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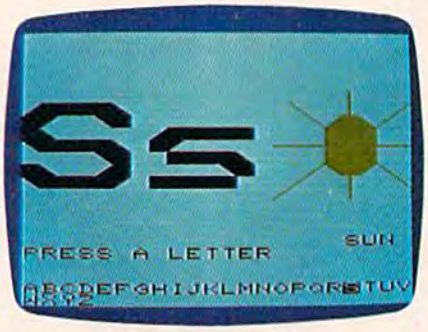
REVIEWS

Children's Educational Games

Tony Roberts, Assistant Managing Editor



ALPHA-BECi *uses simple graphics to teach letters of the alphabet.*

The goal of Boston Educational Computing is to provide owners of the most elementary computer systems with educational software that can be used easily by those with little knowledge of computing.

In its Child Development Series, BECi (pronounced Becky) meets this goal. Among the software in the series are a counting program and an alphabet program aimed at preschool children and an addition-subtraction program targeted for the slightly older child.

All of the programs are on tape and are designed to work on an unexpanded VIC-20, but they perform just as well with a memory expander. *NUMER-BECi* and *ADD/SUB* are also available for the Commodore 64 and Atari computers.

Introducing The Alphabet

ALPHA-BECi is intended to help preschool children learn the letters of the alphabet, both upper- and lowercase, associate each letter with a word beginning with that letter, and see how each letter relates to the others in the alphabet.

For each letter, the program provides a screen which includes the capital letter, the small letter, and a picture of an object. The screen is slowly drawn, giving a child the opportunity to call out the name of the letter or object as soon as he recognizes it.

First, the capital letter is drawn, then the associated small letter, then the object with its name below. The entire alphabet is then printed at the bottom of the screen with the target letter highlighted.

ALPHA-BECi can be run in one of three ways. From a menu you decide whether to run the program sequentially, randomly, or under keyboard control. That is, the program will either step through the alphabet from A to Z, will display random letters, or will show screens for the letters selected by the user. The mode can be changed at any time by pressing RUN/STOP, then rerunning the program.

For a child, watching the colorful objects appear on screen is like opening a present. The program's only sound effect is a boop-boop-boop that comes as the letters of the alphabet are being printed along the bottom of the screen. For an adult, it may become a little annoying, but it seems to be music to a child's ears.

Shapes And Colors

NUMER-BECi teaches the preschooler to identify the numbers from 1 to 12, to identify shapes, and to identify colors. And it is set up so the youngster can learn these new ideas at his own pace.

The menu offers the following options:

1. COUNT LIKE THINGS
2. COUNT UNLIKE THINGS
3. COUNT COLORS
4. COUNT SHAPES
5. COUNT COLORS AND SHAPES

A second menu allows you to select a time limit for the answers. Your options here are to let the program run itself, filling in the answers after a specific time delay; have it wait until the child fills in an answer; or have it set a time limit.

When running the program with a time limit set, a correct answer will shorten the time allowed for the next problem. As long as the child continues providing correct answers, the time limit is shortened until he misses. Then the time limit is

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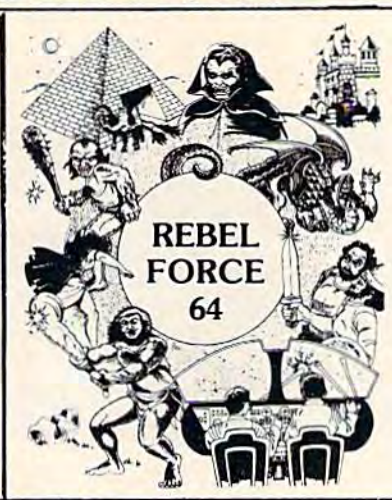

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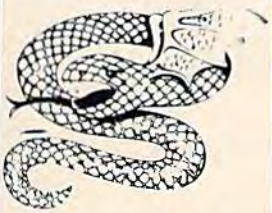

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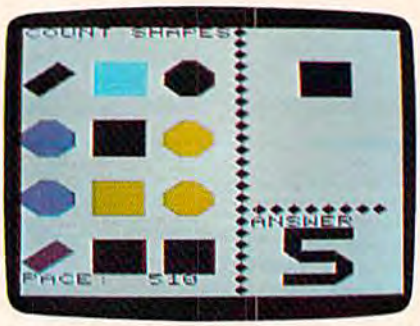

NUMER-BECi *teaches youngsters to recognize and count various colored shapes.*

The top arrow in ADD/SUB *reminds youngsters when to carry or borrow.*

incremented slightly. This feature challenges a child to increase the speed at which he inputs his answers.

When the program is run in the wait-for-answer mode, the child is simply asked to count the number of shapes printed on the screen. If the answer is correct, he moves on to the next problem. If the answer is wrong, the word WHOOPS! is printed in red and the correct answer is displayed.

Under the Count Colors option, the program prints shapes of different colors on the screen and the child is shown a color block and asked to count the number of shapes that match the color block. Count Shapes is a similar exercise with shapes. Shapes and colors are mixed in the final exercise. The child must count the number of black squares, or red triangles, for example.

The child's answer to each problem is printed in large block letters. It takes a second or two to appear for the answer to be printed on the screen after it has been typed in, and this can be a bit disconcerting if you're used to seeing what you type appear on the screen instantly.

Putting 2 And 2 Together

ADD/SUB is BECi's program for older children. The program, which is available for the Commodore 64 as well as the VIC-20, offers choices of addition or subtraction, one to four digits, and decimal or whole numbers. In addition, the user can decide whether to include problems that require carrying or borrowing. For those just learning about carrying and borrowing, there is an option that provides a hint in the form of a large arrow pointing to the column from which a borrow has been made or to which a carry must go.

With *ADD/SUB* you also can select a pace for solving the problems. The standard pace gives the child about seven seconds to answer. When the time is up, the computer will fill in the answer. If the wait-for-answer option is selected, the computer will wait until the numbers are filled in. The set pace option can be used to speed up or slow down the pace to meet a child's needs.

In *ADD/SUB* the problems are displayed in large black numbers with a green plus or minus sign. In multidigit problems, an arrow points to the first digits to be added or subtracted. The answers are filled in from right-to-left, just as they would be done on paper.

Using The Programs

The programs are, as advertised, easy to use. Simply load them from tape and type RUN. Options for play are presented in simple menus. To change the mode of play, press the STOP key, type RUN, and select a new option.

Loading the programs takes a few minutes; a preschooler with a short attention span might spend less time using the program than it takes to load.

The programs are low key. No scores are kept, and the rewards for correct answers are understated. The adjustable nature of the programs and the pacing options, however, provide these programs with an extended life. They are entertaining to a child just beginning to grasp the concepts covered, and they can challenge the more advanced child to solve the problems more quickly.

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Computer Baseball And *Ringside Seat* For Commodore 64

Gregg Keizer, Assistant Book Editor

Ever wanted to manage your own major league team? Most people who follow baseball closely just *know* that they could take their team to the World Series, if only *they* were manager. *Computer Baseball* can give you the feeling of the close game, a pennant race, even the final game of the Series. And it costs far less than buying the Minnesota Twins, the latest team up for sale. You won't even have to pay players' salaries.

This isn't an arcade baseball game like others you may have played. Although players move and hits cross the field, the animation is minimal. *Computer Baseball* is a simulation of the strategy and tactics of a major league team. Using actual statistics, opposing managers can select lineups, choose starting and relief pitchers, set up defense for the bunt or double play, and signal runners to steal. When you put on the manager's cap, *you* make the decisions for your team, hoping to outwit the opposing manager's strategy.

The game includes 28 team rosters, World Series teams all, which you can use to play another opponent, or even the computer manager, Casey. You can even enter data for new teams yourself, or send for a disk containing the most recent American and National League teams, so you can replay an entire season if you want.

How To Play

After you've booted the disk for *Computer Baseball*, you'll be offered several choices. Do you' want to play a two-player game, play against the computer, enter new player data, or watch a demonstration game? Playing against Casey, the computer manager, is a good way to learn the game. Choosing this option presents more decisions. Do you want Casey to manage the home team, the visiting team, or both? I let Casey have the visiting team. But which team?

You'll see 28 teams listed on the screen, ranging from the '06 White Sox to the '81 Dodgers. All 28 played in a World Series, so you can replay a complete seven-game Series, or you can play a What If. What if the '27 Yankees, with Babe Ruth, could have met the '81 Yankees? Who was the better team? Has baseball gotten better, or worse? Once you select Casey's team, as well as your own, the computer will display the team lineups.

Now the decisions become more important. You can choose the starting pitcher(s) and set the batting order for your team. If you want, you can set the order for Casey's team too, but I let him do that. Although setting your batting order takes time, it adds to the game's realism. You have to fill each of the fielding positions, and you only have so many players. You could force a catcher to play outfield, but it's probably not a good idea. As you enter the order, take your time, for any errors you make means you'll have to go through it all again. Unfortunately, there's no option to change your mind in this section of the game.

The screen display appears once you've chosen your team and selected the batting order. The display shows a playing field, players, a scoreboard, and pitcher and batter status information. Once the game starts, you'll be able to tell if the batter is right- or left-handed, where the defense is playing, and the base-running abilities of men on base.

Whether your team is on the field or up to bat, you have several decisions to make. I took the field first, being the home team, so I had to choose my defensive alignment. You can play your outfielders shallow, or in their normal positions. Your infielders you can place even more carefully, moving them in, guarding the lines or setting up for the double play. You can hold base runners, if there are any, tight or loosely, depending on the situation. You can even visit the mound and talk to your pitcher, check to see if he's tired, and perhaps bring in a reliever. Make sure that your reliever is warmed up, though, or he could easily be hit off of.

When your team is up to bat, you have fewer choices to make. You can hit away, hit and

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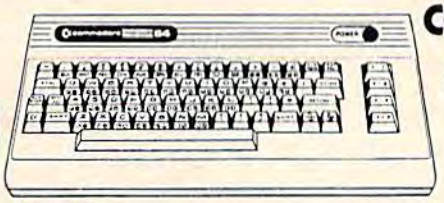

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run, bunt, steal, or signal your runners to edge off the bag a bit more. If you want, you can send in a pinch runner or hitter.

Each pitcher-batter confrontation is displayed on the screen by a single pitch. There are no balls and strikes called, although batters can be struck out. A message appears at the bottom of the screen after each pitch, telling you what's happened. Pop flies, grounders, and base hits are shown to you this way. Runners advance, are thrown out, or score. Although only nine innings are displayed on the screen, extra innings are possible.

Managing It All

Computer Baseball is not for the impatient. It's not a fast-moving, arcade-style game, but it's not meant to be. Instead, the game is for those who love baseball, who have always wanted to step into a manager's cleats. As a simulation, it gives you the feeling of managing a team. Just as in reality, once the basic decisions are made, the players run, hit, and throw in their own ways. A major league manager cannot hit for a player, and neither can you in this game. The statistics of each player determine that.

Some games are pitchers' battles, with low scores. Other games display hitters' powers, and the scores run up quickly. No two games are the same. Again, that reflects the simulation's excellence. As the innings pass, your decisions on pitching and running change, just as in a real game. Strategy is vital. Outguessing the opposing manager is just as important.

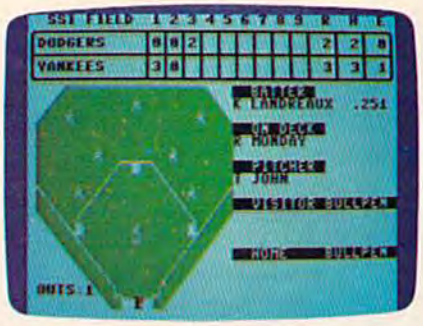
If you enjoy baseball, you'll enjoy this game. The computer takes all the routine drudgery out of keeping track of statistics and lets you concentrate on decision-making. You'll think you've paced and worried in the dugout just like a major league manager.

Ringside Seat

In many ways like *Computer Baseball*, *Ringside Seat* is a game of strategy and statistics. But instead of managing a major league baseball team, you play the part of a boxer's manager. You're not the fighter, but his manager, telling him how to fight when he's in the corner between rounds. Once the bell rings, he boxes in his own way, simply following your strategic suggestions.

When the game is loaded from disk, you have the option of managing either, both, or neither of the fighters. If you want, you can also act as the third judge in the fight, or let the computer handle it. Then you select the two boxers.

The game includes a variety of boxers available to you. Divided into weight classifications, from bantamweight to heavyweight, you simply enter the fighters' names and weight divisions. To see a complete list of the fighters on the game disk, you should press *E* the first time the computer asks you to enter a choice. After a short delay, you should press *L* to see the fighter lists, and then the weight classification. The screen will then show the fighter's identification number, his name, rating, style (slugger or boxer), and his weight division. The lists contain



The Yankees and Dodgers face off in a demo game of Computer Baseball.

The famous Dempsey-Tunney heavyweight title fight is reenacted with Ringside Seat.

current fighters, as well as famous boxers from the past. If you wanted to see how Tunney would have matched up against Foster, for example, you can create this What If scenario.

Once you've chosen the fighters and started the game, you'll see a display on the screen. The boxing ring is shown, as well as representations of the fighters, each still in his corner. Other information, such as the fighters' names, the strategy picked by each manager, condition of the fighter, from cuts to stamina remaining, and even the cumulative judges' score will be displayed. At the top of the screen you'll see descriptions of the fighters' movements during a round. Near the bottom of the screen you'll see messages displayed for the color commentary and blow-by-blow descriptions of the fight.

As in a real fight, you decide how you want your fighter to box that round. The options range from fighting flatfooted, which lets him rest in a round, saving his strength, to going for the knockout. Your fighter's abilities in each of the strategies are listed at the bottom of the screen before the round starts. Some fighters are better at charging in, while others are more effective in the stick and move. Choosing your fighter's style for that round is the most important part of managing. You have to use your fighter wisely, not overworking him, for each strategy reduces the boxer's stamina level. A more aggressive style, such as charging in, or sticking and moving, uses up more stamina than a

defensive posture, like staying away or protecting a cut.

Once the round begins, the fighter is on his own. You'll see a blow-by-blow description of the fight at the bottom of the screen, as well as see the animated figures move in the ring. The only thing you can do once the bell rings is to tell your fighter to cover up. This is helpful if he is getting badly beaten, or if he has a cut opened. Fighters jab, hook, and punch as their statistics allow. Sometimes they'll tie each other up, or back an opponent against the ropes. All you can do is chew at your fingernails, in the true manager tradition.

After each round, the judges' scores are displayed at the top of the screen, showing how each judge awarded points. Each fighter's stamina is changed to reflect how tired he is, and you can choose a different strategy for the next round. The fight continues as many rounds as you selected earlier, from a three-round preliminary bout, to a fifteen-round title fight. When the fight ends, the judges will tabulate their scores and announce a winner, unless a knockout or technical knockout has been called earlier in the fight. Whatever the decision, you can see the judges' scorecards after the fight, seeing how each awarded points and how many knockdowns each fighter had.

As with *Computer Baseball*, you have the option in *Ringside Seat* to enter new data for other fighters, or even to create a fictional boxer, giving him abilities of your own choice.

Fighting It Out

This game is much faster moving than *Computer Baseball*. In a way, that's a disadvantage, for it moves quicker because there are fewer decisions for you to make. I didn't feel as involved in this game as in the baseball simulation for that reason.

The game still gives you the flavor of managing a fighter, and of a bout itself. Pacing is important in the game, for if you expend too much energy early in the fight by constantly choosing to go for the knockout, or to charge in, your fighter will be weak before the fight ends. As the fighter's stamina falls, so does his effectiveness in many of the strategies. When his effectiveness falls below 2, his punches come with less frequency, and land less often.

As in *Computer Baseball*, the animation in *Ringside Seat* is not up to arcade standards. The sound is weak as well. But these detract little from the game's attractions. No arcade-style boxing game gives you the strategic choices and actual fighters that *Ringside Seat* does. Learning how to direct a fighter takes time and practice. This game lets you experience the thrills and agonies of professional boxing, without ever stepping into a gymnasium. Maybe *your* fighter can be a contender.

Computer Baseball
Ringside Seat
Strategic Simulations, Inc.
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C. REGENA

Built-In Functions

In my previous columns I've tried to show some *fun* things you could do with your computer. This month I'm going to discuss some built-in functions so you can see that your computer can perform technical tasks, and not just games, music, and graphics. Your microcomputer can do many things that the "mainframe" computers can.

The computer can be a very powerful tool in mathematical calculations. A computer can go beyond a calculator by putting procedures into a program for repetitious work or for logic-dependent answers. The slide rule generation was limited to three significant figures, and problems may have taken hours of work and pads of paper to solve. The calculators streamlined problem-solving and took the drudgery out of mathematics. Now the microcomputers can solve problems with even less time and effort—and to many decimal places of accuracy. The VIC-20 and Commodore 64 display numbers with nine significant figures (ten are stored internally).

The π key is handy in any calculations involving pi (the ratio of the circumference to the diameter of a circle). π has a built-in value on the VIC and 64 and is available directly from the keyboard. Use SHIFT and the up-arrow key to get the π symbol. Try the command PRINT π and you will get the decimal equivalent of pi. To use π in any calculations, just use the symbol. For example, try PRINT 3* π and press RETURN. This short program, "Circles," illustrates the use of this key:

Circles

```
100 PRINT "{CLR} ** CIRCLES **"   :rem 162
110 PRINT "{DOWN}ENTER THE RADIUS.{DOWN}"
                                  :rem 218
120 INPUT "R = ";R                :rem 131
130 PRINT "{DOWN}AREA = ";↑*R*R   :rem 254
140 PRINT "{DOWN}CIRCUMFERENCE = ";↑*2*R
                                  :rem 129
150 PRINT "{3 DOWN}ANOTHER CIRCLE? (Y/N)
    {SPACE}";                     :rem 254
160 GET A$                        :rem 220
170 IF A$="Y" THEN 100            :rem 38
180 IF A$<>"N" THEN 160           :rem 95
190 PRINT A$                      :rem 140
200 END                           :rem 105
```

The square root function is available on our computers. SQR(X) will return the square root of a number with the variable name of X. Try PRINT SQR(16) to get the square root of 16, or 4. Some valid statements are:

```
10 X=SQR(T)                       :rem 145
30 A=SQR(B)+3+Y                   :rem 76
70 Z=SQR(C*3+F)                   :rem 86
40 ON SQR(R) GOTO 80,100,150      :rem 186
```

"Radius" is a sample program that illustrates the use of the square root function to calculate the radius of a circle if the area is given ($A = \pi r^2$).

Radius

```
100 PRINT "{CLR}RADIUS"           :rem 189
110 PRINT "{DOWN}ENTER AREA OF CIRCLE."
                                  :rem 128
120 INPUT "A = ";A                :rem 97
130 IF A>0 THEN 160               :rem 152
140 PRINT "{DOWN}SORRY, MUST BE > 0."
                                  :rem 174
150 GOTO 110                      :rem 97
160 R=SQR(A/↑)                    :rem 220
170 PRINT "{DOWN}RADIUS = ";R     :rem 12
180 PRINT "{3 DOWN}ANOTHER CIRCLE? (Y/N)
    {SPACE}";                     :rem 1
190 GET A$                        :rem 223
200 IF A$="Y" THEN 100            :rem 32
210 IF A$<>"N" THEN 190           :rem 92
220 PRINT A$                      :rem 134
230 END                           :rem 108
```

ABS(X) is a function that returns the absolute value of a number X. The absolute value of a number is the numeric value without regard for the sign. The absolute value of a negative number is the number without the minus sign. Some valid statements are:

```
10 A=ABS(Y)                       :rem 95
20 IF ABS(SC)=100 THEN 350        :rem 67
30 T=T+ABS(T1-T2)                 :rem 210
```

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INT(X) returns the integer value of a number X, or the whole number part of a number which contains a decimal. The integer function truncates the decimal portion of a number, but it does not round the number. The result is always the largest whole number smaller than the given number, or the whole number to the left of a given number on the number line. Thus, INT(4.56) will be 4, but for negative numbers, INT(−4.56) will be −5. Some valid statements are:

```
10 I=INT(X/Y)                          :rem 3
30 J=J+INT(A)                         :rem 220
50 ON INT(S) GOSUB 200,250,270        :rem 43
```

SGN(X) returns the sign of a number X. The value will be 1 for positive numbers, 0 for zero, and −1 for negative numbers. This function is useful in games where the position of an object may be positive, negative, or zero in relationship to another object. The score could also be tested with the SGN function. Valid statements are:

```
10 S=SGN(X-Y)                          :rem 8
20 ON SGN(SC-T) GOTO 150,370,370 :rem 170
40 IF SGN(R)=-1 THEN 430         :rem 223
```

The following program illustrates the absolute value function, integer function, and sign function for several numbers.

```
100 PRINT "{CLR}NUMBER{3 SPACES}ABS
    {2 SPACES}INT{2 SPACES}SGN"  :rem 103
110 FOR I=1 TO 7                  :rem 10
120 READ N                       :rem 253
130 PRINT N;TAB(8);ABS(N);TAB(14);INT(N);
    TAB(19);SGN(N)               :rem 214
140 NEXT I                        :rem 29
150 DATA 3.4,0,0.6,-2.1,-5,7.2,-5.3
                                 :rem 139
160 END                          :rem 110
```

The VIC-20 and Commodore 64 have several built-in trigonometric functions. Specify a number, numeric variable, or numeric expression within the parentheses (called the "argument" of the function).

SIN(X) returns the sine of an angle specified as X radians.

COS(X) returns the cosine of an angle specified as X radians.

TAN(X) returns the tangent of an angle specified as X radians.

ATN(X) returns the arctangent of a number X. Arctangent is the angle with the tangent of X. The angle will be expressed in radians.

When you are working with angles, remember that the computer uses angles expressed in radians. Since 180 degrees equals pi radians, you can convert D number of degrees to R radians with R=D* π/180. The conversion from radians to degrees is D=R*180/ π .

If you need some of the other trigonometric functions, remember these conversions.

Cotangent (X)=cosine(X)/sine(X) or 1/tangent(X)

Secant(X)=1/cosine(X)

Cosecant(X)=1/sine(X)

Some functions are not defined for certain angles (such as the tangent of 90 degrees), and you need to be careful of overflow conditions or division by zero for the reciprocal functions.

The programs following this column illustrate the use of these trigonometric functions. Enter an angle expressed in degrees, D. Line 170 converts the degrees to radians. The sine, cosine, tangent, cotangent, secant, and cosecant of the angle are printed.

Two more technical functions are the exponential and logarithmic functions. EXP(X) returns e to the power of X, where X is a numeric expression that must be less than or equal to 88.02969191. LOG(X) returns the natural logarithm of X, and X must be a number greater than zero. No longer do you need a book of math tables, nor do you need to calculate interpolations—your computer can calculate logarithms and exponentials almost instantly. Sample valid statements are:

```
10 PRINT LOG(X/Y)                      :rem 1
20 A=EXP(B)                           :rem 96
50 G=LOG(H)-LOG(I)                    :rem 13
70 IF EXP(F)>=50 THEN 200             :rem 27
```

If the computer does not have a built-in function that you need, you can define your own function. The definition procedure is useful if you have a long mathematical formula that is used several places in the program. You can save computer memory and typing time by defining the function at the beginning of the program, then every time you need the function, it is called by the function name.

To define a function, use DEF FN with a variable name (one or two letters long) including a variable name within parentheses. For example,

```
10 DEF FNG(X)=3*X*X+4*X+2
```

Here a function G(X) is defined with a formula. Later in the program you can use a statement such as

```
50 PRINT FNG(7)
```

and G(X) will be evaluated with X=7.

The definition statement needs to be executed before the function is used in the program, so it is a good idea to put all definitions at the beginning of the program.

The above example used a function dependent upon a variable X. The defined formula does not have to contain a variable. For example, we could define a function R(Y) as follows.

```
10 DEF FNR(Y)=INT(8*RND(1))+1         :rem 93
```

R(Y) is defined as a random number from 1 to 8.

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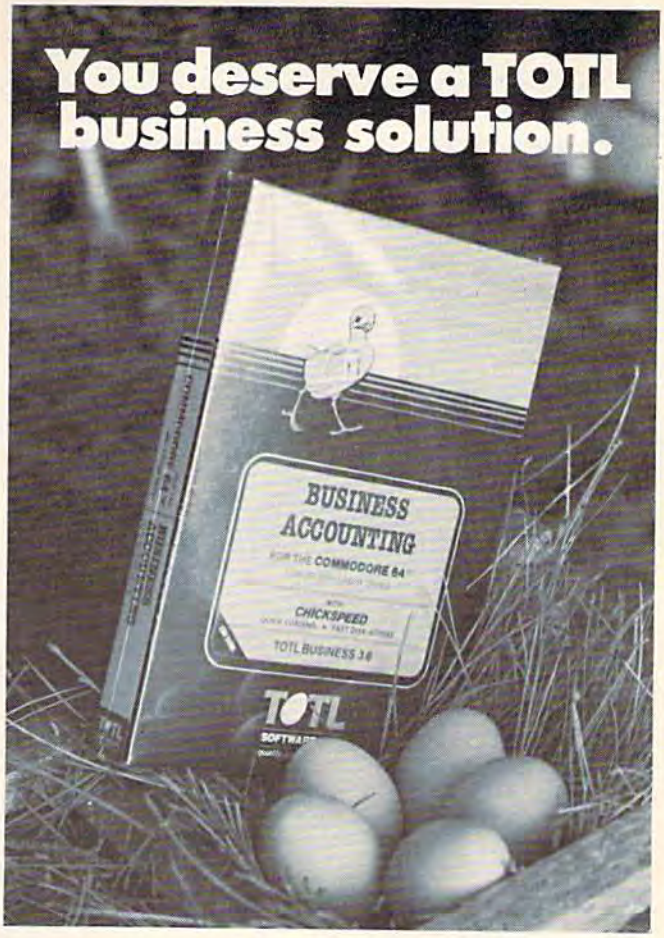

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Now, within the program every time we need a random number from 1 to 8, we can use R(Y):

```
50 C=R(Y)                              :rem 225
80 A=R(Y)+R(Y)                          :rem 9
90 IF R(Y)>4 THEN X=2                  :rem 92
```

A defined function may combine other functions, such as

```
10 DEF FNF(X)=1-SIN(X)                 :rem 225
```

You can see that by using user-defined functions you can really customize your programs and make technical calculations less complicated.

I hope this discussion of the built-in numeric functions and the user-defined functions has shown you the powerful potential of your "home" computer. Technical applications which used to be possible only with large computers or with hours of calculation time are now possible with a combination of built-in functions on our home computers. In a later column I'll discuss the versatility of the string functions available on the VIC and 64.

Angles (VIC Version)

```
100 PRINT "{CLR}** ANGLES **"          :rem 87
110 PRINT "{DOWN}ENTER ANGLE IN DEGREES"
                                       :rem 239
120 INPUT "D = ";D                     :rem 103
130 IF D>=0 THEN 160                   :rem 216
140 PRINT "SORRY, 0<D<360"             :rem 182
150 GOTO 110                            :rem 97
160 IF D>360 THEN 140                    :rem 5
170 R=D*↑/180                          :rem 92
180 PRINT "EQUIVALENT RADIANS = ",R
                                       :rem 37
190 PRINT "SINE OF ANGLE =",SIN(R)
                                      :rem 140
200 PRINT "COSINE OF ANGLE =",COS(R)
                                       :rem 17
210 IF D=90 THEN T$="INFINITY":GOTO 240
                                      :rem 167
220 IF D=270 THEN T$="INFINITY":GOTO 240
                                      :rem 216
230 T$=STR$(TAN(R))                     :rem 62
240 PRINT "TANGENT OF ANGLE = ",T$:rem 85
250 IF T$="INFINITY" THEN C$="0":GOTO 280
                                      :rem 221
260 IF TAN(R)=0 THEN C$="INFINITY":GOTO 2
    80                                :rem 168
270 C$=STR$(1/TAN(R))                 :rem 145
280 PRINT "COTANGENT OF ANGLE = ",C$
                                      :rem 218
290 IF COS(R)=0 THEN S$="INFINITY":GOTO 3
    10                                :rem 183
300 S$=STR$(1/COS(R))                 :rem 157
310 PRINT "SECANT OF ANGLE = ",S$:rem 255
320 IF D=0 OR D=180 OR D=360 THEN CS$="IN
    FINITY":GOTO 340                   :rem 41
330 CS$=STR$(1/SIN(R))                :rem 232
340 PRINT "COSECANT OF ANGLE = ",CS$
                                      :rem 215
350 PRINT "{DOWN}ANOTHER ANGLE? (Y/N)"
                                       :rem 88
360 GET A$                            :rem 222
370 IF A$="Y" THEN 100                 :rem 40
380 IF A$<>"N" THEN 360                :rem 99
390 PRINT A$                          :rem 142
400 END                               :rem 107
```

Angles (64 Version)

```
100 PRINT "{CLR}** ANGLES **"          :rem 87
110 PRINT "{DOWN}ENTER ANGLE IN DEGREES"
                                       :rem 239
120 INPUT "D = ";D                     :rem 103
130 IF D>=0 THEN 160                   :rem 216
140 PRINT "SORRY, 0<D<360"             :rem 182
150 GOTO 110                            :rem 97
160 IF D>360 THEN 140                    :rem 5
170 R=D*↑/180                          :rem 92
180 PRINT "{DOWN}EQUIVALENT RADIANS = ";R
                                       :rem 69
190 PRINT "{DOWN}SINE OF ANGLE =";SIN(R)
                                      :rem 172
200 PRINT "{DOWN}COSINE OF ANGLE =";COS(R
    )                                  :rem 49
210 IF D=90 THEN T$="INFINITY":GOTO 240
                                      :rem 167
220 IF D=270 THEN T$="INFINITY":GOTO 240
                                      :rem 216
230 T$=STR$(TAN(R))                     :rem 62
240 PRINT "{DOWN}TANGENT OF ANGLE = ";T$
                                      :rem 117
250 IF T$="INFINITY" THEN C$="0":GOTO 280
                                      :rem 221
260 IF TAN(R)=0 THEN C$="INFINITY":GOTO 2
    80                                :rem 168
270 C$=STR$(1/TAN(R))                 :rem 145
280 PRINT "{DOWN}COTANGENT OF ANGLE = ";C
    $                                 :rem 250
290 IF COS(R)=0 THEN S$="INFINITY":GOTO 3
    10                                :rem 183
300 S$=STR$(1/COS(R))                 :rem 157
310 PRINT "{DOWN}SECANT OF ANGLE = ";S$
                                       :rem 31
320 IF D=0 OR D=180 OR D=360 THEN CS$="IN
    FINITY":GOTO 340                   :rem 41
330 CS$=STR$(1/SIN(R))                :rem 232
340 PRINT "{DOWN}COSECANT OF ANGLE = ";CS
    $                                 :rem 247
350 PRINT "{3 DOWN}ANOTHER ANGLE? (Y/N)"
                                      :rem 122
360 GET A$                            :rem 222
370 IF A$="Y" THEN 100                 :rem 40
380 IF A$<>"N" THEN 360                :rem 99
390 PRINT A$                          :rem 142
400 END                               :rem 107
```

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HORIZONS: 64

CHARLES BRANNON
PROGRAM EDITOR

Mailbag

Time to bounce back some of the ideas and suggestions you've sent me. In talking about Commodore 64 video, I mentioned that the new 8-pin 64s have improved video clarity, but said that there are no functions assigned to the additional pins (previous 64s had five-pin plugs for audio/video).

J. Robinson of Santa Monica, California, differs. He's rigged up a cable using an 8-pin DIN plug (sorry, Radio Shack doesn't carry them) with the chroma (color) signal coming from pin 8. Normally, chroma is slightly distorted by the luminance mixed with it, but the signal from pin 8 is pure, and the picture is better than ever, as evidenced by some color slides Mr. Robinson sent me. If you can find an 8-pin DIN plug, try it out. By the way, DIN stands for Deutsche Industre Norm (German Industrial Standard).

We've received some letters about the Automatic Proofreader, asking how the checksum is computed on each line. We send program listings to a disk, then run our Lister program, which reads the programs straight from the disk and formats the listings with cursor controls and graphics spelled out.

In addition, the Lister automatically generates the ":rem" checksums by adding together the ASCII values of all the characters in the line. The reason that the numbers are never larger than 255 is that the addition is done internally in only 8 bits, so it will wrap around from 255 to zero (like an odometer past 99999) if the sum is too large. That's why some numbers for long lines are smaller than other numbers for short lines. It all depends where the number wraps around.

Printer Interfaces

A few issues back, columnist Larry Isaacs talked about a parallel printer interface by CardCo called Card/Print (also written as "Card/?"). We've used this interface here and have been generally pleased with its performance, although it will not translate certain 64 control codes in the listing mode.

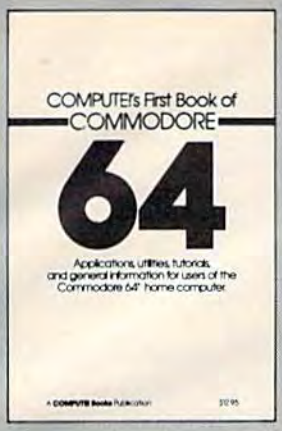
Another interface I've been using is the Tymac Connection. Unlike the Card/Print, the Connection is set up specifically for your printer (ROM chips are available for several printers). The Card/Print will work with almost any Centronics parallel printer, but the Connection uses the graphics capabilities of your Epson, Prowriter, or other dot-matrix graphics printer.

The Connection offers "almost total emulation" of the VIC printers, such as the 1525. In the emulation mode, it will respond identically to the control codes the VIC printer uses, such as dot graphics, elongated/normal text, cursor-up mode, cursor-down mode, and more. You can therefore use all the special features of your printer (high-quality print, italics, double-strike, etc.) and still be able to run programs specific to the VIC printers, such as high-resolution screen dumps.

In addition, the Connection uses your printer's dot graphics capabilities to actually print the built-in graphics characters on the keyboard. Program listings with graphics symbols will appear as they do on the screen. Unfortunately, the graphics characters are formed rather strangely. Characters which should connect, such as Commodore Q and SHIFT-asterisk, do not. The cursor symbols are hard to read. The Connection also cannot reproduce reverse-video text, since your printer's normal character set is used for alphanumerics. But support for graphics is better than no graphics symbols at all.

The Connection has a listing mode, though it cannot interpret some characters. There is also a "transparent" mode, where it just sends the characters along without any interpretation. This is what you would do with some word processing programs. Unlike the Card/Print, there is no way to "lock" in any one mode.

Hardware-wise, the Connection has a 6502 microprocessor with RAM, ROM, and a printer port. How strange to buy another computer for your 64. It has enough RAM to serve as a 2K printer buffer. With a buffer, characters coming from the computer are stored until the printer can "catch up." If you sent something less than 2K long, it would be instantly printed from the computer's



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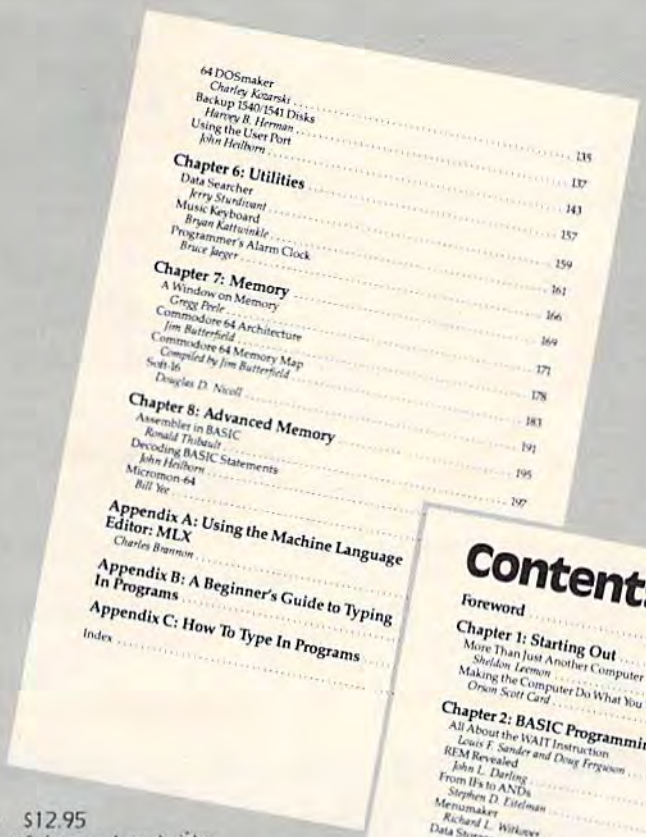
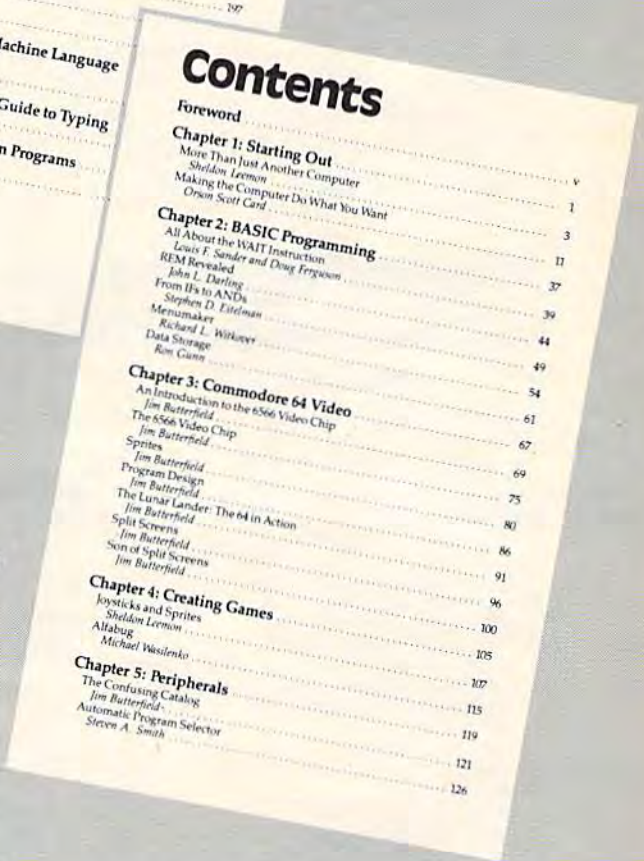
If you are a Commodore 64 owner who wants to learn more about using your computer to its full potential, this is the book for you.





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point of view. The buffer would meanwhile be feeding characters to the printer at the printer's speed. My printer has a 2K buffer, so the combination of the printer and the Connection gives me an effective 4K of buffer space.

The Connection (Tymac)
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Strange Lock-Up Bug

It may have happened to you. It's extremely frustrating, and totally unexpected. Fortunately, it's predictable, hence preventable. Go down to the bottom of the screen (the very bottom, the last line, scroll if you have to). Now start typing. Anything. You could just type a bunch of X's. Keep typing as you wrap around the right margin on the first line, then stop right after you type past the right margin of the second 40-column line (the screen will scroll). Now press the INST/DEL key (unSHIFTed) to erase the last character on the previous line.

Whoa! Suddenly, the command LOAD is printed, you get a ?SYNTAX ERROR, the word RUN appears, and if you had a program in memory, it starts. Who typed SHIFT-RUN/STOP?

This is not a trivial error. If you had a program running, you can't stop it. If not, the cursor appears to be flashing merrily, and all seems well. Try typing. Worry begins to creep into your mind as no characters appear. You reach for the panacea of RUN/STOP-RESTORE. Panic sets in when this does nothing, and you press it over and over again, pounding and smashing at the keyboard in a frantic attempt to regain control. Too bad. You have to reach for the power switch and turn your computer off. RAM is wiped clean. Your program, if any, is gone.

I don't know what causes this error. One theory is that when the 64 tries to scroll color memory, it reaches one line too many past $DBE7 (end of color memory) and mangles the registers of the CIA chip, which controls all interrupts. There is no way around it, other than the emergency reset I covered last month. Just keep it in mind.

Hope you enjoy the word processor in this issue. Since it is a complex software product, we'll use this column in the future as a forum for answering your questions about it, as well as tips for using it.

I'll leave you with something to play with: extended background color mode. Enter it with POKE 53265,PEEK(53265)OR64 and try typing the letter "A", SHIFT-A, then CTRL-9 (reverse on), and inverse video "A" and SHIFTED-A again. See what conclusions you come up with, and try changing memory locations 53282 and 53283.

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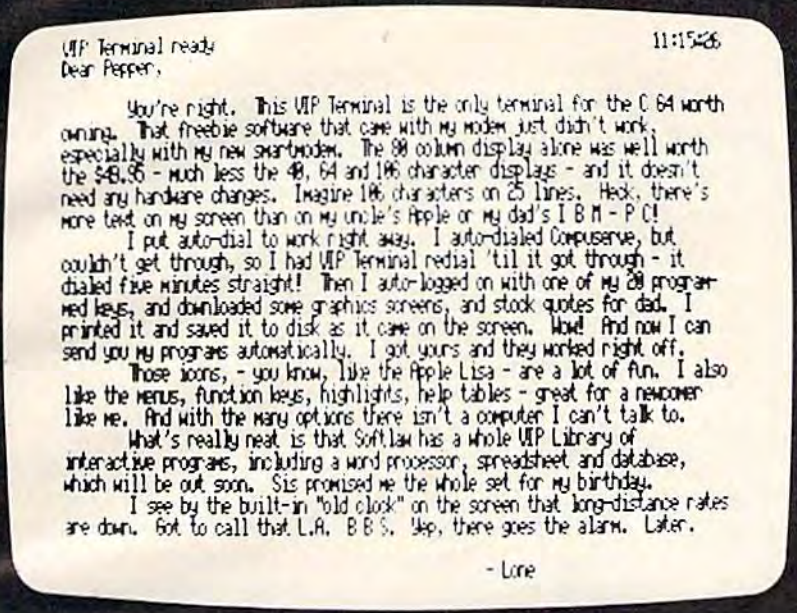

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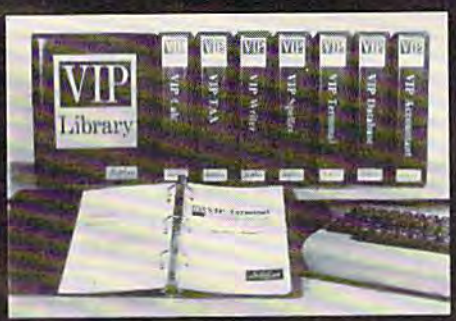

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DAN CARMICHAEL, ASSISTANT EDITOR

Using The Dynamic Keyboard

The *dynamic keyboard* is a useful programming technique that can be used with both the VIC-20 and the 64. This technique enables you to POKE values into the *keyboard buffer* and "fool" the computer into thinking you typed the command from the keyboard. It can be used to do everything from simply running a program to chain-loading programs from tape or disk.

The Keyboard Buffer

The keyboard buffer is a block of memory ten bytes (characters) long that runs from memory addresses 631 to 640. The buffer is a temporary holding area that is used to store data input from the keyboard. If you could type faster than the VIC could read the keyboard (it does this 60 times a second), you could fill up the keyboard buffer. Obviously you can't type this fast, but there are other times the computer's operating system does use the keyboard buffer to temporarily store data. If a BASIC program is running and is at a stage where it is not ready to accept data input from the keyboard (a FOR/NEXT time-delay loop, for example), the keys that are pressed will be temporarily stored in the buffer until the program is ready to process the data. To see how this happens, enter the following line in the direct mode, press RETURN, and while the FOR/NEXT loop is running type the following ten keys: 1 2 3 4 5 6 7 8 9 0.

```
FOR A=1 TO 10000: NEXT
```

As you can see, while the time-delay loop is running, the keys you pressed are not displayed on the screen. As soon as the loop is finished, the computer reads what is stored in the keyboard buffer and processes the data accordingly and prints it on the screen. Now enter the above FOR/NEXT statement again, and while it is running type the following 12 keys: 1 2 3 4 5 6 7 8 9 0 1 2. When the loop is finished, you will see the same ten keys displayed on the screen as before. But what happened to the two extra keys that were pressed, the 1 and 2? Those keys were lost because the keyboard buffer, which runs from 631 to 640, can hold a maximum of ten characters. Any keys that are pressed after the buffer is filled are lost.

The Other Keyboard Buffer Byte

You may wonder how the operating system knows that there is data in the keyboard buffer waiting to be processed. Memory address 198 tells the computer how many characters are in the keyboard buffer ready to be processed. Each time you pressed a key while the computer was executing the above time-delay loop, memory location 198 was incremented by 1. After the loop finished running, the operating system took a look at location 198 (which had a value of ten) and knew that there were ten characters in the buffer waiting to be processed. Enter the following commands in the immediate mode, then while the FOR/NEXT loop is running, type 1 2 3 4 5 6 7 8 9 0.

```
FOR A=1TO10000:NEXTA:POKE 198,0
```

After the loop is finished, you'll notice that our ten characters were not printed on the screen. The reason is that after we came out of the loop we POKEd 198 with a 0. Even though our ten characters *were* in the cassette buffer, the operating system didn't print them as it did before. When we POKEd a value of zero into 198, we told the computer no characters were waiting in the buffer.

Using The Dynamic Keyboard

The keyboard buffer can be a very useful tool when properly used. For example, did you know that when you "chain-load" programs (the first program automatically loading and running the second, the second loading the third, and so on) the

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first program has to be longer than the second? That's because of the variables. The start of BASIC variables always stays just past the end of your BASIC program. When you chain-load programs, any variables that are used in the first program are stored a few bytes past the end of BASIC. If the second program in the chain is longer, it will write over these variables, and all their values will be lost. To illustrate this, enter the following two short programs and save them to tape with the filenames specified below. Be sure to save the second program with the filename "TEST.LOAD.2" right after the first program (use the filename TEST.LOAD.1).

TEST.LOAD.1

```
10 A=10:B=20:C=30                    :rem 120
20 PRINT"{CLR}{DOWN} THIS IS PROGRAM 1"
                                     :rem 244
30 FORT=1TO500:NEXT                  :rem 189
40 LOAD"TEST.LOAD.2"                 :rem 182
```

TEST.LOAD.2

```
10 PRINT" THIS IS A DUMMY LINE"   :rem 251
15 PRINT" THIS IS A DUMMY LINE"     :rem 0
20 PRINT" THIS IS A DUMMY LINE"   :rem 252
25 PRINT" THIS IS A DUMMY LINE"     :rem 1
30 PRINT" THIS IS A DUMMY LINE"   :rem 253
35 PRINT" THIS IS A DUMMY LINE"     :rem 2
40 PRINT" THIS IS A DUMMY LINE"   :rem 254
50 PRINT"{CLR}{DOWN} THIS IS PROGRAM 2"
                                     :rem 248
60 PRINT"A=";A;"B=";B;"C=";C         :rem 41
```

As you can see, the first program sets three variables (A, B, and C), PRINTs a quick message to the screen, then LOADs in the second program, which prints a few messages to the screen (we made it longer here for our demonstration). It then prints the variables A, B, and C that were set during the first program. Note that the printed variable values are zeros, even though we initially set them at 10, 20, and 30, respectively.

What's the answer? The dynamic keyboard, of course. Change the last line (line 40) in the first program to read:

```
40 POKE 631,131 : POKE 198,1
```

Then reSAVE it using the same filename, and RUN it again. For our demonstration, this modification will work only with cassette. Save this modified version to tape, and be sure to save another copy of the second program right after it.

If you changed line 40 and saved both programs correctly, you'll notice that the first program successfully called in and ran the second, even though we removed the LOAD command in line 40.

This is accomplished by the two POKEs we used in line 40. POKE 631,131 places the token for SHIFT-RUN into the keyboard buffer. When you press SHIFT and RUN on the keyboard to LOAD and RUN a tape program, this character (131) is placed in the buffer. Jot this down; you probably won't find it in your *VIC-20 Programmer's Reference Guide*. We POKEd the SHIFT-RUN into location 631, the first byte of the keyboard buffer, because the buffer is of the FIFO (first in—first out) type. That is, when you press a key on the keyboard, the operating system places it in the first byte of the buffer; when ready to be processed, this will be the first character pulled out.

The other POKE we made in line 40 was POKE 198,1. This tells the operating system that there is one character in the buffer waiting to be processed. As soon as the 1 was POKEd into 198, the operating system was fooled into thinking you had typed SHIFT-RUN from the keyboard, and the computer LOADed and ran the next program.

The obvious drawback here is that it will only LOAD and RUN the next program *on tape*. This is because the POKEs we used did not specify a filename. So when using this method of chain-loading, be sure the programs are saved one after the other.

You'll notice that we still have a problem passing variables because of the longer length of the second program. There is another technique which can easily solve that.

Using The Buffer And The Screen

Delete line 40 from the first program and add the following lines:

```
32 PRINT"{CLR}{2 DOWN}LOAD"          :rem 11
40 PRINT"{6 DOWN}5 A=";A;":B=";B;":C=";C;
                                     :rem 113
45 PRINT"RUN"                        :rem 47
50 POKE631,19:FORA=632TO636:POKEA,13:NEXT
   :POKE198,6                        :rem 96
```

As before, SAVE it to tape and reSAVE the second program right after it. Now RUN the first program and see what happens. Be sure to leave the cassette PLAY button pressed down after the first program is loaded.

This time we've successfully passed our variable values from the first program to the second. Here's how we did it.

Line 32 clears the screen (which also moves the cursor to the HOME position). It then moves the cursor down two lines, and prints the word LOAD. Line 40 shows how we pass our variables from one program to another. It prints a line on the screen that looks like (and is) a BASIC statement: the number 5 (the BASIC line number) and the variables A=, B=, and C=. It then prints the current value of these variables, in this case 10, 20, and 30, respectively. Line 45 prints the word RUN and starts our second program.

Line 50 is the key to it all. The first POKE (POKE 631,19) places the value 19 into the first byte of the keyboard buffer. In this case, the ASCII

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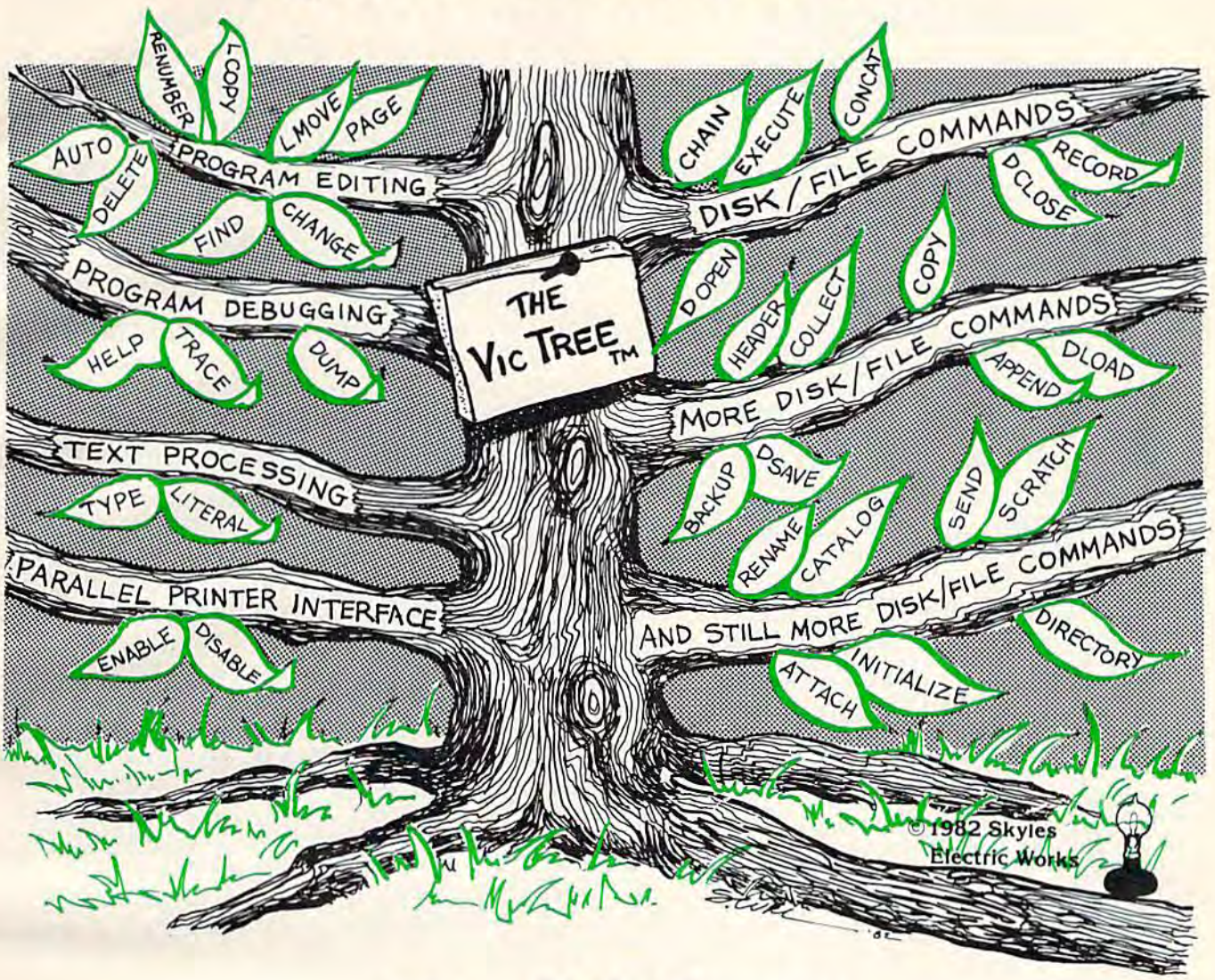

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value of 19 is the control character which stands for HOME CURSOR. The cursor, then, is simply moved to the home position (the upper-left corner) without clearing the screen. The next five POKEs we make to the keyboard buffer are the same (a value of 13), and are done with a FOR/NEXT loop. The ASCII value of 13 is the control character which represents the RETURN key. POKE 198,6 fools the operating system into thinking that six keys have been pressed on the keyboard. The computer starts processing these commands, and away we go. Here's what happens.

The value of 19 moves the cursor to the HOME position, and then the operating system automatically moves it down one more line. The cursor is now sitting on top of the word LOAD we printed on the screen. The next character in the keyboard buffer is a 13, which stands for RETURN. We've fooled the computer into thinking that we typed the word LOAD and then pressed RETURN. The system now loads in the next program on the tape. While the computer is loading the program, the processing of data in the keyboard buffer is temporarily suspended.

After the LOAD has been completed (we now have the second program in BASIC memory), the operating system continues reading data from the keyboard buffer. The next few bytes in the buffer stand for RETURN. The cursor is now sitting on the BASIC line we printed on the screen in the first program. When the computer reads the next value of 13 from the keyboard buffer, it is again fooled into thinking we have just typed in a new BASIC line for the second program. It then enters that line. The cursor has now moved to the next line on the screen, which reads RUN. Reading another 13 from the buffer, it thinks we typed RUN from the keyboard and pressed RETURN, and away it goes with the second program.

Many Different Techniques

The above techniques could have been accomplished a number of different ways using the keyboard buffer and the screen. Just remember one important fact. In most cases, when the computer reads data from the buffer, it thinks it was entered directly from the keyboard. Almost anything you can do from the keyboard can be done from the keyboard buffer. As a matter of fact, you could probably create a computer program itself by POKEing various values into the buffer.

Experiment with this technique and I'm sure you'll find a useful application for it.

If you've got questions or ideas about subjects you'd like to see covered in this column, write to: VICreations, c/o COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

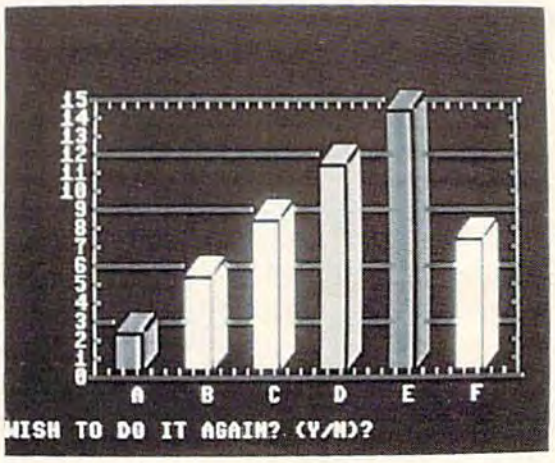
Graph Plotter

Ruth A. Hicks

Not only is "Graph Plotter" an interesting tool for drawing 3-D columnar charts, but the accompanying article takes you step by step through the program itself so you can learn how it was written. The program originally was designed for the Commodore 64, and we've added a version for the unexpanded VIC-20.

"Graph Plotter" is a good demonstration of what beginning programmers can accomplish in the way of graphics on the Commodore 64 and VIC-20. Different graphics techniques were used to create this program. By reading this article and following along with the program listing, you can increase your knowledge of graphics formatting. Of course, if you're not into learning programming, there's no reason why you can't just type in the program listing anyway.

Graph Plotter creates attractive bar graphs with three-dimensional columns. The graphs are particularly exciting in color. There are six columns, each a different color, to which you assign a value from 0 to 15 for the column height. You tell the computer what values each column has, and then you can interpret their meaning.

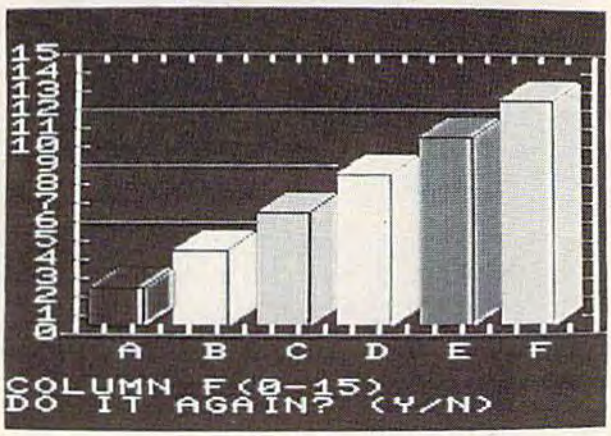


3-D bar graphs are a snap with "Graph Plotter" (64 version).

Modular Programming

Graph Plotter was written with a technique known as *modular* or *block programming*. This means a section at a time was written on the computer and then checked for eye appeal, function, and (of course) that familiar message, "?SYNTAX ERROR." There are five main blocks to this program.

When typing the program, I suggest that you omit unnecessary spaces except in any INPUT or PRINT statements between quotation marks. All



The VIC-20 version of "Graph Plotter."

other spaces are not needed by the computer and only consume more memory. Since this is an article to learn from, let's start some good habits right away by not typing those useless spaces.

Block One

Block one, lines 100-180, creates the graph, including the segments and the outlining border. Instead of using line after line of PRINT statements, we'll be POKEing the information directly into memory inside FOR/NEXT loops.

Line 100 clears the screen and sets the background color to black and the border blue. Line 110 starts the top border on the Commodore 64 at screen memory location 1230 and runs it across the screen to location 1261, drawing a continuous line (these addresses are 7726 to 7745 on the VIC). Refer to the manual which came with your computer for the "Screen and Color Memory Maps." Each time the FOR/NEXT loop is executed, it places the new value of I into the POKE statement with the symbol number 114 (refer to your manual, "Screen Display Codes"). The I value tells the computer *where* to put the symbol and the 114 tells *what* symbol to put in that spot.

The second POKE in line 110 colors the symbol green. Since the "Color Memory Map" (see manual) corresponds to the screen memory map, only with a different set of numbers, all we have to do is calculate the offset. The difference between 55296 and 1024 (the starting address of color and screen memory in the Commodore 64) is 54272, a simple subtraction problem. So, we POKE I+54272 with the color code for green (5) and presto, we have a green symbol at the correct location! The same thing works on the VIC-20, except the offset between screen and color memory is 30720 instead of 54272.

Line 120 draws the left border, beginning at screen memory location 1270 and ending at location 1790 on the Commodore 64 (7748 to 8034 on the VIC). The STEP 40 is used because a Commodore 64 has 40 characters per line across its screen (STEP 22 for the VIC). If you look at your manual and find screen location 1270, then add 40, you'll find that location 1310 is exactly one line below 1270. On the VIC, 7748+22 adds one screen line. The rest of line 120 and the next two lines are similar to lines 110 and 120, except for different screen symbol codes.

The last four lines (150-180) in this section were constructed in the same manner, using FOR-NEXT loops to POKE information directly into screen memory. These lines draw continuous lines on the graph, making it more readable.

Designations

Block two of the program prints a series of numbers on the left side of the graph and letter designations for each of the six columns. Line 190 positions the following PRINT statement at the right spot horizontally so the numbers can be displayed along the left side of the graph. We want the numbers to start at the fourth space right of the border, so we place a SPC(4) after the PRINT, and then place the number to be printed inside quotation marks.

So, lines 190 through 220 label the Y-axis with a sequence of numbers from 15 to 0. Notice that between each colon is a complete PRINT statement, and even though they are all crunched together in only four program lines with *no spaces*, they result in 16 lines of vertical display. Also, notice that with one-digit numbers the SPC() statement is increased from four to five in the Commodore 64 version for proper placement.

The last line of this section (230) puts letter designations along the bottom of the graph beneath the columns. Notice there is only one PRINT since this line is displayed horizontally. In the Commodore 64 version, the first letter is positioned with TAB(9) and the following letters are all equally spread with SPC(4) statements. Again, because of the VIC's smaller screen size, a TAB(4) and SPC(2) statement are used to position the letters properly.

READ-DATA Block

In the third block of the program (lines 240 to 300), DATA is READ that will be used in a later routine to position each vertical bar on the graph and decide its color. Line 240 prevents this DATA from being reREAD unnecessarily with any subsequent passes through the program.

The first statement that READs DATA in this section is in line 260. Here, a READ command is contained in a FOR-NEXT loop so it is executed six times. This causes six strings, representing the six column labels (A,B,C,D,E,F) to be READ and set equal to the string array variable, A$(I).

In line 280, a second set of DATA is READ and assigned to D(I). This string array variable denotes the color code for each vertical bar on the graph.

The last group of DATA in this block is READ from line 300. The values taken from line 290 are the screen memory addresses necessary to properly locate each bar on the graph.

The use of arrays in this section significantly shortens the length of the program. Instead of requiring six separate blocks of code to locate and draw each vertical bar, we will now be able to perform this in one routine.

Input Block

The fourth block of the program (lines 310-420) is the INPUT routine. Notice that that much of this routine is contained within a FOR/NEXT loop

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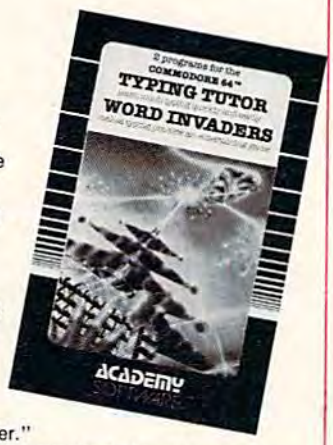

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(lines 310–370).

In this loop, you are asked what value you want for each column. The value that you INPUT determines the height of each vertical bar. Your response is checked in line 360 to make sure it is within the limits of 0 and 15.

After INPUTting the height of each column, the screen memory address (A) for the top of the column is determined by the first statement in line 370.

Here's how it works: A(J) was set as a starting screen location in the first line, then AA (the response) is multiplied by 40, because our screen is 40 characters across (22 for the VIC version). Then AA times 40 (or 22) is subtracted from A(J), because the columns are drawn upward. So, if the response is 10, the column rises 10 segments high. Then 80 (or 44 on the VIC) is added to A to bring it down two rows so we have room for our three-dimensional side. Program execution is then transferred to the subroutine at line 430, which actually draws each column on the graph.

In the process, the variables necessary to this subroutine are passed. The variable C defined in 310 is the offset between the screen memory map and the color memory map as explained above. The actual color of each column (variable D) and the starting screen location of each column, or variable X, are also transferred.

Once a column has been drawn, the user's previous INPUT is erased in line 320 by POKEing blank spaces into this area of screen memory. If you didn't do this, the prior answer, of course, would remain on the screen.

Line 320 enables you to position a PRINT statement exactly where you want vertically without disrupting any printing already on the screen. The cursor is first HOMEd, and then a blank PRINT statement is placed inside a FOR-NEXT loop. As the loop is executed, starting at the HOME position, it counts down vertically to the maximum number set by the FOR-NEXT loop.

The next line is the INPUT statement, now in the right position to be printed. At the end of the INPUT statement is the variable AA, which receives whatever value you enter between the limits of 0 and 15. If the response is less than 0 or greater than 15, the computer erases the answer and asks the same question again.

Once all six vertical bars have been drawn, you will be asked in line 390 if you wish to do another bar graph. If you do, the program will start again at line 100. Otherwise, it will END in line 420.

The Subroutine

The heart of this program is the subroutine beginning at line 430. This is the block which draws the columns by POKEing symbols onto the screen.

Let's start explaining this section with lines 430 and 440. These two lines check to see if the value AA from the INPUT block is a 1 or 0. If AA = 1, the program branches to line 530, which draws the top of a column one segment high on the graph. When AA = 0, it is a null entry, and the program gets another INPUT.

Lines 470 and 480 begin to actually draw the columns, which are three characters wide. Reflecting back to the INPUT block, you'll recall that variables A and X were set for the starting point and top part of the column. So, by POKEing the screen memory locations with the desired character symbols in a FOR-NEXT loop, we can draw the columns to any height we've chosen. Notice there are three POKEs, I, I + 1, I + 2. Each addition to I moves its location over one spot to the right, yielding a three-character-wide column. The different screen display codes create a three-dimensional appearance with reversed characters. The program reverses the character codes by adding 128 to the symbol code (32 + 128 = 160, 101 + 128 = 229). Line 480 follows up line 470 with the color information by adding the color variables C and D to the same locations from line 470.

Lines 510-540 follow the same format as lines 470 and 480. They draw the three-dimensional top segments of the columns. Six character symbols and six color locations are POKEd into the appropriate locations with the variables A, C, and D. By adding or subtracting numbers from A, we can position the symbols on the row above or to the right.

Once this subroutine is completed, line 550 RETURNs to the INPUT block.

Formatting

By now, you should have "Graph Plotter" typed in and SAVEd on tape or disk. The difference between this program and others you have typed is that you now know exactly how it was programmed. Remember the techniques of using PRINT statements for displaying characters vertically and horizontally; of blank PRINT statements and SPC() commands for positioning INPUT or PRINT statements exactly where you want them; of directly placing symbols and colors onto the screen with POKEs and variables. In planning your own programs, use these techniques for your screen displays and see how handy and time-saving they can be for you.

See program listings on page 202.

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MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

Addressing

You'll soon notice that most of your ML programming involves sending bytes around in the computer's memory. It's quite similar to PEEKing and POKEing, but you've got more options on how you *address* these bytes before you send them somewhere. Addressing bytes is like addressing a letter—you want it to get to its destination so you must write the destination on the letter. There are even ways to send the byte c/o another address, but we'll get to that in a minute. First, we need to review our all-ML game in terms of some addressing options we can use when writing an ML program.

A Cumbersome List

So far, our ML game can be divided into three sections (like subroutines). Let's use the 64 version, Program 2, as our example this month; it's essentially the same as the VIC version. The first section (from address 49152 through 49169) puts the number 8 into all the addresses of Color RAM memory. We usually have a choice of which ML *addressing mode* we want to use. We could have used the simplest mode, absolute addressing, and just listed every address we wanted to POKE the 8 into. It would have looked like this:

```
STA 55296
STA 55297
STA 55298
STA 55299 and so on
```

but that's pretty inefficient. We would have had to list a thousand addresses. Instead, we chose to do our POKEing within a loop. The Y register is quite useful for addressing things because it can be used as an *offset*. That is, you can address something so that the actual address you give is *added to whatever Y equals at the time*. This is a special form of absolute addressing called *absolute indexed* (you can use the X register this way too).

How does it work? First we set Y to equal zero (at 49152). Then we load the A register with our color value, 8. Then we have four STAs lined up, using the absolute indexed addressing mode. The first time the computer comes across this list, it will put 8 into 55296, 55552, 55808, and 56064. It will add Y to these addresses, but Y equals 0 this first pass through the loop. Then, we INY (raise it by one). The three registers (A,X, and Y) can only count up to 255; after that, they reset themselves to 0. So, when Y = 1 after the INY, the BNE instruction will "fail" and we'll branch back to 49156 for the second pass through the loop. We can't get past BNE until Y resets itself to zero—BNE means Branch Not Equal (to 0). And Y isn't yet reset to 0.

But, notice what happens the second time through the loop. Since Y now equals 1, we'll be putting our 8 into 55297, 55553, and so on. This storage of 8's continues until all the locations between 55296 and 56319 have been filled.

The Most Common ML Bug

The second section of our game (lines 49171 through 49184) is quite similar and makes use of the same addressing mode. But here we're drawing a horizontal line across the top and bottom of the screen. So, since the screen is only 40 bytes wide, we'll have to test Y (line 49182) to see if it's equal to 40. If not, we BNE back and continue the loop. There are several "B" instructions; all of them begin with the letter B and branch somewhere (if

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conditions pass their test). BEQ means Branch if EQual to 0. We'll get to the others in the future. BEQ and BNE, though, are by far the most commonly used ones.

The other instructions here are also the most frequently used ML commands. STA (STore the A register), LDA (LoaD the A register), STY, LDY, CPY (ComPare Y), INY (raise Y register by 1; literally INcrement Y), DEY (reduce Y by 1, literally DEcrement Y), and their companion instructions (DEX, INX, LDX, STX, CPX) all operate according to the same rules (and set up flags for the "B" instructions to test and then decide whether or not to branch).

One other thing to notice here: The computer will always assume that you are loading *from an address* unless you specify otherwise. If you write LDA 15, the computer copies whatever is in address 15 into the A register. (Whatever was at address 15 remains there; only a copy of it is placed into the A register.) So, if you want to actually put the *number 15* itself into the A register, you must put a number sign in front of it: LDA #15. As you can see, we do this frequently in our program. But beware—the single most common source of ML bugs is forgetting to put in that # when you mean a number as such, or putting it in when you mean to get a copy of a number from some memory location in the computer.

Sending Something C/O

Now on to the new portion of our ML game (lines 49186 to the end). Here we are going to draw vertical lines down the sides of the screen, completing the frame for our game. To do this, we'll need to POKE the first address of screen RAM memory, then POKE the 39th (the top of the right-hand margin), then the 40th (the second space down on the left margin), then the 79th, and so on down. The easiest way to do this in ML is to send a character to the right side of the frame, add 1 to Y (INY) and send the character again, this time to the left side of the screen. Then we must add 40 to our address (22 on the VIC) to get over to the right side again.

As before, we'll set up a loop, but we first have to prepare two bytes in zero page (the first 250 memory cells of the computer). These two bytes will hold our addresses in a special way. We'll change the contents of these bytes as we go along, adding 40 (or 22). You can visualize these special bytes in zero page as a Ping-Pong paddle and, by shifting its angle, you can send the balls low or high or anywhere in between.

Working In The Real World

Our 6502 chip can send things to 65536 memory cells, but how can we store a number that large when each cell will only hold numbers up to 255? It's simple enough: We gang two bytes together to hold large numbers. Take a number like 1024, the start of the 64's screen memory RAM. Divide it by 256 and you get 4. So put that in one of the two bytes holding our number (call it the *most significant byte*, or MSB). Then put the remainder of the division (0 in this case) into the other byte, the *least significant byte*, or LSB. Line them up in memory as LSB/MSB (it's backwards to us, but the computer likes them put in this way). There you have it. Notice that the Assembler program performs this whole task for you automatically when you type in a large address (as in line 49156).

How does this work in the real world? We do need to set up just such a double-byte address for our routine which draws vertical lines. We're going to use the two bytes at 71–72 (space that's not being used by the computer during an ML program run). Notice that we must use zero page for setting up our special c/o addressing method. We start off (line 49186) by putting 39 into the LSB, address 71. Then we put a 4 into 72, the MSB. Since the real address (the target) is 256 × LSB + MSB, we'll get 1063 as the target when we land on these two bytes. 1063 is the first space on the right-hand side of our vertical screen line. We can start there because the first line is already filled in anyway with our horizontal line, built earlier in the program.

At this point we can formally introduce one of the most significant and useful of the ML addressing modes—*Indirect Y*. (It's usually called *indirect indexed*. Who can remember that? Let's call it Indirect Y.) It takes a minute to get it straight, but it's a minute well spent. You'll find many uses for this handy method of sending bytes anywhere in the computer. When you address something this way, it "bounces off" the number you prepare in zero page, it's indirect, it's like sending a letter c/o someone. In effect, it gets readdressed once the computer lands down in zero page.

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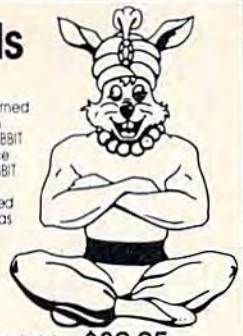

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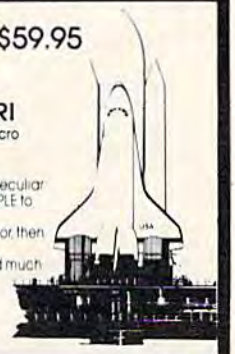

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Program 2: 64 Version

```
49152  LDY   # Ø
49154  LDA   # 8
49156  STA   55296 ,Y
49159  STA   55552 ,Y
49162  STA   55808 ,Y
49165  STA   56064 ,Y
49168  INY
49169  BNE         49156
49171  LDY   # Ø
49173  LDA   # 224
49175  STA   1024 ,Y
49178  STA   1984 ,Y
49181  INY
49182  CPY   # 40
49184  BNE         49175
49186  LDA   # 39
49188  STA   71
49190  LDA   # 4
49192  STA   72
49194  LDX   # 24
49196  LDY   # Ø
49198  LDA   # 224
49200  STA ( 71 ),Y
49202  INY
49203  STA ( 71 ),Y
49205  DEX
49206  BEQ         49224
49208  CLC
49209  LDA   71
49211  ADC   # 40
49213  STA   71
49215  LDA   72
49217  ADC   # Ø
49219  STA   72
49221  JMP    --->   49196
49224  RTS
```

After we load Y (our offset) with 0 again and load A with the framing character (224), we can store the 224 into the address which the computer finds by looking at the double-byte number we put into addresses 71–72. When it sees STA (71),Y—the computer knows what to do. It first calculates the correct target formed by multiplying whatever it finds in cell 72 × 256 and then adding whatever's in cell 71. Then, it also adds the value of the Y register.

So, we can manipulate the number in Y here the same way that we used it with Absolute Indexed above (line 49156), but have the added advantage of being able to manipulate the double-byte address at 71–72 as well. The first time through this loop, the framing character will be sent to 1063. Then we INY and send another framing character to 1064 (the second space down the left side of the screen). Then we DEX. X is counting down from 24 because there are 24 spaces down each side of the screen that we need to fill. If the DEX causes X to equal 0, then the BEQ takes effect and sends us back to BASIC mode via the RTS (ReTurn from Subroutine) at line 49224. If X is not yet zero (and thus we want to continue the looping), we will add 40 to the double-byte number at 71–72.

The adding is done by first clearing the carry, CLC, and then putting the number from 71 into the A register, adding 40 (ADC means ADd with Carry) and then storing the result back into cell 71. Likewise, we get the number from 72, add it to 0, and put it back. Why add to 0? Because there might be a carry from the operation on the number in 71. If so, we need to reflect that in the overall number by adding it to the MSB (in cell 72). After we've added 40 to this special double-byte number, we just jump (JMP) back to the line where we start our loop that prints the framing characters to the screen.

We've covered a good bit of ground this month. You should try out these routines with your Assembler and run them after they've been placed into memory: SYS 12288 (VIC) or SYS 49152 (64). Then, change some of the numbers and see the effects. Try using a different character for the frame. Pay particular attention to the way that Indirect Y addressing accomplishes its effects—we'll be using it frequently from here on.

See program listings on page 201.

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64 BASIC Aid

Harold D. Vanderpool

This extremely useful utility program adds four commands to BASIC and belongs in every programmer's toolbox. The utility itself is written in machine language. To type it in, use the MLX entry program found elsewhere in this issue.

No version of BASIC has everything. No matter what computer you look at, there are things that could be added to customize it for your particular needs. The VIC and 64 have an excellent version of BASIC, Microsoft, which has been popular for years on microcomputers. But if you do a bit of programming, you might find that "64 BASIC Aid" will be among the most valuable utility programs in your library—it adds four extremely useful commands to the 64's BASIC.

It uses up very little of your RAM memory (about 1000 bytes) and after you've typed in and saved a copy, you can use 64 BASIC Aid anytime you want those extra four commands. You LOAD it and RUN it as you would any other program, but it hides itself high up in memory and becomes invisible. You can then program as always, but you've got those four extra commands available to you.

Since these commands are useful for writing and debugging programs, they are available to you only in *direct* mode. (You can't include them in a program itself, but you'd never have reason to use them that way.)

Four Programming Aids

NUMBER 100,10. With this command, you can renumber any program that's in your computer. Just type the command and press RETURN. The new version of the program will start with line 100 and go up from there in steps of ten. You can use any numbers you want as the starting line number and any number from 1 to 255 as the step size. This can be useful in several ways. For example, you might have used up all the line numbers somewhere in your program: you've got lines 25, 26, 27, 28, 29, and so forth. No room for new numbers to insert a line? Just use NUMBER and they'll be spread apart instantly for you.

Within your program, there probably will be GOSUBs or GOTOs or other references to existing line numbers. 64 BASIC Aid takes care of that, adjusting the references automatically. However, if it finds a GOTO that's targeted to a line that doesn't exist in the program, it will print the number 65535 on the screen. This is helpful when you debug your programs. Also, all adjusted lines will be printed on the screen.

DELETE 100–200. When you type this, all the lines between 100 and 200 (inclusive) will disappear from your program. It works the same way that the LIST command works, using the same format. But be careful with this one. If you just type DELETE without any line numbers after it and then hit RETURN, it will delete the whole program.

FIND/GOTO/,500–900. This would print a list on screen of each line between 500 and 900 which contained a GOTO command. Again, you can indicate how you want the line numbers handled in the same way, using the same options, as with the ordinary LIST command. If you want a

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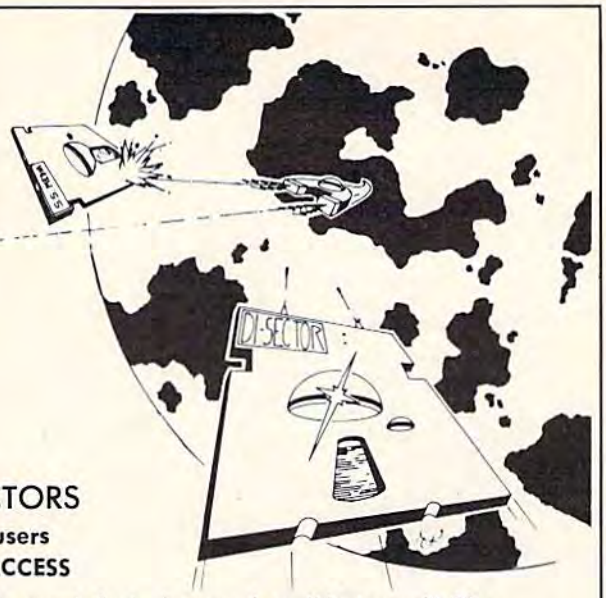

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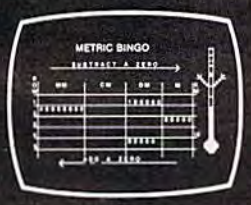

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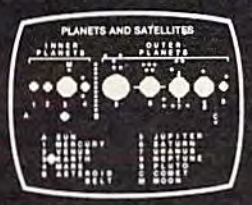

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report on the whole program, just leave off the comma and the line numbers. You can search for anything: variables, strings, commands, numbers. One note, however, about looking for things in quotes. The computer won't know if you want the *word* "to" or the *BASIC command* TO unless you use quotation marks instead of the slashes when you're looking for words as literal words. So, to find the word "to" you'd type:

```
FIND"TO",500-900
```

CHANGE@PRINT@PRINT#4 @,300–400. Similar to FIND, CHANGE will both locate and *replace* all occurrences of something within your program. All the rules for FIND apply the same way to CHANGE. The example here could be very useful if you have a printer. As written, your program is designed to PRINT everything to the screen. But you can make everything go to the printer instead by adding a line at the start of the program, OPEN 4,4 which alerts the computer that a channel has been opened to the printer. Then this CHANGE will make all printing go to channel 4 (Commodore printers are always Device #4, by convention) instead of the screen.

Another use for CHANGE would become apparent if you'd written a large program and used an illegal variable name like TI (reserved for the clock) or TO (a command name). Instead of hunting through the program, trying to find each illegal variable, just SAVE the program, LOAD and RUN 64 BASIC Aid, LOAD the program back in, and type: CHANGE/TI/TR/ and it's fixed in a flash. Like FIND, the whole program is changed if you leave off the line number information.

KILL turns off 64 BASIC Aid. If you want the computer to be returned to its original state, just type KILL and everything will be as if you'd just turned it on.

Here's the information you need to type in 64 BASIC Aid with the special MLX machine language entry program found elsewhere in this issue:

Start address = 39852
End address = 40961

To activate 64 BASIC Aid once it's loaded, enter SYS 39852.

If you don't want to type this program, send $3, a blank cassette or 1541/4040 disk, and a self-addressed, stamped mailer to:

Harold D. Vanderpool
3705 Enon Xenia Pike
Enon, OH 45323

See program listing on page 203.

Bug-Swatter:
Modifications And Corrections

● Two changes are necessary in the 64 version of "Oil Tycoon" (October). Add the following lines to pick a difficulty level or to press E to end the game:

```
230 PRINT"{DOWN} DIFFICULTY LEVEL? 123456
    78E(END){GRN}":T=1                :rem 76
235 POKE56194+T,0:T1=T:T=T+(PEEK(JS)AND4)
    /4-(PEEK(JS)AND8)/8:IF T>9 THEN T=1
                                      :rem 157
237 IF T<1 THENT=9                    :rem 229
263 IF T=9 THEN SYS2048               :rem 240
```

When converting the VIC version to the 64, we also neglected to include the feature which allows you to replace the oil rig by pressing the fire button. Add these lines:

```
435 Q=R-1:IF Q=0 THEN 360             :rem 41
437 J=Z:FORA=0TO21:A%(A)=0:NEXT:B=Q*40+W+
    X:A=PEEK(B):IF A<>7 THEN 480 :rem 255
```

● The text-adventure game "Martian Prisoner" (November) does not respond properly when you attempt to hit a Martian guard. This bug escaped our testing because we found it safer to fool the guards rather than provoke them (hint). Nevertheless, if you want to hit the guards, insert a GOSUB command in line 125:

```
125 IFV=14 THEN GOSUB 3900        :rem 154
```

● Many of you who typed in the VIC version of "Aardvark Attack" (October) encountered a syntax error in line 55. The reason is that the programmer used a keyword abbreviation when he wrote the line, and it works fine when typed in with the abbreviation. That's why our testing detected no errors. Unfortunately, listings do not show abbreviations. Here is the line:

```
55 M=(TANDFNM(J))/4 J....          :rem 77
```

The computer interprets T AND FNM(J) as TAN (tangent) without a value. There are four ways to fix it: (1) insert a space between T and AND; (2) abbreviate AND with A-SHIFT-N; (3) put the T in parentheses; (4) reverse the order—FNM(J)ANDT.

● The 64 version of "Munchmath" (November) does not accept answers beginning with 9. To fix this, remove ORAN$>"9" from line 200.

● In November's "Machine Language For Beginners" column, the VIC version of "The Assembler" program requires an 8K memory expander.

LIST Freezer

Doug Ferguson

This very short routine will prove indispensable to BASIC programmers—it allows you to pause or freeze a LISTing of the program on the screen. The routine is a machine language program presented in the form of a BASIC loader, so you need to know nothing about machine language to use it. What's more, it works equally well on the Commodore 64 or VIC-20.

The VIC-20 and Commodore 64 cry out for a pause feature during a LIST. When you're writing or debugging a program, especially if you lack a printer, you can waste a lot of time typing LIST again and again just to get a look at your BASIC code.

"LIST Freezer" is an elegant solution to the problem. It patches directly into the LIST routine in ROM (Read Only Memory) without interfering with anything else. Once it's activated, there is never any need to turn it off. It also eliminates the screen ripple effect of some other LIST pause routines, including one I published in COMPUTE! Magazine in 1982.

The LIST Freezer

The program below activates the pause feature for either the VIC or 64. Type it in exactly, SAVE it, RUN it, LOAD something in BASIC, and give it a try. (Because it destroys the BASIC loader part of itself in line 80, be sure to SAVE it before typing RUN for the first time.)

To use LIST Freezer, LIST any BASIC program and hold down the SHIFT key. The listing will pause. To freeze it entirely while freeing your hands, press SHIFT LOCK. You can restart the listing at any time by releasing SHIFT or SHIFT LOCK.

Technical Details

For the curious, here's how it works. Line 20 sets the low-byte/high-byte address of a machine language "patch" at the top of RAM (Random Access Memory). The patch consumes 23 bytes of memory on either the VIC or 64.

Line 30 redefines the computer's memory size to protect the patch. It also moves the LIST vector at memory addresses 774–775 (hexadecimal $0306–$0307) to reroute the indirect jump to ROM (address $A717 in the 64 or $C717 in the VIC).

The remaining lines create the patch routine at the top of RAM. Line 50 adjusts the patch to work on either the VIC or 64.

Notice that the program assumes the normal LIST vector at power-up; line 20 thus prevents you from accidentally trying to activate the routine more than once while the power is on.

Also note that the routine clears out the keyboard buffer when activated. Actually this was necessary only for the VIC, but it causes no harm on the 64 and was left in to make the routine universal.

LIST Freezer

```
20 L=232:H=PEEK(56)-1:Q=PEEK(775):IF Q<16
   7 THEN 80                          :rem 236
30 POKE 55,L:POKE 51,L:POKE 56,H:POKE 52,
   H:POKE 774,L:POKE 775,H            :rem 74
40 FOR X=L+H*256 TO X+21:READ D:POKE X,D:
   NEXT                               :rem 51
50 POKE X,Q                           :rem 105
60 DATA 72,152,72,32,159,255,169,1,44,141
   ,2,208,246                         :rem 209
70 DATA 169,0,133,198,104,168,104,76,26
                                      :rem 136
80 NEW                                :rem 82
```

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Centering VIC Screens

Mary Conlin

If you've discovered a clever time-saving technique, or a brief but effective programming shortcut, send it in to "Hints & Tips," c/o COMPUTE!'s GAZETTE for Commodore. If we use it, we'll pay you $35.

Some VIC-20s and TV sets don't match up perfectly — the screen image appears to be a little off-center. This is called *overscan*. If you can't compensate by fiddling with the TV controls — or if you prefer to leave the TV controls as they are for regular TV viewing — there's a way to adjust the screen from the computer.

Two memory locations inside the VIC control the horizontal and vertical positions of the screen image. By using simple POKE statements in direct mode or within a program, you can quickly adjust the screen for any TV. This method works on a VIC of any memory size. You can restore the screen to its normal position at any time by holding down the RUN/STOP key and pressing RESTORE.

(The Commodore 64 lacks these adjustments, but has much less need for them because its screen image is smaller than the VIC's and is less subject to overscan.)

Horizontal Adjustments

The horizontal screen position is controlled by memory location 36880. Normally this location contains a 5. POKEing smaller numbers into this location moves the screen left, and POKEing larger numbers moves it right. For example, to move the screen one position left, type:

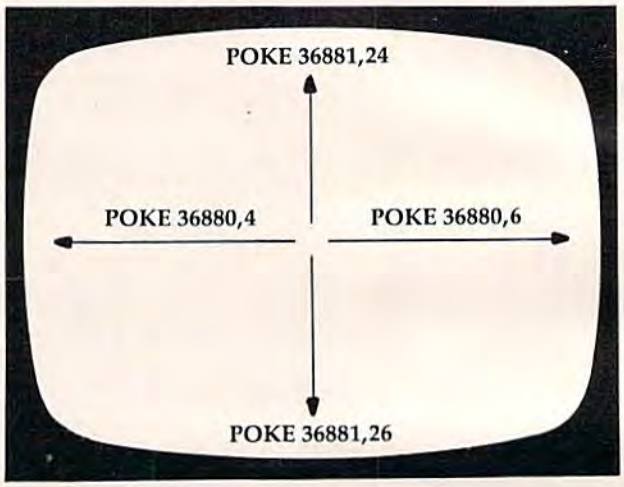
POKE 36880,4 [press RETURN]

Or, to adjust the screen one position right, type:

POKE 36880,6 [press RETURN]

If your screen is off-center by more than one position, try POKEing a 3 or a 7, etc. Once you find the correct value for your particular computer/TV combination, you can include the statement at the beginning of all your BASIC programs so the adjustment is made automatically whenever you type RUN.

Centering VIC Screens On A TV



Vertical Adjustments

The vertical screen position is controlled by memory location 36881. Normally this location contains a 25. POKEing smaller numbers into this location moves the screen up, and POKEing larger numbers moves it down. For example, to move the screen one position up, type:

POKE 36881,24 [press RETURN]

Or, to move the screen one position down, type:

POKE 36881,26 [press RETURN]

Using numbers too high can move the screen completely out of view. If this happens, simply POKE back the 25 or press RUN/STOP-RESTORE. Again, once you find the best number, you can include this statement in all your BASIC programs.

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NEWS & PRODUCTS

VIC-20 Spreadsheet

Computer Software Associates has released a VIC-20 version of PractiCalc Plus, a combination spreadsheet-data base manager program.

The program, available on tape or disk, requires a 16K RAM card expander.

PractiCalc Plus allows full use of mathematical and trigonometric function, incorporates search and sort routines, and has a single-key histogram function. The program, which sells for $49.95 on tape and $54.95 on disk, can be used for budget and business projections, expense tracking, investments, and inventory.

Micro Software International, Inc.
The Silk Mill
44 Oak Street
Newton Upper Falls, MA 02164
(617) 527-7510

Space Game For VIC

Ridge Runner is a machine-language space game for the unexpanded VIC-20.

In the game, produced by Bytes and Bits, you maneuver your multicolor ship through a minefield and a volley from enemy ships.

The game, which requires a joystick and sells for $14.95, includes a horizontally scrolling playfield, multicolor graphics, sound, a high-score recorder, and a pause option.

Bytes and Bits
524 East Canterbury Lane
Phoenix, AZ 85022
(602) 942-1475

Commodore 64 Rescue, VIC-20 Educational Games

Zeppelin Rescue, a game of coordination and skill for the Commodore 64, and several educational games for the VIC-20 are available from Micro Software International.

In *Zeppelin Rescue*, you must overcome the forces of gravity and the slow, cumbersome controls of your airship to rescue the inhabitants of a threatened city. The game includes five cityscapes and four levels—daylight, dusk, night, and dawn.

The program is available on disk for $24.95, or on cassette for $19.95.

The VIC-20 programs are all available on cassette and require no memory expansion. They include *Math Duel*, a basic number skills program for students in grades 1 through 6; *Tiny Tutor*, a simple math problem tutorial for children ages 2 through 7; *VIC Sketch*, a drawing program with SAVE and PRINT features; and *Composer*, which teaches the rudiments of music.

Math Duel and *Tiny Tutor* sell for $19.95. *VIC Sketch* and *Composer* are $14.95 each.

Micro Software International
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44 Oak Street
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One-Handed Bridge

Computer Management Corporation has released *BridgePro*, a program that will allow one person and a Commodore 64 to enjoy a game of bridge.

The program, which is written in machine language, takes care of the shuffling and dealing, and will bid and play three hands.

The program allows replaying hands, prevents illegal bids, and offers a help screen on bidding for bridge newcomers. A game for two players is among *BridgePro*'s other options.

BridgePro is available on disk for $35.

Computer Management Corporation
Customer Service Center
2424 Exbourne Court
Walnut Creek, CA 94596

Help For Programmers

A collection of worksheets, programming aids, grid-sheets, and logs, designed to help simplify VIC-20 and Commodore 64 programming, is available from PM Products.

Programmer's Aids and Logs includes a guide to all keys, POKEs, CHR$ codes, and characters; sound and music worksheets; a condensed BASIC dictionary; grids for screen layout, custom characters, and sprites; and documentation worksheets for variable, subroutine, and file use.

Also included are cutout function key templates and a BASIC-Aid reference card. The package, which sells for $9.95, contains 95 color-coded pages and is punched for use in three-ring binders.

PM Products
4455 Torrance Blvd., #177
Torrance, CA 90503

Programmer's Aids and Logs is a collection of worksheets, reference cards, and programming aids for the VIC or 64.

Tax Preparation Programs

Northland Accounting has produced three tax preparation programs for the Commodore 64 and VIC-20. The programs produce a line-by-line readout of IRS Form 1040 and related schedules. Updates for new tax years will be published annually.

Taxaid I is for the unexpanded VIC-20. The program directs its output to the monitor. *Taxaid II* is for a VIC-20 with 16K. Output can be directed to the monitor or a printer. *Taxaid III* is for the Commodore 64, with output directed to the monitor or printer.

Taxaid I is available on tape for $19.95 or on disk for $24.95. The other two versions are available on tape for $24.95 or on disk for $29.95.

Northland Accounting, Inc.
Software Department
606 Second Ave.
Two Harbors, MN 55616
(218) 834-5012

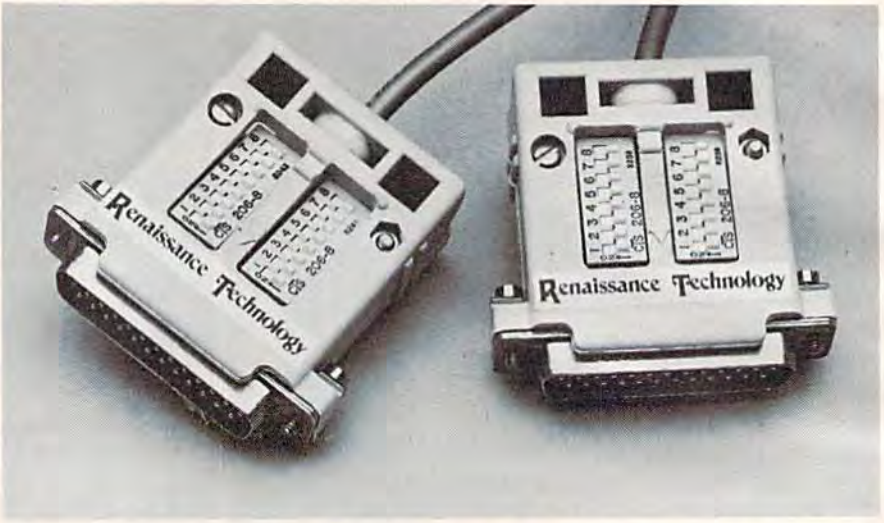
Universal Serial Cable

Renaissance Technology has produced the Universal Serial Cable, which simplifies connections between RS-232 serial computers and peripheral devices.

Built into the cable connectors are sets of DIP switches that can be set according to the requirements of the devices being connected. A cross-reference chart of switch settings is included with the cable.

The Universal Serial Cable sells for $62.

Renaissance Technology Corp.
1070 Shary Circle
Concord, CA 94518
(415) 676-5757



The Universal Serial Cable from Renaissance includes DIP switches in the connectors to eliminate the need for specially wired cables.

Activity-Planning Software

SEI Enterprises has produced a series of programs designed to help groups of users plan their activities.

The programs, which cover vacation, menu, and spending plans, allow up to ten participants to enter their preferences into the computer. Each person is then given a chance to vote on the suggestions made, and the program tallies the results and generates a printout.

The initial series is $24.95 and consists of four programs. They are *Acti-Trip*, for trip planning; *Acti-Spend*, for spending priorities; *Acti-Menu*, for meal planning; and *Acti-Play*, designed for youngsters to determine how to spend their free time.

The programs are available for the Commodore 64 and the VIC-20 with 8K expansion.

SEI Enterprises
17 Serpi Road
Highland Mills, NY 10930

Word Processor For Commodore 64

Easy Script 64, a word processing program from Commodore Software, is available for the Commodore 64.

Features of the program include selectable display colors; hunt and find; search and replace; function key editing; superscripts and subscripts; vertical and horizontal tabs; and the ability to transfer words, phrases and blocks within text. The program includes a form-letter command, and it offers optional sound effect prompts.

Easy Script 64, which sells for $49.95, also is compatible with *Easy Spell 64*, Commodore's spelling checker.

Commodore Software
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

VIC Memory Poster

Kevco has produced *Inside the VIC-20*, a 27 by 21-inch color poster that shows the important memory locations in the VIC.

The chart includes information on the BASIC memory map, video screens, sound and color, as well as data on paddles, joysticks and light pens.

The poster, which makes often-used information avail-

able at a glance, sells for $6.95. A Commodore 64 version is forthcoming.

Kevco Electronic and Software Engineering
480 Georgia Court
Claremont, CA 91711
(714) 626-4148

Investment Manager

Portfolio Manager is an investment management program for the Commodore 64 or 16K VIC-20 computers.

The program, which is the first in a series of personal finance programs planned by Basic Byte, allows the user to easily record and compute stock transactions. *Portfolio Manager* sells for $29.95.

Basic Byte, Inc.
13108 Ludlow
Huntington Woods, MI 48070
(313) 545-6779

Property Management System

MicroSpec has introduced its *Rental Property Manager* program for the Commodore 64.

With the program, a landlord can keep track of up to 200 rental units per diskette. The program maintains 18 fields per record, including information on the property owner, the tenant, the rent payment record, and the availability of the unit.

The system, which requires one disk drive, can produce a variety of reports including tenant lists, overdue rent lists, expired lease lists, vacancy lists, and income and expense reports.

Rental Property Manager sells for $179.95.

MicroSpec, Inc.
Box 836085
Plano, TX 75086
(214) 867-1333

Educational Games For Commodore 64

Bertamax has reached agreement with Commodore Business Machines to convert 21 educational programs for use on the Commodore 64.

Among the programs being converted are several programs designed for children in kindergarten through third grade. The titles include *Number Match It, Addition Match, Subtraction Match, Multiplication Match, Division Match*, and six reading programs in the *Story Mix* series.

Other programs covered in the agreement are: *Spelling in Context*, a 308-lesson program available for grade levels one through eight; *Math Facts Games—Set 2*, a series of four two-player math games; and *Number Cruncher*, 30 lessons in math and problem-solving skills.

Bertamax, Inc.
3647 Stoneway North
Seattle, WA 98103
(206) 547-4056

Spreadsheet For VIC And 64

ESP›Calc is an electronic spreadsheet planning calculator for both the VIC and 64.

The same program runs on both computers, and the size of the spreadsheet is limited only by computer memory. The manual includes step-by-step instructions to help novice spreadsheet users become accustomed to the program.

ESP›Calc is designed to handle things like household budgets, heat and electric use, stock portfolios, and rental property analysis. The program also includes printer options.

The cassette version of *ESP›Calc* sells for $43.50; the disk version is $47.50.

New Leaf Inc.
120 Lynnhaven
Belleville, IL 62223

COMPUTE!'s GAZETTE *welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

How To Type In *COMPUTE!'s Gazette* Programs

Many of the programs which are listed in *COMPUTE!'s Gazette* contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five 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 listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, ⟨⟩, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:
{CLEAR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + CRSR ↑	
{DOWN}	CRSR ↓	
{LEFT}	SHIFT + CRSR ←	
{RIGHT}	CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
⟨1⟩	f1	
⟨2⟩	f2	
⟨3⟩	f3	
⟨4⟩	f4	
⟨5⟩	f5	
⟨6⟩	f6	
⟨7⟩	f7	
⟨8⟩	f8	
{F1}	f1	
{F2}	f2	
{F3}	f3	
{F4}	f4	
{F5}	f5	
{F6}	f6	
{F7}	f7	
{F8}	f8	

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!'s Gazette* for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, *COMPUTE!'s Gazette* for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another 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 "How To Type In *COMPUTE!'s Gazette* 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 and STOP key may 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 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 Gazette* Programs" elsewhere in the magazine.)

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s Gazette *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s Gazette *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time*. This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Replace Original Proofreader

If you typed in the original version of the Proofreader (October 1983 issue), you should replace it with the improved version below. We added a POKE to the original version to protect it from being erased when you LOAD another program from tape. The POKE does protect the Proofreader, and the Proofreader itself was not affected. However, a quirk in the VIC-20's operating system means that programs typed in with the Proofreader and SAVEd on tape cannot be LOADed properly later. If you LOAD a program SAVEd while the Proofreader was in memory, you see ?LOAD ERROR. This applies only to VIC tape SAVEs (disk SAVEs work OK, and the quirk was fixed in the Commodore 64).

If you have a program typed in with the original Proofreader and SAVEd on tape, follow this special LOAD procedure:

1. Turn the power off, then on.
2. LOAD the program from tape (disregard the ?LOAD ERROR).
3. Enter: POKE 45,PEEK(174):POKE 46,PEEK(175):CLR
4. ReSAVE the program to tape.

The program will LOAD fine in the future. We strongly recommend that you type in the new version of the Proofreader and discard the old one.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

MLX Machine Language Entry Program

For Commodore 64 And VIC-20

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost failsafe entry of machine language programs published in COMPUTE!'s GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone. There are separate versions for the Commodore 64 and expanded VIC-20 (at least 8K). MLX was conceived and written by Program Editor Charles Brannon. Important: MLX is required to type in the machine language programs in this issue.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

```
LOAD "filename",1,1   (for tape)
LOAD "filename",8,1   (for disk)
```

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save the correct version of MLX for your computer (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. It you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the comma, SPACE bar, or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later. MLX recognizes these commands:

SHIFT-S: Save	**SHIFT-N: New Address**
SHIFT-L: Load	**SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

The special MLX commands may seem a bit confusing, but as you work with MLX, they will become valuable. For example, what if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

You can use the Save and Load commands to make copies of the completed program. Use Load to reload the tape or disk, then insert a new tape or disk and use Save to make a new copy.

Be sure to save MLX; it will be used for future ML programs in COMPUTE!'s GAZETTE.

See program listings on page 184.

SpeedScript

(Article on page 38.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

SpeedScript—Commodore 64 Version

```
2049 :011,008,010,000,158,050,238
2055 :048,054,049,000,000,000,158
2061 :032,103,009,076,193,009,179
2067 :165,251,141,051,008,165,032
2073 :252,141,052,008,165,253,128
2079 :141,054,008,165,254,141,026
2085 :055,008,166,181,240,032,207
2091 :169,000,141,186,026,160,213
2097 :000,185,000,000,153,000,131
2103 :000,200,204,186,026,208,111
2109 :244,238,052,008,238,055,128
2115 :008,224,000,240,007,202,236
2121 :208,224,165,180,208,222,000
2127 :096,165,181,170,005,180,108
2133 :208,001,096,024,138,101,141
2139 :252,141,123,008,165,251,007
2145 :141,122,008,024,138,101,119
2151 :254,141,126,008,165,253,026
2157 :141,125,008,232,164,180,191
2163 :208,004,240,013,160,255,227
2169 :185,000,000,153,000,000,203
2175 :136,192,255,208,245,206,089
2181 :123,008,206,126,008,202,038
2187 :208,234,096,169,040,133,251
2193 :195,133,020,169,004,133,031
2199 :196,169,216,133,021,173,035
2205 :182,026,133,155,173,183,241
2211 :026,133,156,162,001,173,046
2217 :185,026,133,012,173,195,125
2223 :026,141,032,208,160,000,230
2229 :173,194,026,145,020,177,148
2235 :155,153,196,026,200,041,190
2241 :127,201,031,240,019,192,235
2247 :040,208,235,136,177,155,126
2253 :041,127,201,032,240,005,083
2259 :136,208,245,160,039,200,175
2265 :132,167,136,185,196,026,035
2271 :145,195,136,016,248,164,103
2277 :167,024,152,101,155,133,193
2283 :155,165,156,105,000,133,181
2289 :156,152,157,060,003,192,193
2295 :040,240,008,169,032,145,113
2301 :195,200,076,246,008,024,234
2307 :165,195,105,040,133,195,068
2313 :133,020,144,004,230,196,224
2319 :230,021,232,224,025,240,219
2325 :003,076,179,008,165,155,095
2331 :141,192,026,165,156,141,080
2337 :193,026,096,169,000,133,138
2343 :155,141,182,026,141,188,104
2349 :026,133,038,169,028,133,060
2355 :156,141,183,026,141,189,119
2361 :026,133,039,169,032,162,106
2367 :179,160,255,198,156,145,132
2373 :155,200,230,156,145,155,086
2379 :200,208,251,230,156,202,042
2385 :208,246,145,155,096,133,040
2391 :167,132,168,160,000,177,123
2397 :167,240,006,032,210,255,235
2403 :200,208,246,096,169,012,006
2409 :141,195,026,169,038,133,039
2415 :001,169,011,141,194,026,141
2421 :032,036,009,169,000,141,248
2427 :185,026,032,115,015,169,153
2433 :255,141,138,002,032,245,174
2439 :012,032,150,009,169,100,095
2445 :160,025,032,086,009,238,179
2451 :184,026,096,032,166,009,148
2457 :169,085,160,025,032,086,198
2463 :009,169,000,141,184,026,176
2469 :096,162,039,169,032,157,052
2475 :000,004,202,016,250,169,044
2481 :019,076,210,255,072,041,082
2487 :128,074,133,167,104,041,062
2493 :063,005,167,096,160,000,168
2499 :177,038,133,002,160,000,193
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5217 :166,009,169,132,160,026,247
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5253 :032,228,255,240,251,056,171
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5283 :228,255,240,251,056,233,146
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5427 :133,156,160,000,173,155,060
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5439 :241,021,032,038,022,173,078
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5517 :255,169,001,032,195,255,024
5523 :076,150,009,076,247,020,213
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5535 :027,168,136,136,240,010,108
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5703 :250,096,141,157,027,041,015
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5727 :221,162,022,240,012,202,186
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5739 :157,027,076,000,021,202,078
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5847 :141,146,027,076,151,022,010
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5865 :022,019,141,149,027,076,155
5871 :151,022,200,032,022,019,173
5877 :141,150,027,076,151,022,044
5883 :200,032,022,019,141,151,048
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5919 :140,027,200,076,151,022,135
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5961 :151,022,200,177,155,201,211
5967 :061,240,004,136,076,106,190
5973 :022,200,032,022,019,072,196
5979 :173,157,027,041,015,170,162
5985 :202,104,157,087,020,032,187
5991 :151,022,076,134,022,032,028
5997 :231,255,169,000,032,189,217
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6015 :255,144,001,096,032,166,053
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6051 :032,231,255,076,150,009,148
6057 :032,231,255,169,000,032,120
6063 :189,255,169,015,162,008,205
6069 :160,015,032,186,255,032,093
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6081 :009,162,015,032,198,255,096
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6123 :016,208,003,076,150,009,185
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6135 :184,026,169,000,133,155,146
6141 :169,028,133,156,076,017,064
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6153 :039,133,156,160,001,076,062
6159 :019,024,160,000,162,000,124
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6171 :209,155,240,002,162,255,026
6177 :200,208,011,230,156,165,235
6183 :156,205,189,026,240,002,089
6189 :176,035,232,236,191,026,173
6195 :208,224,024,152,101,155,147
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6219 :233,000,133,039,076,231,019
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6243 :141,158,027,096,096,160,009
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6255 :177,169,048,038,032,061,124
6261 :020,032,021,025,032,210,201
6267 :255,173,161,027,240,010,221
6273 :169,008,032,210,255,169,204
6279 :095,032,210,255,032,225,216
6285 :255,208,005,104,104,076,125
6291 :129,021,200,076,106,024,191
6297 :140,156,027,041,127,032,164
6303 :061,020,201,049,144,017,139
6309 :201,058,176,013,041,015,157
6315 :170,202,189,087,020,032,103
6321 :210,255,076,149,024,201,068
6327 :067,208,026,056,169,080,021
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6363 :027,237,186,026,056,237,220
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6375 :200,024,201,085,208,008,189
6381 :173,161,027,073,001,141,045
6387 :161,027,201,035,240,003,142
6393 :076,149,024,140,156,027,053
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6573 :085,082,069,063,032,040,032
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6597 :216,212,000,197,082,065,201
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6609 :215,044,208,041,058,032,039
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6669 :197,082,082,079,082,000,023
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Program 2:

SpeedScript—VIC-20 Version

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4795 :145,020,177,155,153,139,208
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4843 :101,155,133,155,165,156,076
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4861 :169,032,145,195,200,076,046
4867 :249,018,024,165,195,105,247
4873 :022,133,195,133,020,144,144
4879 :004,230,196,230,021,232,160
4885 :224,023,240,003,076,182,001
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4897 :165,156,141,136,036,096,251
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4927 :133,039,056,173,022,018,248
4933 :237,020,018,170,169,032,203
4939 :160,255,198,156,145,155,120
4945 :200,230,156,145,155,200,143
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8383 :169,000,141,095,037,200,065
8389 :076,149,032,200,169,001,056

8395 :141,103,037,076,149,032,229
8401 :200,032,024,029,141,089,212
8407 :037,076,149,032,200,032,229
8413 :024,029,141,090,037,076,106
8419 :149,032,200,032,024,029,181
8425 :141,092,037,076,149,032,248
8431 :200,032,024,029,141,093,246
8437 :037,076,149,032,200,032,003
8443 :024,029,141,094,037,076,140
8449 :149,032,076,146,031,056,235
8455 :152,101,155,141,085,037,166
8461 :165,156,105,000,141,086,154
8467 :037,032,035,033,056,152,108
8473 :237,099,037,141,083,037,147
8479 :200,076,149,032,200,177,097
8485 :155,201,031,208,249,136,249
8491 :096,056,152,101,155,141,232
8497 :087,037,165,156,105,000,087
8503 :141,088,037,032,035,033,165
8509 :056,152,237,099,037,141,015
8515 :084,037,200,076,149,032,133
8521 :200,177,155,201,061,240,083
8527 :004,136,076,104,032,200,119
8533 :032,024,029,072,173,100,003
8539 :037,041,015,170,202,104,148
8545 :157,077,030,032,149,032,062
8551 :076,132,032,032,231,255,093
8557 :169,000,032,189,255,169,155
8563 :015,162,008,160,015,032,251
8569 :186,255,032,192,255,144,161
8575 :001,096,032,203,019,169,135
8581 :062,032,210,255,032,134,090
8587 :026,240,025,162,015,032,127
```

```
8593 :201,255,176,012,169,179,113
8599 :160,036,032,097,019,169,152
8605 :013,032,210,255,032,231,162
8611 :255,076,187,019,032,231,195
8617 :255,169,000,032,189,255,045
8623 :169,015,162,008,160,015,192
8629 :032,186,255,032,192,255,109
8635 :176,228,032,203,019,162,239
8641 :015,032,198,255,032,134,091
8647 :026,032,231,255,169,001,145
8653 :141,127,036,096,173,141,151
8659 :002,201,005,240,005,173,069
8665 :101,037,208,040,032,203,070
8671 :019,169,105,160,036,032,232
8677 :097,019,032,134,026,208,233
8683 :004,032,187,019,096,169,230
8689 :001,141,101,037,141,127,021
8695 :036,173,019,018,133,155,013
8701 :173,020,018,133,156,076,061
8707 :018,034,165,038,133,155,034
8713 :165,039,133,156,160,001,151
8719 :076,020,034,160,000,162,211
8725 :000,189,179,036,032,235,180
8731 :019,209,155,240,002,162,046
8737 :255,200,208,011,230,156,069
8743 :165,156,205,132,036,240,205
8749 :002,176,035,232,236,134,092
8755 :036,208,224,024,152,101,028
8761 :155,133,038,165,156,105,041
8767 :000,133,039,056,165,038,238
8773 :237,134,036,133,038,165,044
8779 :039,233,000,133,039,076,083
8785 :067,021,032,203,019,169,080
8791 :115,160,036,032,097,019,034
8797 :169,001,141,127,036,169,224
8803 :000,141,101,037,096,096,058
8809 :160,000,204,129,036,240,106
8815 :248,177,169,048,038,032,055
8821 :051,030,032,015,035,032,056
8827 :210,255,173,104,037,240,118
8833 :010,169,008,032,210,255,045
8839 :169,095,032,210,255,032,160
8845 :225,255,208,005,104,104,018
8851 :076,121,031,200,076,107,246
8857 :034,140,099,037,041,127,119
8863 :032,051,030,201,049,144,154
8869 :017,201,058,176,013,041,159
8875 :015,170,202,189,077,030,086
8881 :032,210,255,076,150,034,166
8887 :201,067,208,026,056,169,142
8893 :080,237,129,036,074,056,033
8899 :237,089,037,168,169,032,159
8905 :032,210,255,136,208,250,012
8911 :172,099,037,076,150,034,007
8917 :201,069,208,017,056,173,169
8923 :090,037,237,129,036,056,036
8929 :237,089,037,168,169,032,189
8935 :076,201,034,201,085,208,012
8941 :008,173,104,037,073,001,121
8947 :141,104,037,201,035,240,233
8953 :003,076,150,034,174,097,015
8959 :037,169,000,032,205,221,151
8965 :160,054,132,001,172,099,111
8971 :037,076,150,034,174,103,073
8977 :037,240,026,133,167,041,149
8983 :127,201,065,144,018,201,011
8989 :091,176,014,170,165,167,044
8995 :041,128,073,128,074,074,041
9001 :133,167,138,005,167,096,235
9007 :032,203,019,056,173,021,039
9013 :018,237,131,036,170,173,050
9019 :022,018,237,132,036,032,024
9025 :205,221,169,001,141,127,161
9031 :036,096,014,008,144,211,068
9037 :080,069,069,068,211,067,129
9043 :082,073,080,084,000,194,084
9049 :085,070,070,069,082,032,241
9055 :195,076,069,065,082,069,139
9061 :068,000,194,085,070,070,076
9067 :069,082,032,198,085,076,137
9073 :076,000,196,069,076,069,087
9079 :084,069,032,040,211,044,087
9085 :215,044,208,041,000,058,179
9091 :211,085,082,069,063,032,161
9097 :217,047,206,000,197,210,246
9103 :193,211,197,032,212,197,161
9109 :216,212,000,197,082,065,153
9115 :083,069,032,040,211,044,122
9121 :215,044,208,041,058,060,019
9127 :210,197,212,213,210,206,135
9133 :062,000,203,069,089,058,142
9139 :000,211,065,086,069,058,156
9145 :000,212,065,080,069,032,131
9151 :197,210,210,207,210,000,201
9157 :211,084,079,080,080,069,032
9163 :068,000,214,069,082,073,197
9169 :070,089,032,197,082,082,249
9175 :079,082,000,206,079,032,181
9181 :069,082,082,079,082,083,186
9187 :000,147,032,018,212,146,014
9193 :065,080,069,032,079,082,128
9199 :032,018,196,146,073,083,019
9205 :075,063,000,204,079,065,219
9211 :068,058,000,214,069,082,230
9217 :073,070,089,058,000,208,243
9223 :082,069,083,083,032,018,118
9229 :210,197,212,213,210,206,237
9235 :146,000,036,048,206,079,022
9241 :032,210,079,079,077,000,246
9247 :206,079,032,084,069,088,077
9253 :084,032,073,078,032,066,146
9259 :085,070,070,069,082,046,209
9265 :000,196,069,086,073,067,028
9271 :069,032,035,000,211,069,215
9277 :067,079,078,068,046,032,175
9283 :193,068,068,082,046,032,044
9289 :035,000,208,082,073,078,037
9295 :084,073,078,071,000,206,079
9301 :069,088,084,032,083,072,001
9307 :069,069,084,044,032,146,023
9313 :210,197,212,213,210,206,065
9319 :018,000,200,085,078,084,056
9325 :032,070,079,082,058,000,174
9331 :206,079,084,032,198,079,025
9337 :085,078,068,000,000,000,096
```

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

MLX For VIC And 64

(Article on page 171.)

Program 1: MLX—64 Version

```
100 PRINT"{CLR}{CYN}";CHR$(142);CHR$(8);:
    POKE53281,1:POKE53280,1          :rem 73
101 POKE 788,52:REM DISABLE RUN/STOP
                                     :rem 119
110 PRINT"{RVS}{40 SPACES}";         :rem 176
120 PRINT"{RVS}{15 SPACES}{RIGHT}{OFF}
    {*}£{RVS}{RIGHT} {RIGHT}{2 SPACES}
    {*}{OFF}{*}£{RVS}£{RVS}
    {13 SPACES}";                    :rem 250
130 PRINT"{RVS}{15 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{13 SPACES}";       :rem 35
140 PRINT"{RVS}{40 SPACES}"          :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK}{3 SPACES}A F
    AILSAFE MACHINE LANGUAGE EDITOR
    {5 DOWN}"                        :rem 130
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";             :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F:rem 125
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210            :rem 235
225 PRINT:PRINT:PRINT                :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                   :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230            :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                     :rem 176
260 PRINT:PRINT:PRINT                :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S:POKEV+21,0
                                     :rem 225
310 PRINTRIGHT$("0000"+MID$(STR$(AD),2),5
    );":";:FORJ=1TO6                 :rem 234
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                     :rem 228
390 IFN=-211THEN 710                  :rem 62
400 IFN=-204THEN 790                  :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                   :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                     :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                     :rem 238
420 IF N<>-196 THEN 480              :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                        :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";       :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";        :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                     :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                        :rem 50
480 IFN<0 THEN PRINT:GOTO310         :rem 168
490 A(J)=N:NEXTJ                     :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT      :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(20)
                                     :rem 234
515 IFN=CKSUMTHEN530                 :rem 255
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                        :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0                :rem 227
550 AD=AD+6:IF AD<E THEN 310         :rem 212
560 GOTO 710                         :rem 108
570 N=0:Z=0                           :rem 88
580 PRINT"{+}";                      :rem 79
581 GETA$:IFA$=""THEN581              :rem 95
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                    :rem 229
590 IFA>128THENN=-A:RETURN           :rem 137
600 IFA<>20 THEN 630                  :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {LEFT} {LEFT}";:GOTO690          :rem 172
620 GOTO570                          :rem 109
630 IFA<48ORA>57THEN580              :rem 105
640 PRINTA$;:N=N*10+A-48             :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                     :rem 229
660 Z=Z+1:IFZ<3THEN580                :rem 71
670 IFZ=0THENGOSUB1000:GOTO570       :rem 114
680 PRINT",";:RETURN                 :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                     :rem 149
691 FORI=1TO3:T=PEEK(S%-I)            :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                     :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                       :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                     :rem 236
720 INPUT"{DOWN} FILENAME";F$        :rem 228
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"          :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                     :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                     :rem 158
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                  :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                     :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                               :rem 69
765 POKE254,S/256:POKE253,S-PEEK(254)*256
    :POKE780,253                     :rem 12
766 POKE782,E/256:POKE781,E-PEEK(782)*256
    :SYS65496                        :rem 124
770 IF(PEEK(783)AND1)OR(ST AND191)THEN780
                                     :rem 111
775 PRINT"{DOWN}DONE.":END           :rem 106
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720         :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720             :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                     :rem 212
800 INPUT"{2 DOWN} FILENAME";F$      :rem 244
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"          :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                     :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                     :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                  :rem 2
```

```
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                    :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 70
850 POKE780,0:SYS65493              :rem 11
860 IF(PEEK(783)AND1)OR(ST AND191)THEN870
                                    :rem 111
865 PRINT"{DOWN}DONE.":GOTO310      :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                    :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800            :rem 102
1000 REM BUZZER                     :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
    165                             :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
    5                               :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
    273,0:POKE54272,0:RETURN        :rem 202
2000 REM BELL SOUND                 :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
    47                              :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
    ,0                              :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                    :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
    GOTO1000                        :rem 89
```

Program 2: MLX—VIC Version

```
100 PRINT"{CLR}{PUR}";CHR$(142);CHR$(8);
                                    :rem 181
101 POKE 788,194:REM DISABLE RUN/STOP
                                    :rem 174
110 PRINT"{RVS}{14 SPACES}"         :rem 117
120 PRINT"{RVS} {RIGHT}?{OFF}{*}£{RVS}
    {RIGHT} {RIGHT}{2 SPACES}{*}{OFF}
    {*}£{RVS}£{RVS} "               :rem 191
130 PRINT"{RVS} {RIGHT} {G}{RIGHT}
    {2 RIGHT} {OFF}£{RVS}£{*}{OFF}
    {*}{RVS} "                      :rem 232
140 PRINT"{RVS}{14 SPACES}"         :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK}A FAILSAFE MA
    CHINE":PRINT"LANGUAGE EDITOR{5 DOWN}"
                                    :rem 141
210 PRINT"{BLK}{3 UP}STARTING ADDRESS":IN
    PUTS:F=1-F:C$=CHR$(31+119*F)    :rem 97
220 IFS<256ORS>32767THENGOSUB3000:GOTO210
                                      :rem 2
225 PRINT:PRINT:PRINT:PRINT         :rem 123
230 PRINT"{BLK}{3 UP}ENDING ADDRESS":INPU
    TE:F=1-F:C$=CHR$(31+119*F)      :rem 158
240 IFE<256ORE>32767THENGOSUB3000:GOTO230
                                    :rem 234
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                    :rem 176
260 PRINT:PRINT:PRINT               :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S      :rem 56
310 PRINTRIGHT$("0000"+MID$(STR$(AD),2),5
    );":";:FORJ=1TO6                :rem 234
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                    :rem 228
390 IFN=-211THEN 710                :rem 62
400 IFN=-204THEN 790                :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                  :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                    :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                    :rem 238
420 IF N<>-196 THEN 480             :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                       :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                               :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";      :rem 30
455 FORK=0TO5:N=PEEK(I+K):IFK=3THENPRINTS
    PC(10);                         :rem 34
457 PRINTRIGHT$("00"+MID$(STR$(N),2),3);"
    ,";                             :rem 157
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                    :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                       :rem 50
480 IFN<0 THEN PRINT:GOTO310        :rem 168
490 A(J)=N:NEXTJ                    :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT     :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(20)
                                    :rem 234
515 IFN=CKSUMTHEN530                :rem 255
520 PRINT:PRINT"LINE ENTERED WRONG":PRINT
    "RE-ENTER":PRINT:GOSUB1000:GOTO310
                                    :rem 129
530 GOSUB2000                       :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:rem 80
550 AD=AD+6:IF AD<E THEN 310        :rem 212
560 GOTO 710                        :rem 108
570 N=0:Z=0                          :rem 88
580 PRINT"{+}";                     :rem 79
581 GETA$:IFA$=""THEN581             :rem 95
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                   :rem 229
590 IFA>128THENN=-A:RETURN          :rem 137
600 IFA<>20 THEN 630                 :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {LEFT} {LEFT}";:GOTO690         :rem 172
620 GOTO570                         :rem 109
630 IFA<48ORA>57THEN580             :rem 105
640 PRINTA$;:N=N*10+A-48            :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                    :rem 229
660 Z=Z+1:IFZ<3THEN580               :rem 71
670 IFZ=0THENGOSUB1000:GOTO570      :rem 114
680 PRINT",";:RETURN                :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                    :rem 149
692 FORI=1TO3:T=PEEK(S%-I)           :rem 68
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                    :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                      :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                    :rem 236
720 INPUT"{DOWN} FILENAME";F$       :rem 228
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"         :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                    :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                    :rem 158
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                 :rem 3
```

```
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                    :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 69
765 POKE254,S/256:POKE253,S-PEEK(254)*256
    :POKE780,253                    :rem 12
766 POKE782,E/256:POKE781,E-PEEK(782)*256
    :SYS65496                       :rem 124
770 IF(PEEK(783)AND1)OR(ST AND191)THEN780
                                    :rem 111
775 PRINT"{DOWN}DONE.":END          :rem 106
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720        :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720            :rem 103
782 GOTO720                         :rem 115
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                    :rem 212
800 INPUT"{2 DOWN} FILENAME";F$     :rem 244
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"         :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                    :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                    :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                    :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 70
850 POKE780,0:SYS65493              :rem 11
860 IF(PEEK(783)AND1)OR(ST AND191)THEN870
                                    :rem 111
865 PRINT"{DOWN}DONE.":GOTO310      :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                    :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800            :rem 102
1000 REM BUZZER                     :rem 135
1001 POKE36878,15:POKE36874,190     :rem 206
1002 FORW=1TO300:NEXTW              :rem 117
1003 POKE36878,0:POKE36874,0:RETURN
                                    :rem 74
2000 REM BELL SOUND                 :rem 78
2001 FORW=15TO0STEP-1:POKE36878,W:POKE368
     76,240:NEXTW                   :rem 22
2002 POKE36876,0:RETURN             :rem 119
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                       :rem 89
```

64 Electronic Notepad

(Article on page 112.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 BO=254:SC=246:CH=14               :rem 170
5 POKE53280,BO:POKE53281,SC:POKE646,CH
                                    :rem 17
7 PRINT"{CLR}";TAB(10);"{RVS} ELECTRONIC
  {SPACE}NOTEPAD ",TAB(6)"{DOWN} LOADING
  {SPACE}DATA...PLEASE WAIT"        :rem 83
10 B=885:C=998:FORA=BTOC:READD:POKEA,D:NE
   XT                               :rem 221
12 B=49152:C=49407:FORA=BTOC:READD:POKEA,
   D:NEXT                           :rem 157
14 B=679:C=753:FORA=BTOC:READD:POKEA,D:NE
   XT                               :rem 215
16 PRINT"{CLR}{DOWN} ENTER 2 SECRET CODES
    (0-255):":PRINT"{DOWN} (SEPERATE EACH
    BY A COMMA)"                    :rem 100
17 PRINT"{DOWN} (ENTER 0'S IF NO SECRET C
   ODE){2 DOWN}":POKE646,PEEK(53281):INPU
   TA,B                             :rem 25
19 POKE646,CH:IFA<0ORA>255ORB<0ORB>255THE
   N16                              :rem 196
20 POKE249,A:POKE250,B:A=0:B=0:SYS679
                                    :rem 187
22 PRINT"{CLR}{DOWN} {RVS}D{OFF}ISK OR
   {RVS}T{OFF}APE?"                 :rem 86
23 GETA$:IFA$=""THEN23              :rem 237
24 IFA$="D"THEN30                   :rem 177
25 IFA$="T"THEN29                   :rem 202
26 GOTO22                            :rem 5
29 POKE49303,1:POKE49305,1:POKE49307,255:
   POKE49177,1:POKE49179,1          :rem 163
30 PRINT"{CLR}";TAB(10);"{RVS} ELECTRONIC
    NOTEPAD "                       :rem 15
40 PRINT"{2 DOWN}{3 SPACES}FUNCTION";TAB(
   30);"PRESS"                      :rem 143
45 PRINT"{3 SPACES}{8 T}";TAB(30);"
   {5 T}"                          :rem 198
50 PRINT"{2 DOWN} VIEW NOTEPAD PAGE";TAB(
   31);"F1"                         :rem 120
55 PRINT"{DOWN} CREATE NOTEPAD PAGE";TAB(
   31);"F3"                         :rem 231
60 PRINT"{DOWN} VIEW DISK DIRECTORY";TAB(
   31);"F5"                         :rem 36
65 PRINT"{DOWN} CHANGE PROGRAM OPTIONS";T
   AB(31);"F6"                      :rem 249
70 PRINT"{DOWN} END PROGRAM";TAB(31);"F8"
                                    :rem 252
75 GETA$:IFA$="{F1}"THEN200         :rem 166
80 IFA$="{F3}"THEN600                :rem 40
85 IFA$="{F5}"THEN400                :rem 44
86 IFA$="{F8}"THENPRINT"{CLR}":CLR:POKE24
   9,0:POKE250,0:END                :rem 238
87 IFA$="{F6}"THENRESTORE:GOTO1     :rem 102
90 GOTO75                            :rem 14
200 PRINT"{CLR}"                    :rem 246
210 SYS49152                        :rem 151
215 GOSUB500                        :rem 173
220 GETA$:IFA$=""ORA$="←"THEN220    :rem 49
230 GOTO30                           :rem 49
400 PRINT"{CLR}"                    :rem 248
405 IFPEEK(49303)=1THEN450          :rem 215
410 SYS885                           :rem 57
420 PRINTTAB(7);"{RVS}(PRESS ANY KEY)"
                                    :rem 194
430 GETA$:IFA$=""THEN430             :rem 81
440 GOTO30                           :rem 52
450 PRINT"{DOWN} NO DIRECTORY AVAILABLE":
    PRINT"{DOWN} PROGRAM IN {RVS}TAPE
    {OFF} MODE"                     :rem 12
460 PRINT"{2 DOWN} {RVS} (PRESS ANY KEY)
    {SPACE}"                        :rem 78
470 GETA$:IFA$=""THEN470            :rem 89
480 GOTO30                          :rem 56
500 CLOSE15:OPEN15,8,15:INPUT#15,A,B$,C,D
    :IFA>21THEN510                  :rem 218
505 RETURN                          :rem 122
510 PRINT:PRINT"{DOWN}{3 SPACES}{RVS} *DI
    SK ERROR* ":PRINT"{DOWN}{3 SPACES}
    {RVS} ";B$                      :rem 41
```

```
515 RETURN                              :rem 123
600 PRINT"{CLR}";TAB(9);"{RVS} CREATE NOT
    EPAD PAGE "                         :rem 3
605 PRINT"{2 DOWN} PRESS {RVS}F1{OFF} TO
    {SPACE}SAVE PAGE."                  :rem 83
610 PRINT"{DOWN} PRESS {RVS}F8{OFF} TO AB
    ORT PAGE."                          :rem 142
615 PRINT"{2 DOWN} (PRESS ANY KEY)"
                                        :rem 62
620 GETA$:IFA$=""THEN620                :rem 83
622 PRINT"{CLR}";                       :rem 57
625 GETA$:IFA$=""THENPRINT"{P} {2 LEFT}
    ";:GOTO625                          :rem 197
630 IFA$="{LEFT}"THEN625                :rem 119
635 IFA$="{RIGHT}"THEN625               :rem 252
636 IFA$="{HOME}"THENGOTO625            :rem 44
637 IFA$=CHR$(34)THEN625                :rem 86
638 IFA$="←"THENPRINT" {LEFT}";:GOTO625
                                        :rem 93
640 IFA$="{UP}"THENPRINT" {LEFT}{UP}";:GO
    TO625                               :rem 25
645 IFA$="{DOWN}"THENPRINT" {LEFT}{DOWN}"
    ;:GOTO625                           :rem 30
646 IFA$=CHR$(13)THENPRINT" ";CHR$(13);:G
    OTO625                              :rem 195
650 IFA$="{F1}"THEN680                  :rem 98
655 IFA$="{F8}"THEN30                   :rem 51
675 PRINTA$;" {LEFT}";:GOTO625          :rem 251
680 PRINT" ";:POKE648,60:POKE53272,245:SY
    S49278                              :rem 193
685 GOSUB500:IFA<21THENPOKE648,4:POKE5327
    2,21:GOTO30                         :rem 146
690 PRINT"{DOWN} {RVS} (PRESS ANY KEY) "
                                        :rem 66
695 GETA$:IFA$=""THEN695                :rem 107
697 POKE648,4:POKE53272,21:SYS49374:GOTO6
    25                                  :rem 38
885 DATA 169,001,162,008,160,000        :rem 36
891 DATA 032,186,255,169,002,162        :rem 51
897 DATA 224,160,003,032,189,255        :rem 51
903 DATA 032,192,255,162,001,032        :rem 30
909 DATA 198,255,032,207,255,032        :rem 53
915 DATA 207,255,032,207,255,032        :rem 41
921 DATA 207,255,240,058,032,204        :rem 37
927 DATA 255,032,228,255,201,032        :rem 41
933 DATA 208,005,032,228,255,240        :rem 39
939 DATA 251,162,001,032,198,255        :rem 48
945 DATA 032,207,255,072,032,207        :rem 41
951 DATA 255,168,104,170,152,032        :rem 42
957 DATA 205,189,169,032,032,210        :rem 49
963 DATA 255,032,207,255,240,006        :rem 42
969 DATA 032,210,255,076,196,003        :rem 50
975 DATA 169,013,032,210,255,076        :rem 48
981 DATA 149,003,169,001,032,195        :rem 46
987 DATA 255,032,204,255,096,036        :rem 57
993 DATA 048,013,013,013,013,013        :rem 27
49152 DATA32,54,192, 160, 0, 162, 0, 32
                                        :rem 178
49160 DATA207,255,201,13,240,8,157, 240
                                        :rem 127
49168 DATA193,232,200,76,7,192, 152, 72
                                        :rem 97
49176 DATA169,8,162,8, 160, 1, 32, 186
                                        :rem 206
49184 DATA255,104,162,240,160,193,32,189
                                        :rem 243
49192 DATA255,169,0,162, 0, 160, 4, 32
                                        :rem 188
49200 DATA213,255,96,234,234,234,162, 0
                                        :rem 130
49208 DATA173,134,2,157,0,216,232, 208
                                        :rem 81
49216 DATA250,238,61,192,172,61,192,192
                                        :rem 196
49224 DATA220,208,235,169,216,141,61,192
                                        :rem 237
49232 DATA162,0,189,94,192,32,210, 255
                                        :rem 90
49240 DATA232,224,29,208,245,96,13, 17
                                        :rem 91
49248 DATA69,78,84,69, 82, 32, 78, 79
                                        :rem 192
49256 DATA84,69,80, 65, 68, 32, 80, 65
                                        :rem 172
49264 DATA71,69,32, 78, 65, 77, 69, 32
                                        :rem 175
49272 DATA32,32,13,234,234,234, 32, 187
                                        :rem 84
49280 DATA192,160,0,162,0, 32, 207, 255
                                        :rem 27
49288 DATA201,13,240,8,157,240,194, 232
                                        :rem 138
49296 DATA200,76,133,192,152,72,169, 8
                                        :rem 103
49304 DATA162,8,160,0,32,186,255,104
                                        :rem 31
49312 DATA162,240,160,194,32,189,255,169
                                        :rem 248
49320 DATA0,133,251,169,4,133,252, 169
                                        :rem 83
49328 DATA251,162,255,160,7,32,216, 255
                                        :rem 141
49336 DATA234,234,234,162,0,189,201,192
                                        :rem 188
49344 DATA32,210,255,232,224,18,208,245
                                        :rem 183
49352 DATA96,147,13, 69, 78, 84, 69, 82
                                        :rem 231
49360 DATA32,70,73, 76, 69, 32, 78, 65
                                        :rem 165
49368 DATA77,69,13,234,234,0, 173, 134
                                        :rem 50
49376 DATA2,162,0,157,0, 216, 232, 208
                                        :rem 237
49384 DATA250,172,229,192,192,219,240,7
                                        :rem 201
49392 DATA200,140,229,192,76,222,192,169
                                        :rem 248
49400 DATA216,141,229,192,96,234,234,0
                                        :rem 136
60679 DATA120,169,188,141,20, 3, 169, 2
                                        :rem 43
60687 DATA141,21,3,88,169, 0, 133, 253
                                        :rem 246
60695 DATA169,4,133,254,96,165,197, 201
                                        :rem 157
60703 DATA57,240,3,76,49,234, 160, 0
                                        :rem 189
60711 DATA177,253,69,249,145,253,200,177
                                        :rem 249
60719 DATA253,69,250,145,253,200,234,208
                                        :rem 238
60727 DATA239,230,254,165,254,201,8,208
                                        :rem 190
60735 DATA229,169,4,133,254,160, 0, 162
                                        :rem 86
60743 DATA0,232,208,253,200,208,250, 76
                                        :rem 125
60751 DATA 49, 234, 0, 0, 0, 0, 0, 0
                                        :rem 119
```

Canyon Cruiser

(Article on page 96.)

Program 1:

Canyon Cruiser—64 Version

```
100 RESTORE                          :rem 181
110 GOTO150                          :rem 97
120 WX=INT(255-W):IFWX<160THENWX=160
                                     :rem 216
130 POKE53250,WX:POKE53251,ABS(W-25)
                                     :rem 68
140 POKE53286,7:POKE53286,2:RETURN:rem 24
150 PRINT"{CLR}":POKE53280,6:POKE53281,6
                                     :rem 149
160 FORW=0TO10:READR$(W):NEXTW       :rem 138
170 DATA"STARTER"                    :rem 27
180 DATA"BEGINNER"                   :rem 65
190 DATA"LEARNER"                    :rem 1
200 DATA"FLYER"                      :rem 114
210 DATA"LEADER"                     :rem 158
220 DATA"ACE"                        :rem 187
230 DATA"LIEUTENANT"                 :rem 236
240 DATA"GENERAL"                    :rem 242
250 DATA"COMMODORE"                  :rem 154
260 DATA"FLEET COMMANDER"            :rem 252
270 DATA"HAN SOLO ?????????"         :rem 66
280 PRINT"{HOME}{5 DOWN}";SPC(15);"{WHT}6
    4-CANYON"                        :rem 142
290 PRINT                            :rem 40
300 PRINT"{HOME}{9 DOWN}";SPC(11);"{RVS}I
    NSTRUCTIONS (Y/N)"               :rem 81
310 FORW=1TO200:NEXTW                :rem 69
320 PRINT"{HOME}{9 DOWN}";SPC(11);"INSTRU
    CTIONS (Y/N)"                    :rem 65
330 FORW=1TO200:NEXTW                :rem 71
340 GETZ$:IFZ$=""THEN300             :rem 127
350 POKE53280,0:POKE53281,0          :rem 237
360 IFZ$="Y"THEN1540                 :rem 121
370 PRINT"{HOME}{5 DOWN}";SPC(15);"{4}6
    4-CANYON"                        :rem 32
380 PRINT                            :rem 40
390 PRINT"{HOME}{9 DOWN}";SPC(11);"
    {18 SPACES}"                     :rem 108
400 FORW=1TO50:P=INT(RND(TI)*1000)+1024:I
    FPEEK(P)=32THENPOKEP,46:POKEP+54272,1
                                     :rem 180
410 NEXTW                            :rem 43
420 POKE53271,0:POKE53277,0          :rem 240
430 FORW=12288TO12350:READN:POKEW,N:NEXTW
                                     :rem 99
440 FORW=12352TO12414:READN:POKEW,N:NEXTW
                                     :rem 93
450 POKE53276,PEEK(53276)OR2↑0+2↑1:REM SE
    T MULTI COLOR MODE               :rem 254
460 POKE53285,8:POKE53286,2:POKE53287,6:R
    EM SET COLORS                    :rem 179
470 POKE53248,0:POKE53249,0          :rem 248
480 POKE53264,PEEK(53264)AND(255-(2↑0+2↑1
    ))                               :rem 95
490 POKE2040,192:POKE2041,193        :rem 83
500 POKE53269,PEEK(53269)OR(2↑0+2↑1)
                                     :rem 22
510 POKE53275,0                      :rem 39
520 FORW=20TO160STEP2:POKE53248,W:POKE532
    49,W:GOSUB120:NEXTW              :rem 30
530 FORW=160TO180STEP2:POKE53249,PEEK(532
    49)+3:GOSUB120:NEXTW             :rem 232
540 PRINT"{HOME}{19 DOWN}{YEL}{RVS}";SPC(
    13);"GET READY..."               :rem 164
550 FORW=181TO255STEP2:L=PEEK(53249)+2:PO
    KE53249,(L)*((L>255)+1):GOSUB120:NEXT
                                     :rem 70
560 FORW=235TO255:POKE53251,W:GOSUB140:NE
    XTW                              :rem 250
570 GOTO740                          :rem 112
580 REM ** DATA FOR THE SHIP **      :rem 63
590 DATA 3, 0, 192, 15, 195, 240, 67, 0,
    {SPACE}193                       :rem 236
600 DATA 170, 170, 170, 171, 85, 234, 42,
     150, 168                        :rem 18
610 DATA 42, 150, 168, 26, 170, 164, 34,
    {SPACE}170, 136                  :rem 224
620 DATA 32, 170, 8, 32, 40, 8, 48, 40, 1
    2                                :rem 123
630 DATA 0, 40, 0, 0, 40, 0, 0, 60, 0
                                     :rem 97
640 DATA 0, 20, 0, 0, 40, 0, 0, 0, 0
                                     :rem 42
650 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
                                     :rem 197
660 REM ** DATA FOR THE ASTEROID **
                                     :rem 101
670 DATA 0, 0, 0, 0, 0, 0, 1, 0, 0
                                     :rem 200
680 DATA 15, 92, 208, 0, 253, 252, 63, 20
    7, 253                           :rem 130
690 DATA 63, 223, 255, 12, 252, 252, 63,
    {SPACE}245, 60                   :rem 180
700 DATA 7, 127, 112, 15, 208, 245, 12, 1
    24, 127                          :rem 165
710 DATA 19, 255, 252, 55, 255, 220, 63,
    {SPACE}197, 244                  :rem 239
720 DATA 13, 63, 204, 15, 31, 76, 3, 61,
    {SPACE}240                       :rem 221
730 DATA 0, 3, 192, 0, 0, 0, 0, 0, 0
                                     :rem 51
740 GOTO910:REM ** RUN THE GAME **:rem 36
750 DATA"{6}{RVS} {OFF}{K}{3 SPACES}
    {RVS}{K} {OFF}"                  :rem 29
760 DATA"{5}{RVS} {OFF}{K}{3 SPACES}
    {RVS}{K} {OFF}"                  :rem 29
770 DATA"{4}{RVS} {OFF}{K}{4 SPACES}
    {RVS}{K} {OFF}"                  :rem 29
780 DATA"{3}{RVS} {OFF}{K}{5 SPACES}
    {RVS}{K} {OFF}"                  :rem 29
790 DATA"{2}{RVS} {OFF}{K}{6 SPACES}
    {RVS}{K} {OFF}"                  :rem 29
800 DATA"{1}{RVS} {OFF}{K}{7 SPACES}
    {RVS}{K} {OFF}"                  :rem 1
810 DATA"{YEL}{RVS} {OFF}{K}{8 SPACES}
    {RVS}{K} {OFF}"                  :rem 31
820 DATA"{BLU}{RVS} {OFF}{K}{9 SPACES}
    {RVS}{K} {OFF}"                  :rem 161
830 DATA"{7}{RVS} {L}{OFF}{3 SPACES}
    {RVS}{K} {OFF}"                  :rem 50
840 DATA"{5}{RVS} {L}{OFF}{3 SPACES}
    {RVS}{K} {OFF}"                  :rem 49
850 DATA"{4}{RVS} {L}{OFF}{4 SPACES}
    {RVS}{K} {OFF}"                  :rem 49
860 DATA"{3}{RVS} {L}{OFF}{5 SPACES}
    {RVS}{K} {OFF}"                  :rem 49
870 DATA"{2}{RVS} {L}{OFF}{6 SPACES}
    {RVS}{K} {OFF}"                  :rem 49
880 DATA"{1}{RVS} {OFF}{K}{7 SPACES}
    {RVS}{H} {OFF}"                  :rem 28
890 DATA"{YEL}{RVS} {OFF}{K}{8 SPACES}
    {RVS}{H} {OFF}"                  :rem 58
900 DATA"{BLU}{RVS} {OFF}{K}{9 SPACES}
    {RVS}{H} {OFF}"                  :rem 179
```

```
910 FORW=53248TO53264:POKEW,0:NEXTW
                                    :rem 174
920 PRINT"{CLR}{2 DOWN}";SPC(15);"{RED}
    {RVS}{A}+++++{S}"               :rem 75
930 POKE53271,2:POKE53277,2         :rem 250
940 POKE53275,253                   :rem 152
950 FORW=1TO10                      :rem 78
960 PRINTSPC(15);"{RED}{RVS}-{Q}{OFF}
    {3 SPACES}{RVS}{W}{RED}{RVS}-{OFF}"
                                    :rem 242
970 NEXTW                           :rem 54
980 PRINT"{RED}{RVS}{4 SPACES}{PUR}{OFF}T
    IME: 5{RED}{RVS}{2 SPACES}{A}{R}+
    {X}{OFF}{3 SPACES}{RVS}{Z}+{R}
    {S}{16 SPACES}"                 :rem 32
990 PRINT"{UP}";:FORW=1TO10:PRINTSPC(12);
    "{RED}{RVS} {Q}{OFF}{9 SPACES}{RVS}
    {W} {OFF}":NEXTW                :rem 155
1000 POKE53248,160:POKE53249,74     :rem 192
1010 PRINT"{HOME}"                  :rem 166
1020 TI$="000005"                   :rem 42
1030 PRINT"{HOME}{13 DOWN}{9 RIGHT}{PUR}"
     ;                              :rem 97
1040 A1=INT(10-VAL(TI$)):PRINTA1    :rem 108
1050 IFA1<>0THEN1030                :rem 100
1060 LDP=53248                      :rem 234
1070 FORSYP=74TO140:POKE53249,SYP:GOSUB14
     0:NEXTSYP                      :rem 231
1080 PRINT"{HOME}{23 DOWN}";        :rem 111
1090 FORW=0TO7:READC$(W):NEXTW      :rem 132
1100 FORW=0TO7:READBC$(W):NEXTW     :rem 190
1110 TL=12:C$=C$(7):BC$=BC$(7)      :rem 33
1120 GOSUB1440:TI$="000000"         :rem 169
1130 C$=C$(ABS(LEN(C$)-11))         :rem 110
1140 E=PEEK(53279)AND2↑0:IFE=1THEN1290
                                    :rem 210
1150 IFTI>800THENC$=C$((LEN(C$)-12)):BC$=
     BC$((LEN(C$)-11)):GOTO1460     :rem 155
1160 IFINT(RND(TI)*100)<20THENC$=BC$
                                    :rem 58
1170 IFINT(RND(TI)*100)=4THENGOSUB1440
                                    :rem 10
1180 TL=ABS(TL+((INT(RND(TI)*3)-1)))
                                    :rem 4
1190 TL=TL-(1*((TL<(40-LEN(C$)))+1))
                                    :rem 116
1200 TL=TL*((TL<0)+1)               :rem 116
1210 PRINT:PRINTSPC(TL);C$;         :rem 204
1220 IFAS=1THEN1470                 :rem 81
1230 P=PEEK(203):IFP=45THEN1280     :rem 23
1240 IFP=50THEN1270                 :rem 65
1250 P=PEEK(56320)AND12:IFP=8THEN1280
                                    :rem 137
1260 IFP<>4THEN1290                 :rem 81
1270 GOSUB140:POKELD,PEEK(LD)+2:POKELD,PE
     EK(LD)+3:GOTO1130              :rem 40
1280 GOSUB140:POKELD,PEEK(LD)-2:POKELD,PE
     EK(LD)-3:GOTO1130              :rem 45
1290 E=PEEK(53279)AND2↑0:IFE=0THEN1150
                                    :rem 210
1300 PRINT"{UP}{YEL}":PRINTSPC(TL);"{RVS}
     YOU CRASHED!"                  :rem 11
1310 R=R+INT(TI/400):IFR>10THENR=10
                                    :rem 70
1320 FORW=0TO150STEP2:GOSUB140:POKE2040,W
     :POKE2040,192:GOSUB140         :rem 95
1325 POKE2041,W:NEXT                :rem 189
1330 POKE53280,0:POKE53281,0        :rem 28
1340 PRINTSPC(6)"{RVS}YOUR RATING: ";R$(R
     )                              :rem 186
1350 FORW=1TO10:GETZ$:NEXTW         :rem 225
1360 GETZ$:IFZ$=":"ORZ$=";"ORZ$=""THEN136
     0                              :rem 158
1370 POKE53251,0                    :rem 86
1380 POKE2040,192:FORW=PEEK(53249)TO120ST
     EP-1:POKE53249,W:GOSUB140:NEXTW
                                    :rem 157
1390 POKE53248,ABS(PEEK(53248)-10):POKE53
     275,0                          :rem 42
1400 POKE53277,1:POKE53271,1:FORW=PEEK(53
     249)TO0STEP-1:POKE53249,W:GOSUB140
                                    :rem 2
1405 NEXT                           :rem 9
1410 RUN                            :rem 187
1420 POKE53287,PEEK(53287)+1        :rem 6
1430 TI$="000000":R=R+2:IFR>10THENR=10
                                    :rem 123
1440 IFAS=1THEN1210                 :rem 77
1450 AS=1:POKE53250,ABS(PEEK(53248)-20):P
     OKE53251,255:RETURN            :rem 221
1460 GOSUB1420:GOTO1210             :rem 73
1470 POKE53251,PEEK(53251)-5        :rem 255
1480 POKE53251,PEEK(53251)-5        :rem 0
1490 POKE53251,PEEK(53251)-5        :rem 1
1500 POKE53251,PEEK(53251)-5        :rem 249
1510 POKE53250,PEEK(53250)-(5-INT(RND(TI)
     *10))                          :rem 15
1520 IFPEEK(53251)<20THENPOKE53251,0:AS=0
                                    :rem 96
1530 GOTO1230                       :rem 200
1540 PRINT"{CLR}{DOWN} YOU ARE THE PILOT
     {SPACE}OF A NEW SPACESHIP."    :rem 11
1550 PRINT"{DOWN}YOU MUST TEST THE CRAFT
     {SPACE}TO ITS LIMITS."         :rem 23
1560 PRINT"{DOWN}YOU CAN FLY USING THE :
     {SPACE}AND ; KEYS,"            :rem 127
1570 PRINT"{DOWN}OR USE A JOYSTICK (PORT
     {SPACE}2)."                    :rem 228
1580 PRINT"{DOWN} THE SHIP WILL CHANGE CO
     LOR TO WARN OF"                :rem 146
1590 PRINT"{DOWN}CHANGES IN THE CANYON SI
     ZE."                           :rem 83
1610 PRINT"{DOWN} AT THE END OF YOUR FLIG
     HT YOU WILL BE"                :rem 85
1620 PRINT"{DOWN}RANKED. YOU MUST NOT HIT
      THE SIDES OF"                 :rem 152
1630 PRINT"{DOWN}THE CANYON, BUT ASTEROID
     S WILL FLY BY."                :rem 6
1640 PRINT"{DOWN} {WHT}GOOD LUCK!{5} (H
     IT A KEY TO RESTART)"          :rem 235
1650 WAIT198,1:GETZ$:PRINT"{CLR}";:RUN
                                    :rem 160
```

Program 2:

Canyon Cruiser—VIC Initialization

If using tape rather than disk, line 30 should read:

```
30 PRINT"LO";CHR$(34);"VIC-CANYON.PRG"
```

```
10 POKE52,28:POKE56,28:CLR          :rem 18
15 FORI=7168TO7679:POKEI,PEEK(25600+I):NE
   XTI                              :rem 176
20 FORX=0TO19                       :rem 27
21 READC                            :rem 194
22 FORD=0TO7:READE:POKE7168+C*8+D,E:NEXTD
                                    :rem 29
23 NEXTX                            :rem 252
30 PRINT"LO";CHR$(34);"VIC-CANYON.PRG";CH
   R$(34);",8"                      :rem 135
40 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT"RU
   N"                               :rem 13
```

```
50 PRINT"{9 UP}";                          :rem 138
60 END                                     :rem 61
63000 DATA033,231,231,231,000,000,231,231
      ,231                                 :rem 173
63001 DATA034,231,231,231,231,231,231,231
      ,231                                 :rem 187
63002 DATA035,000,003,007,055,127,127,127
      ,063                                 :rem 200
63003 DATA036,000,192,248,248,252,124,238
      ,254                                 :rem 223
63004 DATA037,123,127,063,061,063,015,003
      ,000                                 :rem 195
63005 DATA038,254,238,124,252,248,248,192
      ,000                                 :rem 227
63006 DATA042,214,124,254,186,186,146,016
      ,016                                 :rem 223
63007 DATA043,000,000,000,000,000,000,000
      ,000                                 :rem 145
63008 DATA044,255,255,255,255,255,255,255
      ,255                                 :rem 243
63009 DATA047,224,224,224,224,224,224,224
      ,224                                 :rem 215
63010 DATA048,240,240,240,240,240,240,240
      ,240                                 :rem 192
63011 DATA049,231,231,231,007,007,231,231
      ,231                                 :rem 196
63012 DATA050,231,231,231,224,224,231,231
      ,231                                 :rem 191
63013 DATA051,231,231,231,224,224,255,255
      ,255                                 :rem 211
63014 DATA052,231,231,231,007,007,255,255
      ,255                                 :rem 211
63015 DATA053,255,255,255,000,000,231,231
      ,231                                 :rem 199
63016 DATA054,255,255,255,255,255,000,000
      ,000                                 :rem 207
63017 DATA055,255,255,255,224,224,231,231
      ,231                                 :rem 219
63018 DATA056,255,255,255,007,007,231,231
      ,231                                 :rem 219
63019 DATA057,007,007,007,007,007,007,007
      ,007                                 :rem 209
```

Program 3:

Canyon Cruiser—VIC Main Program

This program should be SAVEd as VIC-CANYON.PRG (see line 30 of Program 2).

```
90 POKE36869,240                           :rem 106
100 PRINT"{WHT}"                           :rem 103
110 GOTO150                                 :rem 97
120 WX=INT(255-W):IFWX<160THENWX=160
                                           :rem 216
150 PRINT"{CLR}"                           :rem 250
160 FORW=0TO10:READR$(W):NEXTW             :rem 138
170 DATA"STARTER"                           :rem 27
180 DATA"BEGINNER"                          :rem 65
190 DATA"LEARNER"                            :rem 1
200 DATA"FLYER"                            :rem 114
210 DATA"LEADER"                           :rem 158
220 DATA"ACE"                              :rem 187
230 DATA"LIEUTENANT"                       :rem 236
240 DATA"GENERAL"                          :rem 242
250 DATA"COMMODORE"                        :rem 154
260 DATA"FLEET COMMANDER"                  :rem 252
270 DATA"HAN SOLO ?????????"                :rem 66
350 POKE36879,8                             :rem 60
370 PRINT"{HOME}{4 DOWN}{6 SPACES}VIC-CAN
    YON"                                   :rem 153
380 PRINT                                   :rem 40
400 FORW=1TO50:P=INT(RND(TI)*506)+7680:IF
    PEEK(P)=32THENPOKEP,46:POKEP+30720,1
                                           :rem 148
410 NEXTW                                   :rem 43
540 PRINT"{BLU}{HOME}{18 DOWN}{RVS}";SPC(
    5);"GET READY..."                      :rem 229
580 TI$="000005"                             :rem 4
590 PRINT"{HOME}{11 DOWN}{RED}{8 SPACES}
    {RVS}TIME 5{2 LEFT}";                   :rem 68
600 A1=INT(10-VAL(TI$)):PRINTA1;"{3 LEFT}
    ";                                     :rem 206
610 IFA1<>0THEN600                           :rem 7
740 GOTO920:REM ** RUN THE GAME **:rem 37
750 DATA"{WHT},/{4 SPACES}9,{3 SPACES}"
                                           :rem 191
760 DATA"{CYN},/{4 SPACES}9,{3 SPACES}"
                                            :rem 90
770 DATA"{PUR},/{5 SPACES}9,{3 SPACES}"
                                            :rem 88
780 DATA"{GRN},/{6 SPACES}9,{3 SPACES}"
                                           :rem 219
790 DATA"{BLU},/{7 SPACES}9,{3 SPACES}"
                                           :rem 221
800 DATA"{YEL},/{8 SPACES}9,{3 SPACES}"
                                            :rem 84
810 DATA"{RED},/{9 SPACES}9,{3 SPACES}"
                                           :rem 211
820 DATA"{WHT},/{10 SPACES}9,{3 SPACES}"
                                           :rem 189
830 DATA"{WHT},/{4 SPACES}9,{3 SPACES}"
                                           :rem 190
840 DATA"{CYN},/{4 SPACES}9,{3 SPACES}"
                                            :rem 89
850 DATA"{PUR},/{5 SPACES}9,{3 SPACES}"
                                            :rem 87
860 DATA"{GRN},/{6 SPACES}9,{3 SPACES}"
                                           :rem 218
870 DATA"{BLU},/{7 SPACES}9,{3 SPACES}"
                                           :rem 220
880 DATA"{YEL},/{8 SPACES}9,{3 SPACES}"
                                            :rem 92
890 DATA"{RED},/{9 SPACES}9,{3 SPACES}"
                                           :rem 219
900 DATA"{WHT},/{10 SPACES}9,{3 SPACES}"
                                           :rem 188
920 PRINT"{CLR}":PRINT"{UP}";:POKE36869,2
    55                                      :rem 23
925 PRINTSPC(9);"{RED}7!!!8"                :rem 10
950 FORW=1TO10                              :rem 78
960 PRINTSPC(9);"{RED}";CHR$(34);"2 1";CH
    R$(34)                                   :rem 1
970 NEXTW                                   :rem 54
980 PRINT"{RED},,,,,,,75!4 3!58,,,,,,";
                                           :rem 135
990 FORW=1TO10:PRINTSPC(6);"{RED},2
    {7 SPACES}1,":NEXTW                    :rem 172
1000 POKE7713,42:POKE38433,4                :rem 34
1020 TI$="000005"                           :rem 42
1070 FOR SYP=55TO297STEP22:POKE38400+SYP-
     22,0:POKE7680+SYP-22,32                :rem 58
1075 POKE38400+SYP,4:POKE7680+SYP,42:NEXT
      SYP:SP=297:AB=32:CB=0                 :rem 53
1080 PRINT"{HOME}{20 DOWN}";                :rem 60
1090 FORW=0TO7:READC$(W):NEXTW              :rem 132
1100 FORW=0TO7:READBC$(W):NEXTW             :rem 190
1110 TL=6:C$=C$(7):BC$=BC$(7)               :rem 244
1120 GOSUB1440:TI$="000000"                 :rem 169
1130 C$=C$(ABS(LEN(C$)-11))                 :rem 110
1150 IFTI>800THENC$=C$((LEN(C$)-12)):BC$=
     BC$((LEN(C$)-11)):GOTO1460             :rem 155
1160 IFINT(RND(TI)*100)<20THENC$=BC$
                                            :rem 58
```

```
1170 IFINT(RND(TI)*100)=4THENGOSUB1440
                                    :rem 10
1180 TL=ABS(TL+((INT(RND(TI)*3)-1)))
                                    :rem 4
1190 TL=TL-(1*((TL<(22-LEN(C$)))+1))
                                   :rem 116
1200 TL=TL*((TL<0)+1)              :rem 116
1205 POKESP+7680,AB:POKESP+38400,CB
                                    :rem 48
1210 PRINT:PRINTSPC(TL);C$;        :rem 204
1220 IFAS=1THEN1470                 :rem 81
1230 P=PEEK(203):IF P=64 THEN 1285:rem 29
1235 IF P=45 THEN 1280              :rem 74
1240 IF P=22 THEN 1270              :rem 64
1260 GOTO 1285                     :rem 210
1270 SP=SP+1:IF PEEK(7680+SP)<>32 THEN 13
     00                             :rem 93
1271 AB=PEEK(7680+SP):CB=PEEK(38400+SP)
                                   :rem 227
1272 POKESP+38400,4:POKESP+7680,42:GOTO 1
     130                           :rem 254
1280 SP=SP-1:IF PEEK(7680+SP)<>32 THEN 13
     00                             :rem 96
1281 AB=PEEK(7680+SP):CB=PEEK(38400+SP)
                                   :rem 228
1282 POKESP+38400,4:POKESP+7680,42:GOTO 1
     130                           :rem 255
1285 IF PEEK(7680+SP)<>32AND PEEK(7680+SP
     )<>42THEN 1300                 :rem 22
1286 AB=PEEK(7680+SP):CB=PEEK(38400+SP)
                                   :rem 233
1287 POKESP+38400,4:POKESP+7680,42:GOTO 1
     130                            :rem 4
1300 POKE36869,240:PRINT"{CLR}":PRINTSPC(
     5);"{RVS}YOU CRASHED!"         :rem 63
1330 POKE36879,8                   :rem 107
1340 PRINTSPC(5);"{RVS}YOUR RATING:"
                                   :rem 160
1345 PRINTSPC(11-LEN(R$(R))/2);"{RVS}";R$
     (R)                           :rem 175
1350 FORW=1TO10:GETZ$:NEXTW        :rem 225
1360 GETZ$:IFZ$="":"ORZ$=";"ORZ$=""THEN136
     0                             :rem 158
1410 RUN                           :rem 187
1430 TI$="000000":R=R+1:IFR>10THENR=10
                                   :rem 122
1440 IFAS=1THEN1205                 :rem 81
1450 AS=1:RETURN                   :rem 230
1460 GOSUB1430:GOTO1205             :rem 78
1470 AS=0                          :rem 205
1475 FORQ=1TOLEN(C$)/2:PRINT"{LEFT}";:NEX
     TQ                            :rem 191
1480 PRINT"{2 UP}#${DOWN}{2 LEFT}%&"
                                   :rem 157
1530 GOTO1230                      :rem 200
```

Tetracrystals Of Veluria

(Article on page 86.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Tetracrystals—VIC Version

```
10 POKE52,25:POKE56,25:CLR:GOSUB5000:CLR
                                   :rem 166
13 S7$="{RVS}{3 SPACES}{OFF}{2 SPACES}":C
   7$="BWRCPGBY"                   :rem 240
20 G1$="  -- Y VALUE --{2 SPACES}":G2$="AB
   CDEFGHIJKLMNOP":G3$="+{+3+{+3+
   {+3+{+3+{+3+{+3+{+3+{+3+":
   CJ$="XYPC"                      :rem 101
60 TG=1:GOSUB1100                  :rem 235
100 GOSUB8200:GOSUB6000:GOSUB8200:rem 223
160 PRINT"{CLR}SPEED":INPUTHF      :rem 196
180 PRINT"{DOWN}CHR?{DOWN}"        :rem 168
190 GOSUB8000                      :rem 226
195 IF(G$<"1")OR(G$>"4")THEN190    :rem 119
197 G=VAL(G$)*4-1:POKE7167,G        :rem 49
255 PRINT"{CLR}{3 SPACES}** X VALUE
    **":PRINT"{2 SPACES}";G2$:SYS6401
                                   :rem 188
260 H=0:FORG=1TO16:PRINTMID$(G1$,G,1);MID
    $(G2$,G,1);MID$(G3$,H+1,16):H=ABS(H-1
    ):NEXTG                        :rem 125
280 FORG=0TO3                       :rem 11
282 PRINT"{HOME}"MID$(CJ$,G+1,1)   :rem 172
285 GOSUB8000                      :rem 231
290 IFG$="{F1}"THEN280             :rem 100
295 IFG$="{F7}"THEN510             :rem 104
300 H=ASC(G$)-49:ONG+1GOTO325,345,365,385
                                   :rem 240
301 GOTO285                        :rem 108
305 NEXTG                           :rem 30
325 H=H-16:IF((H<0)OR(H>15))THEN285
                                   :rem 198
330 PRINT"{HOME}{DOWN}{2 RIGHT}";G2$;:POK
    E7704+H,81:XV=7726+H:GOTO305   :rem 148
345 H=H-16:IF((H<0)OR(H>15))THEN285
                                   :rem 200
350 FORJ=1TO16:POKE7703+J*22,J:NEXTJ:POKE
    7725+H*22,81:YV=H:GOTO305       :rem 4
365 IF((H<0)OR(H>1))THEN285        :rem 250
370 PV=H+49:SB=2↑H:GOTO305          :rem 76
385 IF((H<0)OR(H>7))THEN285         :rem 2
390 POKEXV+YV*22+30720,H:POKEXV+YV*16+302
    08,H:POKEXV+YV*22,PV:POKEXV+YV*16-558
    ,PV                            :rem 14
395 POKEXV+YV*16-302,((H*16)+SB):GOTO280
                                   :rem 31
510 POKE36879,SS:TG=1:CP=0:GOTO750:rem 52
600 SYS6406:SYS6431                :rem 108
650 SYS6577                        :rem 115
655 FORG=1TOHF:NEXTG                :rem 45
656 GETG$:IFG$<>""THENGOSUB7000     :rem 84
657 IFCPTHENGOSUB7310               :rem 62
660 SYS6475:SYS6542                :rem 123
690 GOSUB1000:TG=1                  :rem 35
695 GOSUB1100                      :rem 230
700 SYS6401:SYS6424                :rem 106
750 SYS6573                        :rem 112
755 FORG=1TOHF:NEXTG                :rem 46
756 GETG$:IFG$<>""THENGOSUB7000     :rem 85
757 IFCPTHENGOSUB7310               :rem 63
760 SYS6468:SYS6535                :rem 128
790 GOSUB1000:TG=0                  :rem 35
795 GOSUB1100:GOTO600              :rem 240
1000 J=INT(RND(1)*16):H=INT(RND(1)*3):POK
     E36874+H,PEEK(6993+J):POKE36878,(JOR
     8):RETURN                     :rem 70
1100 POKE36866,128*TG+16:POKE36867,32:POK
     E36864,10:POKE648,2*TG+28:Z=TG*2+156
                                   :rem 119
```

```
1120 FORH=217TO228:POKEH,Z:POKEH+12,Z+1:N
     EXTH:PRINT"{HOME}";:RETURN  :rem 149
5000 OPEN1,1,0,"CRYSTALS T3/JAN"  :rem 85
5020 FORG=0TO39:FORH=1TO16        :rem 82
5030 INPUT#1,Y:X=G*16+H+6400:POKEX,Y:PRIN
     TY;                          :rem 225
5060 NEXTH,G                      :rem 197
5075 INPUT#1,L:IFL<>99999THENSTOP :rem 78
5080 CLOSE1:RETURN                :rem 142
6000 SS=PEEK(36879):PRINT"{CLR}"SPC(66)S7
     $"F1 BDR":PRINTS7$"F3 SCN    :rem 166
6010 PRINTS7$"F5 REV":PRINTS7$"F7 FIN
     {DOWN}"                      :rem 210
6012 FORG=1TO8:PRINTS7$;G;MID$(C7$,G,1);S
     7$:NEXTG                     :rem 216
6020 FORG=0TO7:FORH=0TO7:POKE38583+G*22+H
     ,G:NEXTH:NEXTG               :rem 200
6030 POKE36879,SS                 :rem 219
6050 GOSUB8000:IFG$="{F1}"THENG=(SS+1)AND
     7:SS=(SSAND248)ORG           :rem 202
6052 IFG$="{F3}"THENSS=(SS+16)AND255
                                  :rem 216
6054 IFG$="{F5}"THENG=(SS+8)AND15:SS=(SSA
     ND240)ORG                    :rem 124
6056 IFG$="{F7}"THENRETURN        :rem 227
6060 GOTO6030                     :rem 206
7000 IF(G$<"{F1}")OR(G$>"{F6}")THENRETURN
                                  :rem 144
7010 G=ASC(G$)-132:ONGGOTO7100,7200,7210,
     7300,7400,7450,7600          :rem 142
7100 CP=0:RETURN                  :rem 226
7200 H=25:GOTO7220                :rem 243
7210 H=-25                        :rem 227
7220 GOSUB8000:G=ASC(G$)-48:IF(G<0)OR(G>9
     )THEN7220                    :rem 116
7240 HF=HF+G*H:RETURN              :rem 36
7300 CP=1                         :rem 203
7310 GOSUB8000:IFG$="{F7}"THENRETURN
                                   :rem 95
7320 IFG$="{F1}"THENCP=0:RETURN    :rem 21
7330 GOTO7000                     :rem 205
7400 PV=INT(RND(1)*8)*16+1:GOTO7500
                                  :rem 222
7450 GOSUB8000:G=ASC(G$)-49:IF(G<0)OR(G>7
     )THEN7450                    :rem 125
7460 PV=G*16+1                    :rem 232
7500 XV=INT(RND(1)*16):YV=INT(RND(1)*16):
     QV=XV+YV*16+7424             :rem 118
7510 POKEQV,PV:POKEQV+512,PV:RETURN
                                   :rem 52
7600 RUN13                         :rem 38
8000 GETG$:IFG$=""THEN8000        :rem 191
8010 RETURN                       :rem 169
8200 POKE36866,150:POKE36867,46:POKE36864
     ,5:POKE36879,27:RETURN       :rem 211
```

Program 2:

Tetracrystals—VIC DATA Maker

```
2 REM PREPARES{14 SPACES}DATAFILE FOR
  {10 SPACES}TETRACRYSTALS        :rem 142
5 DIMCS(40)                        :rem 90
8 FORG=1TO40:READH:CS(G)=H:NEXTG   :rem 38
10 PRINT"{CLR} CHECKSUM";          :rem 83
13 FORJ=1TO40                      :rem 10
15 TL=0                           :rem 115
18 FORK=1TO16                      :rem 19
20 READL:TL=TL+L                  :rem 248
23 NEXTK                          :rem 239
25 IFTL<>CS(J)THENPRINT:PRINT"TYPO IN LIN
   E";100+J*10:STOP                :rem 95
28 NEXTJ                          :rem 243
30 READL:IFL<>99999THENPRINT"INSUFFICIENT
   DATA":STOP                     :rem 152
32 PRINT" OK{2 DOWN}"             :rem 242
35 PRINT"GET DATA TAPE READY{3 SPACES}HIT
   A KEY TO CONTINUE              :rem 199
36 GETG$:IFG$=""THEN36              :rem 1
37 PRINT:PRINT                    :rem 190
38 CLR                             :rem 76
40 OPEN1,1,1,"CRYSTALS T3/JAN"    :rem 245
43 FORJ=1TO40:READL:NEXTJ         :rem 114
45 FORJ=1TO40                      :rem 15
50 FORK=1TO16                      :rem 15
53 READL:PRINT#1,L;CHR$(13);      :rem 143
55 NEXTK                          :rem 244
58 NEXTJ                          :rem 246
60 READL:IFL<>99999THENPRINT"CHECK DATA":
   GOTO65                         :rem 208
63 PRINT#1,L                      :rem 194
65 CLOSE1                          :rem 18
99 END                             :rem 73
101 DATA2175,2423,2474,1942,2180  :rem 98
102 DATA2431,2113,1935,2660,2567  :rem 98
103 DATA2317,1710,2352,2061,1928  :rem 93
104 DATA2461,2246,1533,2072,1693 :rem 100
105 DATA1626,1883,1556,1844,2604 :rem 113
106 DATA1715,2310,2659,1771,1908 :rem 109
107 DATA2411,1971,2168,2142,1770 :rem 101
108 DATA2510,1251,3302,0,0        :rem 28
110 DATA169,29,208,3,234,169,31,133,252,1
    69,0,133,251,234,160,0        :rem 68
120 DATA145,251,200,208,251,96,234,169,29
    ,162,31,208,5,234,169,31      :rem 179
130 DATA162,29,133,252,134,254,169,0,133,
    251,133,253,234,160,0,177     :rem 216
140 DATA253,10,9,240,133,1,177,253,9,15,3
    7,1,145,251,200,208           :rem 166
150 DATA238,96,234,169,28,162,29,208,5,23
    4,169,30,162,31,133,252       :rem 143
160 DATA134,254,169,0,133,251,133,253,234
    ,172,255,27,162,4,185,65      :rem 182
170 DATA27,149,0,136,202,208,247,169,32,1
    33,5,234,234,160,0,177        :rem 75
180 DATA253,162,0,9,16,24,232,106,176,3,1
    44,250,234,181,0,145          :rem 220
190 DATA251,200,208,235,96,234,169,148,16
    2,29,208,5,234,169,150,162    :rem 38
200 DATA31,133,252,134,254,169,0,133,251,
    133,253,234,160,0,177,253     :rem 208
210 DATA74,74,74,74,145,251,200,208,245,9
    6,234,234,169,29,208,2        :rem 94
220 DATA169,31,133,2,133,252,160,0,132,1,
    234,177,1,41,4,240            :rem 101
230 DATA5,32,204,25,164,254,200,208,242,9
    6,234,132,254,169,0,133       :rem 116
240 DATA253,152,41,240,208,4,169,17,133,2
    53,152,41,15,208,6,169        :rem 75
250 DATA34,5,253,133,253,200,152,41,15,20
    8,6,169,68,5,253,133          :rem 229
260 DATA253,165,254,9,15,168,200,208,6,16
    9,136,5,253,133,253,234       :rem 138
270 DATA76,11,26,5,253,133,253,96,234,234
    ,164,254,169,48,37,253        :rem 101
280 DATA208,19,152,56,233,17,168,177,1,41
    ,12,240,5,169,3,32            :rem 137
290 DATA4,26,164,254,234,169,80,37,253,20
    8,19,152,56,233,15,168        :rem 100
300 DATA177,1,41,12,240,5,169,5,32,4,26,1
    64,254,234,169,160            :rem 128
310 DATA37,253,208,19,152,24,105,15,168,1
    77,1,41,12,240,5,169          :rem 230
```

```
320 DATA10,32,4,26,164,254,234,169,192,37
    ,253,208,19,152,24,105          :rem 76
330 DATA17,168,177,1,41,12,240,5,169,12,3
    2,4,26,164,254,234              :rem 129
340 DATA169,1,37,253,208,50,165,254,56,23
    3,16,168,177,1,41,15            :rem 244
350 DATA234,234,234,234,208,34,165,254,56
    ,233,16,170,41,240,240,11       :rem 215
360 DATA138,56,233,16,168,177,1,41,12,208
    ,13,164,254,177,1,56            :rem 243
370 DATA233,3,134,251,164,251,145,1,169,2
    ,37,253,208,41,164,254          :rem 76
380 DATA136,177,1,41,15,234,234,234,234,2
    34,234,234,208,25,164,254       :rem 228
390 DATA136,152,41,15,240,7,136,177,1,41,
    12,208,10,164,254,177           :rem 22
400 DATA1,56,233,3,136,145,1,169,4,37,253
    ,208,44,164,254,200             :rem 176
410 DATA177,1,41,15,234,234,234,234,234,2
    34,234,208,28,169,1,133         :rem 121
420 DATA251,164,254,200,200,152,41,15,240
    ,6,177,1,41,12,208,9            :rem 208
430 DATA164,254,177,1,56,233,3,145,251,16
    9,8,37,253,208,44,165           :rem 45
440 DATA254,24,105,16,168,177,1,41,15,234
    ,234,234,234,208,28,169         :rem 134
450 DATA16,133,251,165,254,24,105,32,176,
    7,168,177,1,41,12,208           :rem 27
460 DATA10,164,254,177,1,56,233,3,145,251
    ,234,164,254,96,234,234         :rem 135
470 DATA87,81,90,0,219,102,160,42,65,90,8
    3,88,43,37,36,28                :rem 57
480 DATA163,175,175,187,195,201,207,209,2
    15,215,219,221,225,228,232,235
                                    :rem 235
490 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                    :rem 75
500 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                    :rem 67
50000 DATA99999                     :rem 44
```

Program 3: Tetracrystals—64 version

```
10 GOTO9000:REM MACHINE LANGUAGE LOADER
                                    :rem 113
13 S7$="{RVS}{7 SPACES}{OFF}{4 SPACES}":C
   7$="BLKWHTREDCYNPURGBLUYEL":PS=53280
   :RV=49760                        :rem 17
20 G1$=" -- Y VALUE --{2 SPACES}":G2$="AB
   CDEFGHIJKLMNOP":G3$="+E+3+E+3+
   E+3+E+3+E+3+E+3+E+3+E+3+"
                                    :rem 181
30 CJ$="XVALUEYVALUEPLANT#COLOR"    :rem 97
60 GOSUB1100:REM NORMAL COLORS      :rem 97
100 GOSUB6000:REM SET UP SCREEN/BORDER
                                    :rem 51
110 GOSUB1100                       :rem 212
160 PRINT"{CLR}SPEED? (THE LOWER THE NUMB
    ER THE FASTER)":INPUTHF         :rem 14
180 PRINT"{DOWN}WHICH CHARACTER SET?
    {SHIFT-SPACE}(1-4){DOWN}"       :rem 58
190 GETG$:IFG$=""THEN190            :rem 99
195 IF(G$<"1")OR(G$>"4")THEN190     :rem 119
197 G=VAL(G$)*4-1:POKE49664,G       :rem 105
255 PRINT"{CLR}"SPC(130)"{3 SPACES}** X
     VALUE **":PRINTSPC(52);G2$:SYS49670
                                    :rem 100
260 H=0:FORG=1TO16:PRINTSPC(9)MID$(G1$,G,
    1)" "MID$(G2$,G,1);             :rem 90
270 PRINTMID$(G3$,H+1,16):H=ABS(H-1):NEXT
    G                               :rem 194
280 FORG=0TO3                       :rem 11
282 PRINT"{HOME}"MID$(CJ$,G*6+1,6):PRINT"
    *-F1 TO CANCEL-*-F7 TO BEGIN GAME-*"
                                    :rem 173
285 GETG$:IFG$=""THEN285            :rem 109
290 IFG$="{F1}"THEN280              :rem 100
295 IFG$="{F7}"THEN510              :rem 104
300 H=ASC(G$)-49:ONG+1GOTO325,345,365,385
                                    :rem 240
301 GOTO285                         :rem 108
305 NEXTG                           :rem 30
325 H=H-16:IF((H<0)OR(H>15))THEN285
                                    :rem 198
330 PRINT"{HOME}{5 DOWN}"SPC(12);G2$;:POK
    E1236+H,81:XV=1276+H:GOTO305    :rem 44
345 H=H-16:IF((H<0)OR(H>15))THEN285
                                    :rem 200
350 FORJ=1TO16:POKE1235+J*40,J:NEXTJ:POKE
    1275+H*40,81:YV=H:GOTO305       :rem 248
365 IF((H<0)OR(H>1))THEN285         :rem 250
370 PV=H+49:SB=2↑H:GOTO305          :rem 76
385 IF((H<0)OR(H>7))THEN285         :rem 2
390 POKEXV+YV*40+54272,H:POKEXV+YV*40,PV
                                    :rem 213
395 POKEXV+YV*16+48132,((H*16)+SB):GOTO28
    0                               :rem 138
510 POKEPS,RB:POKEPS+1,SC:CP=0      :rem 140
520 PRINT"{CLR}{DOWN}"SPC(7);"T E T R A C
     R Y S T A L S":GOTO700         :rem 248
600 SYS49670:SYS49695               :rem 233
650 SYS49841                        :rem 164
655 FORG=1TOHF:NEXTG                :rem 45
656 GETG$:IFG$<>""THENGOSUB7000     :rem 84
657 IFCPTHENGOSUB7310               :rem 62
660 SYS49806:SYS49739               :rem 239
690 GOSUB1000:REM MUSIC             :rem 127
700 SYS49665:SYS49688               :rem 240
750 SYS49837                        :rem 170
755 FORG=1TOHF:NEXTG                :rem 46
756 GETG$:IFG$<>""THENGOSUB7000     :rem 85
757 IFCPTHENGOSUB7310               :rem 63
760 SYS49799:SYS49732               :rem 244
790 GOSUB1000:REM MUSIC             :rem 128
795 GOTO600                         :rem 116
1000 REM MUSIC                      :rem 38
1050 VM=(INT(RND(1)*3))*16:VM=VM+(INT(RND
     (1)*16))                       :rem 243
1060 POKE50688,VM                   :rem 208
1070 SYS50689                       :rem 211
1080 RETURN                         :rem 169
1099 RETURN                         :rem 179
1100 POKE53280,254:POKE53281,246:RETURN
                                    :rem 8
6000 RB=PEEK(PS):SC=PEEK(PS+1):PRINT"
     {CLR}"SPC(131)S7$"F1 BORDER":rem 195
6005 PRINTSPC(11)S7$"F3 SCREEN      :rem 250
6008 PRINTSPC(11)S7$"F5 REVERSE     :rem 91
6010 PRINTSPC(11)S7$"F7 CONTINUE{DOWN}
                                    :rem 176
6012 FORG=1TO8:PRINTSPC(11)S7$;G;MID$(C7$
     ,G*3-2,3):NEXTG                :rem 70
6020 FORG=0TO7:FORH=0TO7:POKE55627+G*40+H
     ,G:NEXTH:NEXTG                 :rem 198
6030 POKEPS,RB:POKEPS+1,SC          :rem 133
6050 GETG$:IFG$=""THEN6050          :rem 197
6051 IFG$="{F1}"THENRB=(RB+1)AND15:rem 70
6052 IFG$="{F3}"THENSC=(SC+1)AND15:rem 76
6054 IFG$="{F5}"THENPOKERV,((PEEK(RV)+128
     )AND255)                       :rem 248
6055 IFG$="{F5}"THENFORX=1344TO1663:POKEX
     ,((PEEK(X)+128)AND255):NEXTX   :rem 31
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6056 IFG$="{F7}"THENRETURN          :rem 227
6060 GOTO6030                       :rem 206
7000 IF(G$<"{F1}")OR(G$>"{F6}")THENRETURN
                                    :rem 144
7010 G=ASC(G$)-132:ONGGOTO7100,7200,7210,
     7300,7400,7450,7600            :rem 142
7100 CP=0:RETURN                    :rem 226
7200 H=25:GOTO7220                  :rem 243
7210 H=-25                          :rem 227
7220 GOSUB8000:G=ASC(G$)-48:IF(G<0)OR(G>9
     )THEN7220                      :rem 116
7240 HF=HF+G*H:RETURN                :rem 36
7300 CP=1:RETURN                    :rem 229
7310 GOSUB8000:IFG$="{F7}"THENRETURN
                                     :rem 95
7320 IFG$="{F1}"THENCP=0:RETURN      :rem 21
7330 GOTO7000                       :rem 205
7400 PV=INT(RND(1)*8)*16+1:GOTO7500
                                    :rem 222
7450 GOSUB8000:G=ASC(G$)-49:IF(G<0)OR(G>7
     )THEN7450                      :rem 125
7460 PV=G*16+1                      :rem 232
7500 XV=INT(RND(1)*16):YV=INT(RND(1)*16):
     QV=XV+YV*16+49152              :rem 170
7510 POKEQV,PV:POKEQV+256,PV:RETURN
                                     :rem 57
7600 RUN13                           :rem 38
8000 GETG$:IFG$=""THEN8000          :rem 191
8010 RETURN                         :rem 169
9000 DIMCS(54)                      :rem 243
9010 FORG=1TO54:READCS(G):NEXTG     :rem 182
9020 PRINT"{CLR}"SPC(6);"T E T R A C R Y
     {SPACE}S T A L S{2 DOWN}":PRINT"-- C
     HECKSUM:";                     :rem 95
9030 FORJ=1TO54                     :rem 119
9040 TL=0                           :rem 218
9050 FORK=1TO16                     :rem 120
9060 READL:TL=TL+L                  :rem 101
9070 NEXTK                          :rem 90
9080 IFTL<>CS(J)THENPRINT:PRINT"TYPO IN L
     INE";9340+J*10:STOP             :rem 8
9090 NEXTJ                          :rem 91
9100 READL:IFL<>99999THENSTOP       :rem 83
9110 PRINT" OK{DOWN}":PRINT"-- LOADING MA
     CHINE LANGUAGE."               :rem 17
9120 CLR:M=49664                    :rem 126
9130 POKEM,3                        :rem 168
9150 FORJ=1TO54:READK:NEXTJ         :rem 222
9155 FORJ=1TO40                     :rem 122
9160 FORK=1TO16:M=M+1               :rem 231
9165 READL:POKEM,L                  :rem 107
9170 NEXTK                           :rem 91
9175 NEXTJ                           :rem 95
9179 M=50688                        :rem 111
9180 FORJ=41TO46                    :rem 178
9185 FORK=1TO16:M=M+1               :rem 238
9190 READL:POKEM,L                  :rem 105
9195 NEXTK                           :rem 98
9200 NEXTJ                           :rem 84
9204 M=50943                         :rem 94
9205 FORJ=47TO54                    :rem 181
9210 FORK=1TO16:M=M+1               :rem 227
9215 READL:POKEM,L                  :rem 103
9220 NEXTK                           :rem 87
9225 NEXTJ                           :rem 91
9230 READL:IFL<>99999THENSTOP       :rem 87
9240 RUN13                           :rem 40
9270 DATA2500,2910,2637,1944,2015:rem 155
9272 DATA2122,2553,2150,2153,2209:rem 148
9274 DATA1612,1875,2521,2061,1928:rem 166
9276 DATA2461,2415,1534,2241,1863:rem 163
9278 DATA1627,2052,1726,1845,2604:rem 171
9280 DATA1717,2311,2660,1772,1910:rem 158
9282 DATA2412,1972,2169,2143,1771:rem 167
9284 DATA2511,1251,2546,2115,1718:rem 158
9286 DATA1762,2481,2247,1939,2497:rem 189
9288 DATA1436,546,282,778,929      :rem 248
9290 DATA1246,1495,1077,1002       :rem 164
9350 DATA169,192,208,3,234,169,193,133,25
     2,169,0,133,251,234,160,0     :rem 237
9360 DATA145,251,200,208,251,96,234,169,1
     92,162,193,208,5,234,169,193:rem 149
9370 DATA162,192,133,252,134,254,169,0,13
     3,251,133,253,234,160,0,177   :rem 72
9380 DATA253,10,9,240,133,2,177,253,9,15,
     37,2,145,251,200,208          :rem 231
9390 DATA238,96,234,169,4,32,81,196,240,5
     ,169,4,32,85,196,234           :rem 20
9400 DATA172,0,194,162,4,185,65,196,149,1
     ,136,202,208,247,169,32       :rem 146
9410 DATA133,6,234,234,234,234,234,234,23
     4,160,15,177,253,162,0,9      :rem 176
9420 DATA16,24,232,106,176,3,144,250,234,
     181,1,145,251,136,16,235      :rem 170
9430 DATA32,101,196,144,228,96,169,216,32
     ,81,196,240,5,169,216,32      :rem 201
9440 DATA85,196,234,160,15,177,253,74,74,
     74,74,145,251,136,16,245      :rem 213
9450 DATA32,101,196,144,238,96,234,0,0,0,
     0,0,169,192,208,2              :rem 77
9460 DATA169,193,133,3,133,252,160,0,132,
     2,234,177,2,41,4,240          :rem 224
9470 DATA5,32,204,194,164,254,200,208,242
     ,96,234,132,254,169,0,133     :rem 234
9480 DATA253,152,41,240,208,4,169,17,133,
     253,152,41,15,208,6,169       :rem 138
9490 DATA34,5,253,133,253,200,152,41,15,2
     08,6,169,68,5,253,133          :rem 36
9500 DATA253,165,254,9,15,168,200,208,6,1
     69,136,5,253,133,253,234      :rem 192
9510 DATA76,11,195,5,253,133,253,96,234,2
     34,164,254,169,48,37,253      :rem 210
9520 DATA208,19,152,56,233,17,168,177,2,4
     1,12,240,5,169,3,32           :rem 192
9530 DATA4,195,164,254,234,169,80,37,253,
     208,19,152,56,233,15,168      :rem 209
9540 DATA177,2,41,12,240,5,169,5,32,4,195
     ,164,254,234,169,160          :rem 247
9550 DATA37,253,208,19,152,24,105,15,168,
     177,2,41,12,240,5,169          :rem 38
9560 DATA10,32,4,195,164,254,234,169,192,
     37,253,208,19,152,24,105      :rem 194
9570 DATA17,168,177,2,41,12,240,5,169,12,
     32,4,195,164,254,234          :rem 248
9580 DATA169,1,37,253,208,50,165,254,56,2
     33,16,168,177,2,41,15          :rem 52
9590 DATA234,234,234,234,208,34,165,254,5
     6,233,16,170,41,240,240,11     :rem 22
9600 DATA138,56,233,16,168,177,2,41,12,20
     8,13,164,254,177,2,56          :rem 43
9610 DATA233,3,134,251,164,251,145,2,169,
     2,37,253,208,41,164,254       :rem 131
9620 DATA136,177,2,41,15,234,234,234,234,
     234,234,234,208,25,164,254     :rem 27
9630 DATA136,152,41,15,240,7,136,177,2,41
     ,12,208,10,164,254,177         :rem 77
9640 DATA2,56,233,3,136,145,2,169,4,37,25
     3,208,44,164,254,200           :rem 241
9650 DATA177,2,41,15,234,234,234,234,234,
     234,234,234,208,28,169,1,133   :rem 185
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9660 DATA251,164,254,200,200,152,41,15,24
     0,6,177,2,41,12,208,9          :rem 16
9670 DATA164,254,177,2,56,233,3,145,251,1
     69,8,37,253,208,44,165         :rem 109
9680 DATA254,24,105,16,168,177,2,41,15,23
     4,234,234,234,208,28,169       :rem 198
9690 DATA16,133,251,165,254,24,105,32,176
     ,7,168,177,2,41,12,208         :rem 91
9700 DATA10,164,254,177,2,56,233,3,145,25
     1,234,164,254,96,234,234       :rem 190
9710 DATA87,81,90,0,219,102,160,42,65,90,
     83,88,43,37,36,28              :rem 111
9720 DATA162,192,208,2,162,193,133,252,13
     4,254,169,132,133,251,169,0    :rem 79
9730 DATA133,253,96,234,24,169,16,101,253
     ,144,1,96,133,253,169,40       :rem 193
9740 DATA101,251,144,2,230,252,133,251,24
     ,96,234,0,0,0,0,0              :rem 50
9749 REM -- MACHINE LANGUAGE MUSIC --
     {18 SPACES}COULD BE OPTIONAL:rem 147
9750 DATA173,0,198,10,170,74,41,240,74,72
     ,74,74,74,133,251,104          :rem 40
9760 DATA56,229,251,168,189,32,199,153,0,
     199,232,200,189,32,199,153     :rem 69
9770 DATA 0,199,136,132,252,162,7,185,0,1
     99,153,0,212,200,202,208       :rem 128
9780 DATA246,169,1,141,3,212,169,10,141,2
     4,212,164,252,169,1,25         :rem 79
9790 DATA4,199,153,4,212,162,5,160,0,234,
     234,234,200,208,250,238        :rem 128
9800 DATA3,212,238,24,212,202,208,241,96,
     0,0,0,0,0,0,0                  :rem 99
9809 REM -- MUSIC DATA STATEMENTS --
                                    :rem 21
9810 DATA0,0,0,5,64,140,48,0,0,0,0,32,152
     ,105,0,0                       :rem 99
9820 DATA0,0,16,57,194,0,0,0,15,0,0,0,0,0
     ,0,0                           :rem 152
9830 DATA134,3,180,4,71,5,71,6,12,7,12,7,
     104,9,143,10                   :rem 80
9840 DATA143,10,143,12,24,14,24,14,195,16
     ,209,18,31,21,30,25            :rem 168
9850 DATA49,28,165,31,135,33,162,37,62,42
     ,193,44,60,50,99,56            :rem 216
9860 DATA75,63,15,67,15,67,69,75,125,84,2
     14,94,121,100,199,112          :rem 63
9870 DATA12,7,97,8,143,10,143,10,218,11,1
     43,12,24,14,210,15             :rem 118
9880 DATA195,16,209,18,31,21,30,25,49,28,
     49,28,162,37,62,42             :rem 161
10000 DATA99999                     :rem 40
```

Hardhat Climber

(Article on page 82.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Hardhat Climber—VIC Version

```
0 POKE51,192:POKE52,29:POKE55,192:POKE56,
  29:POKE36869,255:POKE36878,15:POKE36879
  ,25                               :rem 83
1 D=37154:P1=37151:P2=37152:DO(0)=-1:DO(1
  )=1:DI=DO(INT(RND(1)*2))          :rem 54
2 A$=">>>>>>>>>>>>>>>>>>>>{LEFT}{INST}>"
  :DIMB(11):G=30720:E2=0            :rem 126
3 SC=1:CH=2:E1=0:D(0)=4:D(1)=2:D(4)=7:Z=5
  7:E3=1:Q=10000:J=56               :rem 32
10 GOSUB100:POKE36869,255:E4=0:E5=2
                                    :rem 246
15 GOSUB70:H=0:Y=0                  :rem 60
16 S=8143+INT(RND(1)*20):IFPEEK(S+22)=620
   RPEEK(S)=59THEN16                :rem 145
17 T=PEEK(S):POKES,58:POKES+G,0     :rem 161
19 V=7712+B(Y):W=62:DO=DO(INT(RND(1)*2))
                                    :rem 7
20 SYS828:ONPEEK(1)GOTO35,26,28,31,33
                                    :rem 110
21 FORN=1TO23:NEXT:GOTO41           :rem 95
26 IFPEEK(S+22)=ZTHENPOKES,T:POKES+G,D(T-
   J):S=S+22:GOTO40                 :rem 84
27 GOTO41                           :rem 7
28 DI=-1:IFPEEK(S+21)<62THENPOKES,T:POKES
   +G,D(T-J):S=S-1:GOTO40           :rem 147
29 IFT<>ZTHENPOKES,T:POKES+G,D(T-J):S=S+D
   I:T=PEEK(S):GOTO55               :rem 83
30 GOTO41                           :rem 1
31 IFT=ZTHENPOKES,T:POKES+G,D(T-J):S=S-22
   :GOTO40                          :rem 78
32 GOTO41                           :rem 3
33 DI=1:IFPEEK(S+23)<62THENPOKES,T:POKES+
   G,D(T-J):S=S+1:GOTO40            :rem 98
34 GOTO29                           :rem 11
35 POKE36876,240:POKES,T:POKES+G,D(T-J):S
   =S-22+DI:T=PEEK(S):POKES,58:IFT=60THEN
   55                               :rem 5
36 IFPEEK(S+22)=60THENSS=SS+1000:PRINT"
   {HOME}{RVS}"TAB(8-LEN(STR$(SS)))SS
                                    :rem 62
37 FORN=1TO5:NEXT:POKES,T:POKES+G,D(T-J):
   S=S+22+DI:T=PEEK(S):POKES,58:IFPEEK(S+
   22)>61THEN55
38 POKES+G,0:POKE36876,0:GOTO41     :rem 102
40 POKE36876,200:POKE36876,0:T=PEEK(S):PO
   KES,58:POKES+G,0                 :rem 165
41 IFT=61THENSS=SS+150:PRINT"{HOME}{RVS}"
   TAB(8-LEN(STR$(SS)))SS:H=H+1:T=62:IFH=
   16THEN64                         :rem 240
42 IFT=60THEN55                     :rem 133
43 GOSUB98                          :rem 88
45 POKEV,W:POKEV+G,D(W-J):V=V+DO:W=PEEK(V
   ):POKEV,60:POKEV+G,7             :rem 145
46 IFDO=22ANDPEEK(V+22)=56THENDO=DO(INT(R
   ND(1)*2)):GOTO48                 :rem 195
47 IFW=63THENDO=22                  :rem 90
48 IFW=58THEN55                     :rem 149
49 IFV<8164THEN20                   :rem 242
50 Y=Y+1:IFY=12THEN55               :rem 11
51 POKEV,62:GOTO19                  :rem 92
55 POKE36876,0:SO=250:IFT=60THENT=W
                                    :rem 138
56 POKE36874,SO:IFPEEK(S+22)<>56ANDS<8164
   THENPOKES,T:POKES+G,D(T-J):S=S+22:T=PE
   EK(S):POKES,58:POKES+G,0         :rem 185
57 FORN=1TO17:NEXT:SO=SO-5:IFSO>150THEN56
                                    :rem 137
58 POKE36874,0:CH=CH-1:IFCH=-1THENPOKED,2
   55:POKE36869,240:PRINT"{CLR}{BLK}"SS:E
   ND                               :rem 104
59 PRINT"{HOME}{RVS}"TAB(14)CH::POKEV,W:P
   OKEV+G,D(W-J):Y=Y+1:IFW=58THENPOKEV,T:
   POKEV+G,D(T-J)                   :rem 248
60 IFY>10THEN15                     :rem 130
61 IFS>8163THENPOKES,T:GOTO16       :rem 100
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62 POKES,58:POKES+G,0:GOTO19          :rem 234
64 IFY=11THEN67                       :rem 141
65 FORN=Y+1TO11:POKE7712+B(N),62:SS=SS+10
   0:PRINT"{HOME}{RVS}"TAB(8-LEN(STR$(SS)
   ))SS:GOSUB98                       :rem 194
66 POKE36877,250:FORM=240TO250:POKE36876,
   M:NEXT:POKE36876,0:POKE36877,0:NEXT
                                      :rem 113
67 E2=E2+.05:SC=SC+1:E1=E1+1:IFE1>8THENE1
   =8                                 :rem 227
68 GOTO15                             :rem 13
69 GOTO69                             :rem 23
70 PRINT"{CLR}{PUR}";:FORN=1TO21:PRINTA$:
   NEXT:PRINTA$"{HOME}":B$=">888888888888
   88888888"                          :rem 108
71 PRINT"{2 DOWN}"TAB(6)"?>>>>>>>>>?{RED}"
   :PRINTTAB(6)"9{PUR}88888888{RED}9":PRI
   NTTAB(6)"9>>>>>>>>>9":PRINTTAB(6)"9>>>>
   >>>>9{PUR}"                        :rem 12
72 FORN=1TO3:PRINTB$"{4 DOWN}":NEXT:PRINT
   B$"{HOME}";:POKE8185,62            :rem 162
73 PRINT"{RVS}"TAB(8-LEN(STR$(SS)))SS;TAB
   (14)CH;TAB(17)SC:POKE7697,163:FORN=0TO
   11:POKE7712+B(N),60                :rem 61
74 POKE7712+B(N)+G,7:NEXT:FORN=7834TO8164
   STEP110:IFN=8164THEN80             :rem 73
75 FORO=1TO3                          :rem 230
76 R=N+1+INT(RND(1)*20):IFPEEK(R)<>56THEN
   76                                 :rem 17
77 FORM=RTOR+88STEP22:POKEM,57:POKEM+G,2:
   NEXT:IFO>1ANDRND(1)<E2THENPOKER+(INT(R
   ND(1)*2)+2)*22,63                  :rem 203
78 IFRND(1)<.5ANDPEEK(R-22)=62THENPOKER-2
   2,63                               :rem 170
79 NEXT                               :rem 175
80 FORO=1TOE1                         :rem 37
81 R=N+3+INT(RND(1)*16):IFPEEK(R)<>56ORPE
   EK(R-22)<>62ORPEEK(R+1)=62ORPEEK(R-1)=
   62THEN85                           :rem 198
84 POKER,62:POKER-22,63               :rem 98
85 NEXT                               :rem 172
86 FORO=1TO4                          :rem 233
87 R=N-21+INT(RND(1)*20):IFPEEK(R)<>62ORP
   EEK(R+22)=62THEN87                 :rem 227
88 POKER,61:POKER+G,0:NEXT:NEXT       :rem 255
89 POKE7710,63:POKE7715,63:POKE7731,63:PO
   KE7738,63                          :rem 125
90 FORN=7812TO8142STEP110:POKEN,63:NEXT:F
   ORN=7833TO8163STEP110:POKEN,63:NEXT:RE
   TURN                               :rem 85
98 IFSS>=Q*E3THENCH=CH+1:E3=E3+1:PRINT"
   {HOME}{RVS}"TAB(14)CH              :rem 253
99 RETURN                             :rem 82
100 DATA,1,21,22,23,24,42,43,44,45,46,47
                                      :rem 197
101 DATA255,255,153,102,102,153,255,255,1
    95,255,255,195,195,255,255,195,60,60,
    25,255,188                        :rem 64
102 DATA60,36,231,3,4,24,24,60,126,126,60
    ,60,66,165,153,153,165,66,60,,24,36,1
    26,126,126                        :rem 11
103 DATA126,,,,,,,,,,,,,,,,           :rem 51
106 DATA169,,133,1,169,255,141,34,145,169
    ,32,44,31,145,208,5,169,1,133,1,96,16
    9,8,44                            :rem 98
107 DATA31,145,208,5,169,2,133,1,96,169,1
    6,44,31,145,208,5,169,3,133,1,96,169,
    4,44,31                           :rem 142
108 DATA145,208,3,133,1,96,169,127,141,34
    ,145,169,128,44,32,145,208,4,169,5,13
    3,1,96                            :rem 102
109 FORN=0TO11:READB(N):NEXT:FORN=7616TO7
    679:READM:POKEN,M:NEXT            :rem 61
110 FORN=828TO899:READM:POKEN,M:NEXT:RETU
    RN                                :rem 89
```

Program 2:

Hardhat Climber—64 Version

```
1 PRINT"{CLR}{7 DOWN}{12 RIGHT}HARDHAT CL
  IMBER":POKE53280,1:POKE53281,1:GOSUB780
                                      :rem 76
2 POKE52,48:POKE56,48:CLR             :rem 231
5 PRINT"{CLR}"                        :rem 153
6 PRINT"{7 DOWN}{12 RIGHT}HARDHAT CLIMBER
  "                                   :rem 212
10 POKE53280,1:POKE53281,1            :rem 184
20 DO(0)=-1:DO(1)=1:DI=DO(INT(RND(1)*2))
                                      :rem 180
30 A$=">>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
   >>>>>{LEFT}{INST}>":DIMB(11):G=54272:E
   2=0                                :rem 19
40 SC=1:CH=2:E1=0:D(0)=4:D(1)=2:D(4)=7:Z=
   57:E3=1:Q=10000:J=56               :rem 81
44 FORI=GTOG+24:POKEI,0:NEXT          :rem 30
45 POKEG+24,15:POKEG+5,17:POKEG+6,240:POK
   EG,100                             :rem 230
50 GOSUB710:E4=0:E5=2                 :rem 192
60 GOSUB500:H=0:Y=0                   :rem 106
70 S=1905+INT(RND(1)*38):IFPEEK(S+40)=620
   RPEEK(S)=59THEN70                  :rem 153
80 T=PEEK(S):POKES,58:POKES+G,0       :rem 161
90 V=1123+B(Y):W=62:DO=DO(INT(RND(1)*2))
                                      :rem 252
100 JV=255-PEEK(56321):GETQ$          :rem 61
101 IFJV=1THENJV=4:GOTO109            :rem 124
102 IFJV=4THENJV=3:GOTO109            :rem 127
103 IFJV=8THENJV=5:GOTO109            :rem 134
104 IFJV=2THEN109                     :rem 252
105 IFJVAND16=16THENJV=1:GOTO109      :rem 237
108 JV=0                              :rem 166
109 ONJVGOTO210,120,140,170,190       :rem 173
110 FORN=1TO23:NEXT:GOTO260           :rem 193
120 IFPEEK(S+40)=ZTHENPOKES,T:POKES+G,D(T
    -J):S=S+40:GOTO250                :rem 178
130 GOTO260                           :rem 101
140 DI=-1:IFPEEK(S+39)<62THENPOKES,T:POKE
    S+G,D(T-J):S=S-1:GOTO250          :rem 250
150 IFT<>ZTHENPOKES,T:POKES+G,D(T-J):S=S+
    DI:T=PEEK(S):GOTO360              :rem 173
160 GOTO260                           :rem 104
170 IFT=ZTHENPOKES,T:POKES+G,D(T-J):S=S-4
    0:GOTO250                         :rem 181
180 GOTO260                           :rem 106
190 DI=1:IFPEEK(S+41)<62THENPOKES,T:POKES
    +G,D(T-J):S=S+1:GOTO250           :rem 201
200 GOTO150                           :rem 97
210 POKEG+1,17:POKEG+4,17             :rem 156
215 POKES,T:POKES+G,D(T-J):S=S-40+DI:T=PE
    EK(S):POKES,58:IFT=60THEN360      :rem 43
220 IFPEEK(S+40)=60THENSS=SS+1000:PRINT"
    {HOME}{RVS}"TAB(8-LEN(STR$(SS)))SS
                                      :rem 105
230 FORN=1TO5:NEXT:POKES,T:POKES+G,D(T-J)
    :S=S+40+DI:T=PEEK(S):POKES,58:rem 204
235 IFS>1943ORPEEK(S+40)>61THEN360
                                      :rem 241
240 POKEG+4,16:POKES+G,0:GOTO260      :rem 147
250 POKEG+1,9:POKEG+4,17:POKEG+4,16:T=PEE
    K(S):POKES,58:POKES+G,0           :rem 134
```

```
260 IFT<>61THEN270                          :rem 36
265 SS=SS+150:PRINT"{HOME}{RVS}"TAB(8-LEN
    (STR$(SS)))SS:H=H+1:T=62:IFH=16THEN44
    0                                       :rem 160
270 IFT=60THEN360                           :rem 231
280 GOSUB690                                :rem 185
290 POKEV,W:POKEV+G,D(W-J):V=V+DO:W=PEEK(
    V):POKEV,60:POKEV+G,7                   :rem 195
300 IFDO=40ANDPEEK(V+40)=56THENDO=DO(INT(
    RND(1)*2)):GOTO320                      :rem 21
310 IFW=63THENDO=40                         :rem 131
320 IFW=58THEN360                           :rem 237
330 IFV<1944THEN100                         :rem 73
340 Y=Y+1:IFY=12THEN60                      :rem 57
350 POKEV,62:GOTO90                         :rem 141
360 POKEG+4,16:SO=250:IFT=60THENT=W
                                            :rem 136
361 FORQQ=1TO30:NEXT                        :rem 16
365 T1=T                                    :rem 180
370 POKEG+1,SO:POKEG+4,33:IFPEEK(S+40)<>5
    6ANDS<1944THEN375                       :rem 227
372 GOTO 380                                :rem 112
375 POKES,T:POKES+G,D(T-J):S=S+40:T=PEEK(
    S):POKES,58:POKES+G,0                   :rem 122
380 FORN=1TO17:NEXT:SO=SO-5:IFSO>150THEN3
    70                                      :rem 231
390 POKEG+4,16:CH=CH-1:IFCH=-1THENPOKE532
    72,21:GOTO1000                          :rem 2
400 PRINT"{HOME}{RVS}"TAB(25)CH:POKEV,W:P
    OKEV+G,D(W-J):Y=Y+1                     :rem 43
405 IFW=58THENPOKEV,T1:POKEV+G,D(T1-J)
                                            :rem 124
410 IFY>10THEN60                            :rem 177
420 IFS>1943THENPOKES,T:GOTO70              :rem 146
430 POKES,58:POKES+G,0:GOTO90               :rem 24
440 IFY=11THEN470                           :rem 233
450 FORN=Y+1TO11:POKE1123+B(N),62:SS=SS+1
    00:PRINT"{HOME}{RVS}"TAB(8-LEN(STR$(S
    S)))SS                                  :rem 187
455 GOSUB690:NEXT                           :rem 54
460 POKEG+4,33:FORM=9TO176STEP2:POKEG+1,M
    :NEXT:POKEG+4,32                        :rem 50
470 E2=E2+.05:SC=SC+1:E1=E1+1:IFE1>8THENE
      1=8                                   :rem 17
480 GOTO60                                  :rem 59
490 GOTO490                                 :rem 115
500 PRINT"{CLR}{PUR}";:FORN=1TO22:PRINTA$
    :NEXT:PRINTA$"{HOME}"                   :rem 220
505 B$=">888888888888888888888888888888888
    888888"                                 :rem 15
510 PRINT"{3 DOWN}"TAB(15)"?>>>>>>>>?
    {RED}":PRINTTAB(15)"9{PUR}88888888
    {RED}9"                                 :rem 121
515 PRINTTAB(15)"9>>>>>>>>>9":PRINTTAB(15)
    "9>>>>>>>>>9{PUR}"                      :rem 243
520 FORN=1TO3:PRINTB$"{4 DOWN}":NEXT:PRIN
    TB$"{HOME}";:POKE1983,62                :rem 207
530 PRINT"{RVS}"TAB(8-LEN(STR$(SS)))SS;TA
    B(25)CH;TAB(31)SC:POKE1054,163
                                            :rem 157
535 FORN=0TO11:POKE1123+B(N),60             :rem 18
540 POKE1123+B(N)+G,7:NEXT:FORN=1344TO194
    4STEP200:IFN=1944THEN600                :rem 143
550 FORO=1TO3                               :rem 20
560 R=N+1+INT(RND(1)*38):IFPEEK(R)<>56THE
    N560                                    :rem 118
570 FORM=RTOR+160STEP40:POKEM,57:POKEM+G,
    2:NEXT                                  :rem 3
575 IFO>1ANDRND(1)<E2THENPOKER+(INT(RND(1
    )*2)+2)*40,63                           :rem 132
580 IFRND(1)<.5ANDPEEK(R-40)=62THENPOKER-
    40,63                                   :rem 216
590 NEXT                                    :rem 221
600 FORO=1TOE1                              :rem 83
610 R=N+3+INT(RND(1)*36)                    :rem 50
615 IFPEEK(R)<>56ORPEEK(R-40)<>62ORPEEK(R
    +1)=62ORPEEK(R-1)=62THEN630             :rem 82
620 POKER,62:POKER-40,63                    :rem 142
630 NEXT                                    :rem 216
640 FORO=1TO4                               :rem 21
650 R=N-39+INT(RND(1)*38):IFPEEK(R)<>62OR
    PEEK(R+40)=62THEN650                    :rem 77
660 POKER,61:POKER+G,0:NEXT:NEXT            :rem 43
670 POKE1122,63:POKE1125,63:POKE1161,63:P
    OKE1166,63                              :rem 129
680 FORN=1304TO1904STEP200:POKEN,63:NEXT:
    FORN=1343TO1943STEP200:POKEN,63:NEXT
                                            :rem 90
685 RETURN                                  :rem 131
690 IFSS>=Q*E3THENCH=CH+1:E3=E3+1:PRINT"
    {HOME}{RVS}"TAB(25)CH                   :rem 45
700 RETURN                                  :rem 119
710 DATA,1,39,40,41,42,78,79,80,81,82,83
                                            :rem 231
720 DATA255,255,153,102,102,153,255,255,1
    95,255,255,195,195,255,255,195,60,60
                                            :rem 31
725 DATA25,255,188                          :rem 180
730 DATA60,36,231,3,4,24,24,60,126,126,60
    ,60,66,165,153,153,165,66,60,,24,36
                                            :rem 195
735 DATA126,126,126                         :rem 220
740 DATA126,,,,,,,,,,,,,,,,,                :rem 58
750 DATA169,,133,1,169,255,141,34,145,169
    ,32,44,31,145,208,5,169,1,133,1,96
                                            :rem 163
755 DATA169,8,44                            :rem 83
760 DATA31,145,208,5,169,2,133,1,96,169,1
    6,44,31,145,208,5,169,3,133,1,96,169
                                            :rem 15
765 DATA4,44,31                             :rem 20
770 DATA145,208,3,133,1,96,169,127,141,34
    ,145,169,128,44,32,145,208,4,169,5
                                            :rem 176
775 DATA133,1,96                            :rem 76
776 FORN=0TO11:READB(N):NEXT                :rem 251
777 RETURN                                  :rem 133
780 FORI=0TO11:READX:NEXT:PRINT"{9 DOWN}
    {9 RIGHT}REDEFINING CHARACTERS"
                                            :rem 204
782 POKE56334,PEEK(56334)AND254:POKE1,PEE
    K(1)AND251                              :rem 194
783 FORI=12288TO12288+256*8:POKEI,PEEK(I+
    40960):NEXTI                            :rem 115
784 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334
    )OR1                                    :rem 146
785 FORI=12288+56*8TO12288+63*8+7:READM:P
    OKEI,M:NEXTI                            :rem 158
786 POKE53272,(PEEK(53272)AND240)+12
                                            :rem 196
800 RETURN                                  :rem 120
1000 PRINT"{CLR}YOUR SCORE IS ";SS
                                            :rem 109
1010 PRINT"{6 DOWN}DO YOU WISH TO PLAY AG
     AIN (Y/N) ?";                          :rem 158
1020 GETA$:IFA$=""THEN1020                  :rem 169
1030 IFA$="Y"THENPOKE53272,(PEEK(53272)AN
     D240)+12:GOTO2                         :rem 133
1040 IFA$<>"N"THEN1020                      :rem 183
1050 SYS2048                                :rem 147
```

Cave-In For 64

(Article on page 80.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 POKE56,28:CLR:DEFFNW(X)=PEEK(37151)AND3
  2:B=36865:GOSUB6                    :rem 186
2 PRINT"{CLR}{WHT}"SPC(73)"CAVE-IN"SPC(10
  1)"{BLK}F1 FOR HELP":GOTO56         :rem 101
3 A$="+01-22-01+22+01":F=A+VAL(MID$(A$,D*
  3+1,3))*V                           :rem 248
4 X=VAL(MID$(A$,D*3+4,3)):L=F+X:R=F-X:RET
  URN                                 :rem 118
5 PRINTSPC(230)"V":RETURN             :rem 194
6 Y=30:POKEB+14,42:POKEB+1,150:GOTO8
                                      :rem 112
7 Y=28:POKEB+14,107:POKEB+1,22:POKEB,25:P
  OKEA,VAL(MID$("235241243242",D*3+1,3))
                                      :rem 146
8 POKE648,Y:IFFNW(W)THENRETURN        :rem 249
9 GOTO8                               :rem 170
10 PRINTSPC(207)"M{DOWN}{LEFT}{M}{DOWN}
   {LEFT}N":RETURN                    :rem 186
11 PRINTSPC(161)"M{DOWN}M{DOWN}{LEFT}
   {M}{DOWN}{LEFT}{M}{DOWN}{LEFT}
   {M}{2 DOWN}{2 LEFT}N{UP}N":RETURN
                                      :rem 79
12 PRINTSPC(92)W$MID$(X$,37)"{2 DOWN}
   {3 LEFT}N{UP}N{UP}N":RETURN        :rem 81
13 PRINT"{DOWN}{RIGHT}"W$MID$(X$,19)"
   {2 DOWN}{3 LEFT}N{UP}N{UP}N":RETURN
                                      :rem 34
14 PRINT"M"X$"{LEFT}N":RETURN         :rem 72
15 PRINTSPC(209)"N{DOWN}{LEFT}{G}{DOWN}
   {LEFT}M":RETURN                    :rem 191
16 PRINTSPC(188)"N{UP}N{2 DOWN}{2 LEFT}
   {G}{DOWN}{LEFT}{G}{DOWN}{LEFT}
   {G}{DOWN}{LEFT}M{DOWN}M":RETURN
                                      :rem 87
17 PRINTSPC(146)"N{UP}N{UP}N{3 DOWN}
   {3 LEFT}{G}"MID$(Y$,40)W$:RETURN
                                      :rem 55
18 PRINTSPC(83)"N{UP}N{UP}N{3 DOWN}
   {3 LEFT}{G}"MID$(Y$,22)W$:RETURN
                                      :rem 8
19 PRINTSPC(20)"N"Y$"M{HOME}":RETURN
                                      :rem 93
20 PRINTSPC(229)"P{DOWN}{LEFT}{T}":RETU
   RN                                 :rem 66
21 PRINTSPC(205)"{T}P{DOWN}{LEFT}{M}
   {DOWN}{2 LEFT}{@}@":RETURN         :rem 141
22 PRINTSPC(158)"{2 T}P"MID$(X$,40)"
   {3 LEFT}{3 T}":RETURN              :rem 153
23 PRINTSPC(89)"{2 T}P"MID$(X$,22)"
   {3 LEFT}{3 T}":RETURN              :rem 109
24 PRINT"{DOWN}P"MID$(X$,4)"{LEFT}{T}":
   RETURN                             :rem 225
25 PRINTSPC(231)"O{DOWN}{LEFT}{T}":RETU
   RN                                 :rem 63
26 PRINTSPC(210)"O{T}{DOWN}{2 LEFT}
   {G}{DOWN}{LEFT}L{@}":RETURN
                                      :rem 157
27 PRINTSPC(168)"O{2 T}{DOWN}{3 LEFT}
   {G}"MID$(Y$,43)"{3 T}":RETURN
                                      :rem 88
28 PRINTSPC(105)"O{2 T}{DOWN}{3 LEFT}
   {G}"MID$(Y$,25)"{3 T}":RETURN
                                      :rem 80
29 PRINTSPC(42)"O"MID$(Y$,4)"{T}":RETUR
   N                                  :rem 213
30 PRINTSPC(230)"{T}{DOWN}{LEFT}{T}":
   RETURN                             :rem 14
31 PRINTSPC(207)"{3 T}{2 DOWN}{3 LEFT}
   {3 @}":RETURN                      :rem 237
32 PRINTSPC(161)MID$(Z$,13)SPC(147)MID$(Z
   $,13):RETURN                       :rem 104
33 PRINTSPC(92)MID$(Z$,7)"{DOWN}"SPC(251)
   MID$(Z$,7):RETURN                  :rem 51
34 PRINTSPC(23)Z$SPC(154)SPC(245)Z$"
   {HOME}":RETURN                     :rem 160
35 PRINT"{CLR}{WHT}":FORV=0TO5:GOSUB3:IFP
   EEK(F)=32THENPRINT"{HOME}":ONVGOSUB34,
   33,32,31,30:GOTO41                 :rem 226
36 PRINT"{HOME}":IFPEEK(L)=32THENONV+1GOS
   UB14,13,12,11,10,5:GOTO38          :rem 86
37 ONV+1GOSUB24,23,22,21,20,5         :rem 62
38 PRINT"{HOME}":IFPEEK(R)=32THENONV+1GOS
   UB19,18,17,16,15,5:GOTO40          :rem 112
39 ONV+1GOSUB29,28,27,26,25,5         :rem 89
40 NEXT                               :rem 163
41 GOSUB77:W=PEEK(37151):IFY=30GOTO44
                                      :rem 251
42 IF(WAND32)=0THENPOKEB,Z:GOSUB6:POKEA,X
                                      :rem 134
43 GOTO41                              :rem 5
44 IFK=0ANDP<TITHENX=PEEK(B)+1:POKEB,X:P=
   TI+40:IFX=122THENRETURN            :rem 167
45 IF(WAND4)GOTO51                    :rem 70
46 V=1:GOSUB3:IFPEEK(F)<>32THENA=F:POKE30
   720+A,1:GOTO35                     :rem 123
47 IFA=7397ANDK=0THENRETURN           :rem 236
48 IFPEEK(A)<>13GOTO51                :rem 47
49 K=K-1:PRINTSPC(116)"MAN FOUND"SPC(34)"
   MEN LEFT="K:POKEA,160              :rem 178
50 IFK=0THENPRINTSPC(72)"CAVE-IN":IFGTHEN
   O=1                                :rem 43
51 IF(WAND16)=0THEND=VAL(MID$(D$,D+3,1)):
   GOTO35                             :rem 229
52 POKE37154,127:X=PEEK(37152)AND128:POKE
   37154,255:IFX=0THEND=VAL(MID$(D$,D+1,1
   )):GOTO35                          :rem 119
53 IF(WAND8)=0THEND=VAL(MID$(D$,D+4,1)):G
   OTO35                              :rem 185
54 IF(WAND32)=0ANDO=0THENZ=PEEK(B):X=PEEK
   (A):GOSUB7                         :rem 201
55 GOTO41                              :rem 8
56 D=3:D$="+02-44-02+44":PRINTSPC(91)"
   {WHT}MINE BEING DUG                :rem 131
57 POKE648,28:A=7397:X$="{21 SPACES}":PRI
   NT"{CLR}{RVS}{CYN} "X$;:FORW=1TO21
                                      :rem 142
58 PRINT"{OFF}{BLU}"X$"{CYN}{RVS} ";:NEXT
   :PRINTX$"{HOME}":POKE7673,160:POKE3839
   3,3:PRINTSPC(141)"{WHT}E           :rem 131
59 GOSUB77:X=INT(RND(1)*4):Y=X        :rem 83
60 W=A+VAL(MID$(D$,X*3+1,3))          :rem 237
61 IFPEEK(W)=32THENZ=0:POKEW,X:POKEA+VAL(
   MID$(D$,X*3+1,3))/2,160:A=W:GOTO59
                                      :rem 15
62 X=(X+1)*-(X<3):IFX<>YGOTO60        :rem 4
63 X=PEEK(A):POKEA,160:IFZ=0THENPOKEA,13:
   Z=1:K=K+1                          :rem 76
```

```
64 IFX<>5THENA=A-VAL(MID$(D$,X*3+1,3)):GO
   TO59                                :rem 131
65 W$="M{DOWN}M{DOWN}M":X$="{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}                       :rem 101
66 Y$="{DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}[G]
   {DOWN}{LEFT}[G]{DOWN}{LEFT}  :rem 31
67 D$="3012301":GOSUB6:Z$="[19 T]":POKE
   A,209:GOSUB35                   :rem 133
68 GOSUB7:POKE217,156:POKE218,156:rem 188
69 PRINT"{HOME}{RVS}{CYN}PRESS THE FIRE B
   UTTON{OFF}{RIGHT}{WHT}TWICE=PLAY - ONC
   E=END                           :rem 91
70 FORW=37933TO38329STEP22:FORX=0TO18:POK
   EW+X,1:NEXT:NEXT                :rem 187
71 GOSUB77:IFFNW(X)GOTO71          :rem 84
72 GOSUB6:PRINT"{CLR}              :rem 155
73 IFFNW(X)=0GOTO73                :rem 157
74 FORW=0TO30:IFFNW(X)=0GOTO88     :rem 143
75 NEXT                            :rem 171
76 POKE56,30:CLR:END               :rem 194
77 GETA$:IFA$<>CHR$(133)THENRETURN:rem 83
78 POKEB,25:GOSUB6:PRINT"{CLR}PICK ONE
   {BLK}":PRINT"{DOWN} F1=NOVICE":PRINT"
   {DOWN} F3=ADVANCED              :rem 20
79 PRINT"{DOWN} F5=OLD MAP":PRINT"{DOWN}
   {SPACE}F7=END":PRINT"{DOWN}{WHT}*CURRE
   NT LEVEL                        :rem 56
80 PRINT"{3 DOWN}GOAL-{BLK}FIND THE MINER
   S"SPC(7)"AND GET BACK           :rem 112
81 PRINT"{WHT}{2 DOWN}JOYSTICK-{BLK}MOVE"
   :PRINT"SEE MAP Q↑               :rem 152
82 PRINT"SEE LEFT<W>SEE RIGHT"SPC(11)"V"S
   PC(18)"SEE BACK[HOME]{WHT}":IFGTHENPRI
   NT"{3 DOWN}*":GOTO84            :rem 88
83 PRINT"{DOWN}*                   :rem 85
84 GETA$:IFA$<>""THENW=ASC(A$)-132:ONABS(
   W)GOTO86,87,68,72               :rem 118
85 GOTO84                          :rem 18
86 G=0:GOTO88                      :rem 5
87 G=1                             :rem 36
88 O=0:K=0:PRINT"{CLR}":GOTO56     :rem 154
```

Alpha-Shoot

(Article on page 118.)

Program 1: Alpha-Shoot — VIC Version

```
5 PRINT"{CLR}":Y=7900:SV=36878:SS=36876:C
  L=36879:POKECL,78:POKESV,14      :rem 225
7 H=8108:CL=30720:J=37137:POKE650,128:POK
  E651,1                           :rem 130
8 DIM AB(26):FORX=1TO26:AB(X)=32:NEXTX
                                   :rem 25
10 GOSUB200                        :rem 115
12 GOSUB40                         :rem 71
14 GOSUB215:FORX=8120TO8141:POKEX,67:POKE
   X+30720,3:NEXTX                 :rem 225
16 GOSUB250:GOSUB265               :rem 213
30 GOSUB435:GOTO16                 :rem 89
40 PRINT"{CLR}":RESTORE:Y=7900     :rem 198
42 READL:IFL=0THEN90               :rem 232
43 POKE Y,L                        :rem 103
50 POKEY,L:READ P:POKESS,P:READ D  :rem 48
60 FORX=1TOD:NEXTX:POKESS,0        :rem 54
70 Y=Y+1:FORX=1TO10:NEXTX:IFL=32THENY=Y-1
                                   :rem 161
80 IFY=7922THENY=7952              :rem 253
85 GOTO 42                         :rem 12
90 READA$:IFA$="0"THEN100          :rem 137
92 READP:READD                     :rem 113
95 PRINT"{4 RIGHT}"A$:POKESS,P     :rem 163
97 FORX=1TOD:NEXTX:POKESS,0:FORX=1TO10:NE
   XTX:PRINT"{HOME}":GOTO90        :rem 246
100 FORX=1TO1500:NEXTX:RETURN      :rem 146
170 DATA 1,135,310,2,135,310,3,175,310,4,
    175,310,5,183,310,6,183,310    :rem 239
173 DATA 7,175,615,8,163,310,9,163,310,10
    ,159,310,11,159,310            :rem 131
175 DATA 12,147,120,13,147,120,14,147,120
    ,15,147,120,16,135,602         :rem 5
177 DATA17,175,310,18,175,310,19,163,601,
    20,159,310
178 DATA21,159,310,22,147,601,23,175,121
                                   :rem 221
179 DATA 32,175,121,32,175,231,24,163,601
    ,25,159,310,32,159,310         :rem 26
181 DATA 26,147,605,0              :rem 7
183 DATA"NOW",135,310,"{4 RIGHT}I",135,31
    0,"{6 RIGHT}KNOW",175,310      :rem 11
184 DATA"{11 RIGHT}MY",175,310     :rem 105
185 DATA"{DOWN}{4 RIGHT}A",183,310,"
    {DOWN}{5 RIGHT}B",183,310,"{DOWN}
    {6 RIGHT}C'S",175,610          :rem 158
187 DATA"{2 DOWN}NEXT",163,310,"{2 DOWN}
    {5 RIGHT}TIME",163,310,"{2 DOWN}
    {10 RIGHT}WON'T",159,310       :rem 107
189 DATA"{3 DOWN}YOU",159,310,"{3 DOWN}
    {4 RIGHT}SING",147,310,"{3 DOWN}
    {9 RIGHT}WITH",147,310         :rem 247
190 DATA"{5 DOWN}{5 RIGHT}ME",135,630,"0"
                                   :rem 154
200 PRINTTAB(5):PRINT"ALPHA-SHOOT"
                                   :rem 167
202 LE=-1:KR=0                     :rem 4
204 PRINT"{2 DOWN}WHICH GAME- 1,2,3,OR 4"
                                   :rem 50
205 POKE198,0:WAIT198,1:GETA$:     :rem 235
206 IFA$="1"THEN211                :rem 1
207 IFA$="2"THENLE=0:GOTO 211      :rem 116
208 IFA$="3"THENLE=1:GOTO 211      :rem 119
209 IFA$="4"THENLE=2:GOTO 211      :rem 122
210 GOTO205                        :rem 99
211 RETURN                         :rem 116
215 R$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
                                   :rem 110
225 PRINT"{CLR}":POKEH,83:POKE36879,10:GO
    SUB228:POKE7703+V,R:RETURN     :rem 245
228 R=INT(LEN(R$)*RND(1)+1):P=ASC(MID$(R$
    ,R,1))-64                      :rem 31
229 IFLE=1THEN232                  :rem 241
```

```
230 R$=LEFT$(R$,R-1)+RIGHT$(R$,LEN(R$)-R)
                                    :rem 31
232 R=P:V=INT(RND(1)*350+1)         :rem 3
236 IFLE=0THENKR=KR+1:R=KR          :rem 144
237 IFLE=1THENWAIT198,1:GETB$:R=ASC(B$)-6
    4                               :rem 251
238 IFR>26ORR<1THENR=1              :rem 115
239 RETURN                          :rem 126
250 POKE37139,0:X=(PEEK(37137)AND60)/4
                                    :rem 96
252 POKE37154,127:J=PEEK(37152)AND128:POK
    E37154,255                      :rem 110
255 IFX=11THEND=-1:GOSUB275         :rem 136
257 IFJ=0 THEND= 1:GOSUB275         :rem 29
259 IFX=7THENGOSUB300               :rem 61
260 RETURN                          :rem 120
265 GETA$:IFA$=""THENGOTO270        :rem 146
266 IFA$="C"THEND=-1:GOSUB275       :rem 188
267 IFA$="B"THEND=+1:GOSUB275       :rem 186
268 IFA$=" "THENGOSUB300            :rem 87
270 RETURN                          :rem 121
275 X=H+D:IFX<8098ORX>8119THENRETURN
                                    :rem 57
276 POKESS,130:POKEH,32:POKEX,83:H=X
                                    :rem 229
278 POKESS,0:RETURN                 :rem 236
300 G=H:FORU=1TO19:G=G-22:IFPEEK(G)<>32TH
    ENPOKEG,32:POKEG+22,32:GOTO350:rem 92
305 POKESS,U+220:POKEG,30:IFU>1THENPOKEG+
    22,32                           :rem 62
306 GOSUB435:NEXTU:POKESS,0:POKEG,32:RETU
    RN                              :rem 73
350 POKESS,0:POKE36877,220:FORL=13TO0STEP
    -1:POKE36878,L:POKE36879,40:GOSUB375
                                    :rem 208
355 NEXTL:POKE36877,0:POKE36878,14:GOSUB3
    90                              :rem 92
357 POKE36879,10:GOSUB228:POKE7703+V,R:RE
    TURN                            :rem 21
375 POKEG,90:POKEG+22,42:POKEG-22,42:POKE
    G+1,42:POKEG-1,42               :rem 140
377 POKEG+23,77:POKEG-23,77:POKEG-21,78:P
    OKEG+21,78                      :rem 209
379 POKEG,32:POKEG+22,32:POKEG-22,32:POKE
    G-1,32:POKEG+1,32               :rem 136
381 POKEG-23,32:POKEG+23,32:POKEG-21,32:P
    OKEG+21,32:RETURN               :rem 192
390 AB(R)=R:FORX=1TO22:POKE8141+X,AB(X):P
    OKE8141+X+30720,7               :rem 149
392 NEXTX:FORX=23TO26:POKE8150+X,AB(X):PO
    KE8150+X+30720,7:NEXT           :rem 42
394 FORX=1TO26:IFAB(X)=32THENRETURN
                                    :rem 254
395 NEXTX:FORX=1TO26:AB(X)=32:NEXTX:POKE3
    6879,78:FORW=1TO1000:NEXTW:GOSUB40:RU
    N                               :rem 127
435 IFLE<2THENRETURN                :rem 57
436 Q=V+7703:IFPEEK(162)<41 THEN RETURN
                                    :rem 5
440 IFQ>8074THENPOKEQ,32:V=2:RETURN
                                    :rem 226
442 POKEQ,32:POKEQ+1,R:V=V+1:POKE162,0
                                    :rem 28
445 RETURN                          :rem 125
```

Program 2: Alpha-Shoot — 64 Version

```
4 POKE53280,6:POKE53281,1:FORT=54272TO542
  96:POKET,0:NEXTT                  :rem 248
5 PRINT"{CLR}":Y=1424:HF=54273:LF=54272:C
  L=54272:POKE54296,15:POKE54277,66
                                    :rem 100
6 POKE54278,68:POKE54284,17:POKE54285,250
  :POKE54279,100:POKE54280,100      :rem 155
7 H=1798:POKE650,128:POKE651,1      :rem 194
8 DIM AB(26):FORX=1TO26:AB(X)=32:NEXTX
                                    :rem 25
10 GOSUB200                         :rem 115
12 GOSUB40                          :rem 71
14 GOSUB215:FORX=1824TO1863:POKEX,67:POKE
   X+54272,3:NEXTX                  :rem 241
16 GOSUB250:GOSUB265                :rem 213
30 GOSUB435:GOTO16                  :rem 89
40 PRINT"{CLR}":RESTORE:POKE53281,1:Y=155
   1                                :rem 139
42 READL:IFL=0THEN90                :rem 232
43 POKE Y,L:POKEY+CL,2              :rem 65
50 READHP:POKEHF,HP:READ LP:POKELF,LP:REA
   D:POKE54276,17                   :rem 40
60 FORX=1TOD:NEXTX:POKE54276,16     :rem 207
70 Y=Y+1:FORX=1TO10:NEXTX:IFL=32THENY=Y-1
                                    :rem 161
80 IFY=1464THENY=1517               :rem 239
85 GOTO 42                          :rem 12
90 READA$:IFA$="0"THEN100           :rem 137
92 READHP:READLP:READD              :rem 171
95 PRINT"{13 RIGHT}"A$:POKE54276,17:POKEH
   F,HP:POKELF,LP                   :rem 160
97 FORI=1TOD+7:NEXT:POKE54276,16:FORX=1TO
   10:NEXT:PRINT"{HOME}":GOTO90     :rem 50
100 FORX=1TO1500:NEXTX:RETURN       :rem 146
170 DATA 1,34,75,310,2,34,75,310,3,51,97,
    310,4,51,97,310,5,57,172,310    :rem 49
171 DATA6,57,172,310                :rem 7
173 DATA 7,51,97,615,8,45,198,310,9,45,19
    8,310,10,43,52,310,11,43,52,310
                                    :rem 216
175 DATA 12,38,126,120,13,38,126,120,14,3
    8,126,120,15,38,126,120,16,34,75,602
                                    :rem 187
177 DATA17,51,97,310,18,51,97,310,19,45,1
    98,601,20,43,52,310,21,43,52,310
                                    :rem 55
178 DATA22,38,126,601,23,51,97,121
                                    :rem 188
179 DATA 32,51,97,121,32,51,97,231,24,45,
    198,601,25,43,52,310,32,43,52,310
                                    :rem 55
181 DATA 26,38,126,605,0            :rem 155
182 DATA"NOW"                       :rem 237
183 DATA34,75,310,"{4 RIGHT}I",34,75,310,
    "{6 RIGHT}KNOW",51,97,310,"{11 RIGHT}
    MY"                             :rem 45
184 DATA51,97,310                   :rem 121
185 DATA"{DOWN}{4 RIGHT}A",57,172,310,"
    {DOWN}{5 RIGHT}B",57,172,310,"{DOWN}
    {6 RIGHT}C'S",51,97,610         :rem 47
187 DATA"{2 DOWN}NEXT",45,198,310,"
    {2 DOWN}{5 RIGHT}TIME",45,198,310,"
    {2 DOWN}{10 RIGHT}WON'T"        :rem 26
188 DATA43,52,310                   :rem 117
189 DATA"{3 DOWN}YOU",43,52,310,"{3 DOWN}
    {4 RIGHT}SING",38,126,310,"{3 DOWN}
    {9 RIGHT}WITH"                  :rem 94
190 DATA38,126,310,"{5 DOWN}{5 RIGHT}ME",
    34,75,630,"0"                   :rem 28
200 PRINT"{HOME}{10 DOWN}{14 RIGHT}{RVS}
    {BLU}ALPHA SHOOT"               :rem 218
202 LE=-1:KR=0                      :rem 4
```

```
204 PRINT"{HOME}{12 DOWN}{9 RIGHT}WHICH G
    AME-1,2,3,OR 4"                :rem 244
205 POKE198,0:WAIT198,1:GETA$:     :rem 235
206 IFA$="1"THEN211                  :rem 1
207 IFA$="2"THENLE=0:GOTO 211      :rem 116
208 IFA$="3"THENLE=1:GOTO 211      :rem 119
209 IFA$="4"THENLE=2:GOTO 211      :rem 122
210 GOTO205                         :rem 99
211 RETURN                         :rem 116
215 R$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
                                   :rem 110
225 PRINT"{CLR}":POKEH,83:POKE53281,0:POK
    E53280,2:GOSUB228:POKE1065+V,R:RETURN
                                   :rem 122
228 R=INT(LEN(R$)*RND(1)+1):P=ASC(MID$(R$
    ,R,1))-64                      :rem 31
229 IFLE=1THEN232                  :rem 241
230 R$=LEFT$(R$,R-1)+RIGHT$(R$,LEN(R$)-R)
    :R=P                           :rem 56
232 V=INT(RND(1)*350+1)            :rem 234
236 IFLE=0THENKR=KR+1:R=KR         :rem 144
237 IFLE=1THENPOKE198,0:WAIT198,1:GETB$:R
    =ASC(B$)-64                    :rem 98
239 IFR>26ORR<0THENPOKE198,0:GOTO237
                                   :rem 239
240 RETURN                         :rem 118
250 XV=(PEEK(56320)AND15)          :rem 130
252 JV=15-XV:KV=(PEEK(56320)AND16)
                                   :rem 208
255 IFJV=4THEND=-1:GOSUB274        :rem 161
257 IFJV=8THEND=1:GOSUB274         :rem 122
259 IFKV=0THENGOSUB300             :rem 127
260 RETURN                         :rem 120
265 GETA$:IFA$=""THEN270            :rem 89
266 IFA$="C"THEND=-1:GOSUB274      :rem 187
267 IFA$="B"THEND=1:GOSUB274       :rem 142
268 IFPEEK(197)=60THENPOKE198,0:POKE197,0
    :GOSUB300                      :rem 248
270 RETURN                         :rem 121
274 H=H+D:IFH<1784THENH=1784       :rem 130
275 IFH>1823THENH=1823               :rem 3
276 POKEHF,10:POKELF,70:POKEH-D,32:POKEH,
    83:POKEH+CL,1                   :rem 58
277 POKE54276,33:POKE54276,32:RETURN
                                   :rem 133
300 G=H:FORU=1TO19:G=G-40:IFPEEK(G)<>32TH
    ENPOKEG,32:POKEG+40,32:GOTO350:rem 92
305 POKE54276,17:POKEHF,U+60:POKELF,U+125
    :POKEG,30:IFU>1THENPOKEG+40,32:rem 60
307 GOSUB435:NEXTU:POKEG,32:POKE54276,16:
    RETURN                         :rem 227
350 POKE54283,129:GOSUB374:POKE53280,2:PO
    KE53281,0                      :rem 126
355 POKE54283,128:GOSUB390         :rem 239
357 GOSUB228:POKE1065+V,R:RETURN     :rem 9
374 POKE53280,0:POKE53281,2        :rem 245
375 POKE54276,16:POKEG,90:POKEG+40,42:POK
    EG-40,42:POKEG+1,42:POKEG-1,42
                                   :rem 144
377 POKEG+41,77:POKEG-41,77:POKEG-39,78:P
    OKEG+39,78:FORL=0TO300:NEXT    :rem 108
379 POKEG,32:POKEG+40,32:POKEG-40,32:POKE
    G-1,32:POKEG+1,32              :rem 136
381 POKEG-41,32:POKEG+41,32:POKEG-39,32:P
    OKEG+39,32:RETURN              :rem 210
390 AB(R)=R:FORX=1TO22:POKE1873+X,AB(X):P
    OKE1873+X+54272,7              :rem 167
392 NEXTX:FORX=23TO26:POKE1938+X,AB(X):PO
    KE1938+X+54272,7:NEXT          :rem 64
394 FORX=1TO26:IFAB(X)=32THENRETURN
                                   :rem 254
395 NEXTX:FORX=1TO26:AB(X)=32:NEXTX:FORW=
    1TO1000:NEXTW:GOSUB40:RUN      :rem 106
435 IFLE<2THENRETURN               :rem 57
436 Q=V+1065:IFPEEK(162)<41 THEN RETURN
440 IFQ>1742THENPOKEQ,32:V=2:RETURN
                                   :rem 221
442 POKEQ,32:POKEQ+1,R:V=V+1:POKE162,0
                                   :rem 28
445 RETURN                         :rem 125
```

Machine Language For Beginners

(Article on page 150.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: VIC Version

```
12288   LDY    # 0
12290   LDA    # 8
12292   STA    37888 ,Y
12295   STA    38144 ,Y
12298   STA    38656 ,Y
12301   INY
12302   BNE          12292
12304   LDY    # 0
12306   LDA    # 224
12308   STA    4096 ,Y
12311   STA    4580 ,Y
12314   INY
12315   CPY    # 22
12317   BNE          12308
12319   LDA    # 21
12321   STA    71
12323   LDA    # 16
12325   STA    72
12327   LDX    # 24
12329   LDY    # 0
12331   LDA    # 224
12333   STA  ( 71 ),Y
12335   INY
12336   STA  ( 71 ),Y
12338   DEX
12339   BEQ          12357
12341   CLC
12342   LDA    71
12344   ADC    # 22
12346   STA    71
12348   LDA    72
12350   ADC    # 0
12352   STA    72
12354   JMP     --->    12329
12357   RTS
```

Program 3: VIC BASIC Loader

```
1000 FORI=12288TO12359:READ DA:POKEI,DA:N
     EXT                           :rem 145
12288 DATA 160,000,169,008,153,000
                                   :rem 131
```

```
12294 DATA 148,153,000,149,153,000
                                    :rem 133
12300 DATA 151,200,208,244,160,000
                                    :rem 112
12306 DATA 169,224,153,000,016,153
                                    :rem 131
12312 DATA 228,017,200,192,022,208
                                    :rem 127
12318 DATA 245,169,021,133,071,169
                                    :rem 146
12324 DATA 016,133,072,162,024,160
                                    :rem 127
12330 DATA 000,169,224,145,071,200
                                    :rem 123
12336 DATA 145,071,202,240,016,024
                                    :rem 126
12342 DATA 165,071,105,022,133,071
                                    :rem 127
12348 DATA 165,072,105,000,133,072
                                    :rem 131
12354 DATA 076,041,048,096,013,013
                                    :rem 138
```

Program 4: 64 BASIC Loader

```
1000 FORI=49152TO49229:READ DA: POKEI,DA:
     NEXT                           :rem 151
49152 DATA 160,000,169,008,153,000
                                    :rem 131
49158 DATA 216,153,000,217,153,000
                                    :rem 134
49164 DATA 218,153,000,219,200,208
                                    :rem 138
49170 DATA 241,160,000,169,224,153
                                    :rem 138
49176 DATA 000,004,153,192,007,200
                                    :rem 131
49182 DATA 192,040,208,245,169,039
                                    :rem 159
49188 DATA 133,071,169,004,133,072
                                    :rem 151
49194 DATA 162,024,160,000,169,224
                                    :rem 143
49200 DATA 145,071,200,145,071,202
                                    :rem 127
49206 DATA 240,016,024,165,071,105
                                    :rem 136
49212 DATA 040,133,071,165,072,105
                                    :rem 134
49218 DATA 000,133,072,076,044,192
                                    :rem 143
49224 DATA 096,013,013,013,013,013
                                    :rem 126
```

Graph Plotter

(Article on page 145.)

Program 1: Graph Plotter—64 Version

```
100 PRINT"{CLR}":POKE53281,0:POKE53280,6
                                    :rem 138
110 FORI=1230TO1261:POKEI,114:POKEI+54272
    ,5:NEXT:REM TOP                 :rem 114
120 FORI=1270TO1790STEP40:POKEI,107:POKEI
    +54272,5:NEXT:REM LEFT          :rem 88
130 FORI=1301TO1821STEP40:POKEI,115:POKEI
    +54272,5:NEXT:REM RIGHT         :rem 161
140 FORI=1830TO1861:POKEI,113:POKEI+54272
    ,5:NEXT:REM BOTTOM              :rem 98
150 FORI=1351TO1380:POKEI,67:POKEI+54272,
    5:NEXT                          :rem 66
160 FORI=1471TO1500:POKEI,67:POKEI+54272,
    5:NEXT                          :rem 64
170 FORI=1591TO1620:POKEI,67:POKEI+54272,
    5:NEXT                          :rem 71
180 FORI=1711TO1740:POKEI,67:POKEI+54272,
    5:NEXT:PRINT:PRINT:PRINT        :rem 154
190 PRINT: PRINTSPC(4)"15":PRINTSPC(4)"14
    ":PRINTSPC(4)"13":PRINTSPC(4)"12"
                                    :rem 145
200 PRINTSPC(4)"11":PRINTSPC(4)"10":PRINT
    SPC(5)"9":PRINTSPC(5)"8"        :rem 102
210 PRINTSPC(5)"7":PRINTSPC(5)"6":PRINTSP
    C(5)"5":PRINTSPC(5)"4":PRINTSPC(5)"3"
                                    :rem 181
220 PRINTSPC(5)"2":PRINTSPC(5)"1":PRINTSP
    C(5)"0"                         :rem 82
230 PRINTTAB(9)"A"SPC(4)"B"SPC(4)"C"SPC(4
    )"D"SPC(4)"E"SPC(4)"F"          :rem 199
240 IFZ$="Y"THEN310                 :rem 64
250 DATAA,B,C,D,E,F                 :rem 34
260 FORI=1TO6:READA$(I):NEXTI       :rem 38
270 DATA7,6,4,13,8,14               :rem 49
280 FORI=1TO6:READD(I):NEXTI         :rem 7
290 DATA1792,1797,1802,1807,1812,1817
                                    :rem 116
300 FORI=1TO6:READA(I):NEXTI        :rem 253
310 C=54272:FORJ=1TO6               :rem 202
320 FORK=1971TO1975:POKEK,32:NEXTK:PRINT"
    {HOME}":FORL=1TO22:PRINT:NEXTL
                                    :rem 228
330 PRINT"VALUE FOR COLUMN ";A$(J);" (0-1
    5) ";                           :rem 162
340 INPUTA$:IFVAL(A$)=0THEN320      :rem 31
350 AA=VAL(A$):AA=INT(AA+.5):D=D(J):X=A(J
    )                               :rem 122
360 IFAA<0ORAA>15THEN320            :rem 161
370 A=A(J)-(AA*40)+80:GOSUB430:NEXTJ
                                    :rem 41
380 PRINT"{HOME}":FORI=1TO22:PRINT:NEXT:F
    ORI=1971TO1983:POKEI,32:NEXT    :rem 75
390 PRINT"WISH TO DO IT AGAIN? (Y/N)"
                                    :rem 65
400 GETZ$:IFZ$=""THEN400            :rem 125
410 IFZ$="Y"THEN100                 :rem 60
420 END                             :rem 109
430 IFAA=1THEN530                   :rem 221
440 IFAA=0THEN RETURN               :rem 37
450 POKEX,160:POKEX+1,231:POKEX+2,105
                                    :rem 162
460 POKEX+C,D:POKE(X+1)+C,D:POKE(X+2)+C,D
    :IFAA=2THEN490                  :rem 30
470 FORI=X-40TOASTEP-40:POKEI,160:POKEI+1
    ,231:POKEI+2,160                :rem 185
480 POKEI+C,D:POKE(I+1)+C,D:POKE(I+2)+C,D
    :NEXTI:GOTO510                  :rem 56
490 POKEA,247:POKEA+1,208:POKEA+2,105
                                    :rem 107
500 POKEA+C,D:POKE(A+1)+C,D:POKE(A+2)+C,D
    :GOTO530                        :rem 89
510 POKEA,247:POKEA+1,208:POKEA+2,224
                                    :rem 102
520 POKEA+C,D:POKE(A+1)+C,D:POKE(A+2)+C,D
                                    :rem 80
530 POKEA-40,233:POKEA-39,160:POKEA-38,20
    6                               :rem 105
540 POKE(A-40)+C,D:POKE(A-39)+C,D:POKE(A-
    38)+C,D                         :rem 172
550 RETURN                          :rem 122
```

Program 2:
Graph Plotter—VIC Version

```
100 PRINT"{CLR}":POKE36879,11     :rem 253
110 FORI=7726TO7745:POKEI,114:POKEI+30720
    ,5:NEXTI                      :rem 191
120 FORI=7748TO8034STEP22:POKEI,107:POKEI
    +30720,5:NEXTI                :rem 94
130 FORI=7767TO8053STEP22:POKEI,115:POKEI
    +30720,5:NEXTI                :rem 96
140 FORI=8056TO8075:POKEI,113:POKEI+30720
    ,5:NEXTI                      :rem 187
150 FORI=7793TO7810:POKEI,64:POKEI+30720,
    5:NEXTI                       :rem 148
160 FORI=7859TO7876:POKEI,64:POKEI+30720,
    5:NEXTI                       :rem 164
170 FORI=7925TO7942:POKEI,64:POKEI+30720,
    5:NEXTI                       :rem 153
180 FORI=7991TO8008:POKEI,64:POKEI+30720,
    5:NEXTI:PRINT                 :rem 94
190 PRINTSPC(0)"15":PRINTSPC(0)"14":PRINT
    SPC(0)"13":PRINTSPC(0)"12":PRINTSPC(0
    )"11"                         :rem 142
200 PRINTSPC(0)"10":PRINTSPC(1)"9":PRINTS
    PC(1)"8":PRINTSPC(1)"7"       :rem 44
210 PRINTSPC(1)"6":PRINTSPC(1)"5":rem 170
220 PRINTSPC(1)"4":PRINTSPC(1)"3":PRINTSP
    C(1)"2":PRINTSPC(1)"1":PRINTSPC(1)"0"
                                  :rem 147
230 PRINTTAB(4)"A"SPC(2)"B"SPC(2)"C"SPC(2
    )"D"SPC(2)"E"SPC(2)"F"        :rem 184
240 IFZ$="Y"THEN310               :rem 64
250 DATAA,B,C,D,E,F               :rem 34
260 FORI=1TO6:READA$(I):NEXTI     :rem 38
270 DATA7,6,4,3,5,1               :rem 201
280 FORI=1TO6:READD(I):NEXTI       :rem 7
290 DATA8035,8038,8041,8044,8047,8050
                                  :rem 113
300 FORI=1TO6:READA(I):NEXTI      :rem 253
310 C=30720:FORJ=1TO6             :rem 194
320 FORK=8138TO8141:POKEK,32:NEXTK:PRINT"
    {HOME}{19 DOWN}"              :rem 179
330 PRINT"COLUMN ";A$(J);" (0-15) ";
                                  :rem 62
340 INPUT Y$:IFVAL(Y$)=0THEN320   :rem 79
350 Y=VAL(Y$):Y=INT(Y+.5):D=D(J):X=A(J)
                                  :rem 23
360 IFY<0ORY>15THEN320            :rem 79
370 A=A(J)-(Y*22)+44:GOSUB430:NEXTJ
380 PRINT"{HOME}{20 DOWN}"        :rem 211
390 PRINT"DO IT AGAIN? (Y/N)"     :rem 99
400 GETZ$:IFZ$=""THEN400          :rem 125
410 IFZ$="Y"THEN100               :rem 60
420 END                           :rem 109
430 IFY=1THEN530                  :rem 180
440 IFY=0THENRETURN               :rem 252
450 POKEX,160:POKEX+1,231:POKEX+2,105
                                  :rem 162
460 POKEX+C,D:POKE(X+1)+C,D:POKE(X+2)+C,D
    :IFY=2THEN490                 :rem 245
470 FORI=X-22TOASTEP-22:POKEI,160:POKEI+1
    ,231:POKEI+2,160              :rem 185
480 POKEI+C,D:POKE(I+1)+C,D:POKE(I+2)+C,D
    :NEXTI:GOTO510                :rem 56
490 POKEA,227:POKEA+1,208:POKEA+2,105
                                  :rem 105
500 POKEA+C,D:POKE(A+1)+C,D:POKE(A+2)+C,D
    :GOTO530                      :rem 89
510 POKEA,227:POKEA+1,208:POKEA+2,224
                                  :rem 100
520 POKEA+C,D:POKE(A+1)+C,D:POKE(A+2)+C,D
                                  :rem 80
530 POKEA-22,233:POKEA-21,160:POKEA-20,20
    6                             :rem 87
540 POKE(A-22)+C,D:POKE(A-21)+C,D:POKE(A-
    20)+C,D                       :rem 154
550 RETURN                        :rem 122
```

64 BASIC Aid

(Article on page 156.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
39852 :173,254,159,133,055,173,095
39858 :255,159,133,056,169,076,002
39864 :133,124,173,217,155,133,095
39870 :125,173,218,155,133,126,096
39876 :076,143,156,240,003,076,122
39882 :008,175,169,201,133,124,244
39888 :169,058,133,125,169,176,014
39894 :133,126,096,219,155,133,052
39900 :139,134,151,186,189,001,252
39906 :001,201,140,240,016,208,008
39912 :002,164,140,166,151,165,252
39918 :139,201,058,176,003,076,123
39924 :128,000,096,189,002,001,148
39930 :201,164,208,237,165,139,084
39936 :016,002,230,122,132,140,130
39942 :162,000,134,165,202,232,133
39948 :164,122,185,000,002,056,029
39954 :253,217,159,240,019,201,083
39960 :128,240,019,230,165,232,014
39966 :189,216,159,016,250,189,025
39972 :217,159,208,228,240,191,255
39978 :232,200,208,224,132,122,136
39984 :165,165,010,170,189,245,224
39990 :159,072,189,244,159,072,181
39996 :032,233,155,076,115,000,159
40002 :032,178,157,165,095,166,091
40008 :096,133,036,134,037,032,028
40014 :019,166,165,095,166,096,017
40020 :144,010,160,001,177,095,159
40026 :240,004,170,136,177,095,144
40032 :133,122,134,123,165,036,041
40038 :056,229,122,170,165,037,113
40044 :229,123,168,176,030,138,204
40050 :024,101,045,133,045,152,102
40056 :101,046,133,046,160,000,094
40062 :177,122,145,036,200,208,246
40068 :249,230,123,230,037,165,142
40074 :046,197,037,176,239,032,097
40080 :051,165,165,034,166,035,248
40086 :024,105,002,133,045,144,091
40092 :001,232,134,046,032,089,178
40098 :166,076,131,164,032,124,087
40104 :165,032,115,000,133,139,240
40110 :162,000,134,073,032,140,203
40116 :157,165,165,201,000,208,052
40122 :007,162,002,134,073,032,084
40128 :140,157,032,115,000,240,108
```

```
40134 :003,032,253,174,032,178,102
40140 :157,165,095,166,096,133,248
40146 :122,134,123,032,215,170,238
40152 :208,011,200,152,024,101,144
40158 :122,133,122,144,002,230,207
40164 :123,032,202,159,240,005,221
40170 :032,220,157,176,003,076,130
40176 :143,156,132,085,230,085,047
40182 :164,085,166,049,165,050,157
40188 :133,139,177,122,240,216,255
40194 :221,000,002,208,237,232,134
40200 :200,198,139,208,241,136,106
40206 :132,011,132,151,165,073,166
40212 :240,091,032,240,157,165,177
40218 :052,056,229,050,133,167,201
40224 :240,040,200,240,202,177,107
40230 :122,208,249,024,152,101,126
40236 :167,201,002,144,064,201,055
40242 :075,176,060,165,167,016,197
40248 :002,198,139,024,101,011,019
40254 :133,151,176,005,032,036,083
40260 :158,240,003,032,012,158,159
40266 :165,151,056,229,052,168,127
40272 :200,165,052,240,015,133,117
40278 :140,166,051,189,000,002,122
40284 :145,122,232,200,198,140,105
40290 :208,245,024,165,045,101,118
40296 :167,133,045,165,046,101,249
40302 :139,133,046,165,122,166,113
40308 :123,133,095,134,096,166,095
40314 :067,165,068,032,061,158,161
40320 :032,225,255,169,000,133,174
40326 :198,164,151,076,242,156,097
40332 :164,122,200,148,049,169,224
40338 :000,149,050,185,000,002,020
40344 :240,021,197,139,240,005,226
40350 :246,050,200,208,242,132,212
40356 :122,096,201,171,240,004,230
40362 :201,045,208,001,096,076,029
40368 :008,175,144,005,240,003,239
40374 :032,166,157,032,107,169,077
40380 :032,019,166,032,121,000,046
40386 :240,011,032,166,157,032,064
40392 :115,000,032,107,169,208,063
40398 :224,165,020,005,021,208,081
40404 :006,169,255,133,020,133,160
40410 :021,096,032,202,159,133,093
40416 :067,032,202,159,133,068,117
40422 :056,165,020,229,067,165,164
40428 :021,229,068,096,165,122,169
40434 :133,034,165,123,133,035,097
40440 :165,045,133,036,165,046,070
40446 :133,037,096,165,034,197,148
40452 :036,208,004,165,035,197,137
40458 :037,096,164,011,200,177,183
40464 :034,164,151,200,145,034,232
40470 :032,001,158,208,001,096,006
40476 :230,034,208,236,230,035,233
40482 :208,232,164,011,177,036,094
40488 :164,151,145,036,032,001,057
40494 :158,208,001,096,165,036,198
40500 :208,002,198,037,198,036,219
40506 :076,036,158,160,000,132,108
40512 :165,132,015,032,205,189,034
40518 :169,032,164,165,041,127,000
40524 :032,210,255,201,034,208,248
40530 :006,165,015,073,255,133,217
40536 :015,200,177,095,240,025,072
40542 :016,236,201,255,240,232,250
40548 :036,015,048,228,132,165,212
40554 :032,124,158,200,177,174,203
40560 :048,214,032,210,255,208,055
40566 :246,032,215,170,056,096,165
40572 :160,157,132,174,160,160,043
40578 :132,175,056,233,127,170,255
40584 :160,000,202,240,238,230,182
40590 :174,208,002,230,175,177,084
40596 :174,016,246,048,241,032,137
40602 :107,169,165,020,133,053,033
40608 :165,021,133,054,032,253,050
40614 :174,032,107,169,165,020,065
40620 :133,051,165,021,133,052,215
40626 :032,142,166,032,202,159,143
40632 :032,202,159,208,033,032,082
40638 :172,159,032,202,159,032,178
40644 :202,159,208,003,076,143,219
40650 :156,032,202,159,165,099,247
40656 :145,122,032,202,159,165,009
40662 :098,145,122,032,183,159,185
40668 :240,226,032,202,159,032,087
40674 :202,159,032,202,159,201,157
40680 :034,208,011,032,202,159,110
40686 :240,197,201,034,208,247,085
40692 :240,238,170,240,188,016,056
40698 :233,162,004,221,212,159,217
40704 :240,005,202,208,248,240,119
40710 :221,165,122,133,059,165,103
40716 :123,133,060,032,115,000,219
40722 :176,211,032,107,169,032,233
40728 :081,159,165,060,133,123,233
40734 :165,059,133,122,160,000,157
40740 :162,000,189,000,001,201,077
40746 :048,144,017,072,032,115,214
40752 :000,144,003,032,130,159,004
40758 :104,160,000,145,122,232,049
40764 :208,232,032,115,000,176,055
40770 :008,032,145,159,032,121,051
40776 :000,144,248,201,044,240,181
40782 :184,208,150,032,172,159,215
40788 :032,202,159,032,202,159,102
40794 :208,008,169,255,133,099,194
40800 :133,098,048,014,032,202,111
40806 :159,197,020,208,015,032,221
40812 :202,159,197,021,208,011,138
40818 :032,209,189,169,032,076,053
40824 :210,255,032,202,159,032,242
40830 :183,159,240,210,032,162,088
40836 :159,230,151,032,036,158,130
40842 :230,045,208,002,230,046,131
40848 :096,032,162,159,198,151,174
40854 :032,012,158,165,045,208,002
40860 :002,198,046,198,045,096,229
40866 :032,240,157,160,000,132,115
40872 :011,132,151,096,165,053,008
40878 :133,099,165,054,133,098,088
40884 :076,142,166,165,099,024,084
40890 :101,051,133,099,165,098,065
40896 :101,052,133,098,032,202,042
40902 :159,208,251,096,160,000,048
40908 :230,122,208,002,230,123,095
40914 :177,122,096,137,138,141,253
40920 :167,067,072,065,078,071,224
40926 :197,068,069,076,069,084,017
40932 :197,070,073,078,196,075,149
40938 :073,076,204,078,085,077,059
40944 :066,069,210,000,165,156,138
40950 :065,156,165,156,198,155,117
40956 :152,158,172,013,013,013,005
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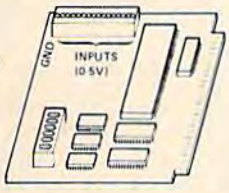

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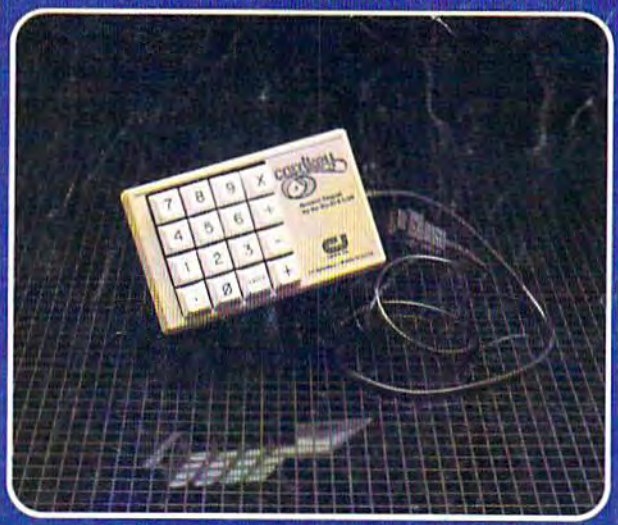

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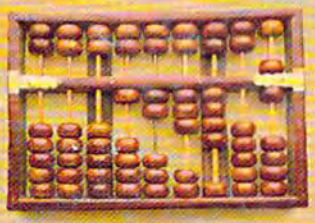

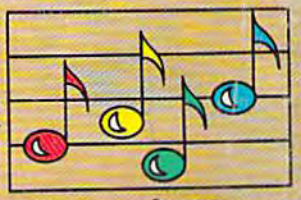

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