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RUN

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April 1989
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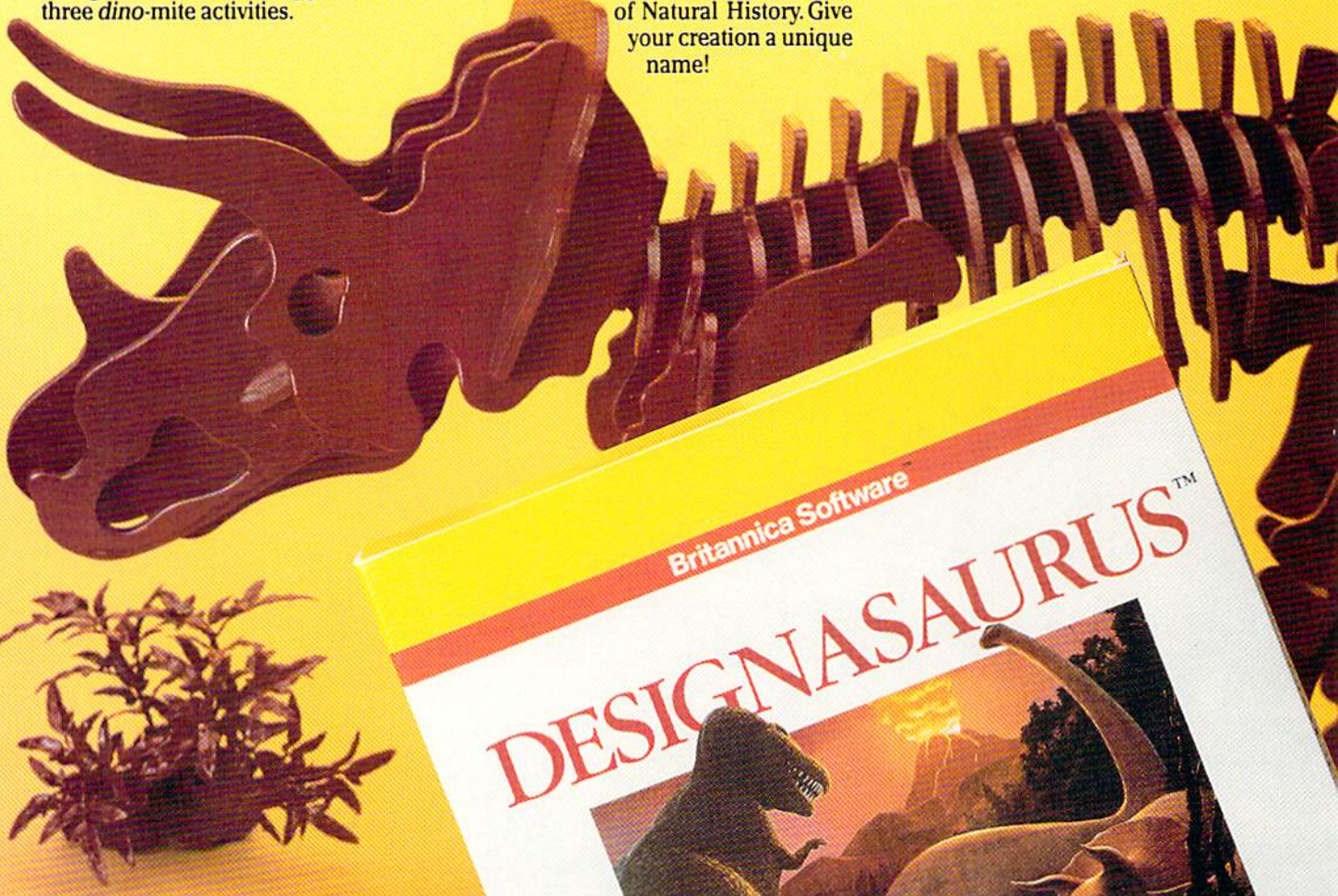
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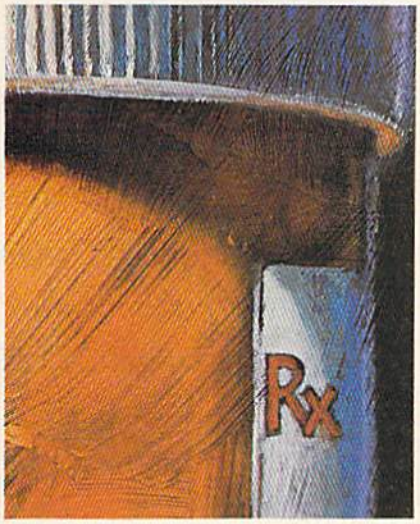
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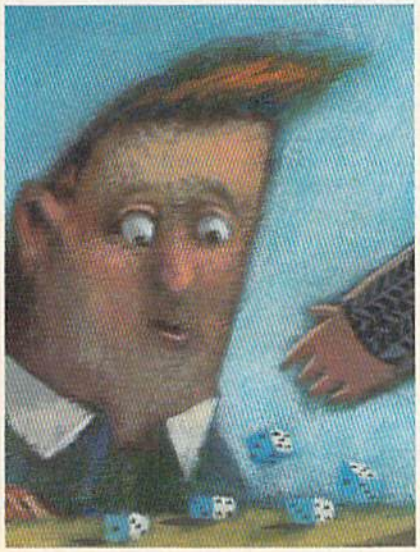
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APRIL 1989



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BY CATHERINE KANNER

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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.

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



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!"

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
                                    :REM*35
4Ø NEW                              :REM*2Ø2
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
  Ø7,255,162,1,16Ø,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*25Ø
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*1ØØ
```

—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
```

```
   ,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.

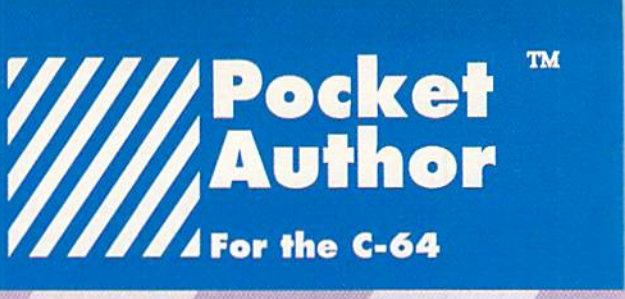
```
0 REM KEY OF F OR KEY OF C - NEAL SMITH
                                    :REM*65
10 PRINT"{SHFT CLR}LISTEN TO THE KEY OF C.
   .."                              :REM*181
20 VOL 9:READ C:SOUND1,C,30:IF C=0 THEN 40
   :ELSE GOTO20                     :REM*124
30 DATA 4297,4822,5412,5724,6429,7217,8102
   ,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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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*1Ø3
```

—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

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.

```
Ø REM 64/128 DIRECTORY INTO ARRAY - R. ERI
  C LEE                                :REM*2Ø7
1Ø DIMN$(288),E%(288):DN=8:IFFRE(Ø)=FRE(1)
   THEN3Ø:REM DN IS DRIVE #            :REM*73
2Ø Y=235:X=236:NC=2Ø8:B=842:IT=2816:GOTO4Ø
                                       :REM*127
3Ø POKE5328Ø,Ø:POKE53281,Ø:Y=214:X=211:NC=
   198:B=631:IT=828                    :REM*1
4Ø PRINTCHR$(147)CHR$(153):GOSUB9Ø:OPEN1,D
   N,Ø,"$Ø":OPEN3,Ø:J=1:SYS IT+4       :REM*117
5Ø POKEB,13:POKENC,1:INPUT#3,N$(J)     :REM*12
6Ø E%(J)=PEEK(252):J=J+1:SYS IT:IFPEEK(254
   )THEN5Ø                             :REM*48
7Ø CLOSE1:CLOSE3:PRINTCHR$(147):FS=J-1:FOR
   I=1TOFS:PRINTE%(I),N$(I):NEXT       :REM*137
8Ø PRINT FS"FILES":BF=PEEK(251)*256+PEEK(2
   52):PRINTBF"BLOCKS FREE":END        :REM*233
9Ø FOR I=IT TO IT+171:READ A:POKE I,A:NEXT
   :RETURN                             :REM*96
1ØØ DATA 169,Ø,24Ø,97,32,2Ø4,255,162,1,134
    ,254,32,198,255,32,228,255,32      :REM*68
11Ø DATA 228,255,32,183,255,2Ø8,116,16Ø,29
    ,32,228,255,136,2Ø8,25Ø,24Ø,71:REM*16Ø
12Ø DATA 24,16Ø,13,162,12,32,24Ø,255,169,1
    6Ø,32,21Ø,255,169,32,16Ø,15,32:REM*114
13Ø DATA 21Ø,255,136,2Ø8,25Ø,24,16Ø,13,162
    ,12,32,24Ø,255,32,228,255,2Ø1      :REM*89
14Ø DATA 13,24Ø,77,2Ø1,34,2Ø8,245,16Ø,Ø,32
    ,228,255,133,253,32,21Ø,255,32:REM*216
15Ø DATA 228,255,2Ø1,34,24Ø,12,32,21Ø,255,
    169,Ø,24Ø,242,162,1,32,198,255:REM*117
16Ø DATA 32,228,255,24Ø,1Ø,2Ø1         :REM*221
17Ø DATA 8Ø,24Ø,43,2Ø1,8Ø:REM READ INSTRUC
   TIONS FOR ALTERING LINE 17Ø         :REM*58
18Ø DATA 24Ø,39,2Ø8,241,32,228,255,32,228,
   255,32                              :REM*4Ø
19Ø DATA 228,255,133,252,32,228,255,133,25
   1,169,Ø,24Ø,15Ø,169,1,32,195        :REM*239
2ØØ DATA 255,169,Ø,24Ø,8,169,Ø,133,254,169
    ,Ø,24Ø,239,32,2Ø4,255,24,16Ø       :REM*238
21Ø DATA 13,162,12,32,24Ø,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.*

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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**.

Check Reader Service number 400.

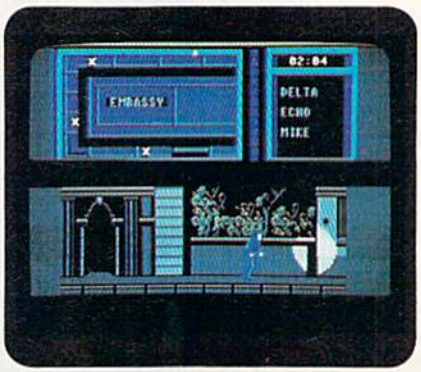
FOUR FOR THE 64

NORTHBROOK, IL—Mindscape 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 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.



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



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

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 **Snapdragon**, 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—Mindscape (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.

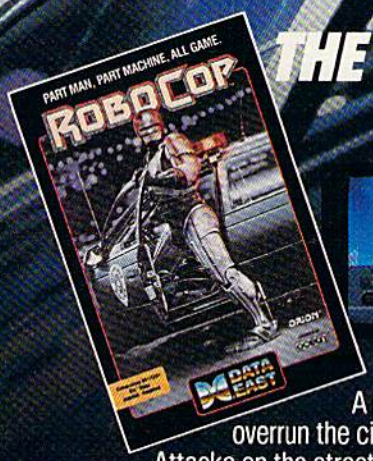
Top Flight packages Top Gun, which puts you in combat as a Navy F-14 fighter pilot; Infiltrator, where you control a Gizmo DHX-1 Chopper to infiltrate enemy lines in a search for the ►

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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 Ninjitsu, except one—the Last Ninja. Players are transported 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, nunchuckas 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 crevasse-strewn 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.

Check Reader Service number 410.■

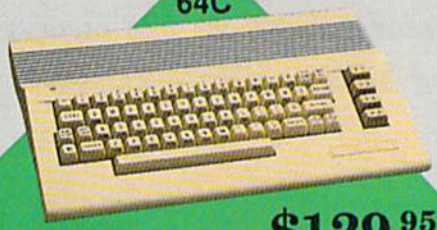
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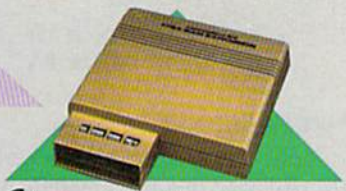


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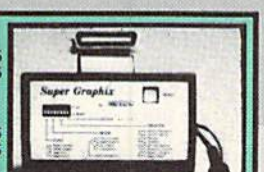
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MAIL RUN

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 BROUSSARD
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:

1. We cannot call your toll-free number. Please list a non-800 number.
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.
3. If we ask a question, and you don't know the answer, again, don't put us on hold. Instead, invite us to call back at a predetermined time and be there when we call.
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 incorrect. The correct number is 1-205-351-9038. Thank you.

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

PLEASE "ICONTROL" 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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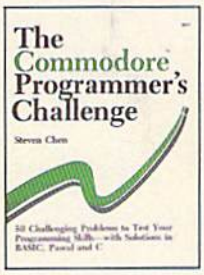
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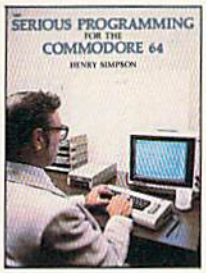
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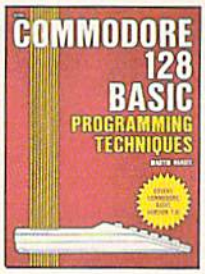
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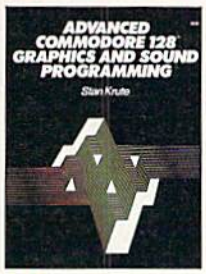
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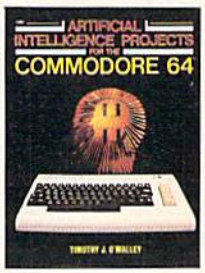
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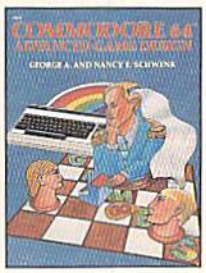












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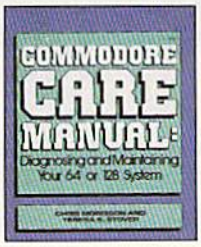
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Compiled by BETH S. JALA

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.

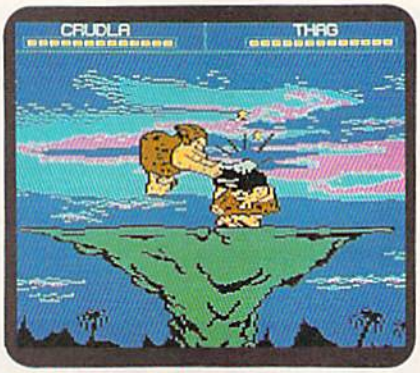
Whether you go head to head against a friend or the computer, you're bound to have a delightful time. What else would you expect with competitors named Thag, Ugha, Gronk and Glunk?

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



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

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

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!

MAVIS BEACON TEACHES TYPING ..... A

Learning to Type Made Fun!

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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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 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.

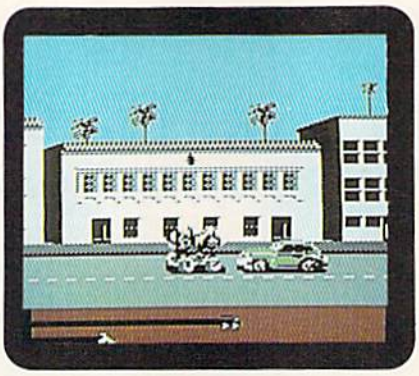
Pay attention, and you'll leave Mavis Beacon's mythical classroom a faster and more accurate typist. (But even Mavis would advise you to use *RUN*'s Checksum program when you are entering program listings from the magazine.) *(The Software Toolworks, 19808 Nordhoff Place, Chatsworth, CA 91311. C-64/$39.95.)*

—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 dropping 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

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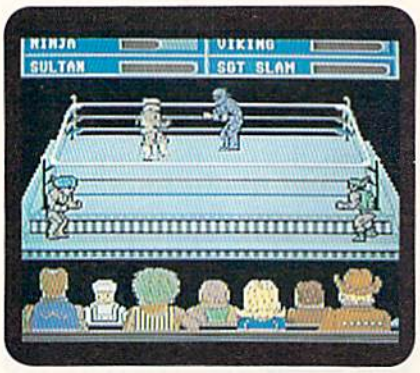
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Your mat men can play against the computer or a friend in Take Down.

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 results 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 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 roma, 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. 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

This is ten point university, in outline.
Here is the same font in italics.
This is 18 point roma, 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.

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), it's 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.

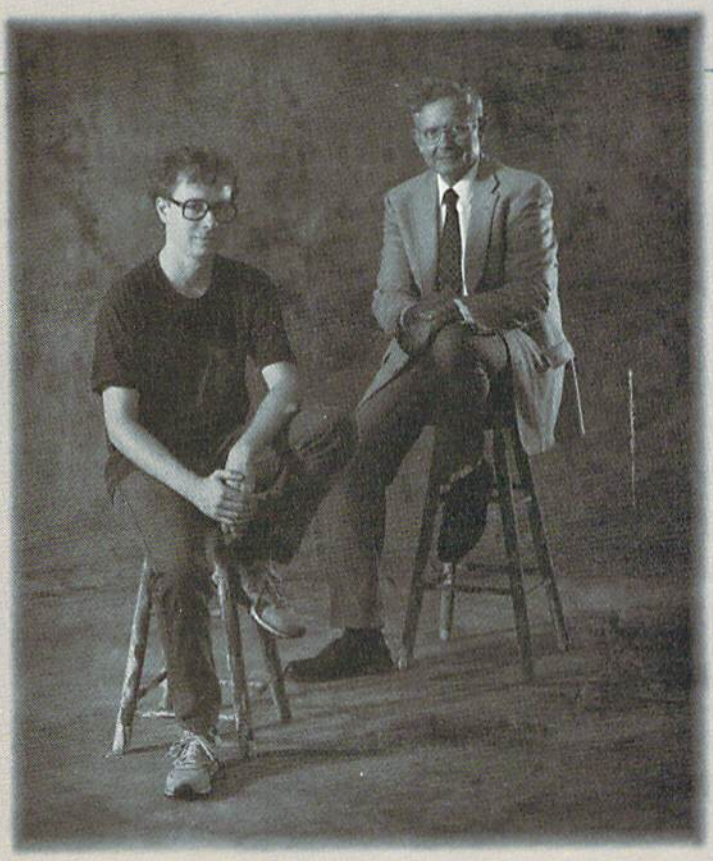
The irony is that this word processor is designed for use with the *G*raphic *E*nvironment *O*perating *S*ystem. Yet, GEOS Writer 64 claims as its strength the fact that it is, to a large extent, non-graphic. There's nothing wrong with that position; it just seems to be an attempt to produce a solution 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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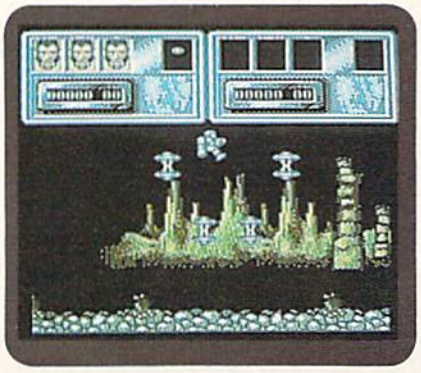
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and mind-boggling logic puzzles? Bored with realistic wargames that take longer to play than the actual battles they simulate? Ever feel like just grabbing your joystick and blasting some galactic terrorists? If the finger over your joystick button 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

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.

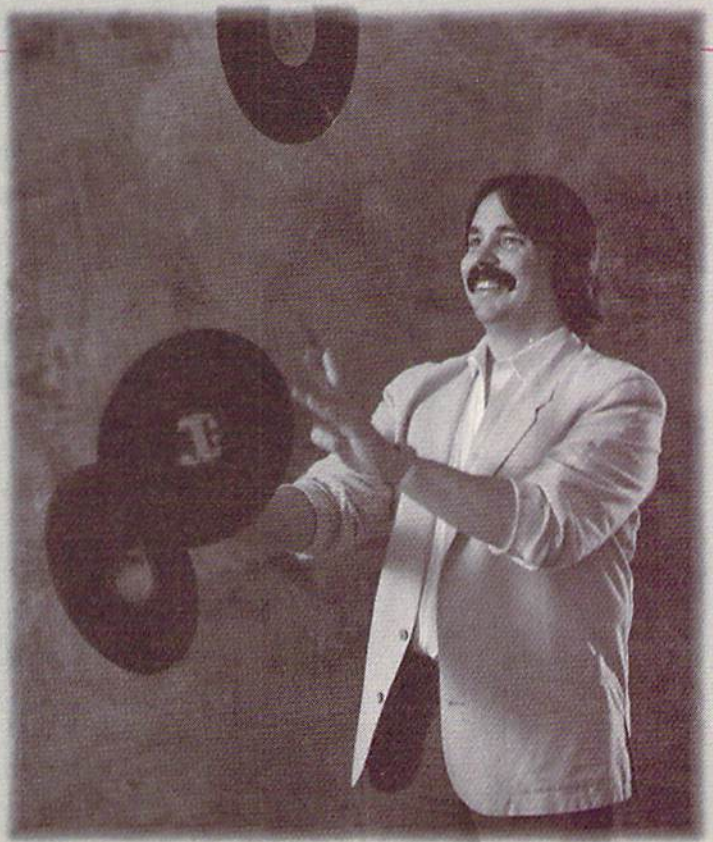
I question how useful this program actually is. As a time saver, I think it falls somewhat short of the mark. Generating a specific or random encounter entails going through several menus and a lot of disk swapping.

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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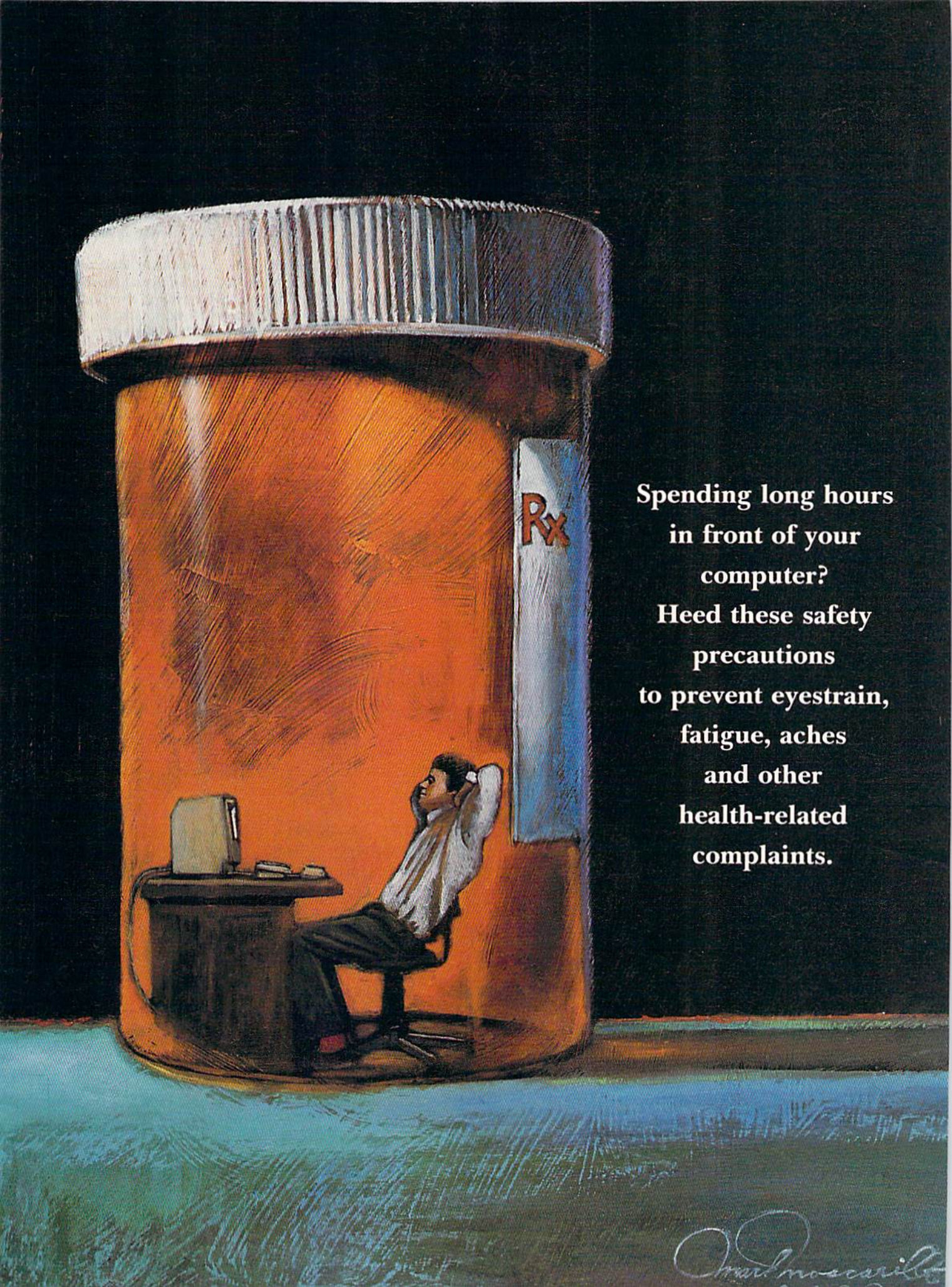
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— Douglas Banker, Rock and Roll Business Manager

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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 electromagnetic 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 radiation 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

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.

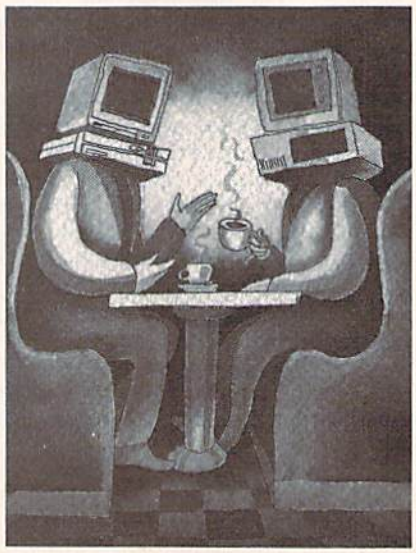
By MIKLOS GARAMSZEGHY

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—5¼- 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 5¼-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 ►

RUN it right: **C-128 (in 40- or 80-Column mode); 1571 or 1581 disk drive**

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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 Commodore 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. R

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.*

Listing 1. Machine language generator program.

```
10 OPEN 8,8,8,"MDOS.ML,P,W"
                          :REM*234
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$(H);:NEXT:GOTO 2
   0                      :REM*100
55 IF LEN(A$)<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$)/2            :REM*67
75 FOR I=1 TO N           :REM*73
80 H$=MID$(B$,I*2-1,2):H=DEC(H$
   )                      :REM*251
85 PRINT#8,CHR$(H);:NEXT:GOTO 2
   0                      :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
    0000200000000000000 00FFA90
    82C0DDCF0FBAD         :REM*174
103 DATA 00DD4910 8D00DDAD0CDC 6
    0A23F8E00FF91FAA200 8E00FFC
    860A23F8E00FF         :REM*233
104 DATA 91644C4C13A23F8E00FF B
    1FA4C4C13A90085FAA9 0B85FBA
    0009891FAC8C0         :REM*249
105 DATA 0AD0F9A8782C0DDC2039 1
    32032132045 13C9029 26290ED
    0262032132045         :REM*218
106 DATA 1329ED01C2032132045 1
    32032132045132 03213 2045132
    032132045 1358        :REM*28
107 DATA 4CCCFF8D2613D0F786FA 8
    4FBA2028E2813A0008C 00FF782
    C0DDC2039132 0        :REM*33
108 DATA 321329ED0192032132 0 4
    513C000D0F6AE2813CA 8E2813E
    6FBE000D0E958          :REM*237
109 DATA 608D2613D0F986FA84FB A
    A20C6FFA000F00520B7 FFD0122
    0CFFF2045 13C0         :REM*78
110 DATA 00D0F1E6FBA9FEC5FBD0 E
    984FA4CCCFF8C2713EE 271386F
    BA0084FAAA20           :REM*179
111 DATA C9FF2051320D2FFC000 D
    0F6E6FBAD2713C5FBD0 ED4CCCF
    F86FA84FBA202          :REM*168
112 DATA 8E2813A9408D251378A0 0
    0382047FFAD00DDCD00 DDD0F84
    D2513294 0F0F1         :REM*234
113 DATA 2051138D0CDCAD251349 4
    08D2513A9082C0DDCF0 FBC000D
    0D8E6FBAE2813          :REM*30
114 DATA CA8E2813D0CD182047FF 2
    C0DDC2039132 0321385 FCAD00D
    D29EF8D00DD58          :REM*82
115 DATA 4CCCFF86FBA9005FAA9 2
    0204513D0FB606FA84 FBAA20C
    6FFA0002 0B7FF         :REM*213
116 DATA F0034CEF142 0CFFF8D22 1
    3297FC909DD0232 04513 D008E6F
    BA9FEC5FBF011          :REM*228
117 DATA A90A204513C000D0D6E6 F
    BA9FEC5FBD0CE84FA4C CCFFC90
    9F0E8C9209 0C1         :REM*46
118 DATA F0E2AD2213C9419 0DBC9 5
    B9011C97B9004C9809 0 F2295FC
    9209 0A64CE014         :REM*106
119 DATA 09204CE0148C2713EE27 1
    386FBA0084FAAA20C9 FF2051D1
    3297F8D2213C9          :REM*199
120 DATA 0AF026C909DF01FC909F0 1
    BC9209 1AC9419 013C9 5B900DC
    96190 0BC97BB0         :REM*142
121 DATA 07295F4C5E15098020D2 F
    FC000D0CAE6FBAD2713 C5FBD0C
    14CCCFF86FA85          :REM*23
122 DATA FB78A93F8D00FFAD000C 8
    D2B13CE2B13D007A900 8D00FF5
    86 0AD2B138D29         :REM*173
123 DATA 13A5FA8564A5FB85652 0 B
    616A000B1FAD1649018 D005C8C
    02 0D0F3A000B1         :REM*66
124 DATA FAAAB16491FA8A9164C8 C
    02 0D0F1CE2913D0D82 0 C5164C8
    11584FBAAA900          :REM*195
125 DATA 85FAA899000CC8C00AD0 F
    8A92099000CC8D0FA2 0 C6FFA00
    02 0AB16900 34C        :REM*153
126 DATA 7F16C922D0F42 0AB16C9 2
    2F0F9991 00CC8C0 16D0 F1A92 0A
    000204513C02 0         :REM*174
127 DATA D0F92 0AB16B0DAD0F92 0 A
    B162 0AB16B0D02 0AB16 8D2D13A
    0162 045132 0AB        :REM*182
128 DATA 168D2E132 0451318AD2D 1
    36D080C8D080C9003EE 090CAD0
    90C186D2E138D          :REM*82
129 DATA 090CA0012 0AB16B03 0C9 0
    0F02CC922D0F32 0AB16 B023C92
    2F0F72 04513C0         :REM*144
130 DATA 16D0F0A0122 05D13A000 2
    045132 0C516EE000CD0 03EE010
    C4C01162 0CCFF         :REM*234
131 DATA AD080C38ED2D138D080C A
    D090CED2E138D090CA2 00A0162
    05D139D04 0CE8         :REM*206
132 DATA C018D0F5A9FFA0004C45 1
    3182 0B7FFD0034CCFFF 386 0A56
    418692 0856490         :REM*55
133 DATA 02E6656 02 0B616A5FA18 6
    92 085FA900 2E6FB6085 FB8665A
    900 85FA85648D         :REM*250
134 DATA 000CEE000CA92 0A0002 0 5
    313C02 0D0F9A0002 05D 13C900D
    0034C47172 05D         :REM*247
135 DATA 13C9E5F0F6C9F6F0F2A0 0
    02 05D13C9E5D0062 0C5 164CEC1
    6A00B2 05D1329         :REM*237
136 DATA 10AAA946E000F002A944 A
    0002 05313A0002 05D13 2053138
    8C00DD0F5A01A          :REM*176
137 DATA 205D13882 05313C02 0D0 F
    52 0C2164CDE16A000A9 FF4C531
    300                    :REM*188
138 DATA -1                :REM*251
```

Listing 2. MS-DOS Connection main program.

```
10 T$="MSDOS - 128{2 SPACEs}BY
   M. GARAMSZEGHY"         :REM*41
20 :                       :REM*78
30 COLOR 0,7:COLOR 4,7     :REM*2
40 COLOR 6,1:COLOR 5,2 :REM*233
50 WI=39:IF PEEK(215) THEN WI=7
   9:FAST                  :REM*192
60 WINDOW 0,0,WI,24,1: PRINT T$
                           :REM*120
70 PRINT"{3 CRSR DNs}INITIALIZI
   NG...PLEASE WAIT"       :REM*56
80 GRAPHICCLR:DIM FA(810),DI$(2
   88),LE$(288),FM(112):REM*100
90 IF PEEK(4864)<>245 THEN BLOA
   D"MDOS.ML"              :REM*48
100 M0$="READING...":M1$="WRITI
    NG...":M2$=" DIRECTORY":M3$
    =" FAT"                :REM*7
110 M6$="MS-DOS":M7$="CBM-DOS"
                           :REM*0
120 BL$="{8 SPACEs}":DB=PEEK(46
    25)*256+256:TB=DB+5376
                           :REM*94
130 GOSUB 880:PRINT "{CRSR DN}S
    ELECT SOURCE DISK TYPE:{CRS
    R DN}":PRINT"1 = ";M6$
                           :REM*16
140 PRINT "2 = ";M7$:PRINT"{CRS
    R DN}3 = QUIT":TC=0:SD=0
                           :REM*190
150 PRINT:INPUT "YOUR CHOICE [1
    , 2, OR 3]";TC         :REM*207
160 IF TC<1 OR TC>2 THEN 870
                           :REM*96
170 PRINT:PRINT:INPUT"SELECT SO
    URCE DEVICE [8 TO 12]";SD
                           :REM*51
180 IF SD<8 OR SD>12 THEN 130
                           :REM*103
190 T$=M6$:IF TC=2 THEN T$=M7$
                           :REM*191
200 DK$="(SOURCE)":DR=SD:GOSUB ►
```

```
    2Ø4Ø                    :REM*55
21Ø XF=Ø:IF X$=CHR$(27) THEN 13
    Ø                       :REM*2
22Ø GOSUB 88Ø:PRINT MØ$ M2$;:EF
    =Ø                      :REM*73
23Ø DX=1:ON TC GOSUB 89Ø,136Ø
                            :REM*2ØØ
24Ø IF EF THEN GOTO 195Ø:REM*35
25Ø GOSUB 88Ø:PRINT "DISK NAME
    = ";TT$                 :REM*57
26Ø PRINT US;"BYTES USED;{2 SPA
    CEs}";DC;"ENTRIES"      :REM*31
27Ø PRINT:PRINT "FILENAME";TAB(
    26);"SIZE"              :REM*253
28Ø GOSUB 2Ø3Ø              :REM*81
29Ø IF WI>4Ø THEN GOSUB 185Ø
                            :REM*158
3ØØ WINDOW 1,7,35,22,1:Y1=Ø:Y2=
    1                       :REM*224
31Ø FOR I=1 TO 15:IF I<=DC THEN
     PRINT DI$(I);TAB(24);LE$(I
    )                       :REM*2Ø3
32Ø NEXT: WINDOW Ø,22,WI,24:GOS
    UB 2Ø3Ø                 :REM*66
33Ø IF WI<7Ø THEN PRINT "SELECT
     FILE TO READ & PRESS <CR>"
                            :REM*125
34Ø WINDOW 1,7,35,21:POKE 2Ø8,Ø
                            :REM*111
35Ø PRINT "{CTRL 9}";DI$(Y2);"{
    CTRL Ø}";TAB(24);LE$(Y2);CH
    R$(27)"J";              :REM*149
36Ø GET A$:IF A$="" THEN 36Ø:EL
    SE A=ASC(A$)            :REM*2Ø1
37Ø IF A=13 THEN 48Ø:ELSE IF A=
    82 THEN XF=1:GOTO 22Ø
                            :REM*221
38Ø PRINT DI$(Y2);TAB(24);LE$(Y
    2);CHR$(27)"J";         :REM*11
39Ø IF A=17 THEN Y2=Y2+1:Y1=Y1+
    1: IF Y2<=DC THEN PRINT
                            :REM*49
4ØØ IF Y1>14 THEN Y1=14:REM*254
41Ø IF Y2>DC THEN Y2=DC:IF Y1<1
    4 THEN Y1=Y1-1          :REM*224
42Ø IF A=145 THEN Y2=Y2-1:Y1=Y1
    -1:PRINT A$;            :REM*17
43Ø IF Y2<1 THEN Y2=1:Y1=Ø
                            :REM*39
44Ø IF Y1<Ø THEN Y1=Ø:PRINT CHR
    $(27)"I";               :REM*228
45Ø IF A=19 THEN 3ØØ        :REM*74
46Ø IF A=27 OR A=147 THEN 13Ø
                            :REM*98
47Ø GOTO 35Ø                :REM*32
48Ø XF=Ø:IF TC=1 THEN GOSUB 148
    Ø:ELSE GOSUB 155Ø       :REM*2Ø
49Ø IF XF THEN 24Ø: ELSE WC=Ø:T
    D=Ø                     :REM*196
5ØØ GOSUB 88Ø:PRINT "FILE LOADE
    D = ";DI$(Y2);";";LE;"BYTES
    ":PRINT                 :REM*32
51Ø PRINT "{CRSR DN}SELECT TARG
    ET DISK TYPE:{CRSR DN}":PRI
    NT"1 = ";M6$            :REM*181
52Ø PRINT "2 = ";M7$:PRINT"{CRS
    R DN}3 = RETURN TO SOURCE D
    IRECTORY"               :REM*247
53Ø PRINT:INPUT "YOUR CHOICE [1
    , 2, OR 3]";WC          :REM*244
54Ø IF WC<1 OR WC>2 THEN 24Ø
                            :REM*73
55Ø PRINT:PRINT:INPUT"SELECT TA
    RGET DEVICE [8 TO 12]";TD
                            :REM*2Ø2
56Ø IF TD<8 OR TD>12 THEN 24Ø
                            :REM*196
57Ø DX=Ø: DR=TD:T$=M6$:IF WC=2
    THEN T$=M7$             :REM*178
58Ø PRINT:PRINT:INPUT"TARGET FI
    LENAME";TA$             :REM*47
59Ø GOSUB 88Ø:DK$="(TARGET)": O
    N WC GOTO 61Ø,6ØØ       :REM*11
6ØØ GOSUB 173Ø:IF EF THEN 25Ø:E
    LSE 161Ø                :REM*1Ø8
61Ø P=INSTR(TA$,"."):IF P=Ø THE
    N TA$=TA$+".":GOTO 61Ø
                            :REM*25
62Ø F1$=LEFT$(LEFT$(TA$,P-1)+BL
    $,8)+LEFT$(MID$(TA$,P+1,3)+
    BL$,3)                  :REM*1Ø4
63Ø GOSUB 2Ø4Ø:GOSUB 88Ø:PRINT
    MØ$;M2$                 :REM*227
64Ø GOSUB 89Ø:BANK Ø:GOSUB 88Ø:
    PRINT M1$;F1$           :REM*6
65Ø FOR Z=DB TO FB STEP 32:IF P
    EEK(Z)=Ø OR PEEK(Z)=229 THE
    N BZ=Z:Z=FB+1           :REM*1Ø1
66Ø NEXT:IF BZ>FB THEN 195Ø
                            :REM*34
67Ø FOR Z=1 TO 11:POKE BZ-1+Z,A
    SC(MID$(F1$,Z,1)):NEXT
                            :REM*165
68Ø FOR Z=11 TO 31:POKE BZ+Z,Ø:
    NEXT                    :REM*178
69Ø POKE BZ+28,LE-INT(LE/256)*2
    56:POKE BZ+29,LE/256
                            :REM*144
7ØØ FC=3:GOSUB 85Ø:FC=J :REM*31
71Ø POKE BZ+26,FC AND 255:POKE
    BZ+27,FC/256            :REM*21Ø
72Ø FOR AD=TB TO TP-1 STEP 512
                            :REM*168
73Ø GOSUB 131Ø              :REM*16
74Ø GOSUB 85Ø:FA(FC)=J:FC=J:NEX
    T:FA(FC)=4Ø95           :REM*92
75Ø BANK Ø:PRINT "ENCODING";NC;
    M3$;" CLUSTERS"         :REM*18Ø
76Ø FOR I=Ø TO NC:P=FB+INT(1.5*
    I)                      :REM*17Ø
77Ø IF I AND 1 THEN POKE P,((FA
    (I) AND 15)*16) OR PEEK(P):
    POKE P+1,FA(I)/16       :REM*135
78Ø IF (I AND 1)=Ø THEN POKE P,
    FA(I) AND 255:POKE P+1,FA(I
    )/256                   :REM*2Ø7
79Ø GOSUB 184Ø:NEXT:PRINT M1$;M
    3$:AD=FB                :REM*221
8ØØ FOR LS=1 TO P3:GOSUB 133Ø:A
    D=AD+512:NEXT           :REM*149
81Ø AD=FB:FOR LS=P3+1 TO P3*2:G
    OSUB 133Ø:AD=AD+512:NEXT
                            :REM*135
82Ø PRINT M1$;M2$           :REM*247
83Ø AD=DB:FOR LS=F1 TO F1+P4-1:
    GOSUB 133Ø:AD=AD+512:NEXT
                            :REM*141
84Ø GOTO 21ØØ               :REM*126
85Ø FOR Z=FC+1 TO NC :IF FA(Z)=
    Ø THEN J=Z:Z=NC+1       :REM*165
86Ø NEXT:RETURN             :REM*249
87Ø WINDOWØ,Ø,WI,24,1:END
                            :REM*79
88Ø WINDOW Ø,2,WI,24,1:RETURN
                            :REM*118
89Ø BANK 15:POKE 2588,Ø :CLOSE1
    5:TX=16:OPEN 15,DR,15
                            :REM*1Ø4
9ØØ X=DS:IF PEEK(2588)=Ø THEN E
    F=1:RETURN              :REM*231
91Ø PRINT#15,"UØ>B1":INPUT#15,A
                            :REM*144
92Ø IF A THEN TX=Ø          :REM*17
93Ø TT$="<NO LABEL>" : PRINT#15
    ,"UØ"+CHR$(1Ø+TX)       :REM*87
94Ø SYS 4865 :IF PEEK(2816) AND
     14 THEN EF=1 :RETURN
                            :REM*155
95Ø B1=64+TX:S=1:T=Ø:AD=6144:P=
    AD: GOSUB 123Ø:PØ=PEEK(P+13
    )                       :REM*59
96Ø P1=PEEK(P+14):P2=PEEK(P+16)
    :P3=PEEK(P+22):P4=PEEK(P+17
    )/16                    :REM*187
97Ø P5=PEEK(P+19)+PEEK(P+2Ø)*25
    6:P6=PEEK(P+24):P7=PEEK(P+2
    6)-1                    :REM*2Ø9
98Ø FS=P1+P2*P3+P4:NC=(P5-FS)/P
    Ø:PRINT                 :REM*243
99Ø AD=DB:F1=P1+P2*P3:FOR LS=F1
     TO F1+P4-1:GOSUB 122Ø:AD=A
    D+512:NEXT:FB=AD        :REM*59
1ØØØ IF DX=Ø THEN 115Ø      :REM*85
1Ø1Ø SYS 4895,DB/256,TB/256:SYS
     4892,TB/256,Ø:I=TB:REM*35
1Ø2Ø DC=Ø:US=Ø:BANK Ø       :REM*212
1Ø3Ø IF PEEK(I)=255 THEN 114Ø
                            :REM*159
1Ø4Ø X$="":FOR J=1 TO 11:X$=X$+
    CHR$(PEEK(I+J)):NEXT
                            :REM*61
1Ø5Ø IF LEFT$(X$,2)=". "THEN 11
    3Ø                      :REM*34
1Ø6Ø IF(PEEK(I+12) AND 8)=8 THE
    N TT$=X$:GOTO 113Ø:REM*127
1Ø7Ø LE=PEEK(I+28)+PEEK(I+29)*2
    56+PEEK(I+3Ø)*256*256
                            :REM*2Ø
1Ø8Ø FM=PEEK(I+26)+PEEK(I+27)*2
    56                      :REM*68
1Ø9Ø DC=DC+1:DI$(DC)=X$:FM(DC)=
    FM                      :REM*93
11ØØ US=US+LE:LE$(DC)=STR$(LE)
                            :REM*75
111Ø IF(PEEK(I+12) AND 16)=16 T
    HEN LE$(DC)="<DIR>":REM*99
112Ø IF INSTR(X$,"..") THEN DI$
    (DC)="<PARENT>{3 SPACEs}"
                            :REM*114
113Ø GOSUB 183Ø:I=I+32:GOTO 1Ø3
    Ø                       :REM*77
114Ø IF XF THEN RETURN :REM*232
115Ø PRINT:PRINT MØ$;M3$;" ..."
    ;NC;"CLUSTERS"          :REM*129
116Ø FOR LS=1 TO P3:GOSUB 122Ø:
    AD=AD+512:NEXT:BANK Ø
                            :REM*1Ø9
117Ø FOR I=Ø 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.

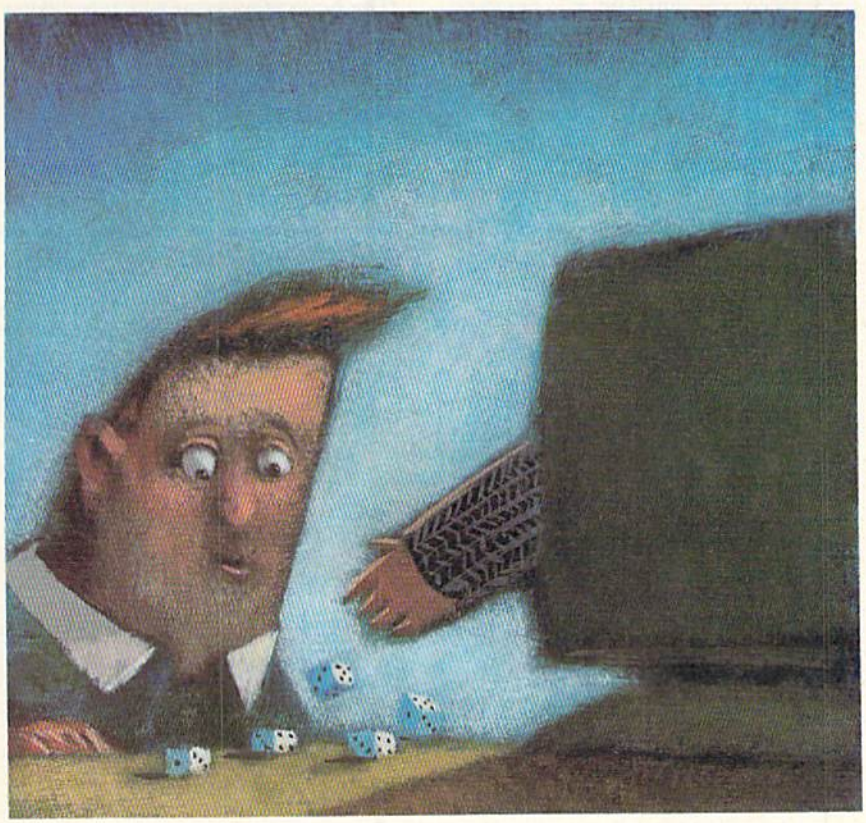
By ROBERT COOK

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.

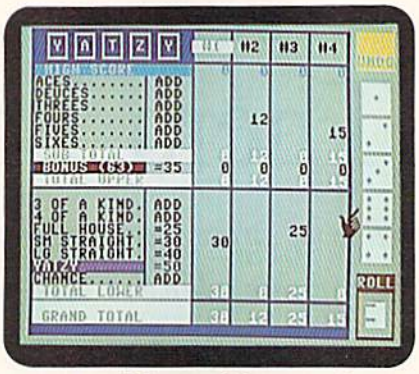
The categories in the lower half of the scoring area can be satisfied with any numbers; it's the configuration of the dice that counts. For three and four of a kind, you need at least three or four dice of the same number, but all five dice are totaled in the score. A full house—three dice of one number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

RUN it right: **C-64; joystick**

ILLUSTRATED BY KEVIN HAWKES

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!



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

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.

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.

```
Ø REM YATZY - ROBERT B. COOK
                              :REM*119
1ØØ GOSUB38Ø:GOSUB412:GOSUB326
                              :REM*6
1Ø2 GOSUB114:GOSUB174         :REM*7
1Ø4 GOSUB2Ø2:GOSUB286         :REM*41
1Ø6 C1=C1+1:IFC1=NP*13THEN314
                              :REM*247
1Ø8 PL=PL+1:IFPL>NPTHENPL=1
                              :REM*99
11Ø GOTO1Ø2                   :REM*179
112 = START =                 :REM*52
114 PRINT"{HOME}{CTRL Ø}{CTRL 1
    }"TAB(58)LEFT$("{CTRL 7}{CO
    MD H}{CTRL 1}#1 {CTRL 7}{CO
    MD H}{CTRL 1}#2 {CTRL 7}{CO
    MD H}{CTRL 1}#3 {CTRL 7}{CO
    MD H}{CTRL 1}#4 {CTRL 7}{CO
    MD J}",NP*6+2)            :REM*97
116 PRINT"{HOME}{CTRL 2}"TAB(54
    +PL*4)"{CTRL 9} #"MID$(STR$
    (PL),2)" {CTRL Ø}{COMD H)"
                              :REM*73
118 RL=1:PRINTDN$TAB(36)"{CRSR
    UP}{CTRL 2}"RN$(1)  :REM*1ØØ
12Ø FORL1=1TO5:POKE2Ø4Ø+L1,2ØØ:
    DI(L1)=Ø:NEXT:POKESP+21,62
                              :REM*243
122 GOSUB13Ø:IFRL=4THENRETURN
                              :REM*194
124 GOSUB154:IFRD>ØTHEN122
                              :REM*86
126 RETURN                    :REM*13
128 = ROLL DICE =             :REM*1Ø7
13Ø FORL1=1TO5                :REM*61
132 IFDI(L1)=ØTHENDN(L1)=INT(RN
    D(1)*6+1)                 :REM*23Ø
134 NEXT                      :REM*9
136 FORL1=1TO5:IFDI(L1)=1THEN14
    6                         :REM*131
138 T1=INT(RND(1)*6+1)        :REM*7
14Ø POKEWV,129:POKELF,85:POKEHF
    ,36                       :REM*1Ø8
142 POKE2Ø4Ø+L1,192+T1:FORL2=1T
    O25: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
15Ø RETURN                    :REM*37
152 = CHOOSE DICE =           :REM*249
154 POKESP+1,92:POKESP+21,63:RD
    =Ø:T1=1                   :REM*27
156 JS=PEEK(5632Ø)AND31:IFJS=31
    THEN156                   :REM*2Ø3
158 IFJS=15ANDT1=ØTHENFORL1=1TO
    5:POKE2Ø4Ø+L1,192+DN(L1):DI
    (L1)=1:NEXT:RD=Ø          :REM*121
16Ø IFJS=15ANDT1=6THEN17Ø
                              :REM*2Ø
162 IFJS=15ANDT1>ØTHENPOKE2Ø4Ø+
    T1,2ØØ:RD=RD+1:DI(T1)=Ø
                              :REM*229
164 IFJS=29THENT1=T1+1:IFT1>6TH
    ENT1=6                    :REM*215
166 IFJS=3ØTHENT1=T1-1:IFT1<ØTH
    ENT1=Ø                    :REM*226
168 POKESP+1,68+24*T1:FORL1=1TO
    99:NEXT:GOTO156           :REM*25
17Ø WAIT5632Ø,16,15:RETURN
                              :REM*2Ø7
172 = CHOOSE LINE =           :REM*184
174 POKESP+21,254             :REM*66
176 LN=1:POKESP+15,86         :REM*245
178 JS=PEEK(5632Ø)AND31:IFJS=31
    THEN178                   :REM*76
18Ø IFJS=15ANDMX(PL,LN)=ØTHENRE
    TURN                      :REM*155
182 IFJS=15THENGOSUB3Ø8:REM*195
184 FORL1=1TO99:NEXT:IFJS=3ØTHE
    N194                      :REM*237
186 IFJS<>29THEN178           :REM*9Ø
188 LN=LN+1:IFLN=7THENLN=11
                              :REM*1
19Ø IFLN>17THENLN=1           :REM*15Ø
192 GOTO198                   :REM*53
194 LN=LN-1:IFLN=1ØTHENLN=6
                              :REM*2Ø4
196 IFLN<1THENLN=17           :REM*144
198 POKESP+15,78+LN*8:GOTO178
                              :REM*118
2ØØ = CALCULATE =             :REM*176
2Ø2 SC=Ø:MX(PL,LN)=1          :REM*214
2Ø4 ON-(LN<7)GOTO2Ø8:GOTO222
                              :REM*13
2Ø6 = UPPER =                 :REM*113
2Ø8 FORL1=1TO5                :REM*143
21Ø 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*1Ø5
22Ø = LOWER =                 :REM*158
222 T1=Ø:T2=Ø:SC=Ø            :REM*225
224 FORL1=1TO6:CT(L1)=Ø: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
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230 NEXT:NEXT              :REM*97
232 ONLN-1ØGOSUB24Ø,24Ø,25Ø,262
    ,262,274,282           :REM*2Ø6
234 SC(PL,4)=SC(PL,4)+SC:SC(PL,
    5)=SC(PL,3)+SC(PL,4)
                           :REM*133
236 RETURN                 :REM*123
238 * 3 OR 4 OF A KIND *
                           :REM*219
24Ø FORL1=1TO6             :REM*16Ø
242 IFLN=11ANDCT(L1)>2THENSC=T2
                           :REM*69
244 IFLN=12ANDCT(L1)>3THENSC=T2
                           :REM*124
246 NEXT:RETURN            :REM*149
248 * FULL HOUSE *         :REM*68
25Ø FORL1=1TO6             :REM*19Ø
252 IFCT(L1)=2THENT1=T1+2
                           :REM*164
254 IFCT(L1)=3THENT1=T1+3
                           :REM*128
256 IFT1=5THENSC=25        :REM*66
258 NEXT:RETURN            :REM*161
26Ø * SMALL STRAIGHT OR LARGE S
    TRAIGHT *              :REM*225
262 FORL1=1TO6             :REM*2Ø2
264 T1=T1+1:IFCT(L1)=ØTHENT1=Ø
                           :REM*88
266 IFLN=14ANDT1=4THENSC=3Ø
                           :REM*219
268 IFLN=15ANDT1=5THENSC=4Ø
                           :REM*63
27Ø NEXT:RETURN            :REM*173
272 * YATZY *               :REM*Ø
274 FORL1=1TO6             :REM*198
276 IFCT(L1)=5THENSC=5Ø:REM*192
278 NEXT:RETURN            :REM*181
28Ø * CHANCE *             :REM*143
282 SC=T2:RETURN           :REM*154
284 = PRINT =              :REM*19
286 POKE646,Ø:IFLN=16THENPOKE64
    6,4                    :REM*151
288 PRINTLEFT$(DN$,LN+4)TAB(19+
    (4*(PL-1)))RIGHT$(" "+STR$(
    SC),3)                 :REM*177
29Ø GOSUB3Ø2               :REM*11Ø
292 FORL=1TO5:T=VAL(MID$("Ø1112
    132224",L*2,2))        :REM*37
294 POKE646,1:IFL=2THENPOKE646,
    2                      :REM*148
296 PRINTLEFT$(DN$,T)TAB(19+(4*
    (PL-1)))RIGHT$(" "+STR$(SC(
    PL,L)),3)              :REM*1Ø
298 NEXT:POKESP+21,62:RETURN
                           :REM*66
3ØØ = BLIP =               :REM*44
3Ø2 POKESR,24Ø:POKEWV,17:POKEHF
    ,5Ø:POKELF,35          :REM*12
3Ø4 FORL1=1TO99:NEXT:POKEWV,16:
    POKESR,Ø:RETURN        :REM*222
3Ø6 = BUZZ =               :REM*183
3Ø8 POKESR,24Ø:POKEWV,33:POKEHF
    ,5                      :REM*8
31Ø FORL1=1TO15Ø:NEXT:POKEWV,32
    :RETURN                :REM*12Ø
312 = END GAME =           :REM*2Ø4
314 POKESP+21,Ø:POKE829,234
                           :REM*84
316 PRINT"{HOME}{CTRL 9}{CRSR D
    N}{3 CRSR RTs}{CTRL 2} PRES
    S{2 SPACEs}FIRE "      :REM*12Ø
318 FORL1=1TONP:HS=SC(L1,5):IFH
    S<=PEEK(829+L1*2)*256+PEEK(
    83Ø+L1*2)THEN322       :REM*11
32Ø POKE829+L1*2,HS/256:POKE83Ø
    +L1*2,(HS/256-INT(HS/256))*
    256                    :REM*116
322 NEXT:WAIT5632Ø,16,16:WAIT56
    32Ø,16,15:RUN          :REM*223
324 = SCREEN =             :REM*89
326 PRINT"{SHFT CLR}{CTRL 7}{CO
    MD L}{CTRL 9} {COMD A}{SHFT
    *}{COMD S}{COMD A}{SHFT *}
    {COMD S}{COMD A}{SHFT *}{CO
    MD S}{COMD A}{SHFT *}{COMD
    S}{COMD A}{SHFT *}{COMD S}
    {CTRL Ø}{SHFT O}{3 COMD Ys}
    {SHFT O}{3 COMD Ys}{SHFT O}
    {3 COMD Ys}{SHFT O}{3 COMD
    Ys}{COMD J}{CTRL 8}{CTRL 9}
    {4 SPACEs}"            :REM*1Ø3
328 PRINT"{CTRL 7}{COMD L}{CTRL
    9} {SHFT -}Y{2 SHFT -s}A{2
    SHFT -s}T{2 SHFT -s}Z{2 SH
    FT -s}Y{SHFT -} {CTRL Ø}{CO
    MD H}{3 SPACEs}{COMD H}{3 S
    PACEs}{COMD H}{3 SPACEs}{CO
    MD H}{3 SPACEs}{COMD J}{CTR
    L 8}{CTRL 9}{4 SPACEs}"
                           :REM*2Ø8
33Ø PRINT"{CTRL 7}{COMD L}{CTRL
    9} {COMD Z}{SHFT *}{COMD X
    }{COMD Z}{SHFT *}{COMD X}{C
    OMD Z}{SHFT *}{COMD X}{COMD
    Z}{SHFT *}{COMD X}{COMD Z}
    {SHFT *}{COMD X} {CTRL Ø}{S
    HFT L}{3 COMD Ps}{SHFT L}{3
    COMD Ps}{SHFT L}{3 COMD Ps
    }{SHFT L}{3 COMD Ps}{COMD J
    }{CTRL 8}{CTRL 9}UNDO"
                           :REM*85
332 PRINT"{CTRL 7}{COMD L}{CTRL
    9}{COMD 7} HIGH SCORE{6 SP
    ACEs}{CTRL Ø}{CTRL 7}{COMD
    G}{3 SPACEs}{COMD G}{3 SPAC
    Es}{COMD G}{3 SPACEs}{COMD
    G}{3 SPACEs}{COMD J}{CTRL 8
    }{4 COMD Ys}{CTRL 7}
                           :REM*197
334 PRINT"{COMD L}{CTRL 1}ACES.
    .......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*13
336 PRINT"{COMD L}{CTRL 1}DEUCE
    S......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*192
338 PRINT"{COMD L}{CTRL 1}THREE
    S......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*97
34Ø PRINT"{COMD L}{CTRL 1}FOURS
    .......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*19
342 PRINT"{COMD L}{CTRL 1}FIVES
    .......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*148
344 PRINT"{COMD L}{CTRL 1}SIXES
    .......{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*37
346 PRINT"{CTRL 7}{COMD L}{CTRL
    2}{CTRL 9} SUB TOTAL{7 SPA
    CEs}{CTRL Ø}{CTRL 7}{COMD G
    }{3 SPACEs}{COMD G}{3 SPACE
    s}{COMD G}{3 SPACEs}{COMD G
    }{3 SPACEs}{COMD J} :REM*55
348 PRINT"{CTRL 7}{COMD L}{CTRL
    3}{CTRL 9} BONUS (63) {CTR
    L Ø}{CTRL 7}{COMD G}{CTRL 3
    }=35 {CTRL 7}{COMD G}{3 SPA
    CEs}{COMD G}{3 SPACEs}{COMD
    G}{3 SPACEs}{COMD G}{3 SPA
    CEs}{COMD J}       :REM*198
35Ø PRINT"{CTRL 7}{COMD L}{CTRL
    2}{CTRL 9} TOTAL UPPER{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}
                           :REM*198
352 PRINT"{COMD L}{12 COMD Ys}{
    SHFT O}{4 COMD Ys}{SHFT O}{
    3 COMD Ys}{SHFT O}{3 COMD Y
    s}{SHFT O}{3 COMD Ys}{SHFT
    O}{3 COMD Ys}{COMD J}
                           :REM*245
354 PRINT"{COMD L}{CTRL 1}3 OF
    A KIND.{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*215
356 PRINT"{COMD L}{CTRL 1}4 OF
    A KIND.{CTRL 7}{COMD G}{CTR
    L 1}ADD {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*22Ø
358 PRINT"{COMD L}{CTRL 1}FULL
    HOUSE..{CTRL 7}{COMD G}{CTR
    L 1}=25 {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{3
    SPACEs}{COMD J}      :REM*186
36Ø PRINT"{COMD L}{CTRL 1}SM ST
    RAIGHT.{CTRL 7}{COMD G}{CTR
    L 1}=3Ø {CTRL 7}{COMD G}{3
    SPACEs}{COMD G}{3 SPACEs}{C
    OMD G}{3 SPACEs}{COMD G}{SH
    FT SPACE}{2 SPACEs}{COMD J}
                           :REM*218
362 PRINT"{COMD L}{CTRL 1}LG ST
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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 O}{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 O}{3 COMD
     Ys}{SHFT O}{3 COMD Ys}{SHF
    T O}{3 COMD Ys}{SHFT O}{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 CRSR 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 CRSR 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}{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
    }{COMD I} {COMD I}{CTRL Ø}{
    2 SHFT -s}{CTRL 9}{COMD I}{
    COMD F}{CTRL Ø}{SHFT LB.}{2
     SHFT -s}{COMD *}{CTRL 9}{C
    OMD *}{CTRL Ø}{SHFT LB.}{SH
    FT -}                :REM*227
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*75
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*214
39Ø PRINT"{4 CRSR 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"{CRSR DN}{CTRL 2}{6 S
    PACEs}TO CHANGE NUMBER OF P
    LAYERS               :REM*92
394 PRINT"{2 CRSR DNs}{1Ø SPACE
    s}PRESS {COMD 2}FIRE {CTRL
    2}TO PLAY            :REM*123
396 PRINT"{3 CRSR DNs}{9 SPACEs
    }HOW MANY PLAYERS?{COMD 2}"
    ;                    :REM*214
398 PRINTTAB(27)NP"{3 CRSR 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$(1)="{CTRL 9}{SHFT LB.}{
    CTRL Ø}{COMD K}{2 CRSR LFs}
    {CRSR DN}{CTRL 9}{COMD K}{C
    TRL Ø}{COMD K}{HOME}":REM*5
418 RN$(2)="{CTRL 9}{SHFT E} {2
     CRSR LFs}{CRSR DN} {SHFT D
    }{HOME}"             :REM*15
42Ø RN$(3)="{CTRL 9}{SHFT E} {2
     CRSR LFs}{CRSR DN}{SHFT D}
     {HOME}"             :REM*173
422 DN$="{HOME}{23 CRSR 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,ØØ1
    ,192,ØØØ             :REM*44
458 DATAØØ3,128,ØØØ,ØØ7,ØØØ,Ø28
    ,Ø14,ØØØ             :REM*239
46Ø DATAØ14,Ø61,192,ØØ7,123,Ø64
    ,ØØ7,118             :REM*187
462 DATA224,ØØ7,189,16Ø,ØØ7,219
    ,112,ØØ7             :REM*166
464 DATA222,2Ø8,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
```

```
    ,255,255              :REM*18
5Ø2 DATA225,255,255,243,255,255
    ,255,255              :REM*196
5Ø4 DATA255,255,255,255,255,255
    ,255,ØØØ              :REM*24
5Ø6 * THREE *             :REM*2Ø
5Ø8 DATA255,255,255,255,255,255
    ,255,255              :REM*13Ø
51Ø DATA2Ø7,255,255,135,255,255
    ,135,255              :REM*3
512 DATA255,2Ø7,255,255,255,255
    ,255,255              :REM*181
514 DATA255,231,255,255,195,255
    ,255,195              :REM*49
516 DATA255,255,231,255,255,255
    ,255,255              :REM*196
518 DATA255,255,243,255,255,225
    ,255,255              :REM*228
52Ø DATA225,255,255,243,255,255
    ,255,255              :REM*214
522 DATA255,255,255,255,255,255
    ,255,ØØØ              :REM*234
524 * FOUR *              :REM*44
526 DATA255,255,255,255,255,255
    ,243,255              :REM*195
528 DATA2Ø7,225,255,135,225,255
    ,135,243              :REM*167
53Ø DATA255,2Ø7,255,255,255,255
    ,255,255              :REM*135
532 DATA255,255,255,255,255,255
    ,255,255              :REM*1Ø5
534 DATA255,255,255,255,255,255
    ,255,255              :REM*111
536 DATA255,255,243,255,2Ø7,225
    ,255,135              :REM*1Ø1
538 DATA225,255,135,243,255,2Ø7
    ,255,255                :REM*7
54Ø DATA255,255,255,255,255,255
    ,255,ØØØ              :REM*252
542 * FIVE *              :REM*224
544 DATA255,255,255,255,255,255
    ,243,255              :REM*213
546 DATA2Ø7,225,255,135,225,255
    ,135,243              :REM*137
548 DATA255,2Ø7,255,255,255,255
    ,255,255              :REM*1Ø6
55Ø DATA255,231,255,255,195,255
    ,255,195               :REM*21
552 DATA255,255,231,255,255,255
    ,255,255              :REM*184
554 DATA255,255,243,255,2Ø7,225
    ,255,135              :REM*119
556 DATA225,255,135,243,255,2Ø7
    ,255,255              :REM*233
558 DATA255,255,255,255,255,255
    ,255,ØØØ              :REM*2Ø6
56Ø * SIX *               :REM*16
562 DATA255,255,255,255,255,255
    ,243,255              :REM*167
564 DATA2Ø7,225,255,135,225,255
    ,135,243              :REM*155
566 DATA255,2Ø7,255,255,255,255
    ,255,255              :REM*12Ø
568 DATA243,255,2Ø7,225,255,135
    ,225,255               :REM*82
57Ø DATA135,243,255,2Ø7,255,255
    ,255,255              :REM*182
572 DATA255,255,243,255,2Ø7,225
    ,255,135               :REM*89
574 DATA225,255,135,243,255,2Ø7
    ,255,255              :REM*251
576 DATA255,255,255,255,255,255
    ,255,ØØØ              :REM*2Ø8
578 * RIGHTHAND *         :REM*115
58Ø DATAØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
    ,ØØ6,ØØØ                :REM*7
582 DATAØØØ,ØØ7,ØØØ,ØØØ,ØØ3,128
    ,ØØØ,ØØ1               :REM*48
584 DATA192,ØØØ,ØØØ,224,ØØØ,ØØØ
    ,112,Ø56               :REM*64
586 DATAØØ3,188,112,ØØ2,222,224
    ,ØØ7,11Ø               :REM*163
588 DATA224,ØØ5,189,224,Ø14,219
    ,224,Ø11               :REM*131
59Ø DATA123,224,Ø13,187,224,ØØ6
    ,255,192               :REM*119
592 DATAØØ3,255,192,ØØ1,255,128
    ,ØØØ,255                :REM*73
594 DATA128,ØØØ,127,128,ØØØ,Ø63
    ,192,ØØØ               :REM*79 ■
```


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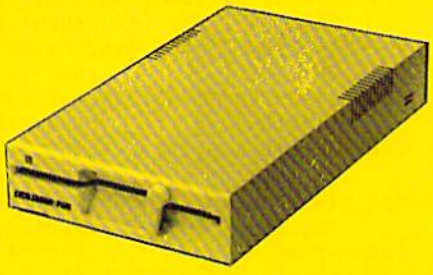
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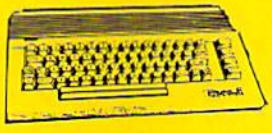
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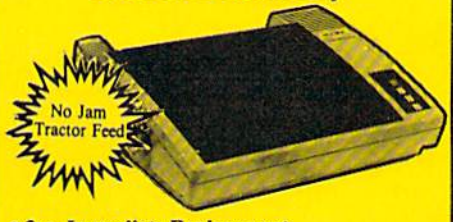
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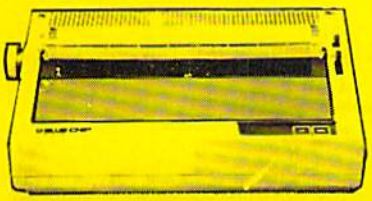
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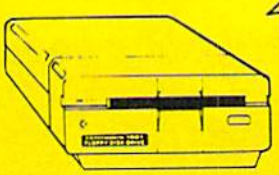
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The Multitasking Factor

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

By JIM BUTTERFIELD



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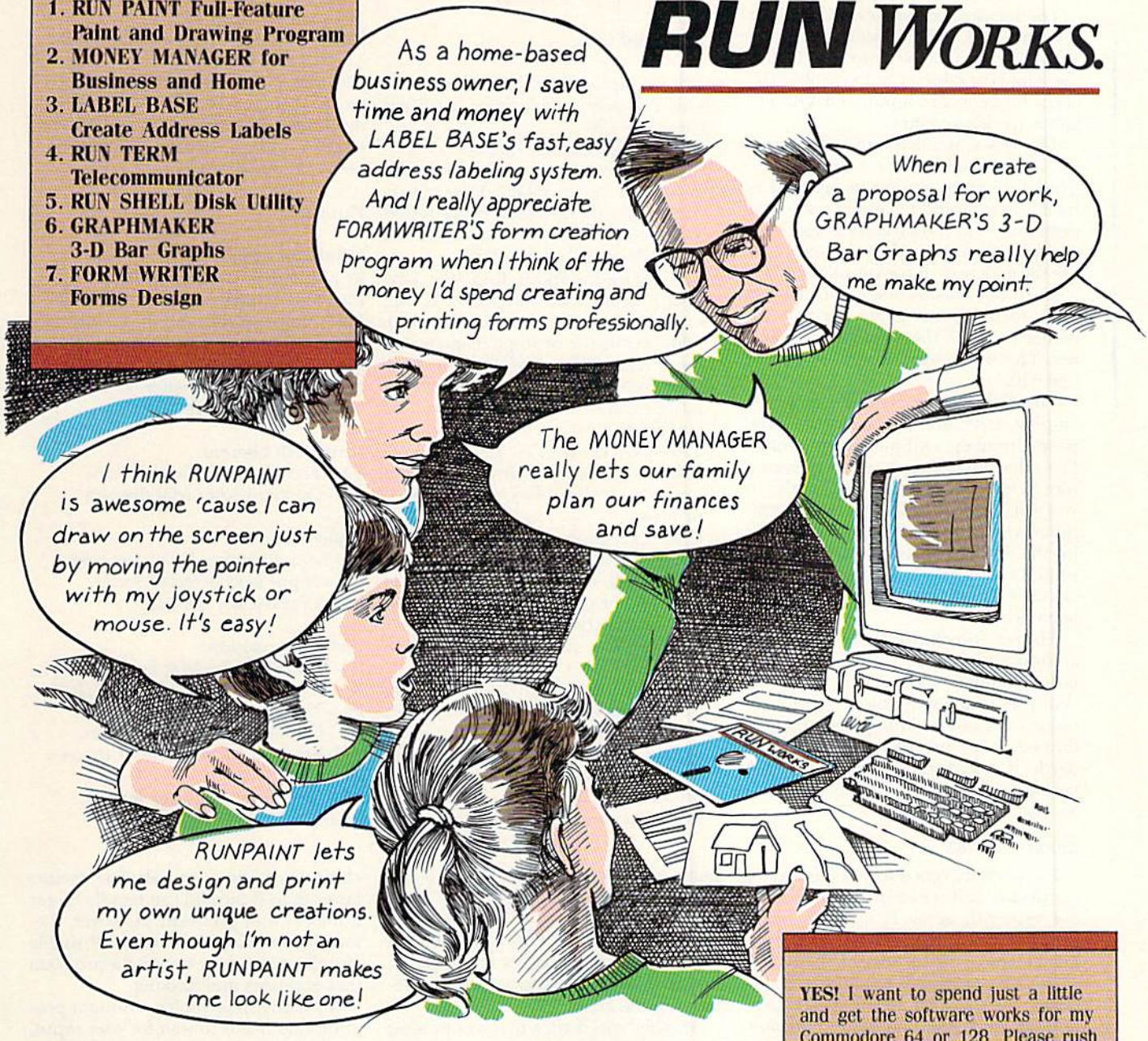
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refer to Table 1 to see how it's done.

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.

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.
N$—Input keys detected so far.
X$—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.

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 normally 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 machine 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. R

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
    $,P8                :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
    IME NUMBERS         :REM*85
150 P(0)=2              :REM*23
160 PN=0                :REM*102
170 P8=3                :REM*72
```

MULTITASKING FACTOR

```
180 REMARK:{2 SPACEs}ENTER NEW
    PRIME IN TABLE      :REM*215
190 PN=PN+1             :REM*210
200 P(PN)=P8            :REM*117
210 REMARK:{2 SPACEs}TRY A NEW
    VALUE AS PRIME      :REM*114
220 P8=P8+2             :REM*111
230 P1=1                :REM*118
240 REMARK:{2 SPACEs}TRY FACTOR
     P2 FROM TABLE      :REM*173
250 P2=P(P1)            :REM*65
260 P3=P8/P2            :REM*251
270 IF P3=INT(P3) GOTO 220
                        :REM*143
280 P1=P1+1             :REM*99
290 IF P3<P2 GOTO 190   :REM*135
300 REMARK:{2 SPACEs}LOOK FOR K
    EYBOARD INPUT       :REM*212
310 IF N>0 GOTO 370     :REM*28
320 N=1                 :REM*134
330 PRINT "NUMBER (0 = END): ";
                        :REM*204
340 N$=""               :REM*55
350 REMARK:{2 SPACEs}PRINT PROM
    PT SEQUENCE         :REM*53
360 PRINT CHR$(164);CHR$(157);
                        :REM*179
370 GET X$:IF X$="" GOTO 730
                        :REM*129
380 IF X$=CHR$(13) GOTO 480
                        :REM*223
390 IF X$=CHR$(20) AND LEN(N$)>
    0 GOTO 440          :REM*13
400 IF X$<"0" OR X$>"9" GOTO 73
    0                   :REM*219
410 N$=N$+X$            :REM*187
420 PRINT X$;           :REM*65
430 GOTO 360            :REM*252
440 N$=LEFT$(N$,LEN(N$)-1)
                        :REM*229
450 PRINT X$;           :REM*103
460 GOTO 360            :REM*25
470 REMARK:{2 SPACEs}NUMBER REC
    EIVED, ANALYZE...   :REM*209
480 PRINT " ":PRINT "( I HAVE";
    PN;"PRIMES SO FAR)" :REM*95
490 N=VAL(N$):X$=""     :REM*75
500 IF N<2 THEN END     :REM*51
510 PRINT N;"= ";       :REM*42
520 REMARK: TRY FACTORS FROM TA
    BLE                 :REM*38
530 P4=0                :REM*165
540 REMARK: TRY NEXT FACTOR
                        :REM*214
550 IF P4>PN THEN P2=P2+2:GOTO
    580                 :REM*188
560 P2=P(P4)            :REM*157
570 P4=P4+1             :REM*147
580 P3=N/P2             :REM*235
590 IF P3=INT(P3) THEN N=P3:K=K
    +1:GOTO 580         :REM*11
600 IF K=0 GOTO 670     :REM*76
610 REMARK: FACTOR FOUND .. PRI
    NT IT               :REM*24
620 PRINT X$;MID$(STR$(P2),2);
                        :REM*126
630 IF K>1 THEN PRINT "{UP ARRO
    W}";MID$(STR$(K),2);:REM*35
640 X$="*"              :REM*91
650 K=0                 :REM*205
660 REMARK:{2 SPACEs}MAYBE ANOT
    HER FACTOR          :REM*10
670 IF P2<P3 GOTO 550   :REM*2
680 REMARK:{2 SPACEs}NO MORE FA
    CTORS               :REM*130
690 IF N>1 THEN PRINT X$;MID$(S
    TR$(N),2);          :REM*195
700 PRINT               :REM*86
710 N=0                 :REM*13
720 REMARK:{2 SPACEs}BACK FOR M
    ORE PRIMES          :REM*158
730 IF PN<P9 GOTO 250   :REM*190
740 GOTO 310            :REM*35
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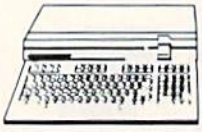
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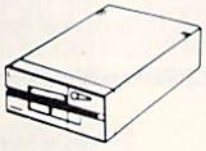


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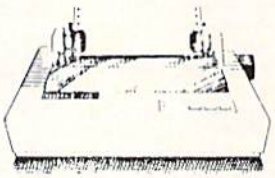
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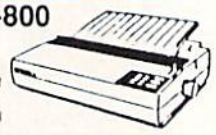
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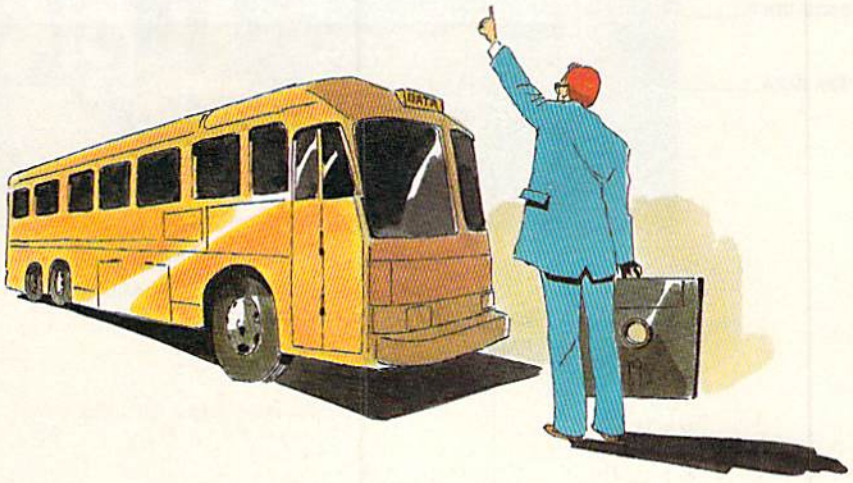
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Journey to the Center of Your Disk Drive

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 electromechanical 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 5¼-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.

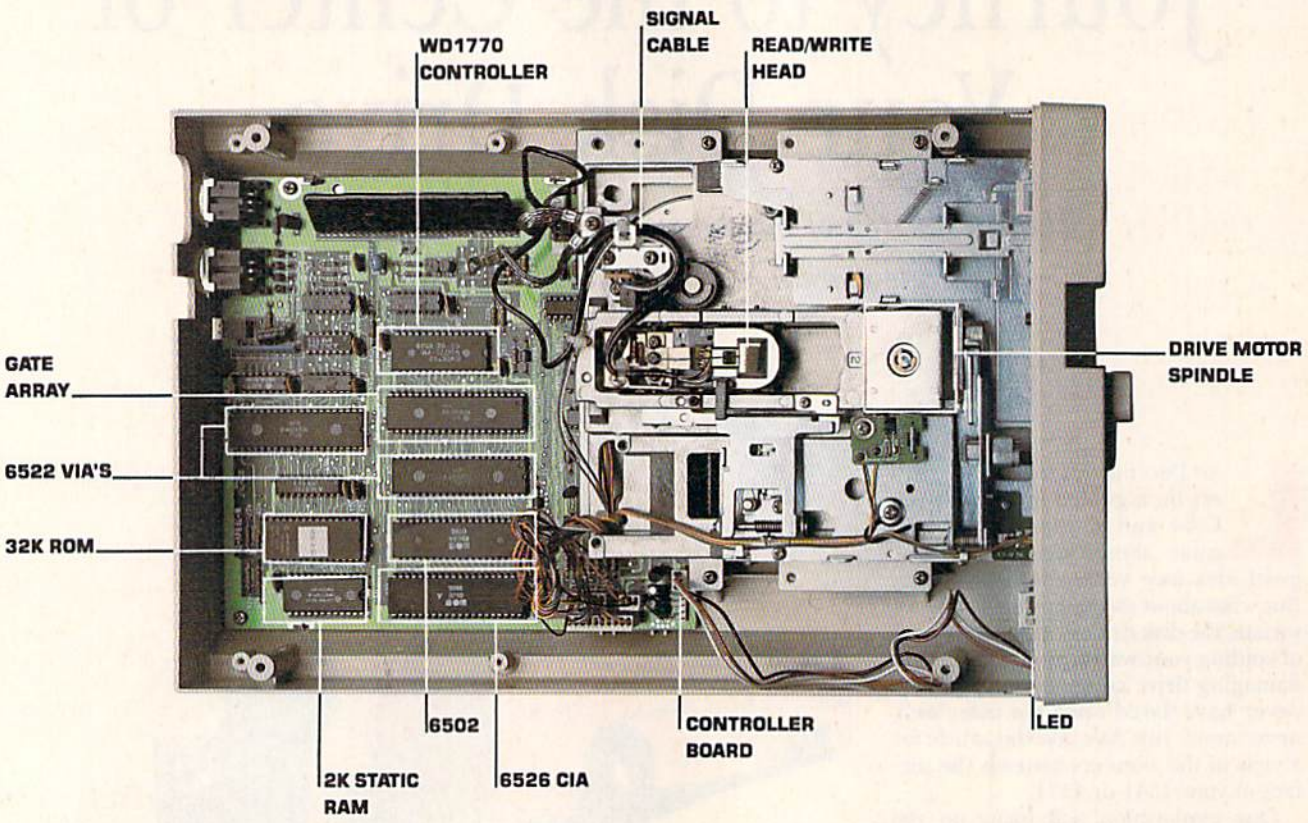
In addition to holding the disk in place, the clamping mechanism that's activated by closing the drive door latch engages the read/write head. This is encased in a spring-loaded plastic housing, which is shaped something like two tongue depressors hinged together at the back edge.

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 ►

ILLUSTRATED BY KERRY GAVIN



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 tranformations to 12 and 5 volts dc take place before the power arrives at the main circuit board.

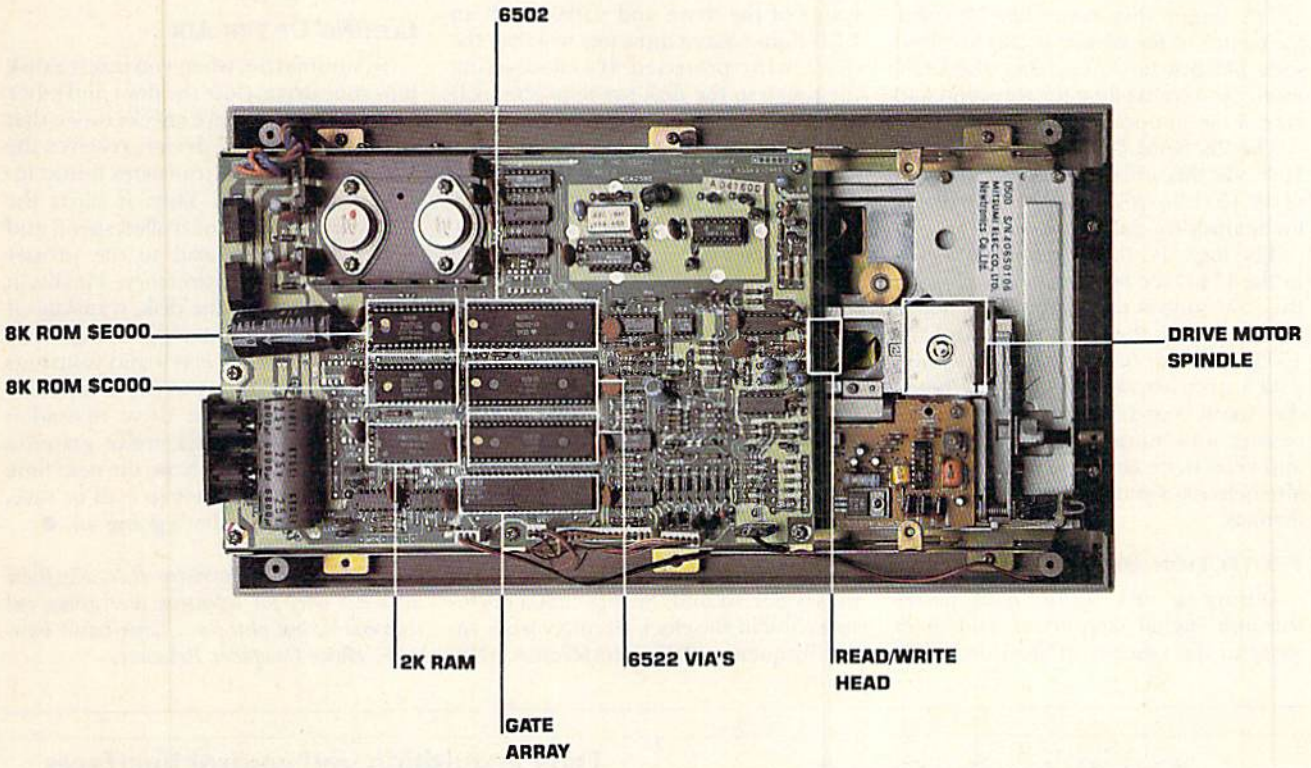
The 1541's main circuit board lies above the mechanical components and the power supply, while in the 1571 the main board is underneath the power supply at the rear of the drive enclosure. Wrapped around the circuitry is a ventilated metal shield that reduces electromagnetic interference and aids in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



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- ►

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.)

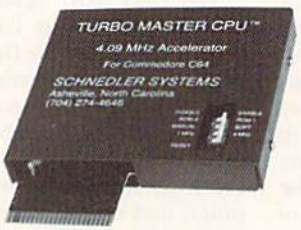
Coming Up for Air

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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Amazing!

Treat yourself to an unbelievable bundle of advanced C-128 commands heretofore available only on top-of-the-line personal computers.

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! R

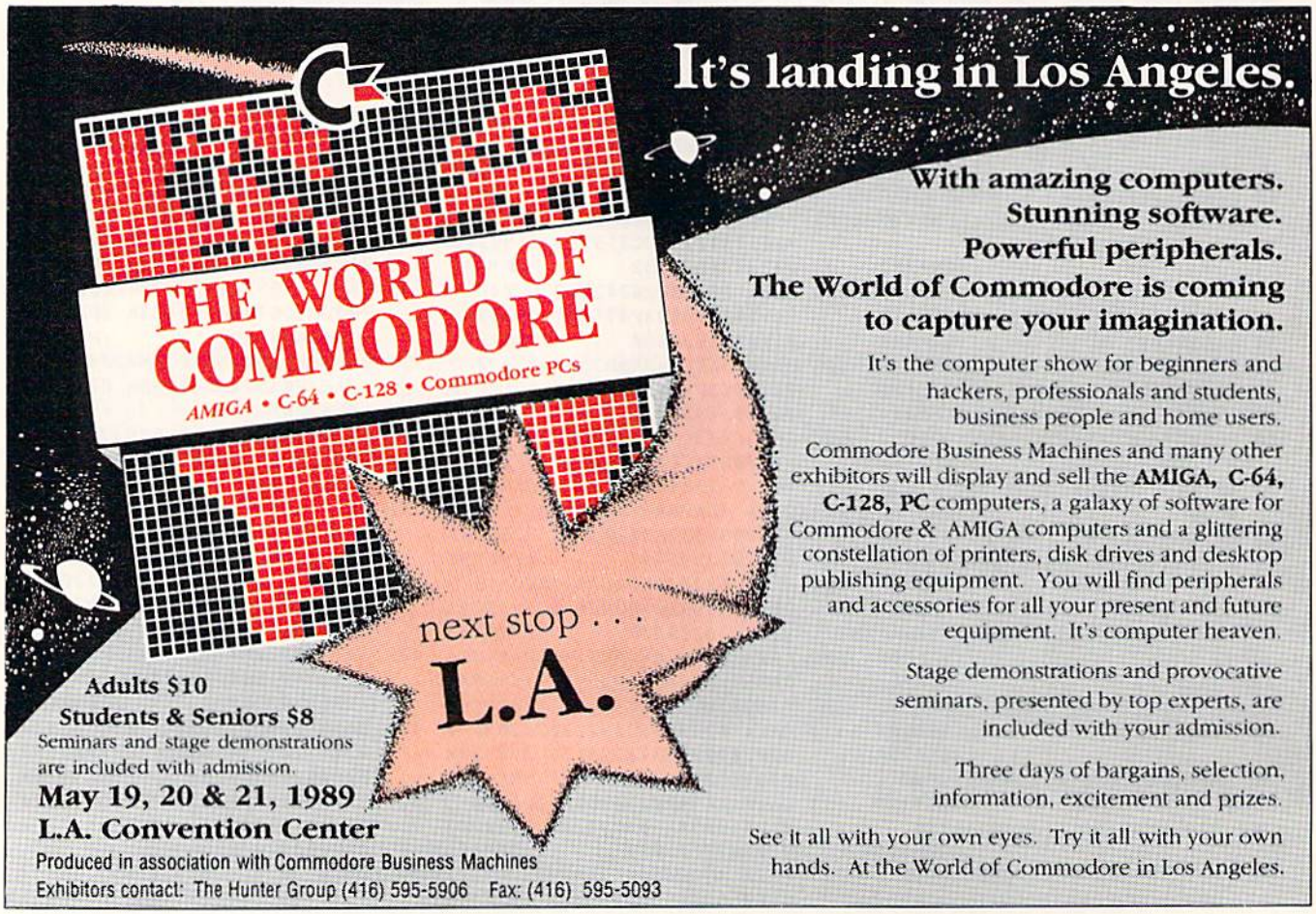
Bearing a name nearly identical to that of RUN*'s associate editor, Harold Bjornson is a successful hog farmer in central Minnesota who fills the long winter evenings by programming on his C-128.*

Listing 1. The Amazing! program.

```
10 OPEN 8,8,8,"AMAZING,P,W"
                          :REM*145
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$(H);:NEXT:GOTO 2
   0                      :REM*100
55 IF LEN(A$)<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$)/2            :REM*67
75 FOR I=1 TO N           :REM*73
80 H$=MID$(B$,I*2-1,2):H=DEC(H$
   )                      :REM*251
85 PRINT#8,CHR$(H);:NEXT:GOTO 2
   0                      :REM*129
100 REM AMAZING C128 UTILITY
                          :REM*190
101 DATA 011C281C0A0058B2CE09 2
    832293ADE20434C4541 523A8B2
    058B23830207A7        :REM*67
102 DATA 20DE20353AD520DE2030 0
    06F1C1400972038303 8 2C31303
    03A9720373932         :REM*158
103 DATA 2C3132353AFE0220303A 9
    720373237392C313339 3A972030
    73238302C3032         :REM*125
104 DATA 383A8F2020202020204E 4
    541542050524F475241 4D000000
    01E0053B2323O         :REM*221
105 DATA 3AFE253A8B2058B23430 2
    0A72053B2303AFE26000 A21C230
    08F2024384220         :REM*86
106 DATA 2431432041542024314 3
    64600D91C28009922 93 9F223BA
    6532922434F4D         :REM*198
107 DATA 4D4F444F52452042415 4
    9432056372E3020313 1 3232333
    6352042595445         :REM*198
108 DATA 532046524545220000A1D 3
    200 99A65329222020 20 2843293
    13938362043 4F        :REM*127
109 DATA 4D4D4F444F524520454C 4
    54354524F4E4943532C 204C544
    42E220D351D3C         :REM*183
110 DATA 0099A65329222020202020 2
    020202020 2843293139 3737204
    D4943524F534F         :REM*17
111 DATA 46542043 4F525020E2200 5
    E1D46000 99A65329222 0 2020202
    020202020202020       :REM*25
112 DATA 414C4C2052494748545 3 2
    052455345525645 4422 0070 1D4
    B00993A992252         :REM*157
113 DATA 454144592E223A990086 1
    D5000D720382303AE7 2030 2C3
    13AE720352C34         :REM*139
114 DATA 00AF1D5A00F9203 82CC7 2
    8313333293A43552428 3029B22
    21220929D223A         :REM*70
115 DATA 435524283129B2222090 2
    200DC1D640087204E3A 8620452
    4284EAA31293A         :REM*79
116 DATA 8120491B2302A4204EAB 3
    13A8720452428 49293A 823A515
    2B24E00F71D6E         :REM*80
117 DATA 0087204E3A8620432428 4
    EAA31292C414E24284E AA31290
    0161E78008120         :REM*102
118 DATA 49B23120A4204E3A8720 4
    3242849292C414E2428 49293A8
    200251E820053         :REM*207
119 DATA 59B2373A4124B2222200 4
    61E8C00A1204B45243A 8B204B4
    524B2C7283334         :REM*125
120 DATA 2920A7204B4524B22227 2
    722006 91E9600 8B204B 4524B2C
    728323029200B0        :REM*107
121 DATA 204B4524B2C728313438 2
    920A7203134300080 1E A0008B2
    04B4524B2C728         :REM*109
122 DATA 313333292 0A7203823 0 0
    0AD1EAA008B204B4524 B222222
    0A7208D203238         :REM*75
123 DATA 303A8120545 4B2312 0A4 2
    03137353A822054543A 8920313►
```

RUN it right: **C-128**

```
    43ØØØE21EB4ØØ          :REM*71
124 DATA 8B2Ø4B4524B2C7283133 2
    92ØAF2Ø4124B2222222Ø A72ØEØ2
    C3Ø2C53592C22          :REM*166
125 DATA 2Ø223A993A5359B25359 A
    A313A892Ø32353ØØØF8 1EBEØØ8
    B2Ø4B4524B2C7          :REM*214
126 DATA 283133292Ø A72Ø323333Ø Ø
    Ø2A1FC8ØØ8B2Ø4B4524 B222112
    22ØBØ2Ø4B4524          :REM*34
127 DATA B22291222ØBØ2Ø4B4524 B
    2221D222ØBØ2Ø4B4524 B2229D2
    22ØA72Ø3134 3Ø         :REM*2
128 DATA ØØ451FD2ØØ8B2Ø4B4524 B
    22293222ØA72Ø5359B2 3Ø3A412
    4B22222ØØ6A1F          :REM*96
129 DATA D3ØØ8B2Ø4B4524B22213 2
    22ØA72Ø992Ø43552428 31293B3
    A5359B23Ø3A41          :REM*75
13Ø DATA 24B22222ØØ781FDCØØ41 2
    4B24124AA4B4524ØØ86 1FE6ØØE
    Ø2C3Ø2C53592C          :REM*224
131 DATA 4124ØØAD1FFØØØ8B2Ø4B 4
    524B2C7283133292ØA7 2Ø99435
    5242831293B3A          :REM*16
132 DATA 8D2Ø32393Ø3A4124B222 2
    2ØØB81FFAØØ4B4524B2 2222ØØC
    C1FØ4Ø18B2Ø53          :REM*53
133 DATA 59B132342ØA72Ø5359B2 3
    234ØØD61FØEØ1892Ø31 343ØØØE
    C1F18Ø14BB231          :REM*111
134 DATA AB4B3A992Ø435524284B 2
    93B3A8EØØØØ2Ø22Ø18F 2Ø5Ø415
    253452Ø434F4D          :REM*68
135 DATA 4D414E44ØØ222Ø2CØ151 B
    23Ø3A993A5359B25359 AA313A8
    B2Ø5359B13234          :REM*23
136 DATA 2ØA72Ø5359B23234ØØ3Ø 2
    Ø36Ø1812Ø57B2312ØA4 2Ø4EØØ4
    Ø2Ø4ØØ14C4CB2          :REM*213
137 DATA C32843242857292ØØ55 2
    Ø4AØ18B2ØC328412429 B34C4C2
    ØA72Ø33353ØØØ          :REM*188
138 DATA 7Ø2Ø54Ø18B2ØC8284124 2
    C4C4C29B24324285729 2ØA72Ø5
    1B257ØØA62Ø5E          :REM*92
139 DATA Ø1823A8B2Ø51B23Ø2ØA7 2
    Ø993A992Ø452428BB28 3129AC5
    152293A5359B2          :REM*161
14Ø DATA 5359AA333A8B2Ø5359B1 3
    2342ØA72Ø5359B23234 ØØD62Ø6
    8Ø18B2Ø51B3B1          :REM*1Ø7
141 DATA 3Ø2ØA72Ø993A992Ø414E 2
    42851293A5359B25359 AA333A8
    B2Ø5359B13234          :REM*1Ø
142 DATA 2ØA72Ø5359B23234ØØE7 2
    Ø72Ø1992Ø2252454144 592E223
    A8EØØFØ2Ø7CØ1          :REM*61
143 DATA 832Ø3136ØØ1Ø2186Ø183 2
    Ø2296434F52452Ø4D45 4C54444
    F574E2Ø574152          :REM*57
144 DATA 4E494E479F22ØØ2D219Ø Ø
    1832Ø22434F4D5Ø5554 4552Ø5
    34C414E472Ø45          :REM*181
145 DATA 52524F5222ØØ52219AØ1 8
    32Ø225749434B45444C 592Ø535
    4555Ø49442Ø48          :REM*235
146 DATA 554D414E2Ø4552524F52 2
    122ØØ7521A4Ø1832Ø22 9942555
    253542Ø52414D          :REM*79
147 DATA 2Ø434849502Ø44455445 4
    3544544219F22ØØ9421 AEØ1832
    Ø22435Ø552Ø4F          :REM*17
148 DATA 5645524C4F41442Ø494E 4
    4494341544544 2ØØAE 21B8Ø18
    32Ø225A383Ø2Ø          :REM*254
149 DATA 4D495353494E472Ø4552 5
    24F5222ØØD321C2Ø183 2Ø22444
    9534B2Ø445249          :REM*1Ø
15Ø DATA 56452Ø555Ø5349444452Ø 4
    44F574E2Ø4552524F52 22ØØFB2
    1CCØ183Ø2243           :REM*121
151 DATA 4F4F4B49452Ø4352554D 4
    2532Ø494E2Ø4B455942 4F41524
    42Ø4552524F52          :REM*58
152 DATA 22ØØ1B22D6Ø1832Ø2249 4
    4494F542Ø4154 2Ø4B45 59424F4
```

Circle 54 on Reader Service card.

AMAZING!

```
    1524420455252       :REM*101
153 DATA 4F5222003B22E0018320 2
    253594E54415820494E 2045525
    24F52204D4553       :REM*158
154 DATA 53414745220005E22EA01 8
    3202240495353494E47 2043 4F4
    E564552534154       :REM*111
155 DATA 494F4E2050494543452 2 0
    07C22F401832022 4D49 5354414
    B4520494E2042       :REM*90
156 DATA 5241494E43454C4C5322 0
    09A22FE01832022 5649 432D323
    02049 4E564153      :REM*250
157 DATA 494F4E2045525 24F5222 0
    00BD220802832022544F 4F204D5
    543482047454F       :REM*217
158 DATA 5320494E2052414D2045 5
    2524F522200D8221202 8320225
    04F574552204E       :REM*31
159 DATA 4F54204F4E204552524F 5
    22200FD221C02832022 5741495
    4494E4720464F       :REM*137
160 DATA 5220313534312052455 3 5
    04F4E53452E2E2E2200 0623260
    2832032360027       :REM*208
161 DATA 233002832022 4C495354 2
    22C224C495354204954 2 0594F5
    55253454C4621       :REM*153
162 DATA 22005523 3A02832022 44 4
    952222C22594F552047 4554205
    94F5552204F57       :REM*12
163 DATA 4E2044495245435 44F52 5
    9204255442E22008323 4402832
    0224449D2222C       :REM*44
164 DATA 22594F5520474554205 9 4
    F5552204F574E204449 5245435
    44F52592042 55      :REM*145
165 DATA 442E2200A0234E02832 0 2
    252554E222C22444F2D 52554E2
    D52554E2D5255       :REM*132
166 DATA 4E2200CC23580283202 2 4
    449D2222C2249205341 4944204
    7455420594F55       :REM*241
167 DATA 5220 4F574E2044495245 4
    3544F525922000002462 0283202
    24E4557222C22       :REM*152
168 DATA 4E45572057484154 3F20 2
    0594F55205345454D20 5052455
    4545920 4F4C44      :REM*76
169 DATA 2054 4F204D452E22028 2
    46C02832022 4C4F4144 222C202
    24C4F41442049       :REM*150
170 DATA 5420594F555253454C46 2
    04944494F5421220048 2476028
    32022444C4F41       :REM*120
171 DATA 44222C22464F52474554 2
    049542042 4552442122 0068248
    002832022424C       :REM*207
172 DATA 4F4144222C22464F5247 4
    55420495420 4E455244 2122008
    B248A02832022       :REM*218
173 DATA 48454C50222C2248454C 5
    02059 4F555253454C46 2 0444F5
    24B2122 00A824      :REM*45
174 DATA 940283202253595322 2C 2
    25359532042F52205349 5354455
    23F2200D8249E       :REM*59
175 DATA 02832022424F4F54222C 2
    2544845534520424F4F 5453204
    15245204D4144       :REM*3
176 DATA 4520464F52205741 4C4B 4
    94E2722000625A80283 2022454
    E44222C22454E       :REM*188
177 DATA 443F2044 4F2059 4F552 0 5
    448494E4B2049274D2 0 5355494
    34944414C3F22       :REM*115
178 DATA 002D25B2028320224253 4
    15645222C2257484154 2 0444F4
    55320422D5341       :REM*24
179 DATA 56452 04D45414E3F2200 5
    425BC02832022445341 5645222
    C225748415420       :REM*140
180 DATA 444F45532044 2D534156 4
    5204D45414E3F2200 79 25C6028
    32022535 415645     :REM*12
181 DATA 222C2253415645 2059 4F 5
    55253454C4620425553 5445522
    12200A925D002       :REM*114
182 DATA 8320225350 5244454622 2
    C225748154204B494E 44204F4
    620574F52442 0      :REM*201
183 DATA 49532027535052444546 2
    73F2200CF25DA02832 0 2253435
    241544348222C       :REM*221
184 DATA 225748455245204444F45 5
    3204954204954434 83F 2200FB2
    5E402832022 44      :REM*54
185 DATA 454C455445222C22492 0 5
    74953482049 20434F55 4C44204
    4454C4554452 0      :REM*130
186 DATA 594F552122002126EE02 8
    32022494622 2C224946 2057495
    348455320 5745      :REM*96
187 DATA 52452 0484F525345532E 2
    E2E2200 4826F802832 0 2246415
    354222C22484F       :REM*237
188 DATA 572041424F5554204D45 4
    449554D2053504545 44 3F2200 7
    7262023832022       :REM*205
189 DATA 534C4F57222C22492057 4
    F4E27542054414B4520 5448415
    42046524F4D2 0      :REM*159
190 DATA 412048554D414E2E2200 9
    E26 0C03832022 4D4F4E 49544F5
    2222C22492744       :REM*47
191 DATA 2052415448455220 5741 5
    443482054562E2200C2 2616038
    32022504C4159       :REM*203
192 DATA 222C22504C4159204954 2
    041474149 4E2053414D 2E2E2E2
    200EF262 00383      :REM*198
193 DATA 202252454E554D424552 2
    22C224C45542053 4545 2E2E2E3
    12C322C362C34       :REM*2
194 DATA 2C382C31312E2E2E2200 1
    8272A03832022545241 50222C2
    2544849532049       :REM*99
195 DATA 532041205452415 02E2E 2
    E484548454845484522 0067273
    403972037 3932      :REM*7
196 DATA 2C36343A9720383 0382C 3
    1313 03A9720373237 39 2C303A9
    720373238302C       :REM*195
197 DATA 303A993A992241505249 4
    C2046 4F4F4C532046 52 4F4D205
    2554E204D4147       :REM*246
198 DATA 415A494E4521223A8000 0
    000                 :REM*18
199 DATA -1             :REM*53
```

■

ADVERTISEMENT

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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Circle 87 on Reader Service card.

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 printhead, 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 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

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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.



The handsome NX-1000 quadruplets, from Star Micronics.

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 expanded 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- ►

PHOTOGRAPHED BY LARRY DUNN

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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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 BLoaded 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$(L)),S
150 SPRITE S,1,RND(1)*16+1,0,1,1,0
160 MOVSPR S,RND(1)*360 #
    RND(1)*15+1
170 GET KE$: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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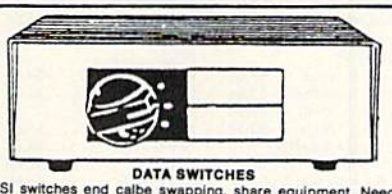
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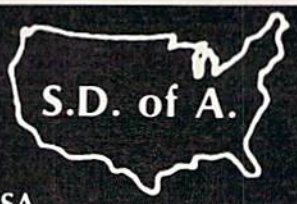
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GEOWATCH

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, geoWrite 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 "GwriteWkdsk1 "; 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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Circle 187 on Reader Service card.

From p. 34.

```
118Ø IF I AND 1 THEN FA(I)=X2*16+INT(X1/16):ELSE FA(I)=X1+256*(X2 AND 15)   :REM*56
119Ø GOSUB 184Ø:NEXT:RETURN                                                 :REM*166
12ØØ LS=(SC-2)*PØ+FS:GOSUB 122Ø:AD=AD+512:IF PØ=1 THEN RETURN               :REM*137
121Ø LS=LS+1:GOSUB 122Ø:AD=AD+512:RETURN                                    :REM*162
122Ø GOSUB 125Ø                                                             :REM*5
123Ø PRINT#15,"UØ"+CHR$(B1)+CHR$(T)+CHR$(S)+CHR$(1)+CHR$(T)                :REM*241
124Ø BANK 15: SYS 488Ø,Ø,Ø,AD/256:RETURN                                    :REM*34
125Ø SP=(P7+1)*P6                                                           :REM*171
126Ø SI=INT((LS-INT(LS/SP)*SP)/P6) AND P7                                   :REM*11Ø
127Ø IF TX THEN SI=XOR(SI,1)                                                :REM*19Ø
128Ø T=INT(LS/SP):S=LS-INT(LS/P6)*P6+1                                      :REM*149
129Ø B1=64:IF SI THEN B1=8Ø                                                 :REM*17Ø
13ØØ RETURN                                                                 :REM*167
131Ø LS=(FC-2)*PØ+FS:GOSUB 133Ø:IF PØ=1 THEN RETURN                         :REM*33
132Ø AD=AD+512:LS=LS+1                                                      :REM*72
133Ø GOSUB 125Ø:B1=B1+2:REM*13Ø
134Ø PRINT#15,"UØ"+CHR$(B1)+CHR$(T)+CHR$(S)+CHR$(1)+CHR$(T)                :REM*99
135Ø BANK 15: SYS 4883,Ø,Ø,AD/256:RETURN                                    :REM*174
136Ø CLOSE 15:OPEN 15,SD,15,"IØ"                                            :REM*194
137Ø CLOSE 1:OPEN 1,SD,Ø,"$Ø":IF DS THEN 195Ø                               :REM*28
138Ø DC=Ø:BANK 15:SYS 4889,1,Ø,TB/256:BANK Ø:PRINT:REM*24
139Ø CLOSE 1:FR=(PEEK(3Ø76)+PEEK(3Ø77)*256)*254                             :REM*233
14ØØ SYS 4892,TB/256,Ø:US=(PEEK(3Ø8Ø)+PEEK(3Ø81)*256)*254                   :REM*1Ø
141Ø TT$="":FOR Z=3Ø88 TO 31Ø8:TT$=TT$+CHR$(PEEK(Z)):NEXT                  :REM*39
142Ø Z=TB:BANK Ø                                                            :REM*227
143Ø DC=DC+1:DI$(DC)="":LE=PEEK(Z+22)+PEEK(Z+23)*256                        :REM*112
144Ø LE$(DC)=STR$(LE*254):GOSUB 183Ø                                        :REM*2Ø
145Ø FOR Z1=1 TO 21:DI$(DC)=DI$(DC)+CHR$(PEEK(Z+Z1)):NEXT                   :REM*23
146Ø Z=Z+32:IF PEEK(Z)=255 THEN RETURN                                      :REM*249
147Ø GOTO 143Ø                                                              :REM*8
148Ø SC=FM(Y2):AD=TB:GOSUB 88Ø:PRINT MØ$;DI$(Y2)                            :REM*2Ø4
149Ø IF LE$(Y2)="<DIR>" THEN AD=DB:XF=1:GOSUB 196Ø                          :REM*193
15ØØ IF SC=Ø THEN 99Ø                                                       :REM*1Ø7
151Ø GOSUB 12ØØ: SC=FA(SC):IF SC>4Ø9Ø OR AD>254*256 THEN 153Ø               :REM*212
152Ø GOTO 151Ø                                                              :REM*39
153Ø LE=VAL(LE$(Y2)):IF LE>65Ø24-TB THEN LE=65Ø24-TB                        :REM*171
154Ø TP=TB+LE:IF XF THEN 1ØØØ: ELSE 16ØØ                                    :REM*125
155Ø GOSUB 18ØØ:IF INSTR(DI$(Y2),"CBM") THEN GOSUB 179Ø:GOTO 137Ø           :REM*58
156Ø EF=Ø:GOSUB 88Ø:PRINT "CBM FILE = "DI$(Y2):GOSUB 168Ø:IF EF=1 THEN RETURN   :REM*192
157Ø CLOSE 1:OPEN 1,SD,2,Z$:IF DS THEN EF=1:CLOSE 1:RETURN                  :REM*19Ø
158Ø GOSUB 88Ø:PRINT MØ$;Z$:ZZ=4868:IF MO=2 THEN ZZ=4874                    :REM*148
159Ø BANK 15:SYS ZZ,1,Ø,TB/256:TP=PEEK(25Ø)+PEEK(251)*256:LE=TP-TB          :REM*64
16ØØ CLOSE 1:SYS 4886,Ø,TP/256,(TP-32768) AND 255:RETURN                    :REM*182
161Ø GOSUB 2Ø4Ø:IF X$=CHR$(27) THEN 5ØØ                                     :REM*177
162Ø EF=Ø:TA$=LEFT$(TA$,16)+","+FT$+",W":GOSUB 88Ø:PRINT M1$;TA$             :REM*113
163Ø CLOSE 1:OPEN 1,TD,8,TA$:IF DS THEN 166Ø                                :REM*128
164Ø SA=4871:IF MO=2 THEN SA=4877                                           :REM*12
165Ø SYS SA,1,TB/256,TP/256                                                 :REM*129
166Ø IF DS THEN PRINT DS$:EF=1                                              :REM*148
167Ø CLOSE 1:GOTO 21ØØ                                                      :REM*69
168Ø PRINT:PRINT "SELECT COPY MODE:{CRSR DN}"                               :REM*194
169Ø PRINT "1 = BINARY":PRINT"2 = TRANSLATE PETASCII <> ASCII{CRSR DN}"     :REM*5
17ØØ INPUT "SELECT MODE [1 OR 2]";MO                                        :REM*19Ø
171Ø IF MO<1 OR MO>2 THEN EF=1                                              :REM*196
172Ø RETURN                                                                 :REM*65
173Ø GOSUB 168Ø:PRINT:PRINT                                                 :REM*2Ø1
174Ø PRINT"SELECT TARGET FILE TYPE:{CRSR DN}"                               :REM*13Ø
175Ø PRINT "S = SEQ":PRINT "P = PRG":PRINT "U = USR{CRSR DN}"               :REM*7
176Ø INPUT "SELECT [S, P, OR U]";FT$                                        :REM*41
177Ø IF FT$<>"S" AND FT$<>"P" AND FT$<>"U" THEN EF=1                         :REM*236
178Ø RETURN                                                                 :REM*133
179Ø GOSUB 88Ø:PRINT MØ$;DI$(Y2):CLOSE 15:OPEN 15,SD,15,"/Ø:"+Z$:XF=1:RETURN   :REM*117
18ØØ Z=16:AD=TB                                                             :REM*212
181Ø IF MID$(DI$(Y2),Z,1)=" " THEN Z=Z-1:GOTO 181Ø                          :REM*169
182Ø Z$=LEFT$(DI$(Y2),Z):RETURN                                             :REM*54
183Ø PRINT "{2 SPACEs}ENTRY # ";DC;CHR$(27);"J";:RETURN                     :REM*1ØØ
184Ø PRINT "CLUSTER # ";I;CHR$(27);"J";:RETURN                              :REM*224
185Ø WINDOW 45,5,79,24:PRINT "BUFFER SIZE =";65Ø24-TB ;"BYTES"              :REM*124
186Ø PRINT:PRINT "NOTES:":REM*4
187Ø PRINT "USE <UP> AND <DOWN> TO HI-LIGHT"                                :REM*25Ø
188Ø PRINT "FILE OR SUB-DIRECTORY.{2 SPACEs}USE <HOME>"                      :REM*183
189Ø PRINT "TO RETURN TO THE TOP OF THE LIST."                              :REM*144
19ØØ PRINT: PRINT "THEN PRESS <RETURN> TO READ."                            :REM*246
191Ø PRINT:PRINT "USE 'R' TO GET ROOT DIRECTORY"                            :REM*43
192Ø PRINT "AND <ESC> FOR OPENING MENU"                                     :REM*2Ø8
193Ø PRINT: PRINT "DO NOT REMOVE SOURCE DISK FROM":REM*68
194Ø PRINT "DRIVE UNLESS PROMPTED.":RETURN                                  :REM*27
195Ø GOSUB 88Ø:PRINT "DISK ERROR":GOSUB 211Ø:GOTO 13Ø                       :REM*84
196Ø IF LEFT$(DI$(Y2),2)="<P" THEN 2ØØØ                                     :REM*182
197Ø FOR Z=LEN(TT$) TO 1 STEP-1:IF MID$(TT$,Z,1)=" " THEN 199Ø              :REM*165
198Ø Z1=Z:Z=Ø                                                               :REM*135
199Ø NEXT:TT$=LEFT$(TT$,Z1)+"/"+DI$(Y2):RETURN                              :REM*252
2ØØØ FOR Z=LEN(TT$) TO 1 STEP-1:IF MID$(TT$,Z,1)<>"/" THEN 2Ø2Ø             :REM*73
2Ø1Ø Z1=Z-1:Z=Ø                                                             :REM*4
2Ø2Ø NEXT:TT$=LEFT$(TT$,Z1):RETURN                                          :REM*124
2Ø3Ø PRINT "+----------+":RETURN                                            :REM*144
2Ø4Ø GOSUB 88Ø:PRINT"{2 CRSR DNs}INSERT "T$" DISK "DK$                      :REM*178
2Ø5Ø PRINT"IN DRIVE" DR                                                     :REM*24
2Ø6Ø PRINT "{CRSR DN}THEN PRESS <RETURN> TO CONTINUE"                       :REM*192
2Ø7Ø PRINT "{CRSR DN}OR <ESC> TO RESELECT"                                  :REM*39
2Ø8Ø GET X$:IF X$=CHR$(27) OR X$=CHR$(13) THEN RETURN                       :REM*91
2Ø9Ø GOTO 2Ø8Ø                                                              :REM*124
21ØØ DR=SD:IF SD<>TD THEN 22Ø: ELSE 19Ø                                     :REM*184
211Ø POKE2Ø8,Ø:PRINT:PRINT"{CRSR DN}PRESS A KEY TO CONTINUE":GETKEY A$:RETURN:   :REM*169
```

■

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RUN Amok

Item: In our Special Programming Issue for 1989, a printing glitch rendered two Data statement numbers illegible in the listing of the Tag 'Em game program (p. 66). In line 670, the last group should read 41. In line 680, the second group should read 73. We apologize (on behalf of our printing house!) to all those readers who typed in the program that far and then were baffled.

Item: We also regret a dash that appeared—instead of a multiplication sign—in the listing accompanying the letter headed "Knock on Wood," in January 1989's Mail RUN (p. 12). Line 1372 should read: BZ=(I−1)*10+5. ■

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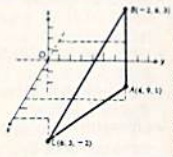
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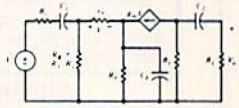
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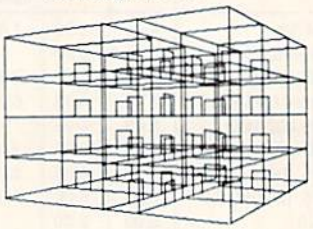
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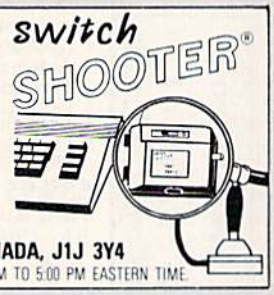
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RUN's Checksum

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:READB:CK=CK+B:POKE SA+I,B:NEXT
40 IFCK<>20651 THENPRINT"DATA ERROR!":END
50 POKESA+11,24:POKESA+111,38:POKESA+140,234
60 PRINTCHR$(147)STR$(MO)" RUN CHECKSUM":PRINT
70 PRINT"TO TOGGLE ON OR OFF, SYS"SA:IF MO=128
   THEN 100
80 POKESA+13,124:POKESA+15,165:POKESA+25,124:PO
   KESA+26,165
90 POKESA+39,20:POKESA+41,21:POKESA+123,205:POK
   ESA+124,189
100 POKESA+4,INT(SA/256):SYS SA:NEW
110 DATA 120,162,24,160,13,173,4,3,201,24,208,4
   ,162,13,160,67,142,4,3,140
120 DATA 5,3,88,96,32,13,67,152,72,169,0,141,0,
   255,133,176,133,180,166,22
130 DATA 164,23,134,167,132,168,170,189,0,2,240
   ,58,201,48,144,7,201,58,176
140 DATA 3,232,208,240,189,0,2,240,42,201,32,20
   8,4,164,180,240,31,201,34
150 DATA 208,6,165,180,73,1,133,180,230,176,164
   ,176,165,167,24,125,0,2,133
160 DATA 167,165,168,105,0,133,168,136,208,239,
   232,208,209,169,42,32,210
170 DATA 255,165,167,69,168,170,169,0,32,50,142
   ,169,32,32,210,255,32,210
180 DATA 255,169,13,32,210,255,104,168,96,104,1
   70,24,32,240,255,104,168
190 DATA 96,56,32,240,255,138,72,152,72,24,162,
   0,160,0,32,240,255,169
200 DATA 42,208,198
```

MAY

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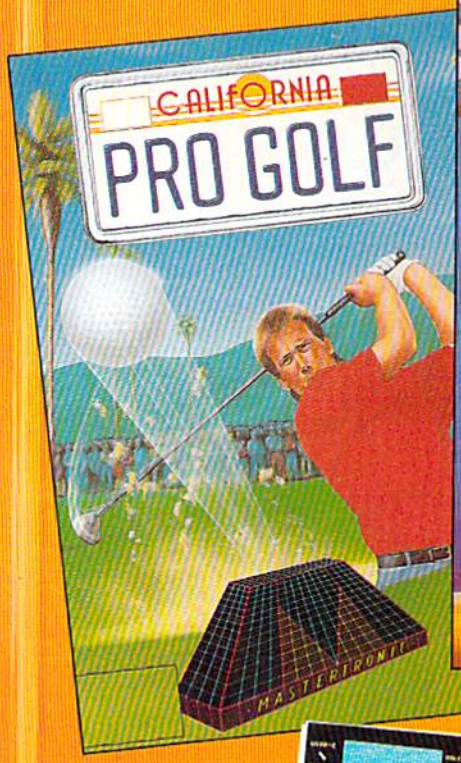


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