Standard VIC 20

no additional memory needed

(CG008) Alien Panic $12.95
Race against time as your guy digs holes to trap aliens in 4 floor laddered, brick construction site. Requires joystick.

(CG096) Antimatter Splatter $24.95
This game is as good as its name. Another pure machine code game, this one is fast! The alien at the top of the screen is making a strong effort to rid the world of humankind by dropping anti-matter on them. The splatter cannon and you are our only hope as more and more antimatter falls. Joystick again is optional equipment.

(CG026) Collide $12.95
"Vic" controls one, you the other as cars go opposite directions on 4 lane track. Requires joystick.

(CG094) Exterminator $24.95
Recently scoring a rating of 10 out of a possible 10 this game was praised as "one of the best I've seen on any computer" by a prominent reviewer in a leading magazine. The idea is to shoot a centipede before it overuns you, the problem being every time you hit it, it divides into two separate shorter ones. Several other little creatures bounce around during this struggle. All of them lethal. 100% machine language makes the rapid fire action very smooth. A joystick is optional, but as always, recommended, (a trac ball is also very nice!).

(CG054) Krazy Kong $12.95
Three screens, a gorilla, barrels, and changing difficulty levels help to make this one of our most popular. Joystick optional.

(CG098) Racefun $19.95
Extensive use of multicolored character capabilities of the "Vic" make this one very appealing to the eye. Fast all machine language action, quick response to the stick or keyboard controlled throttle, combine with the challenge of driving in ever faster traffic to make it appeal to the rest of the body. Joystick controlling is an option.

(CG058) Rescue From Nufon $12.95
Must find 30 hostages in this 100 room, 5 story, alien infested, graphic adventure game. A continual big seller. Keyboard only (n. = north w = west etc.)

(CG068) The Catch . . . $12.95
Another all machine language game based on the principle that one person with one joystick guiding one catch/shield can catch everything that one alien can throw at one. The action comes slowly at first but by the fourth wave you'll be aware of . . . "The Catch" . . .

Expanded Memory Vic 20 Games

(CG090) Defender On Tri $19.95
Pilot a defender style ship on mission to save trapped scientists from a fiery fate (they are aboard an alien vessel deep in the gravity well of sol). Excellent graphics. Short scene setting story in the instructions. "Defender On Tri" requires at least 3K added memory.

(CG092) 3D Man $19.95
The maze from probably the most popular arcade game ever, with perspective altered from over-head to eye level. The dots, the monsters, the power dots, the side exits, the game is amazing. "3D Man" requires at least 3K added memory.

(CG088) Space Quest $19.95
Our first 8K memory expander game and its a beauty. The scene (a short story is included) is far in the future, a time when man's knowledge has reduced an entire galaxy into a mapped series of quadrants. This game has stratagy (you plot your own hyperspace jumps on Galaxy map), action (against a starry background you find yourself engaged in a dogfight, laser style), exploration (you must fly your ship deep into caverns to pick up necessary fuel). "Space Quest" requires at least 8K memory expansion and a joystick.

Commodore 64

(CG602) 3D-64, Man $19.95
This available on the expanded "Vic 20" game, has been completely rewritten for the 64 and uses sprites, sounds, and other features not available on the "Vic". This one requires a joystick.

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```
,235,235,59,59,15,3
141 DATA3,3,3,3,3,3,1,5,21,22,21,21,21,21,
    5,5,1,1,0,0,0,0,0,0,0
142 DATA0,0,252,255,3,60,255,255,245,213,2
    13,213,217,234,230
143 DATA231,255,255,255,255,252,92,84,85,8
    5,149,165,138,128,96,96
144 DATA88,88,89,22,5,5,1,1,0,0,0,0,0,255,
    255,255,255,255,255,125,125,125,1
    25,125
145 DATA255,255,255,255,195,0,65,65,0,65,8
    5,85,85,170,20,20
146 DATA40,170,170,85,170,85,85,85,85,0,0,
    63,255,192,60,255
147 DATA255,95,87,87,87,103,171,155,219,25
    5,255,255,255,63,53,21
148 DATA85,85,86,90,162,2,9,9,37,37,101,14
    8,80,80,64,64,0
149 DATA12,63,251,171,235,235,43,43,235,23
    5,235,236,236,240,192
150 DATA192,192,192,192,192,192,64,80,84,1
    48,84,84,84,84,80,80,64,64,0,0,0,
    0,0,0,0,0
151 PRINT"{CLEAR}{05 DOWN}HELLO, THERE! MY
     NAME {DOWN}IS FRED, THE SEE-THRU
     {DOWN}MOUSE. WHAT'S YOURS"
152 PRINT:INPUTN$
153 PRINT"{CLEAR}{02 DOWN}WELL,"N$
154 PRINT"{DOWN}I HAPPEN TO LIVE IN   {DOW
    DOWN}YOUR COMPUTER. THEY   {DOWN}
    CALL ME A SEE-THRU"
155 PRINT"{DOWN}MOUSE BECAUSE I'M     {DOW
    DOWN}INVISIBLE!"
156 PRINT"{DOWN}BUT YOU CAN SEE ME BY {DOW
    DOWN}PAINTING ME DIFFERENT {DOWN}
    COLORS. JUST PRESS THE"
157 PRINT"SPACE BAR TO BEGIN."
158 GETB$:IFB$=""THEN158
159 IFB$=" "THEN161
160 GOTO158
161 PRINT"{CLEAR}{DOWN}FIRST LET'S COLOR M
    Y  {DOWN}FACE. PICK A NUMBER."
162 PRINT"{DOWN}1=RED       8=LT.OR."
163 PRINT"{DOWN}2=CYAN      9=PINK"
164 PRINT"{DOWN}3=PURPLE   10=LT.CYAN"
165 PRINT"{DOWN}4=GREEN    11=LT.PUR."
166 PRINT"{DOWN}5=BLUE     12=LT.GRN."
167 PRINT"{DOWN}6=YELLOW   13=LT.BLUE"
168 PRINT"{DOWN}7=ORANGE   14=LT.YEL."
171 PRINT:INPUTC$:D=VAL(C$)+2
172 IFD<3ORD>16THEN161
173 PRINT"{CLEAR}{DOWN}THANK YOU, "N$
174 PRINT"{DOWN}NOW HOW ABOUT MY EARS":GOS
    UB185
175 PRINT"{CLEAR}{DOWN}VERY GOOD! NOW MY E
    YES":GOSUB185
176 PRINT"{CLEAR}OKAY, "N$
177 PRINT"{DOWN}ONE LAST TIME TO COLOR{DOW
    DOWN}MY MOUTH.":GOSUB185:GOTO193
185 PRINT"{DOWN}1=BLACK":PRINT"{DOWN}2=WHI
    TE":PRINT"{DOWN}3=RED":PRINT"{DOW
    DOWN}4=CYAN"
186 PRINT"{DOWN}5=PURPLE":PRINT"{DOWN}6=GR
    EEN":PRINT"{DOWN}7=BLUE":PRINT"{D
    DOWN}8=YELLOW"
187 Y=Y+1:PRINT:INPUTH$(Y):H(Y)=VAL(H$(Y))
188 IFH(Y)<1ORH(Y)>8ANDY=1THENY=0:GOTO173
189 IFH(Y)<1ORH(Y)>8ANDY=2THENY=1:GOTO175
190 IFH(Y)<1ORH(Y)>8ANDY=3THENY=2:GOTO176
191 H(Y)=H(Y)+7
192 RETURN
193 PRINT"{CLEAR}{DOWN}OKAY,"N$
194 PRINT"{DOWN}HERE WE GO. IF YOU    {DOW
    DOWN}WANT TO CHANGE MY     {DOWN}
    COLORS, PRESS THE"
195 PRINT"{DOWN}SPACE BAR.":PRINT"{DOWN}AN
    D WHEN YOU WANT TO  {DOWN}QUIT, P
    RESS E."
196 PRINT"{DOWN}BUT TO SEE ME AS YOU  {DOW
    DOWN}JUST PAINTED ME, PRESS{DOWN}
    ANY KEY BUT THOSE TWO."
197 GETF$:IFF$=""THEN197
198 IFF$=" "THENY=0:POKE36869,240:POKE3687
    9,27:GOTO161
199 IFF$="E"THEN250
200 PRINT"{CLEAR}":POKE36869,255
201 PRINT"{CLEAR}":POKE36869,255
202 POKE36879,9
210 POKE36878,D*15+1
220 X=7887:C=30720
221 FORA=1TO2
222 FORB=0TO20STEP5
223 POKEX,B+A:POKEX+C,H(1)
224 X=X+1
225 NEXTB
226 X=X+17:NEXTA
227 FORA=3TO5
228 FORB=0TO20STEP5
229 POKEX,B+A:POKEX+C,H(3)
230 X=X+1:NEXTB
231 X=X+17:NEXTA
232 POKE7888+C,H(2):POKE7889+C,H(2):POKE79
    10+C,H(2):POKE7911+C,H(2)
233 POKE7890+C,H(2):POKE7912+C,H(2)
234 GOTO197
250 POKE36869,240:POKE36879,27
260 PRINT"{CLEAR}{09 DOWN}SO LONG,"N$"!" ©
```

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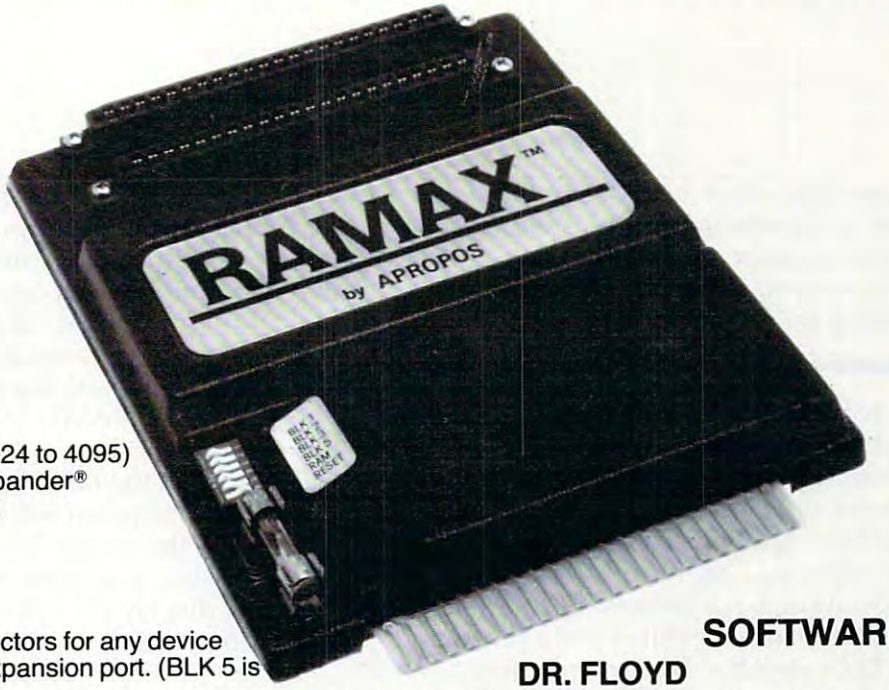

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APROPOS TECHNOLOGY

Atari Starshot

Matthias M. Giwer

You are flying down a trench bisecting an artificial world. A disembodied voice whispers in your ear, "Turn off your computer – BASIC is too slow." As this game will demonstrate, Atari BASIC can *be fast enough if you know how to speed it up.*

The features in the Atari computer give it a graphics potential that approaches that available in dedicated graphics-oriented computers. And, features of Atari BASIC allow very fast manipulation of strings, Direct Memory Access for the Player/Missile Graphics, and the direct call of machine language from BASIC. This game combines all of these features and a few others.

Let's start the discussion of this program with the subroutine at line 30000. The first thing to do is to enable the Player/Missile Graphics.

Appendix A of the *Atari Hardware Manual* gives a detailed example of how to do this. This method only works when there is nothing on the screen. As soon as you write to the screen, this method fails. The usual approach is to reserve enough pages for the screen RAM, the Player/Missile graphics pages, etc. All in all, to use Player/Missile Graphics with GRAPHICS 7, you wind up reserving 32 pages and, in the process, taking care of the computer rather than letting the Operating System (OS) take care of you. Here is how to do it right.

RAMTOP

Contained in register 106 is the number of pages of RAM available to you for your use after everything needed for the system has been accounted for. What we want to do is to change this number so that RAM is protected for the Player/Missile Graphics pages. This is accomplished by POKE 106, PEEK(106)-16. This puts a number into that register that is 16 pages less than the number the Operating System determines upon powering up the computer or upon system reset. But just POKEing a new number does nothing until the computer makes use of it.

The second GRAPHICS 7 call causes the Operating System to make use of this new RAMTOP to relocate the screen RAM and the display list below RAMTOP. If you do not make this graphics call, you will find that the screen memory is above the new, lower protected memory limit, and the system will crash at the first attempt to scroll the screen. In other words, your system registers that point to the first screen byte, and the display list will be above RAMTOP. The Operating System cannot handle this.

You proceed as normal but much more cleanly now that you have lowered the effective top of your RAM and made the Operating System reorganize itself around that new maximum RAM with the second graphics call. Lines 30204 and 30206 are the enabling POKEs for Player/Missile Graphics as described in many articles and in *De Re Atari*. Line 30208 is the POKE to tell the Operating System where to find the start of the Player-Missile data. The start of this data is now simply RAMTOP.

With Player/Missile Graphics set up this way, you can forget about what the rest of the system is doing and treat it just as though Player/Missile Graphics were not in use. The Operating System *will* take care of you.

Player Definition

The next routine of interest is at line 30236. (This is the machine language routine published in the February 1982 issue of **COMPUTE!**.) It provides relocation of the four players at machine language speeds by means of two POKEs and, since the routine is executed during the vertical blanking time, the motion appears to be continuous. The

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rest of the 30000 lines define the players. Note that the RESTORE in line 30310 makes Player 3 the same as Player 2, although it is defined as a different color in line 30230.

Now let's jump to lines 100-120 – we will get to the earlier lines later. These lines are the definitions that will be used for named subroutines later. The use of named subroutines is a desirable feature that greatly aids program development.

Lines 1890-1930 are both the one-time calls and those such as DISPLAY that are needed to set up the game at the start.

The subroutine at line 10000 draws the background in the way that makes this illusion of motion possible. Note that each set of lines is drawn with a different COLOR and that the COLOR numbers rotate 1, 2, 3, 1, 2, 3, and so forth. I will get back to this in a minute.

Color Rotation Simulates Motion

The START subroutine at line 5000 POKEs numbers into the color registers so that you can see the screen and draws the eight attackers. You will note also that COLOR J also rotates the COLOR assigned to the attacker graphic although in a more complex manner than in BACKGROUND.

The DISPLAY subroutine at line 6300 controls the scoring and number of lives information that will be shown in the bottom alphanumeric window.

ASELECT at line 6500 picks the order in which the attackers will attack from among the predefined ATTACK1-4$ in lines 54 and 60.

Within the infinite loop at line 2100 you'll find the reason why I used different COLORs to draw the background. The four statements in line 2110 rotate the colors used in the background through the registers in a "bucket brigade" manner; the colors seem to be moving toward you. Given the drawn background, it appears as though you are moving forward through the trench. This illusion of motion requires the use of three different colors as a minimum. If there were only two colors, they would appear to flicker back and forth rather than move. The instructions in this line will be used in almost every subroutine so that this illusion of motion is maintained.

This technique is useful in many applications – you can simulate many kinds of motion. If you were to reverse the order of the instructions, you would have the illusion of going backwards. Line 2120 is simply a short delay.

Another line that you will find throughout the program is first used at line 5017. A=74+PADDLE(0)/ 2.92 is the equation that limits the motion of Player 0 on the screen. 74 is the farthest left X location that Player 0 can move to. The range of values for the PADDLE(0) is 0 to 228. Dividing this range of values by 2.92 converts the largest value of 228 to the rightmost location of Player 0 and makes the full left-to-right motion of the Player a full turn of the PADDLE. This equation is also put into every subroutine where the program execution takes a noticeable amount of time in order to simulate continuous motion.

The subroutine MOVE at line 5100 is a loitering loop that waits a random number of loops until the first attack begins. When the number 50 is reached, program execution jumps to SELECT at line 5200.

The SELECT subroutine picks the sequence of the attackers from ATTACK1$ through ATTACK4$. ATTACK$ for the first wave was initially called in line 1930. This routine randomly picks one of the four attack sequences defined in lines 54 and 60. An attempt to read the ninth element in this string is TRAPped to line 5211 which redraws the attackers and starts over.

Note this use of the TRAP instruction. It is not meant simply to avoid a program crash, but rather to perform an integral program function. Rather than a RAM and time-consuming test or loop, one simple statement is used.

Lines 5215-5240 erase the chosen attacker, position Player 1 over the erased attacker, and give some warning sounds. Line 5241 calls the subroutine JOIN at line 5800. This routine adds together the strings which are used to define the X and Y positions of Player 1 as it moves from its initial position to its attack position.

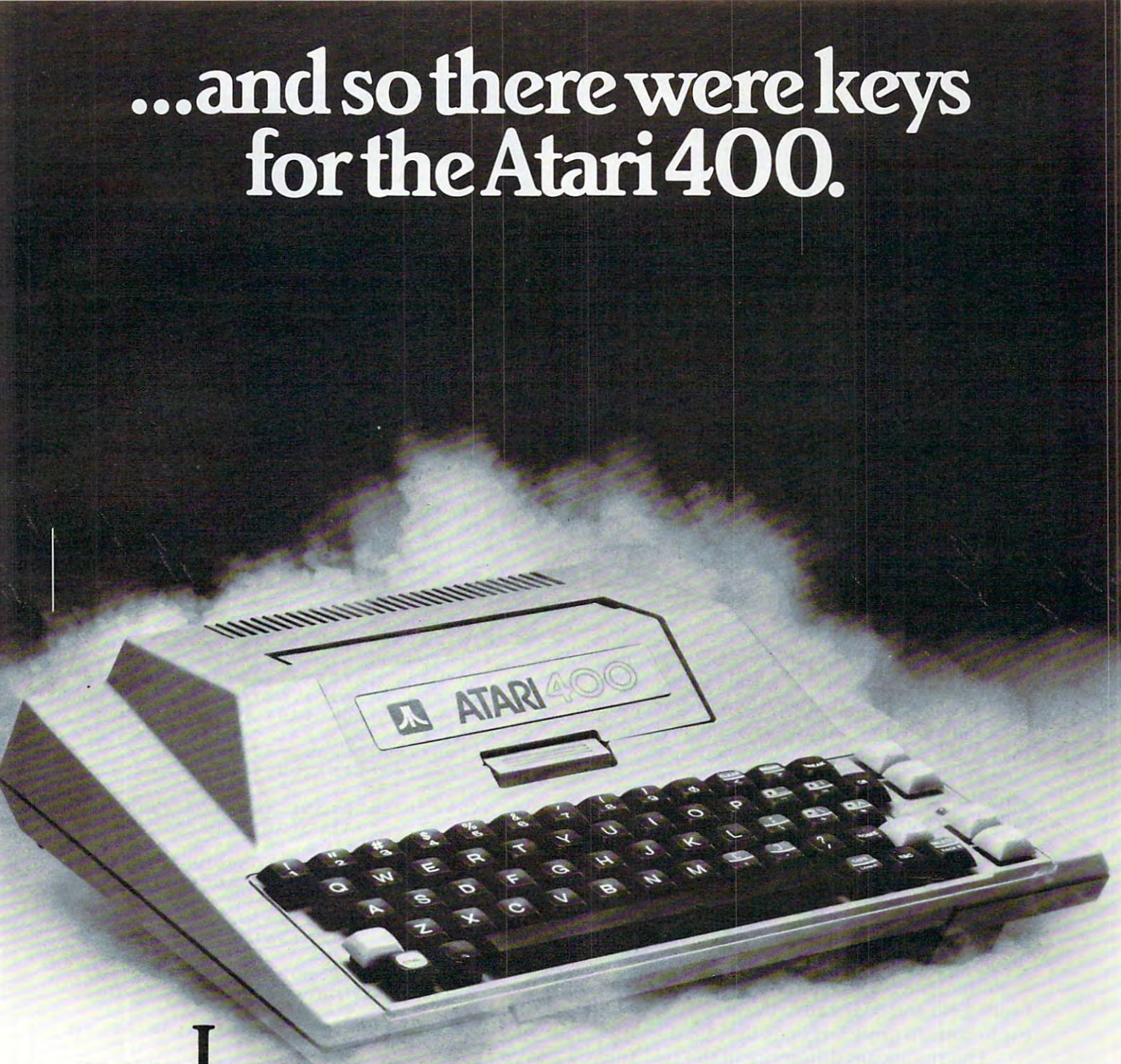
Special TRAPs

The strings are the AX1$ and AY1$ through AX8$ and AY8$ that were defined back in the beginning of the program. These are the X and Y coordinates to be POKEd into PLX+1 and PLY+1. They are stored as groups of three numbers. These values are read in lines 5260-5270. Note that by using TRAP here I do not have to keep track of the number of elements in the string. And again instead of some test or loop, a simple statement is used. These strings are merely added together. No matter what the sequence of the attack, the last pattern is always the same, and the last set of numbers in the string is always the same.

The ATTACK subroutine at line 5300 is where the shooting occurs. The first call is for the subroutine PATTERN at line 5600. This subroutine chooses among five possible X position patterns and five possible Y position patterns. These are the rest of the strings defined in the beginning of the program. This independent choice of X and Y patterns permits a total of 25 different attack patterns.

In line 5315, the X and Y values for this attack motion are read out in groups of three. In this case, the TRAP is used to jump back to the PATTERN subroutine call to pick another pair of

...and so there were keys for the Atari 400.



In the beginning there was the membrane keyboard.

So it was to be done that Inhome Software would create a full-stroke keyboard for the Atari 400 Home Computer and it would be called the B Key 400, and would sell for $119.95 U.S. funds.

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strings when the end of the STRING is reached. This gives continuously varying motion to the attacker.

Lines 5324 and 5325 change the size of the attacker as it comes "closer" or goes "farther away." F and G are flags that control the firing and motion of the missiles. It is worth examining how these flags function.

F controls the attacker's missile firing. Other than its housekeeping function, the primary purpose of the IF F=0 is to fix the X and Y location at the moment of firing so that the motion is calculated only from this point. After F is set to 1, these statements are no longer executed. If they were, the missile would weave back and forth in X and Y in unison with the attacker. Behind the F=1 flag are the calculations that determine whether the missile passes to the left or to the right. The G flag performs a similar program function.

Lines 5350 and 5352 check for missile-to-player collisions and direct action to the appropriate subroutine. Line 5355 clears the collision registers.

HITYOU, HITME, HITUS

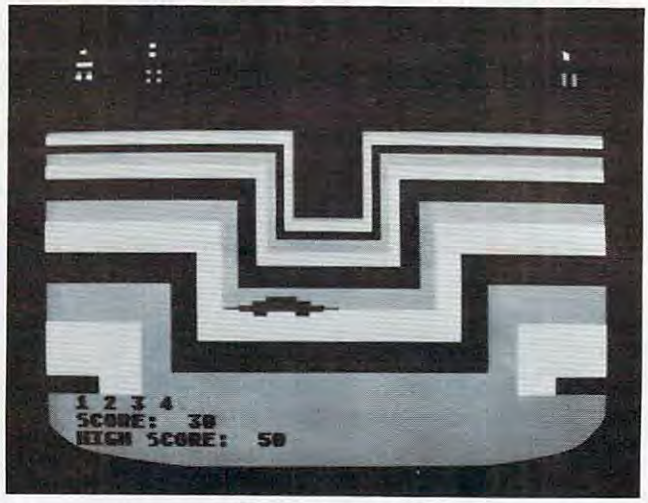
The HITYOU, HITME, and HITUS subroutines introduce Players 2 and 3 as the explosions. In HITYOU and HITME, these two players are sequentially put in the same location as the hit player. This sequence is controlled by the TT variable. Note that the two explosion shapes are the same but of different colors. Also, when they are called, they are placed one Y position different. The purpose is to give some illusion of a dynamic explosion.

Lines 5440 and 5540 move the hit player and explosions off the screen. The logical truth statements determine whether the hit player was to the left or right of center when hit and then move it off the screen to the left or right as appropriate. Lines 5545 and 5547 cause the attacker and the explosions to grow larger as they go by.

The significant difference in the two subroutines is that in HITYOU there is an additional collision test in line 5560. This requires you to get out of the way of the hit player as it rolls off the screen. If you don't, you are also destroyed, and both players roll off the screen. This is controlled by the HITUS subroutine. Being hit by the attacker's missile and by the damaged attacker causes you to lose one life.

Good Practice

This is a quick review of a fairly complex program. It exploits many of the Atari's features. The method of reserving the Player/Missile Graphics pages by moving RAMTOP lets the machine take care of you and perhaps completes the official Atari version of how to turn on the function.



Flowing colors create the illusion of 3-D movement in "Starshot."

```
40 J=66:PX=5
50 DIM ATTACK$(8),AX5$(J),AY5$(J),AX
   $(3*J),AY$(3*J),APX1$(J),APY1$(J)
   ,APX$(J),APY$(J)
51 DIM AX4$(J),AY4$(J),APX2$(J),APY2
   $(J),APX3$(J),APY3$(J),APX4$(J),A
   PY4$(J),APX5$(J),APY5$(J)
52 DIM AX3$(J),AY3$(J),AX2$(J),AY2$(
   J),AX6$(J),AY6$(J),AX7$(J),AY7$(J
   ),AY8$(J),AX8$(J),AX1$(J),AY1$(J)
53 DIM PLAYER$(10),ATTACK1$(8),ATTAC
   K2$(8),ATTACK3$(8),ATTACK4$(8)
54 ATTACK2$="37628415":ATTACK3$="286
   47135":ATTACK4$="47618325"
60 ATTACK1$="54637281":PLAYER$="1 2
   3 4 5"
61 AX5$="13613613513413313213113012912
   81271261241221211211221231241251
   26126"
62 AY5$="03803703503403403403503703904
   1041043045047049052056059062065068
   071074"
63 AX4$="11812012212412612813013213413
   413213012812612612612612612612612
   6126"
64 AY4$="03603403203002803003203403704
   0400430500570630700760820800780760
   75074"
65 AX6$="15615415215014814614414214013
   8136"
66 AY6$="03803603403303403603804004204
   0038"
67 AX2$="07808008208408608809009209409
   6098"
68 AY2$="03804204404604805005204904604
   2038"
69 AX1$="05806006206406606807007207407
   6078"
70 AY1$="03803503103503804204604804604
   2038"
71 AX3$="09810010210410610811011211411
   6118"
72 AY3$="04004404804604404204003803603
   7038"
73 AX7$="17617417217016816616416216015
   8156"
74 AY7$="03803603403203003303603904204
   0038"
75 AX8$="19619419219018818618418218017
   8176"
76 AY8$="04004404804604404204003803603
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ATARI SINGS YOUR FAVORITE SONGS!!!

THE Original VOICE BOX Speech Synthesizer by the ALIEN GROUP has received rave reviews:

MICRO COMPUTING–"The VOICE BOX injects an endearing personality to your computer. The possibilities are enormous."

COMPUTE–"The VOICE BOX offers more human-like tones and does not blank out the screen."

CREATIVE COMPUTING–"English text and phonetic code may be freely intermixed rather than requiring separate modes as is the case without exception with every other speech system. A mode called talking face displays an animated face with impressive lip sync animation."

ANTIC–"There is a great potential for teaching children to spell and an added dimension to games overall. I believe the VOICE BOX is well worth the price tag."

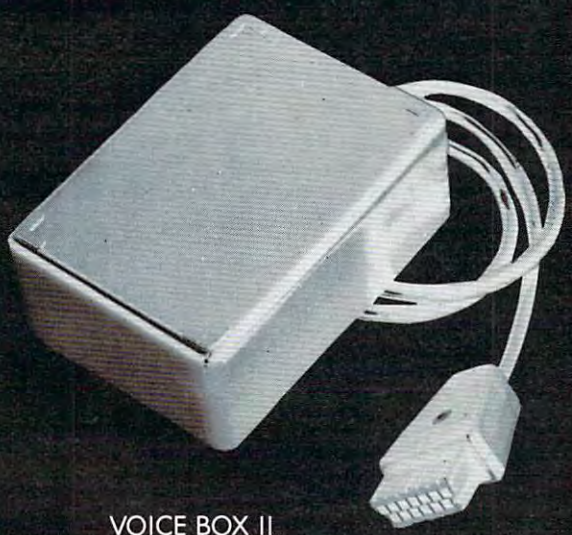
ANALOG–"For ATARI owners who want to add speech to their programs, the Alien Group VOICE BOX is probably the best choice."

POPULAR SCIENCE–"The speech quality is excellent. Besides creating speech, the software has a bit of fun with graphics."

and on the new VOICE BOX II.....

TIME MAGAZINE–"Machine of the Year" "The VOICE BOX by the Alien Group enables an ATARI to say aloud anything typed on its keyboard in any language. It also sings "Amazing Grace" and "When I'm 64" or anything else that anyone wants to teach it.

INCORPORATE THE SINGING HUMAN FACE
INTO YOUR PROGRAMS AND GAMES



VOICE BOX II
Speech & Singing Synthesizer

The New **VOICE BOX II** for **ATARI** plugs into the serial port of the **ATARI** 400/800 with sound coming out of the TV/monitor. 48K DISK is required. It has all of the features of the original **VOICE BOX** plus many exciting new hardware and software features:

- The ability to sing with voice and 3 part music.
- A library of 30 famous songs.
- A comprehensive music system that allows the user to easily enter or modify new songs.
- Software that can convert the bottom two rows of the **ATARI** keyboard into a piano with a range of 3½ octaves using the shift and control keys.
- Programmable musical sound effects such as tremolo, vibrato, glissando and click track.
- A singing *human* face with lip-sync animation designed by Jerry White.
- A talking or singing ***ALIEN*** face with software that allows the user to change the face and 8 mouth patterns as he sees fit.
- The ability to speak with inflection and feeling.
- Can speak in a foreign language with correct foreign spelling as input.
- A talk and spell program by Ron Kramer. Users can program any vocabulary for this spelling game. In fact, this program can even speak in a foreign language like French, where the user must spell the correct word in English, or vice versa.
- **GREEN GOBLINS**–A talking arcade game by John Wilson.
- Random Sentence Generator–An amusing grammar game that helps teach school children to identify parts of speech and recognize a variety of sentence structures.
- **NUMBER SPEAK**–A subroutine by Scott Matthews that converts up to a 9 digit number into normal English pronunciation. Ideal for building your own math games.
- **STUD POKER**–A talking poker game by Jerry White.
- The screen never blanks out while talking or singing.
- Singing or speaking subroutines can be incorporated into your programs, requiring as little as 100 bytes of RAM plus 5 bytes for each word.
- Entries into the $5000 talking or singing game contest can be written using the **VOICE BOX II**–send for contest information.
- Price $169.00 includes **VOICE BOX II** and all of the above software.
- Inquire about our discounts for educational institutions.

To order by mail send a check or money order to the ALIEN GROUP for $169. Then, try the VOICE BOX II for 10 days, and if it isn't the finest value you've ever seen in a computer peripheral, the most challenging and provocative addition you've ever made to your system, return it in its original condition for a full refund.

THE ALIEN GROUP
27 West 23rd Street (212) 741-1770
New York, NY 10010

ALSO AVAILABLE AT LEADING COMPUTER STORES THROUGHOUT THE WORLD.

```
   036038"
83 APX1$="126120114110110114120126132138142142138132126120114110114120126"
84 APY1$="074077082090095100104105107091121141121091071051041000950900820077"
85 APX2$="126128130134138142142136130124121118110107104107110118120124126128"
86 APY2$="074079084086088094100106110114110108106100094087080080080078076075"
87 APX3$="126130134138142146142138134130126126130134138142144142138134130126"
88 APY3$="074074074074074082086090098106114120114106098090086082074074074074"
89 APX4$="126134142134126118110110126134142134126118110110126134142132126126"
90 APY4$="074078082086092086082078074078082086092096092088084080076072072074"
91 APX5$="126132138144150156162156150144138132126120116110104098104110116126"
92 APY5$="074070068070074080084090096102106102096092086082078074070072074"
100 BACKGROUND=10000:START=5000:MOVE=5100:SELECT=5200:ATTACK=5300:HITME=5400:HITYOU=5500
110 PATTERN=5600:RESET=5700:JOIN=5800:HITUS=5900
120 XSCR=6000:YSCR=6100:LOSS=6200:DISPLAY=6300:RESET2=6400:ASELECT=6500
1890 GOSUB 30000
1900 GOSUB BACKGROUND
1910 GOSUB START
1920 GOSUB DISPLAY
1930 GOSUB ASELECT
2000 REM CONTROL LOOP
2100 FOR IJK=1 TO 2 STEP 0
2110 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
2120 Q=SIN(1)
2130 GOSUB MOVE
2900 NEXT IJK
5000 REM START
5005 POKE 708,10:POKE 709,0:POKE 710,56:POKE PLY,150:POKE 53761,132:REM 709,152
5010 FOR I=1 TO 8
5011 FOR J=0 TO 2
5016 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5017 A=74+PADDLE(0)/2.92:POKE PLX,A:POKE 53760,A-33
5019 COLOR J*I:IF J*I=4 OR J*I=0 OR J*I=8 OR J*I=12 OR J*I=16 THEN COLOR 1
5020 PLOT 20*I-10,J:DRAWTO 20*I-11,J
5021 COLOR J*I:IF J*I=4 OR J*I=0 OR J*I=8 OR J*I=12 OR J*I=16 THEN COLOR 2
5022 PLOT 20*I-8,J+3:DRAWTO 20*I-12,J+3
5025 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5033 COLOR J*I:IF J*I=4 OR J*I=0 OR J*I=8 OR J*I=12 OR J*I=16 THEN COLOR 3
5034 PLOT 20*I-8,J+6:DRAWTO 20*I-9,J+6:PLOT 20*I-12,J+6:DRAWTO 20*I-11,J+6
5036 NEXT J:NEXT I
5090 RETURN
5100 REM MOVE
5105 FOR IJK=1 TO 2 STEP 0
5110 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5111 A=SIN(1)
5120 A=74+PADDLE(0)/2.92:POKE PLX,A:POKE 53760,A-33
5130 RR=RR+1:IF RR=50 THEN GOSUB SELECT:RR=INT(40*RND(0)):POKE 53763,0:POKE 53761,132
5185 NEXT IJK
5190 RETURN
5200 REM SELECT
5205 JJJ=JJJ+1
5210 TRAP 5211:R=VAL(ATTACK$(JJJ,JJJ)):COLOR 0:GOTO 5215:TRAP 40000
5211 GOSUB START:JJJ=0:GOTO 5205
5215 FOR J=0 TO 2
5220 PLOT 20*R-10,J:DRAWTO 20*R-11,J
5223 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5224 A=74+PADDLE(0)/2.92:POKE PLX,A:POKE 53760,A-33
5225 PLOT 20*R-8,8-J:DRAWTO 20*R-9,8-J:PLOT 20*R-12,8-J:DRAWTO 20*R-11,8-J
5230 NEXT J
5235 PLOT 20*R-8,3:DRAWTO 20*R-12,3:PLOT 20*R-8,5:DRAWTO 20*R-12,5
5236 POKE PLX+1,36+20*R:POKE PLY+1,38:PLOT 20*R-8,4:DRAWTO 20*R-12,4
5238 FOR Z=250 TO 50 STEP -50:FOR X=15 TO 0 STEP -5:SOUND 3,Z,8,X:NEXT X
5239 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5240 NEXT Z
5241 GOSUB JOIN
5249 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP:POKE 53763,134
5250 A=86+PADDLE(0)/2.92:POKE PLX,A:POKE 53760,A-33
5255 FOR J=1 TO 200
5260 TRAP 5280:X=VAL(AX$(J*3-2,J*3)):Y=VAL(AY$(J*3-2,J*3)):POKE PLX+1,X:POKE PLY+1,Y:TRAP 40000:POKE 53762,Y-20
5265 TEMP=PEEK(710):POKE 710,PEEK(709):POKE 709,PEEK(708):POKE 708,TEMP
5266 A=74+PADDLE(0)/2.92:POKE PLX,A:POKE 53760,A-33
5270 NEXT J
5280 GOSUB ATTACK:GOSUB RESET
5290 RETURN
5300 REM ATTACK
5305 GOSUB PATTERN
5310 FOR J=1 TO 200
5315 TRAP 5305:X=VAL(APX$(J*3-2,J*3)):Y=VAL(APY$(J*3-2,J*3)):TRAP 4
```

```
      0000
5321  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5322  A=74+PADDLE(0)/2.92:POKE PLX,A:
      POKE 53760,A-33
5324  IF Y>94 THEN POKE 53257,1:POKE
      53258,1
5325  IF Y<94 THEN POKE 53257,0:POKE
      53258,0
5330  POKE PLX+1,X:POKE PLY+1,Y:POKE
      53762,Y-20
5333  IF F=0 THEN M1P=MYPMBASE+777+Y:
      POKE 53253,X:POKE M1P,12:M1PO=M
      1P:T=MYPMBASE+907+Y:XT=X
5335  IF F=0 THEN F=1:POKE 53765,207:
      POKE 53764,100
5337  IF F=1 THEN M1P=M1P+7:XT=(-1.5+
      XT)*(XT<128)+(1.5+XT)*(XT>128):
      POKE 53253,XT:POKE M1P,12:POKE
      M1PO,0
5338  IF F=1 THEN M1PO=M1P:POKE 53765
      ,160:IF M1P>T-50 THEN F=0:POKE
      M1PO,0
5339  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5340  IF G=0 THEN IF PTRIG(0)=0 THEN
      MOP=MYPMBASE+768+150:PT=80+PADD
      LE(0)/2.29:POKE MOP,3:G=1:POKE
      53252,PT
5342  IF G=1 THEN MOPO=MOP:TO=MOP-70:
      G=2:POKE 53765,15:POKE 53764,50
5347  IF G=2 THEN MOP=MOP-7:PT=(3.5+P
      T)*(PT<128)+(-3.5+PT)*(PT>128):
      POKE MOP,3:POKE MOPO,0
5349  IF G=2 THEN POKE 53252,PT:MOPO=
      MOP:POKE 53765,160:IF MOP<TO TH
      EN G=0:POKE MOPO,0
5350  IF PEEK(53256)=2 THEN GOSUB HIT
      YOU
5352  IF PEEK(53257)=1 THEN GOSUB HIT
      ME:POKE MOPO,0:POKE M1PO,0
5355  POKE 53278,0
5375  NEXT J
5380  POKE PLX,PADDLE(0):POKE PLY,148
5395  RETURN
5400  REM HITME
5405  POKE 53761,15:POKE MOPO,0:POKE
      M1PO,0:RR=0
5410  FOR J=1 TO 200
5412  IF TT=0 THEN POKE 53258,3:POKE
      PLY+2,144+RR:POKE PLX+2,A:POKE
      PLX,A:POKE PLY,148+RR:TT=1
5413  IF TT=1 THEN POKE 53259,3:POKE
      PLY+3,144+RR:POKE PLX+3,A:POKE
      PLX,A:POKE PLY,148+RR:TT=0
5415  TRAP 5410:X=VAL(APX$(J*3-2,J*3)
      ):Y=VAL(APY$(J*3-2,J*3)):TRAP 4
      0000
5421  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5424  IF Y>94 THEN POKE 53257,1:POKE
      53258,1
5425  IF Y<94 THEN POKE 53257,0:POKE
      53258,0
5427  POKE PLX+1,X:POKE PLY+1,Y:POKE
      53762,Y+20
5430  IF TT=0 THEN POKE 53258,3:POKE
      PLY+2,144+RR:POKE PLX+2,A:POKE
      PLX+3,0:TT=1
5431  IF TT=0 THEN POKE 53258,3:POKE
      PLY+2,144+RR:POKE PLX+2,A:POKE
      PLX,A:POKE PLY,148+RR:TT=1
5432  IF TT=1 THEN POKE 53259,3:POKE
      PLY+3,144+RR:POKE PLX+3,A:POKE
      PLX,A:POKE PLY,148+RR:TT=0
5435  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5440  RR=(RR+7):A=(A+7)*(A>128)+(A-7)
      *(A<127):IF A<0 THEN J=201
5441  POKE 53760,RR
5442  IF A<0 OR A>255 THEN J=201
5444  IF 144+RR>255 THEN J=201
5490  NEXT J:GOSUB YSCR
5495  POKE PLY+2,229:POKE PLY+3,229:P
      OKE 53761,0
5497  RETURN
5500  REM HITYOU
5505  POKE 53763,15:POKE MOPO,0:POKE
      M1PO,0:RR=0:POKE MOP,0:POKE M1P
      ,0
5510  FOR J=1 TO 200
5531  IF TT=0 THEN POKE PLY+2,Y-10:PO
      KE PLX+2,X:POKE PLY+1,Y:POKE PL
      X+1,X:POKE PLX+3,0:TT=1
5532  IF TT=1 THEN POKE PLY+3,Y-9:POK
      E PLX+3,X:POKE PLY+1,Y:POKE PLX
      +1,X:POKE PLX+2,0:TT=0
5534  A=74+PADDLE(0)/2.92:POKE PLX,A:
      POKE 53762,Y:POKE 53760,41+PADD
      LE(0)/2.92
5540  Y=Y+7:X=(X+3.5)*(X>128)+(X-3.5)
      *(X<128)
5545  IF Y>94 THEN POKE 53257,1:POKE
      53258,1:POKE 53259,1
5547  IF Y>130 THEN POKE 53257,3:POKE
       53258,3:POKE 53259,3
5550  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5560  IF PEEK(53260)<>0 THEN GOSUB HI
      TUS
5582  IF Y>255 THEN J=201
5584  IF X>255 OR X<0 THEN J=201
5590  NEXT J:GOSUB XSCR
5595  POKE PL2+2,0:POKE PLX+3,0:POKE
      53763,0
5597  RETURN
5600  REM SELECT PATTERN
5610  R=INT(5*RND(0))+1
5621  IF R=1 THEN APX$=APX1$
5622  IF R=2 THEN APX$=APX2$
5623  IF R=3 THEN APX$=APX3$
5624  IF R=4 THEN APX$=APX4$
5625  IF R=5 THEN APX$=APX5$
5626  TEMP=PEEK(710):POKE 710,PEEK(70
      9):POKE 709,PEEK(708):POKE 708,
      TEMP
5630  R=INT(5*RND(0))+1
5641  IF R=1 THEN APY$=APY1$
5642  IF R=2 THEN APY$=APY2$
5643  IF R=3 THEN APY$=APY3$
5644  IF R=4 THEN APY$=APY4$
5645  IF R=5 THEN APY$=APY5$
5690  RETURN
5700  REM RESET
5710  F=0:G=0:POKE 53257,0:POKE PLX+1
      ,0
5790  RETURN
5800  REM JOIN
5810  IF R=1 THEN AX$=AX1$:AX$(LEN(AX
      $)+1)=AX2$:AX$(LEN(AX$)+1)=AX3$
      :AX$(LEN(AX$)+1)=AX4$
5812  IF R=1 THEN AY$=AY1$:AY$(LEN(AY
      $)+1)=AY2$:AY$(LEN(AY$)+1)=AY3$
```

```
    :AY$(LEN(AY$)+1)=AY4$
5815 IF R=2 THEN AX$=AX2$:AX$(LEN(AX
    $)+1)=AX3$:AX$(LEN(AX$)+1)=AX4$
5817 IF R=2 THEN AY$=AY2$:AY$(LEN(AY
    $)+1)=AY3$:AY$(LEN(AY$)+1)=AY4$
5820 IF R=3 THEN AX$=AX3$:AX$(LEN(AX
    $)+1)=AX4$
5822 IF R=3 THEN AY$=AY3$:AY$(LEN(AY
    $)+1)=AY4$
5825 IF R=4 THEN AX$=AX4$:AY$=AY4$
5830 IF R=5 THEN AX$=AX5$:AY$=AY5$
5835 IF R=6 THEN AX$=AX6$:AX$(LEN(AX
    6$)+1)=AX5$
5837 IF R=6 THEN AY$=AY6$:AY$(LEN(AY
    6$)+1)=AY5$
5840 IF R=7 THEN AX$=AX7$:AX$(LEN(AX
    $)+1)=AX6$:AX$(LEN(AX$)+1)=AX5$
5842 IF R=7 THEN AY$=AY7$:AY$(LEN(AY
    $)+1)=AY6$:AY$(LEN(AY$)+1)=AY5$
5845 IF R=8 THEN AX$=AX8$:AX$(LEN(AX
    $)+1)=AX7$:AX$(LEN(AX$)+1)=AX6$
    :AX$(LEN(AX$)+1)=AX5$
5847 IF R=8 THEN AY$=AY8$:AY$(LEN(AY
    $)+1)=AY7$:AY$(LEN(AY$)+1)=AY6$
    :AY$(LEN(AY$)+1)=AY5$
5890 RETURN
5900 REM HITUS
5905 POKE 53763,15:POKE MOPO,0:POKE
    M1PO,0:RR=0:POKE MOP,0:POKE M1P
    ,0
5910 FOR J=1 TO 200
5931 POKE PLY+2,Y-10:POKE PLX+2,X:PO
    KE PLY+1,Y:POKE PLX+1,X
5932 POKE PLY+3,Y-10:POKE PLX+3,A:PO
    KE PLY,Y:POKE PLX,A
5940 Y=Y+7:X=(X+3.5)*(X>128)+(X-3.5)
    *(X<128):A=(A+3.5)*(A>112)+(A-3
    .5)*(A<112)
5950 TEMP=PEEK(710):POKE 710,PEEK(70
    9):POKE 709,PEEK(708):POKE 708,
    TEMP
5982 IF Y>255 THEN J=201
5984 IF X>255 OR X<0 THEN J=201
5990 NEXT J:GOSUB YSCR
5995 POKE PL2+2,0:POKE PLX+3,0:POKE
    53763,0
5997 RETURN
6000 REM XSCR
6010 SCORE=SCORE+10
6080 GOSUB DISPLAY
6090 RETURN
6100 REM YSCR
6120 PLAYER$(2*PX-1,2*PX-1)=" "
6125 PX=PX-1
6130 IF PX=0 THEN GOSUB LOSS
6180 GOSUB DISPLAY
6190 RETURN
6200 REM LOSS
6210 IF SCORE>HSCR THEN HSCR=SCORE
6220 GOSUB RESET2
6280 GOSUB DISPLAY
6290 RETURN
6300 REM DISPLAY
6305 POKE 53258,0:POKE 53259,0
6310 ? PLAYER$
6320 ? "SCORE:   ";SCORE
6330 ? "HIGH SCORE:   ";HSCR
6340 IF PX=0 THEN ? " PUSH TRIGGER F
    OR ANOTHER GAME";
6350 IF PX=0 THEN IF PTRIG(0)=1 THEN
     6350:GOSUB RESET2:GOSUB ASELEC
    T
6360 ? PLAYER$
6362 ? "SCORE:   ";SCORE
6364 ? "HIGH SCORE:   ";HSCR
6390 RETURN
6400 REM RESET2
6410 SCORE=0:PLAYER$="1 2 3 4 5"
6430 PX=5
6490 RETURN
6500 REM ASELECT
6510 ZZ=INT(4*RND(0))+1
6520 IF ZZ=1 THEN ATTACK$=ATTACK1$
6522 IF ZZ=2 THEN ATTACK$=ATTACK2$
6524 IF ZZ=3 THEN ATTACK$=ATTACK3$
6526 IF ZZ=4 THEN ATTACK$=ATTACK4$
6590 RETURN
10000 REM BACKGROUND
10005 FOR I=0 TO 3:POKE 708+I,0:NEXT
     I
10007 COLOR 3:PLOT 0,20:DRAWTO 70,20
    :DRAWTO 70,40:DRAWTO 90,40:DRA
    WTO 90,20:DRAWTO 159,20
10010 COLOR 1:FOR I=1 TO 2
10020 PLOT 0,20+I:DRAWTO 70-I,20+I:D
    RAWTO 70-I,40+I:DRAWTO 90+I,40
    +I:DRAWTO 90+I,20+I:DRAWTO 159
    ,20+I:NEXT I
10040 COLOR 2:FOR I=1 TO 2
10050 PLOT 0,22+I:DRAWTO 68-I,22+I:D
    RAWTO 68-I,42+I:DRAWTO 92+I,42
    +I:DRAWTO 92+I,22+I:DRAWTO 159
    ,22+I:NEXT I
10060 COLOR 3:FOR I=1 TO 3
10070 PLOT 0,24+I:DRAWTO 66-I,24+I:D
    RAWTO 66-I,44+I:DRAWTO 94+I,44
    +I:DRAWTO 94+I,24+I:DRAWTO 159
    ,24+I:NEXT I
10080 COLOR 1:FOR I=1 TO 3
10090 PLOT 0,27+I:DRAWTO 63-I,27+I:D
    RAWTO 63-I,47+I:DRAWTO 97+I,47
    +I:DRAWTO 97+I,27+I:DRAWTO 159
    ,27+I:NEXT I
10100 COLOR 2:FOR I=1 TO 5
10110 PLOT 0,30+I:DRAWTO 60-I,30+I:D
    RAWTO 60-I,50+I:DRAWTO 100+I,5
    0+I:DRAWTO 100+I,30+I:DRAWTO 1
    59,30+I:NEXT I
10120 COLOR 3:FOR I=1 TO 5
10130 PLOT 0,35+I:DRAWTO 55-I,35+I:D
    RAWTO 55-I,55+I:DRAWTO 105+I,5
    5+I:DRAWTO 105+I,35+I:DRAWTO 1
    59,35+I:NEXT I
10140 COLOR 1:FOR I=1 TO 7
10150 PLOT 0,40+I:DRAWTO 50-I,40+I:D
    RAWTO 50-I,60+I:DRAWTO 110+I,6
    0+I:DRAWTO 110+I,40+I:DRAWTO 1
    59,40+I:NEXT I
10160 COLOR 2:FOR I=1 TO 7
10170 PLOT 0,47+I:DRAWTO 43-I,47+I:D
    RAWTO 43-I,67+I:DRAWTO 117+I,6
    7+I:DRAWTO 117+I,47+I:DRAWTO 1
    59,47+I:NEXT I
10180 COLOR 3:FOR I=1 TO 9
10190 PLOT 0,54+I:DRAWTO 36-I,54+I:D
    RAWTO 36-I,74+I:DRAWTO 124+I,7
    4+I:DRAWTO 124+I,54+I:DRAWTO 1
    59,54+I:NEXT I
10200 COLOR 1:FOR I=1 TO 12
10210 PLOT 0,63+I:DRAWTO 27-I,63+I:D
    RAWTO 27-I,83+I:DRAWTO 133+I,8
    3+I:DRAWTO 133+I,63+I:DRAWTO 1
    59,63+I:NEXT I
10220 COLOR 2:FOR I=1 TO 20
10230 PLOT 0,75+I:DRAWTO 14,75+I:PLO
    T 159,75+I:DRAWTO 145,75+I:NEX
    T I
10300 RETURN
```

```
30000 REM *****PM SETUP*****
30010 GRAPHICS 7:POKE 106,PEEK(106)-
      16:GRAPHICS 7:POKE 752,1:REM *
      ****16 PAGE RESERVE*****
30020 ? :? :? "{9 SPACES}PREPARE FOR
       COMBAT"
30204 POKE 53277,3:REM *****GRACTL P
      LAY&MISS*****
30206 POKE 559,62:REM *****DMACTL,1L
      INE,PLAY,MIS,NORM FIELD*****
30208 POKE 54279,PEEK(106):REM *****
      PMBASE IS NOW RAMTOP*****
30210 POKE 53256,3:POKE 53257,0:POKE
       53258,0:POKE 53259,0:REM ****
      *PLAY SIZES*****
30212 POKE 623,33:REM *****PRIORITY
      PL OVER PF*****
30214 MYPMBASE=256*PEEK(106):REM ***
      **NEW PM BASE*****
30230 POKE 704,134:POKE 705,24:POKE
      706,46:POKE 707,54:POKE 1788,(
      PEEK(106)+4):REM *****START OF
       PM DATA*****
30232 POKE 710,52:POKE 709,58:POKE 7
      11,29:POKE 712,0
30236 REM *****VBLANK INTERUPT ROUTI
      NE*****
30238 FOR I=1536 TO 1706:READ A:POKE
       I,A:NEXT I
30240 FOR I=1774 TO 1787:POKE I,0:NE
      XT I
30242 DATA 162,3,189,244,6,240,89,56
      ,221,240,6,240,83,141,254,6,10
      6,141
30244 DATA 255,6,142,253,6,24,169,0,
      109,253,6,24,109,252,6,133,204
      ,133
30246 DATA 206,189,240,6,133,203,173
      ,254,6,133,205,189,248,6,170,2
      32,46,255
30248 DATA 6,144,16,168,177,203,145,
      205,169,0,145,203,136,202,208,
      244,76,87
30250 DATA 6,160,0,177,203,145,205,1
      69,0,145,203,200,202,208,244,1
      74,253,6
30252 DATA 173,254,6,157,240,6,189,2
      36,6,240,48,133,203,24,138,141
      ,253,6
30254 DATA 109,235,6,133,204,24,173,
      253,6,109,252,6,133,206,189,24
      0,6,133
30256 DATA 205,189,248,6,170,160,0,1
      77,203,145,205,200,202,208,248
      ,174,253,6
30258 DATA 169,0,157,236,6,202,48,3,
      76,2,6,76,98,228,0,0,104,169
30260 DATA 7,162,6,160,0,32,92,228,9
      6
30262 S=USR(1696)
30276 PLX=53248:PLY=1780:PLL=1784
30278 POKE PLL,9:POKE PLL+1,8:POKE P
      LL+2,26:POKE PLL+3,26
30282 FOR I=MYPMBASE+1024 TO MYPMBAS
      E+1032:READ A:POKE I,A:NEXT I:
      REM *****DEFENDER PLAYER 0****
      *
30283 DATA 24,24,60,60,126,255,126,3
      6,36
30285 FOR I=0 TO 7:READ A:POKE MYPMB
      ASE+1280+I,A:NEXT I:REM *****A
      TTACKER PLAYER 1*****
30287 DATA 204,204,204,252,252,48,48
      ,48
30299 REM *****EXPLOSION PLAYER 2***
      **
30300 FOR I=MYPMBASE+1280+256 TO MYP
      MBASE+256+1305:READ A:POKE I,A
      :NEXT I
30305 DATA 24,36,80,52,90,52,105,93,
      170,237,181,106,253,94,171,246
      ,173,85,44,90,116,44,52,44,24,
      8
30309 REM *****EXPLOSION PLAYER 3***
      **
30310 RESTORE 30305:FOR I=MYPMBASE+1
      280+512 TO MYPMBASE+1305+512:R
      EAD A:POKE I,A:NEXT I
30590 RETURN
32000 SAVE "D:STARSHOT.7":STOP
32001 LIST "D2:STARSHOT.7":STOP
```

©

Atari CX85 Numerical Keypad

Charles Brannon, Program Editor

The new Atari CX85 Numerical Keypad is an add-on, ten-key number pad (adding-machine style) with seven additional function keys. Its primary use is to make it easier to type in numbers. The Keypad was originally developed for use with the *Bookkeeper* software package, but is now available separately.

Seventeen-Key "Joystick"

The keypad plugs into the second joystick port. Using it from your program could be pretty tricky, except that Atari provides a *handler* program that reads the keypad like a joystick and causes it to respond like the built-in keyboard. With the handler program, you can immediately use the keypad in almost any program, including those you write in BASIC. It's especially valuable for VisiCalc, where you are constantly working with numbers. The handler program is provided only on disk.

To use the keypad, you boot the handler diskette *first*, then insert your applications disk (such as VisiCalc). The handler loads into a usually unused area of memory ($0600, page six). This conflicts with some programs, especially machine language routines that also need page six. The handler disk also contains the assembler source code of the handler and an alternate version of it that lets you define your own function keys.

It's a well-made peripheral. It has an extra-wide zero key and a raised bump on the "5" key; both are accounting standards. The keys have a nice feel, similar to the Atari 800 keyboard. The underside of the unit has three notches to let you position the cord conveniently. One of its best features is one-touch cursor control provided by default on the four "definable function" keys. It also has a minus key, decimal, and RETURN key (labeled ENTER). The unit is light, but it won't tip over.

Function Keys

To change the key values returned by the keypad, you can use the POKE command in BASIC to change locations using an alternate form of the handler program. You load the alternate handler from DOS, exit to BASIC with SYSTEM RESET, and POKE in replacement values. If you POKE in a value of 255, the function keys will behave like the console keys START, SELECT, and OPTION.

You could change the four function keys to arithmetic symbols for a four-function calculator program. Or, for typing in program listings, you could change the period key (or the ENTER key) to a comma, and you'd have a high-speed way of entering DATA statements. A keyboard overlay is provided to let you label the functions.

If you want to change the keypad's functions drastically, or relocate the handler in memory, you can modify the provided source code (machine language). The source code was written with the Atari Macro Assembler (AMAC), so you'll need the Program/Text Editor and AMAC to edit it (both are available from APX, the Atari Program Exchange).

Documentation

The Numerical Keypad comes with two manuals: a user guide and technical notes. The user guide is adequate for setting up and using the keypad for its primary uses.

The technical notes are a laudable attempt to provide the intermediate to advanced user with solid information. A schematic of the keypad is even provided, along with theory of operation, suggested changes, and a listing of the handler routine. Since the VIC and Commodore 64 use an Atari-compatible joystick port, the technical notes may even permit you to adapt this versatile peripheral to the Commodore computers.

CX85 Numerical Keypad
Atari, Inc.
1196 Borregas Avenue
Sunnyvale, CA 94086
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Atari's new plug-in keypad.

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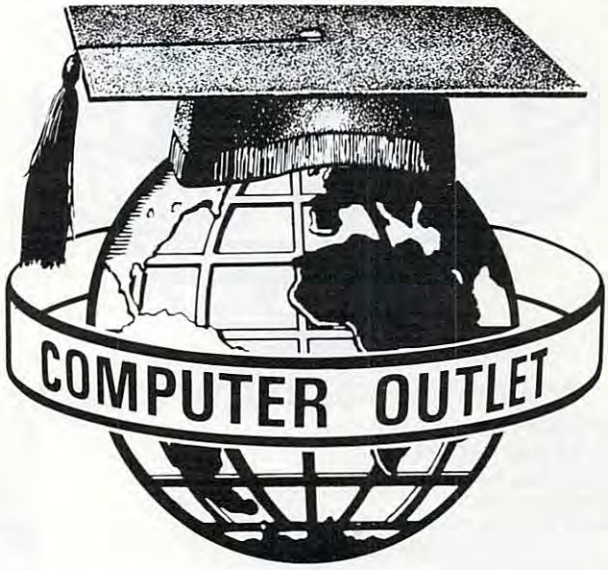

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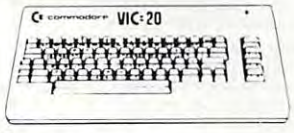

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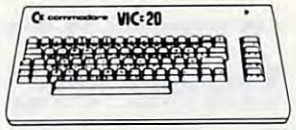

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Three VIC Cartridge Games By Creative Software

Harvey B. Herman

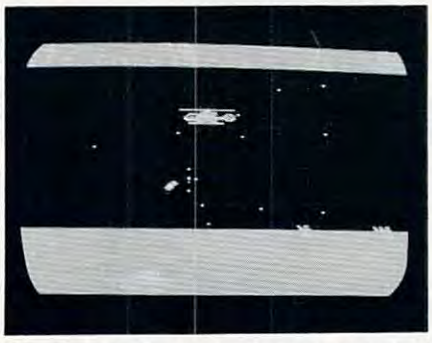
Choplifter

The objective of *Choplifter* is to save lives, specifically the lives of hostages trapped behind enemy lines. Points are scored only when the helicopter you are piloting brings men back to home base. Destroying the enemy is secondary – you do what is necessary to insure the safe arrival of your men.

The pre-game demo has some clever graphics – the "i" in Tom Griner (he's the programmer) waves at you, as the hostages do later. At this point, you are given the option of changing the default colors by successive pressing of any function key (not documented).

When the game begins, your helicopter is on its home base. Lift up with the joystick and fly left toward enemy lines. Watch the three-dimensional star background and front-line pass behind and below, respectively. Listen to the realistic chopper noises.

The hostages are either trapped in houses or are frantically running around on the ground waving to you. Set the chopper down carefully, and the hostages will climb aboard (16 max). If you accidentally land on one, you hear a plaintive "blink."



Evading the hostile tank, the helicopter attempts to rescue the waving hostages (lower right) in the VIC version of Choplifter.

Lift off and return them to base.

Sounds easy? Not quite. There are hazards to watch out for, like enemy tanks, jets, and killer satellites. The enemy is out to get your chopper, and you must either avoid them or destroy them with your cannon. A perfect score results when you have returned all 64 men to base in the three missions allowed.

I usually lose too many men, but my kids seem to have mastered the game fairly quickly. Although the game's action noticeably slows when too many hostages or enemies are in the field of view, this game is fun and challenging.

Serpentine

I played this game on an Apple once, and the VIC version appears to be identical. You are a blue segmented serpent moving in an irregular maze. Your twists and turns are controlled by a joystick. Hostile red segmented serpents are after you and will eat you if you're careless. You survive by creeping up on them from the rear or side, and snipping off their segmented tails.

When the evil serpent is red, you cannot attack from the front or you will be eaten (lose a turn). But if you snip off enough of a red serpent, it turns green, and you are free to attack it from any direction. In fact, at that time a successful frontal attack awards your blue serpent an extra segment. Similarly, extra segments are given when you eat frogs, which hop around randomly on the maze, or the eggs laid by enemy serpents.

There are several complications and strategies which make the game more interesting. A red snake will turn green when

The swiftly creeping serpents are a blur as they flee through the maze in Serpentine.

it has fewer segments than your blue snake and back again when it has more. When snakes lay eggs, they lose a segment. If a head-on collision with a green snake is imminent and your snake decides to lay an egg, you might find yourself face-to-face with an angry red one.

My kids enjoyed this game more than the other two, and I was able to pick up a strategy tip from watching them play. They sometimes delay the clearing of all red snakes from the board until their blue snake lays an egg. Assuming a frog doesn't get the egg (frogs love eggs), they get an extra turn after the board is cleared.

The game uses color, music, and sound effectively. Tension builds when the game gets more difficult as successive screens are cleared, but the points go up proportionally. One kid suggested a speed-up button to help escape tight spots, even if it cost penalty points. Overall, we found it exciting and engaging.

Trashman

In principle, this game is very similar to *Pac-Man*. You are at the controls of a garbage truck riding around town (a maze), collecting trash (dots), and emptying trash cans (energizers). Both activities score points, and the object of the game is to clear successive screens and achieve as high a score as possible. Giant flies are continually molesting your truck, and you must evade them or lose a turn.

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After a trash can is emptied, the flies change color, and for a short time it is safe to counterattack. But don't wait too long, or they will revert to their original color and revert to their essential nastiness.

This game offers a choice of difficulty (or bonus) levels at the start, and my kids appreciate this feature. They consistently play at the highest level, but have not lost interest yet. The game has good sound effects and well-drawn, animated flies, especially at the beginning and when the flies are caught and sent back to home base. I also liked the idea of a random bonus which appears about halfway through a screen to liven things up a little. The joystick is optional for this program, but recommended.

Among these three games, we liked *Serpentine* the best, then *Trashman*, then *Choplifter*. Personal taste will be the deciding factor, so try them out before you purchase, if possible. But if you are an inveterate game player, you'll probably enjoy all of these VIC cartridges; they're among the better ones we've seen.

Choplifter
Serpentine
Trashman

Creative Software
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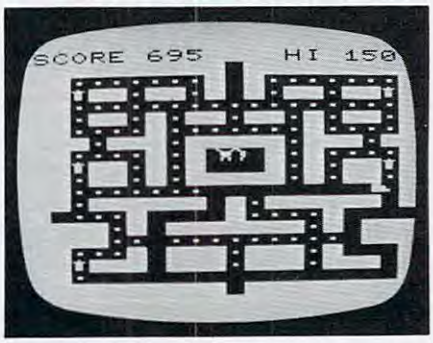

Players must negotiate a maze to pick up garbage in Trashman.

Hescount For PET/CBM And VIC

Steve Leth

One of the facilities available on many mainframe computer systems is a program profiler – a utility that monitors the execution of a program and counts how many times each statement is executed. This information can be used in a number of ways to assist in the development of a new program or the modification of an old one. For instance, statements in a program that are executed many times are prime candidates for various time-saving techniques. Speeding up a line that is executed a thousand times will have a much greater effect on a program's total run time than doing the same thing to a line that is executed only once. We'll see more of this in an example later on.

Profiler information can also be used for general program testing and debugging. Finding the cause of an endless loop is a lot easier when you know exactly which statements are part of the loop. Another area of program development that is often ignored is the testing of seldom-used paths through a program's logic. Many a "well-tested" program contains large stretches that were never executed during its debugging stages. A profiler lets you find these unexecuted statements and devise input or other conditions that will force them to be executed.

Simple To Use

"OK, sounds great. But I don't have a mainframe, I've got a VIC!" Yes, I know, and so do the people at Human Engineered Software, who have developed *Hescount*, a BASIC program profiler for all versions of Commodore PET/CBM and VIC.

For the most part, using *Hescount* is pretty simple: you load it by running a BASIC loader program. As usual, the loader resets the top-of-memory pointer so *Hescount* won't be destroyed by running your program. Next, you load the BASIC program you want profiled and type "SYS 0".

Hescount will now set up the program so that its execution can be monitored by hooking into the zero-page CHARGET routine and reserving memory space for the line counts. You just run the program as usual. While your program is running, *Hescount* will keep track of how many times each line is executed, placing this count in the space it reserved during the initial setup.

Because *Hescount*'s monitoring takes up some time, your program will run about 20 percent slower than usual. When the program is finished, the line counts must be extracted from *Hescount*'s internal format and put someplace where you can access them. To do this, you enter "SYS 0" again. This time, *Hescount* will take the line numbers and the counts and place them in a two-dimensional array named UQ%. The number of elements in UQ% will be stored in UQ%(0,0), the numbers of the executed lines in UQ%(0,i), and the number of times that line was executed in UQ%(1,i).

Hescount also unhooks itself from the CHARGET routine and returns your program to its normal state. Now you can take the data stored in the array UQ% and list it on the screen or printer or save it on disk for later analysis.

How *Hescount* Works

Let's look at an example to see just what *Hescount* shows us about a program. Program 1, called "Dice," is a short program that calculates the odds of each number that can result when two dice are rolled. Just to make the program a little more general, I've set it up to handle the "odd"

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dice, with other than six sides, used in many role-playing games. Table 1 shows the output for a pair of ten-sided dice. Notice that it took 223 jiffies (just under four seconds) for the program to run.

If we run Dice under *Hescount*, and then enter SYS 0 to collect the line counts into the array UQ%, the results can be printed using the routine that starts at line 1000 in Dice. This output is shown in Table 2: a table of line numbers and how many times each one was executed. We can see that there are only two points in Dice worth trying to speed up: lines 40 and 50, which execute 100 times each, and lines 70 and 80, which execute 19 times each. We can pick up a little speed by combining lines 20 through 50 into one line. (See Program 2.)

However, most of the time saving came from moving the expression "(S↑2)" from inside the FOR loop to line 55. The run time is now down to 149 jiffies (about two and a half seconds); any other changes I could think of just made the run times longer. Although this example is trivial (it's pretty obvious which statements will execute the most), you can see how this whole process would be very effective with a large program.

A Few Limitations

If you are getting the impression that I like *Hescount*, you're right. It is useful, reasonably simple to use, and very nicely documented. The manual that comes with it is easy to read and quite complete. There are actually two manuals, totaling 25 pages. The first is a *User Manual*, which describes how to load and use *Hescount* and how to access the line counts. A demo program, included on the tape or disk, acquaints you with *Hescount*'s operation.

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Program 1: Dice

```
1 REM ********* DICE *********
2 REM ** UNMODIFIED PROGRAM **
5 INPUT"□NUMBER OF SIDES";S
6 TI$="000000"
7 PRINT:PRINT"THERE ARE"S*2"POSSIBLE COMBINATONS":PRINT
10 DIMC(2*S)
20 FORI=1TOS
30 FORJ=1TOS
40 C(I+J)=C(I+J)+1
50 NEXT:NEXT
60 FORI=2TO2*S
70 PRINTI,C(I),C(I)/(S*2)
80 NEXT
85 PRINT
90 PRINT"EXECUTION TOOK";TI;"JIFFIES"
100 END
1000 DEFFNZ(A)=A-(A<0)*65563
1010 OPEN4,4:PRINT#4,"LINE      TIMES EXECUTED"
1020 FORI=1TOUQ%(0,0)
1030 PRINT#4,FNZ(UQ%(0,I)),FNZ(UQ%(1,I)):NEXT:CLOSE4
```

Program 2: Modified Dice

```
1 REM ******* DICE *******
2 REM ** MODIFICATION #3 **
5 INPUT"□NUMBER OF SIDES";S
6 TI$="000000"
7 PRINT"THERE ARE"S*2"POSSIBLE COMBINATONS"
10 DIMC(2*S)
30 FORI=1TOS:FORJ=1TOS:C(I+J)=C(I+J)+1:NEXT:NEXT
55 S1=S*2
60 FORI=2TO2*S
70 PRINTI,C(I),C(I)/S1
80 NEXT
90 PRINT"EXECUTION TOOK"TI"JIFFIES"
100 END
1000 DEFFNZ(A)=A-(A<0)*65563
1010 OPEN4,4:PRINT#4,"LINE      TIMES EXECUTED"
1020 FORI=1TOUQ%(0,0)
1030 PRINT#4,FNZ(UQ%(0,I)),FNZ(UQ%(1,I)):NEXT:CLOSE4
```

Table 1:
Output Of A Pair Of Ten-Sided Dice

NUMBER OF SIDES? 10
THERE ARE 100 POSSIBLE COMBINATIONS

2	1	.01
3	2	.02
4	3	.03
5	4	.04
6	5	.05
7	6	.06
8	7	.07
9	8	.08
10	9	.09
11	10	.1
12	9	.09
13	8	.08
14	7	.07
15	6	.06
16	5	.05
17	4	.04
18	3	.03
19	2	.02
20	1	.01

EXECUTION TOOK 223 JIFFIES

Table 2:
Results Of Line Counts

LINE	TIMES EXECUTED
1	1
2	1
5	1
6	1
7	1
10	1
20	1
30	10
40	100
50	100
60	1
70	19
80	19
85	1
90	1
100	1
1000	0
1010	0
1020	0
1030	0

information on how to customize *Hescount*, how it works "under the hood," and also includes a complete assembly listing.

Of course, *Hescount* does have a few kinks. The means of accessing the line counts is somewhat clumsy but it is well explained. *Hescount* also has some limitations involving mixed BASIC/machine language programs, some odd types of FOR/NEXT loops, and utilities that also use the CHARGET routine (such as Skyles Electric Works' *Disk-O-Pro*). Fortunately, all these problems are minor and are discussed in the documentation. Versions for PET/CBM ROMs 2, 3, and 4 and the VIC-20 are included, along with a short demo program. All in all, *Hescount* is a good program to add to your software development toolkit.

Hescount
Human Engineered Software
71 Park Lane
Brisbane, CA 94005
$23.95 Tape
$26.95 Disk

Micro-Systems' VIE Cartridge VIC To IEEE Interface

Karl Kelley

Have you wanted to add the disk drive for your other Commodore computer to your VIC? If you are like many Commodore owners, you may have already owned a 4016, 4032, or 8032 PET/CBM computer along with a disk drive and a printer.

Micro-Systems Development, Inc. is marketing an interface cartridge which converts the user port to IEEE protocol and allows direct access to IEEE devices of all kinds. My particular interest right now is the IEEE disk drives and printers manufactured by Commodore – the ones I already own.

I ordered the VIE Cartridge from Micro-Systems, and as soon as I received it, I opened the durable plastic case to check out the insides.

Inside were four chips and a female edge connector, mounted

on a good quality, solder-dipped printed circuit board with two male edge connectors. The large edge connector plugs into the VIC user port. The female connector mounted on the PC board is a straight through extension of the user port lines. This means that use of the VIE cartridge does not restrict one from later expansion. The smaller male edge connector is that sorely needed IEEE port designed to mate with Commodore's P/I cable.

Note: Though the device is extremely well constructed, care *must* be used when plugging it into the VIC and especially when plugging additional cartridges into the VIE. Remember, it is only a PC board and cannot be subjected to excessive flexure. The safest approach is to plug the other cartridge into the VIE before plugging the VIE into the VIC.

The instructions consist of one typewritten page with a brief explanation of the device and instructions for enabling/disabling the interface software. The instructions are entirely adequate.

Once installed, the interface can be enabled via

```
SYS40000
```

This actuates the approximately 1K EPROM onboard software. Once enabled, the interface can be disabled by any one of the following:

```
"RESTORE"
Software BRK
VIC Power Off
SYS64850 (the exit routine)
```

Recall that VIC BASIC is really a modification of PET BASIC 3.0 and does not contain the direct disk commands of BASIC 4.0 such as DLOAD, DSAVE, etc. So users who have become "dependent" on BASIC 4.0 will have to re-learn the syntax of disk operations from the earlier BASICs. For example, to save a program under the name TESTPROG on drive 1, execute the following:

```
OPEN1,8,15,"I1":SAVE
"TESTPROG",8:CLOSE1
```

Of course, initialization is not required on the 8050 drives, and if the disk has previously been initialized, the OPEN and CLOSE statements are not necessary.

File handling is straightforward and identical to PET BASIC 3.0. Again, BASIC 4.0 users will miss the random file commands available in BASIC 4.0, but fortunately, the RANDOM 1.0 program (in BASIC) on the Commodore DEMO disk can be copied directly for use on the VIC-20.

There are a few things to watch out for while using the VIE. On the larger Commodore machines, the IEEE port is part of the MAIN LOGIC ASSEMBLY and cannot be enabled/disabled at will. Accidentally disabling the VIE when files are OPENed on the disk or printer can cause loss of data. The convenience of the RESTORE (warm start) key is now an albatross. If you are doing disk operations and hit the RESTORE key (disabling the VIE) while disk files are OPEN, you have accomplished the same thing as unplugging the P/I cable. Under certain circumstances, this could also result in lost data.

Likewise, printer format commands will be lost if the VIE is disabled. This is not a disaster, but it is inconvenient. I have learned to set off these format/control commands in routines or programs on their own for quick recovery.

The device performs well and in accordance with the manufacturer's specifications. At $79.95, the VIE Cartridge is a valuable addition to the VIC for users who already own Commodore disk drives and/or printers, and for anyone contemplating using the VIC as an IEEE controller.

Micro-Systems Development, Inc.
11105 Shady Trail, Suite 103
Dallas, TX 75229
$79.95

AARDVARK — THE ADVENTURE PLACE

TRS-80 COLOR COMMODORE 64 VIC-20 SINCLAIR/TIMEX TI99

WE CARRY MORE THAN ADVENTURES!!

MAXI-PROS WORD PROCESSING NEW

The easiest to use word processor that I know of. Has all the features of a major word processor (right and left margin justification, page numbering, global and line editing, single, double, triple spacing, text centering, etc.) at a very cheap price because we wrote it in BASIC. Includes 40 page manual and learning guide. Easily modified to handle almost any printer combination. Available on disk or tape for VIC20, COMMODORE64, and TRS-80 COLOR computer. Requires 13k RAM on Vic, 16k EXTENDED on TRS-80 COLOR. $19.95 on tape $24.95 on disk. NEW

GENERAL LEDGER — Complete bookkeeping for a small business. Disk required. For Vic20 (13k), Commodore64, TRS-80 COLOR (16k EXTENDED). $69.95 (Send $1.00 for manual before ordering.)

LABYRINTH — 16K EXTENDED COLOR BASIC — With amazing 3D graphics, you fight your way through a maze facing real time monsters. The graphics are real enough to cause claustrophobia.

Similar game for Timex/Sinclair 16k - hunting treasure instead of monsters $14.95.

ADVENTURE WRITING/DEATHSHIP by Rodger Olsen — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of TI99, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

Dealers—We have the best deal going for you. Good discounts, exchange programs, and factory support. Send for Dealer Information.

Authors—Aardvark pays the highest commissions in the industry and gives programs the widest possible advertising coverage. Send a Self Addressed Stamped Envelope for our Authors Information Package.

ADVENTURES — Adventures are a unique form of computer game. They let you spend 30 to 70 hours exploring and conquering a world you have never seen before. There is little or no luck in Adventuring. The rewards are for creative thinking, courage, and wise gambling — not fast reflexes.

In Adventuring, the computer speaks and listens to plain English. No prior knowledge of computers, special controls, or games is required so everyone enjoys them—even people who do not like computers.

Except for Quest, itself unique among Adventure games, Adventures are non-graphic. Adventures are more like a novel than a comic book or arcade game. It is like reading a particular exciting book where you are the main character.

All of the Adventures in this ad are in Basic. They are full featured, fully plotted adventures that will take a minimum of thirty hours (in several sittings) to play.

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC. Now available for TI99.

TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

Dungeons of Death — Just for the 16k TRS-80 COLOR, this is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. At the normal price for an Adventure ($14.95 tape, $19.95 disk), this is a giveaway.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

32K TRS 80 COLOR Version $24.95.

Adds a second level with dungeons and more Questing.

PRICE AND AVAILABILITY:

All adventures are $14.95 on tape. Disk versions are available on VIC/COMMODORE and TRS-80 Color for $2.00 additional. $2.00 shipping charge on each order.

Please specify system on all orders

ALSO FROM AARDVARK — This is only a partial list of what we carry. We have a lot of other games (particularly for the TRS-80 Color and OSI), business programs, blank tapes and disks and hardware. Send $1.00 for our complete catalog.

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TRS-80 COLOR TIMEX/SINCLAIR COMMODORE 64 VIC-20

$2.00 shipping on each order

Microteach Teacher's Aide For The Atari

Mike Kinnamon

Since I am a teacher, many educational programs are brought to me by well-meaning computer users and salespeople, who believe that I can immediately put them to use in my classroom. Unfortunately, some of these programs do not lend themselves to practical classroom applications. They tend to be either too broad or repetitive, too much like drills.

Microteach Teacher's Aide (48K, two disk drives) is not in that category; it is a welcome solution to the problem of tailoring computer-assisted education.

With this program, a teacher with no knowledge of computer languages can create computer-based lessons that deal specifically with a particular curriculum. A teacher may write courses and assign them to individuals or groups of students, keeping a record of each student's progress readily available.

To use *Teacher's Aide*, you first format a blank diskette, using your standard Atari Disk Operating System. This becomes your courseware disk. Next, place the *Teacher's Aide* in drive number one and your newly created courseware disk into drive number two. Reboot the entire system without BASIC; Optimized System Services' BASIC A+ is used by the program on disk number one.

The program's features are numerous and quite varied. Mastering its many modules will take several sessions, but the end result is well worth the time. A teacher can enter the edit mode and easily create a unit of study categorized into sections and chapters which coincide with the textbook being used in the classroom. You can re-edit an existing chapter or section for an alternate or improved use. You can dissect any individual chapter or section and create advanced or remedial editions of a given lesson. Each courseware diskette can be assigned a volume number, thereby creating an entire year's curriculum in any sequence and of any breadth.

Each TV screen is treated as a page of a textbook. The teacher has the options of color of pages and timed or untimed pages. The entire page, section, or chapter can be listed to the printer, giving the student a hard copy for study notes, homework, or tests.

Flexible Options

Questions may be presented to the student during or after each lesson. Several types of questions (multiple choice, fill-in-the-blank, true-false, or yes-no) can be used in any order, in each lesson. Each question can be timed or untimed, and assigned a weighted point value at the teacher's discretion. If the student answers a question incorrectly, the teacher may assign a page, section, or chapter to be reviewed by the student in order to better assure a minimum competency of the lesson. A student's responses thus determine the rate at which he or she progresses through the lesson.

The computer will keep a complete, detailed record of each student's performance. The teacher may review a student's status at any time and view the chapters, sections, and pages completed by each student. Scores on the questions are available with such details as number of times attempted before a correct answer was entered and the weighting value of each question. The teacher may list all students on a given disk, assign chapters to particular students, set up a new student file, or delete an old file by entering the report/review module of the program.

The editing commands are thorough, allowing the teacher to create new pages, edit old ones, insert or delete a page, and step forward or backward a page at a time.

Only graphics mode 0 (the standard text mode) can be used with this program, which is somewhat disappointing, but I know a few teachers who have spent the time to create high-resolution graphics to adorn the text. With a little imagination and creative endeavor, a teacher can use the keyboard graphics characters with pleasing results. Since each page is static, no animation of the graphics is possible. This prevents a dynamic presentation, which may limit the program's usefulness in primary classrooms.

The major advantage of *Teacher's Aide* is that absolutely no knowledge of programming or computer language is required. This is a real blessing for those teachers who have wanted to use computers in their curriculum but haven't had time to become proficient programmers. Test and grade management, a major consumer of a teacher's time, is greatly simplified with this program. The validity of any test question can be easily determined in a matter of minutes, greatly improving a curriculum's instructional value and a test's ability to measure learning. I would highly recommend this program. It requires an Atari 400/800 and two disk drives.

Microteach Teacher's Aide
Compumax
P.O. Box 1139
Palo Alto, CA 94301
$195

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in **COMPUTE!** are written in a computer language called BASIC. BASIC is easy to learn and is built into most computers (on some computers, you have to purchase an optional BASIC cartridge).

BASIC Programs

Each month, **COMPUTE!** publishes programs for many machines. To start out, type in only programs written for your machine, e.g., "TI Version" if you have a TI-99/4. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from one computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How to Type COMPUTE!'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always SAVE a copy of your program before you RUN it. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1) Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.

2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

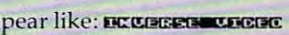
3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type COMPUTE!'s Programs" elsewhere in the magazine.)

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in **COMPUTE!** *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on the CAPUTE! page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* **COMPUTE!**, *please send them to Ask The Readers, P.O. Box 5406, Greensboro, NC 27403.*

How To Type COMPUTE!'s Programs

Many of the programs which are listed in **COMPUTE!** contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: 
Enter these characters with the Atari logo key, {🡅}.

When you see	Type	See	
{CLEAR}	ESC SHIFT <		Clear Screen
{UP}	ESC CTRL -		Cursor Up
{DOWN}	ESC CTRL =		Cursor Down
{LEFT}	ESC CTRL +		Cursor Left
{RIGHT}	ESC CTRL *		Cursor Right
{BACK S}	ESC DELETE		Backspace
{DELETE}	ESC CTRL DELETE		Delete character
{INSERT}	ESC CTRL INSERT		Insert character
{DEL LINE}	ESC SHIFT DELETE		Delete line
{INS LINE}	ESC SHIFT INSERT		Insert line
{TAB}	ESC TAB		TAB key
{CLR TAB}	ESC CTRL TAB		Clear tab
{SET TAB}	ESC SHIFT TAB		Set tab stop
{BELL}	ESC CTRL 2		Ring buzzer
{ESC}	ESC ESC		ESCape key

Graphics characters, such as CTRL-T, the ball character ● will appear as the "normal" letter enclosed in braces, e.g. {T .

A series of identical control characters, such as 10 spaces, three cursor-lefts, or 20 CTRL-R's, will appear as {10 SPACES}, {3 LEFT}, {20 R}, etc. If the character in braces is in inverse video, that character or characters should be entered with the Atari logo key. For example, {■} means to enter a reverse-field heart with CTRL-comma, {5■} means to enter five inverse-video CTRL-U's.

Commodore PET/CBM/VIC

Generally, any PET/CBM/VIC program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor-down key; {3DOWN} would mean to press the cursor-down key three times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listing. For example, S would mean to type the S key while holding the shift key. This would result in the "heart" graphics symbol appearing on your screen. Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

Sometimes in a program listing, especially within quoted text when a line runs over into the next line, it is difficult to tell where the first line ends. How many times should you type the SPACE bar? In our convention, when a line breaks in this way, the ~ symbol shows exactly where it broke. For example:

```
100 PRINT "TO START THE GAME  ~
    YOU MAY HIT ANY OF THE KEYS
    ON YOUR KEYBOARD."
```

shows that the program's author intended for you to type two spaces after the word *GAME*.

All Commodore Machines

Clear Screen	{CLEAR}	Cursor Left	{LEFT}
Home Cursor	{HOME}	Insert Character	{INST}
Cursor Up	{UP}	Delete Character	{DEL}
Cursor Down	{DOWN}	Reverse Field On	{RVS}
Cursor Right	{RIGHT}	Reverse Field Off	{OFF}

VIC/CBM 64 Conventions

Set Color To Black	{BLK}	Function Two	{F2}
Set Color To White	{WHT}	Function Three	{F3}
Set Color To Red	{RED}	Function Four	{F4}
Set Color To Cyan	{CYN}	Function Five	{F5}
Set Color To Purple	{PUR}	Function Six	{F6}
Set Color To Green	{GRN}	Function Seven	{F7}
Set Color To Blue	{BLU}	Function Eight	{F8}
Set Color To Yellow	{YEL}	Any Non-implemented Function	{NIM}
Function One	{F1}		

To enter any color code, hold down CTRL and press the appropriate color key. Use CTRL-9 for RVS on and CTRL-0 for RVS off.

8032/Fat 40 Conventions

Set Window Top	{SET TOP}	Erase To Beginning	{ERASE BEG}
Set Window Bottom	{SET BOT}	Erase To End	{ERASE END}
Scroll Up	{SCR UP}	Toggle Tab	{TGL TAB}
Scroll Down	{SCR DOWN}	Tab	{TAB}
Insert Line	{INST LINE}	Escape Key	{ESC}
Delete Line	{DEL LINE}		

When you see an underlined character in a PET/CBM/VIC program listing, you need to hold down SHIFT as you enter it. Since the VIC-20 and Commodore 64 have fewer keys than the PET/CBM, some graphics are grouped with other keys and have to be entered by holding down the Commodore key. If you see any of the symbols in the left column underlined in a listing, hold down the Commodore key and enter the symbol in the right column. Just use SHIFT to enter all other underlined characters.

!	K	←	*	1	E
"	I	↑	PI	2	R
#	T	.	S	3	W
$	@	–	Z	4	H
%	G	=	X	5	J
'	M	<	C	6	L
&	#	>	V	7	Y
\	–	,	D	8	U
;	F	/	P	9	I
?	B	*	N	@	SHIFT*
(	£	+	Q	[	SHIFT+
)	SHIFT-£	0	A	]	SHIFT–

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in brackets, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

TRS-80 Color Computer

No special characters are used, other than lowercase. When you see letters printed in inverse video (white on black), press SHIFT-0 to enter the characters, and then press SHIFT-0 again to return to normal uppercase typing.

Texas Instruments 99/4

No special control characters are used. Enter all programs with the ALPHA lock on (in the down position). Release the ALPHA lock to enter lowercase text.

Timex TS-1000, Sinclair ZX-81

Study your computer manual carefully to see how to enter programs. Do not type in the letters for each command, since your machine features single-keystroke entry of BASIC commands. You may want to switch to the FAST mode (where the screen blanks) while entering programs, since there will be less delay between lines. (If the blanking screen bothers you, switch to the SLOW mode.)

KMMM Pascal for PET/CBM/C64 $85

A subset of standard Pascal with extensions.
- Machine language Pascal Source Editor with cursor oriented window mode.
- Machine Language P-Code Compiler
- P-Code to machine language transfer for optimized object code.
- Run-time package
- Floating point capability
- User manual and sample programs

Requires 32K Please specify configuration.

EARL for PET (disk file based) $65

Editor, Assembler, Relocater, Linker

Generates relocatable object code using MOS Technology mnemonics. Disk file input (can edit files larger than memory). Links multiple object programs as one memory load. Listing output to screen or printer. Enhanced editor operates in both command mode and cursor oriented "window" mode.

RAM/ROM for PET/CBM

4K or 8K bytes of soft ROM with optional battery backup.

RAM-ROM is compatible with any large keyboard machine. Plugs into one of the ROM sockets above screen memory to give you switch selected write protectable RAM.

Use RAM/ROM as a software development tool to store data or machine code beyond the normal BASIC range. Use RAM/ROM TO LOAD A ROM image where you have possible conflicts with more than one ROM requiring the same socket. Possible applications include machine language sort (such as SUPERSORT), universal wedge, Extramon, etc.

RAM/ROM — 4K	$75
RAM/ROM — 8K	90
Battery Backup Option	20

SUBSORT for PET/CBM $35

Excellent general purpose machine language sort routine.

THE WHOLE PET CATALOG $9

A two year 320 page compendium of the Midnite Software Gazette for Commodore computer users. Contains 500 reviews of commercial products, 700 education programs (reviewed and organized by course), 200 reviews of free games, info on over 1800 free programs, list of PET and VIC user groups, and many pages of helps and hints.

SuperGraphics 2.0

NEW Version with TURTLE GRAPHICS

SuperGraphics, by John Fluharty, provides a 4K machine language extension which adds 35 full featured commands to Commodore BASIC to allow fast and easy plotting and manipulation of graphics on the PET/CBM video display, as well as SOUND Commands. Animations which previously were too slow or impossible without machine language subroutines now can be programmed directly in BASIC. Move blocks (or rocketships, etc.) or entire areas of the screen with a single, easy to use BASIC command. Scroll any portion of the screen up, down, left or right. Turn on or off any of the 4000 (8000 on 8032) screen pixels with a single BASIC command. In high resolution mode, draw vertical, horizontal, and diagonal lines. Draw a box, fill a box, and move it around on the screen with easy to use BASIC commands. Plot curves using either rectangular or polar co-ordinates (great for Algebra, Geometry and Trig classes.)

The SOUND commands allow you to initiate a note or series of notes (or even several songs) from BASIC, and then play them in the background mode without interfering with your BASIC program. This allows your program to run at full speed with simultaneous graphics and music.

Seven new TURTLE commands open up a whole new dimension in graphics. Place the TURTLE anywhere on the screen, set his DIRECTION, turn him LEFT or RIGHT, move him FORWARD, raise or lower his plotting pen, even flip the pen over to erase. Turtle commands use angles measured in degrees, not radians, so even elementary school children can create fantastic graphic displays.

Specify machine model (and size), ROM type (BASIC 3 or 4)

SuperGraphics (disk or tape)	$40
SuperGraphics in ROM ($A000 or $9000)	$55

Volume discounts available on ROM version for schools.

FLEX-FILE NEW VERSION 2

for PET/CBM Computers

FLEX-FILE is a set of flexible, friendly programs to allow you to set up and maintain a data base. Includes versatile Report Writer and Mail Label routines, and documentation for programmers to use Data Base routines as part of other programs.

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Record size limit is 256 characters. The number of records per disk is limited only by record size and free space on the disk. File maintenance lets you step forward or backward through a file, add, delete, or change a record, go to a numbered record, or find a record by specified field (or partial field). Field lengths may vary to allow maximum information packing. Both subtotals and sorting may be nested up to 5 fields deep. Any field may be specified as a key. Sequential file input and output, as well as file output in WordPro and PaperMate format is supported. Record size, fields per record, and order of fields may be changed easily.

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Typical mail records may be packed 3000 per disk on 8050 (1400 in 4040). Labels may be printed any number wide, and may begin in any column position. There is no limit on the number or order of fields on a label, and complete record selection via type code or field condition is supported.

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- all FORTH 79 STANDARD extensions.
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- auto repeat key.
- sample programs.
- standard size screens (16 lines by 64 characters).
- 150 screens per diskette on 4040, 480 screens on 8050.
- ability to read and write BASIC sequential files.
- introductory manual.
- reference manual.

Runs on any 16K or 32K PET/CBM (including 8032) with ROM 3 or 4, and CBM disk drive. Please specify configuration when ordering.

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Simple metacompiler for creating compacted object code which can be executed independently (without the FORTH system).

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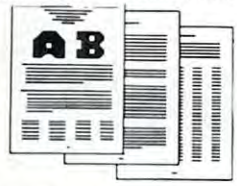
by Michael Riley



Paper-Mate is a full-featured word processor for Commodore computers. Page-Mate incorporates 60 commands to give you full screen editing with graphics for all 16K or 32K machines (including 8032), all printers, and disk or tape drives. Many additional features are available (including most capabilities of WordPro 3).

For writing text, Page-Mate has a definable keyboard for operator flexibility. Shift lock on letters only, or use keyboard shift lock. All keys repeat.

Page-Mate text editing includes floating cursor, scroll up or down, page forward or back, and repeating insert and delete keys. Text block handling includes transfer, delete, append, save, load, and insert.

All formatting commands are imbedded in text for complete control. Commands include margin control and release, column adjust, 9 tab settings, variable line spacing, justify text, center text, and auto print form letter (variable block). Files can be linked so that one command prints an entire manuscript. Auto page, page headers, page numbers, pause at end of page, and hyphenation pauses are included.

Unlike most word processors, CBM graphics as well as text can be used. Page-Mate can send any ASCII code over any secondary address to any printer.

Page-Mate functions with all Commodore machines with at least 16K, with any printer, and either cassette or disk.

To order Page-Mate, please specify machine and ROM type.

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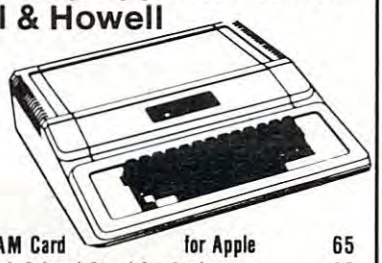

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Software For Toddlers

Fred D'Ignazio, Associate Editor

I first started working with children and computers back in the early 1970s. I was a programmer for a large computer time-sharing company, and I took a briefcase computer terminal with me to elementary school classrooms around the District of Columbia. We dialed up the main computer on the telephone and plugged it into the terminal.

I wrote all the programs that I demonstrated to the kids. That's because there wasn't anything else out there.

Sure, there was CAI (Computer-Assisted Instruction) *courseware* available. But that was mostly for older kids, and it was very expensive. I operated my little computer-literacy project on a shoestring. CAI materials were over my students' heads and beyond the reach of my wallet.

Then came the flood of personal computers. But still no inexpensive software for children in preschool through early elementary school. Parents and teachers who wanted software had to write it themselves. Or they could find an occasional listing in a computer magazine.

Now, suddenly all this is changing. People have finally realized that even the smallest kids can use computers to have fun and to learn.

And computers are appearing in people's homes by the millions. By the *millions*.

Thousands upon thousands of the families who now have computers also have little kids. These kids represent an enormous market for software. Software companies and traditional publishing companies are leaping into this market by the dozens. All of a sudden we are being deluged by programs for little kids.

Software Reviews

In future columns, I will continue to write about the computer friend and about "programming languages" for little kids (see my column last month.) But I will also devote part of each column to reviewing the best of the new software for little kids.

If you don't find a major piece of software reviewed in my column, look for it in other **COMPUTE!** columns (such as in Glenn Kleiman's or David Thornburg's column or in the Reviews section of each issue.) Or write me directly (Fred D'Ignazio, 2117 Carter Road, SW, Roanoke, VA 24015). I'll get the software and respond to you personally. If it merits review, I'll also include it in a forthcoming column.

E.T. On Your Computer

Everybody is going computer. Everything that now appears in a book, in the comics, in the movies, or on TV will soon be loaded into a computer. Within the next few years, we will see all our kids' heroes and superheroes, myths, fairy tales, and favorite characters appear electronically on personal computers. Big Bird, Strawberry Shortcake, and Papa Smurf will all be computerized. So will Batman, Wonder Woman, and

---

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. His books include Katie and the Computer *(Creative Computing),* Chip Mitchell: The Case of the Stolen Computer Brains *(Dutton/Lodestar), and* R2-D2's Question and Answer Book About Computers *(Random House).*

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in **COMPUTE!**.

NEW MULTI-USER SOFTWARE LETS THE WHOLE FAMILY SHARE IN THE JOY OF LEARNING.

Is the personal computer doing all it can to help our children learn?

To some degree, no, although it's not fair to blame it entirely on the computer. After all, computers are only as good as their software.

How can we improve this situation?

A solution already exists. But first, some background.

Where personal computers fail.

For years, studies have shown that children learn more efficiently in group situations. Peer groups, for example, motivate slower learners to persevere. Groups of older and younger children encourage divergent thinking. Even the simple "group" of a parent and child promotes faster acceptance of new ideas by combining education with trust and confidence.

But personal computers and their programs are designed to be personal. One computer, one child. It's hard for anyone else to be part of the learning experience, even you.

At least not until today.

A simple solution.

When two educational researchers, Dr. Matilda Butler and Dr. William Paisley, observed this problem they proposed an interesting, yet simple, solution. Instead of writing programs that shut out brothers, sisters, friends, and parents, why not give everyone the opportunity to share learning simultaneously. This one idea sparked an entire line of unique educational programs and gave birth to a new company, Edupro.

Software that shares.

With Edupro's Microgroup™ computer programs, up to eight players work at solving math, language, social studies, or science problems which are presented as contests, races, and puzzles. The players work together, either competitively or cooperatively, as they race against time, each other, or both.

The *Math-Race* program, for example, converts your computer into an electronic race track where children compete to answer math problems and advance toward the finish line. *Picture-Play* encourages everyone to create pictures together, teaching both spatial relationships and the value of cooperation. And *Team-Work* combines both cooperation and competition by pitting two teams (of up to four players) against each other in a race to solve word and number puzzles.

For the first time, your personal computer can bring all the benefits of group learning into your home. With a little assist from Edupro.

Designed for the simplest computers.

These unique programs run on the Atari 400 or 800, two of the world's most popular home computers. Remember, these aren't game cartridges, they're full *computer programs*, designed by educators. All are available on floppy disk or cassette, and each one requires the minimum amount of computer memory (16K for cassette, 24K for disk). That means the simplest Atari computer can let your children share the learning experience with up to seven additional friends. Joysticks required for *Word-Draw*, *Math-Hunt*, and *Picture-Play*; paddles required for *Word-Race*, *Math-Race*, and *Team-Work*.

Trust your own experience.

At the fall 1982 Computer-Using Educators Conference hundreds of educators witnessed hands-on demonstrations of our programs. Many of them said that this was a most effective way to judge their potential. But we want to offer you an even better opportunity. One those educators missed.

We want you and your children to experience this new way to learn. So choose one or more programs on either disk or cassette. Try them yourself. Watch your children get more excited about learning. Enjoy the thrill of sharing the experience with them. We know of no other software that can turn a personal computer into a tool for sharing the joy of learning.

Fill out the order form and see the results for yourself.

I want to share the joy of learning with my children. Please send me the programs I've indicated below. I understand that each program is available on either disk or cassette (my choice) and comes with a complete set of instructions and catalog listing over 50 programs. Plus a coupon good for a 10% discount on my next order.

Quantity	Program Description	# of Disk	# of Cassette
	STORYBOOK FRIENDS: Ages 5–9		
_____	WORD-DRAW: Storybook People and Places	_____	_____
_____	MATH-HUNT: Number Relationships	_____	_____
	AMERICAN THEMES: Ages 8–13		
_____	TEAM-WORK: Social Studies	_____	_____
_____	MATH-HUNT: American Years: Multiplication and Division	_____	_____
	THE WORLD AROUND US: Ages 12–Adult		
_____	WORD-DRAW: Science	_____	_____
_____	MATH-RACE: Powers and Roots	_____	_____
	JUST FOR FUN: All Ages		
_____	PICTURE-PLAY	_____	_____
Total #			**Total Amount $**
_____	programs on disk @ $24.95 each		_____
_____	programs on cassette @ $19.95 each		_____
_____	Picture-Play, disk @ $19.95		_____
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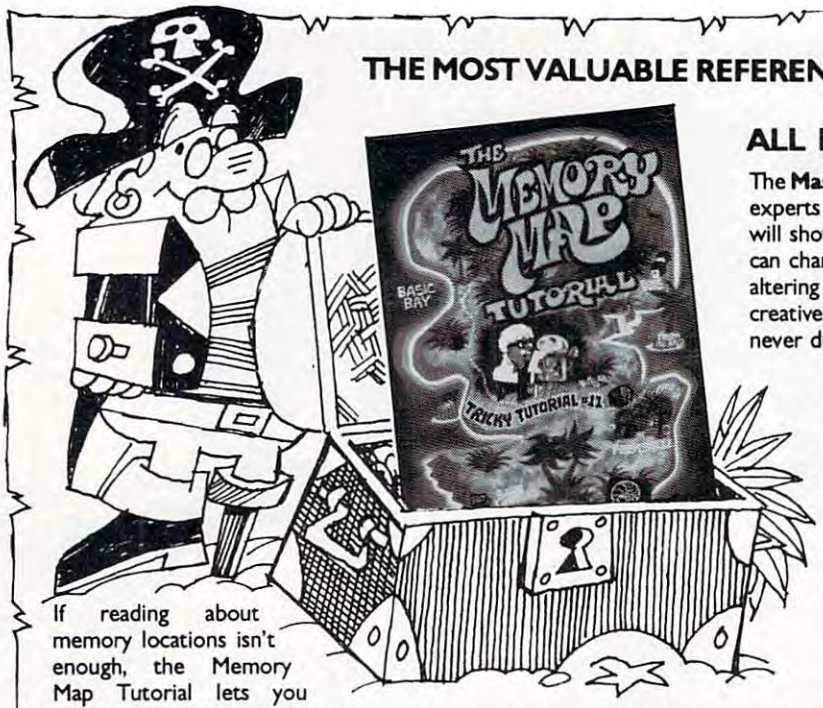

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The **Master Memory Map™** is a guide for beginners and experts to the hidden treasures of your computer. We will show you hundreds of memory locations that you can change using PEEK and POKE statements. By altering the contents of these locations you can really get creative with your computer. Fascinating things you never dreamed you could do are now possible. We explain the locations controlling Player Missile Graphics, Sound Effects, the GTIA chip, Display Lists and more. There are also hints on speeding up BASIC programs and using memory more efficiently, just to name a few. The ATARI version of the MMM will also include pages of information on the 1200XL. Put some magic into your programs with our Master Memory Map...

For ATARI - $12.95
For Commodore 64 - $14.95
For VIC-20 - $9.95

If reading about memory locations isn't enough, the Memory Map Tutorial lets you watch them work. It is the perfect companion to the Master Memory Map. We discuss in detail over 30 of the most important memory locations and their functions...16K tape or disk required. $29.95 for ATARI computers.

"The book just oozes good information and is truly one of the great values for the Atari."

Gordon Banks, Huntsville Users Group

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DIGGING AROUND FOR SOME NEW GAMES?

Other guys will sell you Bezerk™, Space Invaders™, and Tutti Frutti™ for a total price of almost a HUNDRED BUCKS! Our new User Exchange offers this three pack of similar arcade games for only $24.95. Included are Aliens and Survive for 16K tape or 32K disk users and Robot Attack requiring 32K.

DIGGERBONK (© 1982, Steve Robinson) An arcade-style game with a continuously scrolling maze that never repeats itself. Guide your digger upward before it gets carried off the bottom of the screen while battling Orange Whirlers, Pulsing Greenies, Twinklers, Bombs, Purple Gurples, the ever-nasty Aqua Chasers, and a menacing fog! For all ages. $29.95

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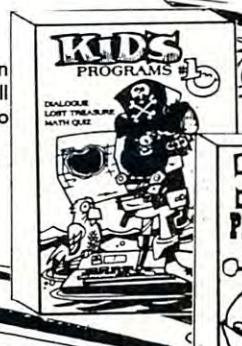
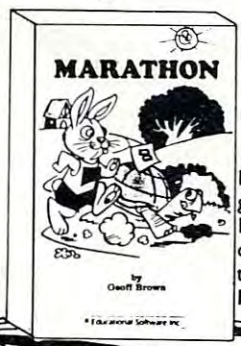
16K Tape or 24K Disk. $24.95

Music Major: An extensive program designed to teach the fundamentals of music in a serious yet lighthearted manner. It gives you comprehensive lessons on such topics as note counting, key signatures, note recognition, measure practice and a sample Beethoven quiz. Parents and teachers can add to or modify the quizzes.
32K Tape or Disk required..$39.95

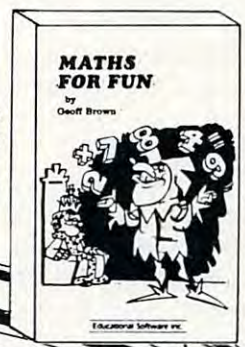
KIDS #1: Kids ages 4 to 10 can find lost treasures on a small island, do a math quiz, or talk to their Atari.
16K Tape or 24K Disk $14.95



Kids #2: A collection of 3 games designed to help your child's spelling skills. Includes a spelling bee, the Scrambler and Touch. For Kids 4 to 10.
16K Tape or 24K Disk $14.95



Marathon: Build mathematical skills using a challenging race against the computer or an opponent. Race through different levels of difficulty but watch out...one wrong move and your opponent can take the lead.
16K Tape or 24K Disk and joystick required..$19.95



Maths for Fun: Use inventive math games to make learning those ho-hum excercises fun.
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Proto's Fun Day - Proto will have an entertaining day with kids (ages 4 to 10) helping him match shapes, assemble new robots in Professor Von Chip's lab, and grow a blooming garden in two different ways. 16K Tape or 32K Disk $29.95

Cat in the Hat. So will R2-D2 and E.T.

Some of this new software will be junk: dull, of little educational value, using the big names (like E.T. or the Smurfs) only for the purpose of hooking the kids.

But there will also be a lot of good software. Its range and diversity will be breathtaking. And it will be fun *and* educational. Some of the new packages include *PLATO* software from Control Data Corporation; "Sesame Street" software from the Children's *Computer* Workshop (CCW is a spin-off from CTW, the Children's Television Workshop); "Dr. Seuss" software and games from Theodore Geiss and Coleco; electronic books from TI that read themselves (using TI's Magic Wand™ bar code reader); plus software from dozens of other major companies and institutions, including the Children's Capitol Museum in Washington, D.C., and Milton Bradley.

I'll review all of these major software products in this column and give prices and the names and addresses where the products can be obtained.

An Unparalleled Opportunity

The flood of programs for little kids is the cutting edge of the computer revolution. Programs for older kids and for adults will also have a powerful impact. But the impact on little kids will be the greatest.

Why? First, because they are little kids. Computers will be among the first things they see. Computer-assisted learning will be part of their earliest learning experience. It will affect *what* they learn and *how* they learn. It will shape kids' feelings about learning in general.

Second, up until now, most learning by little kids has been informal. Very few children today receive sustained, cumulative instruction before the age of five, when they are enrolled in kindergarten.

Soon all this is going to change. Four-year-olds, three-year-olds, two-year-olds, and kids even younger will sit down in front of their family computers and run exciting, fun programs that teach them things they otherwise wouldn't learn until they were twice as old. Or even older.

Third, much of this learning will be noninstitutional and extracurricular. Educational TV programs like *Sesame Street* made a stab at turning the home into a "learning center." Now computers and the new "toddler" software will make this possible. Formal learning at home will skyrocket. And it will be largely self-sustained and unsupervised. Parents will encourage their kids to run the programs. But the kids will either do it or not. The amount of learning that takes place will depend mostly on the kids themselves and on the quality of the software they are exposed to.

When this class of computer-literate kids enters the public school system, watch out. Each kid will test out at a different grade level *on different subjects*. The strain on public schools will be enormous. Parents will pressure schools to continue the individualized instruction that the children began at home on their computers. The schools will have to respond. Whether they want to or not, the public schools, from kindergarten up, will be forced to computerize their curriculums extensively. Otherwise, the teachers will be overwhelmed by too many kids operating at too many levels.

Millions of our youngest children will soon be exposed to computer software embodying all sorts of values.

What will be the outcome of all these changes in terms of children's values and the overall quality of their development? Millions of our youngest children will soon be exposed to computer software embodying all sorts of values. These values will affect the children's emotional disposition, their learning ability, and their social and spiritual development.

Little kids are especially vulnerable to new values. Their character still has not fully formed. And yet what supervision are these kids likely to get when they sit down at their computer and run these programs? What control will parents, and even teachers, have on the shape and scope of their kids' development?

I will deal with these important questions and others like them in future columns. Also, I'd like to hear from you readers. What are *your* views?

The Learning Center

What is the best way to teach little kids? Is it drill? Simulation? Invention? Discovery? Games? Or some combination?

The programs now appearing for children are based on one or more of the above learning philosophies. When you are selecting software for your kids, it's good to know which philosophy (or methodology) the software uses.

For each of the various philosophies, there are several good software packages. Drill is perhaps the oldest form of computer instruction. In recent years, drill programs have been maligned because they are said to be unimaginative, they don't take full advantage of the computer, and "they program kids, rather than the other way around."

The Light Pen at the Right Price:

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Less is more. This maxim has never been more true than now with the introduction of our new Edumate Light Pen. This affordable and reliable tool was originally designed and developed for use with our Learning Center educational software—however, it is the perfect accessory for your Atari 400/800, VIC-20 or Commodore 64, regardless of application. Response has been so overwhelming that we now announce a new price schedule for quantity orders:

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But drill programs have a place, especially when they are fun and exciting, and when they teach new facts and concepts.

One drill-type package I recommend is *The Learning Center*, written by Bruce Mitchell. Bruce and his wife Diane run the Small World kindergarten and preschool in Durham, North Carolina. Diane is one of Small World's teachers. Bruce and Diane also have two young sons. Bruce's programs are based on experiences with his sons, one of whom had a learning disability, and on several years experience with kids at Small World.

The programs are divided into three areas: Special Skills, Math and Number Skills, and Language Skills. The Special Skills section covers identification of colors, color names, and shape recognition and differentiation. The Math and Number Skills section covers counting, number recognition, addition and subtraction, and ones and tens. The Language Skills section includes programs for alphabet recognition, letter sequence, and symbol discrimination.

Children can interact with the programs using the computer keyboard or an inexpensive light pen sold by *The Learning Center*'s distributor, the Programmer's Institute. The programs are very friendly and easy to use. They are appropriate even for the youngest, non-reading children. My three-year-old, Eric, likes them a lot – especially the "Count with Me" program that lets him "count the monsters."

My only criticism is that the color program is sometimes not responsive to the light pen. I learned that this can be corrected by turning up my monitor's contrast control. The problem is present only in the Atari version and will be corrected with a new, more sensitive Atari light pen soon to be available from Programmer's Institute.

The Learning Center programs cost $74.95 for a cassette and $79.95 for a diskette. I have the version that runs on the Atari 400/800. I understand they also run on the VIC, the Commodore 64, the TRS-80 Model I, Model III, and Color Computer, the Apple, and the TI-99/4A.

The Edumate™ light pen costs $34.95. To find out more about the light pen and *The Learning Center* package, contact:

The Programmer's Institute
P.O. Box 3191
Chapel Hill, NC 27514
919-967-0861

KinderComp

Two other excellent software packages are *KinderComp* and *Rhymes & Riddles*, distributed by Spinnaker Software Corporation of Cambridge, Massachusetts. Both packages employ several teaching philosophies. They are so attractive and fun to use that they have captivated my entire family, including three-year-old Eric, seven-year-old Catie, and their parents.

Each package is $29.95. They are available for the Atari computers, the Apple II+ (48K, DOS 3.3) and IIe, and the IBM PC. Contact:

Spinnaker Software Corporation
215 First Street
Cambridge, MA 02142
617-868-4700

KinderComp was written by Doug Davis for his daughter Amy. The name makes it sound like a collection of arithmetic programs, but it is really six programs that teach a diverse group of numerical and alphabet-oriented skills.

One of the programs is called "Draw." It can be used by even the youngest children (say, kids under two). To work the program, the child twists a joystick and creates multicolored, musical pictures on the display screen.

My three-year-old had no problem using Draw to create all sorts of shapes. When I asked him to tell me what he was drawing, I was boggled. "Up here, Daddy," he said, "is an upside-down two. Over here is a house. These are steps. This is the roof. This here is the room where the doggie lives. This is a hotel. That's a big swimming pool. Over here is the fire escape. This green stuff is Hulk Grass. It's bigger than the hotel."

Draw is a super program because of its visual and auditory feedback, because it's so easy to use, and because it stimulates a child's manual dexterity, creativity, and artistic skills.

The other *KinderComp* programs are more focused and less open-ended. But they are original and exciting. "Scribble" amplifies and animates a child's random scribbles. "Names" turns a child's name into a fascinating sound and light show. (Boy, was I jealous when Eric turned his name into a hilarious musical cartoon. I never got that kind of reinforcement with my name "Fred.")

"Sequence" helps kids learn number sequence; "Letters" teaches them lowercase letters and the location of letters on the keyboard; and "Match" is a great pattern-matching game.

Both the *Learning Center* programs from Programmer's Institute and *KinderComp* from Spinnaker are valuable for the *specific* skills they teach young children. But they are equally valuable as "doorways" for children to enter the world of computers. Even the youngest children can use the computer for fun, purposeful activities that *they* control. They learn the computer keyboard. They learn how to manipulate and respond to material on the display screen. They learn how to operate the computer and run programs.

Computer skills still baffle and intimidate a large number of adults. People once believed that mastery of these skills required a college educa-

tion. Yet *The Learning Center* and *KinderComp* teach these skills to little kids who are still running around in diapers.

An important aspect of toddler software is the way it reinforces children's response – that is, the way it responds to kids' right and wrong answers. Both *The Learning Center* (*LC*) and *KinderComp* (*KC*) score high in this category. For right answers, *LC* gives a happy face and a happy tune; *KC* gives a happy face with a wink. For wrong answers, *LC* gives a sad face and a toot; *KC* gives a sad face crying a big tear.

I like both packages' responses to wrong answers because they are quickly over and do not intimidate a child. I like *KC*'s response very much because the computer doesn't show disapproval or anger when the child errs. Instead it becomes *sad*.

KC is good also because it gives the child hints when he is wrong, and eventually gives him the right answer. But after the child gets an answer wrong, he is not rewarded for later getting it right. This confused my son Eric. When he didn't get a happy face on the screen for an answer at which he had worked especially hard, he wilted a little bit.

On the other hand, *KC* is especially good because it lets the child follow his progress with a string of pluses (+) on the screen (one "plus" for each correct answer). And the child gets a special reward for answering a series of questions correctly. This feature made a big hit with Eric.

Last, I also recommend *Rhymes & Riddles*, another package from Spinnaker. *R&R* was written by a husband and wife team. The format is "updated, nonviolent Hangman." On the screen appear a bunch of dashes. The dashes represent missing letters. The child tries to guess the letters. By guessing all the letters, a child builds either 1) a nursery rhyme, 2) the answer to a riddle (Sample riddle: Why can't bikes stand up? Answer: Because they are *two* tired.), or 3) a famous saying.

If a child doesn't guess the right letters after a certain number of tries, she doesn't see some poor little man or woman get hanged. Instead, she builds a sad face, and the program displays the correct letters.

All three games (*The Learning Center*, *KinderComp*, and *Rhymes & Riddles*) help kids learn the computer keyboard, the letters of the alphabet, and the spelling of different words. The kids' learning is reinforced with colorgraphics pictures and musical segments taken from nursery rhymes and the children's songs.

Kids' Computer Magazines

Software for kids isn't the only thing that's happening. There are also a growing number of kids' computer magazines. Three good ones that I recommend are:

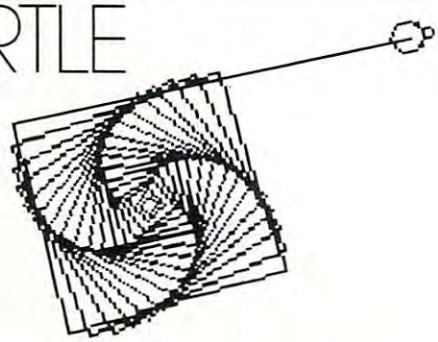
CompuKids ($16/year; $9/half-year) P.O. Box 874, Sedalia, MO 65301. Call (toll-free) 800-822-KIDS. Wide range of articles, tutorials, interviews, stories, puzzles, and games for kids just getting started in computers. Elementary school and junior high. Also, CompuKids Computer Club (for an additional $8/year).

Enter ($12.95/year) Children's Television Workshop, One Lincoln Plaza, New York, NY 10023. Call 212-595-3456. Like *CompuKids*, a wide range of articles, stories, puzzles, games, etc. Glossy, full-color format patterned after CTW's *Sesame Street* and *3-2-1 Contact* magazines. For kids seven and up.

Turtle News and *Logo Newsletter* (Kids $9/year; Adults $25/year) Young Peoples' Logo Association, 1208 Hillsdale Drive, Richardson, TX 75081. Call 214-783-7548. Focus on Logo, PILOT, and Turtle Graphics programming, but also features articles and programs in BASIC. Education, entertainment, and material to help kids with special needs. For kids seven and up.

All three of these magazines encourage kids to contribute articles, stories, and programs. C

FRIENDS OF THE TURTLE



David D. Thornburg, Associate Editor

Robots Are Turtles, Too

With the continuing development of excellent turtle graphics environments on every computer with a halfway decent display, it is easy to lose sight of the fact that the turtle was originally a computer-controlled robot. The power and ease of turtle graphics have allowed the screen-based progeny to totally eclipse their mechanical forebears.

While Friends of the Turtle supports and encourages the use of mechanical turtles such as the Big Trak and the Terrapin Turtle, we haven't received many comments from the users of these devices. Because of the recent entry of the Heath and Androbot robots (see this month's *Computers And Society* column), I think it is about time for us to make it clear that we will grow even more aggressive in our support of turtles – both mechanical and screen-oriented.

Although people who use turtles often share a common programming language, the interests of people who use one type of turtle are different from those who use the other. The speed, precision, color, and available complexity of a display turtle present challenges of a different sort from those of a mechanical, imprecise, and (relatively) slow robot. Where the user of screen turtles might be interested in the creation of landscapes, the user of a robot may be more interested in solving mazes.

Both people may use the same language (e.g., Logo) and computer system, but each has a different set of objectives. We want this column to be a comfortable home to *all* turtle users. You can help make it one by sharing your applications with us.

For example, one marvelous application for the Big Trak was developed by Katie Thornburg for use with school children between second and sixth grades. She uses several dozen pieces of 1 x 4 inch wood cut into 13-inch lengths (the length corresponding to one forward unit of Big Trak motion). She places these pieces of wood on a 4 x 8-foot sheet of pegboard to create a maze that each child must "program" his or her way out of.

By having the constraints of a maze (rather than a more general problem, such as moving in a square path), the children are highly motivated to create error-free programs. Additional challenges can be created by having two teams race against each other, or by having each of two teams construct a maze to be solved by the other team. This inexpensive addition to the Big Trak has greatly increased the value of this tool in the computer classroom.

Turtles At The CES

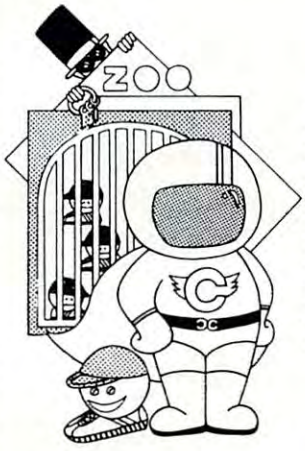
There were at least three things I saw at the Winter Consumer Electronics Show that are of value to friends of the turtle. The first of these was the introduction of the Mattel Aquarius computer (currently selling for under $170) with an under $100 Logo cartridge. While the graphics resolution on this computer isn't tremendous, I was impressed by the fact that Mattel's Logo was developed by The LISP Company. Since Logo is a user-friendly version of LISP (*LIS*t *P*rocessing), I felt comforted to know that this would not be a pure turtle graphics package passing itself off as Logo.

The second delight was a preview of a forthcoming turtle graphics package for the Commodore 64 from HES. I am very impressed with this program. Once I get a copy, I will review it in this column.

The third development of interest was the introduction of a new company, Androbot. This company, founded by Atari founder Nolan Bushnell, introduced a computer-operated robot named TOPO and a self-contained android named B.O.B. (Brains On Board). TOPO is described in this month's *Computers And Society* column, so I won't say any more about it here.

B.O.B. is a thoroughly engaging creation programmed to "seek" people out and initiate "conversations" with them. To help with this task, B.O.B. sports five Polaroid ultrasonic position sensors to map the environment, and two IR

NEXA presents

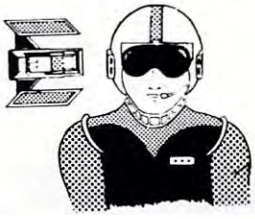


Captain Cosmo is an exciting fast-action video arcade game. It can be played by 1 to 4 players and has 99 skill levels. Try it and you can't let go!

Requires Atari 400/800 with 32K Joysticks, and a Disk Drive.

Delta Squadron is a strategic war game that really puts you in the pilot's seat. With this game you will experience the thrill and excitement of a real space pilot. **Delta Squadron** is a "must" for all strategic game enthusiasts, and a change of pace for those who wants a challenge!

Requires 64K Apple II with DOS 3.3 and paddle.



Superbowl Football is a realistic football game. You can design your own plays and has thousands of defensive and offensive plays. This is the ultimate in computer football games.

Requires Atari 400/800 with 48K, a Disk Drive and Joysticks.

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Each of the PDI Preschool Challengers develops critical pre-reading skills in the 3-6 year old— shape and letter recognition, number concepts, listening skills, spacial relationship, classification and eye/hand coordination.

At the same time, they fascinate and delight the child hour after hour with lovable, interactive playmates.

All PDI Preschool Challengers feature brilliant graphics, color, music and exciting sound effects, and some have voice narrations.

Available 16K ATARI (Cassette w/joystick) and 24K ATARI (Disk w/joystick) Preschool IQ Builder 1 available on 32K APPLE (Disk).

THE ADVENTURES OF OSWALD
Using the joystick, your child helps Oswald climb, run and jump through two different adventures. Includes "Oswald and the Golden Key" in which Oswald eludes a pesky ghost.

SAMMY THE SEA SERPENT
Features three story adventure games in which Sammy gets into a lot of tight spots—including finding his way back to the sea.

HERE COMES VIOLET
Violet (her name *and* color!) has a real problem—she's the cutest monster ever seen, *BUT* she wants to be ugly so she can scare people. A delightful interactive adventure.

PRESCHOOL IQ BUILDER 1
A stimulation program in two parts.
a. Decide if pairs of figures are similar or not.
b. Match the letter on the screen with the correct one on the keyboard.

PRESCHOOL IQ BUILDER 2
The face on the screen sings a happy song when the correct match is made between letters, numbers, symbols or words. 6 levels of difficulty.

Available at leading stores or direct from PDI.

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Program Design, Inc, 11 Idar Court, Greenwich, CT 06830

sensors to find people (and other warm bodies such as stoves, spotlights, etc.). These sensors feed information to a central computer that uses three 8088 processors with up to 3 M bytes of RAM.

What makes B.O.B. so interesting is its potential to dynamically program itself. In principle, B.O.B. can make a map of a room and develop an optimal path for performing some task, such as vacuuming a rug.

B.O.B. charmed everyone who saw it – especially when it became clear that no one knew exactly what B.O.B. was going to do next, or how it was going to get out of a jam.

Androids using adaptive programming techniques represent the next generation of robots. If you write programs using a list processing language such as Logo, you have all the tools you need to develop adaptive programs yourself.

Robots can (and will) be very sophisticated in the near future. But they are a lot of fun as well. So don't forget that Friends of the Turtle is a place for ideas on both screen and mechanical turtles.

Let me hear from you!

Friends of the Turtle
P.O. Box 1317
Los Altos, CA 94022

Sinclair/Timex
Guess That Animal

Ralph Kennedy

This article adapts a previously published **COMPUTE!** *program to the Sinclair ZX-81. It is also a brief tutorial on the special features of the ZX-81's BASIC, showing how you can reload programs without losing data previously saved. The program requires 16K.*

This is an adaption for the Sinclair ZX-81 of Daniel Hastie's "Guess that Animal!" program, which appeared in the August 1982 issue of **COMPUTE!**. The 16K RAM pack is required.

The most significant difference between Hastie's versions (for PET and Atari) and the ZX-81 version is that no data tapes are used. The ZX-81 is not equipped to read or write such tapes, but it does save all variables and arrays when it saves programs. This means that if you play the game for a while and then save the program, it will be more "knowledgeable" when it is reloaded than it was in its pristine state.

Saving The Program

Incidentally, on those occasions when you have no need of a record of the values of the variables in a program you are saving, you can save an amount of time roughly proportional to the amount of memory set aside for variables and arrays simply by entering CLEAR before saving the program.

When you have typed this program into your ZX-81 and have assured yourself that all is well with it, enter CLEAR and save the program once so that you have on tape a reasonably quick-loading version without variables. Later, after you've played the game for some time and want to save program and data, simply respond with a N to the question "Would you like to try again?" and you will then see instructions on saving the data.

A version saved in accordance with these instructions will begin running automatically when it is loaded back into the computer. If you save the program by stopping it and entering SAVE, be sure to start it using GOTO START when you reload. Using RUN will wipe out all the data you spent so much time saving and loading.

ZX-81 BASIC Special Features

Two rather nice features of the ZX-81's BASIC are exploited in this program to aid in documentation and in ease of use. These are (1) its acceptance of long variables (with all characters being significant), and (2) its acceptance of such commands as GOTO MEMCHECK, GOSUB TRUNCATE, etc.

These features enable a programmer to write a well-documented program with fewer REM statements than would otherwise be needed, since lines like 467 GOTO MEMCHECK are reasonably self-documenting. They also make possible the use, mentioned above, of GOTO START to start a program without losing data or, when CONT doesn't work, to get back into a stopped program at the right place and without losing data.

Finally, these special features enable the programmer during debugging to use such commands as LIST GET or LIST ASK to list sections of the program where problems are suspected. All this can be quite handy for those whose memory for numbers leaves something to be desired. Just be sure that the first thing your program does is define the relevant variables, and you're in business.

Note: Underlined characters should be entered in *inverse video*.

```
10 PRINT "IF YOU HAVE USED RUN, ALL BUT S
   TARTER DATA HAVE BEEN LOST."
20 PRINT
30 PRINT "PRESS BREAK, RELOAD, AND USE GO
   TO START IF YOU WANT TO USE OLD D
   ATA."
40 PRINT
50 PRINT AT 10,0;"IF YOU ENTER AN ANIMAL ~
   OR A QUESTION INCORRECTLY,"
60 PRINT "YOU CAN CORRECT YOUR MISTAKE BY
    ENTERING ""S"" IMMEDIATELY."
70 PRINT "YOU WILL THEN BE GIVEN A CHANCE
    TO MAKE A NEW ENTRY."
80 PRINT AT 21,0;"PRESS N/L TO START."
85 PAUSE 3E4
90 FAST
100 REM *GUESS THAT ANIMAL*
110 REM
170 REM **READ STARTER DATA**
180 GOSUB 900
240 REM ** START GAME **
250 CLS
260 PRINT "THINK OF AN ANIMAL, AND I WILL ~
   TRY TO GUESS IT."
280 PRINT AT 21, 0; "PRESS N/L WHEN READY.
   "
290 PAUSE 3E4
```

```
295 CLS
300 REM ** SET UP ANSWER STRING AND POINTE
    R **
310 LET C$=""
320 FOR Z=1 TO NS
322 GOSUB ASK
324 NEXT Z
328 REM SEARCH FOR MATCH
330 LET K=LEN C$
333 FOR I= NS+1 TO N
337 IF T$(I, TO K) =C$ THEN GOTO 350
340 NEXT I
341 REM NO MATCH FOUND
342 GOTO 450
344 REM MATCH FOUND
350 LET Z=I
352 LET I=N
354 NEXT I
360 GOSUB ASK
362 GOTO 330
365 REM
440 REM
450 REM *GUESSED IT OR GIVE UP*
460 IF A$="Y" THEN PRINT G$
465 IF A$="Y" THEN GOTO 700
467 GOTO MEMCHECK
470 PRINT "I GIVE UP, WHAT IS IT?"
475 INPUT M$
480 IF M$ ="" THEN GOTO 475
482 IF LEN M$>=35 THEN PRINT "TOO LONG. MO
    DIFY NAME"
483 IF LEN M$>=35 THEN GOTO 475
485 PRINT "          ";M$
490 PRINT
495 LET H$=Q$(Z)(7 TO )
497 GOSUB CLEAR SCREEN
500 PRINT "WHAT WOULD BE A GOOD QUESTION T
    O TELL THAT FROM "; H$
520 INPUT N$
521 IF N$="S" THEN GOTO 5010
523 IF N$="" THEN GOTO 520
525 IF LEN N$>45 THEN PRINT "QUESTION IS T
    OO LONG. TRY ANOTHER"
527 IF LEN N$>45 THEN GOTO 520
530 IF N$(LEN N$)< > "?" THEN LET N$=N$+"?
    "
532 GOSUB CLEAR SCREEN
533 PRINT N$
535 PRINT
540 PRINT "WHAT WOULD BE THE ANSWER FOR ";
     M$;"?";" ";
550 GOSUB GET
560 LET R$=INKEY$
565 IF R$< >"S" AND R$< > "Y" AND R$ < > "
    N" THEN GOTO 550
567 IF R$="S" THEN GOTO 5040
570 PRINT ("YES" AND R$="Y")+("NO" AND R$=
    "N")
575 PAUSE 60
580 PRINT
600 REM
610 REM * REPLACE FINAL GUESS WITH NEW QUE
    STION *
625 LET Q$(Z)=N$
650 REM * ADD OLD AND NEW FINAL GUESSES *
655 LET X$=T$(Z)
660 GOSUB TRUNCATE
665 LET T$(N+1)=T$(Z, TO K)+"Y"
670 LET T$(N+2)=T$(Z, TO K)+"N"
675 LET Q$(N+1)="IS IT "+(M$ AND R$="Y")+(
    H$ AND R$="N")+"?"
680 LET Q$(N+2)="IS IT "+(M$ AND R$="N")+(
    H$ AND R$="Y")+"?"
690 LET N=N+2
695 GOSUB CLEAR SCREEN
700 PRINT "WOULD YOU LIKE TO TRY AGAIN?"
710 GOSUB GET
740 LET A$=INKEY$
750 IF A$="Y" THEN GOTO 250
760 IF A$< >"N" THEN GOTO 710
800 CLS
810 PRINT "READY TAPE RECORDER FOR SAVE."
820 PRINT
830 PRINT "PRESS PLAY AND RECORD, AND THEN
     N/L TO SAVE PROGRAM AND DATA."
840 PAUSE 4E4
850 SAVE "GUESS THAT ANIMAL"
860 CLS
870 GOTO 240
900 REM ** INITIALIZE VARIABLES WITH START
    ER DATA **
905 CLEAR
910 DIM T$(101,20)
920 DIM Q$(101,45)
930 LET START=240
940 LET ASK=1350
950 LET TRUNCATE=1510
960 LET CLEAR SCREEN=2000
970 LET MEMCHECK=2510
980 LET GET=3010
1010 LET N=11
1020 LET NS=3
1030 LET T$(1)="S"
1040 LET T$(2)="S"
1050 LET T$(3)="S"
1060 LET T$(4)="NNN"
1070 LET T$(5)="NNY"
1080 LET T$(6)="NYN"
1090 LET T$(7)="NYY"
1100 LET T$(8)="YNN"
1110 LET T$(9)="YNY"
1120 LET T$(10)="YYN"
1130 LET T(11)="YYY"
1140 LET Q$(1)="DOES IT HAVE FOUR FEET?"
1150 LET Q$(2)="IS IT DOMESTIC?"
1160 LET Q$(3)="DOES IT EAT MEAT?"
1170 LET Q$(4)="IS IT A WORM?"
1180 LET Q$(5)="IS IT AN EAGLE?"
1190 LET Q$(6)="IS IT A CHICKEN?"
1200 LET Q$(7)="IS IT A MAN?"
1210 LET Q$(8)="IS IT AN ELEPHANT?"
1220 LET Q$(9)="IS IT A WOLF?"
1230 LET Q$(10)="IS IT A COW?"
1240 LET Q$(11)="IS IT A DOG?"
1250 LET G$="GOOD, I GUESSED IT."
1280 RETURN
1290 REM
1295 REM
1349 REM PRINTS QUESTIONS AND GETS ANSWERS
1350 GOSUB CLEAR SCREEN
1360 PRINT Q$(Z);" ";
1370 GOSUB GET
1410 LET A$=INKEY$
1420 IF A$="Y" OR A$="N" THEN GOTO 1440
1430 GOTO 1370
1440 LET C$=C$+A$
1450 PRINT ("YES" AND A$="Y")+("NO" AND A$=
    "N")
1460 RETURN
1470 REM
1480 REM
1500 REM TRUNCATE (FINDS LAST NONSPACE)
```

```
1510 FOR K=1 TO LEN X$
1520 IF X$(K)=" " THEN GOTO 1540
1530 NEXT K
1540 LET K=K-1
1550 RETURN
1999 REM CLEAR SCREEN WHEN FULL
2000 IF PEEK 16442<=5 THEN CLS
2010 RETURN
2020 REM
2500 REM MEMCHECK
2510 GOSUB CLEAR SCREEN
2520 IF N<=99 THEN GOTO 470
2530 CLS
2540 PRINT "NO ROOM FOR NEW ANIMALS."
2550 PRINT AT 5,10; "MENU"
2560 PRINT AT 10, 0; "1. ERASE CURRENT ANI
    MALS AND START OVER."
2570 PRINT "2. CONTINUE PLAYING WITH CURRE
    NT FILE."
2580 PRINT "3. SAVE CURRENT FILE."
2590 PRINT "4. FINISH."
2600 PRINT AT 21,0; "ENTER OPTION NUMBER."
2610 LET A$=INKEY$
2630 IF A$="1" THEN GOTO 180
2640 IF A$="2" THEN GOTO START
2650 IF A$="3" THEN GOTO 800
2660 IF A$="4" THEN STOP
2670 GOTO 2610
3000 REM WAIT TO GET SINGLE CHARACTER FROM
      KEYBOARD
3010 SLOW
3020 IF INKEY$< >"" THEN GOTO 3020
3030 IF INKEY$ = "" THEN GOTO 3030
3040 FAST
3050 RETURN
3060 REM
3070 REM
5000 REM CORRECTIONS
5010 CLS
5015 PRINT "ENTER NEW ANIMAL."
5020 INPUT M$
5030 GOTO 482
5040 CLS
5042 PRINT "ENTER NEW QUESTION."
5045 FAST
5050 INPUT N$
5060 GOTO 525
```

VIC Kaleidoscope

Alan W. Poole

Try VIC Kaleidoscope. You'll find the colors and music mesmerizing. And you can freeze the display and turn the sound off as you please. For any size VIC.

This program produces an endless display of colorful patterns, along with "music" related to the pattern being drawn. If you see a design that is especially pleasing, press the space bar to freeze the picture. Press the space bar again to restart the kaleidoscope. Press the S key to turn the sound on or off.

Variables

A: Used in the MOD function and used as the address to plot a square

B: Used in the MOD function

C: Color number

CC: Color number for border

I, J: Loop counters

K$: Key pressed

N: Number of function being used to calculate coordinates of points

R: Random number

S: Kaleidoscope stopped flag. 1 = kaleidoscope going, 0 = kaleidoscope stopped

S1: Speaker address

SA: Screen memory starting address

SD: Sound flag. 1 = sound on, 0 = sound off

X, Y: Position to plot a square

```
20 GOSUB5000
97 REM
98 REM *** MAIN LOOP ***
99 REM
100 FORI=0TO999999
110 FORJ=0TO10
120 ONNGOSUB500,550,600,650,700,750
129 REM PLOT POINTS
130 A=SA+22*Y+X:POKEA,160:POKEA+30720,C
140 A=SA+22*(21-Y)+X:POKEA,160:POKEA+30720
    ,C
150 A=SA+22*Y+21-X:POKEA,160:POKEA+30720,C
160 A=SA+22*(21-Y)+21-X:POKEA,160:POKEA+30
    720,C
170 A=SA+22*X+Y:POKEA,160:POKEA+30720,C
180 A=SA+22*X+21-Y:POKEA,160:POKEA+30720,C
190 A=SA+22*(21-X)+Y:POKEA,160:POKEA+30720
    ,C
200 A=SA+22*(21-X)+21-Y:POKEA,160:POKEA+30
    720,C
205 GETK$:IFK$="S"THENSD=1-SD:IFSD=0THENPO
    KEV,0
210 IFSD=0THEN230
220 POKES1,128+(X+Y)*2.8:POKEV,15
230 IFK$=" "THENS=1-S
235 IFS=0THENPOKEV,0:GETK$:GOTO230
239 REM RANDOMLY CHANGE COLOR, FUNCTION, A
    ND BORDER
240 IFRND(1)<.1THENC=INT(RND(1)*8)
270 IFRND(1)<.07THENN=INT(RND(1)*6+1)
275 IFRND(1)<.065THENGOSUB1000
280 NEXT:NEXT:END
497 REM
498 REM *** FUNCTIONS TO CALCULATE POINTS ~
    ***
499 REM
500 B=15:X=FNMOD(ABS(I-SGN(J-6)*(J+2)))
510 B=21:Y=FNMOD(J*J+2*J+7)
520 RETURN
550 B=18:X=FNMOD(I*J)
560 B=12:Y=FNMOD(ABS(ABS(I-ABS(2*I-2*J))))
570 RETURN
600 B=20:X=FNMOD(I)
610 B=20:Y=FNMOD(J)
620 RETURN
650 B=12:X=FNMOD(ABS(Y-J))
660 B=20:Y=FNMOD(ABS(2*J-ABS(I-ABS(2*I-J))
    )+RND(1)*3)
670 RETURN
700 B=16:X=FNMOD(ABS(I-SGN(J-10)*J))
710 B=21:Y=FNMOD(I*J)
720 RETURN
750 B=22:X=FNMOD(ABS(3*J-ABS(2*I-ABS(2*I-J
    ))))
760 B=22:Y=FNMOD(ABS(2*J-ABS(2*X-ABS(2*X-J
    ))))
770 RETURN
997 REM
998 REM *** CHANGE BORDER COLOR ***
999 REM
1000 CC=INT(RND(1)*7)
1010 POKE36879,PEEK(36879)AND248ORCC
1020 POKE646,CC
1029 REM CHANGE 23RD ROW TO MATCH BORDER
1030 PRINT"{HOME}{22 DOWN}";
1040 PRINT"{REV}                    ";
1045 POKESA+505,160:POKESA+31225,CC
1050 RETURN
4997 REM
4998 REM *** INITIALIZATION ***
4999 REM
5000 PRINT"{HOME}{CLEAR}":POKE36879,8
5010 PRINTTAB(5)"{RED}K{CYN}A{PUR}L{GRN}E{
    BLU}I{YEL}D{WHT}O{RED}S{CYN}C{PUR}O{G
    RN}P{BLU}E"
5020 PRINT:PRINT:PRINT"{GRN}PRESS SPACE
    BAR TO FREEZE KALEIDOSCOPE"
5025 PRINT:PRINT"PRESS SPACE BAR AGAIN TO
    CONTINUE"
```

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```
5030 PRINT:PRINT"PRESS S TO TURN OFF   SOUN
    D"
5035 PRINT:PRINT"PRESS S AGAIN TO TURN SOUN
    D BACK ON"
5040 PRINT"{04 DOWN}"
5050 PRINT"{WHT}PRESS RETURN TO BEGIN";
5060 GETK$:R=RND(1):IFK$<>CHR$(13)THEN5060
5070 R=RND(R*1000)
5080 SD=1:S=1:N=INT(RND(1)*5+1):C=INT(RND(1
    )*7+1)
5090 PRINT"{CLEAR}"
5100 SA=4*(PEEK(36866)AND128)+64*(PEEK(3686
    9)AND112)
5110 S1=36876:V=36878
5120 DEFFNMOD(A)=INT((A/B-INT(A/B))*B+.05)*
    SGN(A/B)
5130 RETURN                                  ©
```

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INSIDE THE VIC

By: Don French

THE BOOK

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Instant Commodore 64 Art

Bob Urso

Both of these Commodore 64 graphics programs – one random, the other user-controlled – create impressive, handsome designs.

Anyone seeing your 64 while you're running one of these two programs might think that you've just looted the Museum of Modern Art. Each program lets you create colorful and expressive graphics on your Commodore 64.

Program 1 is a totally random graphics routine. Color, direction, and symbol selection are done in lines 30-89. POKEing in the symbol and updating its position for the next cycle are handled by line 90. Lines 95 and 96 limit the design to the screen area.

The time (line 11) is set at 1000 to clear the screen after it fills up a bit. You can increase T to let your design become more complicated; or you can eliminate lines 11 and 99-120, and the graphics will fill your screen until the next power outage.

The second program is called "Sketch-0"; it lets *you* do the designing. You can change the colors by pressing the color keys without having to press CONTROL. The symbol select keys are grouped to the left so that they do not interfere with your direction selection keys.

You can move in eight directions, allowing for diagonal, as well as horizontal and vertical, lines. Once you press a direction key, the design will continue to print in that direction until it reaches the edge of the screen, or until you press any of the other keys to stop it.

It's doubtful that you'll ever make a Rembrandt jealous, but you should be more than rewarded for the short time it takes to type these programs.

Program 1: Random Graphics Routine

```
10 REM RANDOM  DOODLE
11 T=1000
15 PRINT"{CLEAR}"
17 POKE53280,0:POKE53281,0
20 P=1024+INT(RND(1)*999)+1:G=P+54272
30 Z=INT(5*RND(1))+1
40 IFZ=1THENS=81
41 IFZ=2THENS=64
42 IFZ=3THENS=84
43 IFZ=4THENS=102
44 IFZ=5THENS=160
45 K=INT(8*RND(1))+1
50 IFK=1THENC=9
51 IFK=2THENC=1
52 IFK=3THENC=2
53 IFK=4THENC=3
54 IFK=5THENC=4
55 IFK=6THENC=5
56 IFK=7THENC=6
57 IFK=8THENC=7
80 D=INT(8*RND(1))+1
81 IFD=1THENR=-39
82 IFD=2THENR=-40
83 IFD=3THENR=-41
84 IFD=4THENR=-1
85 IFD=5THENR=1
86 IFD=6THENR=39
87 IFD=7THENR=40
88 IFD=8THENR=41
89 M=INT(40*RND(1))+1
90 FORZ=1TOM:POKEP,S:POKEG,C:P=P+R
95 IFP<=1024THENP=P-R
96 IFP>=2023 THEN P=P-R
97 G=P+54272
99 T=T-1
100 IFT=0THENGOTO10
110 PRINT"TIME";T
120 PRINT"{03 UP}"
1101 NEXTZ
1110 GOTO30
```

Program 2: Sketch-0

```
10 REM SKETCH-0
20 P=1524:S=160:C=1
90 POKE53280,0:POKE53281,0
95 GOTO1000
99 PRINT"{CLEAR}"
100 G=P+54272
200 POKE P,S :POKEG,C
300 GET G$:IFA$<>G$ANDG$<>""THENA$=G$
310 IFA$="I"THENP=P-40
320 IFA$="U"THENP=P-41
330 IFA$="O"THENP=P-39
340 IFA$="J"THENP=P-1
```

Four smart ways to make your Atari 400/800, TRS-80 COLOR, VIC-20 and Commodore 64 much more intelligent.

1

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2

The Tax Handler makes April 15th just another day. This is the perfect complement to our Color Accountant. The Tax Handler will help prepare your tax returns and probably save you money. Included are:

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3

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4

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```
350 IFA$="K"THENP=P+1
360 IFA$="N"THENP=P+39
365 IFA$="M"THENP=P+40
370 IFA$=","THENP=P+41
380 IFA$="1"THENC=0
390 IFA$="2"THENC=1
400 IFA$="3"THENC=2
410 IFA$="4"THENC=3
420 IFA$="5"THENC=4
430 IFA$="6"THENC=5
440 IFA$="7"THENC=6
450 IFA$="8"THENC=7
460 IFA$="Q"THENS=81
470 IFA$="A"THENS=64
480 IFA$="Z"THENS=66
490 IFA$="W"THENS=102
500 IFA$="S"THENS=160
510 FORZ=1024TO1984STEP40:IFP=ZTHENP=P+1
530 IFP<1024THENP=P+40
540 IFP>2023THENP=P-40
550 GOTO 100
1000 PRINT"{CLEAR}":PRINT"{02 DOWN}      DOO
     DLE":PRINT"{DOWN}"
1010 PRINT"HERE ARE THE SYMBOLS YOU CAN PRI
     NT"
1020 PRINT"    PRESS Q FOR Q"
1021 PRINT"    PRESS A FOR C"
1022 PRINT"    PRESS Z FOR B"
1023 PRINT"    PRESS W FOR &"
1024 PRINT"    PRESS S FOR {REV} {OFF}"
1030 PRINT"{GRN}TO CHANGE COLORS PRESS 1 TH
     RU 8"
1040 PRINT"FOR THE COLOR INDICATED ON THE K
     EY":PRINT"{DOWN}"
1070 PRINT"TO MOVE YOUR SYMBOL PRESS"
1080 PRINT"           U   I   O"
1090 PRINT"            M ↑ N"
1100 PRINT"          J← Q @K"
1110 PRINT"            N B M"
1120 PRINT"            N   M   ,"
1130 PRINT"{PUR}TO STOP SYMBOL PRESS ANY CO
     LOR KEY"
1150 PRINT"FINISHED WITH INSTRUCTIONS? PRES
     S Y"
1160 INPUTR$:IF R$="Y" GOTO 99
```

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Graphics On The Sinclair/Timex

Derek Stubbs

This short guide to the graphics capabilities of Sinclair/Timex computers demonstrates pattern creation, circles, conic sections, and bar graphs. To show how graphics can be used in games, there is "Asterbelt," which will test your abilities as a spaceship pilot.

One great advantage of a computer over most calculators is that a computer can handle letters as well as numbers and can give a graphic output. You possibly bought your ZX/TS hoping to produce some fabulous graphics. If you did, you were soon disappointed by two things: the manual says little about graphics, and computer magazines often contain programs with graphics commands that you cannot use, such as HPLOT, SET, RESET, DRAW, and XDRAW.

Don't be worried. The ZX/TS has lots of graphics capability. My favorite is the unique graphic symbol facility. It can print a million-million different patterns. They each remind you of an Indian blanket, or an urban landscape, or the tiles in an oriental design. Sometimes a striking 3-D pattern emerges.

Program 1 generates a random string of graphic symbols (lines 10-40) and then prints and reprints them until the screen is full (lines 50-110). After a pause of four seconds (line 200), a new pattern is generated. Experiment by reducing the string-length of 11 in lines 10, 20, and 60.

Figures And Graphs

To many people, graphics means geometric figures. A simple program (Program 2A) will draw a circle of radius R and center X,Y. The speed of plotting and the interval between points depend on I. You should experiment with values of R, X, Y, and I before going on to a more fascinating plot (Program 2B). Start with R=X=Y=15 and I=.2.

Now you will see how Program 2B – which I call "Figures" – will print all kinds of conic sections (circles, ellipses, parabolas, and hyperbolas) and all kinds of lissajous figures (weaves, pretzels, and figures of eight). The interesting thing is that Program 2B is only one line longer than Program 2A – yet it is far more versatile.

A third graphics feature that has many uses is a simple graphic plot of data. Program 3, "Graphs," will plot any mathematical function that you input, as A$. It always fits on the screen because you define the limits, XMIN and XMAX.

If you need to plot a bar graph, Program 4 will be adequate. Typically, such a graph is used to plot "time-data" such as "sales per month" or "bushels of corn per year." Also you might use it for "frequency" data like "how many people weighing 50-100 lbs., 100-150 lbs. and so on." Program 4 allows you to plot and label the axes and bars so that you can understand how to mix the PRINT and PLOT commands to get a good screen. Instead of printing I in line 170, you can print another label such as the time or interval concerned; call it C$ and INPUT it at line 135.

The ultimate graphics program is the moving graphics game. You'll have fun with Asterbelt (Program 5). You're the captain of a spaceship denoted by an asterisk at coordinates X, Y. You can drive it to port or starboard by pressing P or S. A thousand asteroids appear as blobs (subroutine 1000). If you collide with an asteroid, a flash occurs as you destroy it with your hyperspace shields; and you move on through the exploded remnants (subroutine 2000).

You can make it harder by having only two squares between you and the next asteroid to appear. You can adapt subroutine 2000 to keep a count of your collisions. Warning: in the non-play mode, the screen clears very slowly.

Program 1: Random Symbols

```
1 REM ***A MILLION-MILLION PATTERNS
10 DIM G(11)
20 FOR I=1 TO 11
30 LET G(I)=128+INT(RND*12)
40 NEXT I
50 LET C=0
60 FOR I=1 TO 11
70 PRINT CHR$ G(I)
80 NEXT I
90 LET C=C+1
```

```
100 IF C>60 THEN GOTO 200
110 GOTO 60
200 PAUSE 240
210 CLS
220 GOTO 20
```

Program 2A: Circle

```
1 REM***CIRCLE***
10 INPUT R
20 INPUT X
30 INPUT Y
40 INPUT I
50 LET T=0
60 PLOT X+R*COST,Y+R*SINT
70 LET T=T+1
80 IF T>2*PI THEN STOP
90 GOTO 60
```

Program 2B: Figures

```
1 REM *** FIGURES***
10 DIM A(4)
20 FOR I=1 TO 4
30 LET A(I)=25*RND
40 NEXT I
50 FOR N=0 TO 100
60 PLOT A(1)-A(1)*COS(N/A(2)),A(3)-A(3)
   *SIN(N/A(4))
70 NEXT N
80 PAUSE 240
90 CLS
100 GOTO 10
```

Program 3: Graphs

```
1 REM***GRAPHS***
10 INPUT XMIN
20 INPUT XMAX
30 INPUT A$
40 LET X=XMIN
50 LET YMIN=VAL A$
60 LET X=XMAX
70 LET YMAX=VAL A$
80 IF YMAX<YMIN THEN GOSUB 5000
90 LET XL=XMAX - XMIN
100 LET YL=YMAX - YMIN
110 GOSUB 1000
120 GOSUB 2000
130 STOP
1000 FOR I=0 TO 63
1010 PLOT I,0
1020 NEXT I
1030 FOR I=0 TO 43
1040 PLOT 0,I
1050 NEXT I
1060 RETURN
2000 FOR X=XMIN TO XMAX STEP XL/63
2010 LET Y=VAL A$
2020 PLOT (X-XMIN)*63/XL,(Y-YMIN)*43/YL
2030 NEXT X
2040 RETURN
5000 LET U=YMIN
5010 LET V=YMAX
5020 LET YMAX=U
5030 LET YMIN=V
5040 RETURN
```

Program 4: Bar Graphs

```
1 REM***BAR GRAPHS***
10 PRINT "NUMBER OF BARS (<=20)?"
20 INPUT B
30 PRINT "HEIGHT OF TALLEST BAR?"
40 INPUT HMAX
50 PRINT "LABEL ON X-AXIS?"
60 INPUT A$
70 PRINT "LABEL ON Y-AXIS?"
80 INPUT B$
100 CLS
110 GOSUB 1000
120 FOR I=1 TO B
130 INPUT H
140 FOR J=2 TO 43*H/HMAX
150 PLOT (I*63/J),J
160 NEXT J
170 PRINT AT 21,31*I/B;I
180 NEXT I
190 STOP
1000 FOR I=0 TO 63
1010 PLOT I,2
1020 NEXT I
1030 PRINT AT 21,(31-LEN A$);A$
1040 FOR I=2 TO 43
1050 PLOT 0,I
1060 NEXT I
```

Program 5: Asterbelt

```
1 REM***ASTER-BELT***
10 DIM A(1000)
20 LET X=9
30 LET Y=6
40 GOSUB 1000
50 LET A(1)=J
60 GOSUB 1000
70 LET A(2)=J
80 FOR N=4 TO 1000
90 PRINT AT X<Y;"*"
100 IF Y=A(N-3) THEN GOSUB 2000
110 GOSUB 1000
120 LET A(N)=J
130 IF INKEY$="P" THEN LET Y=Y-1
140 IF INKEY$="S" THEN LET Y=Y+1
150 NEXT N
1000 LET J=INT(30*RND)
1010 PRINT AT 12,J;" "
1020 SCROLL
1030 RETURN
2000 FAST
2010 FOR M=1 TO 15
2020 LET R=3*RND
2030 LET T=2*PI*RND
2040 PRINT AT X+R*COST,Y+R*SINT;"."
2050 NEXT M
2060 SLOW
2070 RETURN
```

MACHINE LANGUAGE

Jim Butterfield, Associate Editor

Part I

NUMERIC OUTPUT

Outputting strings from machine language is no problem. The programmer takes the characters from memory and sends them out. Numbers need more work: the binary values must be changed to ASCII characters which must be sent out one at a time.

An added complexity is format: numbers often need to be carefully formed into a specific number of characters, so that they will print neatly in columns. Zero suppression is often desirable, so that a number such as 00204 will print as 204. Some of these jobs are fairly straightforward mechanical tasks; the hardest part is often the math routine which is needed to break up a binary number into several digits.

Single Digits

Binary values of zero to nine are easy. All we need to do is to change them to ASCII before sending them out.

We've mentioned before that ASCII represents the character zero, for example, as hexadecimal 30, decimal 48. PRINT CHR$(0) will not print a zero character – indeed, it won't print anything – so that we must do the job with PRINT CHR$(48). So, to print a binary zero, we must change it to hex 30, binary one must be changed to hex 31, and so forth, up to binary 9 changing to hex 39. Binary 10 is a different matter: we must make two digits out of it, one and zero. The easiest way to convert a single digit is with an ORA command: ORA #$30 will insert the desired high bits.

When we move on to more complex numbers, we'll need to remember that each digit, as we generate it, must be converted to ASCII before output.

Let's write a simple program to print several single numeric digits. We'll use $FFD2 for PRINT; this will work on all PET/CBM machines, VIC, and Commodore 64. Our coding goes:

```
      LDX  #$00    (start at zero)
LOOP  TXA          (move number to A)
      ORA  #$30    (convert to ASCII)
      JSR  $FFD2   (print it)
      INX          (go to next number)
      CPX  #$0A    (less than ten?)
      BCC  LOOP    (yes, print it)
      RTS
```

The output looks like a large number – the digits are printed side by side – but, in fact, it's ten independent digits.

As an exercise, let's convert the above program to BASIC POKEs and run it. Our BASIC equivalent goes:

```
100 DATA 162, 0,  138,  9,48
110 DATA 32,210,255,  232,  224,10
120 DATA 144,245,  96
200 FOR J=848 TO 861:READ X
210 POKE J,X:NEXT J
300 FOR J=1 TO 10:SYS 848:NEXT J
```

The first three lines give the machine language program in decimal. The individual instructions have been separated by spaces to make them more visible. Lines 200 and 210 POKE the program into the cassette area. Finally, line 300 invokes the machine language program ten times; you'll get a hundred digits printed.

Hexadecimal Output

Hex output, like input, is fairly easy. Hexadecimal might be viewed as a compact way of representing binary, and since the computer has binary, the conversion must be easy. It is. All we need to do is grab four bits at a time. Each group of four bits is a hex digit value, which can be converted to ASCII and then output. For example, a decimal value of 225 (hex E1) can be converted this way: take the high four bits, binary 1110, and convert and print as a hex character. That works out to a letter E. Now take the low four bits, binary 0001, and do the same, giving us the digit 1. We've printed E1, the hex value.

Let's get technical. How do we get the four high bits? By giving four shift-right instructions. The bits obligingly move over to the low order side, and zeros are left in the vacated space. Later, how do we get the four low bits? By taking the original value and performing an AND #$0F, which wipes out the high bits.

When the four-bit group is extracted, how do

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we change to ASCII? If the four-bit value is zero to nine, we can use the simple ORA #$30 as mentioned before. For the six high values, ten to fifteen (A to F), we would need to use arithmetic, usually the ADC command. Of course, we could bypass the whole question by setting up a table of digits and looking up each digit. Most programmers go for the arithmetic.

Multiple bytes are no problem for hex. We just convert them starting at the high order end: each byte generates two hex digits. Let's write a program to convert some memory bytes into hex and display them. First, a subroutine to convert and output a four-bit value in the A register as two hex digits:

```
HEXDIG CMP  #$0A     (alphabetic digit?)
       BCC  SKIP     (no, skip next part)
       ADC  #$06     (add seven)
  SKIP ADC  #$30     (convert to ASCII)
       JMP  $FFD2    (print it)
```

There are a couple of curious coding quirks above. We need to add seven to the alphabetics: why does the coding say ADC #$06? Because the carry bit is set, that's why. Adding six plus a carry makes a total increase of seven. Another oddity: the subroutine doesn't return with RTS. Instead, it goes to another subroutine; when the other subroutine (FFD2) returns, it will return directly to the caller.

Now an outer subroutine. This one breaks a byte in the A register into two four-bit numbers and prints the two digits. It uses HEXDIG, above:

```
HEXOUT PHA          (save the byte)
       LSR  A
       LSR  A       (extract four..)
       LSR  A       (.. high bits)
       LSR  A
       JSR  HEXDIG  (print hex char)
       PLA          (bring back byte)
       AND  #$0F    (extract low four)
       JMP  HEXDIG  (restore ASCII)
```

Again, we save an RTS by doing a JMP direct to a subroutine.

Now we can do the main job: displaying a number of memory locations:

```
   JOB LDX  #$00     (counter)
 JLOOP LDA  $FFC0,X  (get a byte)
       JSR  HEXOUT   (print it)
       LDA  #$20     (space char)
       JSR  $FFD2    (print it)
       INX
       CPX  #$0A     (ten bytes yet?)
       BCC  JLOOP    (no, do another)
       LDA  #$0D     (RETURN char)
       JMP  $FFD2    (print it)
```

We've written the program to display a specific range of addresses. You may change it to display what you wish.

The four LSR instructions may be considered the equivalent of dividing by 16. That's what the word "hexadecimal" means, of course: hex for six and decimal for ten, giving a total of 16.

Sneaky Hex

You may have decided that hexadecimal output is quite easy. It is, compared to decimal, and that gives us an interesting possibility.

Could we write hex numbers that looked like decimal numbers? In other words, could we print decimal 22 by somehow converting it to look like hex 22, and then printing it? It sounds complex: decimal 22 would be written as hex 16, and hex 22 has a decimal value of 34. Not much in common there. But there's a gimmick.

The 6502 processor has an arithmetic feature called "decimal mode." When we invoke it (with the SED, Set Decimal, command), decimal arithmetic takes place using numbers that look like hex. In other words, the decimal value of 22 is stored as hex 22. The proper name for this kind of number is not hexadecimal, of course. This numbering system is called "binary coded decimal."

We can't go into the inner mysteries of BCD at this time, but a few facts can be noted. Decimal mode affects only the ADC (add with carry) and SBC (subtract) instructions; all other instructions still deal with binary numbers. If you're going to play with decimal mode, kill the interrupt for the moment; your interrupt routines may not be able to cope with "new math." And remember to put everything back (clear decimal mode, restore the interrupt) when you've finished doing the task at hand.

Decimal mode arithmetic is great for things like keeping score in video games. The scores can be easily translated and delivered to the screen. But decimal mode is not too good for serious mathematics: multiplication, division, square roots and such become much harder to handle. For most applications, stick with binary.

We'll be talking about how to convert binary numbers to decimal in the next session. ©

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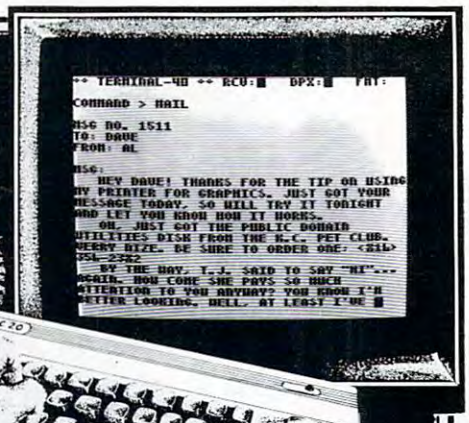

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PET/CBM POP

Michael W. Schaffer

You can avoid stacking up too many subroutines by using POP to cancel a GOSUB (command that sends control to a subroutine at a given line number and then RETURNs to the statement after GOSUB). A programming tool for all PET/CBM computers.

Atari BASIC and the Microsoft BASIC used on the Apple II provide a rather useful command called POP. The POP command removes the last GOSUB from the stack, so that a RETURN will return the program to the second-to-last GOSUB. For example, in this program:

```
10 GOSUB100
20 PRINT "CONTROL RETURNS HERE."
30 STOP
100 GOSUB200
110 PRINT"NOT HERE."
120 STOP
200 POP
210 PRINT "GOING"
220 RETURN
```

the RETURN on line 220 returns the program to line 20 (not 110). This utility can be very useful, but it is not available in Commodore BASIC. Well, it wasn't.

Here is a machine language utility that executes a POP on all PET/CBM models. The code is position independent – in other words, it can be moved to any convenient spot in memory without any changes. I prefer to locate the code at the top of memory. A POKE 53,127:POKE 52,0:CLR (for 32K systems) will prevent BASIC from using this space.

Program 1 provides the machine language routine in the form of a BASIC loader. The program will load and protect the POP routine, and then indicate the proper SYS location to call the routine. Programs 2 and 3 provide changes for older ROMs.

A GOSUB in BASIC pushes five bytes onto the system stack. These bytes tell BASIC where to start running when the RETURN statement is executed. These five bytes are the low and high bytes of the CHRGET pointer (locations 119 and 120 for newer ROMs, 221 and 222 for Original ROMs) and the current line number (locations 54 and 55 for newer ROMs, 136 and 137 for Original ROMs), and the token for GOSUB (141). To perform a POP, all we do is remove these five bytes from the stack. The routine uses the same subroutine that BASIC uses (JSR $B322 for BASIC 4.0, JSR $C2AA for Upgrade BASIC, JSR $C2AC for Original BASIC) to search the stack for the GOSUB token. The subroutine loads the accumulator with the token found at the top of the stack. We compare it to 141 to see if we have located a GOSUB. If a GOSUB is not found, then an error is returned. The error message sent is "?without gosub error in xxxx". Notice that the standard BASIC error routine is used, so program and variable integrity are assured. The five PLAs simulate the action of a RETURN without really doing anything.

This utility is especially useful in highly "modular" programs. An error handling subroutine can easily remove "pending" GOSUBs from the stack to prevent them from building up (and resulting in an "?out of memory error").

To use this POP in the preceding program, change the POP in line 200 to a SYS 32512, or whatever SYS location the loader indicates should be used. The program does not change in any other way.

Program 1: BASIC 4.0 Version

```
10 POKE53,PEEK(53)-1:POKE 52,0:CLR
20 SADR=PEEK(52)+PEEK(53)*256
30 FOR ADDR=SADR TO SADR+22
40 READ DTTA:POKE ADDR,DTTA:NEXT ADDR
50 PRINT"USE SYS ";SADR
60 END
70 DATA 169,255,133,71,32,34,179,201
80 DATA 141,240,5,162,29,76,207,179
90 DATA 154,104,104,104,104,104,96
```

Program 2: Make These Changes For Upgrade BASIC

```
70 DATA 169,255,133,71,32,170,194,201
80 DATA 141,240,5,162,29,76,87,195
```

Program 3: Make These Changes For Original BASIC

```
70 DATA 169,255,133,71,32,172,194,201
80 DATA 141,240,5,162,29,76,89,195
```

Bootmaker For VIC, PET, And 64

M. G. Ryschkewitsch

Here's a good, short boot routine that's going to simplify your programming efforts. This general technique can be applied to many different boots (programs that load other programs). A timesaver for any Commodore computer.

How many times have you turned on your computer and wished that you didn't have to go through the tedium of loading utility programs or remembering where to PEEK, POKE, or SYS to link them in?

I'd like to describe a booting system which uses the "dynamic keyboard" technique and a modified version of the "Universal Wedge."

This particular boot can be used to simplify setting up your computer for the graphing utility which follows, but the general technique is simple and useful for a wide variety of boots. A similar technique can be used, for example, to ask a user questions in order to initialize a printer prior to loading a word processing program. If your PET has BASIC 4.0 and you put your boot on a diskette as the first program, the process is particularly simple. Press SHIFT/RUN, and the hard part is done by the computer.

The Dynamic Keyboard Technique

The dynamic keyboard technique involves fooling the computer into thinking the user is entering data from the keyboard. This is particularly easy with the PET. It involves printing messages on the screen and POKEing two locations in PET memory, the keyboard buffer at decimal addresses 623-632 and location 158, which normally contains the current number of characters in the buffer.

Your BASIC program must print all the entries you'd normally make on the screen in the proper locations (to leave room for the normal PET messages such as LOADING, etc.) and then return the cursor to the home position. If you then POKE the number of carriage returns (character 13) that you'd normally enter beginning with location 623 and that number also into location 158, here's what happens.

After the PET finishes executing your boot, it will wake up with the cursor in the home position and believe you've pushed the RETURN key a number of times. The first RETURN will cause it to execute the line that the cursor is on, and, after printing any appropriate messages, it will execute as many subsequent lines as there are RETURNS in the buffer. The only catch is that each line that you want it to execute *must* be in the right place or you will get no response or a SYNTAX ERROR. Study the example in Program 1 to see exactly what is necessary.

Note that Program 1 is merely an example of setting up a boot program using the dynamic keyboard technique. If the files INVISIBLE WEDGE, PRINTER, and WORD PROC existed on a disk, the program would first enable the use of the Invisible Wedge utility as described below. It would then load and execute a printer setup routine called PRINTER. Finally, it would load and run a word processing program with the file name WORD PROC.

Sleight Of Hand

There is a hitch to this procedure if you want to use the Universal Wedge. That program clears the screen and prints a message when it's executed, wiping out your carefully laid out screen. The part of the Wedge that prints the message is fortunately in BASIC, but it requires a bit of sleight of hand to modify since the BASIC line editor will change the machine code that does the work unless you protect it.

If you load the Universal Wedge without running it and use the Monitor (SYS 54386 for 4.0), you will find what looks like a BASIC program from locations hexadecimal $0400 to $0496, terminated by the usual set of triple double zeros. Starting at $0500 and $0700, there are two blocks

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of machine code that do the actual work. If you also PEEK at the contents of decimal 42 and 43 (which store the location of the end of the BASIC text and the start of variable storage), you will find that they point to a location at the end of the second block of machine code ($B8 and $08).

Now POKE42,131 and POKE43,4 and type CLR. This tells the editor that BASIC really doesn't include the two blocks of machine code. You can then change the BASIC program as long as you don't increase it by more than 106 characters. Try to use less than this just to be safe. In Program 2, two UP CURSORs replace the CLEAR/HOME and all the CURSOR DOWNs in the original.

You can now use the Monitor to save everything up to the address hexadecimal $08B8. And from now on you can load this version of the Wedge just as you would load the original.

This same technique is equally applicable to the VIC-20 and Commodore 64 (see Program 3). For both these machines, the keyboard buffer is located in memory locations 631-640 decimal, and the number of characters in the buffer is contained in location 198 decimal. The VIC's narrow screen width must be taken into account when formatting the program. Some of the messages may run over onto a second line.

A small investment in bootmaking now can pay big dividends later by causing fewer errors, saving time and making the computer easier for others to use.

Program 1: Sample Boot Program

```
100 QO$=CHR$(34): REM DEFINE QUOTE FOR PRI
    NTING
110 REM PRINT ENTRIES TO THE SCREEN IN PRO
    PER SPOTS
120 PRINT"{CLEAR}{03 DOWN}LOAD";QO$;"INVIS
    IBLE WEDGE";QO$;",8"
130 PRINT"{04 DOWN}RUN"
140 PRINT"{DOWN}LOAD";QO$;"PRINTER";QO$;",
    8"
150 PRINT"{04 DOWN}RUN"
160 PRINT"{02 DOWN}LOAD";QO$;"WORD PROC";Q
    O$;",8"
170 PRINT"{04 DOWN}RUN{HOME}"
180 REM POKE SIX RETURNS INTO KEYBOARD BUF
    FER
190 REM POKE # OF RETURNS INTO LOC. 158
200 FORI=1TO6:POKE622+I,13:NEXT:POKE158,6
```

Program 2: Invisible Wedge

```
5 A=12*16^3:REM $C000
10 IFPEEK(A)<>76THEN SYS1639:REM BASIC 2
15 IFPEEK(A)=76 THEN SYS2151:REM BASIC 4
20 PRINT"{02 UP}UNIVERSAL DOS SUPPORT LOA
    DED"
25 NEW



100 QO$=CHR$(34): REM DEFINE QUOTE FOR PRI
    NTING
110 REM PRINT ENTRIES TO THE SCREEN IN PRO
    PER SPOTS
120 PRINT"{CLEAR}{03 DOWN}LOAD";QO$;"PRINT
    ER";QO$;",8"
130 PRINT"{04 DOWN}RUN"
140 PRINT"{02 DOWN}LOAD";QO$;"WORD PROC";Q
    O$;",8"
150 PRINT"{05 DOWN}RUN{HOME}"
160 REM POKE FOUR RETURNS TO KEYBOARD BUFF
    ER
170 REM POKE # OF RETURNS TO LOC. 198
180 FORI=1TO4:POKE630+I,13:NEXT:POKE198,4
```

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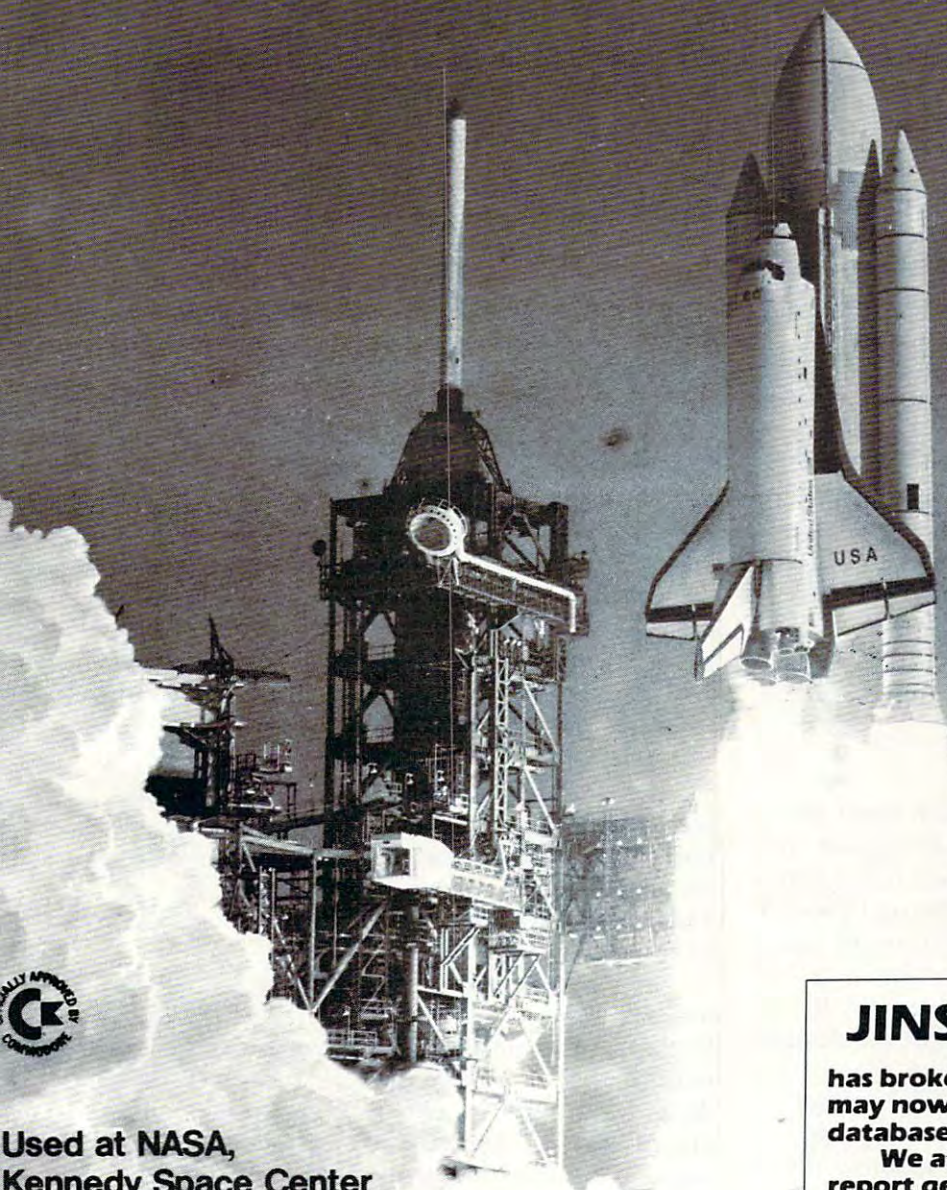

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Basic Atari BASIC Sorts

E P McMahon

Choosing a sort routine that eliminates unnecessary searches can save you time. Four sorting methods are examined in terms of their speed, and there are some hints on making sorts work faster.

Sorts – many programmers ignore them, many don't understand them, and most misuse them.

Let's look at the *insertion* sort, the *selection* sort, and the *bubble* sort. (The widely used bubble sort is about the most inefficient sort routine around.)

Why is it so widely used? Maybe because it's so simple: go through the list to be sorted and examine items, an adjacent pair at a time. If any pair is not in the correct order, swap the pair. Continue to the end of the list. If a swap was performed, repeat the above steps; if not, the sort is finished. This sounds more simple and direct than it may be.

Some Terms Defined

A *file* contains *records* (or *items*) which are to be sorted according to the *keys* which are a part, or all of, each record. (The last name in a file of names and addresses is a key for alphabetizing the list.) We will assume *sorted* means "placed in the order of ascending or descending value of the keys." Another way to sort is to build an auxiliary file of pointers which identify the records in the desired order – a good approach for large disk files.

One more definition: a *stable* sort does not disturb the results of a previous sort when the sort keys are equal. For example, you sort a file of records consisting of names and addresses alphabetically by first name (key = first name). You then sort the file by last name. If the sort is stable, when you have finished the second sort John Doe will follow Jane Doe and precede Joseph Doe; if not, the order of the Does will be arbitrary.

Multiple passes through a stable sort (in reverse order of importance of the keys) will accomplish the same thing as a *sort on multiple keys*. Simply said, a sort on multiple keys checks the second key any time the first keys of two records being compared are equal. This is how to convert any of the following single key sorts into a multiple key sort.

Let's discuss the program listings now so you can refer to them as you read the rest of this article.

Bubble Sort

The first program is a bubble sort written in Atari BASIC. I'll review this listing since some of the REMark lines will apply to the other programs, and sections of the code will be identical in the other programs.

The file to be sorted is in string S$ and consists of N records each of length LREC. We will sort this file *in place* according to the key which is part of the record. The key starts at KB and ends at KF characters offset from the beginning of each record.

Lines in the 100's initialize; line 200 sets the clock to zero. Lines in the 1000's and 1100's are the sorts. Line 1500 reads and prints the clock; and the subroutine in the 2000's generates a random file to be sorted (each record consists of two random letters and a blank).

Let's look at the bubble sort. Why is it so weak? Primarily because many redundant comparisons are made, but also because records being moved are put down and picked up at each step. There really are better ways to sort which are just as easy.

The bubble sort (Program 1) uses one trick to make the "standard" bubble sort a little faster. Each pass through the file moves the largest remaining out-of-place record to its correct position. Also, we might be lucky and find some records already sorted. Remember that we use a flag to signal if another pass through the file is necessary. The trick is to use that flag to identify the location of the last swap made (line 1040). We never need examine past that point again; so, as shown in the program, FLAG and TOP limit the search. The bubble still isn't good enough.

Insertion Sort

I'll use a card player sorting a hand of 13 cards to help you visualize what's going on in each sort.

Our right-handed card player does the insertion sort by holding the first dealt card in the left hand and the other 12 cards in the right. Notice that the first card is already "inserted" in the sorted file in the left hand. He or she examines the next card to be sorted, initially card number

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two, and compares it to the cards in the left hand, initially just the first card. If card two is bigger, it remains card two as it is placed in the left hand; if smaller, card one is shifted to become card two, and card two from the right hand becomes card one in the left.

Each step, then, compares the next card to be inserted (from the right hand) with the last card in the left hand. If the new card is larger, it becomes the last card; if not, the old card in the left hand is moved one space lower, and the new card is compared with the next old card in line. This last step is repeated until the new card is inserted.

Now what is the worst case for this sort? A file that must be inverted. Each card must be compared with every card in the left hand, and every card in the left hand must be moved in each step. Best case? When the file is in order except for a new entry at the end (new last card).

Some people defend using the bubble sort when it's used to add a record to an already sorted file, but the insertion sort is faster at this, too. Just put the new record at the end of the file (new record number N) and change the loop indices (line 1000) to "FOR J = N TO N" and less than one pass through the sort will correctly place the new record.

Program 2 is an insertion sort written in Atari BASIC. Lines 1000-1100 are the sort itself; the rest of the lines follow the same convention described for the bubble sort.

Selection Sort

The selection sort is just as easy. This time, the card player holds all the cards in the right hand and scans from left to right for the smallest. The smallest card is extracted, placed in the left hand as card one, and the cards in the right hand are shifted to the right to fill the gap caused by the extracted card. The cards in the right hand are now numbered two to thirteen. The process repeats: scan the cards in the right hand, extract the smallest, and add it at the end of the cards in the left hand. Shift cards in the right hand to the right to remove the gap. When only one card remains in the right hand, it is the largest, and the sort is finished.

The worst case for this sort is also a file that must be inverted. Each card that is selected is the last one in the set of unsorted cards.

Let's look at the differences in these algorithms. In the insertion sort, we examined a *sorted* sub-list and insert a new record; in the selection sort, we examine an *unsorted* sub-list and select a new record. Suppose you are interested in the first ten items in a 100-item file. Which routine would you use? The selection sort of course, stopping after the tenth item is found.

If you implement the selection algorithm exactly as stated above to sort string variables, you'll find that shifting the "cards" in the right hand to remove the gap is inconvenient. (Try shifting a string of, say, ten characters five spaces to the right. If you don't know what will happen, try A$(6,16) = A$(1,10) and see what the result is.)

A Couple Of Tricks

Atari BASIC loves to shift strings to the left, so we'll modify the sort algorithm to take advantage of this. All we do is hold the unsorted cards in the left hand and put the extracted cards in the right hand. The gap is removed by shifting cards in the left hand to the left. Take a look at Program 3, a modified selection sort. There are a couple of tricks there. The variable TAIL defined in line 1000 locates the last record in the file S$. This location is the spot in our right hand where the selected card (record) will be placed.

The second trick is using the variable LAST to remember information from the last examination pass through the left hand. It is set to the next-to-the-smallest item in the list, so it has a head start on our next examination search. It is easy to save this information during the search.

Note that we save time on every other search (unless there are ties – then we save more) because we have to reset the flag in case we do not hit a swap. Line 1090 extracts the selected record, line 1100 moves the entire right side of the file one record to the left in one fell swoop, and the selected record is put at the tail. Lines 1140 to 1160 put the last record in its place at the end.

What would the bubble sort look like to our card player? He would examine cards one and two, and swap them if necessary. He would then compare cards two and three, swapping if needed. The process continues with cards three and four, four and five, and so on, to 12 and 13. Finished? Not yet. If any pair of cards were swapped, the process is repeated from the start. Have you ever sorted cards this way? Would you?

Modified Insertion Sort

The string-moving trick in the selection sort suggested that the same trick could be applied to the insertion sort. This results in the modified insertion sort (Program 4), where the sorted file is on the right of the string and the unsorted part of the file is on the left. The first record is always the record to be inserted, and when the insertion spot is found, the string up to the insertion spot is shifted to the right, over the first record.

This is a fast program; unfortunately, it is no longer as stable as the first three programs. It can be made stable by adding an artificial record to the file which is guaranteed to be the last record for any search key (no ties), since the instability

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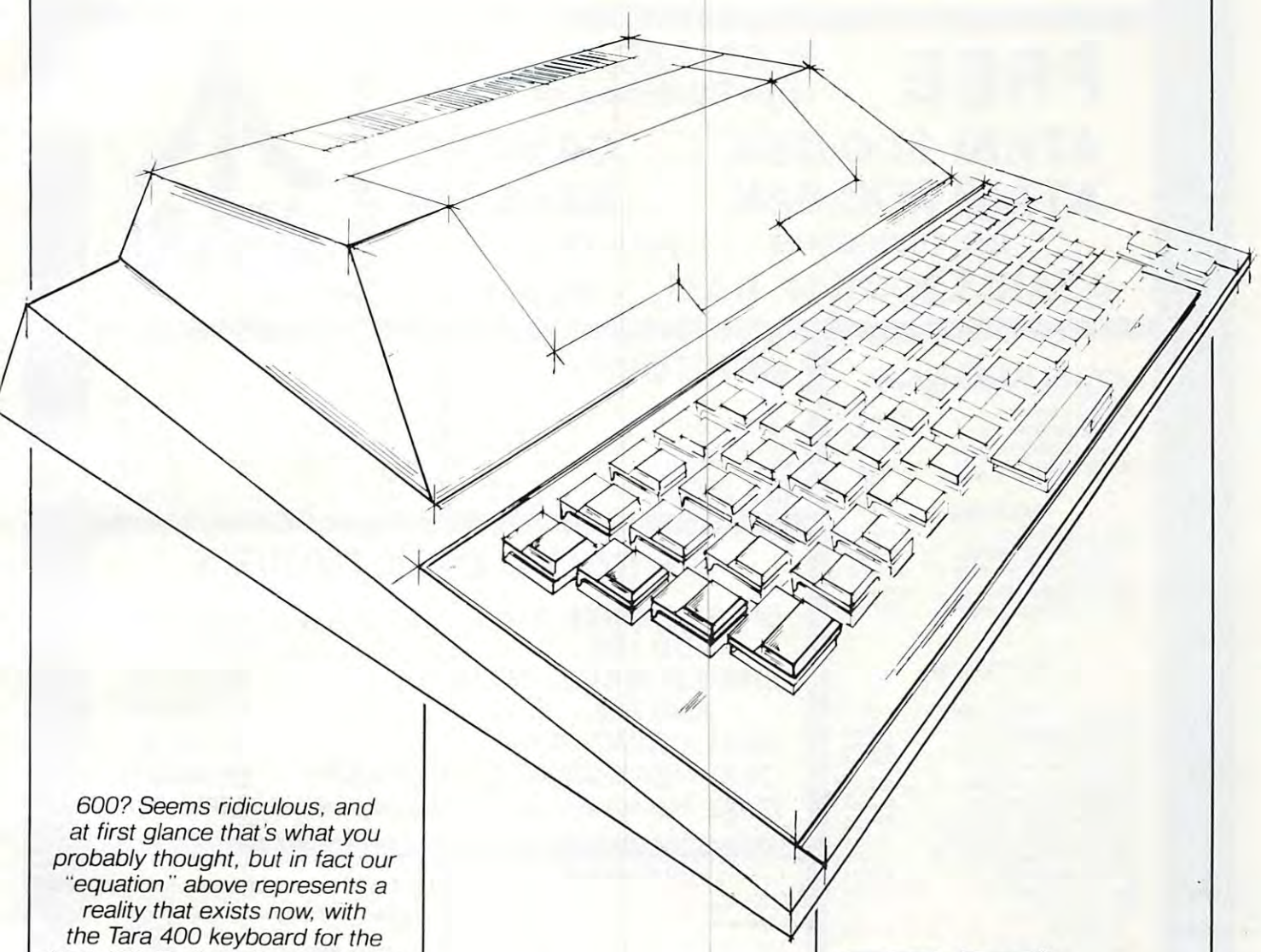

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occurs only with the last record in the file. To examine the stability of these sorts, sort first with both keys (KB and KF) equal to two, and then sort with both equal to one.

There is another way to make the modified insertion sort stable, and that is to pick the record to be inserted from the end of the unsorted part of the list (record J instead of record 1) and remove the equal sign from the sort test in line 1020. This results in a slower program than the modified insertion sort shown.

Powering Up

A short set of runs of the four programs (with no PRINT statements and with N=50) gave average times of 80.8 seconds for the bubble, 48 for the insertion, 34 for modified selection, and 23.3 for modified insertion. The programs can be powered, made faster. One easy way is to precompute the constant part of the test in each sort statement. In the insertion sort, for instance, add line 1015 HOLD$=S$((J-1)*LREC+KB, (J-1)*LREC+KF) and substitute HOLD$ for the right side of the test in line 1020.

If the above descriptions of the sort algorithms aren't clear to you, try sorting a hand of cards according to the rules. Then execute the programs as listed. If it will help, print out the loop indices at each step to see what's going on and how the tricks work to save a few searches here and there. If you're going to use these routines in another program, take out the REMs and print statements for more speed. Better yet, code the sort you need in machine language.

There are more efficient (and more complex) sorts: Shell's sort, Quicksort, and Heapsort, for examples. A quite complete study and reference on sorting (and searching) is the third volume of Donald E. Knuth's *The Art of Computer Programming* (Addison-Wesley, Reading, Mass., 1973).

Program 1: Bubble Sort

```
100 DIM S$(200):REM the file
110 DIM HOLD$(3):REM temporary space
    to move a record
120 LREC=3:KB=1:KF=2:REM record leng
    th, begining and end of KEYfield
130 N=13:REM number of records
140 GOSUB 2000:REM generate random f
    ile
200 POKE 20,0:POKE 18,0:POKE 19,0:PO
    KE 20,0:REM start clock at zero
990 REM ******************************
    **
991 REM *{28 SPACES}*
992 REM * bubble sort{16 SPACES}*
993 REM *{28 SPACES}*
994 REM ******************************
    **
1000 TOP=N-1
1010 FLAG=0:REM points to last recor
     d swapped or zero
1020 FOR J=1 TO TOP:REM only look up
      to last record swapped (start
     at N)
1030 IF S$((J-1)*LREC+KB,(J-1)*LREC+
     KF)<=S$(J*LREC+KB,J*LREC+KF) TH
     EN 1080:REM check if NO swap ne
     eded
1040 FLAG=J:REM flag that we're swap
     ping record J
1050 HOLD$=S$((J-1)*LREC+1)
1060 S$((J-1)*LREC+1,J*LREC)=S$(J*LR
     EC+1,(J+1)*LREC)
1070 S$(J*LREC+1,(J+1)*LREC)=HOLD$:R
     EM 1050 to here swaps J and J+1
      (not J-1)
1080 NEXT J
1085 PRINT S$:REM remove this for sp
     eed.  This shows file after eac
     h pass.
1090 IF FLAG<>0 THEN TOP=FLAG-1:GOTO
      1010:REM if a swap was made, r
     eset TOP and start over.
1100 REM ******************************
     **
1101 REM * end of sort{15 SPACES}*
1102 REM ******************************
     **
1490 REM read and print the clock
1500 PRINT ((PEEK(18)*256+PEEK(19))*
     256+PEEK(20))/60:STOP
1990 REM generates a random file
2000 FOR K=0 TO N-1
2010 S$(K*3+1)=CHR$(INT(RND(0)*26+65
     ))
2020 S$(K*3+2)=CHR$(INT(RND(0)*26+65
     ))
2030 S$(K*3+3)=" "
2035 NEXT K:PRINT S$:PRINT
2040 RETURN
```

Program 2: Insertion Sort

```
100 DIM S$(200)
110 DIM HOLD$(3)
120 LREC=3:KB=1:KF=2
130 N=13
140 GOSUB 2000
200 POKE 20,0:POKE 18,0:POKE 19,0:PO
    KE 20,0
990 REM ******************************
    **
991 REM *{28 SPACES}*
992 REM * insertion sort{13 SPACES}*
993 REM *{28 SPACES}*
994 REM ******************************
    **
1000 FOR J=2 TO N:REM pick record to
      be inserted
1010 I=J-1:REM I is the end of the s
     orted part of the file (left ha
     nd)
1020 IF S$((I-1)*LREC+KB,(I-1)*LREC+
     KF)<=S$((J-1)*LREC+KB,(J-1)*LRE
     C+KF) THEN 1050:REM should rec
     J be inserted?
1030 I=I-1:REM no, look at next sort
     ed record
1040 IF I>0 THEN 1020:REM unless thi
     s is the first record
1045 REM insertion starts here
1050 IF I=J-1 THEN 1105:REM don't in
     sert J on itself
1060 HOLD$=S$((J-1)*LREC+1,J*LREC):R
     EM pick up rec J
```

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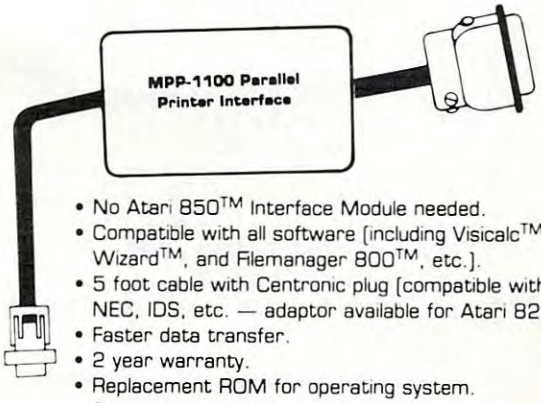

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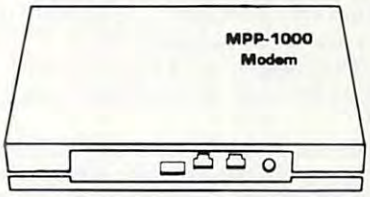

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```
1070 FOR K=J-1 TO I+1 STEP -1:REM sl
     ide sorted records to make room
      for J
1080 S$(K*LREC+1,(K+1)*LREC)=S$((K-1
     )*LREC+1,K*LREC)
1090 NEXT K
1100 S$(I*LREC+1,(I+1)*LREC)=HOLD$:R
     EM insert rec J
1105 PRINT S$:REM take a look at the
      file
1110 NEXT J
1120 REM ******************************
     **
1130 REM * end of sort{15 SPACES}*
1140 REM ******************************
     **
1500 PRINT ((PEEK(18)*256+PEEK(19))*
     256+PEEK(20))/60:STOP
2000 FOR K=0 TO N-1
2010 S$(K*3+1)=CHR$(INT(RND(0)*26+65
     ))
2020 S$(K*3+2)=CHR$(INT(RND(0)*26+65
     ))
2030 S$(K*3+3)=" "
2035 NEXT K:PRINT S$:PRINT
2040 RETURN
```

Program 3: Modified Selection Sort

```
100 DIM S$(200)
110 DIM HOLD$(3)
120 LREC=3:KB=1:KF=2
130 N=13
140 GOSUB 2000
200 POKE 20,0:POKE 18,0:POKE 19,0:PO
    KE 20,0
990 REM ******************************
    **
991 REM *{28 SPACES}*
992 REM * modified selection sort
    {4 SPACES}*
993 REM *{28 SPACES}*
994 REM ******************************
    **
1000 TAIL=(N-1)*LREC+1:REM define la
     st record location
1010 LAST=0:REM initialize
1020 FOR J=0 TO N-2:REM select a rec
     ord
1030 INDEX=LAST:LAST=0:REM adjust po
     inters from last search
1040 IF INDEX>N-J-2 THEN 1090:REM ne
     xt selection is now last unsort
     ed rec
1050 FOR I=INDEX+1 TO N-J-1:REM sear
     ch unsorted part of file
1060 IF S$(I*LREC+KB,I*LREC+KF)<S$(I
     NDEX*LREC+KB,INDEX*LREC+KF) THE
     N LAST=INDEX:INDEX=I:REM best &
      2nd best
1070 NEXT I
1080 IF INDEX=N-1 THEN 1120:REM reco
     rd is in place
1090 HOLD$=S$(INDEX*LREC+1):REM pick
      up selected record
1100 S$(INDEX*LREC+1)=S$((INDEX+1)*L
     REC+1):REM slide many records t
     o close up space
1110 S$(TAIL)=HOLD$:REM put selected
      rec at end
1120 PRINT S$:REM take a look
1130 NEXT J:REM next selection
1140 HOLD$=S$:REM last selection tri
     vially goes at the end
1150 S$(1)=S$(LREC+1)
1160 S$(TAIL)=HOLD$
1170 PRINT S$:REM all done,take a look.
1200 REM ******************************
     **
1210 REM * end of sort{15 SPACES}*
1220 REM ******************************
     **
1500 PRINT ((PEEK(18)*256+PEEK(19))*
     256+PEEK(20))/60:STOP
2000 FOR K=0 TO N-1
2010 S$(K*3+1)=CHR$(INT(RND(0)*26+65))
2020 S$(K*3+2)=CHR$(INT(RND(0)*26+65))
2030 S$(K*3+3)=" "
2035 NEXT K:PRINT S$:PRINT
2040 RETURN
```

Program 4: Modified Insertion Sort

```
100 DIM S$(200)
110 DIM HOLD$(3)
120 LREC=3:KB=1:KF=2
130 N=13
140 GOSUB 2000
200 POKE 20,0:POKE 18,0:POKE 19,0:PO
    KE 20,0
990 REM ******************************
    **
991 REM *{28 SPACES}*
992 REM * modified insertion sort
    {4 SPACES}*
993 REM *{28 SPACES}*
994 REM ******************************
    **
1000 FOR J=N-1 TO 1 STEP -1:REM J wi
     ll be the beginning of the sort
     ed list
1010 I=N:REM I is the end of the sor
     ted part of the file(right hand)
1020 IF S$((I-1)*LREC+KB,(I-1)*LREC+
     KF)<=S$(KB,KF) THEN 1050:REM sh
     ould rec 1 be inserted here?
1030 I=I-1:REM no, look at next sort
     ed record
1040 IF I>J THEN 1020:REM unless thi
     s is the first record in the so
     rted list
1045 REM insertion starts here
1050 IF I=1 THEN 1105:REM don't inse
     rt J on itself
1060 HOLD$=S$(1,LREC)
1070 S$(1,(I-1)*LREC)=S$(LREC+1,I*LR
     EC):REM slide records to make r
     oom to insert rec 1
1100 S$((I-1)*LREC+1,I*LREC)=HOLD$:R
     EM insert rec 1
1105 PRINT S$:REM take a look at the
      file
1110 NEXT J
1120 REM ******************************
     **
1130 REM * end of sort{15 SPACES}*
1140 REM ******************************
     **
1500 PRINT ((PEEK(18)*256+PEEK(19))*
     256+PEEK(20))/60:STOP
2000 FOR K=0 TO N-1
2010 S$(K*3+1)=CHR$(INT(RND(0)*26+65))
2020 S$(K*3+2)=CHR$(INT(RND(0)*26+65))
2030 S$(K*3+3)=" "
2035 NEXT K:PRINT S$:PRINT
2040 RETURN
```

Beginners: see the special program typing instructions on page 128.

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One of the first items many people buy for their computers is a word processing program. A word processor (or its cousin, the text editor) allows text data to be entered, changed, added, or deleted at will. Because a word processor is screen-oriented, the user can manipulate the displayed text and quickly perform editing functions.

Word processing is not the only application which requires the input of extensive text data. Other applications, such as mailing list management or data base management, also involve the entry of much text data. In many of these programs, however, input is laborious and inflexible, limited to line-by-line entries.

With a text editor, text entry is easy. Input for other applications can be just as easy. Although most word processor and text editor programs are written in assembly language, a simple, fast BASIC routine provides some of the advantages of the dedicated text processors, without resorting to machine language. This routine can be incorporated into any program.

This article introduces a use of the GET command that gives the programmer full control of the keyboard and the screen. I have used it to write a text editor, a mailing list program, and an assembler-editor. The routine described below is screen-oriented, displays a blinking cursor, lets each key act normally unless altered by the programmer, and is as fast as the fastest typist. Although I have written this routine for the PET, the idea can be used with many computers. It is necessary to know only a few operating system locations.

What GET Does

The GET command in most BASICs polls the keyboard and returns a value if a key has been struck since the last inquiry. The TRS-80 equivalent is INKEY$. If a key has been struck, GET returns the ASCII value of the key struck; otherwise, it returns the null string (string of length zero). Hitting RETURN is not necessary, and the key hit does not appear on the screen, unless the program provides for that. GET is often used in games for a waiting loop:

```
10 PRINT "HIT ANY KEY TO CONTINUE."
20 GET Z$: IF Z$= "" THEN 20  :REM  NULL ~
    STRING
30 < PROGRAM CONTINUES >
```

In another common use of GET, the answer from the user will appear on the screen as soon as a valid key is hit:

```
10 PRINT "DO YOU WANT [QUESTION]? ANSWER
     'Y' OR 'N' ";
20 GET Z$: IF Z$ <>"Y" AND Z$ <> "N" THEN
     20
30 IF Z$ = "Y" THEN PRINT "YES": . . . YE
    S RESPONSE
40 PRINT "NO": . . . NO RESPONSE
```

The previous example demonstrates two things. First, the keyboard can be *selectively enabled*. (This is sometimes called *softkey*, since the keys are defined by software, not hardware.) Each key can have its usual meaning, a special meaning, or no meaning. (If the key has no meaning, it is said to be disabled.) Second, the program determines what screen output, if any, there is for each key. (By "key" we mean a value that can be input from the keyboard. Most keys have a shifted and an unshifted value.)

Combining GET With Softkeys

These two features can be combined to allow full-screen editing and input under program control. This is far superior to the line-by-line function of the INPUT statement. The routine below has the following advantages:

- full-screen editing.

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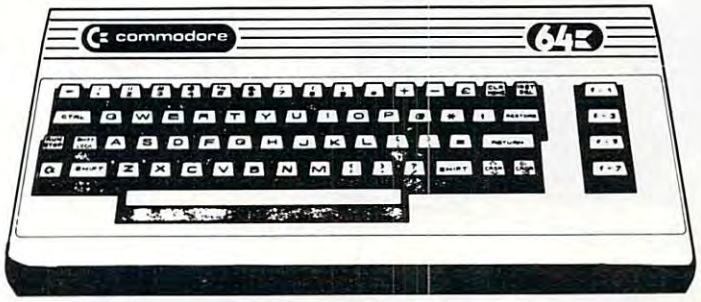

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- windows and margins may be defined for *all* PETs.
- use of all cursor and edit keys.
- all characters permitted, except the double quote mark (the double quote mark is disabled). The colon and comma are permitted.
- TAB function can be simulated without a TAB key.
- blinking cursor (without footprints).
- normal or special use of every key.

Program 1: Kernel Of Screen Editor

```
90 PRINT HOME$; : REM *HOME$= CHR$(19)
100 P=PEEK(196)*256+PEEK(197)+POS(0):IF PO
    S(0)=MB THEN PRINT BELL$; :REM *B
    ELL$=CHR$(7)
110 CH= PEEK(P): K= 128
120 POKE P, CH+K:  T= TIME+ 30
130 IF TIME> T THEN K= 128-K:  GOTO 120
140 GET Z$:  IF Z$= "" OR Z$= QT$ THEN 130
     : REM *QT$= CHR$(34)
200 POKE P, CH: PRINT Z$; ESC$; : GOTO 100
```

The Kernel Routine

Program 1 is the kernel of a screen editor. I use this in any program that involves extensive input. So far, that includes a text editor, a mailing list program, an assembler-editor, and a sales account program.

Lines

90 Puts cursor in top left corner. Not mandatory.

100 p is the location in screen RAM of the cursor. If the cursor has advanced to the margin minus 4 (mb), then the bell rings.

110 ch is the screen character at location p.

120 - 130 The automatic cursor, once a second, alternates the character at the position it is over with the character in reverse video. This can be done manually. Adding 128 to the screen code results in the reverse video character. The variable k changes its value every 30 jiffies (1/2 second) from 0 to 128, providing a simulation of the cursor. (It is assumed that there are originally no reverse video characters on the screen. If there are, change line 110 to: ch = peek(p): kc = 128: if ch> kc then kc = -kc: k = 0, and change line 130 to: if time> t then K = kc-k: goto 120.)

140 The wait loop illustrated above, with one difference: the double quote mark is disabled so that later the program can take data off the screen using the INPUT statement.

150 - 190 This is where all sorts of special work can be done.

200 Puts the character into its original video mode and prints the new character. The program prints the invisible character, esc$, to avoid insert mode, and (CBM 8000 only) to prevent the user from breaking the window through successive HOME's. for Upgrade ROM PETs, use POKE 205, 0. For Original PETs, use POKE 234, 0.

Some Applications

Here are four examples of how to use this control of keyboard and screen. The line numbers given replace or add to the lines in Program 1.

1. To set a bottom margin and prevent scrolling. When accepting lines by the screenful, it is inconvenient to have lines scroll off the top of the screen. It takes special programming not to lose that data. To avoid that, I allow the user to work on only what can fit on the screen, and I do not permit any lines to scroll up. Lines 200-210 work because a p value greater than 34687 means that the cursor is on the last line.

```
200 POKE P,CH: IF P>34687 THEN IF Z$=CR$ O
    R Z$=CD$ THEN 100 : REM 34687=327
    68+80*24-1
210 PRINT Z$; ESC$; :  GOTO 100
```

(cr$ = chr$(13) = car. return,
cd$ = chr$(17) = cursor down)

This kind of bottom margin that prevents scrolling is different from the CBM 8000 Set Bottom command, which allows scrolling.

2. To set a top margin (must be used with bottom margin to prevent scrolling). The PET stores the row number (0-24) of the cursor at memory location 216. "tmargin" is the number of the top row of the margin.

```
105 IF PEEK(216) < TMARGIN THEN PRINT : GO
    TO 100
```

3. To set a left margin.

```
106 IF POS(0) < LMARGIN THEN TAB(LMARGIN -
     1); : GOTO 100
```

4. To set a right margin.

```
115 IF POS(0) < RMARGIN THEN PRINT CHR$(15
    7); : Z$= CR$ : GOTO 200
```

(chr$(157) is cursor left.)

To develop special key functions, use IF statements. For example, the backslash (\ ) key is seldom used. It could be defined to print an often-used phrase, such as the name of your company.

```
150 : IF Z$= "\" THEN Z$= "ACME SOFTWARE, ~
    INC.": GOTO 200
```

In this way the TAB key for PETs can be simulated. Here we will use the RVS key for a TAB key. Tabs are at 5, 10, 20, and 30.

Given: dim tb(4): tb(0) = 4: tb(1) = 9: tb(2) = 19: tb(3) = 29: tb(4) = 40

```
150 IF Z$<> CHR$(18) THEN 200
160 X= -1
170 X= X+1: IF POS(0)> TB(X) THEN 170
180 POKE P, CH: PRINT TAB(TB(X));: GOTO 100
```

Adding Control And Function Keys

The most powerful use of this feature is the implementation of two-key sequences, with the first key acting like a control or SHIFT key. If desired,

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every key can be given an additional meaning. The CBM 8000 offers many special editing features that do not correspond to a single key.

I designated one key, the backslash, as a control key. (This special key can be any one of your choosing. The keys are all *soft* now. If you are using Charles Brannon's Keyprint utility, change the definition of B$ below.) Certain keys after a backslash were given new functions. If the keys are not preceded by a backslash, they operate normally. The four special edit functions I implemented are: delete line (\DEL), insert line (\ INST), erase end (\CRSR right), and erase begin (\ CRSR left). Given: B$="\"

```
150 IF Z$ <> B$ THEN 200
155 POKE P, CH+ 128: REM REVERSE CHAR SO U
    SER KNOWS PROGRAM WAITING FOR NEX
    T KEY
160 GET Z$:  IF Z$= "" THEN 160
170 IF Z$= CHR$(148) THEN Z$= CHR$(149): G
    OTO 200
175 IF Z$= CHR$(20) THEN Z$= CHR$(21): GOT
    O 200
180 IF Z$= CHR$(29) THEN Z$= CHR$(22): GOT
    O 200
185 IF Z$= CHR$(157) THEN Z$= CHR$(150): G
    OTO 200
190 Z$= "" : REM INVALID KEY HIT; IGNORE B
    ACKSLASH
```

Another use of this feature allows you to define the keys to have certain string values. In a mailing list program, I allowed the user to define up to four keys. The user (in my area) might define them:

\m="Mr. and Mrs. "
\d="Dr. and Mrs. "
\p="Philadelphia PA 191"
\n="New York NY 100"

Both the keys used and the strings assigned are changeable.

Accepting Data From The Screen

The PET has a feature that makes accepting a screenful of data possible: an addressable keyboard buffer. Here is how the screen can be accepted:

Given: dim a$(24)
Given: in$=chr$(148)+qt$+esc$+chr$(157)+chr$(148)+chr$(148)

chr$(148) is the insert key; chr$(157) is the cursor left. (Due to the use of esc$, PET <4.0 may have to use a POKE statement to get out of quote mode.)

Important restriction: The maximum length of the line is three less than the screen width; for example, 80 -3=77. This can be enforced by using either a left or right margin (explained above).

Here's the program to accept the screen:

```
400 PRINT HOME$; HOME$ : FOR I=1 TO 10: GE
    T Z$: NEXT I : REM  EMPTY BUFFER
410 FOR I= 0 TO 24
420 :  POKE 623, 13:  POKE 158, 1
430 :  PRINT IN$; :  INPUT A$(I)
440 :  NEXT I
```

The whole screen is now in a$ array. One other restriction: it is important that no key be struck during the few seconds required to accept the screen.

The screen is altered after in$ is printed. This is not important if the next action, for example, is to print the menu. If it is important, all traces can be erased by printing deletes. But then only 24 lines at a time can be taken in: the top 24 for other than CBM 8000, or the bottom 24 with CBM 8000 and the use of the scroll down command. This is because a carriage return will be executed after the last INPUT command. If the bottom screen line is INPUT, then when the carriage return is executed, the line will scroll up. I take only 24 lines at a time anyway, in order to use the top line for instructions and messages.

Speed: The routine in Program 2 is very fast. It will accept typing at the rate of 110 words a minute. Three things are done to attain this speed. All constants are replaced by variables. The variables used most often are the first defined. And the routine is written into the first lines of the program.

Program 2 is an example configuration for a CBM 8000. Lines 100-220 are the GET routine. Lines 300-420 are for the programmer to define his special functions. After a double backslash (\\), the data on the screen is accepted into a$ array in lines 500-660. The top line is used for messages. A ** \\ appears in the top right corner when \\ is hit so that the user knows another keystroke is needed. The text data is displayed in screen pages of 24 lines each. The routine corrects for the insertions and deletions of lines. The screen will not scroll. Lines 1000-1100 define the variables and constants (order is important). Lines 2000-2200 are the beginning of a main program.

Since the strings in the a$ array may contain commas and colons, the strings must be enclosed in quotes to save on tape. Also the a$ array may contain null strings. The PET cannot read a null string from tape. Therefore, use the following for reading and writing:

```
100 FOR I= 0 TO LAST
110 PRINT#1, QT$; CHR$(32); A$(I); QT$; C
    R$; : NEXT I :REM ';CR$;' IS FOR ~
    < 4.0 ONLY
200 FOR I= 0 TO LAST
210 INPUT#1, Z$: A$(I)= MID$(Z$,2) : NEXT ~
    I
```

(chr$(32) may be almost any character, since it is discarded upon reading.)

Program 2: Example Screen Input Routine

```
10 REM*****  EXAMPLE SCREEN INPUT ROUTINE
```

```
20 GOTO 1000
30 :
100 REM**  GET ROUTINE
110 PRINT ESC$, HOME$; :  DL= 0:  IN= 0
120 P= PEEK(PH)*S8+ PEEK(PL)+ POS(0): IF P
    OS(0)= MB THEN PRINT BELL$;
130 CH= PEEK(P): KC= KD: K= KC: IF CH>= KC
     THEN KC= -KC: K= 0
140 POKE P, CH+K:  T= TIME+ THIRTY
150 IF TIME> T THEN K= KC-K:  GOTO 140
160 GET Z$:  IF Z$= "" OR Z$= QT$ THEN 150

170 IF Z$= BS$ THEN 300
180 :     :     :
190 :     :     :
200 POKE P, CH: IF P> LROW THEN IF Z$= CR$
     OR Z$= CD$ THEN 120
210 PRINT Z$; ESC$; :  GOTO 120
220 :
300 REM**  SPECIAL FUNCTIONS
310 POKE V, 42:  POKE V+1, 42:  POKE V+3, ~
    28   :REM  DISPLAY ** \
320 POKE P, CH+KC:  Z$= ""   :REM  INVERSE
     CHARACTER
330 GET X$:  IF X$= "" THEN 330
340 IF X$= "M" THEN Z$= "MR. AND MRS. ":  ~
    GOTO 400
350 IF X$= "P" THEN Z$= "PHILADELPHIA PA 1
    91":  GOTO 400
360 IF X$= CHR$(20) THEN Z$= CHR$(21): DL=
     DL+1: GOTO 400  :REM DELETE LINE

370 IF X$<> CHR$(148) THEN 400   :REM INSE
    RT LINE
380 Z$= CHR$(149):  IF DL= 0 THEN IN= IN+ ~
    1:  GOTO 400
390 DL= DL- 1   :REM  EXCESS DL'S SO ROOM ~
    FOR INSERT
395 :
400 FOR I= V TO V+3:  POKE I, 32:  NEXT I ~
      :REM  CLEAR ** \
410 IF X$<> BS$ THEN 200
420 :
500 REM**  ACCEPT SCREEN
510 POKE P, CH:  PRINT HOME$; HOME$   :REM
      BREAK WINDOW
520 REM*  INSERT LINES IF NECESSARY
530 IF IN= 0 THEN 550
540 FOR I= 24*10-IN TO PG+24-IN STEP -1: A
    $(I+IN)= A$(I):  NEXT I
550 FOR I= 0 TO 23   :REM  ACCEPT SCREEN H
    ERE
560 :  POKE 623, 13:  POKE 158, 1
570 :  PRINT IN$; :  INPUT A$(PG+I)
580 :  PRINT DEL$
590 :  NEXT I
595 PRINT HOME$; CHR$(153);   :REM  SCROLL
     DOWN
600 REM*  SQUEEZE TOGETHER IF NECESSARY
610 IF DL= 0 THEN 640
620 FOR I= PG+24 TO 10*24: A$(I-DL)= A$(I)
    : NEXT :REM  SHIFT LEFT
630 FOR I= 10*24-DL TO 10*24: A$(I)= "": N
    EXT  :REM CLEAR DUP'D LINES
640 RETURN
650 REM**  END ROUTINE
660 :
1000 REM***  IMPORTANT CONSTANTS AND VARIAB
    LES, IN ORDER
1010 Z$="": P=0: CH=0: K=0: T=0: THIRTY= 30
    : KC=0: KD= 128
1020 PH= 197: PL= 196: S8= 256: MB= 74
1030 QT$= CHR$(34): BS$= CHR$(92): ESC$= CH
    R$(27)
1040 LROW= 32768+ 24*80 -1
1050 CR$= CHR$(13): CD$= CHR$(17): X$=""
1060 IN$= CHR$(148)+ QT$+ ESC$+ CHR$(157)+ ~
    CHR$(148)+ CHR$(148)
1070 DEL$= CHR$(145)+ "   "+ CHR$(20)+ CHR$
    (20)+ CHR$(20)
1080 V= 32768+ 75:  DIM A$(10*24)   :REM  1
    0 PAGES OF 24 LINES EACH
1090 HOME$= CHR$(19):  CLS$= CHR$(147):  CU
    $= CHR$(145):  LC$= CHR$(157)
1100 :
2000 REM****  MAIN PROGRAM
2010 PRINT HOME$; HOME$; CLS$:  POKE 59468,
     14  :REM  SET TEXT MODE
2020 PRINT,, "SCREEN  INPUT  PROGRAM"
2030 PRINT,, "    BY CRAIG DISSTON": PRINT: ~
    PRINT
2040 PRINT "ENTER THE PAGE NUMBER OF TEXT T
    O ENTER OR EDIT";
2050 PRINT "   0"; LC$; LC$; LC$; : INPUT P
    AGE
2060 IF PAGE< 1 OR PAGE> 10 THEN 2040
2070 PRINT CLS$
2080 PG= (PAGE-1)*24 +1
2090 FOR I= PG TO PG+ 22
2100 :  PRINT A$(I)
2110 :  NEXT I
2130 PRINT HOME$; "ENTER TEXT FOR PAGE"; PA
    GE; LC$; ":"
2140 PRINT CHR$(15)   :REM  SET TOP MARGIN
2150 :
2160 GOSUB 100
2170 :
2180 GOTO 2000
2190 REM*****  "END PROGRAM."
```

VICSTATION: A "Paperless Office"

Joel Peter Anderson

Don't neglect your VIC when you have paperwork to do. With this program, you can create, review, and edit text files – bringing you one step closer to a paperless office. Along with VICSTATION are two application programs that can use the files created by VIC's Line/Pro. Also, there are some ideas on using the VIC as a smart terminal for telecommunications.

Why did you buy your VIC? Maybe you saw it as a "smart" game machine, or perhaps as an educational tool – or you could have seen it as an inexpensive way to get into word processing. Whatever the reason, you've no doubt learned that the VIC can do quite a lot, probably more than you ever expected!

I have a friend who owns a computer with more memory than mine. He had bought a word processing program to use on his system and was describing how it worked.

"But you haven't got a printer," I pointed out, "what good is a program like that?"

He explained that it was very good indeed. Even if he had to type his final copy by hand, the word processor could be used very effectively to produce the rough draft.

That was something I had never thought of before. I wasn't planning on expanding my system for a long time, but I had a good electric typewriter – couldn't I come up with some way to have my VIC work up the rough drafts? Besides that, maybe some things could just as well be written and saved as tape files.

I came up with the program presented here – a line editor that can create, review, and edit text files – a start on a "paperless" office. Along with the editor, I've included two application programs which can use the files created by VIC's Line/Pro.

Program 1 is all you need to get started. RUNning the program will give you a display LINE/PRO and a list of reserved words. *These are very important* (more about these in a minute).

To begin using the editor, hit any key. The screen will clear, and a green cursor will flash in the upper left corner. Type a line, hit RETURN, and the line will appear as blue text in the lower portion of the screen about four lines down from the top. As you continue to type, each line (up to 88 characters) will appear below the text already entered. As you will see when you have more than a screen of information, the entire text entered scrolls past after each line. If you want to quickly review what you've written, press the CTRL key to slow it down.

Two cautions: Input is through a special INPUT# statement, so if you want to include commas or colons, you have to enclose the entire line in double quotes. And obviously you can't use double quotes in your text. I usually use two apostrophes.

The reserved words are invoked by entering each word in lowercase alone, as input. If you want to have that word as part of the text all by itself, enter it as "read" (enclosed in double quotes, with an extra space following). The program will see it as five characters long and ignore it. Any line beginning with a reserve word, such as "reading is a pleasure," will *not* be picked up. The same trick is used to indent text – " text" indents the word "text" three spaces. The following reserve words pass control temporarily to special subroutines:

SAVE

This is used to put your current text onto tape. A corresponding routine, BYBY, is always used following one or more SAVEs. Although it is optional, when SAVEing, a file name is requested

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and prompts are printed for the datasette. In a series of SAVEs, the file name is only requested the first time – when opening the file. When the text is saved, control returns to the main program, but now, there is no text in memory. If you don't want to add any more to the text file, type "byby". This closes the file and ends the program.

If, on the other hand, you want to create a longer file, and there is no limit to the length of a tape file other than the length of the tape itself, then go back to entering text, editing it, and typing "save" again, as many times as you like. You very likely will wind up with a file longer than this program can handle – but more about that later.

Important note: the closing subroutine "byby" prints the character "£" as an end-of-file marker, so you can't use that in your text. If you can't live without that character, change lines 310 and 670 to use some other odd character. You'll also have to change the application programs because they expect the character "£" to end text files.

EDIT

The edit routine allows you to move line-by-line through your text – a handy way to review what you have written. You can page through a text as much as you want, and you can also change, insert, and delete anything on any line. This also uses an INPUT# statement, so the same caution as above applies. When you hit a line that needs changes, press F7 and change the line however you like as long as it doesn't become longer than 88 characters. To get quickly to something at the end of a text, page backwards past the beginning and you will be at the end of the text (sorry, this doesn't work going forward – getting to the end exits the "edit" routine).

READ

This slowly displays the entire text in memory. To pause after any line, just hit the space bar; to resume, press it again. At the end of the text, the program will wait for you to hit the space bar to return to the main program.

TAPE

"What do I do with these tape files?" you may wonder. Well, by typing in "tape" you can reenter them into the program – for review, editing, to graft them onto another file – anything you want to do as long as you don't exceed the 50-line limit. Also, you cannot use it once SAVE has been invoked.

By the way, if you ever do get kicked out of the program, type "GOTO140" to return to the main program.

BYTE

This last reserved word gives you a quick report of what line you're on and how many characters remain in memory.

FILE READER

Program 2 is what you do when your files get too long for memory. The file reader will display a tape file on the screen, and pause for any keystrokes, except for F1, which ends the program.

When the end of a file is reached, the program goes into an infinite loop which ends either:

- when you press F1 to terminate the session or
- when you press F3 to search for the next file on the tape.

DUMBTERM

Program 3 is a modification of a program that appeared in the August 1982 issue of **COMPUTE!**, "VIC Communications: The RS-232 Interface." What I have done is add several features to smarten up this "dumb terminal."

I noticed that several programs I used for terminals had features where special messages (passwords, i.d.'s, etc.) were often just printed directly to the RS-232 Interface without any translation. As an experiment, I tried doing that with an INPUT# statement. What I got was a simple way to have a screen editor built into your terminal. To use this, hit F3 – a red ? will appear, and the cursor will turn red. As long as you don't care about upper- or lowercase, this will give you the ability to move the cursor back within the text on your screen, modify it, and then send it back over the terminal.

I have found this very handy for editing programs. The host computers I use support a line-based text editor. Often I use the editor to first delete the line I'm changing (it prints it out for verification) and then modify it and send it back using the screen editor. Be careful to enclose anything using commas or colons within double quotes.

The escape key (F1) is simply a way to exit a line being entered. The control "c" (F7) is included because the host computers I use have that as an exit character in various programs. You can change it to whatever character your local mainframes require. Simply change the CHR$(3) in line 2000 to CHR$(1) for "a" and so on.

Finally, the "tape file" command (F2) will take any tape file and send it over the terminal. Like the screen editor, this command doesn't translate; it just sends the characters over, so forget upper- and lowercase. I know from experience that this only works well when you are using some sort of text mode during which all text received is appended to a current file. Also it is necessary to instruct the host computer to go to half mode – the program prints the text file on the screen during transmission.

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DEALER INQUIRIES WELCOME

Half Mode

There is another reason for that last instruction. It's the reason this trick can work at all.

To quote Butterfield and Law, in the article mentioned above, "You can't use the... cassette tape while the RS-232 is in gear." You shouldn't be able to send text via the modem from the cassette. I tried it and you can't – unless you tell the host computer to stop echoing your message. If you do that, your text will go over intact with perhaps a few glitches (it pays to check it).

This feature has been very handy. When I am paying for my computer time, or doing schoolwork within a limited amount of computer time, I find it helps to begin writing a program on my home computer and then send it to the mainframe for editing and implementation. Also, the mainframes I use support a type of word processing. This means that a text created and edited with Line/Pro can be formatted and printed (on a printing terminal) in a nice final copy.

The effectiveness of this may vary on systems other than the CDC Cyber I am familiar with. I think, though, that you will find this a simple but effective way to use your VIC to do some powerful things.

Note: The character which appears as a backslash (\) in Programs 1-3 should be typed as the British pound symbol (£) on the VIC keyboard.

Program 1: Line Editor

```
10 PRINT" {CLEAR}        {REV}LINE/PRO"
20 PRINT"{02 DOWN}{02 RIGHT}THIS LINE-PRO
   CESSOR"
30 PRINT"WILL EDIT AND SAVE A  SERIES OF ~
   LINES (NO    LIMIT, HOWEVER ONLY ~
    50 ";
40 PRINT"LINES ARE TAKEN AT A TIME)."
50 PRINT"{DOWN}{02 RIGHT}SAVE{04 RIGHT}RE
   AD"
60 PRINT"{DOWN}{02 RIGHT}EDIT{04 RIGHT}TA
   PE"
70 PRINT"{DOWN}{02 RIGHT}BYBY"
80 PRINT"{DOWN}{02 RIGHT}BYTE"
90 GETA$:IFA$=""THEN90
100 DIMW$(50)
110 PRINT"{CLEAR}";CHR$(14)
120 FORX=1TO104:B$=B$+" ":NEXTX
130 OPEN1,0,0
140 PRINT"{HOME}";CHR$(30);B$;"{HOME}";
150 INPUT#1,A$
160 PRINT"{BLU}";:IFLEN(A$)=0THEN140
170 IFLEN(A$)=4THENGOSUB230
180 IFLEN(A$)=0THEN140
190 W$(L)=A$:PRINT"{02 DOWN}"
200 PRINT"{CLEAR}";B$:FORX=0TOL:PRINTW$(X)
   :NEXTX
210 L=L+1:GOTO140
220 REM CONTROL ROUTINE
230 IFA$="EDIT"THENA$="":GOSUB490
240 IFA$="SAVE"THENA$="":GOSUB420
250 IFA$="BYTE"THENA$="":GOSUB720
260 IFA$="BYBY"THENA$="":GOSUB300
270 IFA$="READ"THENA$="":GOSUB330
280 IFA$="TAPE"THENA$="":GOSUB640
290 PRINT"{CLEAR}";:RETURN
300 REMEND OF FILE
310 PRINT#2,"{F1}\\\\"
320 CLOSE2:END
330 REM FILE REVIEW
340 PRINT"{CLEAR}{GRN}";:POKE36879,110:FOR
   G=0TOL-1:FORX=1TOLEN(W$(G)):PRINT
   MID$(W$(G),X,1);:NEXTX
350 FOR D=1TO300:NEXT:GETR$:IFR$=" "THENGO
   SUB390
360 PRINT:NEXTG
370 GETR$:IFR$="" THEN 370
380 POKE36879,27:PRINT"{CLEAR}":RETURN
390 FORXX=1TO10:GETR$:NEXTXX
400 GETR$:IF R$=""THEN400
410 RETURN
420 IFFL$="OPEN"THEN450
430 FL$="OPEN":INPUT"TITLE";T$
440 OPEN2,1,1,T$
450 FORG=0TOL-1
460 PRINT#2,W$(G):W$(G)=""
470 NEXTG:L=0
480 RETURN
490 REM EDIT ROUTINE
500 INPUT"CLEAR IT ALL";R$
510 IF LEFT$(R$,1)="Y"THENFORG=0TOL+1:W$(G
   )="":NEXT:L=0:RETURN
520 PRINT"{CLEAR}{04 DOWN}{REV}F5{OFF} PAG
   E FORWARD{DOWN}":PRINT"{REV}F3{OF
   OFF} PAGE BACKWARD{DOWN}":PRINT"{
   REV}F7{OFF} INPUT NEW LINE{DOWN}"

530 FORG=1TO1000:NEXTG:PRINT"{CLEAR}"
540 FORG=0TOL-1
550 PRINT"{HOME}";CHR$(30);B$;"{HOME}";
560 PRINTW$(G);"{HOME}";
570 GETR$:IFR$<>"{F7}"ANDR$<>"{F5}"ANDR$<>
   "{F3}"THEN570
580 IFR$="{F3}"ANDG=0THENG=L-1:GOTO550
590 IFR$="{F3}"ANDG<>0THENG=G-1:GOTO550
600 IFR$="{F5}"THEN620
610 INPUT#1,W$(G)
620 NEXTG
630 RETURN
640 REM TAPE INPUT
650 INPUT"{CLEAR}FILENAME";F$:OPEN2,1,0,F$
   :PRINT"FILE OPEN, BOSS"
660 FORX=LTO50
670 GET#2,L$:IFL$="\"THEN L=X:PRINT"{
   CLEAR}":CLOSE2:RETURN
680 IF L$=CHR$(13)THENNEXTX
690 IFX>50THENCLOSE2:L=X:RETURN
700 W$(X)=W$(X)+L$
710 GOTO670
720 REM BYTES FREE
730 PRINT"{CLEAR}{02 DOWN}{02 RIGHT}{DOWN}
   BYTES FREE"
740 PRINT"{04 RIGHT}{DOWN}";FRE(X):PRINT"{
   DOWN}{REV}LINE";L
750 FORG=1TO1500:NEXTG:PRINT"{CLEAR}";
760 RETURN
770 END
```

Program 2: File Reader

```
20 REM VIC STATION - FILE READER
30 PRINT"{CLEAR}";CHR$(14)
40 PRINT"{CLEAR}{02 DOWN}{REV}{GRN}    FI
   LE@READER       {BLU}{OFF}"
50 PRINT"{03 DOWN}THIS FILE READER WILL O
   PEN A FILE ON   TAPE"
```

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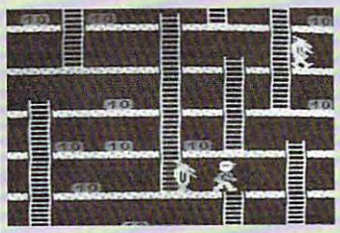

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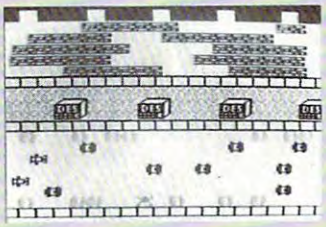

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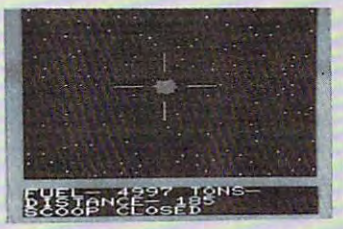

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```
60 PRINT"AND DISPLAY ITS CON-  TENTS. PAU
   SING FOR    KEYSTROKES,"
70 PRINT"{DOWN}{REV}F1{OFF} ENDS CURRENT ~
   FILE":PRINT"{DOWN}{REV}F3{OFF} BE
   GINS NEXT FILE"
80 OPEN1,1,0
90 PRINT"{CLEAR}FILE OPEN"
100 GET#1,W$:IFW$="\"THEN170
110 PRINTW$;
120 GETA$:IFA$=""THEN160
130 GETA$:IFA$<>""THEN130
140 GETA$:IFA$=""THEN140
150 IFA$="{F1}"THEN 170
160 GOTO100
170 PRINT"{REV}END OF FILE"
180 CLOSE1
190 GETA$:IFA$="{F1}"THEN END
200 IFA$="{F3}"THEN 80
210 GOTO190
```

Program 3: Dumbterm Modification

```
0 REM MODIFICATION OF  COMPUTE! PROGRAM(
   8/82)DUMBTERM
1 PRINT"{CLEAR}"
2 PRINT"{02 DOWN}{REV}      DUMBTERM     ~
      ":PRINT"{DOWN}{RIGHT}{REV}F1{
   OFF} ESCAPE LINE":PRINT"{DOWN}{
   RIGHT}{REV}F2{OFF} OPEN TAPE FILE

3 PRINT"{DOWN}{RIGHT}{REV}F3{OFF} SCREEN
    EDITOR":PRINT"{DOWN}{RIGHT}{REV}
   F7{OFF} CTRL 'C'"
4 PRINT"{04 DOWN}{REV}{YEL}    PRESS SPA
   CE BAR          TO BEGIN      {
   BLU}"
5 GETA$:IF A$="" THEN 5
6 PRINT"{CLEAR}";
10 OPEN1,2,3,CHR$(38)+CHR$(160)
20 GETA$: IF A$=""THEN60
21 IF A$="{F3}"THEN GOSUB1000
22 IF A$="{F1}"THEN PRINT#1,CHR$(27)
23 IF A$="{F7}"THEN GOSUB2000
24 IF A$="{F2}"THEN GOSUB3000
30 IFA$=CHR$(147)THEN90:REM CLEAR HOME QU
   ITS
40 A=ASC(A$) AND 127: IF A=20 THEN PRINT#
   1,CHR$(8);:GOTO60
50 IF A>31 OR A=13 THEN PRINT#1, CHR$(A);

60 GET#1,A$:IFA$=""THEN 20
70 A=ASC(A$)AND127 : IF A=8 THEN PRINTCHR
   $(20);:GOTO20
80 IF A>31 OR A=13 THEN PRINT CHR$(A);
85 GOTO20
90 CLOSE1:END
1000 INPUT"{RED}";Q$:PRINT#1,Q$:PRINT"{BLU}
   ";:RETURN
2000 PRINT#1,CHR$(3);:RETURN
3000 INPUT"{RED}FILE NAME?";FM$
3010 OPEN2,1,0,FM$
3020 OP$=""
3025 FOR X=1TO100:NEXT
3030 GET#2,E$:IF E$="\" THEN 3100
3040 IF E$=CHR$(13)THEN PRINT#1,OP$:PRINTOP
   $:GOTO3020
3050 OP$=OP$+E$:GOTO3025
3100 CLOSE2:PRINT"{BLU}";:RETURN
```

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Screen Printer For The Atari Wedge

Michael E. Hepner

Because of its flexible design, the Atari Wedge (published in the November 1982 issue of **COMPUTE!***) can be expanded to include countless new commands. In this Wedge update, SPRINT is added which sends an entire screen to the printer.*

Every Atari owner with a disk drive knows how long it takes to go to DOS and return. I do not wish to find fault with the design of DOS 2.0S. I have several programs that need every spare byte of RAM. So by having only the minimum essential logic in memory and having the extra options in a separate, nonresident module, there is more RAM free for my own use.

But most of my programs are small, leaving plenty of memory unused. It is annoying to wait for memory to be swapped as you go to DOS when you know that 20K of RAM is sitting idle in your computer. But now, with the Wedge, this is no longer a problem. I can use my large programs as always, but for my short programs, I can have Wedge automatically loaded and use all of the disk commands that I normally use without the time delay.

As much as the disk commands have helped me, the nicest feature of the Wedge is its table-driven design. Any new function can be added by simply adding the command name and the address of its routine to the table of commands. In this article, I will show you how to add a utility to copy a text screen to the printer.

SPRINT

Although I wrote a program that worked, making it *easy to use* wasn't so easy. The Wedge has taken care of that problem for me. I chose the command name SPRINT because of the similarity to the LPRINT command. Instead of sending a line to the Line *PRINT*er as LPRINT does, SPRINT sends an entire Screen to the line *PRINT*er.

The screen printer routine prints everything on the screen, up to (but not including) the line with the SPRINT command. The routine reads the screen by changing the operation mode in the Editor's Input/Output Control Block to the special editor input mode which is mentioned on page 27 of the *BASIC Reference Manual*. The routine also changes the vector to the Editor Get routine to bypass the Wedge until the print operation is complete, so that nothing on the screen is accidentally interpreted as a Wedge command.

Program 1 is a BASIC loader for the revised Wedge. It is very similar to the loader in the original Wedge except for the DATA statements. I apologize that most of the DATA statements have changed. I had hoped that only a few bytes other than the end of the program would have to be changed.

Program 2 is the assembly language listing of the screen printer routine alone. If you have an Assembler Editor cartridge and wish to add this routine to the original Wedge, you must take the steps listed below to break the Wedge into two parts, renumber the second part, merge the two parts together again, and then type in the new code for the screen printer routine. The comma-M in the last step is required to merge TEMP with the program in memory.

```
ENTER #D:WEDGE
DEL 100,3140
REN 9000,10
LIST #D:TEMP
ENTER #D:WEDGE
DEL 3150,3390
ENTER #D: TEMP,M
```

ML To BASIC

Program 3 is for anyone who is writing programs in machine language and wants to convert them into a BASIC loader program. Along with converting the machine language to BASIC DATA statements, Program 3 also counts the number of bytes in the machine language program, computes the checksum of those bytes, and writes this information to the lowest numbered DATA statement. I used Program 3 to generate the DATA statements in Program 1. To use Program 3, you

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must first assemble your program and save the machine language output as D:AUTORUN.SYS. Then put in the BASIC cartridge and run Program 3. The DATA statements will be written in LIST format to the file D:DATA. LOAD the main part of your loader program and type ENTER "D:DATA". The DATA statements will be added to your loader program.

Program 1: Wedge BASIC Loader

```
100 REM WEDGE BASIC LOADER
110 GRAPHICS 0:? "Insert a DOS 2.0S
    diskette"
120 ? "with DOS.SYS in drive 1."
130 ? "Press RETURN when you have do
    ne this."
140 IF PEEK(764)<>12 THEN 140
150 POKE 764,255
160 ? :? "Now writing the Wedge AUTO
    RUN.SYS file"
170 TRAP 190:CLOSE #1
180 OPEN #1,8,0,"D:AUTORUN.SYS":TRAP
     4000:GOTO 200
190 CLOSE #1:? :? "Can't open AUTORU
    N.SYS for write.":END
200 REM Disk header values are
210 REM in the data statements.
220 READ NUMBYTES,CHECKSUM
230 FOR I=1 TO NUMBYTES
240 READ A:TRAP 310:PUT #1,A:TRAP 40
    000
250 CKSUM=CKSUM+A
260 NEXT I
270 CLOSE #1
280 IF CKSUM<>CHECKSUM THEN ? "
    {BELL}Bad number in DATA stateme
    nts.":END
290 ? :? "DATA ok, write successful.
    "
300 END
310 ? :? "Error-";PEEK(195);" when a
    ttempting disk write.":CLOSE #1:
    END
320 REM
330 REM Following is the decimal
340 REM equivalent of Wedge 1.1
350 REM Must be type in perfectly
360 REM in order to function.
370 REM
1000 DATA 794,78719
7930 DATA 255,255,0,31,164,31
7936 DATA 104,165,12,141,37,31
7942 DATA 165,13,141,38,31,169
7948 DATA 36,133,12,169,31,133
7954 DATA 13,32,43,31,32,92
7960 DATA 31,169,162,141,231,2
7966 DATA 169,34,141,232,2,96
7972 DATA 32,42,31,32,11,31
7978 DATA 96,169,80,141,68,3
7984 DATA 169,31,141,69,3,169
7990 DATA 0,141,73,3,169,12
7996 DATA 141,72,3,169,11,141
8002 DATA 66,3,162,0,32,86
8008 DATA 228,152,48,1,96,76
8014 DATA 142,34,65,116,97,114
8020 DATA 105,32,87,101,100,103
8026 DATA 101,155,160,0,185,26
8032 DATA 3,201,69,240,7,200
8038 DATA 200,192,34,208,243,96
8044 DATA 200,169,165,153,26,3
8050 DATA 200,169,31,153,26,3
8056 DATA 162,0,189,0,228,157
8062 DATA 165,31,232,224,16,208
8068 DATA 245,169,184,141,169,31
8074 DATA 169,31,141,170,31,24
8080 DATA 173,4,228,105,1,141
8086 DATA 186,31,173,5,228,105
8092 DATA 0,141,187,31,169,0
8098 DATA 133,203,96,185,31,108
8104 DATA 32,32,62,246,8,201
8110 DATA 155,240,4,230,203,40
8116 DATA 96,140,181,31,142,182
8122 DATA 31,165,203,240,86,169
8128 DATA 51,133,205,169,32,133
8134 DATA 206,160,0,177,205,217
8140 DATA 128,5,208,12,200,177
8146 DATA 205,240,40,196,203,208
8152 DATA 240,76,37,32,201,255
8158 DATA 240,53,160,0,177,205
8164 DATA 240,9,230,205,144,2
8170 DATA 230,206,76,242,31,24
8176 DATA 165,205,105,3,133,205
8182 DATA 144,2,230,206,76,215
8188 DATA 31,200,132,204,177,205
8194 DATA 141,183,31,200,177,205
8200 DATA 141,184,31,108,183,31
8206 DATA 160,0,169,46,153,128
8212 DATA 5,169,0,133,203,169
8218 DATA 155,172,181,31,174,182
8224 DATA 31,40,96,68,73,82
8230 DATA 0,134,32,83,67,82
8236 DATA 65,84,67,72,0,31
8242 DATA 33,76,79,67,75,0
8248 DATA 36,33,85,78,76,79
8254 DATA 67,75,0,41,33,82
8260 DATA 69,78,65,77,69,0
8266 DATA 46,33,75,73,76,76
8272 DATA 0,51,33,83,80,82
8278 DATA 73,78,84,0,64,33
8284 DATA 255,129,32,21,34,68
8290 DATA 58,42,46,42,162,80
8296 DATA 169,12,157,66,3,32
8302 DATA 86,228,162,80,169,3
8308 DATA 157,66,3,169,6,157
8314 DATA 74,3,169,129,157,68
8320 DATA 3,169,32,157,69,3
8326 DATA 32,86,228,152,16,3
8332 DATA 76,142,34,162,80,169
8338 DATA 5,157,66,3,169,109
8344 DATA 157,68,3,141,68,3
8350 DATA 169,32,157,69,3,141
8356 DATA 69,3,169,20,157,72
8362 DATA 3,141,72,3,32,86
8368 DATA 228,152,48,13,169,9
8374 DATA 141,66,3,162,0,32
8380 DATA 86,228,76,175,32,162
8386 DATA 80,169,12,157,66,3
8392 DATA 32,86,228,76,30,32
8398 DATA 162,80,157,66,3,169
8404 DATA 0,157,73,3,164,203
8410 DATA 153,128,5,56,152,229
8416 DATA 204,157,72,3,24,169
8422 DATA 128,101,204,157,68,3
8428 DATA 169,5,105,0,157,69
8434 DATA 3,32,86,228,152,16
8440 DATA 3,76,142,34,76,30
8446 DATA 32,169,33,76,238,32
8452 DATA 169,35,76,238,32,169
8458 DATA 36,76,238,32,169,32
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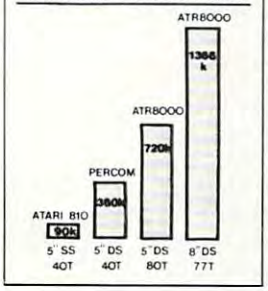

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PERCOM	*	*	*	NO	NO	EXTRA[2]	EXTRA[2]	NO	NO	NO	NO

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```
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8470 DATA 133,12,173,38,31,133
8476 DATA 13,76,116,228,56,165
8482 DATA 84,233,2,16,3,76
8488 DATA 30,32,141,20,34,173
8494 DATA 74,3,141,21,34,162
8500 DATA 80,169,12,157,66,3
8506 DATA 32,86,228,162,80,169
8512 DATA 3,157,66,3,169,17
8518 DATA 157,68,3,169,34,157
8524 DATA 69,3,169,8,157,74
8530 DATA 3,32,86,228,152,16
8536 DATA 3,76,142,34,169,0
8542 DATA 133,84,165,82,133,85
8548 DATA 169,9,141,74,3,173
8554 DATA 4,228,141,169,31,173
8560 DATA 5,228,141,170,31,162
8566 DATA 0,169,22,157,68,3
8572 DATA 169,34,157,69,3,169
8578 DATA 5,157,66,3,169,120
8584 DATA 157,72,3,169,0,157
8590 DATA 73,3,32,86,228,152
8596 DATA 48,71,162,80,169,22
8602 DATA 157,68,3,169,34,157
8608 DATA 69,3,169,9,157,66
8614 DATA 3,169,120,157,72,3
8620 DATA 169,0,157,73,3,32
8626 DATA 86,228,152,48,38,165
8632 DATA 84,205,20,34,48,183
8638 DATA 240,181,173,21,34,141
8644 DATA 74,3,162,80,169,12
8650 DATA 157,66,3,32,86,228
8656 DATA 169,184,141,169,31,169
8662 DATA 31,141,170,31,76,30
8668 DATA 32,72,173,21,34,141
8674 DATA 74,3,169,184,141,169
8680 DATA 31,169,31,141,170,31
8686 DATA 76,143,34,80,58,0
8692 DATA 0,0,142,34,161,34
8698 DATA 72,162,80,169,12,157
8704 DATA 66,3,32,86,228,104
8710 DATA 162,255,154,133,185,76
8716 DATA 64,185,226,2,227,2
8722 DATA 1,31
```

Program 2: Screen Printer Routine

```
2122  .BYTE "SPRINT",0
2124  .WORD SPRINT
3150 ;
3160 ; Start of screen to printer ou
     tput routine
3170 ;
3180 ;
3190 LMARGN=$52
3200 ROWCRS=$54
3210 COLCRS=$55
3220 ;
3230 SPRINT
3240 ;
3250 ; Compute last line to print
3260 ;
3270  SEC
3280  LDA ROWCRS      ;Current cursor
      row is the line below SPRINT
3290  SBC #2          ; minus two to
     skip the SPRINT line
3300  BPL SAVELINE
3310  JMP EXIT        ;Cursor out of
     range - nothing to copy
3320 SAVELINE
3330  STA SVPOS       ;Save last line
3340 ;
3350 ; Save the original open mode o
     f the Editor.
3360 ;
3370  LDA ICAUX1      ;Save ICAUX1
3380  STA SVAUX
3390 ;
3400 ; Open the printer
3410 ;
3420  LDX #$50        ;IOCB #5
3430  LDA #CCLOSE     ;Close it first
3440  STA ICCOM,X
3450  JSR CIO
3460  LDX #$50        ;IOCB #5
3470  LDA #COPN       ;Then open it
3480  STA ICCOM,X
3490  LDA #PNAME&255
3500  STA ICBADR,X
3510  LDA #PNAME/256
3520  STA ICBADR+1,X
3530  LDA #8          ;8 = Output
3540  STA ICAUX1,X
3550  JSR CIO
3560  TYA
3570  BPL HOME
3580  JMP ERROR       ;Error on open
3590 ;
3600 ; Home the cursor.
3610 ;
3620 HOME
3630  LDA #0          ;Place cursor a
     t
3640  STA ROWCRS      ; top of screen
3650  LDA LMARGN      ; and at left
3660  STA COLCRS      ; margin
3670 ;
3680 ; Change EDITOR to special inpu
     t mode.
3690 ;
3700  LDA #9          ;9 = read scree
     n
3710  STA ICAUX1      ; automatically
3720  LDA $E404       ;Restore old E
3730  STA WEDGETAB+4
3740  LDA $E405
3750  STA WEDGETAB+5
3760 ;
3770 ;  Loop to read the screen.
3780 ;
3790 PLOOP
3800  LDX #$00        ;IOCB #0
3810  LDA #EBUF&255
3820  STA ICBADR,X
3830  LDA #EBUF/256
3840  STA ICBADR+1,X
3850  LDA #CGTXTR     ;Get record
3860  STA ICCOM,X
3870  LDA #120        ;120 characters
3880  STA ICBLEN,X
3890  LDA #0
3900  STA ICBLEN+1,X
3910  JSR CIO
3920  TYA
3930  BMI SPERROR     ;Error on read
3940 ;
3950 ; Print the line
3960 ;
3970  LDX #$50        ;IOCB #5
3980  LDA #EBUF&255
3990  STA ICBADR,X
```

```
4000  LDA #EBUF/256
4010  STA ICBADR+1,X
4020  LDA #CPTXTR     ;Put record
4030  STA ICCOM,X
4040  LDA #120        ;120 characters
4050  STA ICBLEN,X
4060  LDA #0
4070  STA ICBLEN+1,X
4080  JSR CIO
4090  TYA
4100  BMI SPERROR     ;Error on write
4110 ;
4120 ; Check if done
4130 ;
4140 CHECK
4150  LDA ROWCRS
4160  CMP SVPOS       ;Compare to end
    ing row
4170  BMI PLOOP       ;Loop if more
4180  BEQ PLOOP       ; lines to read
4190 ;
4200 ; Close IOCB #5 and restore Wed
    ge and Editor mode.
4210 ;
4220 SPDONE
4230  LDA SVAUX       ;Restore saved
4240  STA ICAUX1      ; ICAUX1
4250  LDX #$50        ;Close IOCB #5
4260  LDA #CCLOSE
4270  STA ICCOM,X
4280  JSR CIO
4290  LDA #MYINPUT-1&255  ;Point to
4300  STA WEDGETAB+4      ; Wedge
4310  LDA #MYINPUT-1/256
4320  STA WEDGETAB+5
4330  JMP EXIT        ;Jump to common
     exit
4340 SPERROR
4350  PHA             ;Save error cod
    e
4360  LDA SVAUX       ;Restore saved
4370  STA ICAUX1      ; ICAUX1
4380  LDA #MYINPUT-1&255  ;point to
4390  STA WEDGETAB+4      ;Wedge
4400  LDA #MYINPUT-1/256
4410  STA WEDGETAB+5
4420  JMP ERROR+1     ;Jump past the
    PHA instruction
4430 :
4440 PNAME .BYTE "P:",0
4450 SVPOS .BYTE 0
4460 SVAUX .BYTE 0
4470 EBUF *=*+120
```

Program 3:

Conversion Of ML To BASIC Loader

```
10 DIM L$(40),B$(3)
20 OPEN #4,4,0,"D:AUTORUN.SYS"
30 OPEN #5,8,0,"D:DATA"
40 LNUM=7930:CKSUM=0
50 L$="7930 DATA "
60 DNUM=0
70 TRAP 800:GET #4,BYTE:TRAP 40000
80 IF DNUM<6 THEN 140
90 PRINT #5;L$:PRINT L$
100 LNUM=LNUM+6
110 L$=STR$(LNUM)
120 L$(LEN(L$)+1)=" DATA "
130 DNUM=0
140 B$=STR$(BYTE)
150 IF DNUM>0 THEN L$(LEN(L$)+1)=","
160 L$(LEN(L$)+1)=B$
170 COUNT=COUNT+1:DNUM=DNUM+1
180 CKSUM=CKSUM+BYTE
190 GOTO 70
800 IF PEEK(195)<>136 THEN 900
810 PRINT #5;L$:PRINT L$
820 L$="1000 DATA "
830 L$(11)=STR$(COUNT)
840 L$(LEN(L$)+1)=","
850 L$(LEN(L$)+1)=STR$(CKSUM)
860 PRINT #5;L$:PRINT L$
870 PRINT COUNT;" BYTES OF DATA"
880 PRINT "CHECKSUM=";CKSUM
890 CLOSE #4:CLOSE #5:END
900 CLOSE #4:CLOSE #5
910 PRINT "ERROR ";PEEK(195)
920 END
```

INSIGHT: Atari

Bill Wilkinson

The series on writing your own interpreter continues. In part 2, the expression evaluator and the "PRINT" statement are added to BAIT. There's also a look at Atari's new 200XL computer.

We hope to introduce several new products at the West Coast Computer Faire this year, including some designed specifically for the new model 1200 Atari (of which machine I will speak more below). I can't tell you exactly what the new products will be, but I can say that I think that those who have written software which follows the "rules" will benefit.

Which "rules"? Oh, nothing much. Just those regarding LOMEM, HIMEM, device drivers, reset vectors, break vectors, etc. If you are an author (or company) who is developing or has developed software for the Atari computers, you might want to ask Atari for a copy of the note from Howard Chan, Manager of Software Acquisition, which details what Atari considers the "untouchable" locations as well as what "vectors" are immutable. We hope to be able to reproduce that note in this column next month.

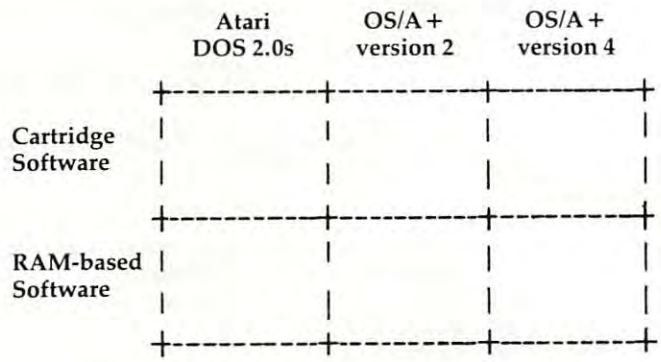
Anyway, what are we looking into in this month's column? Obviously, we will have part two of the series on writing your own interpreter. (And if you missed part one, you must go out right now and buy the March issue! We cannot and will not recap the materials previously covered.) Also, as mentioned, I would like to briefly discuss the new Atari 1200XL machine. But first I am going to hang my head a little.

Pardon Me, My Pratfall Is Showing

After giving everyone else (particularly Atari) a hard time about not doing things "right," I am embarrassed to admit that I, too, did a thing definitely "un-right."

I must start by giving credit to F. T. Meiere, President of the Indy Atari Club from Indianapolis, for not only finding my goof, but also giving me what seems to be a workable and proper fix.

The mistake occurred, not surprisingly, in my fix to the Atari RS-232 drivers, as published in this column in the December 1982 issue of **COMPUTE!**. It came about because of the variety of configurations that I work in. The possible combinations I use can be shown as a small array:



Now, obviously, the vast majority of the Atari user population finds itself in the upper left box (Atari BASIC with Atari DOS). And, yet, because I really don't like working with "MEM.SAV" and "DUP.SYS" (and the consequential swapping in and out and sometimes losing my memory and ...), I generally leave that left-hand column for last. And, unfortunately, in this case I apparently didn't even get to it. For shame.

Anyway, taking F.T. Meiere's advice to heart, I have indeed tested the change he has proposed in several of the possible configurations. Additionally, I have looked at my original code and found out why it failed (and why this new code works). So here, without further ado, is the fix to my RS-232 fix in the form of a change to line 1990 of the assembly language code:

```
was: 1990 JMP (DOSINI)  WRONG!
now: 1990 JMP PATCH3    RIGHT!
```

To Excel Or Not To Excel

The new Atari machine is named the "1200XL." I suppose the "XL" is supposed to designate speed and sexiness, à la sports cars. And certainly the machine *looks* sleek and sexy enough; it is by far the best looking of the current crop of home computers. Were it not for the serial I/O cable, you could easily envision holding the machine in your lap while leaning back in your easy chair, admiring and caressing it as you would a glass of good wine.

Let's look at the obvious features:

- *Pluses:* 62K of RAM, two character sets, a self-test