and score 30 and 40 points. If a large straight is used as a small straight, it counts only the 30 points.

The Yatzy category is five of a kind, and it earns a whopping 50 points. Chance, which just totals all five dice, is the last-resort category where you can use a roll that doesn't fit anywhere else. You'll probably wish you had more than one chance to use Chance!

STRATEGY

Yatzy is a game of strategy as well as luck. The strategy lies both in choosing which dice to reroll and in deciding which scoring category to use for each turn. Of course, you'll hope to get good scores in all 13 categories in each game, but this is often impossible, so you may have to settle for low scores or zeroes in some categories.

If you decide to take a zero or low score in the upper half of the scoring area, place it in the aces category if you



can, to avoid jeopardizing your bonus. The few points lost can probably be made up elsewhere.

The best category in which to take a zero in the lower half is, surprisingly enough, Yatzy; although it brings in a high score, chances are substantial that you will never roll a Yatzy. The large straight and four of a kind are also good candidates for zeroing, because they're hard to roll.

Getting a high score isn't easy—Lou Wallace, RUN's technical manager, hasn't scored higher than 97 in dozens of games.

Note that your subtotals for the upper and lower halves of the scoring area and your grand total are all updated after each score is entered. Also, at the start of a game, your previous high score is displayed at the top of your score column. **R**

Robert Cook is a draftsman and designer of printed circuits who has been programming for about five years.

Listing 1. The Yatzy program.

```

0 REM YATZY - ROBERT B. COOK
      :REM*119
100 GOSUB380:GOSUB412:GOSUB326
      :REM*6
102 GOSUB114:GOSUB174
      :REM*7
104 GOSUB202:GOSUB286
      :REM*41
106 C1=C1+1:IFC1=NP*13THEN314
      :REM*247
108 PL=PL+1:IFPL>NPTHENPL=1
      :REM*99
110 GOTO102
      :REM*179
112 = START =
      :REM*52
114 PRINT"(HOME){CTRL 0}{CTRL 1
      "TAB(58)LEFT$("{CTRL 7}{CO
      MD H}{CTRL 1)#1 {CTRL 7}{CO
      MD H}{CTRL 1)#2 {CTRL 7}{CO
      MD H}{CTRL 1)#3 {CTRL 7}{CO
      MD H}{CTRL 1)#4 {CTRL 7}{CO
      MD J}",NP*6+2)
      :REM*97
116 PRINT"(HOME){CTRL 2}"TAB(54
      +PL*4)"{CTRL 9} #MIDS(STR$
      (PL),2)" {CTRL 0}(COMD H)"
      :REM*73
118 RL=1:PRINTDN$TAB(36) "{CRSR
      UP}{CTRL 2}"RN$(1) :REM*100
120 FORL1=1TO5:POKE2040+L1,200:
      DI(L1)=0:NEXT:POKESP+21,62
      :REM*243
122 GOSUB130:IFRL=4THENRETURN
      :REM*194
124 GOSUB154:IFRD>0THEN122
      :REM*86
126 RETURN
      :REM*13
128 = ROLL DICE =
      :REM*107
130 FORL1=1TO5
      :REM*61
132 IFDI(L1)=0THENDN(L1)=INT(RN
      D(1)*6+1)
      :REM*230
134 NEXT
      :REM*9
136 FORL1=1TO5:IFDI(L1)=1THEN14
      :REM*100
      6 :REM*131
138 T1=INT(RND(1)*6+1) :REM*7
140 POKEWV,129:POKELF,85:POKEHF
      ,36 :REM*108
142 POKE2040+L1,192+T1:FORL2=1T
      025:NEXT:POKEWV,128:REM*243
144 DI(L1)=1:IFT1<>DN(L1)THEN13
      8 :REM*171
146 NEXT :REM*21
148 RL=RL+1:IFRL<4THENPRINTDN$T
      AB(36) "{CRSR UP}{CTRL 2}"RN
      $(RL) :REM*151
150 RETURN :REM*37
152 = CHOOSE DICE =
      :REM*249
154 POKESP+1,92:POKESP+21,63:RD
      =0:T1=1 :REM*27
156 JS=PEEK(56320)AND31:IFJS=31
      THEN156 :REM*203
158 IFJS=15ANDT1=0THENFORL1=1TO
      5:POKE2040+L1,192+DN(L1):DI
      (L1)=1:NEXT:RD=0 :REM*121
160 IFJS=15ANDT1=6THEN170
      :REM*20
162 IFJS=15ANDT1>0THENPOKE2040+
      T1,200:RD=RD+1:DI(T1)=0
      :REM*229
164 IFJS=29THEN1=T1+1:IFT1>6TH
      ENT1=6 :REM*215
166 IFJS=30THEN1=T1-1:IFT1<0TH
      ENT1=0 :REM*226
168 POKESP+1,68+24*T1:FORL1=1TO
      99:NEXT:GOTO156 :REM*25
170 WAIT56320,16,15:RETURN
      :REM*207
172 = CHOOSE LINE =
      :REM*184
174 POKESP+21,254 :REM*66
176 LN=1:POKESP+15,86 :REM*245
178 JS=PEEK(56320)AND31:IFJS=31
      THEN178 :REM*76
180 IFJS=15ANDMX(PL,LN)=0THENRE
      TURN :REM*155
182 IFJS=15THENHENGOSUB308:REM*195
184 FORL1=1TO99:NEXT:IFJS=30THE
      N194 :REM*237
186 IFJS<>29THEN178 :REM*90
188 LN=LN+1:IFLN=7THENLN=11
      :REM*1
190 IFLN>17THENLN=1 :REM*150
192 GOTO198 :REM*53
194 LN=LN-1:IFLN=10THENLN=6
      :REM*204
196 IFLN<1THENLN=17 :REM*144
198 POKESP+15,78+LN*8:GOTO178
      :REM*118
200 = CALCULATE =
      :REM*176
202 SC=0:MX(PL,LN)=1 :REM*214
204 ON-(LN<7)GOTO208:GOTO222
      :REM*13
206 = UPPER =
      :REM*113
208 FORL1=1TO5 :REM*143
210 IFDN(L1)=LNTHENSC=SC+LN
      :REM*111
212 NEXT :REM*87
214 SC(PL,1)=SC(PL,1)+SC(IFSC(P
      L,1)>62THENSC(PL,2)=35
      :REM*248
216 SC(PL,3)=SC(PL,1)+SC(PL,2):
      SC(PL,5)=SC(PL,3)+SC(PL,4)
      :REM*114
218 RETURN :REM*105
220 = LOWER =
      :REM*158
222 T1=0:T2=0:SC=0 :REM*225
224 FORL1=1TO6:CT(L1)=0:NEXT
      :REM*74
226 FORL1=1TO5:T2=T2+DN(L1):FOR
      L2=1TO6 :REM*211
228 IFDN(L1)=L2THENCT(L2)=CT(L2
      )+1 :REM*39
      
```

ROLL THEM BONES

```

230 NEXT:NEXT :REM*97      N}{3 CRSR RTs}{CTRL 2} PRES .....{CTRL 7}{COMD G}{CTR
232 ONLN-10GOSUB240,240,250,262 S{2 SPACES}FIRE " :REM*120 L 1}ADD {CTRL 7}{COMD G}{3
,262,274,282 :REM*206 318 FORL1=1TONP:HS=SC(L1,5):IFH SPACES}{COMD G}{3 SPACES}{C
234 SC(PL,4)=SC(PL,4)+SC:SC(PL, S<=PEEK(829+L1*2)*256+PEEK(
5)=SC(PL,3)+SC(PL,4) 830+L1*2)THEN322 :REM*11 SPACES}{COMD G}{3 SPACES}{COMD G}{3
,320 POKE829+L1*2,HS/256:POKE830 342 PRINT"(COMD L){CTRL 1}FIVES
:REM*133 +L1*2,(HS/256-INT(HS/256))* .....{CTRL 7}{COMD G}{CTR
236 RETURN :REM*123 256 :REM*116 L 1}ADD {CTRL 7}{COMD G}{3
238 * 3 OR 4 OF A KIND * :REM*219 322 NEXT:WAIT56320,16,16:WAIT56 SPACES}{COMD G}{3 SPACES}{C
240 FORL1=1TO6 :REM*160 320,16,15:RUN :REM*223 OMD G}{3 SPACES}{COMD G}{3
242 IFLN=11ANDCT(L1)>2THENSC=T2 324 = SCREEN = :REM*89 SPACES}{COMD J] :REM*19
:REM*69 326 PRINT"(SHFT CLR){CTRL 7}{CO 344 PRINT"(COMD L){CTRL 1}SIXES
244 IFLN=12ANDCT(L1)>3THENSC=T2 MD L}{CTRL 9} (COMD A){SHFT .....{CTRL 7}{COMD G}{CTR
:REM*124 * (COMD S}{COMD A}{SHFT *} (CO L 1}ADD {CTRL 7}{COMD G}{3
246 NEXT:RETURN :REM*149 MD S}{COMD A}{SHFT *} (COMD SPACES}{COMD G}{3 SPACES}{C
248 * FULL HOUSE * :REM*68 S}{COMD A}{SHFT *} (COMD OMD G}{3 SPACES}{COMD G}{3
250 FORL1=1TO6 :REM*190 (CTRL 0}{SHFT O}{3 COMD SPACES}{COMD G}{3 SPACES}{COMD J] :REM*37
252 IFCT(L1)=2THENT1=T1+2 :REM*164 (SHFT O}{3 COMD Ys) 346 PRINT"(CTRL 7){COMD L}{CTRL
254 IFCT(L1)=3THENT1=T1+3 :REM*128 (3 COMD Ys}{SHFT O}{3 COMD 2}{CTRL 9} SUB TOTAL{7 SPA
:REM*128 Ys) (COMD J){CTRL 8}{CTRL 9} }{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
256 IFT1=5THENSC=25 :REM*66 (4 SPACES)" :REM*103 SPACES}{COMD J] :REM*55
258 NEXT:RETURN :REM*161 328 PRINT"(CTRL 7){COMD L}{CTRL 348 PRINT"(CTRL 7){COMD L}{CTRL
260 * SMALL STRAIGHT OR LARGE S TRAIGHT * :REM*225 9} (SHFT -)Y{2 SHFT -}A{2 3}{CTRL 9} BONUS (63) {CTR
:REM*225 SHFT -}T{2 SHFT -}Z{2 SH L 0}{CTRL 7}{COMD G}{CTRL 3
262 FORL1=1TO6 :REM*202 FT -}S{Y{SHFT -} (CTRL 0}{CO }=35 {CTRL 7}{COMD G}{3 SPA
264 T1=T1+1:IFCT(L1)=0THENT1=0 :REM*88 MD H}{3 SPACES}{COMD H}{3 S CE}s}{COMD G}{3 SPACES}{COMD G}{3 SPA
:REM*88 MD H}{3 SPACES}{COMD J}{CTR CE}s}{COMD G}{3 SPACES}{COMD G}{3 SPA
266 IFLN=14ANDT1=4THENSC=30 :REM*219 MD H}{3 SPACES}{COMD J}{CTR CE}s}{COMD G}{3 SPACES}{COMD G}{3 SPA
:REM*219 L 8}{CTRL 9}{4 SPACES}" CEs}{COMD J] :REM*198
268 IFLN=15ANDT1=5THENSC=40 :REM*63 330 PRINT"(CTRL 7){COMD L}{CTRL 350 PRINT"(CTRL 7){COMD L}{CTRL
:REM*63 9} (COMD Z}{SHFT *} (COMD X 2}{CTRL 9) TOTAL UPPER{5 S
270 NEXT:RETURN :REM*173 ) (COMD Z}{SHFT *} (COMD X}{C PACE}s}{CTRL 0}{CTRL 7}{COMD
272 * YATZY * :REM*0 OMD Z}{SHFT *} (COMD X}{COMD G}{3 SPACES}{COMD G}{3 SPA
274 FORL1=1TO6 :REM*198 Z}{SHFT *} (COMD X}{COMD Z}{COMD CE}s}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD
276 IFCT(L1)=5THENSC=50:REM*192 :REM*198 J] :REM*198
278 NEXT:RETURN :REM*181 332 PRINT"(CTRL 7){COMD L}{CTRL 352 PRINT"(COMD L){12 COMD Ys}{
:REM*143 HFT L}{3 COMD Ps}{SHFT L}{3 COMD Ps SHFT O}{4 COMD Ys}{SHFT O}{3 COMD Y
282 SC=T2:RETURN :REM*154 }{SHFT L}{3 COMD Ps}{COMD J s}{SHFT O}{3 COMD Ys}{SHFT O}{3 COMD Ys}{COMD J]
:REM*19 :REM*85 :REM*245
284 = PRINT = :REM*19 334 PRINT"(COMD L){CTRL 1}ACES. 354 PRINT"(COMD L){CTRL 1}3 OF
286 POKE646,0:IFLN=16THENPOKE64 :REM*151 .....{CTRL 7}{COMD G}{CTR A KIND.{CTRL 7}{COMD G}{CTR
6,4 :REM*151 9}{COMD 7} HIGH SCORE{6 SP L 1}ADD {CTRL 7}{COMD G}{3
288 PRINTLEFT$(DN$,LN+4)TAB(19+ ACES}{CTRL 0}{CTRL 7}{COMD SPACES}{COMD G}{3 SPACES}{C
4*(PL-1))RIGHT$(" "+STR$( SC),3) :REM*177 G}{3 SPACES}{COMD G}{3 SPACES}{COMD OMD G}{3 SPACES}{COMD G}{3
:REM*177 290 GOSUB30 :REM*110 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
292 FORL=1TO5:T=VAL(MID$("01112 132224",L*2,2)) :REM*37 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*37 294 POKE646,1:IFL=2THENPOKE646, :REM*148 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
2 :REM*148 336 PRINT"(COMD L){CTRL 1}DEUCE SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
296 PRINTLEFT$(DN$,T)TAB(19+(4* PL-1))RIGHT$(" "+STR$(SC,PL,L)),3) :REM*10 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*10 300 NEXT:POKESP+21,62:RETURN :REM*66 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*66 302 = BLIP = :REM*44 SPACES}{COMD J] :REM*13 356 PRINT"(COMD L){CTRL 1}4 OF
302 POKESP,240:POKEWV,17:POKEHF ,50:POKELF,35 :REM*12 SPACES}{COMD J}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*12 304 FORL1=1TO99:NEXT:POKEWV,16: SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
POKESP,0:RETURN :REM*222 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*222 306 = BUZZ = :REM*183 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
308 POKESP,240:POKEWV,33:POKEHF ,5 :REM*8 SPACES}{COMD J] :REM*192 358 PRINT"(COMD L){CTRL 1}FULL
:REM*8 310 FORL1=1TO150:NEXT:POKEWV,32 :REM*120 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:RETURN :REM*120 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*120 312 = END GAME = :REM*204 SPACES}{COMD J] :REM*186 360 PRINT"(COMD L){CTRL 1}ST
314 POKESP+21,0:POKE829,234 :REM*84 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*84 316 PRINT"(HOME){CTRL 9}{CRSR D SPACES}{COMD J]{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*97 340 PRINT"(COMD L){CTRL 1}FOURS SPACES}{COMD J] :REM*218
:REM*19 342 PRINT"(COMD L){CTRL 1}FIVES SPACES}{COMD J]{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*19 344 PRINT"(COMD L){CTRL 1}SIXES SPACES}{COMD J] :REM*37
:REM*148 348 PRINT"(CTRL 7){COMD L}{CTRL 3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*55 350 PRINT"(CTRL 7){COMD L}{CTRL 2}{CTRL 9} SUB TOTAL{7 SPA
:REM*55 C PACE}s}{CTRL 0}{CTRL 7}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*198 352 PRINT"(COMD L){12 COMD Ys}{SHFT O}{4 COMD Ys}{SHFT O}{3 COMD Ys}{SHFT O}{3 COMD Ys}{SHFT O}{3 COMD Ys}{COMD J]
:REM*198 354 PRINT"(COMD L){CTRL 1}3 OF
:REM*198 A KIND.{CTRL 7}{COMD G}{CTR L 1}ADD {CTRL 7}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*245 356 PRINT"(COMD L){CTRL 1}4 OF
:REM*215 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*220 358 PRINT"(COMD L){CTRL 1}FULL SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
HOUSE..{CTRL 7}{COMD G}{CTR L 1}=25 {CTRL 7}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*186 360 PRINT"(COMD L){CTRL 1}ST SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
RAIGHT.{CTRL 7}{COMD G}{CTR L 1}=30 {CTRL 7}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*218 362 PRINT"(COMD L){CTRL 1}LG ST SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3 SPACES}{COMD G}{3
:REM*218

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RAIGHT.{CTRL 7}{COMD G}{CTR
L 1)=4Ø {CTRL 7}{COMD G}{3
SPACES}{COMD G}{3 SPACES}{C
OMD G}{3 SPACES}{COMD G}{3
SPACES}{COMD J} :REM*93
364 PRINT"(COMD L){CTRL 9}{CTRL
5)YATZY{7 SPACES}{CTRL Ø}{CTRL
7}{COMD G}{CTRL 5)=5Ø
{CTRL 7}{COMD G}{3 SPACES}{COMD
G}{3 SPACES}{COMD G}{3 SPACES}{COMD
G}{3 SPACES}{COMD J}{COMD 1}{4 COMD Ps}
:REM*236
366 PRINT"(CTRL 7){COMD L}{CTRL
1)CHANCE.....{CTRL 7}{COM
D G}{CTRL 1)ADD {CTRL 7}{CO
MD G}{3 SPACES}{COMD G}{3 S
PACES}{COMD G}{3 SPACES}{CO
MD G}{3 SPACES}{COMD J}{CTR
L 9}{COMD 1)ROLL :REM*68
368 PRINT"(CTRL 7){COMD L}{CTRL
2){CTRL 9) TOTAL LOWER{5 S
PACES}{CTRL Ø}{CTRL 7}{COMD
G}{3 SPACES}{COMD G}{3 SPA
CES}{COMD G}{3 SPACES}{COMD
G}{3 SPACES}{COMD J}{COMD
1}{SHFT Ø}{2 COMD Ys}{SHFT
P} :REM*57
37Ø PRINT"(CTRL 7){COMD L}{CTRL
2){CTRL 9){17 COMD Ys}{CTR
L Ø}{CTRL 7}{SHFT Ø}{3 COMD
Ys}{SHFT Ø}{3 COMD Ys}{SHF
T Ø}{3 COMD Ys}{SHFT Ø}{3 C
OMD Ys}{COMD J}{COMD 1}{COM
D G}{2 SPACES}{COMD N}
:REM*82
372 PRINT"(CTRL 7){COMD L}{CTRL
2){CTRL 9) GRAND TOTAL{5 S
PACES}{CTRL Ø}{CTRL 7}{COMD
G}{3 SPACES}{COMD G}{3 SPA
CES}{COMD G}{3 SPACES}{COMD
G}{3 SPACES}{COMD J}{COMD
1}{COMD G}{2 SPACES}{COMD M
} :REM*191
374 PRINT"(CTRL 7){COMD L}{CTRL
9){33 SPACES}{CTRL Ø}{COMD
J}{COMD 1}{SHFT L}{2 COMD
Ps}{SHFT @}{HOME}{2 CCSR DN
s}{COMD 7} :REM*235
376 FORL1=1TONP:PRINT"(COMD 7)"
TAB(15+L1*4)RIGHT$("") "+STR$(
HS(L1)),3):NEXT:RETURN
:REM*194
378 ===== O P T I O N S =
===== :REM*251
38Ø POKE53281,15:POKE5328Ø,15:N
P=1 :REM*1Ø8
382 PRINT"(SHFT CLR){2 CCSR DNS
}{CTRL 5){7 SPACES}{COMD A
}{3 SHFT *s}{COMD S}{COMD A
}{3 SHFT *s}{COMD S}{COMD A
}{3 SHFT *s}{COMD S}{COMD A
}{3 SHFT *s}{COMD S}:REM*218
384 PRINT"(7 SPACES){SHFT -}{CO
MD *}{CTRL 9}{COMD *}{CTRL
Ø}{SHFT LB.}{2 SHFT -s}{CTR
L 9}{COMD V}{COMD O}{COMD C
}{CTRL Ø}{2 SHFT -s}{CTRL 9
} :REM*93
386 PRINT"(7 SPACES){SHFT -}{C
TRL 9}{CTRL Ø}{2 SHFT -s
}{CTRL 9}{CTRL Ø}{SHFT E}{C
TRL 9}{CTRL Ø}{2 SHFT -s
}{CTRL 9}{CRSR RT}{CTRL Ø}{2
SHFT -s}{CTRL 9}{SHFT LB.
}{COMD C}{CTRL Ø}{COMD I}{2
SHFT -s}{CTRL 9}{CRSR RT
}{CTRL Ø}{SHFT -} :REM*227
388 PRINT"(7 SPACES){COMD Z}{3
SHFT *s}{COMD X}{COMD Z}{3
SHFT *s}{COMD X}{COMD Z}{3
SHFT *s}{COMD X}{COMD Z}{3
SHFT *s}{COMD X}{COMD Z}{3
SHFT *s}{COMD X} :REM*75
39Ø PRINT"(4 CCSR DNS){CTRL 2){3
SPACES)PRESS JOYSTICK [(C
TRL 5)PORT 2{CTRL 2)] {CTRL
7)UP {CTRL 2)OR {CTRL 7)DO
WN :REM*9Ø
392 PRINT"(CCSR DN){CTRL 2){6 S
PACES)TO CHANGE NUMBER OF P
LAYERS :REM*92
394 PRINT"(2 CCSR DNS){1Ø SPACE
}s)PRESS {COMD 2)FIRE {CTRL
2)TO PLAY :REM*123
396 PRINT"(3 CCSR DNS){9 SPACES
}HOW MANY PLAYERS?{COMD 2}"
; :REM*214
398 PRINTTAB(27)NP"(3 CCSR LFs
"; :REM*156
4ØØ JS=PEEK(5632Ø)AND31:FORL1=1
TO75:NEXT :REM*2ØØ
4Ø2 IFJS=3ØTHENNP=NP+1:IFNP=5TH
ENNP=1 :REM*139
4Ø4 IFJS=29THENNP=NP-1:IFNP=ØTH
ENNP=4 :REM*176
4Ø6 IFJS>>15THEN398 :REM*53
4Ø8 PRINT"(SHFT CLR)":RETURN
:REM*37
41Ø = INITIALIZE = :REM*2Ø4
412 PL=1:SP=53248:R=RND(-TI)
:REM*2Ø6
414 LF=54272:HF=54273:WV=54276:
SR=54278 :REM*216
416 RN$(1)="{CTRL 9}{SHFT LB.}{C
TRL Ø}{COMD K}{2 CCSR LFs
}{CCSR DN}{CTRL 9}{COMD K}{C
TRL Ø}{COMD K}{HOME}":REM*5
418 RN$(2)="{CTRL 9}{SHFT E}{2
CCSR LFs}{CCSR DN}{SHFT D
}{HOME}" :REM*15
42Ø RN$(3)="{CTRL 9}{SHFT E}{2
CCSR LFs}{CCSR DN}{SHFT D
}{HOME}" :REM*173
422 DNS="({HOME}{23 CCSR DNS
}:REM*118
424 DIM DI(5),MX(4,2Ø),SC(4,5),
HS(4) :REM*18
426 FORL1=LFTOLF+24:POKEL1,Ø:NE
XT:POKELF+24,15 :REM*177
428 IFPEEK(829)=234THEN434
:REM*12Ø
43Ø FORL1=ØTO511:READA:POKE1228
8+L1,A:NEXT :REM*151
432 FORL1=512TO575:POKE12288+L1
,,:NEXT:POKE83Ø,Ø:POKE831,Ø
:REM*164
434 FORL1=1TO5:POKESP+39+L1,1
:REM*21Ø
436 POKESP+2*L1,52:POKESP+1+2*L
1,6Ø+L1*24:REM COLOR,X,Y PO
S :REM*2
438 NEXT :REM*58
44Ø POKE2Ø4Ø,192:POKESP+39,9:PO
KESP,3Ø:POKESP+1,212:REM LE
FT :REM*186
442 POKE2Ø47,199:POKESP+46,7:PO
KESP+14,12Ø:POKESP+15,86:RE
M RIGHT :REM*157
444 POKESP+16,127 :REM*97
446 FORL1=1TONP:HS(L1)=PEEK(829
+L1*2)*256+PEEK(83Ø+L1*2):N
EXT :REM*65
448 RETURN :REM*76
45Ø = SPRITE DATA = :REM*197
452 * LEFTHAND * :REM*126
454 DATAØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
,ØØØ,ØØØ :REM*94
456 DATAØ96,ØØØ,ØØØ,224,ØØØ,ØØØ
,192,ØØØ :REM*44
458 DATAØØ3,128,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
,ØØØ,ØØØ :REM*239
45Ø DATAØ14,Ø61,192,ØØ7,123,Ø64
,ØØ7,118 :REM*187
462 DATA224,ØØ7,189,16Ø,ØØ7,219
,112,ØØ7 :REM*166
464 DATA222,ØØ8,ØØ7,221,176,ØØ3
,255,Ø96 :REM*2Ø8
466 DATAØØ3,255,192,ØØ1,255,128
,ØØ1,255 :REM*216
468 DATAØØØ,ØØ1,254,ØØØ,ØØ3,252
,ØØØ,ØØØ :REM*189
47Ø * ONE * :REM*36
472 DATA255,255,255,255,255,255
,255,255 :REM*174
474 DATA255,255,255,255,255,255
,255,255 :REM*16Ø
476 DATA255,255,255,255,255,255
,255,255 :REM*162
478 DATA255,231,255,255,195,255
,255,195 :REM*93
48Ø DATA255,255,231,255,255,255
,255,255 :REM*224
482 DATA255,255,255,255,255,255
,255,255 :REM*184
484 DATA255,255,255,255,255,255
,255,255 :REM*186
486 DATA255,255,255,255,255,255
,255,ØØØ :REM*54
488 * TWO * :REM*2Ø9
49Ø DATA255,255,255,255,255,255
,255,255 :REM*176
492 DATA2Ø7,255,255,135,255,255
,135,255 :REM*49
494 DATA255,2Ø7,255,255,255,255
,255,255 :REM*163
496 DATA255,255,255,255,255,255
,255,255 :REM*182
498 DATA255,255,255,255,255,255
,255,255 :REM*136
5ØØ DATA255,255,243,255,255,225

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ROLL THEM BONES

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,255,255 :REM*18 ,255,255 :REM*105 ,135,243 :REM*155
502 DATA225,255,255,243,255,255 ,255,255 :REM*196 ,255,255 :REM*120
504 DATA255,255,255,255,255,255 ,255,000 :REM*24 ,255,135 :REM*101 ,225,255 :REM*82
506 * THREE * :REM*20 538 DATA225,255,135,243,255,207 ,255,255 :REM*7 ,255,255 :REM*182
508 DATA255,255,255,255,255,255 ,255,255 :REM*130 540 DATA255,255,255,255,255,255 ,255,000 :REM*252 ,255,135 :REM*89
510 DATA207,255,255,135,255,255 ,135,255 :REM*3 542 * FIVE * :REM*224 574 DATA225,255,135,243,255,207
512 DATA255,207,255,255,255,255 ,255,255 :REM*181 ,243,255 :REM*213 ,255,255 :REM*251
514 DATA255,231,255,255,195,255 ,255,195 :REM*49 546 DATA207,225,255,135,225,255 ,135,243 :REM*137 ,255,000 :REM*208
516 DATA255,255,231,255,255,255 ,255,255 :REM*196 ,255,255 :REM*106 578 * RIGHHAND * :REM*115
518 DATA255,255,243,255,255,225 ,255,255 :REM*228 550 DATA255,231,255,255,195,255 ,255,195 :REM*21 ,006,000 :REM*7
520 DATA225,255,255,243,255,255 ,255,255 :REM*214 ,255,255 :REM*184 582 DATA000,007,000,000,003,128
522 DATA255,255,255,255,255,255 ,255,000 :REM*234 ,255,135 :REM*119 ,000,001 :REM*48
524 * FOUR * :REM*44 554 DATA255,255,243,255,207,225 ,255,255 :REM*233 ,007,110 :REM*163
526 DATA255,255,255,255,255,255 ,243,255 :REM*195 ,255,000 :REM*206 586 DATA003,188,112,002,222,224
528 DATA207,225,255,135,225,255 ,135,243 :REM*167 556 DATA225,255,135,243,255,207 ,224,011 :REM*131
530 DATA255,207,255,255,255,255 ,255,255 :REM*135 ,255,255 :REM*16 ,007,110 :REM*119
532 DATA255,255,255,255,255,255 ,255,255 :REM*135 ,243,255 :REM*167 592 DATA003,255,192,001,255,128
564 DATA207,225,255,135,225,255 ,192,000 :REM*73 ,000,255 :REM*73
564 DATA207,225,255,135,225,255 ,192,000 :REM*79 ■

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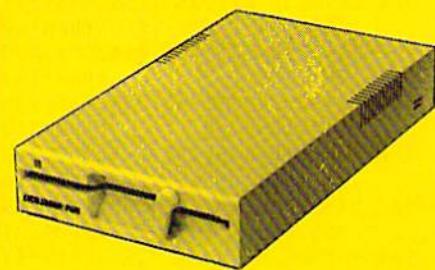
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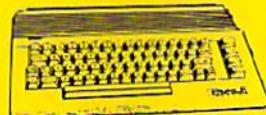


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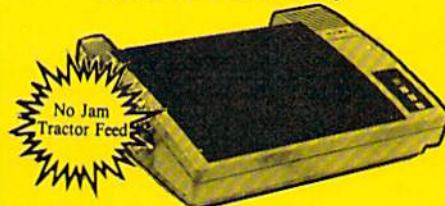
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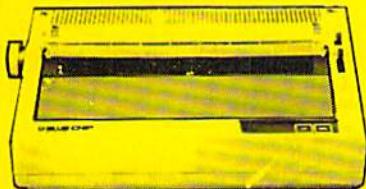
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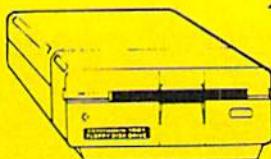
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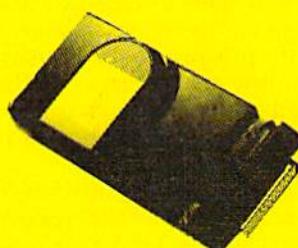
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The Multitasking Factor

This factoring and prime number-generating program demonstrates techniques for emulating multitasking.

Can a small computer do two things at exactly the same time? No, but sometimes it can seem to be doing just that. For example, while it's waiting for input from the keyboard, it can be performing another task.

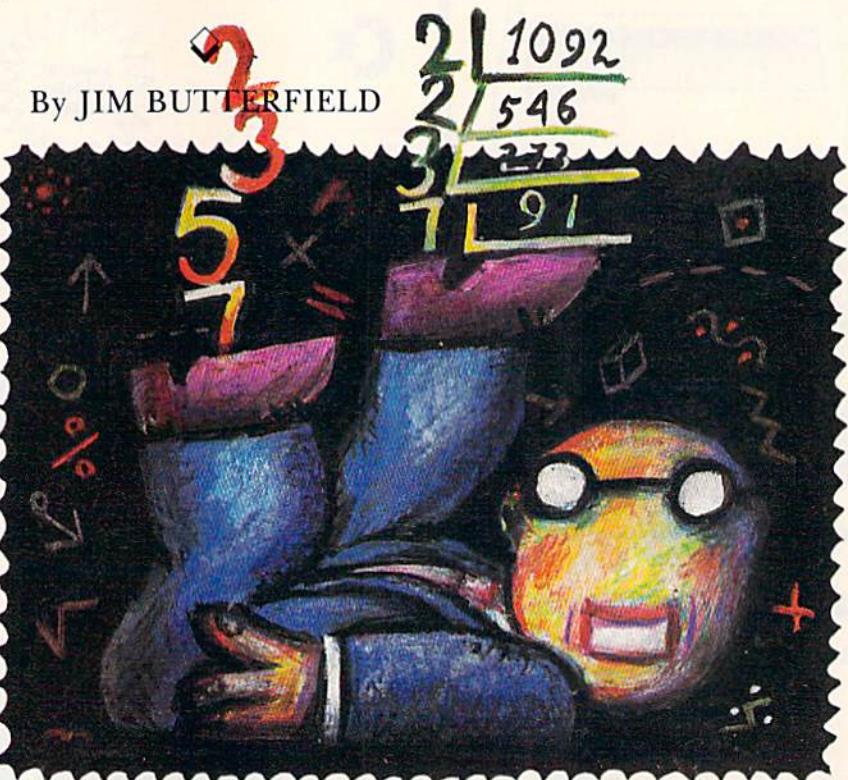
That's exactly what happens in this article's Basic program, Factors. As you enter a value, the computer has little to do except wait for you to type, so it spends the time calculating prime numbers. When you finish typing and press the return key, these primes will speed the job of calculating the number's factors.

This kind of activity—doing two things almost at once—is called "multitasking" and actually happens all the time on your Commodore. For example, no matter what else the machine is doing, it also checks the keyboard and updates the clock sixty times a second. It does this through an "interrupt" routine, which stops the program you're running, performs these special tasks and then resumes the main job. If you think about it, you'll see that your program is slowed down a little by this activity.

With Factors, nothing has to be stopped; the computer calculates prime numbers during the time it's waiting for you to type, when it would otherwise be idle. Once you press return to signal that the number is completely entered, the machine goes to work full-time on the factoring job.

After you enter a number, the computer displays how many prime numbers it has calculated so far. If you typed quickly, there won't be many, but the computer will use the ones it has. If it uses all the values in the prime table and still hasn't found all the factors, it continues the process using a sequence of odd numbers as trial divisors. For example, if it knows that a number isn't divisible by 3, it can be sure the number

By JIM BUTTERFIELD



can't be divided by 33 either. The odd-number method is less efficient, but it still works.

As Factors runs, it gets "smarter" and speeds up, because the table of prime numbers gets bigger. Numbers containing only small factors are always handled quickly—the table of primes is hardly needed. Numbers containing large factors are processed slowly at first, but more and more quickly as the table of primes grows.

A good number to try to see this effect is the easy-to-remember 123456789. Try it as soon as you start running Factors and again a few minutes later; the speed improvement will be quite noticeable. After about 500 prime numbers have been calculated, the computer will have all it needs to find the factors of 123456789, and there will be no further speed improvement. How-

ever, it will continue to enlarge the prime table, up to a maximum of 3400 numbers, for handling other numbers you might input for factoring.

Don't enter a number that contains more than nine digits, because Basic can't hold numbers greater than that with precision, and the factors the computer generates will almost certainly be wrong. Computer experts try to explain such phenomena with jargon like "a 32-bit mantissa," but what they mean is, stop at nine decimal digits. That's why the table of prime numbers stops at 3400: The toughest nine-digit number won't need more than that.

PROGRAM NOTES

Perhaps you're writing a program where the computer could do useful work while waiting for keyboard response. Look through Listing 1 and ►

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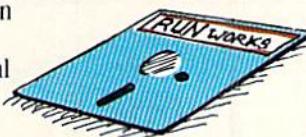
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MULTITASKING FACTOR

refer to Table 1 to see how it's done.

The Factors code is divided into four sections: lines 100–170 start things up; 180–290 calculate the primes and enter them into the table, called P(); 300–460 check for keyboard input; and 470–710 factor the input value.

The trick to multitasking in this case is the Get statement. If the program were to ask for numbers using an Input statement, there would be an enforced wait until you pressed return. By using Get, it can spot when the keyboard is quiet and use the time to do more calculation.

Since Get obtains one keystroke at a time, Factors must string the keys together to make the whole input number. This is done with concatenation in line 410.

The Get routine is inside a bigger looping structure that calculates the prime numbers and puts them in table P(). This outer loop is set up in such a way that Get is checked frequently, so you won't see any hesitation by the computer when you press a key. When you hit the return key, factoring continues until it's complete; no more primes are calculated until the requested work has been done.

The resulting factors are displayed in a convenient format. When the same factor appears more than once, it's shown as raised to a power (variable K holds the power). Multiplication is indicated by an asterisk—the Basic standard. If you'd rather see an X for multiplication, just make the appropriate change in line 640.

SPEED TRICKS

Factors is designed with a number of features that increase program speed. For example, array P(), which holds the table of prime numbers, takes up a lot of memory space—over 17K, in fact. That's no problem as to memory availability, but there's a sneaky speed question. If you create an array and then create new Basic variables, the array must be moved over to make room. If the array is very large, like P() in this case, there'll be a pause while we move this massive chunk in memory. In Factors, I avoided this by defining all the variables—with the DIM (Dimension) statement in line 110—before defining array P().

Of course, a DIM statement is nor-

Table 1. Program references.

Important lines:

190—A new prime value is entered into the prime table here. Reached from line 290.

220—Chooses a new number for testing as a prime. Reached from line 270.

250—The "main loop." Tries a new divisor for the number being tested as a prime. Reached from line 730, if the table of primes isn't full.

310—Tests for input from the keyboard. If the table of primes is full, execution returns here from line 740.

360—Prints the prompt character on the screen. The program loops back here from lines 430 and 460 after it has detected and displayed a valid character.

370—Checks for a new keypress. Line 310 scoots ahead to this point if the prompt message has already been printed.

440—Execution comes here if the delete key is detected at line 390.

480—If the return key is detected at line 380, the program comes here and starts calculating factors.

550—Tries a new factor. Execution loops back here from line 670.

580—Does the trial division. The program skips ahead from line 550 if it has exhausted the prime table, and it loops back from line 590 if the factor is "operational," to see if it has been used more than once.

670—Decides if it's worth trying more

factors. Line 600 sends execution here if a trial factor fails.

730—Decides whether to go back for more primes. The program leaps down here from lines 370 and 400 if there's nothing interesting happening on the keyboard.

Variables:

Whole program:

P()—Table of prime numbers.

P9—Maximum size of the prime table.

PN—Number of primes in the prime table.

P8—Value to be tested as a prime.

P1—Entry in prime table to try as a factor for a new prime.

Prime calculation:

P2—Trial factor for a prime test.

P3—Quotient from trial division.

Input section:

N—Zero if prompt hasn't been sent.

NS—Input keys detected so far.

X\$—Current key detected.

Factor calculation:

N—Number to be factored.

K—Power to which a factor is raised.

P2—Trial factor for factoring test.

P3—Quotient from trial division.

P4—Entry in prime table to try as a factor.

X\$—Separator character for the result.

mally used to set up arrays, but it can also create variables and assign them locations in memory. By the time P() is created with the DIM statement in line 130, all the variables are in place, and there's no need to waste time relocating the array.

Another speed trick involves putting the variables that are used most often at the beginning of the variable table. You do this by using them early in the program. In Factors, the DIM statement in line 110 creates variables P3 and P4 first, since they're used often in calculating factors.

FAST ENOUGH?

Other languages—particularly ma-

chine language—can calculate factors faster than Basic and can handle larger numbers with precision. However, Factors, written in Basic, is quite usable and illustrates how to write a program that emulates multitasking.

Now, any time you're writing a program that needs to wait for user input, think about using the idle time for another job. Perhaps the computer could partly sort a table of names of values or calculate averages. Basic is flexible and fun, and multitasking is just one more example of what it can do for you. \square

Toronto resident Jim Butterfield is a renowned programmer, writer and lecturer in the Commodore field.

Listing 1. Factors program.

```
100 PRINT "MULTITASK FACTORS ..  
JIM BUTTERFIELD" :REM*33  
110 DIM P3,P4,P2,N,PN,K,P1,X$,N  
     :REM*201  
120 P9=3400{3 SPACES}:REM MAX P  
     RIME COUNT :REM*44  
130 DIM P(P9) :REM*118  
140 REMARK:{2 SPACES}SET TWO PR  
     :REM*855  
     :REM*23  
150 P(0)=2 :REM*102  
160 PN=0 :REM*72  
170 P8=3 :REM*72
```

MULTITASKING FACTOR

```

180 REMARK:(2 SPACES)ENTER NEW :REM*129 560 P2=P(P4) :REM*157
PRIME IN TABLE :REM*215 380 IF X$=CHR$(13) GOTO 480 570 P4=P4+1 :REM*147
190 PN=PN+1 :REM*210 390 IF X$=CHR$(20) AND LEN(N$)>0 GOTO 440 580 P3=N/P2 :REM*235
200 P(PN)=P8 :REM*117 400 IF X$<"0" OR X$>"9" GOTO 73 590 IF P3=INT(P3) THEN N=P3:K=K
210 REMARK:(2 SPACES)TRY A NEW :REM*114 410 N$=N$+X$ :REM*13 +1:GOTO 580 :REM*11
VALUE AS PRIME :REM*114 420 PRINT X$; :REM*65 600 IF K=0 GOTO 670 :REM*76
220 P8=P8+2 :REM*111 430 GOTO 360 :REM*252 610 REMARK: FACTOR FOUND .. PRI
230 P1=1 :REM*118 440 N$=LEFT$(N$,LEN(N$)-1) 620 PRINT X$;MID$(STR$(P2),2); :REM*24
240 REMARK:(2 SPACES)TRY FACTOR :REM*173 450 PRINT X$; :REM*103 630 IF K>1 THEN PRINT "(UP ARRO
P2 FROM TABLE :REM*173 460 GOTO 360 :REM*25 W)";MID$(STR$(K),2); :REM*35
250 P2=P(P1) :REM*65 470 REMARK:(2 SPACES)NUMBER REC 640 X$="" :REM*91
260 P3=P8/P2 :REM*251 480 PRINT " " :PRINT "( I HAVE"; 650 K=0 :REM*205
270 IF P3=INT(P3) GOTO 220 490 PN;"PRIMES SO FAR)" :REM*95 660 REMARK:(2 SPACES)MAYBE ANOT
:REM*143 500 IF N<2 THEN END :REM*51 670 IF P2<P3 GOTO 550 :REM*2
:REM*143 510 PRINT N;"=" ; :REM*42 680 REMARK:(2 SPACES)NO MORE FA
520 REMARK: TRY FACTORS FROM TA 700 PRINT :REM*195
530 PRINT "NUMBER (0 = END): "; 710 N=0 :REM*86
540 REMARK: TRY NEXT FACTOR 720 REMARK:(2 SPACES)BACK FOR M
550 IF P4>PN THEN P2=P2+2:GOTO 730 IF PN<P9 GOTO 250 :REM*190
:REM*179 560 IF P4>PN THEN P2=P2+2:GOTO 740 GOTO 310 :REM*35
580 :REM*188
370 GET X$:IF X$="" GOTO 730 ■

```

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FontPak Plus-GEOS	22
GEOS 64 v 2.0	39
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GEOS Write Workshop/64	39
GEOS Write Workshop/128	45

第十一章

I Speak Basic to My C64 Book	8
Jax Book Revealed 2	23
K Jax Book Revealed 1	23
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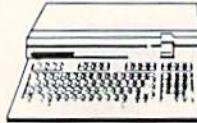
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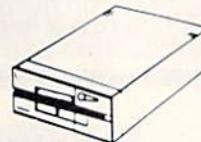
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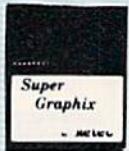
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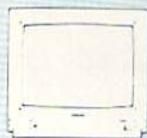
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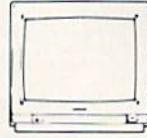


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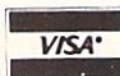
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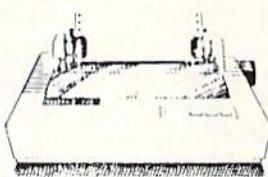
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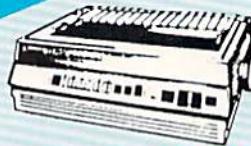
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Journey to the Center of Your Disk Drive

The second stop of our tour bus gives a revealing look at the workings of your 1541 or 1571.



By ELLEN RULE

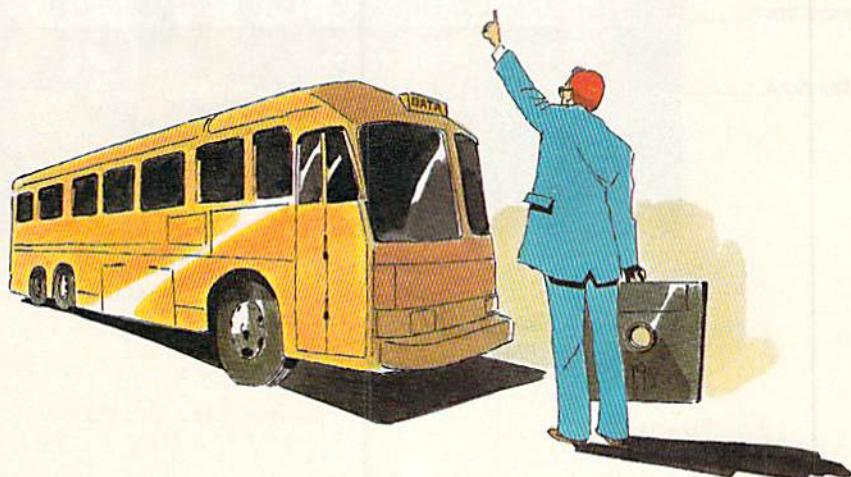
Last December, I took *RUN* readers on a guided tour inside the C-64 and C-128, and, if you came along, you now have a good idea how your computer works. But what about the computer's close associate, the disk drive? Under the threat of voiding your warranty and the risk of damaging drive components, you may never have dared open the case. Well, never mind. Just dive into this article for a view of the wonders beneath the surface of your 1541 or 1571.

Our exploration will focus on the 1541 drives made for Commodore by Newtronics since 1984 and their cousins, the 1571s. The Newtronics' 1541s are characterized by a turn-gate latch and contain the revision C board, copyrighted in 1983. Earlier 1541s, made from 1980 to 1984 by ALPS Electric, had a drop-gate latch and slightly different internal mechanisms. However, the basic operating principles are the same in both types of 1541, as well as in the 1571.

DRIVE MECHANISMS

Inserting a disk into your drive and closing the door latch initiates a complex sequence of electronic and electro-mechanical events. Closing the latch depresses a lever that secures the disk in a clamping apparatus. This holds the disk in the proper position for the spindle mechanism to engage with the hub—the large hole in the center of a 5½-inch disk.

A pulley and belt from the disk drive's motor turn the spindle on the 1541 drive, while on the 1571 the spindle is a direct extension of the drive motor shaft. Proper functioning of the drive depends on a constant rotational speed of 300 rpm, which is maintained by the speed controller board, a small circuit board located near the drive mechanism. Also, on a signal from the main circuit board, the motor control circuit



on the speed controller board turns the drive motor on and off.

The speed controller board contains resistors, capacitors, integrated circuits (ICs) that control the mechanical parts of the drive, and a potentiometer to adjust the drive to exact speed. The drive light, a light-emitting diode (LED) on the front of the case, is wired to the controller board to indicate when read or write access is in progress.

Inside the 1571, another LED and a photoreceptor on the controller board read the index hole near the center of the disk, providing a timing signal when the drive is reading or writing disk formats other than its native Group Code Recording (GCR) format.

In addition to holding the disk in place, the clamping mechanism that's activated by closing the drive door latch engages the read/write head. This is encased in a spring-loaded plastic housing, which is shaped something like two tongue depressors hinged together at the back edge.

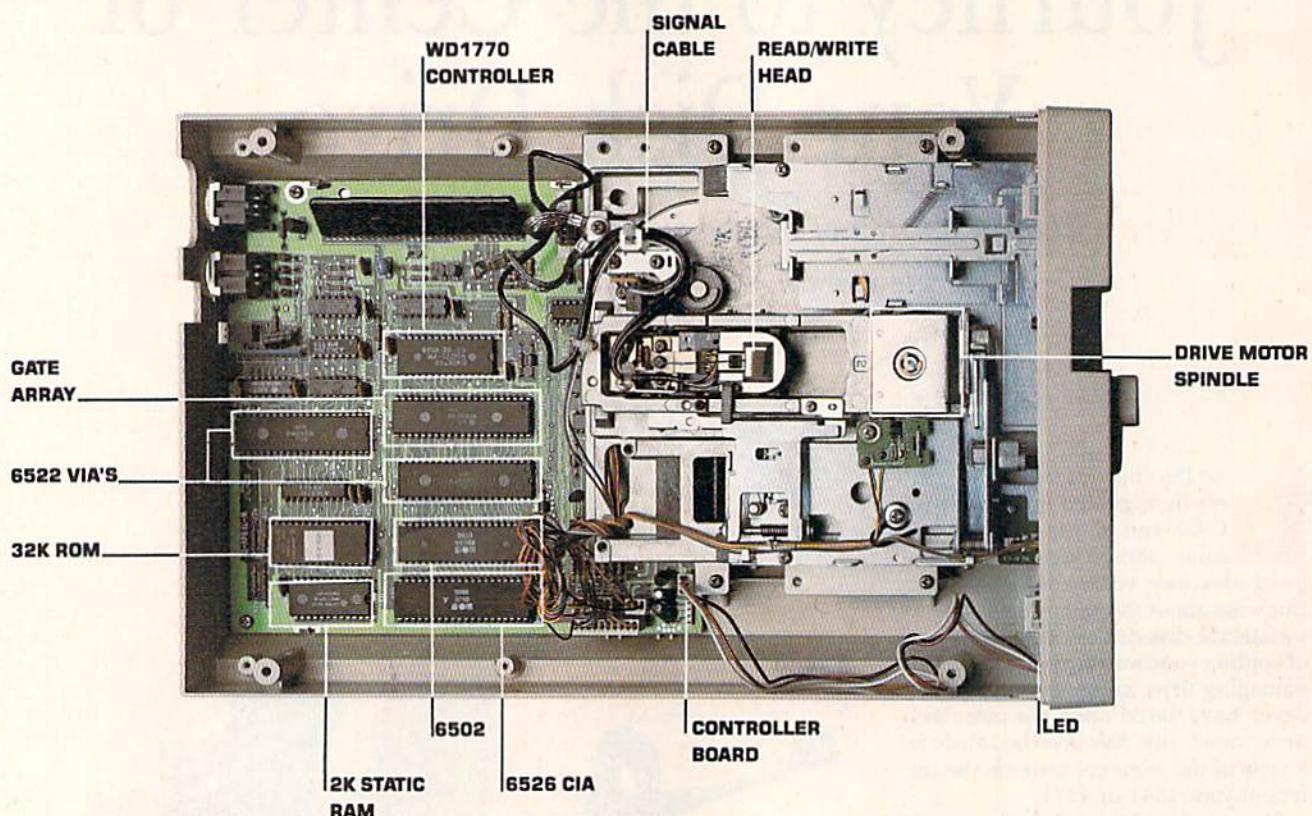
When the 1541 drive latch is closed, the upper part of the read/write unit, which holds a small fiber pressure pad, presses the disk down against the head

in the bottom half of the device. The double-sided 1571 drive contains a head in each half of the read/write mechanism.

The read/write head carriage advances and retreats along two silvery rails, giving the head access, through the long oval opening in the disk jacket, to each of the 35 circular tracks on the disk's magnetic surface. A signal cable carries data from each read/write head to the main circuit board. Movement is provided by a stepper motor that advances under control of the electronic circuitry. A metal drive band that's attached to the head carriage wraps around a pulley and the head transport wheel; the wheel, in turn, attaches to the top of the drive shaft of the stepper motor.

In the 1541, two metal faces atop the head transport wheel act as end stops for the read/write head. Movement of the drive head to track zero, the outermost position, makes the head carriage bump against the end stops, creating the knocking sound familiar to users of the 1541. (The drive seeks track zero to orient itself so it can advance, in steps, to track 18 where the disk directory is stored.) With some models ►

DISK DRIVE



Under the cover of the 1571 disk drive.

of the 1541, the knocking of the transport wheel against the stops can gradually misalign the wheel on its shaft, creating a common source of drive-reading problems. Two screws on the underside of the stepper motor are provided for correcting the alignment.

In the 1571, an electric-eye device serves the same function as the physical contact between transport wheel and end stops in the 1541, thus reducing the likelihood of alignment problems. When the head is positioned at track zero, a tab at the rear of the head carriage prevents the light of an LED from reaching a photosensor, thus generating a track-zero-detect signal that is sent to the head control unit.

THE POWER SUPPLY

All of the drive's mechanical action, as well as its electronic circuitry, is energized by a power supply consisting of a transformer and various other electrical components. The transformer, connected to the power plug through an on/off switch and protected by a fuse, reduces the 120-volt ac household current to lower-voltage ac.

In the 1541 drive, four wires bring

the power from the power supply to the rear corner of the main circuit board, where rectifiers convert the ac to dc, capacitors smooth the dc and two voltage regulators reduce the excess voltage by turning the electrical energy into heat. Finger-like heat sinks around these nickel-size regulators draw the resulting heat away. This whole process results in 12 volts dc for the mechanical components of the drive and 5 volts dc to power most of the electronics. In the 1571, the transformations to 12 and 5 volts dc take place before the power arrives at the main circuit board.

The 1541's main circuit board lies above the mechanical components and the power supply, while in the 1571 the main board is underneath the power supply at the rear of the drive enclosure. Wrapped around the circuitry is a ventilated metal shield that reduces electromagnetic interference and aids in heat dissipation.

THE INTELLIGENT DRIVE

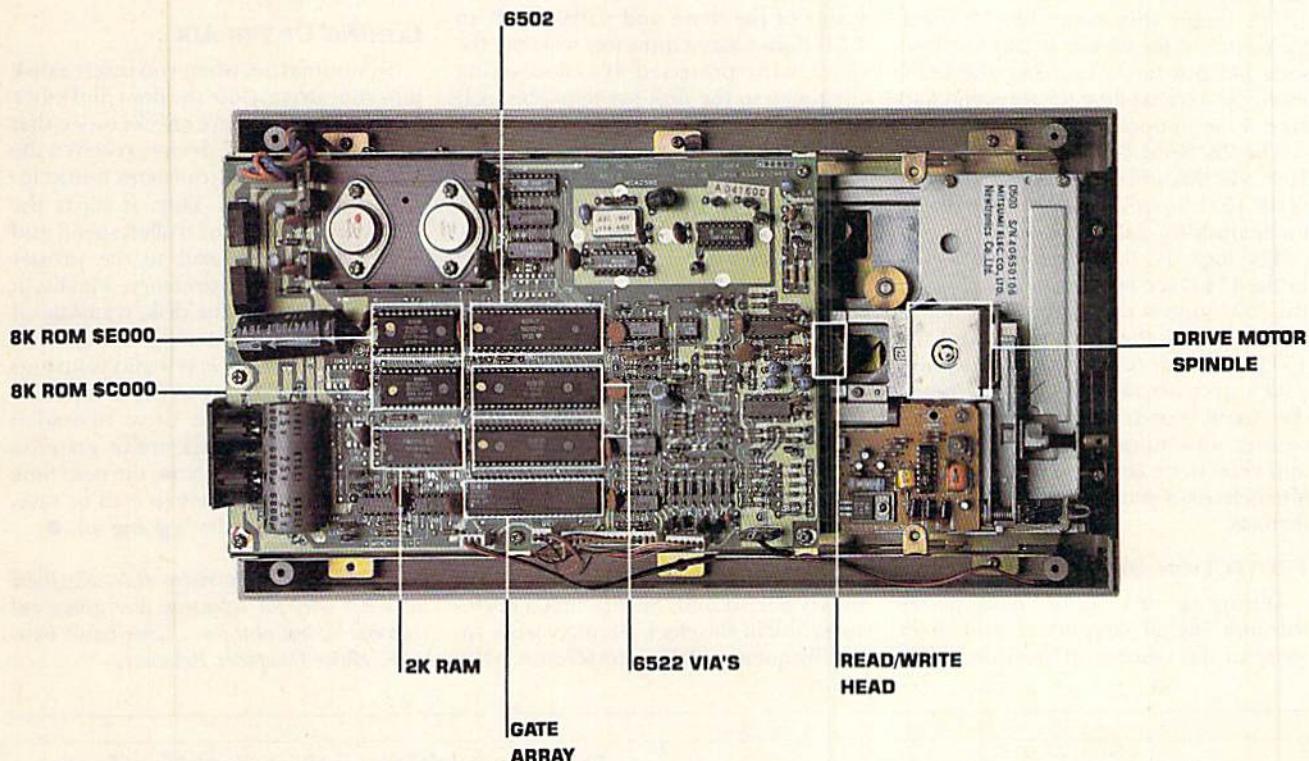
The Commodore drive is, in its electronic aspects, distinctly different from drives made for other computers. Considered an "intelligent" device, it con-

tains ICs that enable it to function without using memory in the computer itself and without taking up any of the computer's processing time. These ICs—a central processing unit (CPU), random access memory (RAM), read only memory (ROM) and interface adapter chips—are familiar to those who toured the C-64 in December's issue. It seems that the Commodore disk drive is, in fact, a computer all of its own. Indeed, with the proper code, the drive can be programmed to function unassisted by the computer!

Communication between the different components of your computer system takes place along "buses," visible as copper traces on the circuit board. The 6502 CPU calls to specific memory addresses in RAM over the 16-line address bus; then the data in those addresses is placed on the 8-line data bus, where it can be read by the CPU. The control bus transmits control signals back and forth between the CPU and I/O components or memory.

When signals are sent from the C-64 or C-128, they come to the drive via one of the round serial connectors at the back of the drive case. Then, while the

DISK DRIVE



The view into Commodore's 1541 disk drive.

computer waits, the disk drive determines whether it is the device being addressed, or whether the command is for another device along the serial bus, such as a second disk drive or a printer. The device number (8, 9, 10 or 11) of the 1541 is established by two solder connections that lie in the midst of a vast field of transistors, capacitors, resistors and diodes at the front-left of the drive's main board. On the 1571, the device number is selected with a switch that's accessible at the rear of the drive case.

Once the drive has determined that it is, in fact, the device being signaled, it checks to see whether a disk has been inserted. If so, it sets the disk spinning at the proper speed; moves the head to the track where the requested data is stored; reads, sorts and formats the data; and then sends it to the computer. To accomplish these tasks, the ICs on the main circuit board of the drive perform the complex interrelated operations summarized below.

THE ICs

The 6502 CPU, a cousin of the ICs that manage the C-64 and C-128, lies in the center of the 1541's circuit board and

near the left edge of the 1571's board. This IC is the workhorse of the disk drive, interpreting the instructions sent along the serial bus from the computer.

The 6502 calls on the disk operating system (DOS), encoded on the two 8K ROM chips that lie just behind it in the 1541, for file management instructions. On the 1571, DOS resides in the 32K ROM chip directly to the rear of the 6502.

The DOS is a complex software interface that acts as an interpreter between the host computer and the drive, checking to make sure the commands sent from the computer follow the proper syntax (format) and keeping track of the file-management details necessary to create, modify and delete files. It also monitors free disk space and maintains the disk directory, to ensure that files don't overlap.

Another, smaller part of the software in the disk drive ROMs is the controller, which deals only with the physical aspects of the disk itself and is responsible for reading from and writing to the sectors on the disk. If DOS requires access to the disk, it notifies the controller, which then reads data from the

desired sectors and hands it to the DOS.

The 1541 drive reads and writes in a format known as Group Code Recording (GCR), while the 1571 can read and write in two different formats: GCR and modified frequency modulation (MFM), a format used by operating systems such as CP/M. (In CP/M mode, the DOS resides inside the host computer, and only the controller portion of the 1571 ROM is used.)

The 6522 versatile interface adapter (VIA) ICs, cousins of the complex interface adapters in the C-64 and C-128, are the disk drive's communicators. One of the two VIAs, designated as the serial bus controller, communicates with the computer through the serial bus and with the drive electronics through the control bus. The second VIA, the drive controller, synchronizes the drive mechanism with the electronics, turning on the drive and moving the stepper motor and drive head to the desired location on the disk.

The 1541's VIAs lie directly to the left of the 6502 CPU. Grouped around the 6502 in the 1571 are the two VIAs and a 6526 complex interface adapter (CIA) that assists the VIAs in their input/out-

DISK DRIVE

put operations. (The 6526 is the same CIA found in the C-64 and C-128.) The 1571's floppy disk controller IC (near the center of the board) is also involved with I/O functions, enabling the drive motor and controlling the direction and rate of the stepper motor.

The 2K RAM chip, to the left of the 1541's ROMs and in the back-left corner of the 1571 board, is used by both drives for temporary data storage.

The logic IC to the left of the VIAs in the 1541, the two gate array chips in the 1571 (one at the center of the board and one near the front-right) and the 1571's hybrid read/write component, which stretches along the right edge of the circuit board, all enhance data processing and storage. The gate arrays and read/write component in the 1571 also help read and write alternative disk formats.

PROTECTION DETECTION

During a disk write, data passes through signal amplifiers and over wires to the read/write head or heads.

At the beginning of the write process, a photosensitive switch mounted in the frame of the drive and paired with an LED light source indicates whether the disk is write-protected. If a tab covering the notch in the disk prevents the LED light from reaching the switch, the switch sends out a signal that the disk is protected and then the drive won't write to it. If the notch is not covered, the disk is write-enabled and data may be stored on it.

COORDINATING IT ALL

Each operation your disk drive performs takes a fixed amount of time, and all the operations are controlled by a system clock acting as a metronome. The 16-MHz (megahertz) output of a quartz oscillator located at the right-front of the 1541's main circuit board and at the center-front of the 1571's board is divided to yield the required clock frequency of 1 MHz, or 1 million pulses per second. Silvery metal enclosures shield the clock circuitry from radio frequency (RF) interference. (No,

they don't cage the notorious Save-with-Replace bug.)

COMING UP FOR AIR

To summarize, when you insert a disk into your drive, close the door and enter LOAD"\$",8, the drive checks to see that it is the designated device, receives the Load message and translates it into internal instructions. Then it starts the disk spinning at a controlled speed and moves the drive head to the proper track to read the directory. Finally, it reads the data off the disk, translates it into a form for internal storage and manipulation, converts it and transmits it over the serial bus to the computer.

By breaking down drive operation into manageable parts, we've gotten a look at how it works. Now, the next time you tell your computer to load or save, you can envision what's going on. ■

Ellen Rule is a psychiatric R.N. who finds time not only for extensive user group involvement, but also for a home-based business, Home Computer Resource.

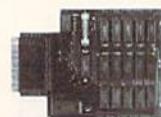
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By HAROLD BJORNSON

Have you ever wished your C-128 had some of the more advanced commands and features available on the ultra-expensive personal computers? Perhaps more colors and faster disk access? Even multitasking? Sound too good to be true? Well, wish no longer.

After spending the last two years working with my trusty assembler, I have come up with the most advanced machine code utility ever seen on a

C-128. Totally menu-driven and self-contained, it is so easy to use that written instructions would be superfluous and just get in the way, so I didn't even bother with them.

To use Amazing!, just type in the following listing (using RUN's Checksum utility) and save it to disk with the filename "List 1". After saving it, you will need to run "List 1" in order to create the Amazing! program. The drive will run for a couple of minutes while it

creates the machine code file on disk.

After the file is created, just type RUN "AMAZING". The program works in 40- or 80-Column mode, but I would suggest you use 80-Column Fast mode, if possible. Have fun and enjoy! ☐

Bearing a name nearly identical to that of RUN's associate editor, Harold Bjornson is a successful hog farmer in central Minnesota who fills the long winter evenings by programming on his C-128.

Listing 1. The Amazing! program.

```
10 OPEN 8,8,8,"AMAZING,P,W"
      :REM*145 102 DATA 20DE20353AD520DE2030 0
      :REM*86   06F1C14009720383038 2C31303
20 READ A$:IF A$="-1" THEN CLOS
      :REM*176   03A9720373932 :REM*158
E8:END
25 IF LEN(A$)<62 THEN 55
      :REM*232   103 DATA 2C3132353AFAE0220303A 9
      :REM*232   720373237392C313339 3A97203
      :REM*232   73238302C3032 :REM*125
30 B$=MIDS(A$,1,20)+MIDS(A$,22,
      :REM*35 20)+MIDS(A$,43,29) :REM*35
35 N=LEN(B$)/2 :REM*38
40 FOR I=1 TO N :REM*20
45 H$=MIDS(B$,I*2-1,2):H=DEC(H$)
      :REM*222 )
      :REM*222
50 PRINT#8,CHR$(H);:NEXT:GOTO 2
      :REM*100
      :REM*100
55 IF LEN(A$)<20 THEN B$=A$:GOT
O 70 :REM*65
60 IF LEN(A$)<42 THEN B$=MIDS(A$,
      :REM*148 106 DATA 24314320415420243143 3
      :REM*148 64600D91C2800992293 9F223BA
      :REM*148 6532922434F4D :REM*198
      :REM*148 107 DATA 4D4F444F524520424153 4
      :REM*148 9432056372E30203131 3232333
      :REM*148 6352042595445 :REM*198
      :REM*148 108 DATA 53204652454522000A1D 3
      :REM*148 20099A6532922202020 2843293
      :REM*148 139383620434F :REM*127
      :REM*148 109 DATA 4D4D4F444F524520454C 4
      :REM*148 54354524F4E4943532C 204C544
      :REM*148 42E2200351D3C :REM*183
      :REM*148 110 DATA 0099A653292220202020 2
      :REM*148 0202020202843293139 3737204
      :REM*148 D4943524F534F :REM*17
85 PRINT#8,CHR$(H);:NEXT:GOTO 2
      :REM*129 111 DATA 465420434F52502E2200 5
      :REM*148 E1D460099A653292220 2020202
      :REM*148 02020202020 :REM*25
100 REM AMAZING C128 UTILITY
      :REM*190 112 DATA 414C4C20524947485453 2
      :REM*190 0524553455256454422 0701D4
      :REM*190 03137353A822054543A 8920313
```

RUN it right: C-128

AMAZING!

43ØØØE21EB4ØØ	:REM*71	234ØØD61FØØ1892Ø31	343ØØØE	143 DATA 832Ø3136Ø1Ø2186Ø183 2
124 DATA 8B2Ø4B4524B2C7283133 2		C1F18Ø14BB231	:REM*111	Ø2296434F52452Ø4D45 4C54444
92ØAF2Ø4124B22222Ø A72ØEØ2		134 DATA AB4B3A992Ø435524284B 2		F574E2Ø574152 :REM*57
C3Ø2C53592C22 :REM*166		93B3A8EØØØØ2Ø22Ø18F Ø2ØØ415		144 DATA 4E494E479F22ØØ2D219Ø Ø
125 DATA 2Ø223A993A5359B25359 A		253452Ø434F4D	:REM*68	1832Ø22434F4D5Ø5554 45522Ø5
A313A892Ø32353ØØF8 1EBEØØ8		135 DATA 4D414E44ØØ222Ø2CØ151 B		34C414E472Ø45 :REM*181
B2Ø4B4524B2C7 :REM*214		23Ø3A993A5359B25359 AA313A8		145 DATA 52524F5222ØØ52219AØ1 8
126 DATA 283133292ØA72Ø32333Ø Ø		B2Ø5359B13234	:REM*23	32Ø225749434B45444C 592Ø535
Ø2A1FC8ØØ8B2Ø4B4524 B222112		136 DATA 2ØA72Ø5359B23234ØØ3Ø 2		4555Ø49442Ø48 :REM*235
22ØBØ2Ø4B4524 :REM*34		Ø36Ø1812Ø57B2312ØA4 Ø4EØØ4		146 DATA 554D414E2Ø4552524F52 2
127 DATA B22291222ØBØ2Ø4B4524 B		Ø2Ø4ØØ14C4CB2	:REM*213	122ØØ7521A4Ø1832Ø22 9942555
2221D222ØBØ2Ø4B4524 B2229D2		137 DATA C328432428572929ØØ55 2		253542Ø52414D :REM*79
22ØA72Ø31343Ø :REM*2		Ø4AØ18B2Ø328412429 B34C4C2		147 DATA 2Ø4348495ØØ2Ø44455445 4
128 DATA ØØ451FDØØ8B2Ø4B4524 B		ØA72Ø33353ØØØ :REM*188		3544544219F22ØØ9421 AEØ1832
22293222ØA72Ø5359B2 3Ø3A12		138 DATA 7ØØ54Ø18B2ØC8284124 2		Ø2243ØØ552Ø4F :REM*17
4B2222ØØ6A1F :REM*96		C4C4C29B24324285729 2ØA72Ø5		148 DATA 5645524C4F41442Ø494E 4
129 DATA D3ØØ8B2Ø4B4524B22213 2		1B257ØØA62Ø5E	:REM*92	44943415445442ØØAE 21B8Ø18
22ØA72Ø992Ø43552428 31293B3		139 DATA Ø1823A8B2Ø51B23ØØA7 2		32Ø225A383ØØØ :REM*254
A5359B23Ø3A41 :REM*75		Ø993A992Ø452428BB28 3129AC5		149 DATA 4D495353494E472Ø4552 5
13Ø DATA 24B2222ØØ781FDCØØ41 2		152293A5359B2	:REM*161	24F5222ØØD321C2Ø183 2Ø22444
4B24124AA4B4524ØØ86 1FE6ØØE		14Ø DATA 5359AA333A8B2Ø5359B1 3		9534B2Ø445249 :REM*1Ø
Ø2C3Ø2C53592C :REM*224		2342ØA72Ø5359B23234 ØØD62Ø6		15Ø DATA 56452Ø555Ø534944452Ø 4
131 DATA 4124ØØAD1FFØØ8B2Ø4B 4		8Ø18B2Ø51B3B1	:REM*1Ø7	44F574E2Ø4552524F52 22ØØFB2
524B2C7283133292ØA7 2Ø99435		141 DATA 3ØØØA72Ø993A992Ø414E 2		1CCØ1832ØØ2243 :REM*121
5242831293B3A :REM*16		42851293A5359B25359 AA333A8		151 DATA .4F4F4B49452Ø4352554D 4
132 DATA 8D2Ø32393Ø3A4124B222 2		B2Ø5359B13234	:REM*1Ø	2532ØØ494E2Ø4B455942 4F41524
2ØØB81FFAØØ4B4524B2 2222ØØC		142 DATA 2ØA72Ø5359B23234ØØE7 2		42ØØ4552524F52 :REM*58
C1FØ4Ø18B2ØØ3	:REM*53	Ø72Ø1992Ø2252454144 592E223		152 DATA 22ØØ1B22D6Ø1832Ø2249 4
133 DATA 59B132342ØA72Ø5359B2 3		A8EØØFØØØCØ1	:REM*61	4494F542Ø41542Ø4B45 59424F4



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Circle 54 on Reader Service card.

```

1524420455252 :REM*101    176 DATA 4520464F522057414C4B 4
153 DATA 4F522203B22E018320 2      94E272200625A80283 2022454
253594E54415820494E 2045525      E44222C22454E :REM*188
24F52204D4553 :REM*158    177 DATA 443F20444F20594F5520 5
154 DATA 5341474522005E22EA01 8      448494E4B2049274D20 5355494
320224D495353494E47 20434F4      34944414C3F22 :REM*115
E564552534154 :REM*111    178 DATA 002D25B2028320224253 4
155 DATA 494F4E20504945434522 0      15645222C2257484154 20444F4
07C22F4018320224D49 5354414      55320422D5341 :REM*24
B4520494E2042 :REM*90    179 DATA 5645204D45414E3F2200 5
156 DATA 5241494E43454C4C5322 0      425BC02832022445341 5645222
09A22FE018320225649 432D323      C225748415420 :REM*140
020494E564153 :REM*250    180 DATA 444F455320442D534156 4
157 DATA 494F4E204552524F5220 0      5204D45414E3F20079 25C6028
0BD220802832022544F 4F204D5      3202253415645 :REM*12
543482047454F :REM*217    181 DATA 222C225341564520594F 5
158 DATA 5320494E2052414D2045 5      55253454C4620425553 5445522
2524F522200D8221202 8320225      12200A925D002 :REM*114
04F574552204E :REM*31    182 DATA 83202253505244454622 2
159 DATA 4F54204F4E204552524F 5      C2257484154204B494E 44204F4
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4494E4720464F :REM*137    183 DATA 49532027535052444546 2
160 DATA 52203135343120524553 5      73F2200FC25DA028320 2253435
04F4E53452E2E2200 0623260      241544348222C :REM*221
2832032360027 :REM*208    184 DATA 22574845524520444F45 5
161 DATA 2330028320224C495354 2      320495420495443483F 2200FB2
22C224C495354204954 20594F5      5E40283202244 :REM*54
55253454C4621 :REM*153    185 DATA 454C455445222C224920 5
162 DATA 220055233A0283202244 4      7495348204920434F55 4C44204
952222C22594F552047 4554205      4454C45544520 :REM*130
94F5552204F57 :REM*12    186 DATA 594F552122002126EE02 8
163 DATA 4E204449524543544F52 5      320224946222C224946 2057495
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0224449D2222C :REM*44    187 DATA 524520484F525345532E 2
164 DATA 22594F55204745542059 4      E2E22004826F8028320 2246415
F5552204F574E204449 5245435      354222C22484F :REM*237
44F5259204255 :REM*145    188 DATA 572041424F5554204D45 4
165 DATA 442E2200A0234E028320 2      449554D205350454544 3F22007
252554E222C22444F2D 52554E2      7260203832022 :REM*205
D52554E2D5255 :REM*132    189 DATA 534C4F57222C22492057 4
166 DATA 4E2200CC235802832022 4      F4E27542054414B4520 5448415
449D222C2249205341 4944204      42046524F4D20 :REM*159
7455420594F55 :REM*241    190 DATA 412048554D414E2E2200 9
167 DATA 52204F574E2044495245 4      E260C038320224D4F4E 49544F5
3544F5259220002462 0283202      2222C22492744 :REM*47
24E4557222C22 :REM*152    191 DATA 2052415448455205741 5
168 DATA 4E455720574841543F20 2      443482054562E2200C2 2616038
0594F55205345454D20 5052455      32022504C4159 :REM*203
45459204F4C44 :REM*76    192 DATA 222C22504C4159204954 2
169 DATA 20544F204D452E220028 2      0414741494E2053414D 2E2E2E2
46C028320224C4F4144 22C202      200EF26200383 :REM*198
24C4F41442049 :REM*150    193 DATA 202252454E554D424552 2
170 DATA 5420594F555253454C46 2      22C224C455420534545 2E2E2E3
04944494F542120048 2476028      12C322C362C34 :REM*2
32022444C4F41 :REM*120    194 DATA 2C382C31312E2E2200 1
171 DATA 44222C22464F52474554 2      8272A03832022545241 50222C2
04954204E4552442122 068248      2544849532049 :REM*99
002832022424C :REM*207    195 DATA 53204120545241502E2E 2
172 DATA 4F4144222C22464F5247 4      E484548454845484522 0067273
554204954204E455244 2122008      4039720373932 :REM*7
B248A02832022 :REM*218    196 DATA 2C36343A97203830382C 3
173 DATA 48454C50222C2248454C 5      131303A972037323739 2C303A9
020594F555253454C46 20444F5      720373238302C :REM*195
24B212200A824 :REM*45    197 DATA 303A993A992241505249 4
174 DATA 9402832022535953222C 2      C20464F4F4C53204652 4F4D205
2535953204F52205349 5354455      2554E204D4147 :REM*246
23F2200D8249E :REM*59    198 DATA 415A494E4521223A8000 0
175 DATA 02832022424F4F5422C 2      000 :REM*18
2544845534520424F4F 5453204 :REM*53    199 DATA -1 :REM*53
15245204D4144 :REM*3

```

Flight notes

6A

Exploring Stealth Mission

Several man-years went into developing Stealth Mission for the Commodore 64/128 computers. The program incorporates many new design concepts. Target-hit detection, for example, is embedded within the Stealth Mission scenery structure itself. This lets the software designer easily assign a different score value to each potential target, including negative scores for destroying targets that should be avoided (hospitals, for example). Programmable scoring is just one unique feature of this third-generation flight simulator.

Stealth Mission Reviews

While we don't like to brag, we certainly can't argue with Stealth Mission reviews like these. Ahoy magazine (7/88) writes that this simulator "pushes the C64/128 envelope beyond the blue horizon, to a whole new level of animation and frame rates... absolutely incredible." Stealth Mission "... sets new standards at the top of the C64 flight simulator heap," according to Info (5-6/88). Commodore (2/89) calls Stealth Mission's combination of strategy and action "truly superior to others. Only a flight simulation this good could come from SubLOGIC." Stealth Mission, winner of the 1988 Consumer Electronics Show "Best Strategy Game" Software Showcase Award. What more can we say?

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HARDWARE GALLERY

Here's a close look at the features of the latest Star Micronics printers—two monochrome and two color.

Compiled by BETH S. JALA

STAR MICRONICS

PRINTERS A

*Something for Everyone,
A Printer Today!*

Noticeably absent from my printer roundup last October was any mention of the ever-popular and relatively inexpensive Star Micronics printers. Better late than never, here's a look at the four variations of the 9-pin NX-1000.

They are termed the NX-1000 Multi-Font, NX-1000C Multi-Font, NX-1000 Rainbow and NX-1000C Rainbow. As the word Rainbow implies, two of the machines are color printers. The "C" suffix denotes those two printers as Commodore-dedicated, meaning that a 6-pin serial cable (instead of the usual printer interface) is used to connect the unit to your computer.

At a glance, all four printers look the same, even to the experienced eye. In performance, the four NX-1000 printers share identical print-speed specs and similar text-printing options. A wide range of fonts and print styles are available on all the machines. On the other hand, many variations exist between the standard and Commodore-dedicated models in the number of Graphics options offered. All other factors aside, the biggest difference among the printers is the most obvious: the two Rainbow models offer color printing; the two Multi-Font models don't.

EXTERNAL SIMILARITIES

All four printers are compact units, with dimensions of 15.1 by 11.3 by 4.3 inches. Sleek, streamlined styling distinguishes these four from most other printers on the market and, in particular, from other printers in their price range. Each unit's on/off switch is conveniently mounted on the front, eliminating awkward fumbling searches.

Despite the fact that they're located inside the printer, each machine's DIP switches are readily accessible. While the NX-1000C Multi-Font and NX-1000C Rainbow each have only one bank of

DIP switches, the two non-Commodore-dedicated models have two banks.

A removable plastic dust cover rests over the carriage and protects the print-head, ribbon cartridge and internals.

PAPER HANDLING

Over the years, I've seen Star Micronics and other printer manufacturers develop innovative solutions to the universal problem of feeding paper through the printer. Multipart forms, various label configurations, business envelopes, stationery and continuous feed forms are just a few of the things that today's printers must be able to handle.

Star Micronics addresses the paper-handling problem on the NX-1000 models by using built-in, non-removable tractor feed units hidden from sight in the rear of each printer. This arrangement is great for easy printing with continuous forms, but is temperamental at best with continuous labels.

For feeding single sheets, each unit is equipped with a removable paper guide that mounts on top of the printer. With this guide in place, pulling the bail lever forward automatically feeds single

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A Superb!

An exceptional product that outshines all others.

B Good.

One of the better products available in its category. A worthy addition to your hardware collection.

C Average.

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

D Poor.

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

E Failure.

Many problems; should be deep-sixed!

forms to the proper top margin.

All four models of the NX-1000 can use the single-form paper guide and the tractor feed in conjunction with one another by simply parking the tractor-fed paper on its sprockets while the paper guide is being used. Once the single-form printing is finished, the continuous form paper can be unparked and advanced. I applaud Star Micronics for this feature. I've previously seen this only on expensive 9- and 24-pin printers, so it represents a significant advancement for low-end machines.

CONTROL PANELS

While there are only four buttons on each of these units, there's an unbelievable array of printing and paper-handling functions that can be performed by pressing them in various combinations.

There's an online button that pauses printing and causes other print functions to be activated or deactivated. A paper-feed button allows for line feeds, or if pressed in conjunction with the online button, produces forward microfeed and page feed.

A print-pitch button lets you cycle through a selection of character widths. These pitches include pica (10 characters per inch), elite (12 cpi), condensed pica (17 cpi), condensed elite (20 cpi), proportional pica and proportional elite.

The NLQ type-style button controls near-letter-quality printing. All models of the NX-1000 can give you NLQ printing in three fonts—Courier, Sanserif and Orator. Courier is the most attractive, with finely detailed characters in every pitch. Sanserif is the least attractive, with rather bland characters that lack the detail of Courier. Orator is the most interesting, because it can print large and small uppercase characters. Italic is available in each of these fonts.

Powering up with various combinations of the control panel buttons depressed results in the performance of different functions—long and short test patterns, a hexadecimal dump and stay-in-panel options (which prevent software codes from altering the print pitch

and NLQ print you have selected).

Complementing the control panel buttons are ten LED lights that indicate functions such as online status, Italic mode, specific fonts, NLQ mode and print pitch. These lights that let you see at a glance what Print modes are active constitute another feature more commonly found on printers further up the price scale.

GRAPHICS OPTIONS

The various models of the NX-1000 don't share the same high-resolution, bit-image graphics capabilities. That's not surprising, because most Commodore-dedicated printers equipped with 6-pin serial interfaces lack the ability to print graphics utilizing all nine of the printhead's pins.

Not hindered by a serial interface, the NX-1000 Multi-Font and the NX-1000 Rainbow both have seven 8-pin, bit-image graphics densities, ranging from 60 dots per inch to 240 dpi, as well as two 9-pin densities of 60 and 120 dpi. Graphics fanatics will find the NX-1000C Rainbow and NX-1000C Multi-Font to be slightly less flexible, with two 7-pin densities of 60 and 120 dpi and five 8-pin densities ranging from 60 to 240 dpi. More importantly, the Commodore-dedicated models lack the 72 and 90 dpi modes that the other two possess.

All four printers offer varying levels of compatibility with graphics software, although the non-Commodore-dedicated models have a distinct advantage when printing bit-mapped graphics. Their higher resolution printing is beneficial when used in conjunction with a printer interface that's set in Transparent mode.

MISCELLANEOUS PRINT OPTIONS

Like most good printers, the four NX-1000 units offer a wide range of Print options not found on the control panel. These include selecting and canceling italics through software, emphasized print, double strike, reverse, underlining, super- and subscripts, international character sets and ex-



The handsome NX-1000 quadruplets, from Star Micronics.

panded print. This list isn't conclusive; many of the options can be mixed for dynamic results!

All four machines offer six variations of double- and quadruple-size characters, which allow for impressive titles and page headings when you're using a word processor or other software.

Line spacing defaults to $\frac{1}{6}$ of an inch, with programmable line spacing available in increments of $\frac{1}{8}$, $\frac{1}{72}$ and $\frac{1}{216}$. This wide range of line spacing is especially valuable when printing graphics.

NX-1000C MULTI-FONT

Of these four printers, the NX-1000C Multi-Font is most likely to appeal to *RUN* readers because, with its Commodore-dedication and serial interface, it's the easiest of the four to connect up to your system and use. At the same time, unfortunately, it's the least versatile.

Like other Commodore-dedicated printers I've encountered over the years, the NX-1000C Multi-Font has its share of idiosyncrasies. One of the most confusing of these, especially to newcomers entering the world of serial interface-equipped printers, is that some disk-drive and screen-printing operations may "hang up" (and suspend further computer activity) when the NX-1000C is offline instead of on.

The NX-1000C Multi-Font has two operating modes—Commodore and ASCII. Using seven of the nine pins on the printhead, Commodore mode prints graphics. ASCII uses a different character set, provides for a backspace and allows for the programming of horizontal tabs.

Like most Commodore-dedicated printers, this NX-1000C has a very small print buffer, holding only one line of print data. For the benefit of new printer users, having a small print buffer basically means that you can't use the computer for anything else while printing is in progress.

NX-1000 MULTI-FONT

The NX-1000 Multi-Font is probably the most popular member of this printer family, mainly because it offers a ratio of price to print options that few other low-end machines can match. Of course, unlike the NX-1000C, it requires the added expense of a printer interface in order to work with your C-64 or C-128. But I know a number of Commodore enthusiasts who are also NX-1000 Multi-Font owners mainly because they're aware that the presence of the serial interface in the Commodore-compatible NX-1000C signals a limitation in the number of available print features.

There seems to be no limit to the number of printing features available with the NX-1000 Multi-Font. ASCII and IBM modes increase software compatibility, especially when used with non-Commodore computers. The previously mentioned graphics capabilities make the NX-1000 Multi-Font a better printer on the whole than the NX-1000C version.

NX-1000C RAINBOW

Color printing and ease of use are the NX-1000C Rainbow's strong points. Like the NX-1000C Multi-Font, the NX-

HARDWARE GALLERY

1000C Rainbow uses a 6-pin serial interface, which you just plug in like a disk drive, and you're in business.

The NX-1000C Rainbow's ability to print in seven colors is one difference between it and the Multi-Font models. Another difference is that, when changing from printing in one color to another, the Rainbow is noisy. It sounds as if a small electric motor kicks in, and the ribbon cartridge shifts position a few times whenever the print color changes.

Using the ribbon provided with the printer, you can print in black, red, blue, violet, yellow, orange and green. The printed colors reproduce reasonably well on white paper. For improved quality and darker color contrast, it's essential to use NLQ combined with Emphasized or Double-Strike mode.

This brings up another point: Because colors are selected using software commands, after you once choose a color, any combination of text and graphics commands can be activated without affecting the color selection.

In all other respects, the Rainbow is a clone of the NX-1000C Multi-Font,

which means it has both a Commodore and an ASCII mode, 7- and 8-pin graphics and uses the same page formatting and printing commands.

NX-1000 RAINBOW

Just like the Commodore-dedicated Rainbow, the NX-1000 Rainbow prints in seven different colors and uses the same color commands. However, because it doesn't suffer the graphics limitations of its Commodore-dedicated cousin, it is capable of printing a wider range of high-density graphics. Partial printing of graphics screens is not a problem with this model because it offers full 8- and 9-pin graphics printing in nine different bit-image Graphics modes.

Like the Commodore-dedicated version, this Rainbow is both slow and noisy when it comes to changing print colors. It differs, though, in offering a standard ASCII and an IBM mode.

SUMMARY

If you ask me what I like the most about these printers, I'd be quick to say

the numerous fonts, italics and print pitches available at the press of a button. The paper handling is also first-rate. All represent technology that was previously absent from any printer in the same price range.

What I like least is the fact that none of them print dark enough. This is especially noticeable when comparing any NX-1000 unit's hardcopy with that of other printers in the same general price range. It may be due to thin ribbon material, the type of ink used or even the printhead design, but whatever the cause, the NX-1000 models need some improvement in this area.

Do I have a favorite? Well, I have a hard time deciding between the NX-1000 Multi-Font and the NX-1000 Rainbow. Regardless of which NX-1000 model you decide to purchase, rest assured that you're getting a veritable treasure trove of technology and features. (Star Micronics, Inc., 200 Park Ave., Suite 3510, New York, NY 10166. Rainbows \$379; Multi-Fonts \$299.)

—TIM WALSH
RUN STAFF ■

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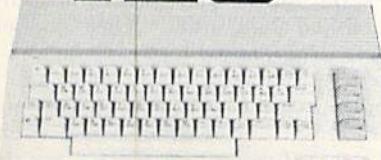


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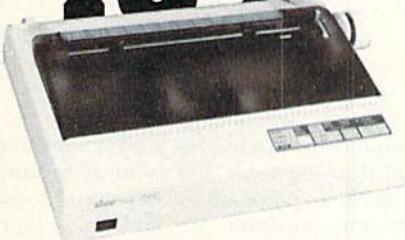
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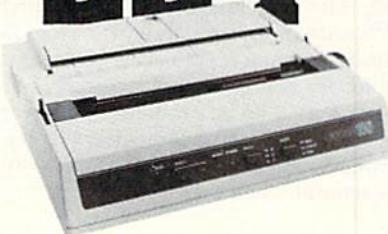
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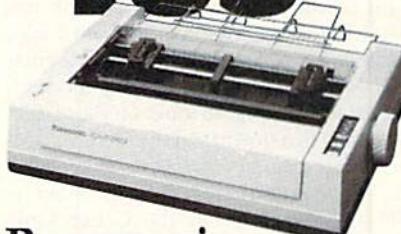


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COMMODORE CLINIC

Finding the Commodore RAMDOS program; drawing hi-res screens in games; discovering the power of the C-128's Sprsav and SShape commands.

By LOU WALLACE

Q I own a 64C and the original gray 1541 disk drive. Is this drive still being made, and can it still be serviced?

—RICHARD TIEGER
RIVERDALE, NY

A The 1541 drive is still very much alive and well, but it has gone through several revisions over the years. As for servicing of your original 1541, it shouldn't be a problem. However, there's a chance that some needed component (such as an original ROM) won't be around when you need it.

Q I own a Commodore 1750 RAM Expander, which I bought before the Commodore RAMDOS program was written. I'd like to get a copy of the program, but I can't find one anywhere. Do you know of a source?

—ANTHONY RUSSO
REVERE, MA

A The C-128 RAMDOS software is available from a number of online telecommunications services. I've seen it on GENie and on QuantumLink (on Q-Link, look in the C-128 Twin Cities libraries in the Commodore Information Network). If you have a modem, but don't belong to one of these services, you can download the C-128 RAMDOS program from RUN's own BBS, the RUNning Board. The number is 603-924-9704. It's in the C-128 Only Library.

Q What's the best high-resolution graphics program for the C-64? I'm interested in drawing hi-res screens for game programs, such as the backdrops in the 3-D adventure game, Maniac Mansion.

—CYRUS W. LASH
APO, NY

A When you ask someone what "the best" is, you usually get an answer that other people may or may not agree with. In my opinion, the best C-64 drawing program is the OCP Advanced Art Studio. It supports both hi-res and

multicolor modes, has a large selection of drawing tools and is an all-around excellent piece of software. For some reason, however, it's not being marketed much any more in the U.S., so it may be difficult to find.

My next favorite is our own RUN Paint. This is another powerful and easy-to-use hi-res and multicolor paint system. It was featured in the March 1989 issue. If you aren't up to typing in the long listing, you can order the March-April 1989 ReRUN disk (\$16.47) or the RUN Works (\$24.97) disk by calling 800-343-0728, or look for the order forms elsewhere in this issue.

Q I typed in the Travel Tally program listing from the July 1988 issue of RUN. There are some program lines missing, so the program won't run. Is there something wrong with this program or am I crazy?

—WALLIS M. HURLEY
ORLANDO, FL

A I'm not qualified to determine whether or not you're crazy. However, there are a lot of lines missing from the listing as published. An error in printing out the listing truncated it far before the end was reached, but the editors had no way of knowing this had happened, so the omission went undetected. We printed the complete listing in the September 1988 issue (RUN Amok, p. 86). Our apologies!

Q I'm stationed in Europe and don't get the opportunity to shop in stores where new products appear as soon as they're released. Where can I buy a KoalaPad? I haven't seen any advertisements for it in your magazine for a long time. Also, do you know of any software that supports the Touch Point graphics tablet? I bought one and now can't find programs for it.

—RAYMOND J. BERNARD II
APO, NY

A KoalaPads haven't been made for a number of years. Your only hope is to find a used one for sale.

As for the Touch Point tablet, there doesn't seem to be much software support for it. At least, I wasn't able to find a single program. I suggest you get Commodore's 1351 proportional mouse, as it makes an excellent input device and is supported by a variety of programs. Or you could try the M-3 Mouse (Contriver Co., Ltd., 18325 Valley Blvd., Suite A, La Puente, CA 91744; phone 818-810-2705), which is 1351-compatible and comes with a Koala Painter-type drawing program.

Q Are programs published in RUN available on disk so I don't have to type them in?

—MAX LOVELADY
BLYTHEVILLE, AR

A Yes, RUN programs are available on our ReRUN disks, which are published bi-monthly. They contain every program for the two issues covered and always include one or more bonus programs. You may buy any one disk for \$16.47 or order a year's subscription (6 issues) for \$69.97 (see the ReRUN ad that appears in each issue of the magazine). For more information, call 800-343-0728.

Q I recently upgraded from a C-64 to a new C-128D and started programming sprites using the new Basic 7 language. In many ways I'm impressed, but there is one problem. On the 64, I could have many sprites in memory at once and change a sprite's definition with a simple Poke to its pointer register. On the 128, all I can have is a measly eight sprites in memory at once! Now, I know more can be loaded into memory, but still, I only get eight at one time. Why did the 128 Basic 7 designers limit users to eight? Is there any way to make the sprite buffer at 3584 (\$0E00) larger?

—WAYNE SHUMAKER
CLEVELAND, OH

A While the eight-sprite buffer seems to be a limitation, Basic 7 has a powerful method of getting

around it in the form of the Sprsav command: It lets you copy the contents of any of the eight sprites into a string variable. Here is an example of saving sprite 8 to the variable S\$:

SPRSAV 8,S\$

When you want to restore a sprite from a variable, just reverse the parameters, like this:

SPRSAV S\$,8

When you consider that the 128 has a full 64K of RAM set aside just for Basic variables, it becomes clear that you can have an immense number of sprites in memory all at once.

For even more programming power, Sprsav can be combined with another Basic 7 command, SShape, which can store a section of the high-resolution bitmap screen into a string variable in much the same manner as Sprsav does with sprites. If the area you save with SShape is the same size as a sprite (24×21 pixels), this bitmap image can be converted into a sprite by storing the string variable into one of the sprite registers. This allows you to just "pick up" a section of the graphic screen as a sprite!

As an example, I've written a small program that prints letters on the hires screen, copies them to a string variable with SShape, and then uses them as sprites with the Sprsav command. If

you type it in and run it, you'll quickly see that not only does this technique store large numbers of sprites in memory, it also demonstrates that Sprsav is a very fast command. This means you can quickly change sprite definitions "on the fly," just as you once did on the 64 by Poking to the sprite definition register.

```
10 REM EXAMPLE OF SPRSAV
20 DIM SP$(58)
30 FOR I=33 TO 90
40 GRAPHIC 1,1
50 CHAR,0,0,CHR$(I)
60 SSHAPE A$,0,0,23,20
70 SP$(I-33)=A$
80 NEXT
90 GRAPHIC 0
100 REM NOW RANDOMLY SELECT A
    CHARACTER
110 REM AND MAKE IT A SPRITE
    WITH SPRSAV
120 S=INT(RND(1)*8)+1
130 L=INT(RND(1)*58)
140 SPRSAV (SP$(L)),S
150 SPRITE S,1,RND(1)*16+1,0,1,1,0
160 MOVSPR S,RND(1)*360 #
    RND(1)*15+1
170 GET KES$:IF KE$ <> "" THEN:FOR
    I=1 TO 8:SPRITE I,0:NEXT:END
180 GOTO 120
```

Q I'm getting a 1581 disk drive for my C-64 and need a program (like Fast Hack 'Em) to transfer my programs (both

protected and unprotected) from the 1541 to the 1581. Will Epyx's FastLoader work? Will GEOS 1.2 work with the 1581?

—THOMAS HAWKINS
CLARENDON, VT

A You can't transfer copy-protected programs from the 1541 to the 1581. The disk format and internal ROMs are too dissimilar to allow that. You can, however, use a file-copy program to copy individual files over, and many unprotected programs work just fine on the 1581. The new RUN Shell program on our RUN Works disk copies files between the 1541, 1571 and 1581 drives with both the C-64 and 128.

Epyx's FastLoad cartridge will not speed up disk access between the 1581 and a C-64, but I believe the Warp Speed cartridge from Cinemaware will. As for GEOS 1.2 (and 1.3), it doesn't support the 1581, but the latest version (GEOS 2.0) does. However, the support is limited to using the 1581 as a data disk, not as a boot disk. ■

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.

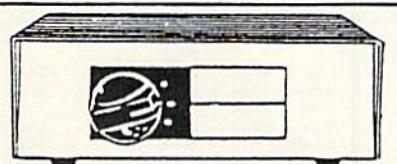


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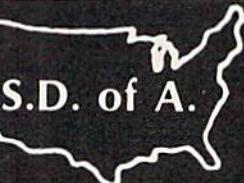
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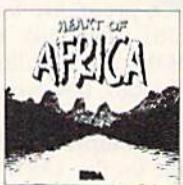
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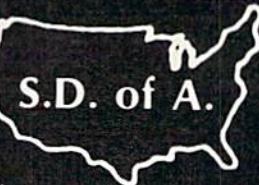
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GEOWATCH

Answers to some commonly asked questions regarding GEOS, plus some geoTips.

By BRUCE THICKSTEN and TIM WALSH

Q The GEOS wastebasket icon is very close to the printer icon at the bottom of the screen, making it easy to overshoot and delete a file instead of printing it. Is there a way to prevent this?

A The GEOS system disk won't let you delete any files because you first would have to drag the file icon to the border. Instead of using the application disk setup supplied on side 2 of disk 2 (GEOS 1.3), copy the system disk, using any copying program. Next, delete the system boot, GEOS and Kernal files from the copy disk. GEOS 1.3 won't let those files move to the border, so they have to be scratched by a separate utility.

When a system disk is copied and changed into a work disk, GEOS still identifies the copy disk as a system boot disk; so if you try to delete any files (except the three boot files), you get the message, "The requested operation cannot be performed on a system boot disk." But, if you've performed all your operations on work disks, there's no problem with accidental deletions.

Q The GEOS manual recommends making backups of your work disks to prevent file loss. Is there a good way to accomplish this?

A A work disk/archival system involves two different aspects: disk construction and disk naming. For geoWrite and geoPaint, you should have one work disk for every lengthy project, and a sequence of library/archive disks.

If you want to make a copy of your disk, go through the steps described in the answer to question 1, above. Leave the front page of the deskTop blank on your work disks, except for those with work-in-progress files. In this way, when the disk is opened, the deskTop shows all text/picture files currently being used.

Archive disks used only for storage should contain the deskTop. Library disks should have the deskTop, geo-

Write and any necessary fonts that make it possible to look at a file without copying it to the work disk. When I add more fonts, I find it helpful to list them in the info pulldown.

All disks should have unique names, but they should be selected to allow you to easily recognize the disk contents. My geoWrite work disks are called "GwriteWkds1"; my geoWrite library disks are labeled "GwriteLib1"; and my geoPaint graphics library disk is "GpaintClip1". Including the spaces is one of my little tricks.

When the deskTop is displayed, disk A and disk B icons appear on the right side of the screen with the names of the current disks. Because the disk name under the icon is center justified, the numbers at the end of the disk names would be off the screen without those extra spaces.

Furthermore, this system of naming disks reduces keystrokes when creating new disks, since when the disk-renaming feature is used, it has the cursor at the end of the existing name. The name on my master work disk starter is "GwriteWk". I type one character to rename the latest copy of my master work disk starter into my newest work disk.

Q I want to separate my geoWrite files, by type, onto different pages of the directory. Is there a way to create more directory pages?

A Create a small file that contains only one word. Then move the file to the last page of your directory and use the file-duplicate pulldown to create more files with names like file, file1, file2, and so on, until the page is full. The next file created is written to the next page, which is the new page.

Next, go back and move all the files named "file" to the border and then to the new page. Continue doing this until there are enough pages. Eight pages (64 file spaces) are usually enough to separate files by type. GeoOrganizer—found on RUN's GEOS Power Pak—simplifies this process by enabling you

to create empty pages or to put files in any slot on the page.

Q When I'm using geoWrite and the 1764 RAM expander, the program occasionally prompts me to "Insert a disk with deskTop V1.3 or higher." Naturally, I have to remove my geoWrite work disk and place a system disk in the drive. How can I get around this awkward situation?

A In order to perform certain functions, GEOS is designed to read files from the system disk. It looks for those files by scanning the disk that occupies the drive. When it doesn't find the file, GEOS produces an "Insert a disk..." message to let you know it cannot continue processing until it finds the files needed.

Many newcomers to GEOS find this awkward. If you continue to use only one drive with GEOS, you'd be wise to read the geoTip by Kenneth Hazlett, below, which explains how he manages with just one disk drive. However, there's nothing better for GEOS 64 or 128 than a second disk drive, such as the 1571.

With a second drive in place and configured as device 9 (via the DIP switches), GEOS becomes a lot more user-friendly. This arrangement lets your work disk reside in device 9 while a backup of your system disk is kept in device 8 or vice-versa. Whenever the work disk performs a function that requires the system disk, it will scan the work disk in device 9 first, then automatically scan the system disk in device 8, and you'll no longer be bothered by "Insert a disk..." messages. Furthermore, whenever you have a copy of geoPaint, geoWrite, and so forth in one drive and your work disk in the other, you won't be constantly prompted to insert disks containing copies of those programs. ■

Bruce Thicksten is a CAD/CAM draftsman. A dedicated 8-bit man, he's been using GEOS for two years.

Tim Walsh is RUN's technical editor and Magic columnist.

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MS - DOS CONNECTION

From p. 34.

```

1180 IF I AND 1 THEN FA(I)=X2*1      1530 :REM*212      :REM*169
    6+INT(X1/16):ELSE FA(I)=X1      1520 GOTO 1510      :REM*39
    +256*(X2 AND 15)   :REM*56      1530 LE=VAL(LE$(Y2)):IF LE>6502
1190 GOSUB 1840:NEXT:RETURN          4-TB THEN LE=65024-TB 1820 Z$=LEFT$(DI$(Y2),Z):RETURN
                                         :REM*171      :REM*54
                                         :REM*166      :REM*100
1200 LS=(SC-2)*P0+FS:GOSUB 1220      1540 TP=TB+LE:IF XF THEN 1000:
    :AD=AD+512:IF P0=1 THEN RE      ELSE 1600      :REM*125
    TURN           :REM*137      1550 GOSUB 1800:IF INSTR(DI$(Y2)
1210 LS=LS+1:GOSUB 1220:AD=AD+5      ),"CBM") THEN GOSUB 1790:G 1840 PRINT "CLUSTER # ";I;CHR$(27);J;:RETURN
    12:RETURN       :REM*162      OTO 1370      :REM*58
1220 GOSUB 1250      :REM*5      1560 EF=0:GOSUB 880:PRINT "CBM
1230 PRINT#15,"U0"+CHR$(B1)+CHR     FILE = "DI$(Y2):GOSUB 1680
    $(T)+CHR$(S)+CHR$(1)+CHR$(     :IF EF=1 THEN RETURN
    T)           :REM*241      :REM*192      :REM*124
1240 BANK 15: SYS 4880,0,0,AD/2    1570 CLOSE 1:OPEN 1,SD,2,Z$:IF
    56:RETURN       :REM*34      DS THEN EF=1:CLOSE 1:RETUR
1250 SP=(P7+1)*P6      :REM*171    N           :REM*190      :REM*183
1260 SI=INT((LS-INT(LS/SP)*SP)/    1580 GOSUB 880:PRINT M0$:Z$:ZZ=
    P6) AND P7      :REM*110      4868:IF MO=2 THEN ZZ=4874
1270 IF TX THEN SI=XOR(SI,1)      :REM*148      :REM*148
1280 T=INT(LS/SP):S=LS-INT(LS/P    1590 BANK 15:SYS ZZ,1,0,TB/256:
    6)*P6+1       :REM*149      TP=PEEK(250)+PEEK(251)*256
1290 B1=64:IF SI THEN B1=80      :REM*170      :LE=TP-TB      :REM*64
1300 RETURN       :REM*167      1600 CLOSE 1:SYS 4886,0,TP/256,
1310 LS=(FC-2)*P0+FS:GOSUB 1330    (TP-32768) AND 255:RETURN
    :IF P0=1 THEN RETURN      :REM*182      :REM*182
                                         :REM*33      :REM*182
1320 AD=AD+512:LS=LS+1      :REM*72
1330 GOSUB 1250:B1=B1+2:REM*130
1340 PRINT#15,"U0"+CHR$(B1)+CHR
    $(T)+CHR$(S)+CHR$(1)+CHR$(     1610 GOSUB 2040:IF X$=CHR$(27)
    T)           :REM*99      THEN 500      :REM*177
1350 BANK 15: SYS 4883,0,0,AD/2    1620 EF=0:TA$=LEFT$(TA$,16)+""
    56:RETURN       :REM*174      +FT$+",W":GOSUB 880:PRINT
1360 CLOSE 15:OPEN 15,SD,15,"I0    M1$:TA$      :REM*113
                                         "           :REM*128
                                         :REM*194      :REM*84
1370 CLOSE 1:OPEN 1,SD,0,"$0":I    1630 CLOSE 1:OPEN 1,TD,8,TA$:IF
    F DS THEN 1950      :REM*28      DS THEN 1600      :REM*128
1380 DC=0:BANK 15:SYS 4889,1,0,    1640 SA=4871:IF MO=2 THEN SA=48
    TB/256:BANK 0:PRINT:REM*24
1390 CLOSE 1:FR=(PEEK(3076)+PEE    77           :REM*12
    K(3077)*256)*254 :REM*233
1400 SYS 4892,TB/256,0:US=(PEEK
    (3080)+PEEK(3081)*256)*254
                                         :REM*10
1410 TT$="":FOR Z=3088 TO 3108:
    TT$=TT$+CHR$(PEEK(Z)):NEXT
                                         :REM*39
1420 Z=TB:BANK 0      :REM*227
1430 DC=DC+1:DI$(DC)=""":LE=PEEK
    (Z+22)+PEEK(Z+23)*256
                                         :REM*112
1440 LE$(DC)=STR$(LE*254):GOSUB
    1830      :REM*20
1450 FOR Z1=1 TO 21:DI$(DC)=DI$(
    DC)+CHR$(PEEK(Z+Z1)):NEXT
                                         :REM*23
1460 Z=Z+32:IF PEEK(Z)=255 THEN
    RETURN       :REM*249
1470 GOTO 1430      :REM*8
1480 SC=FM(Y2):AD=TB:GOSUB 880:
    PRINT M0$:DI$(Y2) :REM*204
1490 IF LE$(Y2)="<DIR>" THEN AD
    =DB:XF=1:GOSUB 1960
                                         :REM*193
1500 IF SC=0 THEN 990 :REM*107
1510 GOSUB 1200: SC=FA(SC):IF S
    C>4096 OR AD>254*256 THEN
                                         :REM*193
                                         :REM*117
                                         :REM*212
                                         :REM*1212
                                         :REM*117
                                         :REM*133
                                         :REM*108
                                         :REM*190
                                         :REM*184
                                         :REM*169

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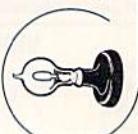
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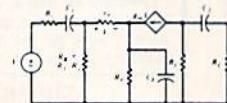
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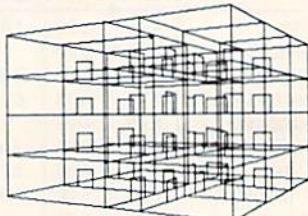
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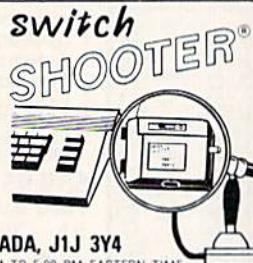
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RUN'S CHECKSUM

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:READ:CK=CK+B:POKE SA+I,B:NEXT
40 IF CK<>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
8,4,164,180,200,31,201,34
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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73 Briwall	46-47	232 Renco Computer	71
64 CompuServe	21, 23, 25	* RUN	
214 Computer Heroes	72	GEOS Power Pak II	16
166 Creative Micro Design	71	RUN Works	43
198 Crown Custom Covers	71	ReRUN Subscription	52
50 Data East USA, Inc.	11	Class Ads	73-74
46 Digital Solutions	7	* Schandler Systems	56
97 Digital Solutions	9	90 Skyles Electric Works	72
238 Discovery Software	CIV	245 Software Discounters	66-67
32 Double Eagle Software	45	87 SubLogic Corp.	59
158 Entertainment On-Line	62	* Tab Books, Inc.	17
174 IHT Software	72	155 Tenex Computer	63
66 Loadstar	1	54 The Hunter Group	58
* Lyco Computer	48-51	236 The Soft Group	71
241 Mastertronics	19	209 Tussey Computer	13
68 Medalist Int'l	5	132 Ultrabyte	72
98 Montgomery Grant	31	187 Utilities Unlimited	69
* NRI Schools	32	* Value-Soft	65
210 Oceanic America	39	96 Xetec, Inc	15

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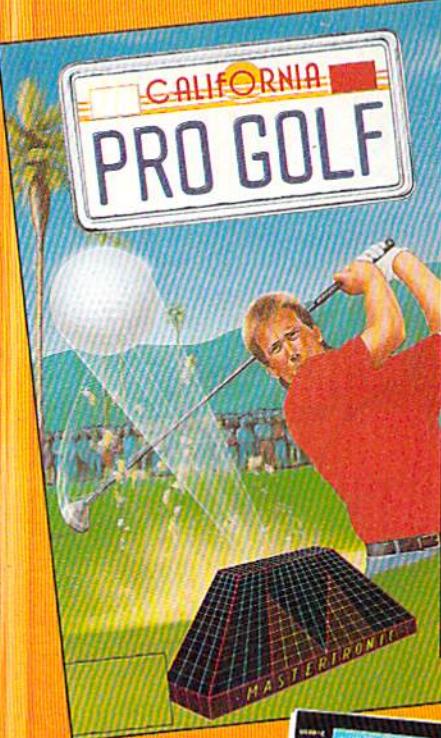
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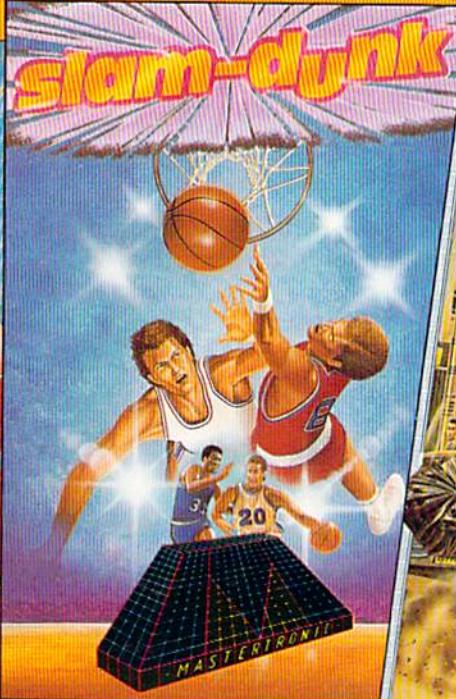
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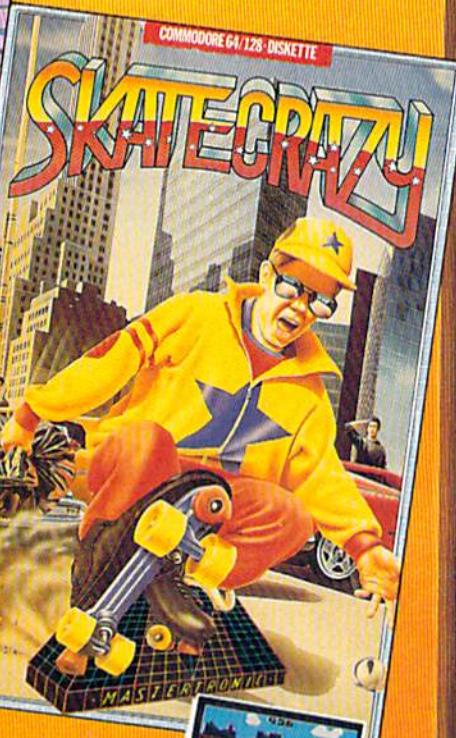
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